WEBSTER'S AMERICAN ENCYCLOPEDIA

L. F. ERICKSON
908 South New Street
Champoign, Illinois

LIBRARY OF THE
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

031
W399

WEBSTER'S AMERICAN ENCYCLOPEDIA

Any person familiar with the average encyclopedia has become impressed with the fact that modern reference works have departed from their original purpose of furnishing accessible and usable information to the public. True, the information is to be found within their bulky volumes but it is incumbent to read scores of pages burdened with technical expressions to gain the few facts necessary to the purpose of the average seeker of knowledge. The articles are erudite and written in a language intelligible only to those learned in the subjects.

The editors, in maturing the plans for this new encyclopedia, decided to produce a reference work in one volume which would be a complete library of useful information; a volume which would contain this wealth of information in a form both accessible to the public and written with sufficient vividness to be interesting; an encyclopedia intended to tell you what you want to know rather than to impress you with the great learning of the writers.

The editors believe that this new work is the only encyclopedia which has been prepared so that all, even the child at school, can understand—a reference work suitable for the clerk, the mechanic, the farmer, the school child, the professional and the business man's desk. At a moment's notice there is placed at the disposal of the reader in a concise, accurate and attractive form the essential facts requisite to the intelligent conception of any subject of human interest. In the working out of these plans the public may be assured that the condensation of the material and the simplification of the language has been intrusted to skilled hands.

The special features the editors claim for this new work are:—First: convenient size—a single volume; second: brevity, simplicity and precision of treatment; third: careful and systematic grouping of material; fourth: readableness—all the articles are written in simple, everyday, business English; and fifth: being new, it has the advantage of the latest information. The editors believe that in every way this work will meet the demands of this exacting age.

The excellence of the mechanical features, paper, illustrations, binding and typography show that no effort has been spared to make the Webster's American Encyclopedia equal to any other reference work that has been placed at the disposal of the public.

Charles Higgins

PRICE, $6.00

EDITORIAL STAFF

CHARLES HIGGINS, MANAGING EDITOR AMERICANIZED ENCYCLOPEDIA BRITTANICA

Assisted by a large corps of specialists and experts, including Associate Editors of the Americanized Encyclopedia Brittanica.

LESLIE-JUDGE COMPANY, NEW YORK

H.G. CARNAHAN CO. CHI.

PUBLISHER'S NOTE

The Webster's American Encyclopedia is a comprehensive presentation of Universal Knowledge. It has 1312 pages and two thousand illustrations and is revised up to the latest date.

It gives a comprehensive yet concise treatment of every principal subject in the English language.

The editors of the various departments, men of international repute in their various fields, have kept always in mind that the essentials of a practical encyclopedia are comprehensiveness, accuracy and simplicity. This work is distinguished by a combination of these requisites.

The value of such a comprehensive and carefully edited work to every intelligent person, cannot be overestimated. It is a complete library in itself.

Copyright 1909
DE BOWER-CHAPLINE CO.

A

A, the first letter in almost all alphabets. Most modern languages, as French, Italian, German, have only one sound for a, namely, the sound which is heard in father pronounced short or long; in English this letter is made to represent seven sounds, as in the words father, mat, mate, mare, many, ball, what, besides being used in such digraphs as ea in heat, oa in boat.—A, in music, is the sixth note in the diatonic scale of C, and stands when in perfect tune to the latter note in the ratio of $\frac{5}{3}$ to 1. The second string of the violin is tuned to this note.

A 1, a symbol attached to vessels of the highest class, A referring to the hull of the vessel, while 1 intimates the sufficiency of the rigging and whole equipment.

AA (ä), the name of a great many streams of central and northern Europe.

AACHEN (ä'*h*ĕn). See Aix-la-Chapelle.

AALBORG (ōl'bor*h*), a seaport of Denmark, on the Liimfiord, see of a bishop, with a considerable trade, shipbuilding, fishing, etc. Pop. 31,457.

AAR (är), the name of several European rivers, of which the chief (160 miles long) is a tributary of the Rhine, next to it and the Rhone the longest river in Switzerland. It has its origin from the upper and lower glaciers of the Aar in the Bernese Alps. On it are Interlaken, Thun, Bern, Solothurn, and Aarau, to which, as to the canton of Aargau, it gives its name.

Aard-vark.

AARD-VARK (ärd'vark), a burrowing insectivorous animal of South Africa, having affinities with the ant-eaters and armadillos. Called also ground-hog and Cape pig.

AARDWOLF (ärd'wulf), a carnivorous burrowing animal of South Africa, allied to the hyenas and civets. Feeds on carrion, small mammals, insects, etc.

AARGAU (är'gou), or **ARGOVIE** (argo-vē), a northern canton of Switzerland; arca, 543 square miles; hilly, well wooded, abundantly watered by the Aar and its tributaries, and well cultivated. It formed part of the canton Bern till 1798. Pop. 206,498, of whom more than half are Protestants. German is almost universally spoken. Capital, Aarau.

AARON (ā'ron), of the tribe of Levi, eldest son of Amram and Jochebed, and brother and assistant of Moses. At Sinai, when the people became impatient at the long-continued absence of Moses, he complied with their request in making a golden calf, and thus became involved with them in the guilt of gross idolatry. The office of high-priest, which he first filled, was made hereditary in his family. He died at Mount Hor at the age of 123, and was succeeded by his son Eleazar.

AARON'S ROD. See Goldenrod and Mullein.

AB, the eleventh month of the Jewish civil, the fifth of the ecclesiastical, year—part of July and part of August.

AB'ACA, or Manila Hemp, a strong fiber yielded by the leaf-stalks of a kind of plantain which grows in the Indian Archipelago, and is cultivated in the Philippines. The outer fibers of the leaf-stalks are made into strong and durable ropes, the inner into various fine fabrics.

AB'ACO, Great and Little, two islands of the Bahamas group.

AB'ACUS, a Latin term applied to an apparatus used in elementary schools for facilitating arithmetical operations, consisting of a number of parallel cords or wires, upon which balls or beads are

Abacus.

Doric capital—*a*, the abacus.

strung, the uppermost wire being appropriated to units, the next to tens, etc.—In classic architecture it denotes the tablet forming the upper member of a column, and supporting the entablature. In Gothic architecture the upper member of a column from which the arch springs.

ABAD'DON, the name given in Rev. ix. 11 as that of the angel of the bottomless pit, otherwise called Apollyon.

ABALONE (ab-a-lō'ne), a name in California for a species of ear-shell that furnishes mother-of-pearl.

ABAN'DONMENT, a term in criminal law. Abandonment is the intentional exposure or desertion of a dependent person by one who is under a legal duty of protecting and maintaining him. A parent or a guardian of the person of a young child is guilty of a misdemeanor at common law if the child is physically injured in consequence of the abandonment; while if death results therefrom the abandoning parent or guardian is guilty of murder.

ABA'RIM, mountain range of eastern Palestine, including Nebo, on which Moses died.

ABATEMENT, in law, has various significations. Abatement of nuisances is the remedy allowed to a person injured by a public or private nuisance, by destroying or removing it himself. A plea in abatement is brought forward by a defendant when he wishes to defeat or quash a particular action on some formal or technical ground. Abatement, in mercantile law, is an allowance, deduction, or discount made for prompt payment or other reason.

AB'ATIS, ABATTIS, in military affairs, a mass of trees cut down and laid with their branches turned toward the enemy in such a way as to form a defense for troops stationed behind them.

ABATTOIR (ab-at-war'), a French term for a slaughter-house, now anglicized since the establishment of the celebrated abattoirs of Paris, instituted by Napoleon in 1807, and brought to completion in 1818. Such public slaughter-houses, provided with every sort of convenience, kept admirably clean, and with a plentiful supply of water, are now to be found in many large towns.

ABBA, a Semitic word equivalent to "Father," which, being applied in the Eastern Church to monks, superiors of monks, and other ecclesiastics, gave rise to the word abbot. In the Syriac and Coptic Churches it is given to the bishops.

ABBAS I., the Great, shah or king of Persia, born in 1557, obtained the throne in 1586, and at his death in 1628 his dominions stretched from the Tigris to the Indus. He is looked upon by the Persians as their greatest sovereign.

ABBASSIDES (ab'as-sīdz), the name of an Arabian dynasty which supplanted the Ommiades. It traced its descent from Abbas (born 566, died 652), uncle of Mohammed, and furnished thirty-seven caliphs to Bagdad between 749 and 1258. Harun al Rashid was a member of this dynasty. See Caliphs.

ABBE (ab-ā), the French word for abbot, was, before the French revolution, the common title of all who had studied theology either with a view to becoming ordained clergymen, or merely in the hope of obtaining some appointment or benefice, to which such study was considered a preliminary requisite.

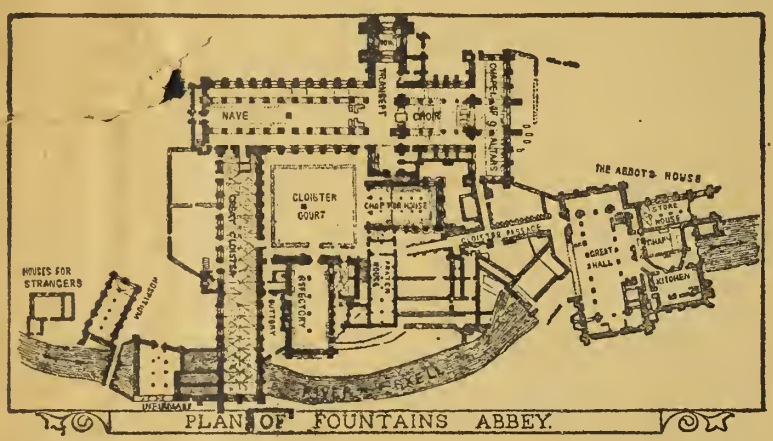
AB'BE, Cleveland, American astronomer and meteorologist, born in New York City 1838. He graduated in 1857 at the Free Academy (now the College of the City of New York), and studied astronomy at Ann Arbor and at Cambridge. From 1868 to 1873 he was director of the Cincinnati Observatory, where he inaugurated a system of daily weather forecasts based upon simultaneous meteorological observations reported by telegraph. In December, 1870, Professor Abbe was called to Washington to prepare the official weather predictions and storm warnings, and was appointed professor of meteorology in the Weather Bureau. To him is due the initiation in 1879, of the movement towar

UNIVERSITY OF
ILLINOIS LIBRARY
AT URBANA-CHAMPAIGN

introduction of the present system of standard time and hourly meridians. In January, 1873, he prepared the first official Monthly Weather Review, which has continued under his editorship. He is professor of meteorology in Columbian University, Washington, lecturer on meteorology in Johns Hopkins University, Baltimore, and a member of the National Academy of Sciences.

ABBEOKU'TA, a town of West Africa, in the Lagos Protectorate, on the Ogun river 45 miles n. of Lagos, composed of scattered lines of mud houses, surrounded by a mud wall. It is connected with Lagos by a railway. Pop. 100,000 to 150,000.

AB'BEY, a monastery or religious community of the highest class, governed by an abbot, assisted generally by a prior, sub-prior, and other subordinate functionaries; or, in the case of a female community, superintended by an abbess. An abbey invariably included a church. A priory differed from an abbey only in being scarcely so extensive an establishment, and was governed by a prior. Some priories sprang originally from the more important abbeys, and remained under the jurisdiction of the abbots; but subsequently any real distinction between abbeys and priories was lost. The greater abbeys formed most complete and extensive establishments, including not only the church and other buildings devoted to the monastic life and its daily requirements, such as the refectory or eating-room, the dormitories or sleeping-rooms, the room for social intercourse, the school for novices, the scribes' cells, library, and so on; but also workshops, storehouses, mills, cattle and poultry sheds, dwellings for artisans, laborers, and other servants, infirmary, guest-house, etc.



PLAN OF FOUNTAINS ABBEY.

ABBEY, Edwin Austin, American figure painter. He was born in Philadelphia, April 1, 1852. He studied at the Pennsylvania Academy of the Fine Arts, and afterward worked in New York until 1883, when he removed to England. In painting he has produced important canvases, dealing with subjects taken from Shakespeare and from romantic story. One of his most important works decorates the delivery room of the Boston Public Library. Its subject is the "Search for the Holy Grail." He was commissioned to paint the scene of the coronation of King Edward VII.

AB'BOT, the head of an abbey (see Abbey), the lady of similar rank being called abbess. An abbess, however, was not, like the abbot, allowed to exercise the spiritual functions of the priesthood, such as preaching, confessing, etc.; nor did abbesses ever succeed in freeing themselves from the control of their diocesan bishop. In the early age of monastic institutions (say 300–600 A.D.) the monks were not priests, but simply laymen who retired from the world to live in common, and the abbot was also a layman. In the course of time the abbots were usually ordained, and when an abbey was directly attached to a cathedral the bishop was also abbot. At first the abbeys were more remarkable for their numbers than for their magnitude, but latterly many of them were large and richly endowed, and the heads of such establishments became personages of no small influence and power, more especially after the abbots succeeded (by the eleventh century) in freeing themselves from the jurisdiction of the bishop of their diocese.

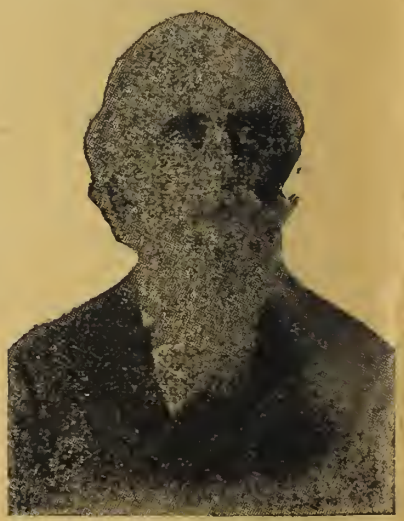
AB'BOTSFORD, the country-seat of Sir Walter Scott, on the south bank of the Tweed, in Roxburghshire, 3 miles from Melrose, in the midst of picturesque scenery, forming an extensive and irregular pile in the Scottish baronial style of architecture.

ABBOTT, Emma (Emma Abbott Wetherell), an American soprano, born 1849 in Chicago, Ill. She studied in Milan under San Giovanni and in Paris under Wartel and Albert James. She made her debut at Covent Garden, London. For three years thereafter she made an operatic and concert tour of England and Ireland under the direction of Colonel Mapleson. Subsequently she returned to the United States, where she sang with the Abbott and Hess Opera Company, and later with the English opera company long known by her name. She died in 1891.

ABBOTT, Jacob, a popular juvenile writer, born at Hallowell, Me., 1803. From 1825 to 1829 he was professor of mathematics and natural philosophy at Amherst. In 1839 he moved to Farmington. He died October 31, 1879. Abbott published more than two hundred volumes, the most noteworthy of which are The Rollo Books (28 volumes), The Franconia Stories (10 volumes), The Rainbow and Lucky Series (5 volumes), a number of juvenile histories, written in collaboration with his brother, and a series of histories of America.

ABBOTT, John Stephens Cabot, an American historian, a brother of Jacob Abbott, was born at Brunswick, Me., 1805, and graduated at Bowdoin College in 1825. He died at Fairhaven, Conn., June 17, 1887. His most noteworthy books are The French Revolution, The History of Napoleon Bonaparte, Napoleon at St. Helena, The History of Napoleon the Third, The History of the Civil War in America, and the History of Frederick II., Called Frederick the Great.

ABBOTT, Lyman, D.D. An American Congregational clergyman and editor, born at Roxbury, Mass., in 1835, son of Jacob Abbott. He graduated at the New York University in 1853. From 1869 he was successively one of the editors of Harper's Magazine, and the principal editor of the illustrated Christian Weekly. He succeeded Henry Ward Beecher as pastor of Plymouth Church, Brooklyn, in 1888, but resigned in May, 1899, and has since devoted himself entirely to literary work.


Lyman Abbott.

ABBREVIA'TIONS, devices used in writing and printing to save time and space: consisting usually of curtailments effected in words and syllables by the removal of some letters, often of the whole of the letters except the first. The following is a list of the more important:—

A.B., *artium baccalaureus,* bachelor of arts; able seaman.

Abp., archbishop

A.C., *ante Christum,* before Christ.

Ac., acre.

Acc., %, or acct., account.

A.D., *anno Domini*, in the year of our Lord: used also as if equivalent to "after Christ," or "of the Christian era."
A.D.C., aide-de-camp.
Æt. or **Ætat.**, *ætatis* (*anno*), in the year of his age.
A.H., *anno Hejiræ*, in the year of the Hegira.
A.M., *ante meridiem*, forenoon; *anno mundi*, in the year of the world; *artium magister*, master of arts.
Anon., anonymous.
A.R.A., associate of Royal Academy (London).
A.R.S.A., associate of the Royal Scottish Academy.
A.U.C, *ab urbe conditâ*, from the building of Rome (753 B.C.).
A.V., authorized version.
B.A., bachelor of arts.
Bart. or **Bt.**, baronet.
B.C., before Christ.
B.C.L., bachelor of civil law.
B.D., bachelor of divinity.
B.L., bachelor of law.
B.M., bachelor of medicine.
Bp., bishop.
B.S., bachelor of surgery.
B.Sc., bachelor of science.
B.V., blessed Virgin.
C., cap., or chap., chapter.
C.A., chartered accountant.
Cantab., *Cantabrigiensis*, of Cambridge
Cantuar., *Cantuariensis*, of Canterbury.
C.B., companion of the Bath.
C.D.V., carte de visite.
C.E., civil engineer.
Cf., *confer*, compare.
C.I., order of the Crown of India.
C.I.E., companion of the Indian Empire.
C.J., chief justice.
C.M., *chirurgiæ magister*, master in surgery; common meter.
C.M.G. companion of the order of St. Michael and St. George.
Co., company or county.
C.O.D., cash on delivery.
Cr., creditor.
Crim. con., criminal conversation.
C.S., civil service, clerk to the signet.
C.S.I., companion of the Star of India.
Ct., Connecticut.
Curt., current, the present month.
Cwt., hundredweight.
d., *denarius*, penny or pence.
D.C., District of Columbia.
D.C.L., doctor of civil law.
D.D., doctor of divinity.
Del., *delineavit*, drew it.
D.F., defender of the faith.
D.G., *Dei gratia*, by the grace of God.
D.L., deputy lieutenant.
D. Litt., *doctor litterarum*, doctor of letters.
Do., *ditto*, the same.
D.O.M., *Deo Optimo Maximo*, to God, the best and greatest.
Dr., doctor, also debtor.
D.Sc., doctor of science.
D.V., *Deo volente*, God willing.
Dwt., pennyweight.
E., east.
Ebor., *Eboracensis*, of York.
E.C., established church.
E.E., errors excepted.
e.g., *exempli gratia*, for example.
E.I., East Indies.
Etc. or **&c.**, *et cetera*, and the rest.
Exr., executor.
F. or **Fahr.**, Fahrenheit's thermometer.
F.A.S., fellow of the Antiquarian Society.
F.C., Free Church.
F.D., *fidei defensor*, defender of the faith.
Fec., *fecit*, he made or did it.
F.G.S., fellow of the Geological Society.
F.H.S., fellow of the Horticultural Society.
Fl., flourished.
Fla., Florida.
F.L.S., fellow of the Linnæan Society.
F.M., field-marshal.
F.O.B., free on board (goods delivered).
F.R.A.S., fellow of the Royal Astronomical (or Asiatic) Society.
F.R.C.P., fellow of the Royal College of Physicians.
F.R.C.S., fellow of the Royal College of Surgeons.
F.R.G.S., fellow of the Royal Geographical Society.
F.R.S., fellow of the Royal Society.
F.R.S.E., fellow of the Royal Society of Edinburgh.
F.S.A., fellow of the Society of Arts or Antiquaries.
F.S.S., fellow of the Statistical Society.
Ft., foot or feet.
F.Z.S., fellow of the Zoological Society.
Ga., Georgia.
Gal., gallon.
G.C.B., grand cross of the Bath.
G.C.M.G., grand cross of St. Michael and St. George.
G.C.S.I., grand commander of the Star of India.
G.P.O., general post-office.
H.B.M., his or her Britannic majesty.
H.E.I.C.S., honorable East India Company's service.
Hhd., hogshead.
H.I.H., his or her imperial highness.
H.M.S., his or her majesty's ship.
Hon., honorable.
H.R., house of representatives.
H.R.H., his (her) royal highness.
H.S.H., his (her) serene highness.
Ia., Iowa.
Ib. or **Ibid.**, *ibīdem*, in the same place.
Id., *idem*, the same.
i.e., *id est*, that is.
I.H.S., *Jesus hominum salvator*, Jesus the Savior of men: originally it was IHΣ, the first three letters of ΙΗΣΟΥΣ (*Iēsous*), *Jesus*.
Incog., *incognito*, unknown.
Inf., *infra*, below.
I.N.R.I., *Iesus Nazarenus Rex Iudæorum*, Jesus of Nazareth, King of the Jews.
Inst., instant, or of this month; institute.
I.O.U., I owe you.
J.P., justice of the peace.
Jr., junior.
J.U.D., *juris utriusque doctor*, doctor both of the civil and the canon law.
K.C., king's counsel.
K.C.B., knight commander of the Bath.
K.C.M.G., knight commander of St. Michael and St. George.
K.C.S.I., knight commander of the Star of India.
K.G., knight of the Garter.
K.G.C.B. knight grand cross of the Bath.
K.P., knight of St. Patrick.
K.T., knight of the Thistle.
Kt. or **Knt.**, knight.
Ky., Kentucky.
L.,**l.**, or **£**, pounds sterling.
L.A., literate in arts.
La., Louisiana.
Lat., latitude.
Lb. or **lb.**, *libra*, a pound (weight).
L.C.J., lord chief-justice.
Ldp., lordship.
L.D.S., licentiate in dental surgery.
Lit. D., doctor of literature.
L.L., Low Latin.
L.L.A., lady literate in arts.
LL.B., *legum baccalaureus*, bachelor of laws.
LL.D., *legum doctor*, doctor of laws (that is, the civil and the canon law).
LL.M., master of laws.
Lon. or **Long.**, longitude.
L.R.C.P., licentiate Royal College of Physicians.
L.R.C.S., licentiate of the Royal College of Surgeons.
L.S.A., licentiate of the Society of Apothecaries.
L.S.D., *libræ*, *solidi*, *denarii*, pounds, shillings, pence.
M.A., master of arts.
Mass., Massachusetts.
M.B., *medicinæ baccalaureus*, bachelor of medicine.
M.C., member of Congress; master in surgery.
M.D., *medicinæ doctor*, doctor of medicine.
Md., Maryland.
Me., Maine.
M.E., mining engineer; Methodist Episcopal.
Messrs., messieurs, gentlemen.
M.F.H., master of fox-hounds.
M.I.C.E., member of the Institution of Civil Engineers.
Mlle., mademoiselle.
Mme., madame.
Mo., Missouri.
M.P., member of Parliament.
M.R.C.S., member of the Royal College of Surgeons.
M.R.C.V.S., member of the Royal College of Veterinary Surgeons.
M.R.I.A., member of the Royal Irish Academy.
MS., manuscript; **MSS.**, manuscripts.
Mus. D., *musicæ doctor*, doctor of music.
N., north.
N.B., *nota bene*, take notice; also North Britain, New Brunswick.
N.C., North Carolina.
N.D., no date.
Nem. con., *nemine contradicente*, one contradicting, unanimously.
N.H., New Hampshire.
N.J., New Jersey.
No., *numero*, number.
N.P., notary public.
N.S., new style, Nova Scotia
N.S.W., New South Wales.
N.T., New Testament.
N.Y., New York.
N.Z., New Zealand.
O., Ohio.
Ob., *obiit*, died.

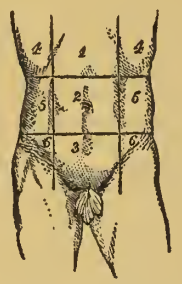
O S., old style.
O.T., Old Testament.
Oxon., *Oxoniensis*, of Oxford.
Oz., ounce or ounces.
Pa., Pennsylvania.
P.C., privy-councilor.
P.E., Protestant Episcopal.
Per cent., *per centum*, by the hundred.
Ph.D., *philosophiæ doctor*, doctor of philosophy.
Pinx., *pinxit*, painted it.
P.M., *post meridiem*, afternoon.
P.O., post-office.
P.O.O., post-office order.
P.P., parish priest.
Pp., pages.
P.P.C., *pour prendre congé*, to take leave.
Prox., *proximo* (*mense*), next month.
P.S., postscript.
Q., question; queen.
Q.C., queen's counsel.
Q.E.D., *quod erat demonstrandum*, which was to be demonstrated.
Q.E.F., *quod erat faciendum*, which was to be done.
Qu., query.
Quant. suff., *quantum sufficit*, as much as is needful.
Q.V., *quod vide*, which see.
R., *rex*, *regina*, king, queen.
R.A., royal academician; royal artillery.
R.A.M., Royal Academy of Music.
R.C., Roman Catholic.
R.E., royal engineers.
Rev., reverend.
R.H.A., Royal Hibernian Academician.
R.I., Rhode Island.
R.I.P., *requiescat in pace*, may he rest in peace.
R.M., royal marines.
R.N., royal navy.
R.S.A., royal Scottish academician.
R.S.V.P., *répondez, s'il vous plait*, reply, if you please.
Rt. Hon., right honorable.
Rt. Wpful., right worshipful.
R.V., revised version.
S., South.
S. or St., saint.
S.C., South Carolina.
Sc., *scilicet*, namely, viz.
S.J., Society of Jesus (Jesuits).
S.P.C.K., Society for Promoting Christian Knowledge.
S.P.Q.R., *senatus populusque Romanus*, the senate and people of Rome.
S.S.C., solicitor before the supreme courts.
St., saint, street.
S.T.D., *sacræ theologiæ doctor*, doctor of divinity.
S.T.P., *sacræ theologiæ professor*, professor of divinity.
T.C.D., Trinity College, Dublin.
Ult., *ultimo*, last.
U.P., United Presbyterian.
U.S., United States.
U.S.A., United States of America.
U.S.N., United States navy.
V., *vide*, see; also *versus*, against.
Va., Virginia.
V.C., Victoria Cross.
Viz., *videlicet*, to wit, or namely.
V.P., vice-president.
V.S., veterinary surgeon.
Vt., Vermont.
W., west.
W.I., West Indies.
W.S., writer to the signet.
Xmas, Christmas.

In **LL.D.**, **LL.B.**, etc., the letter is doubled, according to the Roman system, to show that the abbreviation represents a plural noun.

ABDE'RA, an ancient Greek city on the Thracian coast, the birthplace of Democritus (the laughing philosopher), Anaxarchus, and Protagoras. Its inhabitants were proverbial for stupidity.

ABDICA'TION, properly the voluntary, but sometimes also the involuntary resignation of an office or dignity, and more especially that of sovereign power.

ABDO'MEN, in man, the belly, or lower cavity of the trunk, separated from the upper cavity or thorax by the diaphragm or midriff, and bounded below by the bones of the pelvis. It contains



Abdominal regions.

the viscera belonging to the digestive and urinary systems. What are called the abdominal regions will be understood from the accompanying cut, in which 1 is the epigastric region, 2 the umbilical, 3 the pubic, 4 4 the right and left hypochondriac, 5 5 the right and left lumbar, 6 6 right and left iliac. The name is given to the corresponding portion of the body in other animals. In insects it comprises the whole body behind the thorax, usually consisting of a series of rings.

ABDOM'INAL FISHES, a group of the soft-finned fishes, having fins upon the abdomen, and comprising the herring, pike, salmon, carp, etc.

ABDUC'TION, a legal term, generally applied to denote the offense of carrying off a female, either forcibly or by fraudulent representations. Such a delinquency with regard to a man is styled kidnapping. There are various descriptions of abduction recognized in criminal jurisprudence, such as that of a child, of an heiress, or of a wife.

AB'DUL-HAM'ID, Sultan of Turkey, born in 1842, succeeded his brother Murad V., who was deposed on proof of his insanity in 1876.

ABECEDA'RIAN, a term formed from the first four letters of the alphabet, and applied to the followers of Storch, a German Anabaptist, in the sixteenth century, because they rejected all worldly knowledge, even the learning of the alphabet.

A BECK'ETT, Gilbert Abbot, English writer, born near London, in 1811. He wrote Comic History of England, Comic History of Rome, and Comic Blackstone, and between fifty and sixty plays, some of which still keep the stage. He died in 1856.

A BECKETT, Thomas. See Becket.

ABEL, properly Hebel, the second son of Adam. He was a shepherd, and was slain by his brother Cain from jealousy because his sacrifice was accepted, while Cain's was rejected. Several of the fathers, among others SS. Chrysostom and Augustin, regard him as a type of Christ.

ABELARD (ab'e-lärd), or **ABAILARD,** Peter, a celebrated scholastic teacher, born near Nantes in Brittany, in 1079. He made extraordinary progress with his studies, and, ultimately eclipsing his teachers, he opened a school of scholastic philosophy near Paris, which attracted crowds of students from the neighboring city. His success in the fiery debates which were then the fashion in the schools made him many enemies, among whom was Guillaume de Champeaux, his former teacher, chief of the cathedral school of Notre-Dame, and the most advanced of the Realists. Abelard succeeded his adversary in this school (in 1113), and under him were trained many men who afterward rose to eminence, among them being the future Pope Celestin II., Peter Lombard, and Arnold of Brescia. While he was at the height of his popularity, and in his fortieth year, he became infatuated with a passion for Heloise—then only eighteen years of age—niece of Fulbert, a canon of Paris. Obtaining a home in Fulbert's house under the pretext of teaching Heloise philosophy, their intercourse at length became apparent, and Abelard, who had retired to Brittany, was followed by Heloise, who there gave birth to a son. A private marriage took place, and Heloise returned to her uncle's house, but, refusing to make public her marriage (as likely to spoil Abelard's career), she was subjected to severe treatment at the hands of her uncle. To save her from this Abelard carried her off and placed her in a convent at Argenteuil, a proceeding which so incensed Fulbert that he hired ruffians, who broke into Abelard's chamber and subjected him to a shameful mutilation. Abelard, filled with grief and shame, became a monk in the abbey of St. Denis, and Heloise took the veil. Abelard did not long survive, dying at St. Marcel, near Châlon-sur-Sâone, 1142. Heloise, who had become abbess of the Paraclete, had him buried there, where she herself was afterward laid by his side.

ABELE (a-bēl'), a name of the white poplar.

A'BELITE, ABE'LIAN, a member of a religious sect in Africa which arose in the fourth century after Christ. They married, but lived in continence, after the manner, as they maintained, of Abel, and attempted to keep up the sect by adopting the children of others.

ABELMOS'CHUS (-mos'kus), a genus of tropical plants of the mallow family. One species yields edible pods and also a valuable fiber. The fruit, called okra or ochra, is used in soups.

AB'ERCROMBIE, John, M.D., a Scottish writer on medical and moral science, and an eminent physician, born in Aberdeen, 1781, died at Edinburgh in 1844. He graduated at the university of Edinburgh in 1803, and subsequently

pursued his studies in London, returning to Edinburgh in 1804, where he acquired an extensive practice as a physician. He is known from his Inquiries concerning the Intellectual Powers and his Philosophy of the Moral Feelings.

ABERDEEN', a university city, and royal, municipal, and parliamentary burgh of Scotland, cap. of the county of same name, mainly on the north bank of the Dee at its entrance into the German Occan, and between this river and the Don, with a part also on the south bank of the Dee, while the municipal limits include the adjacent Woodside. There are docks 34 acres in area, an extensive tidal harbor and basin, and a graving-dock. The shipping trade is extensive. The industries embrace wool, cotton, jute, linen, combs, soap, preserved provisions, chemicals, paper, shipbuilding, and especially the cutting and polishing of granite. The fishing industry is of great importance. Pop. (1901), 153,100.—The County of Aberdeen forms the northeastern portion of Scotland, and is bounded on the east and north by the North Sea. Area, 1,251,451 acres. It is divided into six districts (Mar, Formartine, Buchan, Alford, Garioch, and Strathbogie), and is generally hilly, there being in the southwest some of the highest mountains in Scotland, as Ben Macdhui (4295 feet), Cairntoul (4245), Cairngorm (4090), Lochnagar, etc. Pop. 304,420.

ABERRA'TION, in astronomy, the difference between the true and the observed position of a heavenly body, the result of the combined effect of the motion of light and the motion of the eye of the observer caused by the annual or diurnal motion of the earth; or of the motion of light and that of the body from which the light proceeds. When the auxiliary cause is the annual revolution of the earth round the sun it is called annual aberration, in consequence of which a fixed star may appear as much as 20″·4 from its true position; when the auxiliary cause is the diurnal rotation of the earth on its axis it is called diurnal aberration, which amounts at the greatest to 0″·3; and when the auxiliary cause is the motion of the body from which the light proceeds it is called planetary aberration.

A'BIB, the first month of the Jewish ecclesiastical year, and the seventh of the civil year, corresponding to the latter part of March and the first of April. Also called Nisan.

ABIOGENESIS (a-bī-o-jen'e-us), the doctrine or hypothesis that living matter may be produced from non-living; spontaneous generation.

ABJURA'TION, Oath of, an oath which by an English act passed in 1701 had to be taken by all holders of public offices, clergymen, teachers, members of the universities, and lawyers, adjuring and renouncing the exiled Stuarts: superseded in 1858 by a more comprehensive oath, declaring allegiance to the present royal family.—Abjuration of the realm was an oath that a person guilty of felony, and who had taken sanctuary, might take to go into exile, and not return on pain of death.

AB'LATIVE, a term applied to a case of nouns, adjectives, and pronouns in Latin, Sanskrit, and some other languages; originally given to the case in Latin because separation from (ab, from, latus, taken) was considered to be one of the chief ideas expressed by the case.

ABOLI'TIONISTS, the name by which those opponents of slavery were designated who were the most intense in their desire to secure the immediate emancipation of the blacks. Although discredited in many quarters, the abolitionists were in the end successful, from one point of view, in making slavery a national issue and in hastening the time of final decision as to its continuance.

ABOMA'SUM, ABOMA'SUS, the fourth stomach of ruminating animals, next the omasum or third stomach.

ABORIG'INES (ab-o-rij'i-nēz), the name given in general to the earliest known inhabitants of a country, those who are supposed to have inhabited the land from the beginning [The singular of the word is Aboriginal, or sometimes Aborigine.]

ABOR'TION, in medicine, the expulsion of the fœtus before it is capable of independent existence. This may take place at any period of pregnancy before the completion of the twenty-eighth week. A child born after that time is said to be premature. Abortion may be the result of the general debility or ill health of the mother, of a plethoric constitution, of special affections of the uterus, of severe exertions, sudden shocks, etc. Various medicinal substances, generally violent emmenagogues or drastic medicines, are believed to have the effect of provoking abortion, and are sometimes resorted to for this purpose. Attempts to procure abortion are punishable by law in all civilized states. The term is applied in botany to denote the suppression by non-development of one or more of the parts of a flower, which consists normally of four whorls—namely, calyx, corolla, stamens, and pistil.

ABOUKIR (a-bö-kēr'), a small village on the Egyptian coast, 10 miles east of Alexandria. In Aboukir Bay took place the naval battle in which Nelson annihilated a French fleet on the night of 1st and 2d August, 1798, thus totally destroying the naval power of France in the Mediterranean.

ABOUT (a-bö), Edmond François Valentin, a French novelist and miscellaneous writer, born in 1828, died in 1885.

ABRACADAB'RA, a word of eastern origin used in incantations. When written on paper so as to form a triangle, the first line containing the word in full, the one below it omitting the last letter, and so on each time until only one letter remained, and worn as an amulet it was supposed to be an antidote against certain diseases.

A B R A C A D A B R A
A B R A C A D A B R
A B R A C A D A B
A B R A C A D A
A B R A C A D
A B R A C A
A B R A C
A B R A
A B R
A B
A

A'BRAHAM, originally **ABRAM,** the greatest of the Hebrew patriarchs, was born at Ur in Chaldea in 2153 B.C. according to Hales, in 1996 B.C. according to Ussher, while Bunsen says he lived 2850 B.C. He migrated, accompanied by his wife Sarah and his nephew Lot, to Canaan, where he led a nomadic life, which extended over 175 years. His two sons Isaac and Ishmael were the progenitors of the Jews and Arabs respectively.

ABRAHAM, Heights or Plains of. See Quebec.

ABRAX'AS (or **ABRASAX**) **STONES,** the name given to stones or gems found in Syria, Egypt, and elsewhere, cut into almost every variety of shape, but generally having a human trunk and arms, with a cock's head, two serpents' tails for the legs, etc., and the word Abraxas or Abrasax in Greek characters engraved upon them. They appear to have been first used by the Gnostic sect.

ABRIDG'MENT. In the law of copyright an abridgment is deemed a new work, and is not an infringement of the copyright. An abridgment is distinguished in the law of copyright from a compilation. The former is a condensation of the substance, while the latter is a reproduction in part, at least, of the language of the copyrighted article, and is held to be an infringement.

ABROGA'TION, the repealing of a law by a competent authority.

ABRO'MA, a genus of small trees, natives of India, Java, etc., one species of which has a bark yielding a strong white fiber, from which good cordage is made.

ABRUPT', in botany, terminating suddenly, as if a part were cut short off.

AB'RUS, a genus of plants, one species of which has round brilliant scarlet seeds, used to make necklaces and rosaries. Its root is sweetish and mucilaginous, and is used as a substitute for licorice. The seeds yield a strong poison.

ABRUZZI (à-brut'sē), a division of Italy on the Adriatic, between Umbria and the Marches on the north, and Apulia on the south. It is united with Molise to form a compartimento, comprising the four provinces of Aquila degli Abruzzi, Campobasso, Chieti, and Teramo. The seacoast of about 80 miles does not possess a single harbor. The interior is rugged and mountainous, being traversed throughout by the Apennines. The lower parts consist of fertile plains and valleys, yielding corn, wine, oil, almonds, saffron, etc.; area, 6380 sq. miles; pop. 1,441,551.

ABRUZZI, Prince Luigi Amadeo of Savoy-Aosta, Duke of the, an Italian traveler and arctic explorer, son of ex-King Amadeus of Spain, was born in Madrid in 1873, and studied at the naval college in Leghorn. In 1897 he attracted attention by making the first ascent of Mount St. Elias. On June 12, 1899, he set out on his voyage toward the north pole, his plan being to leave his ship, the Stella Polare, in harbor, and send northward a series of sledge expeditions. He spent one winter in the Bay of Teplitz, and would have remained a second had not a serious injury to

the vessel compelled his return. While repairs were being made, one of his sledge parties, under the immediate direction of Captain Umberto Cagni, attained the latitude of 86° 33′, 239.15 statute miles from the pole. His explorations determined the northern boundary of Franz-Josef Land and the non-existence of Peterman's Land.

AB'SALOM, the third son of King David, whose romantic career makes him a prominent figure in Old Testament history.

ABSCOND'ING, the act of leaving the state or concealing oneself therein for a fraudulent purpose, such as hindering, delaying, or defrauding one's creditors. It is not a common-law offense for one to go beyond the boundaries of his country, nor to treat his house as his castle, that is, as a place into which an officer has no right to break in order to serve civil process. But if a debtor went abroad or locked himself in his house to avoid the service of legal process, or if he was about to do either with like intent, the creditor was entitled, upon resorting to the proper proceedings, to seize his property.

AB'SCESS, any collection of purulent matter or pus formed in some tissue or organ of the body, and confined within some circumscribed area, of varying size, but always painful and often dangerous.

ABSENTEE', the name which has been given to a person who possesses property in one country, and resides and spends his income in another. This practice is especially prevalent among Irish land-owners, and many political economists have ascribed much of the poverty and discontent in Ireland to absenteeism.

ABSINTHE, a liqueur or aromatised spirit, prepared by pounding the leaves and flowering tops of various species of wormwood, with angelica root, sweet flag root, the leaves of dittany of Crete, star-anise fruit, and other aromatics, and macerating these in alcohol. After soaking for about eight days the compound is distilled, yielding an emerald-colored liquor, to which a proportion of an essential-oil, usually that of anise, is added. The chief seat of the manufacture is in the canton of Neufchatel, in Switzerland, although absinthe distilleries are scattered generally throughout Switzerland and France. The liqueur is chiefly consumed in France, but there is also a considerable export trade to the United States of America. When taken habitually or in excess, its effects are very pernicious. It is a favorite drink of the Parisians.

AB'SOLUTE, in a general sense, loosed or freed from all limitations or conditions. In politics, an absolute monarchy is that form of government in which the ruler is unlimited or uncontrolled by constitutional checks. In modern metaphysics the Absolute represents the unconditioned, infinite, and self-existent.

ABSOLU'TION, remission of a penitent's sins in the name of God. It is commonly maintained that down to the twelfth century the priests used only what is called the precatory formula, "May God or Christ absolve thee," which is still the form in the Greek Church; whereas the Roman Catholic uses the expression "I absolve thee," thus regarding the forgiveness of sins as in the power of the priest (the indicative form). This theory of absolution was confirmed by the Council of Trent. The passages of Scripture on which the Roman Catholic Church founds in laying down its doctrine of absolution are such as Matt. xvi. 19; xviii. 18; John xx. 23. Among Protestants absolution properly means a sentence by which a person who stands excommunicated is released from that punishment.

ABSOR'BENTS, the system of minute vessels by which the nutritive elements of food and other matters are carried into the circulation of vertebrate animals. The vessels consist of two different sets, called respectively lacteals and lymphatics. The former arise from the digestive tract, the latter from the tissues generally, both joining a common trunk which ultimately enters the blood-vessel system. Absorbents in medicines are substances such as chalk, charcoal, etc., that absorb or suck up excessive secretion of fluid or gas.

ABSORP'TION, in physiology, one of the vital functions by which the materials of nutrition and growth are absorbed and conveyed to the organs of plants and animals. In vertebrate animals this is done by the lymphatics and lacteals, in plants chiefly by the roots. See Absorbents.

ABUSE' OF PROC'ESS, the wrongful employment of a regular judicial proceeding. Courts of justice, refuse to lend themselves to the abuse of their procedure, and may, accordingly, stay or dismiss actions and strike out defenses which are manifestly frivolous or vexatious.

AB'STRACT OF TI'TLE, a statement in writing of the successive conveyances through which a person claims to own a parcel of land. A perfect abstract should furnish a complete history of the title sought to be transferred, showing the origin and nature of the vendor's interest, all incumbrances and other interests, such as mortgages, easements, judgments, trusts, etc., which affect his title. In the United States the public records of conveyances are the principal source of information upon which the maker of the Abstract proceeds.

AB'STINENCE. *See* Fasting, Temperance.

ABSTRAC'TION, the operation of the mind by which it disregards part of what is presented to its observation in order to concentrate its attention on the remainder. It is the foundation of the operation of generalization, by which we arrive at general conceptions. In order, for example, to form the conception of a horse, we disregard the color and other peculiarities of the particular horses observed by us, and attend only to those qualities which all horses have in common. In rising to the conception of an animal we disregard still more qualities, and attend only to those which all animals have in common with one another.

ABSURDUM, REDUCTIO AD, a mode of demonstrating the truth of a proposition, by showing that its contradictory leads to an absurdity. It is much employed by Euclid.

ABT, FRANZ, born in Prussian Saxony, December 22, 1819; died March 31, 1855. He was educated at Leipzig and became professor of music at Bernburg, Zurich and Weisbaden. He wrote the music of over two hundred popular songs.

ABU'TILON, a genus of plants, sometimes called Indian mallows, inhabiting the East Indies, Australia, Brazil, Siberia, etc. Several of them yield a valuable hemp-like fiber. One, a troublesome weed in the Middle United States, has been recommended for cultivation.

ABU-BEKR, or Father of the Virgin, the father-in-law and first successor of Mohammed. His right to the succession was unsuccessfully contested by Ali, Mohammed's son-in-law, and a schism took place, which divided the Mohammedans into the two great sects of Sunnites and Shiites, the former maintaining the validity of Abu-Bekr's and the latter that of Ali's claim.

ABUT'MENT, the part of a bridge which receives and resists the lateral outward thrust of an arch; the masonry, rock, or other solid materials from which an arch springs.

ABY'DOS (1), an ancient city of Asia Minor, on the Hellespont, at the narrowest part of the strait, opposite Sestos. Leander, say ancient writers, swam nightly from Abydos to Sestos to see his loved Hero—a feat in swimming accomplished also by Lord Byron.—(2), an ancient city of Upper Egypt, about 6 miles west of the Nile, now represented only by ruins of temples, tombs, etc. It was celebrated as the burying-place of the god Osiris, and its oldest temple was dedicated to him. Here, in 1818, was discovered the famous Abydos Tablet, now in the British Museum, and containing a list of the predecessors of Rameses the Great, which was supplemented by the discovery of a similar historical tablet in 1864.

ABYSSIN'IA, a country of eastern Africa, which, roughly speaking, may be said to extend from lat. 8° to 16° n. and lon. 35° to 41° e.; having Nubia on the n.w., the Soudan on the w., the Red Sea littoral and the Danâkil territory on the e., and the country of the Gallas on the s.; total area about 120,000 sq. m.; chief divisions Tigré, Amhara, and Shoa. It is as a whole an elevated region, with a general slope to the northwest. The mountains in various parts of the country rise to 12,000 and 13,000 feet, while some of the peaks are over 15,000 feet (Ras Dashan being 15,160), and are always covered with snow. The principal rivers belong to the Nile basin, the chief being the impetuous Tacazzé ("the Terrible"), in the north, and the Abai in the south, the latter being really the upper portion of the Blue Nile. The principal lake is Lake Tzana or Dembea (from which issues the Abai), upward of 6000 feet above the sea, having a length of about 45 and a breadth of 35 miles. Round this lake lies a fertile plain, emphatically called the granary of the country.—According to elevation there are several zones of vegetation. Within the lowest belt, which reaches

an elevation of 4800 feet, cotton, wild indigo, acacias, ebony, baobabs, sugar-canes, coffee-trees, date-palms, etc., flourish, while the larger animals are lions, panthers, elephants, rhinoceroses,

Abyssinian priest.

hippopotamuses, jackals, hyenas, bears, numerous antelopes, monkeys, and crocodiles. The middle zone, rising to 9000 feet, produces the grains, grasses, and fruits of southern Europe, the orange, vine, peach, apricot, the bamboo, sycamore-tree, etc. The principal grains are millet, barley, wheat, maize, and teff, the latter a small seed, a favorite breadstuff of the Abyssinians. Two, and in some places three, crops are obtained in one year. All the domestic animals of Europe, except swine, are known. There is a variety of ox with immense horns. The highest zone, reaching to 14,000 feet, has but little wood, and generally scanty vegetation, the hardier corn-plants only being grown; but oxen, goats, and long-wooled sheep find abundant pasture.—The climate is as various as the surface, but as a whole is temperate and agreeable; in some of the valleys the heat is often excessive, while on the mountains the weather is cold. In certain of the

Abyssinian chief and soldiers.

lower districts malaria prevails.—The chief mineral products are sulphur, iron, copper, coal, and salt, the latter serving to some extent as money.—There has been a great intermixture of races in Abyssinia. What may be considered the Abyssinians proper seem to have a blood-relationship with the Bedouin Arabs. The complexion varies from very dark through different shades of brown and copper to olive. The figure is usually symmetrical. Other races are the black Gallas from the south; the Falashas, who claim descent from Abraham, and retain many Jewish characteristics; the Agows, Gongas, etc. The great majority of the people profess Christianity, belonging, like the Copts, to the sect of the Monophysites. Their religion consists chiefly in the performance of empty ceremonies, and gross superstition as well as ignorance prevails. The head of the church is called the Abuna ("our father"), and is consecrated by the Coptic patriarch of Alexandria. Geez or Ethiopian is the language of their sacred books: it has long ago ceased to be spoken. The chief spoken language is the Amharic; in it some books have been published. Mohammedanism appears to be gaining ground in Abyssinia, and in respect of morality the Moslems stand higher than the Christians. A corrupt form of Judaism is professed by the Falashas.—The bulk of the people are devoted to agriculture and cattle-breeding. The trade and manufactures are of small importance. A good deal of common cotton cloth and some finer woven fabrics are produced. Leather is prepared to some extent, silver filagree work is produced, and there are manufactures of common articles of iron and brass, coarse black pottery, etc. The foreign trade is carried on through Zeila (British) and Djibouti (French) on the Gulf of Aden, and Massowa on the Red Sea (Italian), exports being hides, coffee, wax, gum, ivory, etc., imports textile fabrics, firearms, tobacco, etc. The Abyssinians were converted to Christianity in the fourth century, by some missionaries from Alexandria. The title King of Kings was assumed by Johannes in 1881. Advantage was taken of the troubled state of Abyssinia by the Egyptians, who annexed Massowa and the region adjacent, Abyssinia having been thus shut out from the sea. Hostilities were repeatedly carried on between Johannes and the Egyptians. Latterly the Italians gained and hold possession of Massowa and other territory. Johannes died in 1889, and was succeeded by Menelek II., who admitted of an Italian protectorate over Abyssinia; but quarrels and hostilities broke out, the Italians were defeated, and their protectorate ceased. The population is estimated at about 3,500,000.

ACA'CIA, a genus of plants, consisting of trees or shrubs with compound pinnate leaves and small leaflets, growing in Africa, Arabia, the East Indies, Australia, etc. The flowers, usually small, are arranged in spikes or globular heads at the axils of the leaves near the extremity of the branches. Several of the species yield gum-arabic and other gums; some have astringent barks and pods, used in tanning. An Indian species yields the valuable astringent called catechu; another, the wattle-tree of Australia, from 15 to 30 feet in height, is the most beautiful and useful of the species found there. Its bark contains a large percentage of tannin, and is hence exported. Some species yield valuable timber; some are cultivated for the beauty of their flowers.

Acacia.

ACAD'EMY, an association for the promotion of literature, science, or art; established sometimes by government, sometimes by the voluntary union of private individuals. The name Academy was first applied to the philosophical school of Plato, from the place where he used to teach, a grove or garden at Athens which was said to have belonged originally to the hero Academus. Academies devote themselves either to the cultivation of science generally or to the promotion of a particular branch of study, as antiquities, language, or the fine arts. The most celebrated institutions bearing the name of academies, and designed for the encouragement of science, antiquities, and language respectively, are the French Académie des Sciences (founded by Colbert in 1666), Académie des Inscriptions founded by Colbert in 1663), and Académie Française (founded by Richelieu in 1635), all of which are now merged in the National Institute. The oldest of the academies instituted for the improvement of language is the Italian Accademia della Crusca (now the Florentine Academy), formed in 1582, and chiefly celebrated for the compilation of an excellent dictionary of the Italian language, and for the publication of several carefully prepared editions of ancient Italian poets. In Britain the name of academy, in the more dignified sense of the term, is confined almost exclusively to certain institutions for the promotion of the fine arts, such as the Royal Academy of Arts and the Royal Scottish Academy. The Royal Academy of Arts (usually called simply the Royal Academy) was founded in London in 1768, "for the purpose of cultivating and improving the arts of painting, sculpture, and architecture." The number of academicians is now limited to forty-two, among whom are two

engravers. In the United States there are hundreds of institutions, more or less noted, known as academies, as the American Academy of Political and Social Science, the New York Academy of Design, the Chicago Academy of Sciences, etc.

ACA'DIA, the name formerly given to Nova Scotia. It received its first colonists from France in 1604, being then a possession of that country, but it passed to Britain, by the Peace of Utrecht, in 1713. In 1756, 18,000 of the French inhabitants were forcibly removed from their homes on account of their hostility to the British, an incident on which is based Longfellow's Evangeline.

ACALE'PHA, a nettle, from their stinging properties, a term formerly used to denote the Medusæ or jelly-fishes and their allies.

ACANTHOP'TERI, ACANTHOPTERYGII, a group of fishes, distinguished by the fact that at least the

Spines of acanthopteri.

first rays in each fin exist in the form of stiff spines; it includes the perch, mullet, mackerel, gurnard, wrasse, etc.

ACAN'THUS, a genus of herbaceous plants or shrubs, mostly tropical, two species of which are characterized by large white flowers and deeply indented

Acanthus of Corinthian capital.

shining leaves.—In architecture the name is given to a kind of foliage decoration said to have been suggested by this plant, and much employed in Roman and later styles.

ACAR'IDA, a division of the Arachnida, including the mites, ticks, and water-mites. See Mite.

ACARNA'NIA, the most westerly portion of northern Greece, together with Ætolia now forming a nomarchy with a pop. of 138,444. The Acarnanians of ancient times were behind the other Greeks in civilization, living by robbery and piracy.

ACCA'DIANS, the primitive inhabitants of Babylonia, who had descended from the mountainous region of Elam on the east, and to whom the Assyrians ascribed the origin of Chaldean civilization and writing.

ACCELERA'TION, the increase of velocity which a body acquires when continually acted upon by a force in the direction of its motion. A body falling from a height is one of the most common instances of acceleration.—Acceleration of the Moon, the increase of the moon's mean angular velocity about the earth, the moon now moving rather faster than in ancient times. This phenomenon has not been fully explained, but it is known to be partly owing to the slow process of diminution which the eccentricity of the earth's orbit is undergoing, and from which there results a slight diminution of the sun's influence on the moon's motions.—Diurnal Acceleration of the Fixed Stars, the apparent greater diurnal motion of the stars than of the sun, arising from the fact that the sun's apparent yearly motion takes place in a direction contrary to that of his apparent daily motion. The stars thus seem each day to anticipate the sun by nearly 3 minutes 56 seconds of mean time.

AC'CENT, a term used in several senses. In English it commonly denotes superior stress or force of voice upon certain syllables of words, which distinguishes them from the other syllables. Many English words, as as'pi-ra''tion, have two accents, a secondary and primary, the latter being the fuller or stronger. Some words, as in-com'prehen'-si-bil''i-ty. have two secondary or subordinate accents. When the full accent falls on a vowel, that vowel has its long sound, as in vo'cal; but when it falls on a consonant, the preceding vowel is short, as in hab'it. This kind of accent alone regulates English verse as contrasted with Latin or Greek verse, in which the meter depended on quantity or length of syllables. In books on elocution three marks or accents are generally made use of, the first or acute (') showing when the voice is to be raised, the second or grave (`), when it is to be depressed, and the third or circumflex (^) when the vowel is to be uttered with an undulating sound. In some languages there is no such distinct accent as in English (or German), and this seems to be now the case with French. (—) In music, accent is the stress or emphasis laid upon certain notes of a bar. The first note of a bar has the strongest accent, but weaker accents are given to the first notes of subordinate parts of the bars, as to the third, fifth, and seventh in a bar of eight quavers.

ACCEPT'ANCE, in law, the act by which a person binds himself to pay a bill of exchange drawn upon him. No acceptance is valid unless made in writing on the bill, but an acceptance may be either absolute or conditional, that is, stipulating some alteration in the amount or date of payment, or some condition to be fulfilled previous to payment.

AC'CESS, right of, the right of a private individual owning land on the shore of a body of water, to the free use of the shore, or the free access to the shore.

ACCES'SARY, or **ACCES'SORY,** in law, a person guilty of an offence by connivance or participation, either before or after the act committed, as by command, advice, concealment, etc. An accessary before the fact is one who procures or counsels another to commit a crime, and is not present at its commission; an accessary after the fact is one who, knowing a felony to have been committed, gives assistance of any kind to the felon so as to hinder him from being apprehended, tried, or suffering punishment. An accessary before the fact may be tried and punished in all respects as if he were the principal. In high treason, all who participate are regarded as principals.

AC'CIDENT, in law, an occurrence in which a person is hurt or harmed by another without intent or while lawfully engaged under proper precautions for the protection of others.

ACCIDEN'TALS, notes introduced in the course of a piece of music in a different key from that in which the passage they occur is principally written. They are represented by the sign of a sharp, flat, or natural immediately before the note which is to be raised or lowered.

ACCIDENT INSURANCE, insurance protecting one against injury, disablement, or death from accident. It does not protect from injuries arising from quarrels, or intentionally inflicted injury, but only from such harm as comes from violence and is purely accidental, that is, when the harm is not due to lack of precaution.

ACCIP'ITRES (ak-sip'i-trēz), the name given by Linnæus and Cuvier to the

Head and foot of the osprey. Head and foot of peregrine falcon. Head and foot of American sparrow-hawk.

rapacious birds now usually called Raptores, which see.

ACCLIMATIZA'TION, the process of accustoming plants or animals to live and propagate in a climate different from that to which they are indigenous, or the change which the constitution of an animal or plant undergoes under new climatic conditions, in the direction of adaptation to those conditions. The systematic study of acclimatization has only been entered upon in very recent times, and the little progress that has been made in it has been more in the direction of formulating anticipative, if not arbitrary hypotheses, than of actual discovery and acquisition of facts. The term is sometimes applied to the case of animals or plants taking readily to a new country with a climate and other and other circumstances similar to what they have left, such as European animals and plants in America and New Zealand: but this is more properly naturalization than acclimatization.

ACCOLADE (ak-o-lād'), the ceremony used in conferring knighthood, anciently consisting either in the embrace given by the person who conferred the honor of knighthood or in a light blow on the neck or the cheek, latterly consisting

in the ceremony of striking the candidate with a naked sword.

ACCOMMODA'TION BILL, a bill of exchange drawn and accepted to raise money on, and not given, like a genuine bill of exchange, in payment of a debt, but merely intended to accommodate the drawer: colloquially called a kite.

ACCOMMODATION LADDER, a light ladder hung over the side of a ship at the gangway to facilitate ascending from, or descending to, boats.

ACCOM'PANIMENT, in music, is that part of music which serves for the support of the principal melody (solo or obligato part). This can be executed either by many instruments, by a few, or by a single one.

ACCOM'PLICE, an aider or abettor of crime, punishable either as principal or second in the crime. Intent to commit crime is of course understood. Testimony given by accomplices against other participators in the crime is usually regarded with suspicion and must be corroborated by other testimony or circumstances before it is regarded as convincing.

ACCOR'DION, a keyed musical wind-instrument similar to the concertina, being in the form of a small box, containing a number of metallic reeds fixed at one of their extremities, the sides of the box forming a folding apparatus which acts as a bellows to supply the wind, and thus set the reeds in vibration, and produce the notes both of melody and harmony.

ACCOUNT'ANT, one who keeps accounts; in the United States usually a bookkeeper. In other countries the term is used to designate an expert bookkeeper who inspects the accounts of banks, business houses, and other institutions at regular intervals.

AC'CRA, a British settlement in Africa, in a swampy situation, cap. of Gold Coast, about 75 miles east of Cape Coast Castle. Exports gold-dust, ivory, gums, palm-oil; imports cottons, cutlery, etc. Pop. 20,000.

ACCU'MULATOR, a name applied to a kind of electric battery by means of which electric energy can be stored and rendered portable. In the usual form each battery forms a cylindrical leaden vessel, containing alternate sheets of metallic lead and minium wrapped in felt and rolled into a spiral wetted with acidulated water. On being charged with electricity the energy may be preserved till required for use.

ACCU'SATIVE CASE, in Latin and some other languages, the term applied to the case which designates the object to which the action of any verb is immediately directed, corresponding, generally speaking, to the objective in English.

A'CER, the genus of plants to which belong the maples.

ACETAB'ULUM, an anatomical term applied to any cup-like cavity, as that of a bone to receive the protuberant end of another bone, the cavity, for instance, that receives the end of the thigh-bone.

ACETATES (as'e-tats), salts of acetic acid. The acetates of most commercial or manufacturing importance are those of aluminium and iron, which are used in calico printing; of copper, which as verdigris is used as a color; and of lead, best known as sugar of lead. The acetates of potassium, sodium, and ammonium, of iron, zinc, and lead, and acetate of morphia, are employed in medicine.

ACET'IC ACID, an acid produced by the oxidation of common alcohol, and of many other organic substances. Pure acetic acid has a very sour taste and pungent smell, burns the skin, and is poisonous. From freezing at ordinary temperatures (58° or 59°) it is known as glacial acetic acid. Vinegar is simply dilute acetic acid. Acetic acid is largely used in the arts, in medicine, and for domestic purposes. See Vinegar.

ACET'IC ETHERS, compounds consisting of acetates of alcohol radicals. Common acetic ether is a colorless, volatile fluid, and is a flavoring constituent in many wines. It is made artificially by distilling a mixture of alcohol, oil of vitriol, and acetate of potash.

ACET'YLENE, a highly inflammable hydrocarbon gas which can be simply made with calcic carbide and water, and is now coming into use as an illuminant.

ACHÆ'ANS, one of the four races into which the ancient Greeks were divided. In early times they inhabited a part of northern Greece and of the Peloponnesus. They are represented by Homer as a brave and warlike people, and so distinguished were they that he usually calls the Greeks in general Achæans. Achaia with Elis now forms a nomarchy of the kingdom of Greece. Pop. 181,632.

ACHARD (ăh-ărt), Franz Karl, a German chemist, born 1753, died 1821, principally known by his invention (1789-1800) of a process for manufacturing sugar from beet-root.

ACHEEN', or **ATCHIN,** a native state of Sumatra, with capital of same name, in the northwestern extremity of the island, now nominally under Dutch administration. Though largely mountainous, it has also undulating tracts and low fertile plains. By treaty with Britain the Dutch were prevented from extending their territory in Sumatra by conquest; but, this obstacle being removed, in 1871 they proceeded to occupy Acheen. It was not till 1879, however, after a great waste of blood and treasure, that they obtained a general recognition of their authority. But they have not been able to establish it firmly, and in 1885 were forced to evacuate part of the Acheenese territory, with considerable loss in men and guns. In the seventeenth century Acheen was a powerful state, and carried on hostilities successfully against the Portuguse, but its influence decreased with the increase of the Dutch power. The principal exports are rice and pepper. Area, 19,000 sq. miles; pop. 600,000.

ACHILLES (a-kil'-ēz), a Greek legendary hero, the chief character in Homer's Iliad. His father was Peleus, ruler of Phthia in Thessaly, his mother the sea-goddess Thetis. In discussions on the origin of the Homeric poems the term Achilleid is often applied to those books (i. viii. and xi.–xxii.) of the Iliad in which Achilles is prominent, and which some suppose to have formed the original nucleus of the poem.

ACHIMENES (a-kim'e-nēz), a genus of tropical American plants, with scaly underground tubers, now cultivated in European greenhouses on account of their ornamental character.

ACHLAMYDEOUS (ak-la-mid'i-us), in botany, wanting the floral envelopes, that is, having neither calyx nor corolla, as the willow.

ACHOR (ā'kor), a disease of infants, in which the head, the face, and often the neck and breast become incrusted with thin, yellowish or greenish scabs, arising from minute, whitish pustules, which discharge a viscid fluid.

ACHROMAT'IC, in optics, transmitting colorless light, that is, not decomposed into the primary colors, though having passed through a refracting medium. A single convex lens does not give an image free from the prismatic colors, because the rays of different color making up white light are not equally refrangible, and thus do not all come to a focus together, the violet, for instance, being nearest the lens, the red farthest off. If such a lens of crown-glass, however, is combined with a concave lens of flint-glass—the curvatures of both being properly adjusted—as the two materials have somewhat different optical properties, the latter will neutralize the chromatic aberration of the former, and a satisfactory image will be produced. Telescopes, microscopes, etc., in which the glasses are thus composed are called achromatic.

ACID, a name popularly applied to a number of compounds, solid, liquid, and gaseous, having more or less the qualities of vinegar (itself a diluted form of acetic acid), the general properties assigned to them being a tart, sour taste, the power of changing vegetable blues into reds, of decomposing chalk and marble with effervescence, and of being in various degrees neutralized by alkalies.

ACIERAGE (ā'sē-ėr-āj), a process by which an engraved copper-plate or an electrotype from an engraved plate of steel or copper has a film of iron deposited over its surface by electricity in order to protect the engraving from wear in printing. By this means an electrotype of a fine engraving which, if printed directly from the copper, would not yield 500 good impressions, can be made to yield 3000 or more; and when the film of iron becomes so worn as to reveal any part of the copper, it may be removed and a fresh coating deposited so that 20,000 good impressions may be obtained.

ACIPENSER (as-i-pen'ser), the genus of cartilaginous ganoid fishes to which the sturgeon belongs.

ACKNOWLEDGMENT, an admission, either in writing or by word of mouth, by a person that he owes a debt which, otherwise, might be covered by the statute of limitations. It is also used to designate an act by which one asserts that a document, statement, or other instrument is his own.

ACLIN'IC LINE, the magnetic equator, an irregular curve in the neighborhood of the terrestrial equator, where

the magnetic needle balances itself horizontally, having no dip.

ACNE (ak'nē), a skin disease, consisting of small hard pimples, usually on the face, caused by congestion of the follicles of the skin.

ACOLYTES (ak'o-lits), in the ancient Latin and Greek Churches, persons of ecclesiastical rank next in order below the sub-deacons, whose office it was to attend to the officiating priest. The name is still retained in the Roman Church.

ACONCAGUA (a-kan-kä'gwa), a province, a river, and a mountain of Chile. The peak of Aconcagua, whose summit is just within the Argentine Republic, rises to the height of 22,860 feet, and is probably the highest mountain of the western hemisphere. Area of prov., 6224 sq. miles. Pop. 153,049.

AC'ONITE, a genus of hardy herbaceous plants, represented by the well-known wolf's-bane or monk's-hood, and remarkable for their poisonous properties and medicinal qualities, being used internally as well as externally in rheumatism, gout, neuralgia, etc.

ACON'ITINE, an alkaloid extracted from monk's-hood and some other species of aconite; used medicinally, though a virulent poison.

ACONQUIJA (ä-kon-kē'hä), a range of mountains in the Argentine Republic; the name also of a single peak, 17,000 feet high.

A'CORN, the fruit of the different kinds of oak. The acorn-cups of one species are brought from the Levant under the name of valonia, and used in tanning.

ACOTYLE'DONS, plants not furnished with cotyledons or seed-lobes. They include ferns, mosses, seaweeds, etc., and are also called flowerless plants or cryptogams.

ACOUSTICS (a-kou'stiks), the science of sound. It teaches the cause, nature, and phenomena of such vibrations of elastic bodies as affect the organ of hearing; the manner in which sound is produced, its transmission through air and other media, the doctrine of reflected sound or echoes, the properties and effects of different sounds, including musical sounds or notes, and the structure and action of the organ of hearing, etc. The propagation of sound is analogous to that of light, both being due to vibrations which produce successive waves, and Newton was the first to show that its propagation through any medium depended upon the elasticity of that medium. Regarding the intensity, reflection, and refraction of sound, much the same rules apply as in light. In ordinary cases of hearing the vibrating medium is air, but all substances capable of vibrating may be employed to propagate and convey sound. When a bell is struck its vibrations are communicated to the particles of air surrounding it, and from these to particles outside them, until they reach the ear of the listener. The intensity of sound varies inversely as the square of the distance of the body sounding from the ear. Sound travels through the air at the rate of about 1090 feet per second; through water at the rate of about 4700 feet. Sounds may be musical or non-musical. A musical sound is caused by a regular series of exactly similar pulses succeeding each other at precisely equal intervals of time. If these conditions are not fulfilled the sound is a noise. Musical sounds are comparatively simple, and are combined to give pleasing sensations according to easy numerical relations. The loudness of a note depends on the degree to which it affects the ear; the pitch of a note depends on the number of vibrations to the second which produce the note; the timber, quality or character of a note depends on the body or bodies whose vibrations produce the sound, and is due to the form of the paths of vibrating particles. The gamut is a series of eight notes, which are called by the names Do, Re, Mi, Fa, Sol, La, Si, Do_2, and the numbers of vibrations which produce these notes are respectively proportional to 24, 27, 30, 32, 36, 40, 45, 48. The numerical value of the interval between any two notes is given by dividing one of the above numbers corresponding to the higher note by the number corresponding to lower note. The intervals from Do to each of the others are called a second, a minor third, a fourth, a fifth, a sixth, a seventh, and an octave respectively. The interval from La to Do_2 is a minor third. An interval of $\frac{9}{8}$ is a major tone; $\frac{10}{9}$ is a minor tone; $\frac{16}{15}$ is called a limma. The properties of sound were mathematically investigated by Bacon and Galileo, but it remained for Newton, Lagrange, Euler, Laplace, Helmholtz, etc., to bring the science to its present state.

ACRE, a standard measure of land, consists of 4840 square yards, divided into 4 roods.

ACRE (ā'ker), a seaport of Syria, in Northern Palestine, on the Bay of Acre, early a place of great strength and importance. Taken from the Saracens under Saladin in 1191 by Richard I. of England and Philip of France; bravely defended by the Turks assisted by Sir Sidney Smith in 1799 against Napoleon; in 1832, taken by Ibrahim Pasha; in 1840, bombarded by a British, Austrian, and Turkish fleet, and restored to the Sultan of Turkey. Pop. 10,000.

ACROBAT, one who performs on the trapeze, horizontal bar, or other apparatus, or who, without appliances of any kind, is capable of performing expert gymnastics. Acrobats and acrobatism are very ancient. They were known, in a limited way, to the Greeks and the Romans and were familiar during the middle ages. Rope walking was a favorite act of acrobats and rope walkers are pictured on the walls of the excavated houses at Pompeii.

ACROCORIN'THUS, a steep rock in Greece, nearly 1900 feet high, overhanging ancient Corinth, and on which stood the acropolis or citadel, the sacred fountain of Pirēnē being also here. This natural fortress has proved itself of importance in the modern history of Greece.

AC'ROGENS, a term applied to the ferns, mosses, and lichens (cryptogams), as growing by extension upwards, in contradistinction to endogens and exogens.

ACROP'OLIS, the citadel or chief place of a Grecian city, usually on an eminence commanding the town. That of Athens contained some of the finest buildings in the world, such as the Parthenon, Erechthēum, etc.

ACROS'TIC, a poem of which the first or last, or certain other letters of the line, taken in order, form some name, motto, or sentence. A poem of which both first and last letters are thus arranged is called a double acrostic. In Hebrew poetry, the term is given to a poem of which the initial letters of the lines or stanzas were made to run over the letters of the alphabet in their order, as in Psalm cxix.

ACT, in special senses: (1) In dramatic poetry, one of the principal divisions of a drama, in which a definite and coherent portion of the plot is represented; generally subdivided into smaller portions called scenes. The Greek dramas were not divided into acts. The dictum that a drama should consist of five acts was first formally laid down by Horace, and is generally adhered to by modern dramatists in tragedy. In comedy no such distinction is observed.—(2) Something formally done by a legislative or judicial body; a statute or law passed.—(3) In universities, a thesis maintained in public by a candidate for a degree. See Act of God, of Parliament, of Settlement, etc.

ACTÆ'ON, in Greek mythology, a great hunter, turned into a stag by Artĕmis (Diana) for looking on her when she was bathing, and torn to pieces by his own dogs.

ACTA SANCTORUM, a name applied to all collections of accounts of ancient martyrs and saints, both of the Greek and Roman Churches, more particularly to the valuable collection begun by John Bolland, a Jesuit of Antwerp, in 1643, and which, being continued by other divines of the same order (Bollandists), now extends to sixty volumes, the lives following each other in the order of the calendar.

ACTIN'IA, the genus of animals to which the typical sea-anemones belong. See Sea-anemone.

AC'TINISM, the property of those rays of light which produce chemical changes, as in photography, in contradistinction to the light rays and heat rays. The actinic property or force begins among the green rays, is strongest in the violet rays, and extends a long way beyond the visible spectrum.

ACTINOM'ETER, an instrument for measuring the intensity of the sun's actinic rays. See Actinism.

ACTINOZO'A (lit. ray-animals), a class of animals including sea-anemones, corals, etc., all having rayed tentacles round the mouth.

ACTION, the mode of seeking redress at law for any wrong, injury, or deprivation. Actions are divided into civil and criminal, the former again being divided into real, personal, and mixed.

AC'TIUM, a promontory on the western coast of northern Greece, not far from the entrance of the Ambracian Gulf (Gulf of Arta), now called La Punta, memorable on account of the naval victory gained here by Octavianus (afterward the Emperor Augustus) over Antony and Cleopatra, September 2, B.C. 31, in sight of their armies, en-

camped on the opposite shores of the Ambracian Gulf. Soon after the beginning of the battle Cleopatra fled with sixty Egyptian ships, and Antony basely followed her, and fled with her to Egypt. The deserted fleet was not overcome without making a brave resistance. Antony's land forces soon went over to the enemy, and the Roman world fell to Octavius.

ACT OF GOD, a legal term defined as "a direct, violent, sudden, and irresistible act of nature, which could not, by any reasonable cause, have been foreseen or resisted." No one can be legally called upon to make good loss so arising.

ACT OF PARLIAMENT, a law or statute procceding from the parliament of the United Kingdom passed in both houses, and having received the royal assent. Before it is passed it is a bill and not an act. Acts are either public or private, the former affecting the whole community, the latter only special persons and private concerns. The whole body of public acts constitutes the statute law. An act of parliament can only be altered or repealed by the authority of parliament.

ACT OF SETTLEMENT, an act passed by the English parliament in 1700, by which the succession to the throne of the three kingdoms, in the event of King William and Queen Anne dying without issue, was settled on the Princess Sophia, electress of Hanover, and the heirs of her body being Protestants. The Princess Sophia was the youngest daughter of Elizabeth, queen of Bohemia, daughter of James I. By this act George I., son of the Princess Sophia, succeeded to the crown on the death of Queen Anne.

ACT OF TOLERATION, an act of parliament passed in 1689, by which Protestant dissenters from the Church of England, on condition of their taking the oaths of supremacy and allegiance, and repudiating the doctrine of transubstantiation, were relieved from the restrictions under which they had formerly lain with regard to the exercise of their religion according to their own forms.

ACT OF UNIFORMITY, an English act passed in 1662, enjoining upon all ministers to use the Book of Common Prayer on pain of forfeiture of their livings. See Nonconformists.

ACTOR, one who represents some part or character on the stage. Actresses were unknown to the Greeks and Romans in the earliest times, men or boys always performing the female parts. They appeared under the Roman empire, however. Charles II. first encouraged the public appearance of actresses in England; in Shakespeare's time there were none. See Drama.

ACTS OF THE APOSTLES, one of the books of the New Testament, written in Greek by St. Luke, probably in A.D. 63 or 64. It embraces a period of about thirty years, beginning immediately after the resurrection, and extending to the second year of the imprisonment of St. Paul in Rome. Very little information is given regarding any of the apostles, excepting St. Peter and St. Paul, and the accounts of them are far from being complete.

AC'TUARY, an accountant whose business is to make the necessary computations with regard to a basis for life assurance, annuities, reversions, etc.

ACU'LEUS, in botany, a prickle, or sharp-pointed process of the epidermis, as distinguished from a thorn or spine, which is of a woody nature.

ACUPRES'SURE, a means of arresting bleeding from a cut artery introduced by Sir James Simpson in 1859, and consisting in compressing the artery above the orifice, that is, on the side nearest the heart, with the middle of a needle introduced through the tissues.

ACUPUNC'TURE, a surgical operation, consisting in the insertion of needles into certain parts of the body for alleviating pain, or for the cure of different species of rheumatism, neuralgia, eye diseases, etc. It is easily performed, gives little pain, causes neither bleeding nor inflammation, and seems at times of surprising efficacy.

ADAGIO (ä-dä'jō), a musical term, expressing a slow time, slower than andante and less so than largo.

ADAIR, John, American statesman and soldier, born in South Carolina in 1759, died 1840. He lived many years in Kentucky, took part in the Indian wars toward the end of the 17th century, was a member of the Kentucky convention of 1792, and was a U. S. senator from 1805 to 1806. He was governor of Kentucky from 1820 to 1824, and a member of congress from 1831 to 1832. He was present at the Battle of New Orleans, where he commanded the Kentucky troops.

ADAM and EVE, the names given in Scripture to our first parents, an account of whom and their immediate descendants is given in the early chapters of Genesis. Cain, Abel, and Seth are all their sons that are mentioned by name; but we are told that they had other sons, as well as daughters, and that Adam finally died at the age of 930 years. There are numerous Rabbinical additions to the Scripture narrative, of an extravagant character, such as the myth of Adam having a wife before Eve, named Lilith, who became the mother of giants and evil spirits. Other legends or inventions are contained in the Koran.

ADAM DE LA HALE, an early French writer and musician; born 1240, died 1287. His Jeu de Robin et de Marion may be regarded as the first comic opera ever written.

AD'AMANT, an old name for the diamond; also used in a vague way to imply a substance of impenetrable hardness.

ADAMAN'TINE SPAR, a name of the mineral corundum or of a brownish variety of it.

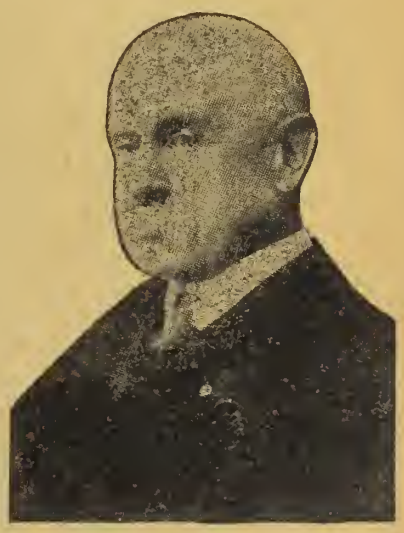
AD'AMITES, a name of sects or religious bodies that have appeared at various times: so called because both men and women were said to appear naked in their assemblies, either to imitate Adam in the state of innocence or to prove the control which they possessed over their passions.

ADAMS Alvin, American business man and capitalist, founder of the Adams Express Company. He was a native of Andover, Vt.; born in 1804 and died in 1877.

ADAMS, Charles Baker, American scientist, born at Dorchester, Mass., in 1814, graduated at Amherst, became professor of natural history at Middlebury College, Vt., in 1838, and in 1847 to his death in 1853 was professor of zoology and astronomy at Amherst.

ADAMS, Charles Fallen, American poet, author of Leedle Yawcob Strauss and Other Poems (1878), and Dialect Ballads. He was born at Dorchester, Vt., in 1842, and served on the Union side in the civil war.

ADAMS, Charles Francis, American statesman, son of President John Quincy Adams, born at Boston in 1807, died 1886. He studied law with Daniel Webster, but did not practice, preferring



Charles F. Adams.

literary work and the study of diplomacy and history. From 1841 to 1846 he was a member of the Massachusetts legislature, and 1848 became the editor of the famous Boston Whig. Having been chairman of the Free Soil convention in 1848 he was nominated for vice-president, and after several years of retirement in literary work he entered congress in 1858. In 1861 he was made American minister to England. On his return in 1868 he was elected to the presidency of Harvard, went to Geneva in 1871 to settle the Alabama claims, and on his return retired into private life for the purpose of completing his work of editing the writings of John Quincy Adams.

ADAMS, Charles Francis, Jr., American author and financier, born in Boston in 1835. Having served in the civil war, he entered the railroad business, was president of the Southern Pacific railroad (1884 to 1890), and from 1893 to 1895 he was chairman of the Massachusetts Park Commission. He is the author of several works on railroad growth and management.

ADAMS, Charles Kendall, American historian and educator, born at Derby, Vt., in 1835, died in 1902. In 1861 he was graduated at the University of

Michigan, where he taught until 1867. He was president of Cornell University from 1885 to 1892, in which latter year he became president of the University of Wisconsin. He is the author of numerous works dealing with European and American history.

ADAMS, Henry, American author and historian, son of Charles Francis Adams, born at Boston in 1838 and graduated at Harvard in 1858. He was engaged for many years on his nine-volume work, History of the United States from 1801 to 1817. He is also the author of several important historical monographs.

ADAMS, Herbert Baxter, American historian and educator, born at Amherst in 1850, died 1901. He was associate professor of history at Johns Hopkins University and wrote a series of monographs on American history of great value.

ADAMS, Isaac, an American inventor, born at Rochester, N. H., in 1803. He invented the printing-press named for him. He died in 1883.

ADAMS, John, second president of the United States, was born at Braintree (now Quincy), Mass., 19th October, 1735. He was educated at Harvard University, and adopted the law as a

John Adams

profession. On 13th May, 1776, he seconded the motion for a declaration of independence proposed by Lee of Virginia, and was appointed a member of committee to draw it up. The declaration was actually drawn up by Jefferson, but it was Adams who fought it through congress. In 1778 he went to France on a special mission, and for nine years resided abroad as representative of his country in France, Holland, and England. After taking part in the peace negotiations he was appointed, in 1785, the first ambassador of the United States to the court of St. James. He was recalled in 1788, and the following year elected vice-president of the republic under Washington. In 1792 he was reelected vice-president, and at the following election in 1797 he became president in succession to Washington. His term of office proved a stormy one, which broke up and dissolved the federalist party. His reelection in 1801 was again opposed by the efforts of Hamilton, which ended in effecting the return of the republican candidate Jefferson. Thus it happened that when Adams retired from office his influence and popularity with both parties were at an end, and he sunk at once into the obscurity of private life. He had the consolation, however, of living to see his son president. He died 4th July, 1826, the fiftieth anniversary of the declaration of independence, and on the same day as Jefferson.

ADAMS, John Couch, English astronomer, born 1819, died 1892, studied at Cambridge, and was senior wrangler in 1843. His investigations into the irregularities in the motion of the planet Uranus led him to the conclusion that they must be caused by another more distant planet, and the results of his labors were communicated in September and October, 1845, to Professor Challis and Airy the astronomer royal. The French astronomer Leverrier had by this time been engaged in the same line of research, and had come to substantially the same results, which, being published in 1846, led to the actual discovery of the planet Neptune by Galle of Berlin. In 1858 Adams was appointed Lowndean professor of astronomy and geometry at Cambridge.

ADAMS, John Quincy, sixth president of the United States, son of John Adams, second president, was born 11th July, 1767. Accompanying his father to Europe he received part of his education there, but graduated at Harvard in 1788. Having adopted the legal profession, in 1791, he was admitted to the bar. In 1794 Washington appointed him minister to the Hague. He afterward was sent to Berlin, and also on a mission to Sweden. In 1798 he received a commission to negotiate a treaty of commerce with Sweden. On the accession of Jefferson to the presidency in 1801 he was recalled. The federalist party had sufficient influence in Massachusetts to elect him to the senate in 1803. In 1809 he went as ambassador to Russia. He assisted in negotiating the peace of 1814 with England, and was afterward appointed resident minister at London. Under Monroe as president he was sercetary of state, and at the expiration of Monroe's double term of office he succeeded him in the presidency (1825). He was not very successful as president, and at the end of his term (1829) he was not reelected. In 1831 he was returned to congress by Massachusetts, and continued to represent this state till his death, his efforts being now chiefly on behalf of the abolitionist party. He died 21st February, 1848.

ADAMS, Maude, an American actress, born at Salt Lake City in 1872. Miss Adams has appeared with great success as Lady Babbie in the Little Minister, in Rostand's l'Aiglon, and in other prominent productions.

ADAMS, Samuel, an American statesman, second cousin of President John Adams, was born in Boston, Sept. 27, 1722, and was educated at Harvard College. He was one of the signers of the declaration of 1776, which he labored most indefatigably to bring forward. He sat in congress eight years, in 1789–94 was lieutenant-governor of Massachusetts, in 1794–97 governor, when he retired from public life. He died Oct. 2, 1803.

ADAMS, William Taylor, an American author who, under the pen name of "Oliver Optic," is one of the best known and most popular of American juvenile story tellers. He was born at Medway, Mass., 1822, and began the publication of his stories in 1853. He died in 1897.

ADAM'S APPLE, the popular name of the prominence seen in the front of the throat in man, and which is formed by the portion of the larynx known as the thyroid cartilage. It is much smaller and less visible in females than in males, and is so named from the idle notion that it was caused by a piece of the forbidden fruit having stuck in Adam's throat.

ADAM'S PEAK, one of the highest mountains in Ceylon, 45 m. east-southeast of Colombo, conical, isolated, and 7420 feet high. On the top, a rocky area of 64 feet by 45, is a hollow in the rock 5 feet long bearing a rude resemblance to a human foot, which the Brahmans

J. Q. Adams

believe to be the footprint of Siva, the Buddhists that of Buddha, the Mohammedans that of Adam. Devotees of all creeds here meet and present their offerings (chiefly rhododendron flowers) to the sacred footprint. The ascent is very steep, and toward the summit is assisted by steps cut and iron chains riveted in the rock.

A'DAR, the twelfth month of the Hebrew sacred and sixth of the civil year, answering to part of February and part of March.

ADDA (ancient Addua), a river of north Italy, which, descending from the Rhætian Alps, falls into Lake Como, and leaving this joins the Po, after a course of about 170 miles.

ADDA, a species of lizard, more commonly called skink.

AD'DAX, a species of antelope of the size of a large ass, with much of its make. The horns of the male are about 4 feet long, beautifully twisted into a wide-sweeping spiral of two turns and

Head of Addax.

a half, with the points directed outward. It has tufts of hair on the forehead and throat, and large broad hoofs. It inhabits the sandy regions of Nubia and Kordofan, and is also found in Caffraria.

ADDER, a name often applied to the common viper, as well as to other kinds of venomous serpents. See Viper.

ADDER'S-TONGUE, a species of fern, whose spores are produced on a spike, supposed to resemble a serpent's tongue.

ADDER'S-WORT, name of snakeweed or bistort, from its supposed virtue in curing the bite of serpents.

ADDICKS, John Edward, American politician, capitalist, and promoter, born in Philadelphia in 1841. In 1884 he began the organization of gas companies in Boston and elsewhere, and in 1895 he was a candidate for United States senator from Delaware. Defeated at that time, he prevented the election of his opponent. The vacancy was not filled before the expiration of the term of the other senator, so that Delaware was for a time without representation.

AD'DINGTON, Henry, Viscount Sidmouth; born 1757, died 1844. Entered parliament, 1783, as a warm supporter of Pitt. Was elected speaker of the House of Commons, 1789, and in 1801 invited by the king to form an administration, chiefly signalized by the conclusion of the Peace of Amiens.

AD'DISON, Joseph, an eminent English essayist, son of the Rev. Lancelot Addison, afterward dean of Litchfield, born at Milston, Wiltshire, 1st May, 1672, died 17th June, 1719. He was educated at the Charterhouse, where he became acquainted with Steele, and afterward at Oxford. He held a fellowship from 1697 till 1711, and gained much praise for his Latin poetry and other contributions to classical literature. He secured as his earliest patron the poet Dryden, who inserted some of his verses in his Miscellanies in 1693. A translation of the fourth Georgic, with the exception of the story of Aristæus, by Addison, appeared in the same collection in 1694, and he subsequently translated for it two and a half books of Ovid. Dryden also prefixed his prose essay on Virgil's Georgics to his own translation of that poem, which appeared in 1697. He contributed a number of papers to the Tatler, either wholly by himself or in conjunction with Steele, thus founding the new literary School of the Essayists. For the Spectator he wrote 274 papers all signed by one of the four letters C. L. L. O. His tragedy of Cato was translated into French, Italian, German and Latin. Of his style as a writer so much has been said that nothing remains to say but to quote the dictum of Johnson, "Whoever wishes to attain an English style, familiar but not coarse, and elegant but not ostentatious, must give his days and nights to the volumes of Addison."

ADDISON'S DISEASE (from Dr. Addison, Guy's Hospital, London, who traced the disease to its source), a fatal disease, the seat of which is the two glandular bodies placed one at the front of the upper part of each kidney, and called supra-renal capsules. It is characterized by anæmia or bloodlessness, extreme prostration, and the brownish or olive-green color of the skin. Death usually results from weakness, and commonly within a year.

ADDUC'TOR, a muscle which draws one part of the body toward another: applied in zoology to one of the muscles which bring together the valves of the shell of the bivalve molluscs.

ADE, George, an American humorist and playwright. He was born at Kentland, Ind., in 1866, graduated at Purdue university in 1887, and was for many years a writer for Chicago newspapers. His first work of note was his Fables in Slang, which ran through a long series of publications, and disclosed a power of satire rare in American literature. Mr. Ade more recently has written a large number of comedies and comic opera libretti which have been very popular.

ADEE, Alvey Augustus, American diplomat, born at Astoria, N. Y., in 1842. He was secretary of legation at Madrid in 1870 and in 1878 chief of the diplomatic bureau at Washington. From 1882 to 1886 he was third assistant secretary of state and served as acting secretary of state in 1900.

ADELAIDE (ad'e-lād), the capital of South Australia, 6 miles east from Port Adelaide (on St. Vincent Gulf), its port, with which it is united by railway, founded in 1837, and named after the queen of William IV. Situated on a large plain, it is built nearly in the form of a square, with the streets at right angles, and is divided into North and South Adelaide, separated by the river Torrens, which is crossed by several bridges, and by means of a dam is converted into a fine sheet of water. Adelaide is connected by railway with Melbourne, and is the terminus of the overland telegraph to Port Darwin. It has a large trade. Pop. (incl. suburbs), about 165,000.

ADELUNG (ad'e-lung), Johann Christoph, a German philologist; born 1732, died 1806. In 1759 he was appointed professor in the Protestant academy at Erfurt, and two years after removed to Leipzig, where he applied himself to the works by which he made so great a name, particularly his German dictionary, Grammatisch-kritisches Wörterbuch der hochdeutschen Mundart (Leipzig, 1774–86), and his Mithridates, a work on general philology. In 1787 he was appointed librarian of the public library in Dresden—an office which he held till his death.

A'DEN, a seaport town and territory belonging to Britain, on the southwest coast of Arabia, in a dry and barren district, the town being almost entirely closed in by an amphitheater of rocks, and possessing an admirable harbor. Occupying an important military position, Aden is strongly fortified and permanently garrisoned. It is of importance also as a coaling station for steamers, and carries on a great amount of commerce, forming an entrepôt and place of transshipment for goods valued at $20,000,000 a year. The peninsula on which it stands somewhat resembles the rock of Gibraltar, and could be rendered as formidable. The total area of the settlement is 70 square miles. It is attached to the Bombay Presidency. Pop. 43,974.

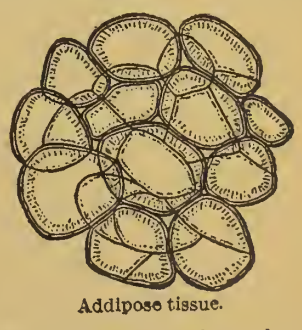
ADENANTHE'RA, a genus of trees and shrubs, natives of the East Indies and Ceylon. A. pavonina is one of the largest and handsomest trees of India, and yields hard solid timber called red sandalwood. The bright scarlet seeds, from their equality in weight (each, 4 grains), are used by goldsmiths in the East as weights.

ADENI'TIS, in medicine, inflammation of one or more of the lymphatic glands

ADHESION, the tendency of two bodies to stick together when put in close contact, or the mutual attraction of their surfaces; distinguished from cohesion, which denotes the mutual attraction between the particles of a homogeneous body. Adhesion may exist between two solids, between a solid and a fluid, or between two fluids. A plate of glass or of polished metal laid on the surface of water and attached to one arm of a balance will support much more than its own weight in the opposite scale from the force of adhesion between the water and the plate. From the same force arises the tendency of most liquids, when gently poured from a jar, to run down the exterior of a vessel or along any other surface they meet.

ADIAN'TUM, a genus of ferns; the maidenhair fern.

AD'IPOSE TISSUE, the cellular tissue containing the oily or fatty matter of the body. It underlies the skin, sur-



Adipose tissue.

rounds the large vessels and nerves, invests the kidneys, etc., and sometimes accumulates in large masses.

ADIRON'DACK MOUNTAINS, in the U. States, a group belonging to the

Appalachian chain extendig from then n.e. corner of the state of New York to near its center. The scenery is wild and grand, diversified by numerous beautiful lakes, and the whole region is a favorite resort of sportsmen and tourists.

AD'IT, a more or less horizontal opening, giving access to the shaft of a mine. It is made to slope gradually from the farthest point in the interior to the mouth, and by means of it the principal drainage is usually carried on. See Mine.

AD'JECTIVE, in grammar, a word used to denote some quality in the noun or substantive to which it is accessory. The adjective is indeclinable in English (but has degrees of comparison), and generally precedes the noun, while in most other European languages it follows the inflections of the substantive, and is more commonly placed after it, though in German it precedes it, as in English.

AJUDICA'TION, in English law, is the decree of the court in bankruptcy declaring a person bankrupt.

ADJUST'MENT, in marine insurance, is the settling of the amount of the loss which the insurer is entitled under a particular policy to recover, and if the policy is subscribed by more than one underwriter, of the amounts which the underwriters respectively are liable to pay.

AD'JUTANT, an officer appointed to each regiment or battalion, whose duty is to assist the commander. He is charged with instruction in drill, and all the interior discipline, duties, and efficiency of the corps. He has the charge of all documents and correspondence, and is the channel of communication for all orders.

ADJUTANT-BIRD, a large grallatorial or wading bird of the stork family, native of the warmer parts of India, where it is known as Hurgila or Argala. It stands about five feet high, has an

Adjutant-Bird.

enormous bill, nearly bare head and neck, and a pouch hanging from the under part of the neck. It is one of the most voracious carnivorous birds known, and in India, from its devouring all sorts of carrion and noxious animals, is protected by law. From underneath the wings are obtained those light downy feathers known as marabou feathers, from the name of an allied species of bird inhabiting western Africa, and also producing them.

ADJUTANT-GENERAL is the chief staff-officer of an army, charged with the execution of all orders relating to the recruitment, equipment, and efficiency of the troops, and who distributes to them the orders of the day.

ADLER, Felix, founder of the Society for Ethical culture, American reformer and lecturer, born in Germany Aug. 13, 1851. He came to the United States in 1857, accompanying his father, who was

Prof. Felix Adler.

called to the pulpit of the Temple Emanuel at New York. Dr. Adler was educated at Columbia College and at Heidelberg, where he received the degree of Ph.D. in 1873. When he organized the Society for Ethical Culture he was professor of Hebrew and Oriental Literature at Cornell University.

ADMINISTRA'TION, in politics, the executive power or body, the ministry or cabinet.

ADMIN'ISTRATOR, in law, the person to whom the goods of a man dying intestate are committed by the proper authority, and who is bound to account when required.

AD'MIRAL, the commander of a sqadron or fleet of war ships, or of the whole naval force of a country. The office of admiral varies in its functions and grades in different countries.

In the United States Navy the grades of admiral, vice-admiral, and rear-admiral were established by act of congress, primarily for the purpose of conferring exceptional distinction upon the great naval commander, Captain David Glasgow Farragut. The lowest of these grades, that of rear-admiral, was established in 1862, as was also that of commodore; though the latter had previously existed as a courtesy title without authority of law. The number of rear-admirals on the active list was limited to nine. In 1864 the President was authorized to appoint one of the rear-admirals a vice-admiral. Under the laws, Captain Farragut became the first commodore, first rear-admiral, and first vice-admiral. In 1899 the number of rear-admirals was increased to eighteen and the grade of commodore on the active list abolished. The act of 1899 fixed the pay of flag officers as follows: Admiral, $13,500 at sea or on shore; senior nine rear-admirals, $7500 while at sea, or on shore duty beyond seas, and $6375 while on shore duty; junior nine rear-admirals, $5500 while at sea, or on shore duty beyond seas, and $4675 while on shore duty. The pay of officers on the retired list is seventy-five per centum of their active pay at time of retirement. The number in 1902 on this list was forty-three. The flag of the admiral is a rectangular blue flag with four white stars, and is flown at the main; that of the vice-admiral, flown at the fore, is a similar flag, with three stars. The flag of a rear-admiral, flown at the mizzen, is similar in shape, has two stars, and is usually blue in color, but in case two or more rear-admirals are in company the senior flies a blue flag, the second in rank a red flag, and the junior a white flag.

AD'MIRALTY, that department of the government of a country that is at the head of its naval service. In Britain the lords commissioners of the admiralty were formerly seven, but are now five in number, with the addition of a civil lord, at the head being of first lord, and four others being naval lords. The first lord is always a member of the cabinet, and it is he who principally exercises the powers of the department.

ADMIRALTY CHARTS are charts issued by the hydrographic department of the admiralty of Britain; they are prepared by specially appointed surveyors and draughtsmen, and, besides being supplied to every ship in the fleet, are sold to the general public at prices much less than their cost. In connection with these charts there are published books of sailing directions, lists of lights, etc. The navigating charts are generally on the scale of half an inch to a mile, and show all the dangers of the coasts with sufficient distinctness to enable the seaman to avoid them; the charts of larger size exhibit all the intricacies of the coast.

ADMIRALTY COURT, a court which takes cognizance of civil and criminal causes of a maritime nature, including captures in war made, and offenses committed, on the high seas, and has to do with many matters connected with maritime affairs. In England the admiralty court was once held before the lord high admiral, and at a later period was presided over by his deputy or the deputy of the lords commissioners. It now forms a branch of the probate, divorce, and admiralty division of the High Court of Justice. There is a separate Irish admiralty court. In Scotland admiralty cases are now prosecuted in the Court of Session, or in the sheriff court. In the United States admiralty cases are taken up in the first instance by the district courts.

ADMIRALTY ISLAND, an island belonging to the United States off the

northwest coast of North America, 80 or 90 miles long and about 20 broad, covered with fine timber and inhabited by Sioux Indians.

ADMIRALTY ISLANDS, a cluster of islands, north of New Guinea, in Bismarck Archipelago, now belonging to Germany. The largest is about 60 miles in length; the rest are much smaller.

AD'NATE, in botany, applied to a part growing attached to another and principal part by its whole length, as stipules adnated to the leaf-stalk.

ADOBE (a-dō'bā), the Spanish name for a brick made of loamy earth, containing about two-thirds fine sand and one-third clayey dust, sun-dried; in common use for building in Mexico, Texas, and Central America.

ADOLPHUS OF NASSAU, elected Emperor of Germany, 1292. In 1298 the college of electors transferred the crown to Albert of Austria, but, Adolphus refusing to abdicate, a war ensued, in which he fell, after a heroic resistance, July 2, 1298.

ADONAI (ad'o-nī), a name of Good among the Jews. See Jehovah.

ADŌ'NIS, a mythological personage, originally a deity of the Phœnicians, but borrowed into Greek mythology. He was represented as being a great favorite of Aphroditē (Venus), who accompanied him when engaged in hunting, of which he was very fond. He received a mortal wound from the tusk of a wild boar, and when the goddess hurried to his assistance she found him lifeless, whereupon she caused his blood to give rise to the anemone. The worship of Adonis, which arose in Phœnicia, latterly was widely spread round the Mediterranean. The name Adonis is akin to the Hebrew Adonai, Lord.

ADOP'TION, the admission of a stranger by birth to the privileges of a child. Among the ancient Greeks and Romans, and also some modern nations, adoption is placed under legal regulation. In many of the states adoption is regulated by law.

ADRIAN, the name of six popes. The first, a Roman, ruled from 772 to 795; a contemporary and friend of Charlemagne. He expended vast sums in rebuilding the walls and restoring the aqueducts of Rome.—**ADRIAN II.,** a Roman, was elected pope in 867, at the age of seventy-five years. He died in 872, in the midst of conflicts with the Greek Church.—**ADRIAN III.,** a Roman, elected 884, was pope for one year and four months only. He was the first pope that changed his name on the occasion of his exaltation.—**ADRIAN IV.,** originally named Nicolas Breakspear, the only Englishman that ever occupied the papal chair, was born about 1100, and died 1159. He issued the famous bull (1158) granting the sovereignty of Ireland, on condition of the payment of Peter's pence, to Henry II.—**ADRIAN V,** of Genoa, settled, as legate of the pope, the dispute between King Henry III. of England and his nobles, in favor of the former; but died a month after his election to the papal chair (1276).—**ADRIAN VI.,** born at Utrecht in 1459, was elected to the papal chair, January 9, 1522. He tried to reform abuses in the church, but opposed the zeal of Luther with reproaches and threats, and even attempted to excite Erasmus and Zuinglius against him. Died 1523, after a reign of one year and a half.

A'DRIAN, a town of the United States, in Michigan, 70 miles w.s.w. of Detroit. Its extensive water-power is employed in works of various kinds. Pop. 10,000.

A'DRIAN, Publius Ælius Hadrianus See Hadrian.

ADRIANO'PLE, an important city of Turkey in Europe. Adrianople received its present name from the Roman emperor Adrian (Hadrian). In 1361 it was taken by Amurath I., and was the residence of the Turkish sovereigns till the conquest of Constantinople in 1453. In 1829 it was taken by the Russians, and here was then concluded the peace of Adrianople, by which Russia received important accessions of territory in the Caucasus and on the coast of the Black Sea. The Russians occupied it also in 1878. Pop. 60,000.

ADRIAN'S (or **HADRIAN'S**) **WALL.** See Roman Walls.

ADRIAT'IC SEA, or **GULF OF VENICE,** an arm of the Mediterranean, stretching in a northwesterly direction from the Straits of Otranto, between Italy and the Turkish and Austrian dominions. Length, about 480 miles; average breadth, about 100; area, about 60,000 square miles. The rivers which it receives, particularly the Po, its principal feeder, have produced, and are still producing, great geological changes in its basin by their alluvial deposits. Hence Adria, between the Po and the Adige, which gives the sea its name, though once a flourishing seaport, is now 17 miles inland. The principal trading ports on the Italian side are Brindisi, Bari, Ancona, Sinigaglia, and Venice; on the east side Ragusa, Fiume, Pirano, Pola, and Trieste.

ADULA'RIA, a very pure, limpid, translucent variety of the common felspar, called by lapidaries moonstone, on account of the play of light exhibited by the arrangement of its crystalline structure. It is found on the Alps, but the best specimens are brought from Ceylon.

ADUL'LAM, Cave of, a cave to which David fled when persecuted by Saul, and whither he was followed by "every one who was in distress, in debt, or discontented" (1 Sam. xxii. 1, 2).

ADULTERA'TION, a term not only applied in its proper sense to the fraudulent mixture of articles of commerce, food, drink, drugs, seeds, etc., with noxious or inferior ingredients, but also by magistrates and analysts to accidental impurity, and even in some cases to actual substitution. The chief objects of adulteration are to increase the weight or volume of the article, to give a color which either makes a good article more pleasing to the eye or else disguises an inferior one, to substitute a cheaper form of the article, or the same substance from which the strength has been extracted, or to give it a false strength. —Among the adulterations which are practiced for the purpose of fraudulently increasing the weight or volume of an article are the following: Bread is adulterated with alum or sulphate of copper, which gives solidity to the gluten of damaged or inferior flour; with chalk or carbonate of soda to correct the acidity of such flour; and with boiled rice or potatoes, which enables the bread to carry more water, and thus to produce a larger number of loaves from a given quantity of flour. Wheat flour is adulterated with other inferior flours, as the flour from rice, bean, Indian-corn, potato, and with sulphate of lime, alum, etc. Milk is usually adulterated with water. The adulterations generally present in butter consist of an undue proportion of salt and water, lard, tallow, and other fats; when of poor quality it is frequently colored with a little annatto, and, at times, with the juice of carrots. Genuine butter should not contain less than 80 per cent of butter-fat. Cheese is also colored with annatto and other substances. Tea is adulterated (chiefly in China) with sand, iron-filings, chalk, gypsum, China clay, exhausted tea leaves, and the leaves of the sycamore, horse-chestnut, and plum, while color and weight are added by black-lead, indigo, Prussian-blue (one of the deleterious ingredients used by the Chinese in converting the lowest qualities of black into green teas), gum, turmeric, soapstone, catechu, and other substances. Coffee is mingled with chicory, roasted wheat, roasted beans, acorns, mangel-wurzel, rye-flour, and colored with burned sugar and other materials. Chicory is adulterated with different flours, as rye, wheat, beans, etc., and colored with ferruginous earths, burned sugar, Venetian red, etc. Cocoa and chocolate are mixed with the cheaper kinds of arrow-root, animal matter, corn, sago, tapioca, etc. Sugar (moist) may be adulterated to some extent with sand and flour. Tobacco is mixed with sugar and treacle, aloes, licorice, oil, alum, etc., and such leaves as rhubarb, chicory, cabbage, burdock, coltsfoot, besides excess of salt and water. Snuffs are adulterated with carbonate of ammonia, glass, sand, coloring matter, etc. Confections are adulterated with flour and sulphate of lime. Preserved vegetables are kept green and poisoned by salts of copper. The acridity of mustard is commonly reduced by flour, and the color of the compound is improved by turmeric. Pepper is adulterated with linseed-meal, flour, mustard husks, etc. Color is given to pickles by salts of copper, acetate of copper, etc. Ale is adulterated with common salt, grains of paradise, quassia, and other bitters, sulphate of iron, alum, etc. Porter and stout are mixed with sugar, treacle, salt, and an excess of water. Brandy is diluted with water, and burned sugar is added to improve the color; sometimes bad whisky is flavored and colored so as to resemble brandy, and sold under its name. Gin is mixed with excess of water, and flavoring matters of various kinds, with alum and tartar, are added. Rum is diluted with water, and the flavor and color are kept up by the addition of cayenne and burned sugar. For champagne gooseberry and other inferior wines are often substituted. Port is manufactured from red Cape and other inferior wines, the body, flavor, strength, and color being produced by gum-dragon, the washings of brandy

casks, and a preparation of German bilberries. Cheap brown sherry is mixed with Cape and other low-priced brandies and is flavored with the washings of brandy casks, sugar-candy, and bitter almonds. Pale sherries are produced by gypsum, by a process called plastering, which removes the natural acids as well as the color of the wine. Other wines are adulterated with elderberry, logwood, Brazil-wood, cudbear, red beetroot, etc., for color; with lime or carbonate of lime, carbonate of soda, carbonate of potash, and litharge, to correct acidity; with catechu, sloe-leaves, and oak-bark for astringency; with sulphate of lime and alum for removing color; with cane-sugar for giving sweetness and body; with alcohol for fortifying; and with ether, especially acetic ether, for giving bouquet and flavor.—Medicines, such as jalap, opium, rhubarb, chinchona bark, scammony, aloes, sarsaparilla, squills, etc., are mixed with various foreign substances. Castor-oil has been adulterated with other oils; and inferior oils are often mixed with cod-liver oil. Cantharides are often mixed with golden-beetle and also artifically-colored glass.—The adulteration of seeds is largely practised also, the seed which forms the adulterant being of course of the most worthless kind that can be had. Thus turnip-seed is mixed with rape, wild mustard, or charlock, which are steamed and kiln-dried to destroy their vitality, so as to evade detection in the progress of growth; old and useless turnip-seed is also used fraudulently mixed with fresh seeds. Clover is also much mixed with plantain and mere weeds.

ADUL'TERY, the voluntary sexual intercourse of a married person with any other than the offender's husband or wife; when committed between two married persons, the offense is called double, and when between a married and a single person, single adultery. The Mosaic, Greek, and early Roman law only recognized the offense when a married woman was the offender. By the Jewish law it was punished with death. A man can obtain a dissolution of his marriage on the ground of his wife's adultery, and a wife can obtain a judicial separation on the ground of her husband's adultery, or a dissolution of the marriage if the offense is coupled with cruelty, desertion, or bigamy. In the United States the punishment of adultery has varied materially at different times. It is, however, very seldom punished criminally.

AD VALO'REM, a term applied to customs or duties levied according to the worth of the goods, as sworn to by the owner, and not according to number, weight, measure, etc.

ADVANCEMENT OF SCIENCE ASSOCIATIONS, organizations to encourage scientific research in all of its departments. The most prominent associations for the advancement of science are those of the United States, Great Britain, and France. Those of the two last mentioned countries are now consolidated and occasionally hold international meetings, the first of which took place at Paris in 1900. The American Association for the Advancement of Science, now one of the most noted scientific societies of America, was founded in 1847 as an outgrowth of the association of American geologists and naturalists. The association is organized in ten sections, each of which holds its own convention at the annual meeting of the association during the summer. The sections embrace the following departments of science: A, mathematics and astronomy; B, physics; C, chemistry; D, mechanical science and engineering; E, geology and geography; F, zoology; G, botany; H, anthropology and experimental medicine. The association also serves as a center for the meeting of a number of important special scientific societies which have become connected with it. The association publishes annually a volume of proceedings, and in 1901 became affiliated with the journal Science, making it the semi-official organ of the society. The membership of the society is about 3,000. The British Association for the Advancement of Science was founded in the city of York in 1831, under the leadership of David Brewster and with the cooperation of many of the most prominent men of the time. The annual meetings of the association are held for a week each summer, and consist mainly of papers read before the several sections of the society and of conferences following them.

AD'VENT, the name applied to the holy season which occupies the four or, according to the Greek Church, six weeks preceding Christmas, and which forms the first portion of the ecclesiastical year, as observed by the Anglican, the R. Catholic and the Greek Church.

AD'VENTISTS, a small religious sect of the United States, who believe in the speedy coming of Christ, and generally practice adult immersion.—There is also a sect called Seventh-day Adventists, who hold that the coming of Christ is at hand, and maintain that the Sabbath is still the seventh day of the week.

AD'VERB, one of the parts of speech used to limit or qualify the signification of an adjective, verb, or other adverb; as, very cold, naturally brave, much more clearly, readily agreed. Adverbs may be classified as follows: 1, adverbs of time, as, now, then, never, etc.; 2, of place, as, here, there, where, etc.; 3, of degree, as, very, much, nearly, almost, etc.; 4, of affirmation, negation, or doubt, as, yes, no, certainly, perhaps, etc.; 5, of manner, as, well, badly, clearly, etc.

ADVER'TISEMENT, a notice given to individuals or the public of some fact, the announcement of which may affect either the interest of the advertiser or that of the parties addressed. The vehicle employed is generally special bills or placards and notices inserted in newspapers and periodicals, and the profit derivable from advertisements forms the main support of the newspaper press.

AD'VOCATE, a lawyer authorized to plead the cause of his clients before a court of law. It is only in Scotland that this word seems to denote a distinct class belonging to the legal profession, the advocates of Scotland being the pleaders before the supreme courts.

ADVOCA'TUS DIAB'OLI (Devil's advocate), in the Roman Catholic Church, a functionary who, when a deceased person is proposed for canonization, brings forward and insists upon all the weak points of the character and life of the deceased, endeavoring to show that he is not worthy of sainthood. The opposite side is taken by the Advocatus Dei, God's advocate.

ADZ, a cutting instrument used for chipping the surface of timber, somewhat of a mattock shape, and having a blade of steel forming a portion of a cylindrical surface, with a cutting edge at right angles to the length of the handle.

ÆGAG'RUS, a wild species of ibex found in troops on the Caucasus, and many Asiatic mountains, believed to be the original source of at least one variety of the domestic goat.

ÆGEAN SEA (ē-jē'an), that part of the Mediterranean which washes the eastern shores of Greece, the southern coast of Turkey, and the western coast of Asia Minor. See Archipelago.

Æ'GILOPS, a genus of grasses, very closely allied to wheat, and somewhat remarkable from the alleged fact that by cultivation one of the species becomes a kind of wheat.

ÆGINA (ē-jī'na), a Greek island in the Gulf of Ægina, south of Athens, triangular in form; area about 32 square miles; pop. 8200.

ÆGIS (ē'jis), the shield of Zeus, according to Homer, but according to later writers and artists a metal cuirass or breastplate, in which was set the head of the Gorgon Medusa, and with which Athena (Minerva) is often figured as being protected.

ÆNE'AS, the hero of Virgil's Ænēid, a Trojan, who, according to Homer, was, next to Hector, the bravest of the warriors of Troy. His son, Æneas Sylvius, was the ancestor of the kings of Alba Longa, and of Romulus and Remus, the founders of the city of Rome.

ÆOLIAN HARP, or **ÆOLUS' HARP,** a musical instrument, generally consisting of a box of thin fibrous wood, to which are attached from eight to fifteen fine catgut strings or wires, stretched on low bridges at each end, and tuned in unison. Its length is made to correspond with the size of the window or other aperture in which it is intended to be placed. When the wind blows athwart the strings it produces very beautiful sounds, sweetly mingling all the harmonic tones, and swelling or diminishing according to the strength or weakness of the blast.

ÆOLIANS, one of the four races into which the ancient Greeks were divided, originally inhabiting the district of Æolis, in Thessaly, from which they spread over other parts of Greece.

Æ'OLUS, in Greek mythology, the god of the winds, which he kept confined in a cave in the Æolian Islands, releasing them when he wished or was commanded by the superior gods.

Æ'ON, a Greek word signifying life, an age, and sometimes eternity, but used by the Gnostics to express spirits or powers that had emanated from the Supreme Mind before the beginning of time.

ÆPYOR'NIS, a genus of gigantic birds whose remains have been found in Madagascar, where it is supposed to have lived perhaps not longer than 200 years ago. It had three toes, and is classed with the cursorial birds (ostrich, etc.). Its eggs measured 14 inches in length, being about six times the bulk of those of the ostrich. The bird which laid them may well have been the roc of Eastern tradition.

A'ERATED BREAD, bread which receives its sponginess or porosity from carbonic acid supplied artificially, and not produced by the fermentation caused by leaven or yeast.

A'ERATED WATERS, waters impregnated with carbonic acid gas, and forming effervescing beverages. Some mineral waters are naturally aerated, as Vichy, Apollinaris, Rosbach, etc.; others, especially such as are used for medicinal purposes, are frequently aerated to render them more palatable and exhilarating. Water simply acrated, or aerated and flavored with lemonade or fruit syrups, is largely used, especially in summer, as a refreshing beverage. There are numerous varieties of apparatus for manufacturing aerated waters.

AERODYNAM'ICS, a branch of physical science, which treats of the properties and motions of elastic fluids (air, gases), and of the appliances by which these are exemplified. This subject is often explained in connection with hydrodynamics.

AERÖE, or **ARROE** (är'eu-e), an island of Denmark, in the Little Belt, 15 miles long by 5 broad, with 12,000 inhabitants. Though hilly, it is very fertile.

A'ÉROLITE, a meteoric stone, meteorite, or shooting-star. See Meteoric Stones.

AERONAUT'ICS. See Airships.

AEROSTATIC PRESS, a simple contrivance for rendering the pressure of the atmosphere available for extracting the coloring matter from dye-woods and similar purposes

AEROSTAT'ICS, that branch of physics which treats of the weight, pressure, and equilibrium of air and gases. See Air, Air-pump, Barometer, Gas, etc.

ÆSCHINES (ēs'ki-nēz), a celebrated Athenian orator, the rival and opponent of Demosthenes, was born 390 B.C. and died in 314. Three of his orations are extant.

ÆSCHYLUS (ēs'ki-lus), the first in time of the three great tragic poets of Greece, born at Eleusis, in Attica, B.C. 525, died in Sicily 456. Before he gained distinction as a dramatist he had highly distinguished himself at the battle of Marathon (490), as he afterward did at Artemisium, Salamis, and Platæa. He first gained the prize for tragedy in B.C. 484. The Persians, the earliest of his extant pieces, formed part of a trilogy which gained the prize in B.C. 472. In B.C. 468 he was defeated by Sophocles, and then is said to have gone to the court of Hiero, king of Syracuse. Æschylus may be called the creator of Greek tragedy, both from the splendor of his dramatic writings, and from the scenic improvements and accessories he introduced. Till his time only one actor had appeared on the stage at a time, and by bringing on a second he was really the founder of dramatic dialogue.

ÆSCULA'PIUS, the god of medicine among the Greeks and latterly adopted by the Romans, usually said to have been a son of Apollo. He was worshiped in particular at Epidaurus, in Peloponnesus, where a temple with a grove was dedicated to him.

ÆS'CULUS, the genus of plants to which belongs the horse-chestnut.

Æ'SOP, the Greek fabulist, is said to have been a contemporary of Crœsus and Solon, and thus probably lived about the middle of the sixth century B.C. But so little is known of his life that his existence has been called in question. He is said to have been originally a slave, and to have received his freedom from a Samian master, Iadmon, No works of Æsop are extant, and it is doubtful whether he ever wrote any. The supposition is that his fables were delivered orally and perpetuated by repetition. Such fables are spoken of both by Aristophanes and Plato.

ÆSTHET'ICS, the philosophy of the beautiful; the name given to the branch of philosophy or of science which is concerned with that class of emotions, or with those attributes, real or apparent, of objects generally comprehended under the term beauty, and other related expressions. The term æsthetics first received this application from Baumgarten (1714–1762), a German philosopher, who was the first writer to treat systematically on the subject, though the beautiful had received attention at the hands of philosophers from early times.

ÆSTIVA'TION, a botanical term applied to the arrangement of the parts of a flower in the flower-bud previous to the opening of the bud.—The term is also applied to the summer sleep of animals. See Dormant State.

Æ'THRIOSCOPE, an instrument for measuring radiation toward a clear sky, consisting of a metallic cup with a highly-polished interior of paraboloidal shape, in the focus of which is placed one bulb of a differential thermometer, the other being outside. The inside bulb at once begins to radiate heat when exposed to a clear sky, and the extent to which this takes place is shown by the scale of the thermometer. The æthrioscope also indicates the presence of invisible aqueous vapor in the atmosphere, radiation being less than when the air is dry.

ÆT'NA. See Etna.

AFFIDA'VIT, a written statement of facts upon oath or affirmation. Affidavits are generally made use of when evidence is to be laid before a judge or a court, while evidence brought before a jury is delivered orally. The person making the affidavit signs his name at the bottom of it, and swears that the statements contained in it are true. The affidavit may be sworn to in open court, or before a magistrate or other duly qualified person.

AFFIN'ITY, in chemistry, the force by which unlike kinds of matter combine so intimately that the properties of the constituents are lost, and a compound with new properties is produced. Of the force itself we know little or nothing. It is not the same under all conditions, being very much modified by circumstances, especially temperature. The usual effect of increase of temperature is to diminish affinity and ultimately to cause the separation of a compound into its constituents; and there is probably for every compound a temperature above which it could not exist but would be broken up. Where two elements combine to form a compound heat is almost always evolved, and the amount evolved serves as a measure of the affinity. In order that chemical affinity may come into play it is necessary that the substances should be in contact, and usually one of them at least is a fluid or a gas. The results produced by chemical combination are endlessly varied. Color, taste, and smell are changed, destroyed, or created; harmless constituents produce strong poisons, strong poisons produce harmless compounds.

AFFINITY, in law, is that degree of connection which subsists between one of two married persons and the blood relations of the other. It is no real kindred (consanguinty). A person cannot, by legal succession, receive an inheritance from a relation by affinity; neither does it extend to the nearest relations of husband and wife so as to create a mutual relation between them. The degrees of affinity are computed in the same way as those of consanguinity or blood. All legal impediments arising from affinity cease upon the death of the husband or wife, excepting those which relate to the marriage of the survivor.

AFFIRMA'TION, a solemn declaration by Quakers and others, who object to taking an oath, in confirmation of their testimony in courts of law, or of their statements on other occasions on which the sanction of an oath is required of other persons.

AFGHANISTAN (áf-gän'i-stän), that is, the land of the Afghans, a country in Asia, bounded on the east by the N. W. Frontier Prov., etc., on the south by Beluchistan, on the west by the Persian province of Khorasan, and on the north by Bokhara and Russian Turkestan. Recently the boundary from the Oxus to the Persian frontier was surveyed and marked off by a Russian and British commission; farther east to the Chinese frontier it was settled in 1895. The area may be set down at about 280,000 sq. miles. The population is estimated at between 4,000,000 and 5,000,000. Afghanistan consists chiefly of lofty, bare, uninhabited tablelands, sandy barren plains, ranges of snow-covered mountains, offsets of the Hindu Kush or the Himalayas, and deep ravines and valleys. Many of the last are well watered and very fertile, but about four-fifths of the whole surface is rocky, mountainous, and unproductive. There are numerous practicable avenues of communication between Afghanistan and India, among the most extensively used being the famous Khyber Pass, by which the river Cabul enters the Punjab; the Gomul Pass, also leading to the Punjab; and the Bolan Pass on the south, through which the route passes to Sind. Of the rivers the

largest is the Helmund, which flows in a south-westerly direction more than 400 miles, till it enters the Hamoon or Seistan swamp. Next in importance are the Cabul in the northeast, which

Afghans.

drains to the Indus, and the Hari Rud in the northwest, which, like other Afghan streams, loses itself in the sand. The climate is extremely cold in the higher, and intensely hot in the lower regions, yet on the whole it is salubrious. The most common trees are pines, oaks, birch, and walnut. In the valleys fruits, in the greatest variety and abundance, grow wild. The principal crops are wheat, forming the staple food of the people; barley, rice, and maize. Other crops are tobacco, sugar-cane, and cotton. The chief domestic animals are the dromedary, the horse, ass, and mule, the ox, sheep with large fine fleeces and enormous fat tails, and goats; of wild animals there are the tiger, bears, leopards, wolves, jackal, hyena, foxes, etc. The chief towns are Cabul (the capital), Kandahar, Ghuzni, and Herat. The inhabitants belong to different races, but the Afghans proper form the great mass of the people. They are allied in blood to the Persians, and are divided into a number of tribes, among which the Duranis and Ghiljis are the most important. The Afghans are bold, hardy, and warlike, fond of freedom and resolute in maintaining it, but of a restless, turbulent temper, and much given to plunder. Tribal dissensions are constantly in existence, and seldom or never do all the Afghans pay allegiance to the nominal ruler of their country. Their language is distinct from the Persian, though it contains a great number of Persian words, and is written, like the Persian, with the Arabic characters. In religion they are Mohammedans of the Sunnite sect. The history of Afghanistan is mainly modern. The British have attempted to control the country and its ruler, called the Ameer, since 1839. The present Ameer is friendly to Britain, but he has been found very difficult to restrain from intrigues with Russia. He is virtually autocrat of his domains.

AF'RICA, one of the three great divisions of the Old World, and the second in extent of the five principal continents of the globe, forming a vast peninsula joined to Asia by the Isthmus of Suez. It is of a compact form, with few important projections or indentations, and having therefore a very small extent of coast-line (about 16,000 miles, or much less than that of Europe) in proportion to its area. This continent extends from 37° 20′ n. lat. to 34° 50′ s. lat., and the extreme points, Cape Blanco and Cape Agulhas, are nearly 5000 miles apart. From west to east, between Cape Verde, lon. 70° 34′ w., and Cape Guardafui, lon. 51° 16′ e., the distance is about 4600 miles. The area is estimated at 11,500,000 square miles, or more than three times that of Europe. The islands belonging to Africa are not numerous, and, except Madagascar, none of them are large. They include Madeira, the Canaries, Cape Verde Islands, Fernando Po, Prince's Island, St. Thomas, Ascension, St. Helena, Mauritius, Bourbon, the Comoros, Socotra, etc.

The most striking feature of northern Africa is the immense tract known as the Sahara or Great Desert, which is inclosed on the north by the Atlas Mountains (greatest height, 12,000 to 13,000 feet), the plateau of Barbary and that of Barca, on the east by the mountains along the west coast of the Red Sea, on the west by the Atlantic Ocean, and on the south by the Soudan. The Soudan, which lies to the south of the Sahara, and separates it from the more elevated plateau of southern Africa, forms a belt of pastoral country across Africa, and includes the countries on the Niger, around Lake Tchad (or Chad), and eastward to the elevated region of Abyssinia. Southern Africa as a whole is much more fertile and well watered than northern Africa, though it also has a desert tract of considerable extent (the Kalahari Desert).

The Nile is the only great river of Africa which flows to the Mediterranean. It receives its waters primarily from the great lake Victoria Nyanza, which lies under the equator, and in its upper course is led by tributary streams of great size, but for the last 1200 miles of its course it has not a single affluent. It drains an area of more than 1,000,000 square miles. The Indian Ocean receives numerous rivers; but the only great river of South Africa which enters that ocean is the Zambesi, the fourth in size of the continent, and having in its course the Victoria Falls, one of the greatest waterfalls in the world In southern Africa also, but flowing westward and entering the Atlantic, is the Congo, which takes origin from a series of lakes and marshes in the interior, is fed by great tributaries, and is the first in volume of all the African rivers, carrying to the ocean more water than the Mississippi. Unlike most of the African rivers, the mouth of the Congo forms an estuary. Of the other Atlantic rivers, the Senegal, the Gambia, and the Niger are the largest, the last being third among African streams.

With the exception of Lake Tchad there are no great lakes in the northern division of Africa, whereas in the number and magnificence of its lakes the southern division almost rivals North America. Here are the Victoria and Albert Nyanza, Lakes Tanganyika, Nyassa, Shirwa, Bangweolo, Moero, and other lakes. Of these the Victoria and Albert belong to the basin of the Nile; Tanganyika, Bangweolo, and Moero to that of the Congo; Nyassa, by its affluent the Shiré, to the Zambesi. Lake Tchad on the borders of the northern desert region, and Lake Ngami on the borders of the southern, have a remarkable resemblance in position, and in the fact that both are drained by streams that lose themselves in the sand.

The climate of Africa is mainly influenced by the fact that it lies almost entirely within the tropics. In the equatorial belt, both north and south, rain is abundant and vegetation very luxuriant, dense tropical forests prevailing for about 10° on either side of the line. To the north and south of the equatorial belt the rainfall diminishes, and the forest region is succeeded by an open pastoral and agricultural country. This is followed by the rainless regions of the Sahara on the north and the Kalahari Desert on the south, extending beyond the tropics, and bordering on the agricultural and pastoral countries of the north and south coasts, which lie entirely in the temperate zone. The low coast regions of Africa are almost everywhere unhealthful, the Atlantic coast within the tropics being the most fatal region to Europeans.

Among mineral productions may be mentioned gold, which is found in the rivers of western Africa (hence the name Gold Coast), and in southern Africa, most abundantly in the Transvaal; diamonds have been found in large numbers in recent years in the south; iron, copper, lead, tin, and coal are also found.—Among plants are the baobab, the date-palm (important as a food plant in the north), the doum-palm, the oil-palm, the wax-palm, the shea-butter tree, trees yielding caoutchouc, the papyrus, the castor-oil plant, indigo, the coffee-plant, heaths with beautiful flowers, aloes, etc. Among cultivated plants are wheat, maize, millet, and other grains, cotton, coffee, cassava, ground-nut, yam, banana, tobacco, various fruits, etc. As regards both plants and animals, northern Africa, adjoining the Mediterranean, is distinguished from the rest of Africa in its great agreement with southern Europe.—Among the most characteristic African animals are the lion, hyena, jackal, gorilla, chimpanzee, baboon, African elephant (never domesticated, yielding much ivory to trade), hippopotamus, rhinoceros, giraffe, zebra, quagga, antelopes in great variety and immense numbers.—Among birds are the ostrich, the secretary-bird or serpent-eater, the honey-guide cuckoo, sacred ibis, guinea fowl.—The reptiles include the crocodile, chameleon, and serpents of various kinds, some of them very venomous.—Among insects are locusts, scorpions, the tsetse-fly whose bite is so fatal to cattle, and white-ants.

The great races of which the population of Africa mainly consists are the Hamites, the Semites, the Negroes, and the Bantus. To the Semitic stock be-

long the Arabs, who form a considerable portion of the population in Egypt and along the north coast, while a portion of the inhabitants of Abyssinia are of the same race (though the blood is considerably mixed). The Hamites are represented by the Copts of Egypt, the Berbers, Kabyles, etc., of northern Africa, and the Somâli, Danâkil, etc., of eastern Africa. The Negro races occupy a vast territory in the Soudan and central Africa, while the Bantus occupy the greater part of southern Africa from a short distance north of the equator, and include the Kaffres, Bechuanas, Swahili, and allied races. In the extreme southwest are the Hottentots and Bushmen (the latter a dwarfish race), distinct from the other races as well as, probably, from each other. In Madagascar there is a large Malay element. To these may be added the Fulahs on the Niger and the Nubians on the Nile and elsewhere, who are of a brownish color, and are often regarded as distinct from the other races, though sometimes classed with the Negroes. In religion a great proportion of the inhabitants are heathens of the lowest type; Mohammedanism numbers a large number of adherents in North Africa, and is rapidly spreading in the Soudan; Christianity prevails only among the Copts, the Abyssinians, and the natives of Madagascar, the latter having been converted in recent times. Elsewhere the missionaries seem to have made but little progress. Over great part of the continent civilization is at a low ebb, yet in some parts the natives have shown considerable skill in agriculture and various mechanical arts, as in weaving and metal working. Of African trade two features are the caravans that traverse great distances, and the trade in slaves that still widely prevails, and is accompanied by an immense amount of bloodshed. Among articles exported from Africa are palm-oil, diamonds, ivory, ostrich feathers, wool, cotton, gold, esparto, caoutchouc, etc. The population is estimated at 170,000,000. Of these a small number are of European origin—French in Algeria, British and Dutch at the southern extremity.

Great areas in Africa have recently been apportioned among European powers as protectorates or spheres of influence. Among states still more or less independent are Morocco, Abyssinia, Bornu, Waday, Bagirmi, Liberia. To Britain belong the Cape Colony, Natal, and the recently independent Orange River Colony and Transvaal, with Rhodesia, etc., farther north, a region in eastern Africa extending from the sea to Lake Victoria and the headwaters of the Nile, Sierra Leone; and other settlements on the west coast, Mauritius, etc.; to France belong Algeria and Tunis, Senegambia, part of Sahara, territory north of the Lower Congo, Madagascar, etc.; the Portuguese possess Angola on the west coast and Mozambique on the east; Germany has considerable tracts on the east, the southwest and the western coasts; to Turkey nominally belong Egypt, Barca, and Tripoli; Italy has a territory on the Red Sea, and part of Somaliland; Spain has a part of the coast of the Sahara; the Congo Free State is under the king of Belgium; Zanzibar is now a British protectorate.

Africa has an ancient history and was colonized by the Greeks and the Romans. Modern exploration began with Mungo Park in 1795 and has continued down to present times through the labors of Lander, Overweg, Barth, Speke, Livingstone, and Stanley.

AGAMEM'NON, in Greek mythology, son of Atreus, King of Mycenæ and Argos, brother of Menelaus, and commander of the allicd Greeks at the siege of Troy. Rcturning home after the fall of Troy, he was treacherously assassinated by his wife, Clytemnestra, and her paramour, Ægisthus. He was the father of Orestes, Iphigenia, and Electra.

AGAMOGENESIS (-jen'e-sis), the production of young without the congress of the sexes, one of the phenomena of alternate generation. See Generation.

AGANIPPE (-nip'ē), a fountain on Mount Helicon, in Greece, sacred to the Muses, which had the property of inspiring with poetic fire whomever drank of it.

AGAPE (ag'a-pē), in ecclesiastical history, the love-feast or feast of charity, in use among the primitive Christians, when a liberal contribution was made by the rich to feed the poor.

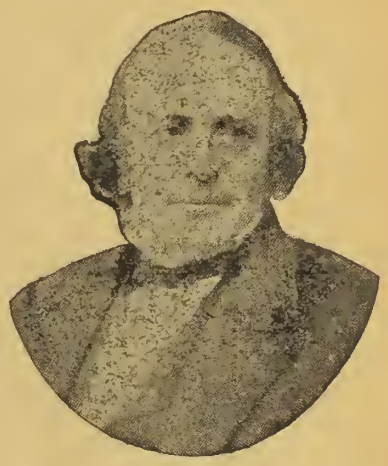
AGAPEMONE (ag-a-pem'o-nē), the name of a singular conventual establishment which has existed at Spaxton, near Bridgewater, Somersetshire, since 1859, the originator of it being a certain Henry James Prince, at one time a clergyman of the Church of England, who called himself the Witness of the First Resurrection. The life spent by the inmates appears to be a sort of religious epicureanism.

A'GAR-A'GAR, a dried seaweed of the Asiatic Archipelago, much used in the East for soups and jellies, and also by the paper and silk manufacturers of eastern Asia as an ingredient in some classes of their goods.

AGAR'IC, a large and important genus of fungi, characterized by having a fleshy cap or pileus, and a number of radiating plates or gills on which are produced the naked spores. The majority of this species are furnished with stems, but some are attached to the objects on which they grow by their pileus. Over a thousand species are known, and are arranged in five sections according as the color of their spores is white, pink, brown, purple, or black. Many of the species are edible, like the common mushroom, and supply a delicious article of food, while others are deleterious and even poisonous.

AGARIC MINERAL, or MOUNTAIN-MEAL, one of the purest of the native carbonates of lime, found chiefly in the clefts of rocks and at the bottom of some lakes in a loose or semi-indurated form resembling a fungus. The name is also applied to a stone of loose consistence found in Tuscany, of which bricks may be made so light as to float in water, and of which the ancients are supposed to have made their floating bricks. It is a hydrated silicate of magnesium, mixed with lime, alumina, and a small quantity of iron.

AGASSIZ (ag'as-ē), Louis John Rudolph, an eminent naturalist, born 1807, died 1873, son of a Swiss Protestant clergyman at Motiers, near the eastern extremity of the Lake of Neufchâtel.



L. Agassiz.

His attention was first specially directed to ichthyology by being called on to describe the Brazilian fishes brought to Europe from Brazil by Martius and Spix. His researches led him to propose a new classification of fishes, which he divided into four classes, distinguished by the characters of the skin, as ganoids, placoids, cycloids, and ctenoids. His system has not been generally adopted, but the names of his classes have been used as useful terms. In 1836 he began the study of glaciers, and in 1840 he published his Études sur les Glaciers, in 1847 his Système Glaciaire. From 1838 he had been professor of natural history at Neufchâtel, when in 1846 pressing solicitations and attractive offers induced him to settle in America, where he was connected as a teacher first with Harvard University, Cambridge, and latterly with Cornell University as well as Harvard. After his arrival in America he engaged in various investigations and explorations, and published numerous works. In 1865–66 he made zoological excursions and investigations in Brazil, which were productive of most valuable results. Agassiz held views on many important points in science different from those which prevailed among the scientific men of the day, and in particular he strongly opposed the evolution theory.

AGASSIZ (ag'a-sē), Mount, an extinct volcano in Arizona, U. S., 10,000 feet in height; a place of summer resort, near the Great Cañon of the Colorado.

AG'ATE, a siliceous semi-pellucid compound mineral, consisting of bands or layers of various colors blended together, the base generally being chalcedony, and this mixed with variable proportions of jasper, amethyst, quartz, opal, heliotrope, and carnelian. The varying manner in which these materials

are arranged causes the agate when polished to assume some characteristic appearances, and thus certain varieties are distinguished, as the ribbon agate, the fortification agate, the zone agate, the star agate, the moss agate, the clouded agate, etc.

AGATHAR'CHUS, a Greek painter, native of Samos, the first to apply the rules of perspective to theatrical scene-painting; flourished about 480 B.C.

AGATHOCLES (a-gath'o-klēz), a Sicilian Greek, one of the boldest adventurers of antiquity, born 361 B.C. By his ability and energy, and being entirely unscrupulous, he raised himself from the position of a potter to that of sovereign of Syracuse and master of Sicily. Wars with the Carthaginians were the chief events of his life. He died (was poisoned) at the age of seventy-two, or, as some say, ninety-five.

AGAVE (a-gā'vē), a genus of plants (which includes the daffodil and narcissus), popularly known as American aloes. They are generally large, and have a massive tuft of fleshy leaves with

American aloe.

a spiny apex. They live for many years —ten to seventy, according to treatment—before flowering. When this takes place the tall flowering stem springs from the center of the tuft of leaves, and grows very rapidly until it reaches a height of 15, 20, or even 40 feet, bearing toward the end a large number of flowers. The best-known species, is the common American aloe, introduced into Europe 1561, and now extensively grown in the warmer parts of the continent as well as in Asia (India in particular). This and other species yield various important products. The sap when fermented yields a beverage resembling cider, called by the Mexicans pulque. The leaves are used for feeding cattle; the fibers of the leaves (called pita, sisal hemp, or henequen) are formed into thread, cord, and ropes; an extract from the leaves is used as a substitute for soap; slices of the withered flower-stem are used as razor-strops.

AGE, a period of time representing the whole or a part of the duration of any individual thing or being, but used more specifically in a variety of senses. In law age is applied to the periods of life when men and women are enabled to do that which before, for want of years and consequently of judgment, they could not legally do. Full age in male or female is twenty-one years, which age is completed on the day preceding the anniversary of a person's birth, who till that time is an infant, and so styled in law.

The term is also applied to designate the successive epochs or stages of civilization in history or mythology. Hesiod speaks of five distinct ages: 1. The golden or Saturnian age, a patriarchal and peaceful age. 2. The silver age, licentious and wicked. 3. The brazen age, violent, savage, and warlike. 4. The heroic age, which seemed an approximation to a better state of things. 5. The iron age, when justice and honor had left the earth. The term is also used in such expressions as the dark ages, the middle ages, the Elizabethan age, etc.

The Archæological Ages or Periods are three—the Stone Age, the Bronze Age, and the Iron Age—these names being given in accordance with the materials chiefly employed for weapons, implements, etc., during the particular period. The Stone Age of Europe has been subdivided into two—the Palæolithic or earlier, and Neolithic or later. The word age in this sense has no reference to the lapse of time, but simply denotes the stage at which a people has arrived in its progress toward civilization; thus there are races still in their stone age.

AGENT, one who acts for another. In law, an agent is always supposed to be acting by authority from his principal, and the relation is held to imply a contract between the two. Briefly the law as to agents may be stated as follows: A principal is liable for all the acts of his agent as if these acts had been done by himself, whether these acts be authorized or not. But, if the third party enters into a contract with the agent under the agent's own name, the principal is not held liable, unless the acts of the agent be included under the scope of the authority received from the principal.

AGERATUM (a-jer'a-tum), a genus of composite plants of the warmer parts of America, one species of which is a well-known flower-border annual with dense lavender-blue heads.

AGESILAUS (a-jes-i-lā'us), a king of Sparta, born in 442 B.C., and elevated to the throne after the death of his brother Agis II. He acquired renown by his exploits against the Persians, Thebans, and Athenians. Though a vigorous ruler, and almost adored by his soldiers, he was of small stature and lame from his birth. He died in Egypt in the winter of 361–360 B.C. Xenophon, Plutarch, and Cornelius Nepos are among his biographers.

AGGLOM'ERATE, in geology, a collective name for masses consisting of angular fragments ejected from volcanoes. When the mass consists of fragments worn and rounded by water it is called a conglomerate.

AG'GREGATE, a term applied in geology to rocks composed of several different mineral constituents capable of being separated by mechanical means, as granite, where the quartz, felspar, and mica can be separated mechanically. In botany it is applied to flowers composed of many small florets having a common undivided receptacle, the anthers being distinct and separate, the florets commonly standing on stalks, and each having a partial calyx.

AGINCOURT (à-zhan-kör), a village of northern France, department Pas de Calais, famous for the battle of October 25, 1415, between the French and English. Henry V., king of England, eager to conquer France, landed at Harfleur, took the place by storm, and wished to march through Picardy to Calais, but was met by a French army under the Constable d'Albert. The English numbered about 15,000 men, while the French numbers are variously stated at from 50,000 to 150,000. The confined nature and softness of the ground were to the disadvantage of the French, who were drawn up in three columns unnecessarily deep. The English archers attacked the first division in front and in flank, and soon threw them into disorder. The second division fled on the fall of the Duc d'Alençon, who was struck down by Henry himself, and the third division fled without striking a blow. Of the French 10,000 were killed, including the Constable d'Albert, with six dukes and princes. The English lost 1600 men killed, among them the Duke of York, Henry's uncle. After the battle the English continued their march to Calais.

AGIO (ā'ji-o), the difference between the real and the nominal value of money, as between paper money and actual coin: an Italian term originally.

AG'NATES, in the civil law relations on the male side, in opposition to cognates, relations on the female side.

AGNES, St., a saint, who, according to the story, suffered martyrdom because she steadfastly refused to marry the son of the prefect of Rome, and adhered to her religion in spite of repeated temptations and threats, A.D. 303. She was first led to the stake, but as the flames did not injure her she was beheaded. Her festival is celebrated on the 21st of January.

AGNES, St., the most southerly of the Scilly Islands. A lighthouse was erected here as early as 1680; another on the Wolf Rock near the island was completed in 1858.

AG'NI, the Hindu god of fire, one of the eight guardians of the world, and especially the lord of the southeast quarter. He is celebrated in many of the hymns of the Rig Veda. He is often represented as of a red or flame color, and rides on a ram or a goat. He is still worshiped as the personification of fire.

AGNOSTICS (ag-nos'tiks), a modern term applied to those who disclaim any knowledge of God or of the origin of the universe, holding that the mind of man is limited to a knowledge of phenomena and of what is relative, and that, therefore, the infinite, the absolute, and the unconditioned, being beyond all experience, are consequently beyond its range.

AGNUS CASTUS, a shrub, a native of the Mediterranean countries, with white flowers and acrid, aromatic fruits. It had anciently the imagined virtue of preserving chastity—hence the term castus.

AGNUS DEI (dē'ī), a term applied to Christ in John i. 29, and in the Roman Catholic liturgy a prayer beginning with the words "Agnus Dei," generally sung before the communion. The term is also

Agni.

commonly given to a medal, or more frequently a cake of wax, consecrated by the pope, stamped with the figure of a lamb supporting the banner of the cross; supposed to possess great virtues, such as preserving those who carry it in faith from accidents, etc.

AGON'IC LINE, in terrestrial magnetism a name applied to the line which joins all the places on the earth's surface at which the needle of the compass points due north and south, without any declination. This line, which varies from time to time, at present passes through S. America and N. America to the Magnetic North Pole, thence to the White Sea, south through the Persian Gulf, Indian Ocean, and Australia to the Southern Magnetic Pole.

AGOUARA (ȧ-gu-ä'rȧ), a name given to the crab-eating racoon of S. America.

AGOUTA (a-gō'ta), an insectivorous mammal peculiar to Hayti, of the tanrec family, somewhat larger than a rat. It has the tail devoid of hair and covered with scales, the eyes small, and an elongated nose like the shrews. Another species belongs to Cuba.

AGRA (ä'gra), a city of India, in the United Provinces, on the right bank of the Jumna, 841 miles by rail from Calcutta. It has various interesting structures, among which are the imperial palace, a mass of buildings erected by several emperors; the Moti Masjid or Pearl Mosque; the mosque called the Jama Masjid (a cenotaph of white marble); and, above all, the Taj Mahal, a mausoleum of the seventeenth century, built by the Emperor Shah Jehan to his favorite queen, of white marble, adorned throughout with exquisite mosaics. Agra has a trade in grain, sugar, etc., and some manufactures, including beautiful inlaid mosaics. It was founded in 1566 by the Emperor Akbar, and was a residence of the following emperors for over a century. Pop. 188,022. The Agra division has an area of 10,139 sq. miles, and a pop. of 5,248,121.

AGRAM, or ZAGRAB, a city in the Austrian Empire, capital of the prov. Croatia and Slavonia, near the river Save; contains the residence of the ban or governor of Croatia and Slavonia, government buildings, cathedral (being the see of a Roman Catholic archbishop), university, theater, etc.; carries on an active trade, and manufactures tobacco, leather, and linens. Pop. 61,002.

AGRARIAN LAWS, laws enacted in ancient Rome for the division of the public lands, that is, the lands belonging to the state. As the territory of Rome increased the public land increased, the land of conquered peoples being always regarded as the property of the conqueror. The right to the use of this public land belonged originally only to the patricians or ruling class, but latterly the claims of the plebeians on it were also admitted, though they were often unfairly treated in the sharing of it. Hence arose much discontent among the plebeians, and various remedial laws were passed with more or less success. Indeed an equitable adjustment of the land question between the aristocracy and the common people was never attained.

AGRIC'OLA, Cneius Julius, lived from A.D. 37 to 93, a Roman consul under the Emperor Vespasian, and governor in Britain, the greater part of which he reduced to the dominion of Rome; distinguished as a statesman and general. His life, written by his son-in-law, the historian Tacitus, gives the best extant account of Britain in the early part of the period of the Roman rule.

AGRIC'OLA, Georg, born in Saxony 1490, died at Chemnitz 1555, German physician and mineralogist. Though tinged with the superstitions of his age, he made the first successful attempt to reduce mineralogy to a science, and introduced many improvements in the art of mining.

AG'RICULTURE is the art of cultivating the ground, more especially with the plow and in large areas or fields, in order to raise grain and other crops for man and beast; including the art of preparing the soil, sowing and planting seeds, removing the crops, and also the raising and feeding of cattle or other live stock. This art is the basis of all other arts, and in all countries coeval with the first dawn of civilization. At how remote a period it must have been successfully practiced in Egypt, Mesopotamia, and China we have no means of knowing. Egypt was renowned as a corn country in the time of the Jewish patriarchs, who themselves were keepers of flocks and herds rather than tillers of the soil. Naturally little is known of the methods and details of agriculture in early times. Among the ancient Greeks the implements of agriculture were very few and simple. Cato, the censor, who was celebrated as a statesman, orator, and general, derived his highest honors from having written a voluminous work on agriculture.

The Romans introduced their agricultural knowledge among the Britons, and during the most flourishing period of the Roman occupation large quantities of corn were exported from Britain to the Continent.

The first English treatise on husbandry and the best of the early works on the subject was published in the reign of Henry VIII. (in 1534), by Sir A. Fitzherbert, judge of the Common Pleas.

The American colonists received their agricultural methods from the English, but the United States has, during the last half century, outstripped the world in the art of agriculture. The government has vastly increased the efficiency of the American farmer by the establishment of experiment stations, of which there are now scores supported at a large annual outlay. They employ over 1,000 persons in administration and inquiry, and issue annual reports and bulletins. With few exceptions, they are departments of the agricultural colleges established under the land-grant act (Morrill Act) of 1862, and are independent of each other as regards the planning and conduct of their operations. They are united in a national system through the Association of American Agricultural Colleges and Experiment Stations and the Office of Experiment Stations in the United States Department of Agriculture. This summarizes the accounts of the work of the stations and kindred institutions throughout the world in the periodical known as the Experiment Station Record, and gives popular résumés of their investigations in the Farmers' Bulletins series of the department, under the general title of Experiment Station Work. It also directly manages the stations in Alaska, Hawaii, and Porto Rico.

AGRIGENTUM (-jen'tum), an ancient Greek city of Sicily (the modern *Girgenti*), founded about 580 B. C., and long one of the most important places on the island. Extensive ruins of splendid temples and public buildings yet attest its ancient magnificence.

AG'RIMONY, a genus of plants, consisting of slender perennial herbs found in temperate regions. Common agrimony, was formerly of much repute as a medicine in England. Its leaves and root-stock are astringent, and the latter yields a yellow dye.

AGRIP'PA, Cornelius Henry, born in 1486, at Cologne, he devoted himself to science, and became famous as a magician and alchemist, and was involved in disputes with the church.

AGRIPPA, Herod. See Herod Agrippa.

AGRIPPA, Marcus Vipsanius, a Roman statesman and general, the son-in-law of Augustus; born B.C. 63, died B.C. 12. He was prætor in B.C. 41; consul in 37, 28, and 27; ædile in 33; and tribune from 18 till his death. He commanded the fleet of Augustus in the battle of Actium. To him Rome is indebted for three of her principal aqueducts, the Pantheon, and several other works of public use and ornament.

AGRIPPI'NA, the name of several Roman ladies: 1. The youngest daughter of Marcus Vipsanius Agrippa, and wife of C. Germanicus; a heroic woman adorned with great virtues. Tiberius, who hated her for her virtues and popularity, banished her to the island of Pandataria, where she starved herself

to death in A.D. 33.—2. A daughter of the last mentioned, and the mother of Nero, by Domitius Ahenobarbus. Her third husband was her uncle, the Emperor Claudius, whom she subsequently poisoned to secure the government of the empire through her son Nero. After ruling a few years in her son's name he became tired of her ascendency, and caused her to be assassinated (A.D. 60).

AGROS'TIS, a genus of grasses, consisting of many species, and valuable as pasture-grasses. The bent-grasses belong to the genus.

AGUA (ag'wä), an active volcano of Central America, in Guatemala, rising to the height of 15,000 feet. It has twice destroyed the old city of Guatemala, in its immediate vicinity.

AGUARDIENTE (ä-gwär-dē-en'te), a popular spirituous beverage of Spain and Portugal, a kind of coarse brandy, made from red wine, from the refuse of the grapes left in the wine-press, etc., generally flavored with anise; also a Mexican alcoholic drink distilled from the fermented juice of the agave.

AGUAS CALIENTES (ag'was kä-lē-en'tās), a town 270 miles n.w. of Mexico, capital of the state of its own name, named from the thermal springs near it; has manufactures of cottons and a considerable trade. Pop. 25,000.

AGUE (ā'gū), a kind of fever, which may be followed by serious consequences, but generally is more troublesome than dangerous. According to the length of the interval between one febrile paroxysm and another, agues are denominated quotidian when they occur once in twenty-four hours, tertian when they come on every forty-eight hours, quartan when they visit the patient once in seventy-two hours. Ague arises from marsh miasmata, a temperature above 60° being, however, apparently required to produce it. To cure the disease and prevent the recurrence, quinine and various other bitter and astringent drugs are given with complete success in the majority of cases.

AGUESSEAU (ä-ges-ō), Henri François d', a distinguished French jurist and statesman, born at Limoges in 1668; was in 1690 advocate-general at Paris, and at the age of thirty-two procureur-général of the parliament. He risked disgrace with Louis XIV. by successfully opposing the famous papal bull Unigenitus. He was made chancellor in 1717. He died in 1751.

AGUILAR (a-gi-lär'), Grace, an English writer, born at Hackney 1816, died at Frankfort 1847.

AGUINALDO (ä-gē-näl'dō), Emilio, a Filipino chief who led the natives of the Philippine Islands in the insurrections against Spain and the United States. Aguinaldo received a good education from the Dominican friars and was mayor of Cavite Viejo when the insurrection of 1896 broke out. After the defeat of the Spanish power and the sale of the islands to the United States, Aguinaldo held out for the independence of the Filipinos and led the native army against the Americans. He was captured March 23, 1901 by General Frederick Funston and took the oath of allegiance a few days subsequently,

AGULHAS (ä-gul'yäs), Cape, a promontory, forming the most southern extremity of Africa, about 90 miles southeast of the Cape of Good Hope, rising to 455 feet above the sea, with a lighthouse.

A'HAB, the seventh king of Israel succeeded his father Omir 928 B.C., and reigned twenty years. At the instigation of his wife Jezebel he erected a temple to Baal, and became a cruel persecutor of the true prophets. He was killed by an arrow at the siege of Ramoth-Gilead.

AHASUE'RUS, in Scripture history, a king of Persia, probably the same as Xerxes, the husband of Esther, to whom the Scriptures ascribe a singular deliverance of the Jews from extirpation.—Ahasuerus is also a Scripture name for Cambyses, the son of Cyrus (Ezra iv. 6), and for Astyages, king of the Medes (Dan. ix. 1).

A'HAZ, the twelfth king of Judah, succeeded his father Jotham, 742 B.C. Forsaking the true religion he gave himself up completely to idolatry, and plundered the temple to obtain presents for Tiglath-pileser, king of Assyria.

AHAZI'AH: 1. Son of Ahab and Jezebel, and eighth king of Israel, died from a fall through a lattice in his palace at Samaria after reigning two years (B.C. 896, 895).—2. Fifth king of Judah, and nephew of the above. He reigned but one year, and was slain (B.C. 884) by Jehu.

AHMEDABAD, or **AHMADABAD** (ä-mad-ä-bäd), a town of India, presidency of Bombay, in district of its own name, on the left bank of the Sabarmati, 310 miles north of Bombay. Pop. 185,889.—Area of dist. 3949 sq. m.; pop. 795,094.

AHMEDNAG'AR, a town of India, presidency of Bombay, in district of its own name, of commonplace appearance, surrounded by an earthen wall. Pop. (including military), 42,032.—Area of dist. 6645 sq. m.; pop. 837,774.

AHMED SHAH, born 1724, died 1773, founder of the Durâni dynasty in Afghanistan. On the assassination of Nadir he proclaimed himself shah, and set about subduing the provinces surrounding his realm. Among his first acts was the securing of the famed Koh-i-noor diamond, which had fallen into the hands of his predecessor. He crossed the Indus in 1748, and his conquests in northern India culminated in the defeat of the Mahrattas at Panipat (6th Jan. 1761). Affairs in his own country necessitated his withdrawal from India, but he extended his empire vastly in other directions far beyond the limits of modern Afghanistan. He was succeeded by his son Timur.

AID, a subsidy paid in ancient feudal times by vassals to their lords on certain occasions, the chief of which were: when their lord was taken prisoner and required to be ransomed, when his eldest son was to be made a knight, and when his eldest daughter was to be married and required a dowry. From the Norman Conquest to the fourteenth century the collecting of aids by the crown was one of the forms of taxation, being latterly regulated by parliament.

AIDE-DE-CAMP (ād-dē-käṇ), a military officer who conveys the orders of a general to the various divisions of the army on the field of battle, and at other times acts as his secretary and general confidential agent.

AIDIN (ä-i-dēn'), or **GUZEL HISSAR,** a town in Asiatic Turkey, about 60 miles southeast of Smyrna. Pop. 35,000.

AIGRETTE', a term used to denote the feathery crown attached to the seeds of various plants, such as the thistle, dandelion, etc.—It is also applied to any head-dress in the form of a plume, whether composed of feathers, flowers, or precious stones.

AI'KIN, John, M.D., an English miscellaneous writer, born 1747, died 1822. His General Biographical Dictionary was begun in 1799 and finished in 1815. He was editor of the Monthly Magazine from 1796 till 1806.

AI'KIN, Lucy, daughter of the preceding, was born in 1781, and died 1864. In 1818 appeared her Memoirs of the Court of Queen Elizabeth, a very popular work. She afterward produced similar works on the reigns of James I. (1822) and Charles I. (1833), and a Life of Addison (1843).

AILAN'TO, Ailanthus, a large and handsome tree, with pinnate leaves one or two feet long, is a native of China, but has been introduced into Europe and North America, where it is in favor for its elegant foliage. A species of silkworm, the ailanthus silkworm feeds on its leaves, and the material produced, though wanting the fineness and gloss of mulberry silk, is produced at less cost, and is more durable. The wood is hard, heavy, glossy, and susceptible of a fine polish.

AIN (aṇ), a southeastern frontier department of France, mountainous in the east (ridges of the Jura), flat or undulating in the west, divided into two nearly equal parts by the river Ain, a tributary of the Rhone; area, 2239 square miles. Capital, Bourg. Pop. 364,408.

AINMILLER (īn'mil-er), Max Emanuel, a German artist who may be regarded as the restorer of the art of glass-painting; born 1807, died 1870. As inspector of the state institute of glass-painting at Munich he raised this art to a high degree of perfection by the new or improved processes introduced by him.

AINOS (ī'nōz), the native name of an uncivilized race of people inhabiting the Japanese island of Yesso, as also Saghalien, and the Kurile Islands, and believed to be the aboriginal inhabitants of Japan. They do not average over 5 feet in height, but are strong and active. They are very hairy, wear matted beards, and have black hair which they allow to grow till it falls over their shoulders. Their complexion is dark brown, approaching to black. They worship the sun and moon, and pay reverence to the bear. They support themselves by hunting and fishing.

AINSWORTH, William Harrison, an English novelist; born 1805, died 1882. He was the son of a Manchester solicitor and intended for the profession of law, but devoted himself to literature. He wrote Rookwood (1834), Jack Sheppard

(1839), and about forty other novels, including Guy Fawkes, Tower of London, Windsor Castle, Lancashire Witches, Flitch of Bacon, etc.

AIR, the gaseous substance of which our atmosphere consists, being a mechanical mixture of 79.19 per cent by measure of nitrogen and 20.81 per cent of oxygen. The latter is absolutely essential to animal life, while the purpose chiefly served by the nitrogen appears to be to dilute the oxygen. Oxygen is more soluble in water than nitrogen, and hence the air dissolved in water contains about 10 per cent more oxygen than atmospheric air. The oxygen therefore available for those animals which breathe by gills is somewhat less diluted with nitrogen, but it is very much diluted with water. For the various properties and phenomena connected with air see such articles as Atmosphere, Airpump, Barometer, Combustion, Respiration, etc.

AIR, in music, a continuous melody, in which some lyric subject or passion is expressed. The lyric melody of a single voice, accompanied by instruments, is its proper form of composition. Thus we find it in the higher order of musical works; as in cantatas, oratorios, operas, and also independently in concertos.—Air is also the name often given to the upper or most prominent part in a concerted piece, and is thus equivalent to treble, soprano, etc.

AIR BEDS AND CUSHIONS, often used by the sick and invalids, are composed of india-rubber or of cloth made air-tight by a solution of india-rubber, and when required for use filled with air, which thus supplies the place of the usual stuffing materials. They tend to prevent bed-sores from continuous lying in one position. They are also cheap and easily transported, as the bed or cushion, when not in use, can be packed in small compass, to be again inflated with air when wanted.

AIR-BLADDER. See Swimming-bladder.

AIR-BRAKE, an American invention used on railroads in the United States. It consists of an automatic device by which air, stored on the train, is applied to the work of pressing the brake on all wheels. The air-brake was invented in 1869 by George Westinghouse, Jr., who has improved it to a high state of perfection. The very high passenger train speeds of recent years led Mr. Westinghouse, in 1897, to place on the market a high-speed brake. This brake is designed to use very high air-pressure when the brake is applied with the train at full speed, which pressure is gradually reduced by an automatic reducing valve on the brake cylinder as the speed diminishes. This brake has not been extensively used. Tests made with the regular high-speed brake attached to a fifty-car train showed the following among other results: Emergency stop of train running at 40 miles per hour made in about 675 feet, in 20 seconds; breaking the train in two at a speed of from 20 to 25 miles per hour, the two sections stopped at distances of from 32 feet to 180 feet apart; applying brakes with train standing to show rapidity of action, all brakes applied within two seconds; comparison of emergency air-brake stop and hand-brake stop at 20 miles per hour: air-brake stop in 158 to 194 feet, hand-brake stop in 1000 feet to 1720 feet; service stop test to determine time of release of brakes, all brakes released in four seconds. Several forms of air-brake besides the Westinghouse have been employed to some extent in America, but they are exactly similar in their principles of operation.

AIR-CELLS, cavities in the cellular tissue of the stems and leaves of plants which contain air only, the juices of the plants being contained in separate vessels. They are largest and most numerous in aquatic plants, the gigantic leaves of which are buoyed up on the surface of the water by their means.—The minute cells in the lungs of animals are also called air-cells. There are also air-cells in the bodies of birds. They are connected with the respiratory system, and are situated in the cavity of the thorax and abdomen, and sometimes extend into the bones. They are most fully developed in birds of powerful and rapid flight, such as the albatross.

AIR-ENGINE, an engine in which air heated, and so expanded, or compressed air is used as the motive power. A great many engines of the former kind have been invented, some of which have been found to work pretty well where no great power is required. They may be said to be essentially similar in construction to the steam-engine, though of course the expansibility of air by heat is small compared with the expansion that takes place when water is converted into steam. Engines working by compressed air have been found very useful in mining, tunneling, etc., and the compressed air may be conveyed to its destination by means of pipes. In such cases the waste air serves for ventilation and for reducing the oppressive heat.

AIR-GUN, an instrument for the projection of bullets by means of condensed air, generally either in the form of an ordinary gun, or of a pretty stout walking-stick, and about the same length. A quantity of air being compressed into the air-chamber by means of a condensing syringe, the bullet is put in its place in front of this chamber, and is propelled by the expansive force of a certain quantity of the compressed air, which is liberated on pressing the trigger.

AIR-PLANTS, or **EPIPHYTES,** are plants that grow upon other plants or trees, apparently without receiving any nutriment otherwise than from the air. The name is restricted to flowering plants (mosses or lichens being excluded) and is suitably applied to many species of orchids. The conditions necessary to the growth of such plants are excessive heat and moisture, and hence their chief localities are the damp and shady tropical forests of Africa, Asia, and America. They are particularly abundant in Java and tropical America.

AIR-PUMP, an apparatus by means of which air or other gas may be removed from an inclosed space; or for compressing air within an inclosed space. An ordinary suction-pump for water is on the same principle as the air-pump; indeed, before water reaches the top of the pipe the air has been pumped out by the same machinery which pumps the water. An ordinary suction-pump consists essentially of a cylinder or barrel, having a valve open-

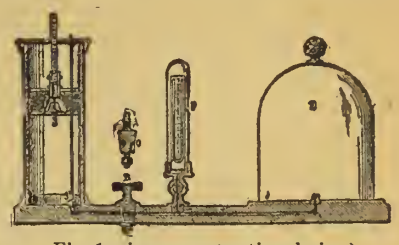


Fig. 1, air-pump (sectional view).

ing from the pipe through which water is to rise and a valve opening into the outlet pipe, and a piston fitted to work in the cylinder (the outlet valve may be in the piston). (See Pump.) The arrangement of parts in an air-pump is quite similar. The barrel of an air-pump fills with the air which expands from the receiver (that is, the vessel from which the air is being pumped), and consequently the quantity of air expelled at each stroke is less as the exhaustion proceeds, the air getting more and more rarefied. Suppose that the receiver (so called because it receives objects to be experimented on) is exactly as large as the barrel; by the first stroke there is just half the air removed, by the second there is one-fourth, by the third there is an eighth, and so on. Suppose the barrel is $\frac{1}{3}$ of the receiver as to volume. On raising the piston the air which filled the receiver now fills both barrel and receiver, so that $\frac{1}{4}$ is removed at the first stroke, $\frac{1}{4}$ of the remaining $\frac{3}{4}$ is removed at the second stroke—that is $\frac{3}{16}$, and $\frac{1}{4}$ of $\frac{9}{16}$ at the third stroke, and so on. Fig. 1 represents the essential parts of a good air-pump in section. E is the receiver, F is a mercurial pressure-gauge, which indicates the extent of exhaustion; R is a cock by means of which air may be readmitted to the receiver or by means of which the receiver may be shut off from the pump-

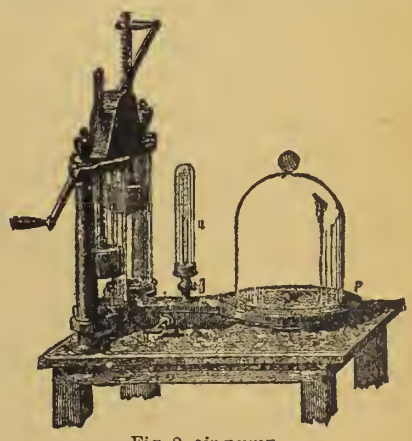


Fig. 2, air-pump.

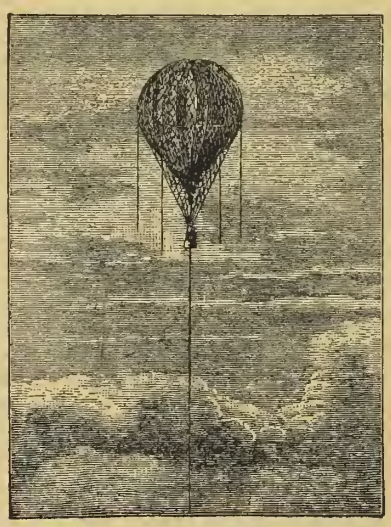
barrel. S is the inlet valve of the barrel; and, inasmuch as the tension of the air in the receiver after some strokes would not be sufficient to lift a valve, this valve is opened by means of the rod

which passes up through the piston. The outlet valve s is kept down by a light spiral spring; it opens when, on the space diminishing in the barrel by the descent of the piston, the contained air has a sufficient pressure. Fig. 2 shows a similar pump in perspective (a double-barreled pump); P is the plate on which the receiver is placed, H the pressure-gauge, R the readmission cock. The pressure-gauge is merely a siphon barometer inclosed in a bell-shaped vessel of glass communicating with the receiver. This barometer consists of a bent tube containing mercury, one end being closed, the other open. As the air is exhausted the smaller is the difference between the height of the mercury in the two branches of the tube, and a complete vacuum would be indicated if the mercury stood at the same level in both. —Air-pumps for compressing air are constructed on the same principle but act the reverse way.—Many interesting experiments may be made with the air-pump. If an animal is placed beneath the receiver, and the air exhausted, it dies almost immediately; a lighted candle under the exhausted receiver immediately goes out. Air is thus shown to be necessary to animal life and to combustion. A bell, suspended from a silken thread beneath the exhausted receiver, on being struck cannot be heard. If the bell be in one receiver from which the air is not exhausted, but which is within an exhausted receiver, it still cannot be heard. Air is therefore necessary to the production and to the transmission of sound. A shriveled apple placed beneath an exhausted receiver becomes as plump as if quite fresh, being thus shown to be full of elastic air. The air-pump was invented by Otto von Guericke, burgomaster of Magdeburg, about the year 1654.

AIRSHIP and **FLYING MACHINE**, vehicles for navigating the atmospheric air, the first being buoyed up by balloons filled with gas, hydrogen preferably; the second being constructed on the principles of a bird's wing. The earliest successful balloon was that made by the brothers Etienne and Joseph Montgolfier, in France. who in 1782 succeeded in causing a silk bag of 50 cubic feet to rise to the ceiling of a room, and in 1783, in the presence of an immense crowd, a balloon 35 feet in diameter rose to a height of 1500 feet. All successful attempts at aerial navigation until 1907-8 were balloons. The gases employed being either hydrogen or ordinary coal gas. The former when pure is between 14 and 15 times lighter than atmospheric air and the latter generally about 2 1-2 times lighter. According to the principles of Archimides bodies immersed in a fluid are buoyed upwards with a force equivalent to the weight of the fluid displaced by them. If their own weight is not sufficient to counterbalance this force, that is if they are lighter than this fluid they rise upward with a force equal to the difference between the weight of the displaced fluid and their own weight. Thus the balloon rises in the air in the same way that a cork rises in the water. Thus for instance if a balloon occupies as much space as 1000 pounds of air, but weighs itself 600 pounds, it will be impelled upwards with a force of 400 pounds.

Balloons are made of silk or cotton, the pieces sewn together and all of it varnished to prevent the escape of gas. A network of cord extends over the varnished cloth supporting a hoop from which a car is suspended by 6 or more strong ropes about 4 feet long. Inside the car are sand bags for ballast and the grappling iron tied to the end of a long rope for anchoring the balloon at the end of the descent. At the top of the balloon there is a valve made of wood from one to three feet in diameter. This is kept closed by a spring but is opened or closed by a rope running down into the car. When the balloonist wishes to ascend he throws some of the ballast over the side of the car. If he wishes to descend he opens the valve and the place of the escaping gas is taken by air whose heavier weight increases the weight of the balloon. Later balloons have been provided with steering apparatus by which the direction of their flight can be regulated at will and not be left to wind.

It is said that as early as 1306 successful balloon ascents were made by the



Balloon above the clouds.

Chinese, but the first European balloonist was Guszman who made the ascent at Lisbon in 1709, using heated air. The first hydrogen balloon was made by Black of Edinburg in 1767. Various experiments were made in Paris by the Mongolfiers, and in May, 1783, a balloon was sent up 100 ft. carrying a cage with a sheep, a cock and a duck. These were the first aerial travellers. Nov. 21, 1783, Pilatre des Rosieros with the Marquis d' Arlands were the first human passengers in a balloon, remaining in the air 25 minutes.

The highest balloon ascent recorded was one of seven miles made from Wolverhampton, Eng. Sept. 5, 1862, by Glazier and Coxwell. At this great height the cold was intense, the thermometer standing at 12 F. The barometer fell 7 inches, as compared with 29 at the surface of the earth. When the balloon was 29,000 feet high, Glaisher became insensible, and remained so for seven minutes. Coxwell at this height had mounted into the ring to adjust the valve-line, when his hands became frozen, and he had to open the valve by seizing the line with his teeth. He too was nearly insensible. Up to the height of 5 miles the aeronauts experienced no difficulty in breathing, except when some exertion was made. Perfect stillness and silence reigns six miles above the earth but a railway train in motion can be heard at a height of 4 miles.

The development of the balloon has been chiefly for its utilization in war. Balloon corps are attached to the armies of the leading nations. They were first used in France in 1794 for the purpose of observing the enemy. During the siege of Paris, 1870-71, the balloon was extensively employed. For military purposes attempts have been made to construct dirigible balloons. The first notable dirigible flight was that of Renaud in 1884 when in a cigar shaped balloon with a powerful motor and a front screw he traversed an oblong course of 5 miles in 23 minutes. Notable successes in dirigible balloons have been since achieved by Santos Dumont, Count de la Vaux, Count Almirigo and Lebaudy,—the latter made a successful flight of more than 80 miles in 1906. At the race of the American Federation of Aero Clubs, held at Chicago, July 4, '08, Dr. F. D. Fielding's balloon, traveled 895 miles, landing at West Shefford, Quebec,

Attempts to imitate the flight of birds by mechanical contrivances antedate the balloon by several hundred years. The first properly authenticated account of an artificial wing was given by Borelli in 1670, and his investigations and experiments furnished the principal basis for experiments until 1867. In this year Professor J. B. Pettigrew, an English scientist, published the results of an elaborate and careful series of studies made by him upon the flight of birds, which wrought a revolution in the construction of flying machines. For thirty years, however, inventors struggled without absolute success.

The first aeroplane types of flying machines were designed by Maxim and Langley in 1891 to '96. The work of inventors and scientists along the line of motor-driven, flying machines has shown steady progress. The motors have been made stronger and lighter, problems of rising and alighting safely solved, and additional scientific knowledge of aerial conditions has been gained. The general and most popular design is that of the simple aeroplane, supported by air, through which it is propelled by detached force. There were many experiments along these lines and those of 1907 were notable, but not until 1908 could it be fairly said that the flying by means of machines heavier than the atmosphere had become an accomplished fact. The experiments in that direction in former years were completely eclipsed in 1908 by Wilbur and Orville Wright, Henry Farman, and Leon Delagrange and others working on both sides of the Atlantic. For a time France appeared to lead in aviation, but that was because the Americans worked more

AIRSHIP AND FLYING MACHINE

or less in secret while the exploits of the Frenchmen were widely advertised. At the close of the year it was generally acknowledged that the Wright brothers of Dayton, O., were far in the lead of all the rest.

In 1907 and the preceding two or three years, considerable progress was made in the direction of constructing dirigible balloons, and one of the most successful types of these was the Zeppelin airship in Germany. This was further developed in 1908, and all records for performances by craft in which gas is the sustaining power were broken. The most remarkable was that in which the airship was destroyed. Count Zeppelin started from the waters of Lake Constance at 6:15 a. m. Aug. 4, in an attempt to make the longest flight on record for a dirigible balloon. He passed over the city of Constance and kept to the west until Basel, on the Swiss frontier, was passed. Then he sailed north-west to Mulhausen and thence northeasterly along the Rhine valley, passing over Strassburg and other cities and continuing until 6 o'clock in the evening when a landing was made on an island in the Rhine, near Oppenheim, Germany. One of the motors was out of order and a stop had to be made for repairs. At 10:15 p. m. the flight was resumed until Mayence was reached. After encircling the city the airship was turned in the direction of home. All went well until Echterdingen, five miles south of Stuttgart, was reached, about 8 a. m. on the 5th. Here it became necessary to make another descent owing to the fusing of the metal in which the piston of the forward motor ran and also because of the escape of gas caused by an ascent of 6,000 feet in the air while maneuvering. The landing was safely made and the necessary repairs were being made when at 3 o'clock in the afternoon a storm, arose, tore the balloon from its moorings and drove it some fifty yards. Here the rear end of the fabric drooped and in a moment smoke and flames were seen to burst out from one end to the other, followed almost immediately by an explosion which brought the motors and framework crashing to the ground. Four of the crew were injured, but Count Zeppelin escaped being hurt. The craft, which was the fourth constructed by Count Zeppelin, was completely destroyed. It was 443 feet long with a diameter of about 45 feet. The balloon part was separated into sixteen separate interior compartments for the inflating gas. The bow tapered to a blunt point, while at the stern were the rudders and frames used in steering. Underneath were suspended two independent platforms, each carrying a motor capable of developing 140 horse power. The outer part of the airship consisted of a rigid envelope of aluminum, this among other things making it distinct from any other craft of the kind constructed. It had made many successful trips in the vicinity of Lake Constance and had carried as many as sixteen passengers at one time.

The other dirigible air ships of the balloon type that attracted attention in 1908 were the Parseval in Germany, the Republic (La Republique) in France and the Baldwin in the United States. These, though differing in detail, are similar in principle, the lifting power in each being a balloon of the usual materials and the motive power a gas engine working in a suspended frame. The Parseval, named after its inventor, Major Von Parseval, made a trip from Berlin, Sept. 15, lasting 11 hours and 15 minutes, at a height of about 1,500 feet and at a speed of about 25 miles an hour. The balloon is 157 feet long and 26 feet in diameter, and its gas capacity is 3,270 cubic yards. It is tube-shaped with rounded ends. The car, which is about 20 feet in length, is suspended so as to swing backward and forward in its plane parallel to the gas bag, not being rigidly fastened to it. The propeller, 14 feet in diameter, is situated just above the car.

The dirigible balloon made by Capt. Thomas A. Baldwin, and accepted by the war department of the United States, is 84 feet long, with a maximum diameter of 18 feet and a minimum diameter of 16 feet, and a capacity of 18,000 cubic feet of gas. The suspended frame is 66 feet in length and the 12 foot propeller makes 450 revolutions per minute, driving the airship at the rate of about 20 miles an hour. The engine is of twenty horse-power. The ship is raised or lowered by means of box-kite planes at the forward end.

The Wright aeroplane, which won the honors of the year both in Europe and America, is what is called a biplane, the surfaces of which are parallel, exactly one above the other and slightly concave on the lower surface. They are made of cloth stretched on a framework of spruce. They are 40 feet long and 6½ feet wide, giving a total area of 260 square feet. The distance between the planes is 6 feet. In front is a horizontal biplane rudder for regulating the height of flight, at the back a vertical biplane rudder for steering. The total length of the machine is 33 feet. Between the planes is a four-cylinder water-cooled twenty-five horse-power motor, designed by the Wright brothers. On its right is a radiator with flat copper tubes and on its left sit the pilot and passenger. The motor drives two wooden propellers 10 feet in diameter by means of crossed chains. The propellers revolve in opposite directions and are geared down in the ratio of 33 to 9. The total weight of the aeroplane with one man on board is about 1,000 pounds. The motor in working order weighs 200 pounds.

The method of operation is apparently very simple. The most interesting feature consists in the "working" of the extreme under part of the wings, whereby the flight of a bird is imitated and perfect lateral stability is secured. The rudder which regulates the horizontal balance has to be used almost continually. In order to make a flight a wooden rail about 72 feet long is laid on the ground. The aeroplane rests upon wooden "skates" and has two rollers in front. On the rail runs a little car upon which the aeroplane rests and the rollers on the rail. When the screws begin to revolve the machine flies rapidly along the rail and at its extremity rises into the air by the help of the horizontal rudder When there is a wind the rail alone is sufficient. In calm weather the aeroplane is launched as by a catapult, by means of a weight of 1,500 pounds, which falls from the top of a pillar 18 feet high and pulls upon ropes passing through pulleys.

The French rights in the Wright patents were sold in October, 1908, to a syndicate headed by Lazare Weiller for $100,000. The tests in France were made in the vicinity of Le Mans by Wilbur Wright, while those in the United States by Orville Wright took place at Fort Myer, Va., under the supervision of army officers.

Next after the Wright aeroplane, that invented by Henry Farman of Paris was the most successful, with that constructed by Leon Delagrange, also of Paris, a close third. The Farman machine consists of two superimposed aero surfaces, each about 33 feet long by 6½ feet wide and set 5 feet apart. The framework of the ship is of wood and steel tubing, and the covering of the aerosurfaces rubber. The body for carrying motor and other machinery and the aeronaut is covered with canvas and is 15 feet long, 2½ feet wide. The motor is of the petrol Antoinette type and the propeller, which is 7½ feet in diameter, is of aluminum sheeting. It makes 1,050 revolutions per minute. The machine is mounted on bicycle wheels and starts by running along the ground under its own power until lifted by the planes. In alighting the power is simply shut off and the machine allowed to glide toward the ground. The whole contrivance weighs about 1,600 pounds. The Delagrange aeroplane is similar in most respects to the Farman machine, the latter being practically only an improved model of the former.

AEROPLANE RECORDS

Sept 12, 1908—Orville Wright remained in air 74 minutes 24 seconds at Fort Myer, Va.; also remained in air 9 minutes 6⅕ seconds with one passenger accompanying him; distance 5.88 miles.

Sept. 16, 1908—Wilbur Wright, 26 miles, in 39 minutes 18⅗ seconds, at Le Mans, France.

Sept. 17, 1908—Orville Wright badly injured and Lieut. Thomas E. Selfridge killed in aeroplane accident at Fort Myer, Va,

Sept, 21, 1908—Wilbur Wright, about 61 miles, in 1 hour 31 minutes 51 seconds, at Le Mans, France; eclipsing all previous records.

Oct. 2, 1908—Henry Farman, 40 kilometers, in 44 minutes 32 seconds at Paris, France; claimed as speed record.

Oct. 6, 1908—Wilbur Wright, with passenger, remains in air 1 hour 4 minutes 26 seconds, at Le Mans, France.

Oct 30, 1908—Henry Farman flies from Mourmelon to Rheims, in France, 20 miles in 20 minutes, at height of 120 to 150 feet.

December 31, 1908—Wilbur Wright breaks all previous aeroplane records at Le Mans, France, with a flight of

two hours and nine minutes, thereby winning the Michelin cup.

July 25, 1909.—Louis Bleriot flies across the English Channel from Calais to Dover in his monoplane in less than thirty minutes.

July 27, 1909.—Orville Wright makes a new world's record for an aeroplane carrying one passenger in his endurance test flight at Fort Myer, remaining in the air 1 hour, 12 minutes, and 36 seconds.

July 30, 1909.—The Wright brothers successfully complete their aeroplane tests for the Government, the 10-mile straightaway flight, with turn, being made at a speed of more than 42 miles an hour.

July 31, 1909.—The dirigible balloon *Zeppelin II* sails from Friedrichshaven to Frankfort, a distance of 220 miles, at an average speed of 21 miles an hour. The Wright aeroplane is formally recognized at Washington as the arm of the aeroplane corps of the United States Army.

Aug. 29, 1909.—Latham at Reims reached a height of 505 feet. Glenn H. Curtiss, American, traveled eighteen miles in 25 minutes, 49 seconds.

The year 1909 saw Louis Bleriot's daring flight across the English Channel. At sunrise on the morning of July 25 M. Bleriot started from the high cliffs near Calais in a monoplane that he had just tested by a trial trip of nine miles. In ten minutes he could not be seen from the French shore, and the torpedo boat that started several miles in advance of him was soon passed. As he came within sight of the English shore he found that the southwest wind had carried him a few miles out of his course. He turned into the wind and went up the coast until he came to an opening in the cliffs near Dover. Here he made a safe landing, although an abrupt drop from a height of sixty-five feet was caused by a strong wind. The news was greeted in Paris with wild enthusiasm and everywhere appeared the statement that "England is no longer an island." The fact that longer and faster flights have been made by an aeroplane over the land does not belittle the daring venture of M. Bleriot. It requires nerve to start from a cliff several hundred feet high to cross an arm of the sea twenty-five miles wide with the rescue boat several miles behind. The time for the trip was 37 minutes and the speed about 40 miles an hour. It was a distinct achievement for the monoplane type of aeroplane. This particular machine, both designed and built by M. Bleriot, was twenty-six feet wide, the smallest that he has used. M. Bleriot also has the honor of being the only aviator who has driven an aeroplane carrying three people.

AISLE (īl), in architecture, one of the lateral divisions of a church in the direction of its length, separated from the central portion or nave by piers or pillars. There may be one aisle or more on each side of the nave. The cathedrals at Antwerp and Paris have seven aisles in all. The nave is sometimes called the central aisle. See Cathedral.

AISNE (ān), a northeastern frontier department of France; area, 2838 sq. miles. It is an undulating, well-cultivated, and well-wooded region, chiefly watered by the Oise in the north, its tributary the Aisne in the center, and the Marne in the south. It contains the important towns of St. Quentin, Laon (the capital), Soissons, and Chateâu Thierry. Pop. 555,925.

AIVA'LI, or KIDONIA, a seaport of Asiatic Turkey, on the Gulf of Adramyti, 66 miles north by west of Smyrna, carrying on an extensive commerce in olive-oil, soap, cotton, etc. Pop. 30,000.

AIX-LA-CHAPELLE (āks-lâ-shâ-pel), a city of Rhenish Prussia, 38 miles west by south of Cologne. The most important building is the cathedral, the oldest portion of which, often called the nave, was erected in the time of Charles the Great (Charlemagne) as the palace chapel about 796. Aix-la-Chapelle, with the adjoining Burtscheid, which may be considered a suburb, is a place of great commerce and manufacturing industry, the chief productions being woolen yarns and cloths, needles, machinery, cards (for the woolen manufacture), railway and other carriages, cigars, chemicals, silk goods, hosiery, glass, soap, etc. A considerable portion of its importance and prosperity arises from the influx of vistors to its springs and baths, there being a number of warm sulphur springs here, and several chalybeate springs, with ample accommodation for strangers. Thirty-seven German emperors and eleven empresses have been crowned in it, and the imperial insignia were preserved here till 1795, when they were carried to Vienna. Pop. 135,245.—Congress of Aix-la-Chapelle, a congress held in 1818, by which the army of the allies in France was withdrawn after France had paid the contribution imposed at the peace of 1815, and independence restored to France.—A treaty of peace concluded at this city, May 2, 1668, as a result of the Triple Alliance, put an end to the war carried on against Spain by Louis XIV. in 1667, after the death of his father-in-law Philip IV., in support of his claims to a great part of the Spanish Netherlands, which he urged in the name of his queen, the infanta Maria Theresa. By this France obtained Lille, Charleroi, Douai, Tournia, Oudenarde, etc. The second peace of Aix-la-Chapelle, October 18, 1748, terminated the Austrian war of succession.

AJACCIO (ä-yäch'ō), the capital of Corsica, on the southwest coast of the island, on a tongue of land projecting into the Gulf of Ajaccio, the birthplace of Napoleon and the seat of a bishop, with coral and sardine fisheries, and a considerable trade. Pop. 20,946.

A'JAX, the name of two Grecian chiefs who fought against Troy, the one being son of Oïleus, the other son of Telamon. The latter was from Salamis, and sailed with twelve ships to Troy, where he is represented by Homer as the boldest and handsomest of the Greeks, after Achilles. On the death of Achilles, when his arms, which Ajax claimed, were awarded to Ulysses, he became insane and killed himself. This is the subject to Sophocles's tragedy Ajax.

AJMEER', AJMIR, or AJMER, a British commissionership in India, Rajputâna, divided into the two districts of Ajmeer and Mairwara; area, 2711 sq. miles. Pop. 476,912.—Ajmeer, the capital, an ancient city, a favorite residence of the Mogul emperors, is 279 miles s.w. of Delhi, at the foot of Taragarh Hill (2853 feet), on which is a fort. Pop. 73,839.

AJOWAN', an umbelliferous plant cultivated in India, Persia, and Egypt, the seeds of which are used in cookery and in medicine, having carminative properties.

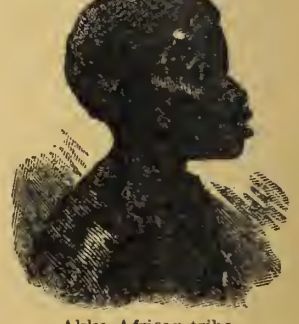
AKAROID RESIN, a resin obtained from some of the grass-trees of Australia, used in varnishes.

AK'BAR, a Mogul emperor, the greatest Asiatic prince of modern times. He was born at Amerkote, in Sind, in 1542, succeeded his father, Humayun, at the age of thirteen, and governed first under the guardianship of his minister, Beyram, but took the chief power into his own hands in 1560. He fought with distinguished valor against his foreign foes and rebellious subjects, conquering all his enemies, and extending the limits of the empire farther than they had ever been before, although on his accession they embraced only a small part of the former Mogul Empire. He died in 1605. His mausoleum at Secundra, near Agra, is a fine example of Mohammedan architecture.

AKEE', a tree much esteemed for its fruit. The leaves are somewhat similar to those of the ash; the flowers are small and white, and produced in branched spikes. The fruit is lobed and ribbed, of a dull orange color, and contains several large black seeds, embedded in a succulent and slightly bitter arillus of a pale straw color, which is eaten when cooked. The akee is a native of Guinea, whence it was carried to the West Indies by Captain Bligh in 1793.

A KEMPIS, Thomas. See Thomas à Kempis.

AKHUND OF SWAT, The, a noted Mohammedan dervish and saint who exerted a considerable influence on the Ameer of Afghanistan during the Turko-Russian war of 1877. The akhund caused no end of anxiety to the



Akka-African tribe.

British government, although he was generally friendly to that power. He died in 1878.

AKKAS, a dwarfish race of central Africa, dwelling in scattered settlements to the northwest of Lake Albert

Nyanza, about lat. 3° n., lon. 29° e. Their height averages about 4½ feet; they are of a brownish or coffee color; head large, jaws projecting (or prognathous), ears large, hands small. They are timid and suspicious, and live almost entirely by the chase, being exceedingly skilful with the bow and arrow.

AKMOLINSK', a Russian province in central Asia, largely consisting of steppes and wastes. Capital, Omsk. Area about 210,000 sq. m. Pop. 678,957.

AK'RON, a town of the United States, in Ohio, 100 miles n.e. of Columbus, on an elevated site. Being furnished with ample water-power by the Little Cuyahoga, it possesses large flour-mills, woolen factories, manufactures of iron goods, etc. In the vicinity extensive beds of mineral paint are worked. Pop. 45,000.

AKSÚ, a town of Chinese Turkestan, 260 miles northeast of Yarkand at the southern base of the Thian-shan mountains. It was formerly the capital of a separate khanate; in 1867 it became a part of the state of Eastern Turkestan under Yakub Beg, but was conquered again by China in 1867. It is celebrated for its manufactures of cotton cloth and saddlery, and is much resorted to by caravans as a entrepot of commerce between Russia Tartary and China.

AKYAB, a town of Burmah, the chief seaport of Aracan, is situated on the eastern side of the island of the same name at the mouth of the Kulaban river 190 miles east of Calcutta. In 1826, being then a mere fishing village, it was chosen for the chief station of the province and now is a great rice port, a well built place with broad and regular streets, good public buildings and a high school. Savage island with a light house, shelters the harbor. Pop. 40,000. Island of the same name has population of 450,000.

ALABAMA (al-a-bá'ma), a Gulf State bounded on the north by Tennessee, on the south by Florida and the Gulf of Mexico, on the east by Georgia, and on the west by Mississippi. Its length is 330 miles, average breadth 154, and area 50,722 square miles. It ranks twenty-seventh in size among the states. The Alleghany range stretches into the northern portion of the state, but the elevation is nowhere great. The Alabama is the chief river of the state. It is formed by the junction of the Coosa and the Talapoosa, which unite about 10 miles above the city of Montgomery. Forty-five miles above Mobile the Alabama is joined by the Tombigbee, and from that point is known as the Mobile River. It is navigable from Mobile to Wetumpka, on the Coosa, some 460 miles. The Tombigbee is navigable to Columbus, and the Black Warrior, one of its chief tributaries, to Tuscaloosa. The Tennessee flows through the northern portion of the state, and the Chattahoochee forms part of its eastern boundary. The climate of Alabama is semi-tropical. The temperature ranges from 82° to 18° Fahr. in winter, and in summer from 105° to 60°; the mean temperature for the year being a little over 60°.

Alabama possesses a rich soil of varied character, and produces corn and cotton in abundance. Wheat, oats and hay also form important articles of agricultural production. The State is heavily timbered, especially in the southern tier of counties.

Shipments of cotton are made from Mobile, and through Savannah, Ga., New Orleans and Charleston, S. C. Rice and sugar cane, sweet potatoes, and all kinds of vegetables and fruits are abundant, and some tobacco is grown in the north. There is an abundant rainfall, aggregating fifty to fifty-four inches per annum, and well distributed throughout the seasons. Much attention is given to stock-raising.

The abundant mineral resources of Alabama have been developed wonderfully during the last decade. Coal is found in vast deposits, side by side with beds of limestone and iron ore of enormous extent. In the valleys of the Tennessee and upper Alabama rivers, the enterprising cities BIRMINGHAM, BESEMER, Sheffield, Roanoke, Huntsville, Decatur and others rank with the most energetic mining and manufacturing cities of the North. It is claimed that pig iron can be manufactured more cheaply in Alabama than anywhere else in the Union. There are large manufactures of cotton goods, and many varied industries have been introduced. The railway system has been rapidly extended since the war. In 1907 there were 2,985 miles of completed railroad.

The population of Alabama, 1,262,505 in 1880, increased 19.4 per cent. during the decade, and the census of 1890 returns it at 1,513,107. It is now, 1909, estimated by the Governor of the state to be 2,100,000. There are over half a million colored people in the State. The chief towns are MONTGOMERY, the capital, Mobile, Birmingham, Bessemer, Anniston, and Huntsville. Mobile is the only seaport.

There is a good school system, supplemented by State-aided universities, and normal and training schools. In the larger cities there are separate school districts.

Alabama was first visited by De Soto in 1540, and takes its name from the very powerful nation of Indians that were at that time found occupying it. Among these were the Alibamas, the Choctaws, the Chickasaws, the Cherokees, and the Apalaches. In 1702 the French settled at Biloxi, founded Mobile in 1711, and for many years were discouraged by disease and famine. In 1763 Alabama was added to Illinois territory and passed through various vicissitudes of Indian wars, claims from different countries and neighboring states, until in 1817 it was formed into a territory and two years later admitted into the Union. Early in 1861 an ordinance of secession was adopted, and Montgomery was made the temporary capital of the Confederacy. The State was the theater of war in 1862, and in 1864 Mobile was the scene of a naval battle, and her forts were silenced by Farragut. In 1865 Mobile, Selma, and Montgomery were taken by Federal troops, and a provisional governor was appointed by President Johnson later in that year. In 1868 a new constitution was adopted, and the State was readmitted to representation in congress.

On July 14, 1868, military rule ceased, and on November 16, 1870, the State ratified the fifteenth amendment to the Federal constitution. For a decade after the Civil War, Alabama suffered from maladministration. Party spirit ran very high, and elections were bitterly contested. The dishonesty of officials and the extravagant railway policy they pursued brought the State and the chief towns into serious financial difficulties. With the reorganization of the public debt in 1876 began an era of quiet and prosperity. Since 1874 Alabama has been invariably Democratic. In 1901 a constitutional convention changed the organic law in such a manner as to insure political supremacy to the white population.

ALABAMA, a river of the United States, in the State of Alabama, formed by the junction of the Coosa and the Tallapoosa. After a course of 300 miles it joins the Tombigbee and assumes the name of the Mobile.

ALABAMA CLAIMS. See Alabama, The.

ALABAMA, The, a ship built at Birkenhead, England, to act as a privateer in the service of the Confederate States of North America during the civil war begun in 1861. Before she was launched her destination was made known to the British government, but owing to some legal formalities the orders given for her detention did not reach Liverpool till the day after she had left that port (29th July, 1862). She received her armament and stores at the Azores, and entered on her destructive career, capturing and burning merchant vessels, till she was sunk in a fight with the Federal war steamer Kearsarge, off Cherbourg, 19th June, 1864. As early as the winter of 1862 the United States government declared that they held themselves entitled at a suitable period to demand full compensation from Britain for the damages inflicted on American property by the Alabama and several other cruisers that had been built, supplied, or recruited in British ports or waters. After a long series of negotiations it was agreed to submit the final settlement of the question to a court of arbitration, consisting of representatives of Britain, and the United States, and of three other members, appointed by the King of Italy, the President of Switzerland, and the Emperor of Brazil. This court

met at Geneva, 17th December, 1871, and a decree was given in September, 1872, that Britain was liable to the United States in damages to the amount of 15,500,000 dollars. After all awards were made to private claimants about 8,000,000 dollars still remain unclaimed.

ALABAS'TER, a name applied to a granular variety of gypsum or hydrated sulphate of lime. It has a fine granular texture, is usually of a pure white color, and is so soft that it can be scratched with the nail. It is found in many parts of Europe; in great abundance and of peculiarly excellent quality in Tuscany.

ALAMEDA (ä'la-mā'da), a city in Alameda county, California, six miles across the bay from San Francisco, on the Southern Pacific Railroad. Its growth has been rapid since 1870. Pop. 19,124.

AL'AMO, a fort in Bexar county, Texas, U. S., celebrated for the resistance its occupants (140 Texans) made to a Mexican force of 4000 from 23d February to 6th March, 1836. At the latter date only six Texans remained alive, and on their surrendering they were slaughtered by the Mexicans.

ALAND (o'land) **ISLANDS,** a numerous group of islands and islets, about eighty of which are inhabited, belonging to Russia, situated in the Baltic Sea, near the mouth of the Gulf of Finland; area, 468 square miles. The principal island, Aland, distant about 30 miles from the Swedish coast, is 18 miles long and about 14 broad. It has a harbor capable of containing the whole Russian fleet. The fortress of Bomarsund, here situated, was destroyed by an Anglo-French force in August, 1854. The inhabitants, who are of Swedish extraction, employ themselves mostly in fishing. The islands were ceded by Sweden to Russia in 1809. Pop. 18,000.

ALA'NI, or **ALANS,** one of the warlike tribes which migrated from Asia westward at the time of the decline of the Roman empire. They are first met with in the region of the Caucasus, where Pompey fought with them. From this center they spread over the south of modern Russia to the confines of the Roman empire. About the middle of the fifth century they joined the Vandals, among whom they become lost to history.

ALARM, in military language, a signal, given by beat of drum, bugle-call, or firing of a gun, to apprise a camp or garrison of a surprise intended or actually made by the enemy. A place, called the alarm-post, is generally appointed at which the troops are to assemble when an alarm is given.—Alarm is also the name given to several contrivances in which electricity is made use of, as a fire-alarm, by which intelligence is at once conveyed to the proper quarter when a fire breaks out; a burglar-alarm, an arrangement of wires and a battery in a house intended to set a bell or bells ringing should a burglar attempt to gain entrance.

ALARM-CLOCK, one which can be set so as to ring loudly at a certain hour to wake from sleep or excite attention.

ALASKA, the largest of the territories of the United States, comprising a vast part of the northwest of the North American continent. It was purchased in 1867 from Russia for $7,200,000. Its area is 577,400 square miles, including not only an enormous tract of mainland, but Prince of Wales Island, the Alexander Archipelago, the Kadiak Islands, the Aleutian Islands, Pribyloff, and St. Lawrence Island in Bering Strait. Its coast line is longer than that of the Atlantic seaboard of the United States. The principal river is the Yukon, which rises in British Columbia less than 200 miles n.n.e. of Sitka, strikes a broad arc of a circle more than 2,000 miles long, and enters Bering Sea on the s. side of Norton Sound through an extensive delta. At 600 miles from the coast it is over a mile wide, and the volume of its water is so great as to freshen the water 10 miles off shore from its principal mouth. The next largest river is the Kuskokwim, which rises on the northern slopes of the Alaskan range of mountains to the eastward of the meridian of 150° w., and empties into Kuskokwim Bay, Bering Sea, in about lat. 60° n. Like the following, it is but little known. Next in order of size are the Colville, flowing into the Arctic Ocean e. of Point Barrow; the Copper, flowing southward from the Alaska Mountains, and emptying into the Bay of Alaska in about lon. 145° w.; the Suschitno, and several Arctic streams. The Rocky Mountains turn westward in about lat. 63° n. and pass into the Alaska Mountains, a range which runs first w., then s.w., and is finally prolonged into the peninsula of Alaska and the Aleutian Islands, the peaks in the two latter being often volcanic. This range apparently culminates in Mt. Wrangel, in about lon. 145° w., lat. 62° 30′ n.; height, 17,500 feet. Near the coast is a less continuous range, which culminates in Mt. Logan (lat. 60° 30′ n.), altitude 19,500 feet, thus overtopping Mt. Elias (18,100 feet), which is situated at the point where the U. S. boundary makes a turn from westward to northward, and which was long regarded as the highest peak north of Mexico. Among these coast mountains is Mt. Cook (in British territory), 15,750 feet, and Mt. Fairweather (U. S.), 15,500 feet. Glaciers are frequent among these mountains, and one from Mt. Elias dips its nose into salt water at Icy Bay.

The population for the whole Territory in 1880 was 33,426, of whom 17,617 were Eskimos, 11,478 Indians, 2,145 Aleuts, 1756 half-breeds, and 430 whites. In 1890 the census enumeration (necessarily largely an estimate), gave 4416 whites, 82 blacks, 1568 half-breeds, 13,735 natives not Eskimos, 2125 Chinese, 8400 Eskimos; total, 30,326. The census (1900) gives a total population of 63,592. Pop., (1908), 130,000.

The coast of this part of America was discovered by a Russian expedition under Bering in 1741. Settlements were gradually made, and the coast was at one time claimed as far s. as San Francisco. In 1799 the Territory was granted to a Russo-American fur company by the Emperor Paul VIII., and the charter was renewed in 1839. New Archangel, now Sitka, was the principal settlement. The privileges of the company expired in 1863, and the Territory was purchased by the U. S. in 1867. Portions of the Territory were soon after explored by employees of the Russo-American Telegraph Company in surveying a route for an overland telegraph line to Europe. Explorations of the coast have since been continued by the Coast and Geodetic Survey. The Yukon has been explored by Dall and Schwatka, and Mt. Elias by several parties, the most successful of which was that of Russell in 1891. From Sept. 8, 1881, to Aug. 29, 1883, a well-equipped meteorological station of the U.S. Signal Service was kept at Point Barrow. In 1884 a district government was created by Congress, with a governor and a district court. The latter sits alternately at Sitka and Wrangel. The laws are those of Oregon. Sitka is the capital and has a land-office. The farming of the Pribylof or Fur Seal islands in Bering Sea was at first granted to the Alaska Commercial Company at a rental amounting to about $300,000 annually. On the expiration of their lease in 1890, the right was acquired by the North American Commercial Company.

A treaty was signed by the Secretary of State and the British Ambassador in Washington on Jan. 30, 1897, providing for the demarcation of so much of the boundary between Alaska and Canada as lies along the 141st meridian. The joint high commission appointed to attempt the settlement of all questions at issue between the U. S. and Canada made its award in 1903.

Alaska is rich in mineral wealth, has immense forests, and its fishing and sealing industries are enormous. Its most valuable exports are furs of seals, bears, foxes, otters, martens, beavers, and other animals. The salmon district has an output of 300,000 cases yearly. Gold is mined extensively in the Klondike district and valuable placer mines have been worked nearer the coast. The Sitka district is the most desirable for permanent residence. It has abundant forests and the climate is mild and the rainfall heavy.

ALAU'DA, a genus of insessorial birds, which includes the larks. See Lark.

A'LAVA, a hilly province in the north of Spain, one of the three Basque provinces; area, 1207 sq. m.; covered by branches of the Pyrenees, the mountains being clothed with oak, chestnut, and other timber, and the valleys yielding grain, vegetables, and abundance of fruits. There are iron and copper mines, and inexhaustible salt springs. Capital, Vittoria. Pop. 93,538.

ALB, a clerical vestment worn by priests while officiating in the more solemn functions of divine service. It is a long robe of white linen reaching to the feet, bound round the waist by a cincture, and fitting more closely to the body than the surplice.

ALBA, Duke of. See Alva.

ALBACETE (al-ba-tha'tā), a town in southern Spain, capital of the province of the same name, 106 miles n.n.w. of Cartagena, with a considerable trade, both direct and transit, and manufactures of knives, daggers, etc. Pop. 21,637.—The province has an area of 6170 sq. m., and a pop. of 237,877.

ALBAN, St., the traditionary proto-martyr of Britain, who flourished in the third century, was, it is said, converted from Paganism by a confessor whom he had saved from his persecutors, and, refusing to sacrifice to the gods, was executed outside of the city of Verulamium (St. Albans) in 285 or 305.

ALBANI (ál-bā′nē), Francesco, a famous Italian painter, born at Bologna in 1578, died in 1660. Among the best known of his compositions are the Sleeping Venus, Diana in the Bath, Danaë Reclining, Galatea on the Sea, Europe on the Bull.

ALBA′NIA, an extensive region in the southwest of Turkey in Europe, stretching along the coast of the Adriatic for about 290 miles, and having a breadth varying from about 90 to about 50 miles. The boundary on the east is formed by a range of mountains, and the country is composed of at least nine ridges of hills, of which six are in lower or southern Albania (ancient Epirus) and the remainder in central and upper or northern Albania. There are no large rivers, and in summer many of the streams are completely dry. The Drin or Drino is the largest. The most beautiful lake is that of Ochrida, 20 miles long, 8 broad at the widest part. The Lake of Scutari, in upper Albania, is the largest. Among trees Albania has many species of oak, the poplar, hazel, plane, chestnut, cypress, and laurel. The vine flourishes, together with the orange, almond, fig, mulberry, and citron; maize, wheat, and barley are cultivated. Its fauna comprises bears, wolves, and chamois; sheep, goats, horses, asses, and mules are plentiful. The chief exports are live stock, wool, hides, timber, oil, salt-fish, cheese, and tobacco. The chief ports are Prevesa, Avlona, and Durazzo. The population, about 1,400,000, consists chiefly of Albanians or Arnauts, or, as they call themselves, Skipetars (mountaineers), with a certain number of Greeks and Turks. The Albanians are distinct in race and language from the surrounding peoples. They are only half civilized,

Albanian peasantry.

are divided into a number of clans, and bloody feuds are still common among them. They belong partly to the Greek, partly to the Roman Catholic Church, but the great majority are Mohammedans. Though their country became a province of the Turkish dominions in the fifteenth century, they still maintain a certain degree of independence, which the Porte has never found it possible to overcome.

AL′BANY, the original Celtic name probably at first applied to the whole of Britain, but latterly restricted to the Highlands of Scotland.

AL′BANY, a city of the United States, capital of the State of New York on the west bank of the Hudson, 132 miles north of New York City, from and to which steamboats run daily. The Erie Canal and the numerous railway lines centering here from all directions greatly contribute to the growth and prosperity of the city, which carries on an extensive trade. It is a great mart for timber, and has foundries, breweries, tanneries, etc. Albany was settled by the Dutch in 1610–14, and the older houses are in the Dutch style, with the gable-ends to the streets. There is a university, an observatory, and a state library with 90,000 volumes. The principal public edifices are the capitol or state-house, the state-hall for the public offices, a state arsenal, and numerous religious edifices. Pop. (1908), 98,537.

Albatros.

Wandering albatros.

AL′BATROS, a large marine swimming bird of several species, of which the wandering albatros is the best known. The bill is straight and strong, the upper mandible hooked at the point and the lower one truncated; there are three webbed toes on each foot. The upper part of the body is of a grayish brown, and the belly white. It is the largest sea-bird known, some measuring 17½ feet from tip to tip of their expanded wings. They abound at the Cape of Good Hope and in other parts of the southern seas, and in Bering's Straits, and have been known to accompany ships for whole days without ever resting on the waves. From this habit the bird is regarded with feelings of attachment and superstitious awe by sailors, it being reckoned unlucky to kill one. Coleridge has availed himself of this feeling in his Ancient Mariner. The albatros is met with at great distances from the land, settling down on the waves at night to sleep. It is exceedingly voracious, whenever food is abundant gorging to such a degree as to be unable to fly or swim. It feeds on fish, carrion, fish-spawn, oceanic mollusca, and other small marine animals. Its voice is a harsh, disagreeable cry. Its nest is a heap of earth; its eggs are larger than those of a goose.

ALBERONI, Cardinal Giulio (jū′li-o ál-bā-rō′nē), born in 1664 in north Italy, and educated for the church. The Duke of Parma sent him as his minister to Madrid, where he gained the affection of Philip V. He rose by cunning and intrigue to the station of prime-minister, became a cardinal, was all-powerful in Spain after the year 1715, and endeavored to restore it to its ancient splendor. He died at Rome in 1752.

AL′BERT I., Duke of Austria, and afterward Emperor of Germany, son of Rodolph of Hapsburg, was born in 1248. On the death of his father in 1292 he claimed the empire, but his arrogant conduct drove the electors to choose Adolphus of Nassau emperor. Adolphus, after a reign of six years, having lost the regard of all the princes of the empire Albert was elected to succeed him. Pope Boniface VIII., however, refused to acknowledge him as emperor. Albert formed an alliance with Philip le Bel of France, and offered so determined and successful a resistance to the papal authority that Boniface was induced to withdraw his opposition, on condition that Albert would break with his French ally. He was assassinated, at Aix-la-Chapelle in 1298, by his nephew, John, Duke of Suabia, whose inheritance he had seized upon, in 1308.

ALBERT, first Duke of Prussia, and last grand-master of the Teutonic Order, was born in 1490; died in 1568.

ALBERT, Prince, Albert-Francis-Augustus-Charles-Emmanuel, Prince of Saxe-Coburg-Gotha, and Prince Consort of England, second son of Ernest I., Duke of Saxe-Coburg, was born at the Rosenau, a castle near Coburg, on 26th August, 1819. In 1837 he entered the University of Bonn, where he devoted himself to the studies of political and natural science, history, philosophy, etc., as well as to those of music and painting. On leaving the university he

Albert, Prince Consort.

made a tour through the chief cities of Italy with Baron Stockmar. On the 10th Feb. 1840, he married his cousin, Queen Victoria of England. An allowance of $150,000 a year was settled upon

the prince, who was naturalized by act of Parliament, received the title of Royal Highness by patent, was made a field-marshal, a Knight of the Garter, of the Bath, etc. Other honors were subsequently bestowed upon him, the chief of which was the title of Prince Consort (1857). His foreign birth at first caused him to be regarded with some suspicion, but his unfailing tact and genuine ability were not long in gaining their due recognition. His services to the cause of science and art were very important; he presided over the commission appointed in 1841 to consider the best means of rebuilding the houses of parliament, and the great exhibition of 1851 owed much of its success to his activity, knowledge, and judgment. The amendment of the Articles of War in 1844 which ultimately put an end to dueling was due to his suggestion. He died of typhoid fever on December 14, 1861, after a short illness.

ALBER'TA, since 1905 one of the provinces of Canada, having Assiniboia and Saskatchewan on the east, British Columbia on the west, the United States on the south, and Athabasca on the north; area, 253,540 sq. miles; pop. 75,000. It is a fertile, grassy region, with trees in the river valleys; coal is abundant and gold is found near Edmonton. The capital is Edmonton.

ALBERT NYAN'ZA, a lake of Africa, one of the head-waters of the Nile, lying (approximately) between lat. 2° 30′ and 1° 10′ n., and with its northeast extremity in about lon. 28° e.; general direction from northeast to southwest, surface about 2500 feet above sea-level. It is surrounded by precipitous cliffs, and bounded on the west and southwest by great ranges of mountains. It abounds with fish, and its shores are infested with crocodiles and hippopotamuses. It receives the Victoria Nile from the Victoria Nyanza, and the White Nile issues from its northern extremity.

ALBIGENSES (al-bi-jen'sēz), a sect which spread widely in the south of France and elsewhere about the twelfth century, and which differed in doctrine and practice from the Roman Catholic Church, by which they were subjected to severe persecution.

ALBINOS (al-bī'nōz), the name given to those persons from whose skin, hair, and eyes, in consequence of some defect in their organization, the dark coloring matter is absent. The skin of albinos, therefore, whether they belong to the white, Indian, or negro races, is of a uniform pale milky color, their hair is white, while the iris of their eyes is pale rose color, and the pupil intensely red, the absence of the dark pigment allowing the multitude of blood-vessels in these parts of the eye to be seen. For the same reason their eyes are not well suited to endure the bright light of day, and they see best in shade or by moonlight. The peculiarity of albinism or leucopathy is always born with the individual, and is not confined to the human race, having been observed also in horses, rabbits, rats, mice, etc., birds (white crows or blackbirds are not particularly uncommon), and fishes.

AL'BION, the earliest name by which the island of Great Britain was known, employed by Aristotle, and in poetry still used for Great Britain. The same word as Albany, Albyn.

AL'BITE, or **SODA-FELSPAR,** a mineral, a kind of felspar, usually of a white color, to which property it owes it name, but occasionally bluish, grayish, greenish, or reddish white.

AL'BOIN, King of the Lombards, succeeded his father Audoin in 561, and reigned in Noricum and Pannonia. After a victorious career in Italy he was slain at Verona, in 573 or 574, by an assassin, instigated by his wife Rosamond, whose hatred he had incurred by sending her, in one of his fits of intoxication, a cup wrought from the skull of her father, and forcing her to drink from it.

ALBRET, Jeanne d' (zhàn dàl-brā), Queen of Navarre, wife of Antoine de Bourbon and mother of Henri IV. of France, a zealous supporter of the reformed religion, which she established in her kingdom; born 1528, died (probably poisoned) 1572, shortly before the massacre of St. Bartholomew.

AL'BUM, a name now generally given to a blank book for the reception of pieces of poetry, autographs, engravings, photographs, etc.

ALBU'MEN, or **ALBUMIN,** a substance, or rather group of substances, so named from the Latin for the white of an egg, which is one of its most abundant known forms. It may be taken as the type of the protein compounds or the nitrogenous class of foodstuffs. One variety enters largely into the composition of the animal fluids and solids, is coagulable by heat at and above 160°, and is composed of carbon, hydrogen, nitrogen, and oxygen, with a little sulphur. It abounds in the serum of the blood, the vitreous and crystalline humors of the eye, the fluid of dropsy, the substance called coagulable lymph, in nutritive matters, the juice of flesh, etc. The blood contains about 7 per cent of albumen. Another variety called vegetable albumen exists in most vegetable juices and many seeds, and has nearly the same composition and properties as egg albumen. When albumen coagulates in any fluid it readily incloses any substances that may be suspended in the fluid. Hence it is used to clarify syrupy liquors. In cookery white of eggs is employed for clarifying, but in large operations like sugar-refining the serum of blood is used. From its being coagulable by various salts, and especially by corrosive sublimate, with which it forms an insoluble compound, white of egg is a convenient antidote in cases of poisoning by that substance. With lime it forms a cement to mend broken ware.

In botany the name albumen is given to the farinaceous matter which surrounds the embryo, the term in this case having no reference to chemical composition. It constitutes the meat of the cocoanut, the flour or meal of cereals, the roasted part of coffee, etc.

ALBUMINU'RIA, a condition in which the urine contains albumen, evidencing a diseased state of the kidneys.

ALBUR'NUM, the soft white substance which, in trees, is found between the liber or inner bark and the wood, and, in progress of time acquiring solidity, becomes itself the wood. A new layer of wood, or rather of alburnum, is added annually to the tree in every part just under the bark.

ALCALDE (Spanish; al-kal-dā), or **ALCAIDE** (Portuguese; al-kī'dā), the name of a magistrate in the Spanish and Portuguese towns, to whom the administration of justice and the regulation of the police is committed. His office nearly corresponds to that of juctice of the peace. The name and the office are of Moorish origin.

ALCES'TIS, in Greek mythology, wife of Admetus, king of Thessaly. Her husband was ill, and, according to an oracle, would die unless some one made a vow to meet death in his stead. This was secretly done by Alcestis, and Admetus recovered. After her decease Hercules brought her back from the infernal regions.

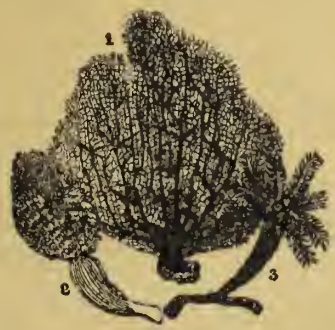
AL'CHEMY, or **ALCHYMY,** the art which in former times occupied the place of and paved the way for the modern science of chemistry (as astrology did for astronomy), but whose aims were not scientific, being confined solely to the discovery of the means of indefinitely prolonging human life, and of transmuting the baser metals into gold and silver. Among the alchemists it was generally thought necessary to find a substance which, containing the orignal principle of all matter, should possess the power of dissolving all substances into their elements. This general solvent, or menstruum universale, which at the same time was to possess the power of removing all the seeds of disease out of the human body and renewing life, was called the philosopher's stone, and its pretended possessors were known as adepts. Alchemy flourished chiefly in the middle ages, though how old might be such notions as those by which the alchemists were inspired it is difficult to say. When more rational principles of chemistry and philosophy began to be diffused and to shed light on chemical phenomena, the rage for alchemy gradually decreased. It is still impossible to assert anything with certainty about the transmutation of metals. Modern chemistry, indeed, places metals in the class of elements, and denies the possibility of changing an inferior metal into gold. But hitherto chemistry has not succeeded in unfolding the principles by which metals are formed and the laws of their production, or in aiding or imitating this process of nature.

ALCIBI'ADES (-dēz), an Athenian of high family and of great abilities, but of no principle, was born at Athens in B.C.450, being the son of Cleinias, and a relative of Pericles, who also was his guardian. He acquired great popularity by his liberality in providing for the amusements of the people, and after the death of Cleon attained a political ascendency which left him no rival but Nicias. Thus he played an important part in the long-continued Peloponnesian war. In 415 he advocated the expedition against Sicily, and

was chosen one of the leaders, but before the expedition sailed he was charged with profaning and divulging the Eleusinian mysteries, and mutilating the busts of Hermes, which were set up in public all through Athens. Rather than stand his trial he went over to Sparta, divulged the plans of the Athenians, and assisted the Spartans to defeat them. He soon left Sparta and took refuge with the Persian satrap Tissaphernes, ingratiating himself by his affectation of Persian manners, as he had previously done at Sparta by a similar affectation of Spartan simplicity. He now began to intrigue for his return to Athens, offering to bring Tissaphernes over to the Athenian alliance, and latterly he was recalled and his banishment canceled. He, however, remained abroad for some years in command of the Athenian forces, gained several victories, and took Chalcedon and Byzantium. In B.C. 407 he returned to Athens, but in 406, the fleet which he commanded having suffered a severe defeat, he was deprived of his command. He once more went over to the Persians, taking refuge with the satrap Pharnabazus of Phrygia, and here he was assassinated in B.C. 404.

ALCO, a small variety of dog, with a small head and large pendulous ears, found wild in Mexico and Peru, and also domesticated.

AL'COHOL, the purely spirituous or intoxicating part of all liquids that have undergone vinous fermentation, extracted by distillation—a limpid colorless liquid, of an agreeable smell and a strong pungent taste. When brandy, whisky, and other spirituous liquors, themselves distilled from cruder materials, are again distilled, highly volatile alcohol is the first product to pass off. The alcohol thus obtained contains much extraneous matter, including a proportion of water, from the first as high as 20 or 25 per cent, and increasing greatly as the process continues. Charcoal and carbonate of soda put in the brandy or other liquor partly retain the fusel-oil and acetic acid it contains. The product thus obtained by distillation is called rectified spirits or spirits of wine, and contains from 55 to 85 per cent of alcohol, the rest being water. By distilling rectified spirits over carbonate of potassium, powdered quicklime, or chloride of calcium, the greater part of the water is retained, and nearly pure alcohol passes over. It is only, however, by very prolonged digestion with desiccating agents and subsequent distillation that the last traces of water can be removed. The specific gravity of alcohol varies with its purity, decreasing as the quantity of water it contains decreases. This property is a convenient test of the alcoholic strength of liquors that contain only alchohol and water; but, on account of the condensation that invariably takes place on the mixture of these two liquids, it can be applied only in connection with special tables of reference, or by means of an instrument specially adapted for the purpose. (See Alcoholometer.) By simple distillation the specific gravity of alcohol can scarcely be reduced below ·825 at 60° Fahr.; by rectification over chloride of calcium it may be reduced to ·794; as it usually occurs it is about ·820. Alcohol is composed of carbon, hydrogen, and oxygen, in the proportions expressed by the formula C_2H_6O. Under a barometric pressure of 29·5 inches it boils at 173° Fahr. (78°·4 C.); in the exhausted receiver of an air-pump it boils at ordinary temperatures. Its congelation has been effected only in recent times at the low temperature of



Alcyonaria.
1. Sea-fan. 2. Sea-pen. 3. Cornuldria rugosa.

−203° Fahr. Its very low freezing-point renders it valuable for use in thermometers for very low temperatures. Alcohol is extremely inflammable, and burns with a pale-blue flame, scarcely visible in bright daylight. It occasions no carbonaceous deposit upon substances held over it, and the products of its combustion are carbonic acid and water. The steady and uniform heat which it gives during combustion makes it a valuable material for lamps. It dissolves the vegetable acids, the volatile oils, the resins, tan, and extractive matter, and many of the soaps; the greater number of the fixed oils are taken up by it in small quantities only, but some are dissolved largely. When alcohol is submitted to distillation with certain acids a peculiar compound is formed, called ether. It is alcohol which gives all intoxicating liquors the property whence they are so called. Alcohol acts strongly on the nervous system, and though in small doses it is stimulating and exhilarating, in large doses it acts as a poison. In medicine it is often of great service.

The name alcohol is also applied in chemistry to a large group of compounds of carbon, hydrogen, and oxygen, whose chemical properties are analogous to that of common or ethylic alcohol.

AL'COHOLISM, a morbid condition of the body (especially of the nervous system) brought on by the immoderate use of alcoholic liquors.

ALCOHOLOM'ETER, an instrument constructed on the principle of the hydrometer, to determine from the specific gravity of spirituous liquors the percentage of alcohol they contain, the scale marking directly the required proportion. If the liquor contain anything besides water and alcohol, previous distillation is necessary.

ALCO'RAN. See Koran.

AL'COTT, Louisa May, a distinguished American authoress, born in 1833. She has written a number of books chiefly intended for the young: Little Women, An Old-fashioned Girl, Little Men, Jack and Gill, etc. Died in 1888.

AL'COVE, a recess in a room, usually separated from the rest of the room by columns, a balustrade, or by curtains, and often containing a bed or seats.

ALCYONA'RIA, animals forming a great division of the class Actinozoa. (See Sea-anemone.) These animals are nearly all composite, and the individual polyps have mostly eight tentacles. They include the organ-pipe corals, sea-pens, fan-corals, etc., as also the red coral of commerce. The polyps essentially resemble those of the genus Alcyonium in structure, and in the number and arrangement of the tentacles.

ALCYO'NIUM, a genus of animals, one familiar species of which, dredged around the British coasts, is named "Dead-Men s Fingers," or "Cow's Paps," from its lobed or digitate appearance. It grows attached to stones, shells, and and other objects. It consists of a mass of little polyps, each polyp possessing eight little fringed tentacles disposed around a central mouth. The Alcyonium forms the type of the Alcyonaria.

ALDEB'ARAN, a star of the first magnitude, forming the eye of the constellation Taurus or the Bull, the brightest of the five stars known to the Greeks as the Hyades. Spectrum analysis has shown it to contain antimony, bismuth, iron, mercury, hydrogen, sodium, calcium, etc.

AL'DEHYDE, the oxidation product of an alcohol intermediate between it and its acid. Common aldehyde is derived from spirit of wine by oxidation, and is a colorless, limpid, volatile, and inflammable liquid, with a peculiar ethereal odor, which is suffocating when strong; specific gravity, 0·79. It oxidizes in air, and is converted into acetic acid. It rapidly decomposes oxide of silver, depositing a brilliant film of metallic silver; hence it is used in silvering curved glass surfaces.

ALDEN, Henry Mills, an American author born at Mt. Tabor, Vt., in 1836. He was a classmate of James A. Garfield in the class of 1857 at Williams College. He has been editor of Harper's Weekly and Harper's Monthy, and is noted for his contributions to the criticism of Greek literature. He has also published volumes of essays, poems, and prose poems.

ALDEN, Mrs. Isabella McDonald, an American author. She was born at Rochester, N. Y., in 1841, and early in her career became widely known through her juvenile stories currently known as the Pansy Books. Her works have been translated into several foreign languages.

ALDEN, John, an early American settler, one of the Pilgrim Fathers. He helped to repair the Mayflower, sailed in her, and signed the compact. He settled at Duxbury, Mass., and married Priscilla Mullens. Alden outlived all the other signers of the compact and has been immortalized by Longfellow in his poem, The Courtship of Miles Standish.

ALDER (ạl'der), a genus of plants, consisting of trees and shrubs inhabiting the temperate and colder regions of the globe. Common alder is a tree which grows in wet situations in Europe, Asia, and the United States. Its wood, light and soft and of a reddish color, is used for a variety of purposes, and is well adapted for work which is to be kept constantly in water. The roots and knots furnish a beautifully-veined wood well suited for cabinet work. The bark is used in tanning and leather dressing, and by fishermen for staining their nets. This and the young twigs are sometimes employed in dyeing, and yield different shades of yellow and red. With the addition of copperas it yields a black dye.

AL'DERMAN, in the United States a representative of a ward or district in the legislative department of a town or city. In some cities aldermen hold separate courts and have the power of a magistrate to a limited extent.

AL'DERNEY, an island belonging to Britain off the coast of Normandy. The coast is bold and rocky, the interior is fertile. About a third of the island is occupied by grass lands; and the Alderney cows, a small-sized but handsome breed, are famous for the richness of their milk. The climate is mild and healthful. The French language still prevails among the inhabitants, but all understand and many speak English. —The Race of Alderney is the strait between the coast of France and this island. Pop. 2062.

ALDERSHOT (ạl'dėr-), a town and military station in England, the latter having given rise to the former. The number of troops usually maintained at Aldershot is about 7000. The town is in the neighborhood of the barracks, immediately beyond the government ground, and in Hampshire. Pop. (including military), 30,974.

AL'DINE EDITIONS, the name given to the works which proceeded from the press of Aldus Manutius and his family at Venice (1490–1597). (See Manutius.) Recommended by their value, as well as by a splendid exterior, they have gained the respect of scholars and the attention of book-collectors. Many of them are the first printed editions of Greek and Latin classics. Others are texts of the modern Italian authors. These editions are of importance in the history of printing. Aldus had nine kinds of Greek type, and no one before him printed so much and so beautifully in this language. Of the Latin character he procured fourteen kinds of type.

AL'DRICH, Thomas Bailey, American poet and writer of prose tales, born at Portsmouth, N. H., Nov. 11, 1836. He was early engaged in commercial occupations, but abandoned them for jounalism, and was the editor of several publications, including the Atlantic Monthly. His works comprise The Bells, Ballad of Baby Bell, Cloth of Gold, Prudence Palfrey, etc. He died in 1907.

ALE and **BEER,** well-known and extensively used fermented liquors, the principle of which is extracted from several sorts of grain, but most commonly from barley, after it has undergone the process termed malting. Beer is a more general term than ale, being often used for any kind of fermented malt liquor, including porter, though it is also used in a more special signification. See Brewing.

ALEMBERT (ȧ-laṇ-bār), Jean le Rond d', a French mathematician and philosopher, born in Paris in 1717, and died there in 1783. He was the illegtiimate son of Madame de Tencin, and was exposed at the Church of St. Jean le Rond (hence his name) soon after birth. He was brought up by the wife of a poor glazier, and with her he lived for more than forty years. His parents never publicly acknowledged him, but his father settled upon him an income of 1200 livres. He showed much quickness in learning, entered the College Mazarin at the age of twelve, and studied mathematics with enthusiasm and success. Having left college he studied law and became an advocate, but did not cease to occupy himself with mathematics. A pamphlet on the motion of solid bodies in a fluid, and another on the integral calculus, which he laid before the Academy of Sciences in 1739 and 1740, showed him in so favorable a light that the Academy received him in 1741 into the number of its members. He soon after published his famous work on dynamics, Traité de Dynamique (1743); and that on fluids, Traité des Fluides. He also took a part in the investigations which completed the discoveries of Newton respecting the motion of the heavenly bodies, and published at intervals various important astronomical dissertations, as well as on other subjects. He also took part, with Diderot and others, in the celebrated Encyclopédie, for which he wrote the Discours Préliminaire, as

T. B. Aldrich.

well as many philosophical and almost all the mathematical articles.

ALEMTEJO (ȧ-lāṇ-tā'zhō), the largest province of Portugal, and the most southern except Algarve; area, 10,255 sq. miles; pop. 413,531. The capital is Evora.

ALENCON (ȧ-lȧn-sōṇ), a town of France, capital of department Orne, and formerly of the Duchy of Alençon, on the right bank of the Sarthe, 105 miles west by south of Paris; well built. Alençon was long famed for its point-lace, called "point d'Alençon." Pop. 17,237.—Alençon, originally a county, later a dukedom, became united with the crown in 1221, and was given by Louis XI. as an appanage to his fifth son, with whom the branch of the Alençon Valois commenced. The first duke of the name lost his life at the battle of Agincourt in 1415; another, called Charles IV., married the celebrated Margaret of Valois, sister of Francis I. He commanded the left wing of the French army at the battle of Pavia, where, instead of supporting the king at a critical moment, he fled at the head of his troops, the consequence of which was the loss of the battle and the capture of the king.

Aleppo.

ALEP'PO, a city of Asiatic Turkey, in northern Syria, on the river Koik, in a fine plain 60 miles southeast of Alexandretta, which is its port, and 195 miles n.n.e. of Damascus. Pop, 100,000.

ALETSCH'-GLACIER, the greatest glacier in Switzerland, canton Valais, a prolongation of the immense mass of glaciers connected with the Jungfrau, the Aletschhorn (14,000 ft.), and other peaks; about 15 miles long.

ALEUROM'ETER, an instrument for indicating the bread-making qualities of wheaten flour. The indications depend upon the expansion of the gluten contained in a given quantity of flour when freed of its starch by pulverization and repeated washings with water.

ALEU'TIAN ISLANDS, a chain of about eighty small islands belonging to the United States, separating the Sea of Kamtchatka from the northern part of the Pacific Ocean, and extending nearly 1000 miles from east to west between lon. 172° e. and 163° w.; total area, 6391 square miles; pop. 1220. They are of volcanic formation, and in a number of them there are volcanoes still in activity. The natives belong to the same stock with those of Kamtchatka.

ALE'WIFE, a fish of the same genus as the shad, growing to the length of 12 inches, and taken in great quantities in the mouths of the rivers of New England, New Brunswick, and Nova Scotia, being salted and exported.

ALEXANDER, surnamed the Great, was the son of Philip of Macedon and his queen Olympias, and was born at Pella,

B.C. 356. In youth he had Aristotle as instructor, and he early displayed uncommon abilities. The victory of Chæronea in 338, which brought Greece entirely under Macedonia, was mainly decided by his efforts. Philip having been assassinated, B.C. 336, Alexander, not yet twenty years of age, ascended the throne. His father had been preparing an expedition against the Persians and Alexander determined to carry it out; but before doing so he had to chastise the barbarian tribes on the frontiers of Macedon as well as quell a rising in Greece, in which he took and destroyed Thebes, put 6000 of the inhabitants to the sword, and carried 30,000 into captivity. His first encounter with the Persian forces (assisted by Greek mercenaries) was at the small river Granīcus, where he gained a complete victory. Most of the cities of Asia Minor now opened their gates to the victor, and Alexander restored democracy in all the Greek cities. In passing through Gordium he cut the Gordian knot, on which it was believed

Coin of Alexander the Great.

the fate of Asia depended, and then conquered Lycia, Ionia, Caria, Pamphylia, and Cappadocia. A sickness, caused by bathing in the Cydnus (B.C. 333), checked his course; but scarcely was he restored to health when he continued his onward course, and this same year defeated the Persian emperor Darius and his army of 500,000 or 600,000 men (including 50,000 Greek mercenaries), near Issus (inner angle of the Gulf of Alexandretta). Alexander did not pursue Darius, but proceeded southward, and secured all the towns along the Mediterranean Sea, though he did not get possession of Tyre (taken 332 B.C.) without a siege of seven months. Palestine and Egypt now fell before him, and in the latter he founded Alexandria, which became one of the first cities of ancient times. On his return Alexander marched against Darius, who had collected an immense army in Assyria, and rejected the proposals of his rival for peace. A battle was fought at Gaugamela, about 50 miles from Arbela, B.C. 331, and, notwithstanding the immense numerical superiority of his enemy, Alexander (who had but 40,000 men and 7000 horse) gained a complete victory. Babylon and Susa opened their gates to the conqueror, who marched toward Persepolis, the capital of Persia, and entered it in triumph. Continuing his progress he subdued Bessus, and advanced to the Jaxartes, the extreme eastern limit of the empire, but did not fully subdue the whole of this region till 328, some fortresses holding out with great tenacity. In one of these he took prisoner the beautiful Roxana, daughter of Oxyartes, a nobleman of Sogdiana, and having fallen in love with her he married her. Alexander now formed the idea of conquering India, then scarcely known even by name. He passed the Indus (B.C. 326), marched toward the Hydaspes (Jhelum), at the passage of which he conquered a king named Porus in a bloody battle, and advanced victoriously through the northwest of India, and intended to proceed as far as the Ganges, when the murmurs of his army compelled him to return. On the Hydaspes he built a fleet, in which he sent a part of his army down the river, while the rest proceeded along the banks. By the Hydaspes he reached the Acesines (Chenab), and thus the Indus, down which he sailed to the sea. Nearchus, his admiral, sailed hence to the Persian Gulf, while Alexander directed his march by land to Babylon, losing a great part of his troops in the desert through which he had to pass. In Susa he married Statira, the eldest daughter of Darius, and rewarded those of his Macedonians who had married Persian women, because it was his intention to unite the two nations as closely as possible. At Opis, on the Tigris, a mutiny arose among his Macedonians (in 324), who thought he showed too much favor to the Asiatics; by firmness and policy he succeeded in quelling this rising, and sent home 10,000 veterans with rich rewards. Soon after, his favorite horse, Bucephalus, died at Ecbatana, and Alexander's grief was unbounded. The favorite was royally buried at Babylon, and here Alexander was engaged in extensive plans for the future, when he became suddenly sick, after a banquet, and died in a few days (323 B.C.), in his thirty-third year, after a reign of twelve years and eight months. His body was after a time conveyed to Egypt with great splendor by his general Ptolemy. He left behind him an immense empire, which was divided among his chief generals, and became the scene of continual wars. The reign of Alexander constitutes an important period in the history of humanity. His career was not merely a series of empty conquests, but was attended with the most important results. The language, and much of the civilization of Greece, followed in his track; large additions were made to the sciences of geography, natural history, etc.; a road was opened to India; and the products of the farthest east were introduced into Europe. Greek kingdoms, under his generals and their successors, continued to exist in Asia for centuries.

ALEXANDER, the name of eight popes, the earliest of whom, Alexander I., is said to have reigned from 109 to 119. The most famous (or infamous) is **ALEXANDER VI.** (Borgia), who was born at Valencia, in Spain, in 1431, and died in 1503. When he was only twenty-five years of age his uncle, Pope Calixtus III., made him a cardinal, and shortly afterward appointed him to the dignified and lucrative office of vice-chancellor. By bribery he prepared his way to the papal throne, which he attained in 1492, after the death of Innocent VIII. Both the authority and revenues of the popes being at this time much impaired, he set himself to reduce the power of the Italian princes, and seize upon their possessions for the benefit of his own family. To effect this end he is said not to have scrupled to use the vilest means, including poison and assassination. His policy, foreign as well as domestic, was faithless and base, and his private life was stained by sensuality. He understood how to extract immense sums of money from all Christian countries under various pretexts. He sold indulgences, and set aside, in favor of himself, the wills of several cardinals. His excesses roused against him the powerful eloquence of Savonarola, who, by pen and pulpit, urged his deposition, but had to meet his death at the stake in 1498. Not long after his election Alexander had the honor of deciding the dispute between the kings of Portugal and Castile concerning their respective claims to the foreign countries recently discovered. His son, Cesare Borgia, and his daughter, Lucrezia, are equally notorious with himself.

ALEXANDER, the name of three Scottish kings. **ALEXANDER I.,** a son of Malcolm Canmore and Margaret of England, succeeded his brother Edgar in 1107, and governed with great ability till his death in 1124.—**ALEXANDER II.** was born in 1198, and succeeded his father William the Lion in 1214. He died in 1248 at Kerrera, an island opposite Oban, when on an expedition in which he hoped to wrest the Hebrides from Norway. He was succeeded by his son, **ALEXANDER III.,** a boy of eight, who in 1251 married Margaret, eldest daughter of Henry III. of England. Like his father he was eager to bring the Hebrides under his sway, and this he was enabled to accomplish in a few years after the defeat of the Norse King Haco at Largs, in 1263. The mainland and islands of Scotland were now under one sovereign, though Orkney and Shetland still belonged to Norway.

ALEXANDER I., Emperor of Russia, son of Paul I. and Maria, daughter of Prince Eugene of Würtemberg, was born in 1777, and died in 1825. On the assassination of his father, in 1801, Alexander ascended the throne, and one of his first acts was to conclude peace with Britain, against which his predecessor had declared war. In 1803 he offered his services as mediator between England and France, and two years later a convention was entered into between Russia, England, Austria, and Sweden for the purpose of resisting the encroachments of France on the territories of independent states. He was present at the battle of Austerlitz (1805), when the combined armies of Russia and Austria were defeated by Napoleon. In the succeeding campaign the Russians were again beaten at Eylau (8th February, 1807) and Friedland (14th June), the result of which was an interview, between Alexander and Napoleon, and the treaty at Tilsit. The Russian emperor now for a time identified himself with the Napoleonic schemes, and soon obtained possession of Finland and an extended territory

on the Danube. The French alliance, however, he found to be too oppressive, and his having separated himself from Napoleon led to the disastrous French invasion of 1812. In 1813 he published a manifesto which served as the basis of the coalition of the other European powers against France, which was followed by the capture of Paris (in 1814), the abdication of Napoleon and the restoration of the Bourbons, and the utter overthrow of Napoleon the following year. After Waterloo, Alexander, accompanied by the Emperor of Austria and the King of Prussia, made his second entrance into Paris, where they concluded the treaty known as the Holy Alliance. The remaining part of his reign was chiefly taken up in measures of internal reform, including the gradual abolition of serfdom, and the promotion of education, agriculture, commerce, and manufactures, as well as literature and the fine arts.

ALEXANDER II., Emperor of Russia, was born April 29, 1818, and succeeded his father Nicholas in 1855, before the end of the Crimean war. After peace was concluded the new emperor set about effecting reforms in the empire, the greatest of all being the emancipation of the serfs in 1861, a measure which gave freedom, on certain conditions, to 22,000,000 of human beings who were previously in a state little removed from that of slavery. Under him, too, representative assemblies in the provinces were introduced, and he also did much to improve education, and to reorganize the judicial system. During his reign the Russian dominions in central Asia were extended, a piece of territory south of the Caucasus, formerly belonging to Turkey, was acquired, and a part of Bessarabia, belonging since the Crimean war to Turkey in Europe, but previously to Russia, was restored to the latter power. The latter additions resulted from the Russo-Turkish war of 1877–78. He was killed by an explosive missile flung at him (by a Nihilist it is supposed) in a street in St. Petersburg, 13th March, 1881. He was succeeded by his second son Alexander III., his eldest son having died in youth. Alexander III's policy was reactionary. He died in 1894.

ALEXANDER SEVE'RUS, a Roman emperor, born in 205, died 235 A.D. He was raised to the imperial dignity in 222 A.D. by the prætorian guards, after they had put his cousin the emperor Heliogabalus to death. When on an expedition into Gaul to repress an incursion of the Germans, he was murdered with his mother in an insurrection of his troops, headed by the brutal Maximin, who succeeded him as emperor.

ALEXANDERS, an umbelliferous biennial plant, a native of Britain, formerly cultivated for its leafstalks, which, having a pleasant aromatic flavor, were blanched and used instead of celery—a vegetable that has taken its place.

ALEXAN'DRIA, an ancient city and seaport in Egypt, at the northwest angle of the Nile delta, on a ridge of land between the sea and Lake Mareotis. Founded by, and named in honor of, Alexander the Great, in B.C. 332, and the center of commerce between the east and west, as well as of Greek learning and civilization, with a population at one time of perhaps 1,000,000. It was especially celebrated for its great library, and its famous lighthouse, one of the wonders of the world, standing upon the little island of Pharos, which was connected with the city by a mole. Under Roman rule it was the second city of the empire, and when Constantinople became the capital of the east it still remained the chief center of trade; but it received a blow from which it never recovered when captured by Amru, general of Caliph Omar in 641, after a siege of fourteen months. Its ruin was finally completed by the discovery of the passage to India by the Cape of Good Hope, which opened up a new route for the Asiatic trade. See Alexandrian Library, Alexandrian School. —Modern Alexandria stands partly on what was formerly the island of Pharos, partly on the peninsula which now connects it with the mainland and has been formed by the accumulation of

soil, and partly on the mainland. Alexandria has two ports, on the east and west respectively of the isthmus of the Pharos peninsula, the latter having a breakwater over 3000 yards in length, with fine quays and suitable railway and other accommodation. The trade of Alexandria is large and varied, the exports being cotton, beans, peas, rice, wheat, etc.; the imports chiefly manufactured goods. At the beginning of the century Alexandria was an insignificant place of 5000 or 6000 inhabitants. The origin of its more recent career of prosperity it owes to Mohammed Ali. In 1882 the insurrection of Arabi Pasha and the massacre of Europeans led to the intervention of the British, and the bombardment of the forts by the British fleet in July. When the British entered the city they found the finest parts of it sacked and in flames, but the damage has been repaired. Pop. 319,766.

ALEXANDRIA, a town and port of the United States, in Virginia, on the right bank of the Potomac (which is of sufficient depth for large vessels), 7 miles miles south of Washington, with straight and spacious streets; carries on a considerable trade, chiefly in flour. Pop. 16,589.

ALEXANDRIAN LIBRARY, the largest and most famous of all the ancient collections of books, founded by Ptolemy Soter (died 283 B.C.), king of Egypt, and greatly enlarged by succeeding Ptolemies. At its most flourishing period it is said to have numbered 700,000 volumes, accommodated in two different buildings, one of them being the Serapeion, or temple of Jupiter Serapis. The other collection was burned during Julius Cæsar's siege of the city, but the Serapeion library existed to the time of the Emperor Theodosius the Great, when, at the general destruction of the heathen temples, the splendid temple of Jupiter Serapis was gutted (A.D. 391) by a fanatical crowd of Christians, and its literary treasures destroyed or scattered. A library was again accumulated, but was burned by the Arabs when they captured the city under the caliph Omar in 641.

ALEXANDRIAN SCHOOL or **AGE,** the school or period of Greek literature and learning that existed at Alexandria in Egypt during the three hundred years that the rule of the Ptolemies lasted (323–30 B.C.), and continued under the Roman supremacy. Ptolemy Soter founded the famous library of Alexandria (see above), and his son, Philadelphus, established a kind of academy of sciences and arts. Among the grammarians and critics were Zenodotus, Eratosthenes, Aristophanes, Aristarchus, and Zoilus, proverbial as a captious critic. Their merit is to have collected, edited, and preserved the existing monuments of Greek literature. To the poets belong Apollonius, Lycophron, Aratus, Nicander, Euphorion, Callimachus, Theocritus, Philetas, etc. Among those who pursued mathematics, physics, and astronomy, was Euclid, the father of scientific geometry; Archimedes, great in physics and mechanics; Apollonius of Perga, whose work on conic sections still exists; Nicomachus, the first scientific arithmetician; and (under the Romans) the astronomer and geographer Ptolemy. Alexandria also was distinguished in philosophical speculation, and it was here that the New Platonic school was established at the close of the second century after Christ by Ammonius of Alexandria (about 193 A.D.), whose disciples were Plotinus and Origen. The principal Gnostic systems also had their origin in Alexandria.

ALEXANDRIAN VERSION, or **CODEX ALEXANDRINUS,** a manuscript in the British Museum, of great importance in Biblical criticism, written on parchment with uncial letters, and belonging probably to the latter half of the sixth century. It contains the whole Greek Bible (the Old Testament being according to the Septuagint), together with the letters of Bishop Clement of Rome, but it wants parts of Matthew, John, and Second Corinthians. The Patriarch of Constantinople, who in 1628 sent this manuscript as a present to Charles I., said he had received it from Egypt (whence its name).

ALEXANDRINE, in prosody, the name given, from an old French poem on Alexander the Great, to a species of verse, which consists of six iambic feet, or twelve syllables, the pause being, in correct Alexandrines, always on the

sixth syllable; for example, the second of the following verses:

A needless Alexandrine ends the song.
That, like a wounded snake, drags its slow length along.

In English Drayton's Polyolbion is written in this measure, and the concluding line of the Spenserian stanza is an Alexandrine. The French in their epics and dramas are confined to this verse, which for this reason is called by them the heroic.

ALEX'IS MICHAI'LOVITCH (son of Michael), second Russian czar of the line of Romanof (the present dynasty), born in 1629, succeeded his father Michael Feodorovitch in 1645, and died in 1676. He did much for the internal administration and for the enlargement of the empire; reconquered Little Russia from Poland, and carried his authority to the extreme east of Siberia. He was father of Peter the Great.

ALEXIS PETRO'VITCH, eldest son of Peter the Great, was born in Moscow, 1690, and died in 1718. He opposed the innovations introduced by his father, who on this account disinherited him by a ukase in 1718, and when he discovered that Alexis was paving the way to succeed to the crown he had his son tried and condemned to death. This affected the latter so much that he died in a few days, leaving a son, afterward the emperor Peter II.

ALEX'IUS COMNE'NUS, Byzantine Emperor, was born in 1048, and died in 1118. He was a nephew of Isaac the first emperor of the Comneni, and attained the throne in 1081, at a time when the empire was menaced from various sides, especially by the Turks and the Normans. From these dangers, as well as from later (caused by the first Crusade, the Normans, and the Turks), he managed to extricate himself by policy or warlike measures, and maintained his position till the age of seventy, during a reign of thirty-seven years.

AL'FA, a name for esparto grass or a variety of it, largely obtained from Algeria.

ALFAL'FA, a prolific forage plant similar to lucerne, largely grown in California, etc.

AL'FENID, an alloy of nickel plated with silver, used for spoons, forks, candlesticks, tea services, etc.

ALFIERI (âl-fē-ā'rē), Vittorio, Count, Italian poet, was born at Asti in 1749, and died in 1803. After extensive European travels he began to write, and his first play, Cleopatra (1775), being received with general applause he determined to devote all his efforts to attaining a position among writers of dramatic poetry. He died at Florence and was buried in the church of Santa Croce, between Macchiavelli and Michael Angelo, where a beautiful monument by Canova covers his remains. His tragedies are full of lofty and patriotic sentiments, but the language is stiff and without poetic grace, and the plots poor. Nevertheless he is considered the first tragic writer of Italy, and has served as a model for his successors.

ALFON'SO. See Alphonso.

AL'FORD, Henry, D.D., Dean of Canterbury, an English poet, scholar, and miscellaneous writer, was born in London in 1810. After attending various schools he entered Trinity College, Cambridge, in 1827, graduated B.A. in 1832, was elected fellow in 1834, and next year became vicar of Wymeswold, Leicestershire. In 1842 he was appointed examiner in logic and moral philosophy to the University of London, and held the appointment till 1857. He early began the great work of his life, his edition of the Greek Testament with commentary, which occupied him for twenty years, the first volume being published in 1849, the fourth and last in 1861. In 1853 he was transferred to Quebec Chapel, London, and in 1857 he was appointed Dean of Canterbury. He died in 1871.

AL'FRED (or **ÆL'FRED**) the Great, King of England, one of the most illustrious rulers on record, was born at Wantage, in Berkshire, A.D. 849, his father being Ethelwolf, son of Egbert, king of the West Saxons. He succeeded his brother Ethelred in 872, at a time when the Danes, or Northmen, had extended their conquests widely over the country, and they had completely overrun the kingdom of the West Saxons by 878. Alfred was obliged to flee in disguise, and stayed for some time with one of his own neat-herds. At length he gathered a small force, and, having fortified himself on the Isle of Athelney, formed by the confluence of the rivers Parret and Tone, amid the marshes of Somerset, he was able to make frequent sallies against the enemy. It was during his abode here that he went, if the story is true, disguised as a harper into the camp of King Guthrum (or Guthorm), and, having ascertained that the Danes felt themselves secure, hastened back to his troops, led them against the enemy, and gained such a decided victory that fourteen days afterward the Danes begged for peace. This battle took place in May, 878, near Edington, in Wiltshire. Alfred allowed the Danes who were already in the country to remain, on condition that they gave hostages, took a solemn oath to quit Wessex, and embraced Christianity. Their king, Guthrum, was baptized, with thirty of his followers, and ever afterward remained faithful to Alfred. They received that portion of the east of England now occupied by the counties of Norfolk, Suffolk, and Cambridge, as a place of residence. The few years of tranquillity (886–893) which followed were employed by Alfred in rebuilding the towns that had suffered most during the war, particularly London; in training his people in arms, and no less in agriculture; in improving the navy; in systematizing the laws and internal administration; and in literary labors and the advancement of learning. These peaceful labors were interrupted, about 894, by an invasion of the Northmen, who, after a struggle of three years, were finally driven out. Alfred died in 901. He had married, in 868, Alswith or Ealhswith, the daughter of a Mercian nobleman, and left two sons: Edward, who succeeded him, and Ethelwerd, who died in 922.

ALGÆ (al'jē), a nat. order of cryptogamic or thallogenous plants, found for the most part in the sea and fresh water, and comprising seaweeds, etc. The higher forms have stems bearing leaf-like expansions, and they are often attached to the rocks by roots, which, however, do not derive nutriment from the rocks. A stem, however, is most frequently absent. The plants are nourished through their whole surface by the medium in which they live. They vary in size from the microscopic diatoms to forms whose stems resemble those of forest trees, and whose fronds rival the leaves of the palm. They are entirely composed of cellular tissue, and many are edible and nutritious, as carrageen or Irish-moss, dulse, etc. Kelp, iodine, and bromine are products of various species. The Algæ are also valuable as manure.

ALGAROBILL'A, the seed-pods of one or two South American trees, valuable as containing much tannin.

AL'GAROT, a violently purgative and emetic white powder, precipitated from chloride of antimony in water; formerly used in medicine.

ALGARVE (âl-gâr'vā), a maritime province of Portugal occupying the southern portion of the kingdom; mountainous but with some fertile tracts. Area, 2099 sq. miles; pop. 254,851.

AL'GEBRA, a kind of generalized arithmetic, in which numbers or quantities and operations, often also the results of operations, are represented by symbols. Thus the expression $xy + cz + dy^2$ denotes that a number represented by x is to be multiplied by a number represented by y, a number c multiplied by a number z, a number d by a number y multiplied by itself (or squared), and the sum taken of these three products. So the equation (as it is called) $x^2 - 7x + 12 = 0$ expresses the fact that if a certain number x is multiplied by itself, and this result made less by seven times the number and greater by twelve, the result is 0. In this case x must either be 3 or 4 to produce the given result; but such an equation (or formula) as $(a+b)(a-b) = a^2 - b^2$ is always true whatever values may be assigned to a and b. Algebra is an invaluable instrument in intricate calculations of all kinds, and enables operations to be performed and results obtained that by arithmetic would be impossible, and its scope is still being extended.

The beginnings of algebraic method are to be found in Diophantus, a Greek of the fourth century of our era, but it was the Arabians that introduced algebra to Europe, and from them it received its name. The first Arabian treatise on algebra was published in the reign of the great Kaliph Al Mamun (813–833) by Mohammed Ben Musa. In 1202 Leonardo Fibonacci of Pisa, who had traveled and studied in the East, published a work treating of algebra as then understood in the Arabian school. From this time to the discovery of printing considerable attention was given to algebra, and the work of Ben

Musa and another Arabian treatise, called the Rule of Algebra, were translated into Italian. The first printed work treating on algebra (also on arithmetic, etc.) appeared at Venice in 1494, the author being a monk called Luca Pacioli da Bergo. Rapid progress now began to be made, and among the names of those to whom advances are to be attributed are Tartaglia and Cardan. About the middle of the sixteenth century the German Stifel introduced the signs +, −, √, and Recorde the sign =. Recorde wrote the first English work on algebra. François Vieta, a French mathematician (1540–1603), first adopted the method which has led to so great an extension of modern algebra, by being the first who used general symbols for known quantities as well as for unknown. It was he also who first made the application of algebra to geometry. Albert Girard extended the theory of equations by the supposition of imaginary quantities. The Englishman Harriot, early in the seventeenth century, discovered negative roots, and established the equality between the number of roots and the units in the degree of the equation. He also invented the signs < >, and Oughthred that of ×. Descartes, though not the first to apply algebra to geometry, has, by the extent and importance of his applications, commonly acquired the credit of being so. The same discoveries have also been attributed to him as to Harriot, and their respective claims have caused much controversy. He obtained by means of algebra the definition and description of curves. Since his time Algebra has been applied so widely in geometry and higher mathematics that we need only mention the names of Fermat, Wallis, Newton, Leibnitz, De Moivre, MacLaurin, Taylor, Euler, D'Alembert, Lagrange, Laplace, Fourier, Poisson, Gauss, Honer, De Morgan, Sylvester, Cayley. Boole, Jevons, and others have applied the algebraic methods not only to formal logic but to political economy.

ALGER, Horatio, an American author, writer of juvenile books, born at Revere, Mass., 1834, died in 1899. He was graduated from Harvard in 1852, and, after studying divinity, became pastor of a Unitarian church at Brewster, Mass. Mr. Alger published over 70 stories, of which nearly 1,000,000 copies have been sold.

ALGER, Russell Alexander, American soldier and statesman, born at Lafayette, Ohio, in 1836. Admitted to the bar in 1859, he enlisted as a volunteer in the Union army at the outbreak of the civil war, and rose from the ranks to be major-general. After the war he grew rich as a lumber merchant in Michigan; was governor of Michigan from 1885 to 1886, commander of the G. A. R. in 1889, and secretary of war in President McKinley's Cabinet. He was appointed Senator in 1892, and elected in 1903 for term expiring in 1907. He died in 1907.

ALGERIA, a French colony in North Africa, having on the north the Mediterranean, on the east Tunis, on the west Morocco, and on the south (where the boundary is ill-defined) the Desert of Sahara; area, 122,878 sq. miles, or, including the Algerian Sahara, 257,000. The country is divided into three departments—Algiers, Oran, and Constantine. The coast-line is about 550 miles in length, steep and rocky, and though the indentations are numerous the harbors are much exposed to the north wind. The country is traversed by the Atlas Mountains, two chains of which—the Great Atlas, bordering on the Sahara, and the Little, or Maritime Atlas, between it and the sea—run parallel to the coast, the former attaining a height of 7000 feet. The intervals are filled with lower ranges, and numerous transverse ranges connect the principal ones and run from them to the coast, forming elevated tablelands and inclosed valleys. The rivers are numerous, but many of them are mere torrents rising in the mountains near the coast. The Shelif is much the largest.

The chief products of cultivation are wheat, barley, and oats, tobacco, cotton, wine, silk, and dates. Among wild animals are the lion, panther, hyena, and jackal; the domestic quadrupeds include the horse, the mule, cattle, sheep, and pigs (introduced by the French). Algeria possesses valuable minerals, including iron, copper, lead, sulphur, zinc, antimony, marble (white and red), phosphate, and lithographic stone.

The two principal native races inhabiting Algeria are Arabs and Berbers. The former are mostly nomads, dwelling in tents and wandering from place to place, though a large number of them are settled in the Tell, where they carry on agriculture and have formed numerous villages. The Berbers, here called Kabyles, are the original inhabitants of the territory and still form a considerable part of the population. They speak the Berber language, but use Arabic characters in writing. The Jews form a small but influential part of the population. Various other races also exist. Except the Jews all the native races are Mohammedans. There are now a considerable number of French and other colonists, provision being made for granting them concessions of land on certain conditions. There are over 260,000 colonists of French origin in Algeria, and over 200,000 colonist natives of other European countries (chiefly Spaniards and Italians). Algeria is governed by a governor-general, who is assisted by a council appointed by the French government. The settled portion of the country, in the three departments of Algiers, Constantine, and Oran, is treated much as if it were a part of France, and each department sends two deputies and one senator to the French chambers. The rest of the territory is under military rule. The colony costs France a considerable sum every year. Pop. of Algeria proper in 1901, 4,739,331; of the Algerian Sahara, 60,000.

The country now called Algeria was known to the Romans as Numidia. It flourished greatly under their rule, and early received the Christian religion. It was conquered by the Vandals in 430–431 A.D., and recovered by Belisarius for the Byzantine Empire in 533–534. About the middle of the seventh century it was overrun by the Saracens. The town of Algiers was founded about 935 by Yussef Ibn Zeiri, and the country was subsequently ruled by his successors and the dynasties of the Almoravides and Almohades. The depredations of the Algerian pirates were a continual source of irritation to the Christian powers, who sent a long series of expeditions against them. For instance in 1815 a United States fleet defeated an Algerian one and forced the dey to agree to a peace in which he recognized the American flag as inviolable.

At last the French determined on more vigorous measures, and in 1830 sent a force of over 40,000 men against the country. Algiers was speedily occupied, the dey retired, and the country was without a government, but resistance was organized by Abd-el-Kader, an Arab chief whom the emergency had raised up.

This and subsequent efforts failed, and the country became a French province, with a French general for governor.

ALGIERS (al'jērz), a city and seaport on the Mediterranean, capital of Algeria, on the Bay of Algiers, partly on the slope of a hill facing the sea. The old town, which is the higher, is oriental

Principal mosque, Algiers.

in appearance, with narrow, crooked streets, and houses that are strong, prison-like edifices. The modern French town, which occupies the lower slope and spreads along the shore, is handsomely built, with broad streets and elegant squares. The climate of Algiers, though extremely variable, makes it a very desirable winter residence for invalids and others from colder regions. Though warm, it is bracing and tonic, and not of a relaxing character. There is a considerable rainfall (average 29 in.), but the dry air and absorbent soil prevent it from being disagreeable. The winter months resemble a bright, sunny American autumn, while the heat of summer is not so intense as that of Egypt. The sirocco or desert wind is troublesome, however, during summer, but in the winter it is merely a pleasant, warm, dry breeze. Hailstorms are not infrequent, but frost and snow in Algiers are so rare as to be almost unknown. Pop. 97,400.

ALGIN, a viscous, gummy substance obtained from certain seaweeds. It can be utilized for all purposes where starch or gum is required; used in

cookery for soups and jellies; in an insoluble form it can be cut, turned, and polished, like horn or vulcanite.

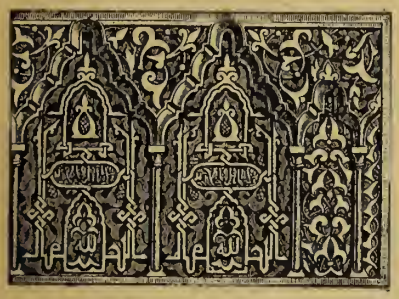
ALGO'A BAY, a bay on the south coast of Cape Colony, 425 miles east from the Cape of Good Hope, the only place of shelter on this coast for vessels during the prevailing northwest gales. The usual anchorage is off Port Elizabeth, on its west coast, now a place of large and increasing trade.

ALGOL', a star in the constellation Perseus (head of Medusa), remarkable as a variable star, changing in brightness from the second to the fifth magnitude.

ALGO'MA, a district of Canada, on the north side of Lake Superior, forming the northwest portion of Ontario, rich in silver, copper, iron, etc.

ALGON'QUINS, a family of North American Indians, formerly spread over a great extent of territory, and still forming a large proportion of the Indians of Canada. They consisted of four groups, namely: (1) the eastern group, comprising the Massachusetts, Narragansets, Mohicans, Delawares, and other tribes; (2) the northeastern group, consisting of the Abenakis, etc.; (3) the western group, made up of the Shawnees, Miamis, Illinois, etc.; and (4) the northwestern group, including the Chippewas or Ojibbewas, the largest of all the tribes.

ALHAM'BRA, a famous group of buildings in Spain, forming the citadel of Granada when that city was one of the principal seats of the empire of the Moors in Spain, situated on a height, surrounded by a wall flanked by many towers, and having a circuit of 2¼ miles. Within the circuit of the walls are two churches, a number of mean houses, and some straggling gardens, besides the palace of Charles V. and the celebrated Moorish palace which is often distinctively spoken of as the Alhambra. This building, to which the celebrity of the site is entirely due, was the royal palace of the kings of Granada. The greater part of the present building belongs to the first half of the 14th century. It consists mainly of buildings surrounding two oblong courts, the one called the Court of the Fishpond (or of the Myrtles), 138 by 74 feet, lying north and south; the other, called the Court of the Lions, from a fountain ornamented with twelve lions in marble, 115 by 66 feet, lying east and west, described as being, with the apartments that surround it, "the gem of Arabian art in Spain, its most beautiful and most perfect example." Its design is elaborate, exhibiting a profusion of exquisite detail gorgeous in coloring, but the smallness of its size deprives it of the element of majesty. The peristyle or portico on each side is supported by 128 pillars of white marble, 11 feet high, sometimes placed singly and sometimes in groups. Two pavilions project into the court at each end, the domed roof of one having been lately restored. Some of the finest chambers of the Alhambra open into this court, and near the entrance a museum of Moorish remains has been formed. The prevalence of stucco or plaster ornamentation is one of the features of the Alhambra, which becomes especially remarkable in the beautiful honeycomb stalactitical pendentives which the ceilings exhibit. Arabesques and geometrical designs with interwoven inscriptions are present in the richest profusion.



Alhambra—Moorish ornament.

AL'IAS, a word often used in judicial proceedings in connection with the different names that persons have assumed, most likely for prudential reasons, at different times, and in order to conceal identity, as Joseph Smith alias Thomas Jones.

AL'IBI, a defense in criminal procedure, by which the accused endeavors to prove that when the alleged crime was committed he was present in a different place.

ALICANTE (ä-lē-kän'tā), a fortified town and Mediterranean seaport in Spain, capital of the province of the same name, picturesquely situated partly on the slope of a hill, partly on the plain at the foot, about 80 miles south by west of Valencia. The principal manufactures are cotton, linen, and cigars, one cigar manufactory employing above 3000 women The chief export is wine, which largely goes to England. Pop. 50,142.—The province is very fruitful and well cultivated, producing wine, silk, fruits, etc. The wine is of a dark color, and is heavy and sweet. Area, 2098 sq. miles. Pop. 470,149.

ALICE MAUD MARY, Princess, second daughter of Queen Victoria, Duchess of Saxony, and Grand Duchess of Hesse-Darmstadt, born 1843, died 1878. In 1862 she married Frederick William Louis of Hesse, nephew of the grand duke, whom he succeeded in 1877.

A'LIEN, in relation to any country, a person born out of the jurisdiction of the country, and not having acquired the full rights of a citizen of it. The position of aliens depends upon the laws of the respective countries, but generally speaking aliens owe a local allegiance, and are bound equally with natives to obey all general rules for the preservation of order which do not relate specially to citizens. In the United States the position of aliens as regards acquisition and holding of real property differs somewhat in the different states, though in recent times the disabilities of aliens have been removed in most of them. Personal property they can take, hold, and dispose of like native citizens. Individual states have no jurisdiction on the subject of naturalization, though they may pass laws admitting aliens to any privilege short of citizenship. A naturalized citizen is not eligible to election as president or vice-president of the United States, and cannot serve as senator until after nine years' citizenship, nor as a member of the house of representatives until after seven years' citizenship. Five years' residence in the United States and one year's permanent residence in the particular state where the application is made are necessary for the attainment of citizenship.

ALIGARH (*a*-lē-gar'), a fort and town in India, in the United Provinces, on the East Indian railway, 84 miles southeast of Delhi. The fort, which had been skilfully strengthened by French engineers in the service of the Mahrattas, was taken by storm after a desperate resistance in 1803 by the British forces under Lord Lake, when the whole district was added to the British possessions. Pop. 70,127.—The district has an area of 1954 square miles, and a population of 1,203,047.

ALIGNMENT (a-līn'ment), a military term, signifying the act of adjusting to a straight line or in regular straight lines, or the state of being so adjusted.

AL'IMENT, food, a term which includes everything, solid or liquid, serving as nutriment for the bodily system. Aliments are of the most diverse character, but all of them must contain nutritious matter of some kind, which, being extracted by the act of digestion, enters the blood, and effects by assimilation the repair of the body. Alimentary matter, therefore, must be similar to animal substance, or transmutable into such. All alimentary substances must, therefore, be composed in a greater or lesser degree of soluble parts, which easily lose their peculiar qualities in the process of digestion, and correspond to the elements of the body. The articles used as food by man do not consist entirely of nutritious substances, but with few exceptions are compounds of various nutritious with indigestible and accordingly innutritious substances. The only nitrogenous aliments are albuminous substances, and these are contained largely in animal food (flesh, eggs, milk, cheese). The principal non-nitrogenous substance obtained as food from animals is fat. Sugar is so obtained in smaller quantities (in milk). While some vegetable substances also contain much albumen, very many of them are rich in starch. Among vegetable substances the richest in albumen are the legumes (peas, beans, and lentils), and following them come the cereals (wheat, oats, etc.). Sugar, water, and salts may pass without any change into the circulatory system; but albuminous substances cannot do so without first being rendered soluble and capable of absorption (in the stomach and intestines); starch must be converted into sugar and fat emulsified (chiefly by the action of the pancreatic juice). One of the objects of cooking is to make our food more susceptible of the operation of the digestive fluids.

The relative importance of the various nutritious substances that are taken into the system and enter the blood depends upon their chemical consti-

tution. The albuminous substances are the most indispensable, inasmuch as they form the material by which the constant waste of the body is repaired. But a part of the operation of albuminous nutriments may be performed equally well, and at less cost, by non-nitrogenous substances, that part being the maintenance of the temperature of the body. As is well known, the temperature of warm-blooded animals is considerably higher than the ordinary temperature of the surrounding air, in man about 98° Fahr., and the uniformity of this temperature is maintained by the heat which is set free by the chemical processes (of oxidation) which go on within the body. Now these processes take place as well with non-nitrogenous as with nitrogenous substances. The former are even preferable to the latter for the keeping up of these processes; by oxidation they yield larger quantities of heat with less labor to the body, and they are hence called the heat-givers. The best heat-giver is fat. Albuminous matters are not only the tissue-formers of the body; they also supply the vehicle for the oxygen, inasmuch as it is of such matters that the blood corpuscles are formed. The more red blood corpuscles an animal possesses, the more oxygen can it take into its system, and the more easily and rapidly can it carry on the process of oxidation and develop heat. Now only a part of the heat so developed passes away into the environment of the animal; another part is transformed within the body (in the muscles) into mechanical work. Hence it follows that the non-nitrogenous articles of food produce not merely heat but also work, but only with the assistance of albuminous matters, which, on the one hand, compose the working machine, and, on the other hand, convey the oxygen necessary for oxidation. See Dietetics, Digestion, Adulteration, etc.

ALIMENTARY CANAL, a common name given to the œsophagus, stomach, and intestines of animals. See Intestine, Stomach.

AL'IMONY, in law, the allowance to which a woman is entitled while a matrimonial suit is pending between her and her husband, or after a legal separation from her husband, not occasioned by adultery or elopement on her part.

AL'IQUOT PART is such part of a number as will divide and measure it exactly without any remainder. For instance, 2 is an aliquot part of 4, 3 of 12, and 4 of 20.

ALISMA'CEÆ, the water-plantain family, the members of which are herbaceous, annual, or perennial. They are floating or marsh plants, and many have edible fleshy rhizomes. They are found in all countries, but especially in Europe and North America, where their rather brilliant flowers adorn the pools and streams.

AL'ISON, Sir Archibald, lawyer and writer of history, was born in Shropshire in 1792, and died in 1867, near Glasgow. He was made a baronet in 1852. His chief work—The History of Europe, from 1789 to 1815—was first issued in ten vols. 1833–42, the narrative being subsequently brought down to 1852, the beginning of the second French Empire. This work displays industry and research, and is generally accurate, but not very readable. Its popularity, however, has been immense, and it has been translated into French, German, Arabic, Hindustani, etc.

His son, General Sir Archibald Alison, born in 1826, entered the army in 1846, and served in the Crimea, in India during the mutiny, and in the Ashantee expedition of 1873–4. In Egypt, in 1882, he led the Highland Brigade at the battle of Tel-el-Kebir, and in 1882–3 remained in command of the army of occupation. He retired from the army in 1893.

ALIZ'ARINE, a substance contained in the madder root, and largely used in dyeing reds of various shades. It forms yellowish-red prismatic crystals, nearly insoluble in cold, but dissolved to a small extent by boiling water, and readily soluble in alcohol and ether. It possesses exceedingly strong tinctorial powers.

AL'KALI, a term first used to designate the soluble part of the ashes of plants, especially of seaweed. Now the term is applied to various classes of bodies having the following properties in common: (1) solubility in water; (2) the power of neutralizing acids, and forming salts with them; (3) the property of corroding animal and vegetable substances; (4) the property of altering the tint of many coloring matters—thus, they turn litmus, reddened by an acid, into blue; turmeric, brown; and syrup of violets and infusion of red cabbages, green. The alkalies are hydrates, or water in which half the hydrogen is replaced by a metal or compound radical. In its restricted and common sense the term is applied to four substances only: hydrate of potassium (potash), hydrate of sodium (soda), hydrate of lithium (lithia), and hydrate of ammonium (an aqueous solution of ammonia). In a more general sense it is applied to the hydrates of the so-called alkaline earths (baryta, strontia, and lime), and to a large number of organic substances, both natural and artificial, described under Alkaloid.—Volatile alkali is a name for ammonia.

ALKALIM'ETER, an instrument for ascertaining the quantity of free alkali in any impure specimen, as in the potashes of commerce. These, besides the carbonate of potash, of which they principally consist, usually contain a portion of foreign salts, as sulphate and chloride of potassium, and as the true worth of the substance, or price for which it ought to sell, depends entirely on the quantity of carbonate, it is of importance to be able to measure it accurately by some easy process. This process depends on the neutralization of the alkali by an acid of known strength, the point of neutralization being determined by the fact that neutral liquids are without action on either red or blue litmus solution. The alkalimeter is merely a graduated tube furnished with a stop-cock at the lower extremity, from which the standard acid is dropped into water in which a certain quantity of the substance is dissolved. The quantity required to produce neutralization being noted, the strength of the liquid tested is easily arrived at. A process of neutralization, exactly the same in principle, may be employed to test the strength of acids by alkalies, the one process being called alkalimetry, the other acidimetry.

AL'KALOID, a term applied to a class of nitrogenized compounds having certain alkaline properties, found in living plants, and containing their active principles, usually in combination with organic acids. Their names generally end in ine, as morphine, quinine, aconitine, caffeine, etc. Most alkaloids occur in plants, but some are formed by decomposition. Their alkaline character depends on the nitrogen they contain. Most natural alkaloids contain carbon, hydrogen, nitrogen, and oxygen, but the greater number of artificial ones want the oxygen. The only property common to all alkaloids is that of combining with acids to form salts, and some exhibit an alkaline reaction with colors. Alkaloids form what is termed the organic bases of plants. Although formed originally within the plant, it has been found possible to prepare several of these alkaloids by purely artificial means.

AL'KANET, a dyeing drug, the bark of the root of a plant with downy and spear-shaped leaves, and clusters of small purple or reddish flowers. The plant is sometimes cultivated in Britain, but most of the alkanet of commerce is imported from the Levant or from southern France. It imparts a fine deep-red color to all unctuous substances, and is used for coloring oils, plasters, lip-salve, confections, etc.; also in compositions for rubbing and giving color to mahogany furniture, and to color spurious port-wine.

ALKAR'SIN, an extremely poisonous liquid containing kakodyle, together with oxidation products of this substance, and formerly known as Cadet's fuming liquor, characterized by its insupportable smell and high degree of spontaneous combustibility when exposed to air.

ALKO'RAN. See Koran.

ALLA BREVE (brā'vā), a musical direction expressing that a breve is to be played as fast as a semibreve, a semibreve as fast as a minim, and so on.

AL'LAH, in Arabic, the name of God, a word of kindred origin with the Hebrew word Elohim. Allah Akbar (God is great) is a Mohammedan war-cry.

ALLAHABAD', an ancient city of India, capital of the United Provinces, on the wedge of land formed by the Jumna and the Ganges. Allahabad is one of the chief resorts of Hindu pilgrims, who have their sins washed away by bathing in the waters of the sacred rivers Ganges and Jumna at their junction; and is also the scene of a great fair in December and January. Pop. 172,032.—The division of Allahabad contains the districts of Cawnpur, Futtehpur, Hamirpur, Banda, Jaunpur, and Allahabad; area, 17,265 square miles; pop. 5,535,803.—The district contains an area of 2852 square miles,

about five-sixths being under cultivation. Pop. 1,487,904.

ALLAMAN'DA, a genus of American tropical plants with large yellow or violet flowers, some of them met with in European greenhouses. A. cathartica has strong emetic and purgative properties.

ALLAN, David, a Scottish painter, born 1744, died 1796. His illustrations of the Gentle Shepherd, the Cotter's Saturday Night, and other sketches of rustic life and manners in Scotland, obtained for him the name of the "Scottish Hogarth."

ALLAN, Sir William, a distinguished Scottish artist, born in 1782, died in 1850. In 1814 he publicly exhibited his pictures, one of which (Circassian Captives) made his reputation. He now turned his attention to historical painting and battle scenes, among them being two pictures of the Battle of Waterloo, the one from the British, the other from the French position, and delineating the actual scene and the incidents therein taking place at the moment chosen for the representation. One of these Waterloo pictures was purchased by the Duke of Wellington. In 1835 he became R.A., in 1838 president of the Scottish Academy, in 1842 he was knighted.

ALLAN'TOIS, a structure appearing during the early development of vertebrate animals—Reptiles, Birds, and Mammalia. It is largely made up of blood-vessels, and, especially in birds, attains a large size. It forms the inner lining to the shell, and may thus be viewed as the surface by means of which the respiration of the embryo is carried on. In Mammalia the allantois is not so largely developed as in Birds, and it enters largely into the formation of the placenta.

ALLEGHANY (al-le-gā'ni), a river of Pennsylvania and New York, which unites with the Monongahela at Pittsburg to form the Ohio; navigable nearly 200 miles above Pittsburg.

ALLEGHANY MOUNTAINS, a name sometimes used as synonymous with Appalachians, but also often restricted to the portion of those mountains that traverses the states of Virginia, Maryland, and Pennsylvania from southwest to northeast, and consists of a series of parallel ridges for the most part wooded to the summit, and with some fertile valleys between. Their mean elevation is about 2500 feet; but in Virginia they rise to over 4000.

ALLEGHENY (al-le-gen'i), a city of the United States, in Pennsylvania, on the river Alleghany, opposite Pittsburg, of which it may be considered virtually to be a suburb, and with which it is connected by six bridges. The principal industries are connected with iron and machinery. Pop. 160,000.

ALLE'GIANCE, the obedience which every subject or citizen owes to the government of his country. It used to be the doctrine of the English law that natural-born subjects owe an allegiance which is intrinsic and perpetual, and which cannot be divested by any act of their own; but this is no longer the case. Aliens owe a temporary or local allegiance to the government under which they for the time reside.

AL'LEGORY, a figurative representation in which the signs (words or forms) signify something besides their literal or direct meaning. In rhetoric allegory is often but a continued simile. Parables and fables are a species of allegory. Sometimes long works are throughout allegorical, as Spenser's Faerie Queene and Bunyan's Pilgrim's Progress. When an allegory is thus continued it is indispensable to its success that not only the allegorical meaning should be appropriate, but that the story should have an interest of its own in the direct meaning apart from the allegorical signification. Allegory is often made use of in painting and sculpture as well as in literature.

ALLEGRO (ål-lā'grō), a musical term expressing a more or less quick rate of movement, or a piece of music or movement in lively time. Allegro moderato, moderately quick; allegro maestoso, quick but with dignity; allegro assai and allegro molto, very quick; allegro con brio or con fuoco, with fire and energy; allegrissimo, with the utmost rapidity.

ALLELUIA. See Halleluia.

ALLEN, Charles Herbert, American statesman, born at Lowell, Mass., in 1848. He was successively member of the Massachusetts legislature, of the state senate, and of the 49th and 50th congresses. In 1898 he became assistant secretary of the Navy, and 1900–1 was the first civil governor of Porto Rico.

ALLEN, Ethan, an American revolutionary partisan and general; born 1737, died 1789. He surprised and

Ethan Allen.

captured Ticonderoga Fort (1775); attacked Montreal, and was captured and sent to England, being exchanged in 1778.

ALLEN, James Lane, an American novelist, born in Kentucky in 1849, graduated from Transylvania University, and former educator. In 1886 he began to publish novels dealing with various social and religious topics. Among these may be mentioned Flute and Violin, The Blue Grass Region, John Gray, The Kentucky Cardinal, and The Reign of Law. His works show considerable power of style.

ALLEN, Viola, an American actress, born in 1867. She made her debut in Esmeralda at the Madison Square Theater in New York in 1882. She subsequently played in the companies of McCullough, Salvini, Barrett, Jefferson, Florence, and others, but her chief success was in the rôle of Glory Quayle in Hall Caine's Christian.

ALLEN, William, cardinal, an English Roman Catholic of the time of Queen Elizabeth, a strenuous opponent of Protestantism and supporter of the claims of Philip II. to the English throne; born 1532, died 1594. It was by his efforts that the English college for Catholics at Douay was established. He was made cardinal in 1587.

ALLEN, William, D.D., American clergyman and author; born 1784, died 1868. He was president of Bowdoin College 1820–1839; author of American Biographical and Historical Dictionary.

ALLEN, Zechariah, an American inventor, born in Providence, R. I., in 1795, died in 1882. He invented the first hot-air furnace for heating dwellings, calculated the power of Niagara Falls, and invented the cut-off valve for steam engines.

ALLENTOWN, a town in Pennsylvania, on the Lehigh river, 8 miles above its junction with the Delaware. It has an important trade in coal and iron ore, with large blast-furnaces, rolling-mills, etc. Pop. 40,000.

ALLIA'CEOUS PLANTS, plants belonging to the genus to which the onion, leek, garlic, shallot, etc., belong, or to other allied genera, and distinguished by a certain peculiar pungent smell and taste.

ALLI'ANCE, a league between two or more powers. Alliances are divided into offensive and defensive. The former are for the purpose of attacking a common enemy, and the latter for mutual defense. An alliance often unites both of these conditions. Offensive alliances, of course, are usually directed against some particular enemy; defensive alliances against any one from whom an attack may come.

ALLIANCE, Holy. See Holy Alliance.

AL'LIBONE, Samuel Austin, LL.D., American author; born 1816, died 1889. He compiled a most useful Critical Dictionary of English Literature and British and American Authors.

ALLIER (ål-lē-ā), a central department of France, intersected by the river Allier, and partly bounded by the Loire; surface diversified by offsets of the Cevennes and other ranges, rising in the south to over 4000 feet, and in general richly wooded. It has extensive beds of coal as well as other minerals; mineral waters at Vichy, Bourbon, L'Archambault, etc. Area, 2822 sq. miles. Capital, Moulins. Pop. 424,582.

AL'LIGATOR, a genus of reptiles, differing from the true crocodiles in having a shorter and flatter head, in having cavities or pits in the upper jaw, into which the long canine teeth of the under jaw fit, and in having the feet much less webbed. Their habits are less perfectly aquatic. They are confined to the warmer parts of America, where they frequent swamps and marshes, and may be seen basking on the dry ground during the day in the heat of the sun. They are most active during the night, when they make a loud bellowing. The largest of these animals grow to the length of 18 or 20 feet. They are covered by a dense armor of horny scales, impenetrable to a rifle-ball, and have a huge mouth, armed with strong, conical teeth. They swim with wonderful celerity, impelled by their long, laterally-compressed, and powerful tails. On

land their motions are proportionally slow and embarrassed because of the length and unwieldiness of their bodies and the shortness of their limbs. They live on fish, and any small animals or carrion, and sometimes catch pigs on

Group of Alligators.

the shore, or dogs which are swimming. They even sometimes make man their prey. In winter they burrow in the mud of swamps and marshes, lying torpid till the warm weather. The female lays a great number of eggs, which are deposited in the sand or mud, and left to he hatched by the heat of the sun, but the mother alligator is very attentive to her young. The most fierce and dangerous species is that found in the southern parts of the United States, having the snout a little turned up, slightly resembling that of the pike. The alligators of South America are there very often called Caymans.

ALLIGATOR-APPLE, a fruit allied to the custard-apple, growing in marshy districts in Jamaica, little eaten on account of its narcotic properties.

ALLIGATOR-PEAR, an evergreen tree with a fruit resembling a large pear, 1 to 2 lbs. in weight, with a firm marrow-like pulp of a delicate flavor; called also avocado-pear, or subaltern's butter. It is a native of tropical America and the West Indies.

ALLISON, William Boyd, an American statesman born at Perry, Ohio, educated at Western Reserve College, and removed as a lawyer to Iowa in 1857. He was member of congress from 1863 to 1871, and has been U. S. senator since 1872. He originated the Bland-Allison act of 1878, was member of the Brussels Conference of 1892, and in the national republican convention of 1880 figured as a candidate for the presidency. He died in 1908.

ALLITERA'TION, the repetition of the same letter at the beginning of two or more words immediately succeeding each other, or at short intervals; as, many men many minds; death defies the doctor; apt alliteration's artful aid; puffs, powders, patches, bibles, billet-doux.

AL'LIUM, a genus of plants containing numerous well-known species of pot-herbs. They are umbelliferous, and mostly perennial, herbaceous plants, but a few are biennial. Among them are garlic, onion, leek, chive, shallot.

ALLOCU'TION, an address, a term particularly applied to certain addresses on important occasions made by the pope to the cardinals.

ALLOP'ATHY, the name applied by homœopathists to systems of medicine other than their own; Hahnemann's principle being that "like cures like," he called his own system homœopathy, and other systems allopathy. See Homœopathy.

ALLOT'ROPY, a term used to express the fact that one and the same element may exist in different forms, differing widely in external physical properties. Thus, carbon occurs as the diamond, and as charcoal and plumbago, and is therefore regarded as a substance subject to allotropy.

ALLOY', a substance produced by melting together two or more metals, sometimes a definite chemical compound, but more generally merely a mechanical mixture. Most metals mix together in all proportions, but others unite only in definite proportions, and form true chemical compounds. Others again resist combination, and when fused together form not a homogeneous mixture, but a conglomerate of distinct masses. The changes produced in their physical properties by the combination of metals are very various. Their hardness is in general increased, their malleability and ductility impaired. The color of an alloy may be scarcely different from that of one of its components, or it may show traces of neither of two. Its specific gravity is sometimes less than the mean of that of its component metals. Alloys are always more fusible than the metal most difficult to melt that enters into their composition, and generally even more so than the most easily melted one. Newton's fusible metal, composed of three parts of tin, two or five parts of lead, and five or eight parts of bismuth, melts at temperatures varying from 198° to 210° F. (and therefore in boiling water); its components fuse respectively at the temperatures 442°, 600°, and 478° F. Sometimes each metal retains its own fusing-point. With few exceptions metals are not much used in a pure state. Gold coins contain 8¼ per cent alloy; silver coins, 7½ per cent. Printers' types are made from an alloy of lead and antimony; brass and a numerous list of other alloys are formed from copper and zinc; bronze from copper and tin.

ALL SAINTS' DAY, a festival of the Christian Church, instituted in 835, and celebrated on the 1st of November in honor of the saints in general.

ALL SOULS' DAY, a festival of the Roman Catholic Church, instituted in 998, and observed on the 2d of November for the relief of souls in purgatory.

ALLSPICE (ąl'spīs), or **PIMENTA,** is the dried berry of a West Indian species of myrtle, a beautiful tree with white and fragrant aromatic flowers and leaves of a deep shining green. It is employed in cookery, also in medicine as an agreeable aromatic, and forms the basis of a distilled water, a spirit, and an essential oil.

ALLU'VIUM, deposits of soil collected by the action of water, such as are found in valleys and plains, consisting of loam, clay, gravel, etc., washed down from the higher grounds. Great alterations are often produced by alluvium—deltas and whole islands being often formed by this cause. Much of the rich land along the banks of rivers is alluvial in its origin.

AL'MADEN, a place in California, about 60 m. s.e. of San Francisco, with rich quicksilver mines, the product of which has been largely employed in gold and silver mining.

AL'MA MA'TER, a term familiarly applied to their own university by those who have had a university education.

AL-MAMUN (ma-mön'), a caliph of the Abasside dynasty, son of Harun-al-Rashid, born 786, died 833. Under him Bagdad became a great center of art and science.

AL'MANAC, a calendar, in which are set down the rising and setting of the sun, the phases of the moon, the most remarkable positions and phenomena of the heavenly bodies, for every month and day of the year; also the several fasts and feasts to be observed in the church and state, etc., and often much miscellaneous information likely to be useful to the public. The term is of Arabic origin, but the Arabs were not the first to use almanacs, which indeed existed from remote ages. In England they are known from the fourteenth century, there being several English almanacs of this century existing in MS. They became generally used in Europe within a short time after the invention of printing; and they were very early remarkable, as some are still, for the mixture of truth and falsehood which they contained. Almanacs, from their periodical character, and the frequency with which they are referred to, are now more and more used as vehicles for conveying statistical and other useful information, some being intended for the inhabitants of a particular country or district, others for a particular class or party. Some of the almanacs that are regularly published every year are extremely useful, and are indeed almost indispensable to men engaged in official, mercantile, literary, or professional business.

ALMA-TAD'EMA, Sir Lawrence, Dutch painter, born in 1836, resident since 1870 in England, where he is a naturalized subject. In 1876 he was elected an associate of the Royal Academy, in 1879 an academician. He received the honor of knighthood in 1899. He is especially celebrated for his

pictures of ancient Roman, Greek, and Egyptian life, which are painted with great realism and archæological correctness.

ALMERIA (ål-mā-rē′à), a fortified seaport of southern Spain, capital of province Almeria, near the mouth of a river and on the gulf of same name. The province, which has an area of 3300 sq. miles, is generally mountainous, and rich in minerals. Pop. of town, 47,326; of province, 359,013.

ALMOND (ä′mund), the fruit of the almond-tree, which grows usually to the height of 20 feet, and is akin to the peach, nectarine, etc. It has beautiful pinkish flowers that appear before the

Almond.

leaves, which are oval, pointed, and delicately serrated. It is a native of Africa and Asia. The fruit is a drupe, ovoid, and with downy outer surface; the fleshy covering is tough and fibrous; it covers the compressed wrinkled stone inclosing the seed or almond within it. There are two varieties, one sweet and the other bitter. The chief kinds of sweet almonds are the Valencian, Jordan, and Malaga. They contain a bland fixed oil, consisting chiefly of olein. Bitter almonds come from Mogador, and besides a fixed oil they contain a substance called emulsin, and also a bitter crystalline substance called amygdalin, which, acting on the emulsin, produces prussic acid, whence the aroma of bitter almonds when mixed with water. Almond-oil, a bland fixed oil, is expressed from the kernels of either sweet or bitter almonds, and is used by perfumers and in medicine. A poisonous essential oil is obtained from bitter almonds, which is used for flavoring by cooks and confectioners, also by perfumers and in medicine. The name almond, with a qualifying word prefixed, is also given to the seeds of other species of plants; thus, Java almonds are the kernels of Canarium commune.

AL′MONER, an officer of a religious establishment to whom belonged the distribution of alms. The grand almoner (grand aumonier) of France was the highest ecclesiastical dignitary in that kingdom before the revolution. The lord almoner, or lord high almoner, of England, is generally a bishop, whose office is well-nigh a sinecure. He distributes the sovereign's doles to the poor on Maundy Thursday.

AL′MUG (or **AL′GUM**) **TREE,** names which occur in 1 Ki. x. 11, 12 and 2 Chr. ii. 8, and ix. 10, 11, as the names of trees of which the wood was used for pillars in the temple and the king's house, for harps and psalteries, etc. They are said in one passage to be hewn in Lebanon, in another to be brought from Ophir. They have been identified by critics with the red sandalwood of India. Some of them may possibly have been transplanted to Lebanon by the Phœnicians.

ALOE (al′ō), the name of a number of plants belonging to the genus Aloë, some of which are not more than a few inches, while others are 30 feet and upward in height; natives of Africa and other hot regions; leaves fleshy, thick, and more or less spinous at the edges or extremity; flowers with a tubular corolla. Some of the larger kinds are of great use, the fibrous parts of the leaves being made into cordage, fishing nets and lines, cloth, etc. The inspissated juice of several species is used in medicine, under the name of aloes, forming a bitter purgative. The American aloe (see Agave) is a different plant altogether.

ALOES-WOOD, the inner portion of the trunk of forest trees found in tropical Asia, and yielding a fragrant resinous substance, which, as well as the wood, is burned for its perfume.

ALPAC′A, a ruminant mammal of the camel tribe, a native of the Andes, especially of the mountains of Chile and Peru, and so closely allied to the llama that by some it is regarded rather as a smaller variety than a distinct species. It has been domesticated, and remains also in a wild state. In form and size it approaches the sheep, but has a longer neck. It is valued chiefly for its long, soft, and silky wool, which is straighter than that of the sheep, and very strong, and is woven into fabrics of great beauty, used for shawls, clothing for warm climates, coat-linings, and umbrellas, and known by the same name. Its flesh is pleasant and wholesome.

ALPENHORN, a long, nearly straight horn, curving slightly, and widening toward its extremity, used in the Alps to convey signals, or notice of something.

ALPENSTOCK, a strong tall stick shod with iron, pointed at the end so as to take hold in, and give support on, ice and other dangerous places in climbing the Alps and other high mountains.

ALPE′NA, a city and the county seat of Alpena Co., Mich., 110 miles north of Bay City, on Thunder Bay, and the Detroit and Mackinaw Railroad. Pop 13,100.

ALPES (ålp), the name of three departments in the southeast of France, all more or less covered by the Alps or their offshoots: Basses-Alpes (bäs-ålp) has mountains rising to a height of 8000 to 10,000 feet, is drained by the Durance and its tributaries, and is the most thinly peopled department in France; area, 2685 miles; capital, Digne. Pop. 129,494. —Hautes-Alpes (ōt-ålp), mostly formed out of ancient Dauphiné, traversed by the Cottian and Dauphiné Alps (highest summits 12,000 ft.), drained chiefly by the Durance and its tributaries It is the lowest department in France in point of absolute population; area, 2158 miles; capital, Gap; pop. 122,924.—Alpes-Maritimes (ålp-mà-ri-tēm) has the Mediterranean on the south, and mainly consists of the territory of Nice, ceded to France by Italy in 1860. The greater part of the surface is covered by the Maritime Alps; the principal river is the Var. It produces in the south cereals, vines, olives, oranges, citrons, and other fruits; and there are manufactories of perfumes, liquors, soap, etc., and valuable fisheries. It is a favorite resort for invalids. Area, 1482 square miles; capital, Nice; pop. 293,213.

AL′PHA and **O′MEGA,** the first and last letters of the Greek alphabet, some-

Alpaca.

times used to signify the beginning and the end, or the first and the last of anything; also as a symbol of the Divine Being. They were also formerly the symbol of Christianity, and engraved accordingly on the tombs of the ancient Christians.

AL′PHABET (from Alpha and Beta, the two first letters of the Greek alphabet), the series of characters used in writing a language, and intended to represent the sounds of which it consists. The English alphabet, like most of those of modern Europe, is derived directly from the Latin, the Latin from the ancient Greek, and that from the Phœnician, which again is believed to have had its origin in the Egyptian hieroglyphics, the Hebrew alphabet also having the same origin. The names of the letters in Phœnician and Hebrew must have been almost the same, for the Greek names, which, with the letters, were borrowed from the former, differ little from the Hebrew. By means of the names we may trace the process by which the Egyptian characters were transformed into letters by the Phœnicians. Some Egyptian character would, by its form, recall the idea of a house, for example, in Phœnician or Hebrew beth. This character would subsequently come to be used wherever the sound b occured. Its form might be afterward simplified, or even completely modified, but the name would still remain, as beth still continued the Hebrew name for b, and beta the Greek. Our letter m, which in Hebrew was called mim, water, has still a considerable resemblance to the zigzag, wavy line which had been chosen to represent water, as in the zodiacal symbol for Aquarius. The letter o, of which the Hebrew name means eye, no doubt originally intended to represent that

organ. While the ancient Greek alphabet gave rise to the ordinary Greek alphabet and the Latin, the Greek alphabet of later times furnished elements for the Coptic, the Gothic, and the old Slavic alphabets, The Latin characters are now employed by a great many nations, such as the Italians, the French, the Spanish, the Portuguese, the English, the Dutch, the German, the Hungarian, the Polish, etc., each nation having introduced such modifications or additions as are necessary to express the sound of the language peculiar to it. The Greek alphabet originally possessed only sixteen letters, though the Phœnician had twenty-two. The original Latin alphabet, as it is found in the oldest inscriptions consisted of twenty-one letters; namely, the vowels a, e, i, o, and u, (v) and the consonants b, c, d, f, h, k, l, m, n, p, q, r, s, t, x, z. The Anglo-Saxon alphabet had two characters for the digraph th, which were unfortunately not retained in later English; it had also the character æ. It wanted j, v, y (consonant), and z. The German alphabet consists of the same letters as the English, but the sounds of some of them are different. Anciently certain characters called Runic were made use of by the Teutonic nations, to which some would attribute an origin independent of the Greek and Latin alphabets. While the alphabets of the west of Europe are derived from the Latin, the Russian, which is very complete, is based on the Greek, with some characters borrowed from the Armenian, etc. Among Asiatic alphabets, the Arabian (ultimately of Phœnician origin) has played a part analogous to that of the Latin in Europe, the conquests of Mohammedanism having imposed it on the Persian, the Turkish, the Hindustani, etc. The Sanskrit or Devanagari alphabet is one of the most remarkable alphabets of the world. As now used it has fourteen characters for the vowels and diphthongs, and thirty-three for the consonants, besides two other symbols. Our alphabet is a very imperfect instrument for what it has to perform, being both defective and redundant. An alphabet is not essential to the writing of a language, since ideograms or symbols may be used instead, as in Chinese.

ALPHON'SO, the name of a number of kings of Spain and Portugal. Alphonso I. was the son of Henry of Burgundy. He conquered Portugal and was recognized by the Pope. The present King of Spain is Alphonso XIII., born May 17, 1886, six months after the death of his father, married 1906, to Princess Victoria of England. In 1907 an heir to the throne was born.

ALPIEE WARBLER, a European bird of the same genus as the hedge-sparrow.

ALPS, the highest and most extensive system of mountains in Europe, included between lat. 44° and 48° n., and lon. 5° and 18° e., covering a great part of Northern Italy, several departments of France, nearly the whole of Switzerland, and a large part of Austria, while its extensive ramifications connect it with nearly all the mountain systems of Europe. The culminating peak is Mont Blanc, 15,781 feet high, though the true center is the St. Gothard, or the mountain mass to which it belongs, and from whose slopes flow, either directly or by affluents the great rivers of central Europe, the Danube, Rhine, Rhone, and Po. Round the northern frontier of Italy the Alps form a remarkable barrier, shutting it off at all points from the main land of Europe, so that, as a rule, it can only be approached from France, Germany, or Switzerland, through high and difficult passes. In the west this barrier approaches close to the Mediterranean coast, and near Nice there is left a free passage into the Italian peninsula between the mountains and the sea. From this point eastward the chain proceeds along the coast till it forms a junction with the Apennines. In the opposite direction it proceeds northwest, and afterward north to Mont Blanc, on the boundaries of France and Italy; it then turns northeast and runs generally in this direction to the Gross Glockner, in central Tyrol, between the rivers Drave and the Salza, where it divides into two branches, the northern proceeding northeast toward Vienna, the southern toward the Balkan Peninsula. The principal valleys of the Alps run mostly in a direction nearly parallel with the principal ranges, and therefore east and west. The transverse valleys are commonly shorter, and frequently lead up through a narrow gorge to a depression in the main ridge between two adjacent peaks. These are the passes or cols, which may usually be found by tracing a stream which descends from the mountains up to its source.

The Alps are very rich in lakes and streams. Among the chief of the former are the lakes of Geneva, Constance, Zurich, Thun, Brienz, on the north side; on the south Maggiore, Como, Lugano, Garda, etc. The drainage is carried to the North Sea by the Rhine, to the Mediterranean by the Rhone, to the Adriatic by the Po, to the Black Sea by the Danube.

In the lower valleys of the Alps the mean temperature ranges from 50° to 60°. Half way up the Alps it averages about 32°—a height which, in the snowy regions, it never reaches. But even where the temperature is lowest the solar radiation produced by the rocks and snow is often so great as to raise the photometer to 120° and even higher. The exhilarating and invigorating nature of the climate in the upper regions during the summer has been acknowledged by all.

In respect to vegetation the Alps have been divided into six zones, depending on height modified by exposure and local circumstances. The first is the olive region. This tree flourishes better on sheltered slopes of the mountains than on the plains of northern Italy. The vine, which bears greater winter cold, distinguishes the second zone. On slopes exposed to the sun it flourishes to a considerable height. The third is called the mountainous region. Cereals and deciduous trees form the distinguishing features of its vegetation. The mean temperature about equals that of Great Britain, but the extremes are greater. The fourth region is the sub-Alpine or coniferous. Here are vast forests of pines of various species. Most of the Alpine villages are in the two last regions. On the northern slopes pines grow to 6,000, and on the southern slopes to 7,000 feet above the level of the sea. This is also the region of the lower or permanent pastures where the flocks are fed in winter. The fifth is the pasture region, the term alp being used in the local sense of high pasture grounds. It extends from the uppermost limit of trees to the region of perpetual snow. Here there are shrubs, rhododendrons, junipers, bilberries, and dwarf willows, etc. The sixth zone is the region of perpetual snow. The line of snow varies, according to seasons and localities from 8,000 to 9,500 feet, but the line is not continuous, being often broken in upon. Few flowering plants extend above 10,000 feet, but they have been found as high as 12,000 feet.

At this great elevation are found the wild goat and the chamois. In summer the high mountain pastures are covered with large flocks of cattle, sheep, and goats, which are in winter removed to a lower and warmer level. The marmot, and white or Alpine hare, inhabit both the snowy and the woody regions. Lower down are found the wild-cat, fox, lynx, bear and wolf; the last two are now extremely rare. The vulture, eagle, and other birds of prey frequent the highest elevations, the ptarmigan seeks its food and shelter among the diminutive plants that border upon the snow-line. Excellent trout and other fish are found; but the most elevated lakes are, from their low temperature, entirely destitute of fish.

ALSACE (ăl-săs), before the French revolution a province of France, on the Rhine, afterward constituting the French departments of Haut- and Bas-Rhin, and subsequently to the Franco-Prussian war of 1870-71 reunited to Germany, and incorporated in the province of Elsass-Lothringen (Alsace-Lorraine). Alsace is generally a level country though there are several ranges of low hills richly wooded. The principal river is the Ill. Corn, flax, tobacco, grapes, and other fruits are grown. Area, 3,198 sq. miles; pop. 1,074,626. The inhabitants mostly speak German, and are of German race. Strasburg is the chief city. The chief productions are wine, hemp, flax, tobacco, madder, copper, iron, etc.

ALSACE-LORRAINE, a province of Germany, on the east of France, partly bounded by the Rhine; area, 5,600 sq. miles, of which Alsace occupies 3,198 and Lorraine 2,402. The three chief towns are Strasburg, Mahlhausen, and Metz. Pop. 1,719,470, of whom 1,310,450 are Catholics and 372,078 Protestants.

ALTAI MOUNTAINS (ăl'tī), an important Asiatic system on the borders of Siberia and Mongolia, partly in Russian and partly in Chinese territory, between lat. 46° and 53° n., lon. 83° and 91° e., but having great eastern extensions. The Russian portion is comprised in the governments of Tomsk and Semipalatinsk, the Chinese in Dsungaria. The rivers of this region, which are large and numerous, are mostly head-waters of

the Obi and Irtish. The area covered by perpetual snow is very considerable, and glaciers occupy a wide extent. The Altai is exceedingly rich in minerals, including gold, silver, copper, and iron. The name Altai means "gold mountain." The inhabitants are chiefly Russians and Kalmuks. The chief town is Barnaul.

ALTAR (al'tar), any pile or structure raised above the ground for receiving sacrifices to some divinity. The Greek and Roman altars were various in form, and often highly ornamental; in temples they were usually placed before the statue of the god. In the Jewish ceremonial the altar held an important place, and was associated with many of the most significant rites of religion. Two altars were erected in the tabernacle in the wilderness, and the same number in the temple, according to instructions given to Moses in Mt. Sinai. These were called the altar of burnt-offering and the altar of incense. In some sections of the Christian church the communion-table, or table on which the eucharist is placed, is called an altar. In the primitive church it was a table of wood, but subsequently stone and metal were introduced, with rich ornaments, sculpture, and painting. After the introduction of Gothic art the altar frequently became a lofty and most elaborate structure.

ALTAZ'IMUTH, a vertical circle with a telescope so arranged as to be capable of being turned round horizontally to any point of the compass, and so differing from a transit-circle, which is fixed in the meridian. The altazimuth is brought to bear upon objects by motions affecting their altitude and azimuth.

AL'TENBURG, a town of Germany, capital of Saxe-Altenburg, 23 miles south of Leipzig. It has some fine streets and many handsome edifices, including a splendid palace; manufactures of cigars, woolen yarn, gloves, hats, musical instruments, glass, brushes, etc. Pop. 37,110.

ALTERATIVES (al'-), medicines, as mercury, iodine, etc., which, administered in small doses, gradually induce a change in the habit or constitution, and imperceptibly alter disordered secretions and actions, and restore healthy functions without producing any sensible evacuation by perspiration, purging, or vomiting.

ALTER EGO, a second self, one who represents another in every respect.

ALTER'NATE, in botany, placed on opposite sides of an axis at a different level, as leaves.—Alternate generation, the reproduction of young not resembling their parents, but their grandparents, continuously, as in the jelly-fishes, etc. See Generation, Alternate.

ALTHÆ'A, a genus of plants. See Hollyhock and Marshmallow.

AL'TITUDE, in mathematics the perpendicular height of the vertex or apex of a plane figure or solid above the base. In astronomy it is the vertical height of any point or body above the horizon. It is measured or estimated by the angle subtended between the object and the plane of the horizon, and may be either true or apparent. The apparent altitude is that which is obtained immediately from observation; the true altitude, that which results from correcting the apparent altitude, by making allowance for parallax refraction, etc

ALTO, in music, the highest singing voice of a male adult, the lowest of a boy or a woman, being in the latter the same as contralto. The alto, or counter-tenor, is not a natural voice, but a development of the falsett . It is almost confined to English singers, and the only music written for it is by English composers. It is especially used in cathedral compositions and glees.

AL'TON, a town in Illinois, on the Mississippi near the mouth of the Missouri, with a state penitentiary, several mills and manufactories, and in the neighborhood limestone and coal. Pop. 17,000.

AL'TONA, an important commercial city in the Prussian province of Schleswig-Holstein, on the right bank of the Elbe, adjoining Hamburg, with which it virtually forms one city. It is a free port, and its commerce, both inland and foreign, is large, being quite identified with that of Hamburg. Pop. 161,507.

ALTOO'NA, a town in Pennsylvania, at the eastern base of the Alleghanies, 244 miles west of Philadelphia, with large machine-shops and locomotive factories. Pop. 45,000.

AL'TRUISM, a term first employed by the French philosopher Comte, to signify devotion to others or to humanity; the opposite of selfishness or egoism.

AL'UM, a well-known crystalline, astringent substance with a sweetish taste, a double sulphate of potassium and aluminium with a certain quantity of water of crystallization. It crystallizes in regular octahedrons. Its solution reddens vegetable blues. Exposed to heat its water of crystallization is driven off, and it becomes light and spongy with slightly corrosive properties, and is used as a caustic under the name of burnt alum. Common alum is strictly potash alum; other two varieties are soda alum and ammonia alum, both similar in properties. The importance of alum in the arts is very great, and its annual consumption is immense. It is employed to increase the hardness of tallow, to remove greasiness from printers' cushions and blocks in calico manufactories; in dyeing it is largely used as a mordant. It is also largely used in the composition of crayons, in tannery, and in medicine (as an astringent and styptic). Wood and paper are dipped in a solution of alum to render them less combustible.

ALU'MINA, the single oxide of the metal aluminium. As found native it is called corundum, when crystallized ruby or sapphire, when amorphous emery. It is next to the diamond in hardness. In combination with silica it is one of the most widely distributed of substances, as it enters in large quantity into the composition of granite, traps, slates, schists, clays, loams, and other rocks. The porcelain clays and kaolins contain about half their weight of this earth, to which they owe their most valuable properties. It has a strong affinity for coloring matters, which causes it to be employed in the preparation of the colors called lakes in dyeing and calico-printing. It combines with the acids and forms numerous salts, the most important of which are the sulphate and acetate, the latter of extensive use as a mordant.

ALUMIN'IUM, a metal discovered in 1827, but nowhere found native, though as the base of alumina (which see) it is abundantly distributed. The mineral cryolite—a fluoride of aluminium and sodium—which is brought from Greenland, is one of the chief sources of aluminium. It is a shining white metal, of a color between silver and platinum, very light, weighing less than glass, and about one-fourth of silver, not liable to tarnish nor undergo oxidation in the air, very ductile and malleable, and remarkably sonorous. It forms several useful alloys with iron and copper; one of the latter (aluminium gold) much resembles gold, and is made into cheap trinkets. Another, known as aluminium bronze, possesses great hardness and tenacity. Spoons, tea and coffee pots, dish-covers, musical and mathematical instruments, trinkets, etc., are made of aluminium.

ALUM-ROOT, the name given in America to two plants on account of the remarkable astringency of their roots, which are used for medical purposes.

ALUM-SLATE, a slaty rock from which much alum is prepared; color grayish, bluish, or iron-black; often possessed of a glossy or shining luster; chiefly composed of clay (silicate of alumina), with variable proportions of sulphide of iron (iron-pyrites), lime, bitumen, and magnesia.

ALUM-STONE, a mineral of a grayish or yellowish-white color, approaching to earthy in its composition, from which (in Italy) is obtained a very pure alum by simply subjecting it to roasting and lixiviation.

AL'VA, or **AL'BA,** Ferdinand Alvarez, Duke of, Spanish statesman and general under Charles V. and Philip II.; was born in 1508; early embraced the military career, and fought in the wars of Charles V. in France, Italy, Africa, Hungary, and Germany. He is more especially remembered for his bloody and tyrannical government of the Netherlands (1567–73), which had revolted, and which he was commissioned by Philip II. to reduce to entire subjection to Spain. Hopeless of finally subduing the country he asked to be recalled, and accordingly, in December, 1573, Alva left the country, in which, as he himself boasted, he had executed 18,000 men. He was received with distinction in Madrid, but did not long enjoy his former credit. He had the honor, however, before his death (which took place in 1582) of reducing all Portugal to subjection to his sovereign. It is said of him that during sixty years of warfare he never lost a battle and was never taken by surprise.

ALVARADO (al-va-rä'dō), Pedro de, one of the Spanish "conquistadors," was born toward the end of the 15th century, and died in 1541. Having crossed the Atlantic he was associated (1519) with Cortez in his expedition to conquer Mexico; and was intrusted with important operations. In July, 1520, during the disastrous retreat from the capital after the death of Montezuma, the perilous command of the rear-guard was assigned to Alvarado. On his return to Spain he

was received with honor by Charles V., who made him governor of Guatemala, which he had himself conquered. To this was subsequently added Honduras. He continued to add to the Spanish dominions in America till his death.

ALWAR (*al-war'*), a state of northwestern Hindustan, in Rajputana; area, 3024 square miles. This semi-independent state has as its ruler a rajah with a revenue of about $1,000,000; military force, about 5000 infantry and 2000 cavalry. Pop. 828,888.—Alwar, the capital, is situated at the base of a rocky hill crowned by a fort, 80 miles s.s.w. of Delhi, surrounded by a moat and rampart, and poorly built, but with fine surroundings; contains the rajah's palace and a few other good buildings. Pop. 56,771.

AMADE'US, Duke of Aosta, second son of Victor Emanuel of Italy, and brother of the present king, was born in 1845, and was chosen by the Cortes King of Spain in 1870, Queen Isabella having had to leave the country in 1868. He abdicated in 1873 and returned to Italy. He died in 1890.

AMAL'FI, a seaport in southern Italy on the gulf of Salerno, 23 miles from Naples, the seat of a bishop, a place of

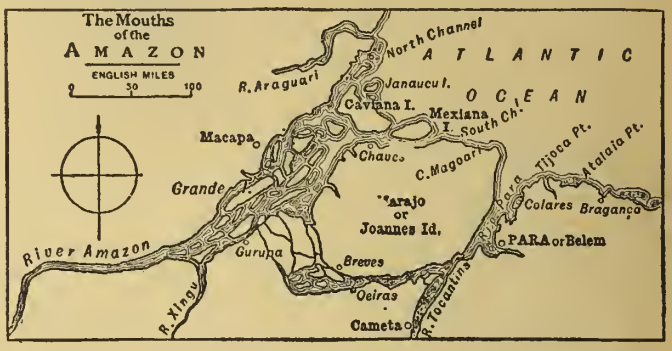
The Cathedral, Amalfi.

great commercial importance in the middle ages, enjoying a republican constitution of its own. Pop. 11,242.

AMAL'EKITES, a Semitic race occupying the peninsula between Egypt and Palestine, named after a grandson of Esau. They were denounced by Moses for their hostility to the Israelites during their journey through the wilderness, and they seem to have been all but exterminated by Saul and David.

AMAL'GAM, a name applied to the alloys of mercury with the other metals. One of them is the amalgam of mercury with tin, which is used to silver looking-glasses. Mercury unites very readily with gold and silver at ordinary temperatures, and advantage is taken of this to separate them from their ores, the process being called amalgamation. The mercury being properly applied dissolves and combines with the precious metal and separates it from the waste matters, and is itself easily driven off by heat.

AMARAPURA (*a-ma-ra-pō'ra*), a deserted city, once the capital of the Burmese Empire, on the left bank of the Irawaddy, quite close to Mandalay. The population in 1800 was 175,000.



AMARYLLIDA'CEÆ, an order of monocotyledonous plants, generally bulbous, occasionally with a tall, cylindrical, woody stem; with a highly colored flower, six stamens, and an inferior three-celled ovary; natives of Europe and most of the warmer parts of the world. The order includes the snowdrop, the snowflake, the daffodil, the belladonna-lily (belonging to the typical genus Amaryllis), the so-called Guernsey-lily (probably a native of Japan), the Brunsvigias, the blood-flowers (Hæmanthus) of the Cape of Good Hope, different species of Narcissus, Agave (American aloe), etc.

AM'ATEUR, any person who pursues an art, science, or other work not for money or other material consideration but for the pure love of the thing itself. In sports the definition of an amateur is made by the rules of the Amateur Athletic union; and this definition may be regarded as the type for sports of all kinds. According to the rules of competition nobody is eligible who in any manner has received compensation of any kind for his work, or who has competed with a professional, or who has in any way realized money through any connection with sport itself, such as the sale of prizes, etc. In certain sports, such as golf, the lines are not so closely drawn, so that playing with a professional does not constitute one a professional. The rules of amateurism in cycling were for years a mere form, as every large manufacturer had his own racers on the track.

AMAURO'SIS, a species of blindness, caused by disease of the nerves of vision. The most frequent causes are a long-continued direction of the eye on minute objects, long exposure to a bright light, to the fire of a forge, to snow, or irritating gases, overfulness of blood, disease of the brain, etc. If taken in time it may be cured or mitigated; but confirmed amaurosis is usually incurable.

AM'AZON, AM'AZONS, a river of South America, the largest in the world, formed by a great number of sources which rise in the Andes; general course north of east; length including windings between 3000 and 4000 miles; area of drainage basin 2,300,000 sq. miles. It enters the Atlantic under the equator by a mouth 200 miles wide, divided into two principal and several smaller arms by the large island Marajo, and a number of smaller islands. In its upper course navigation is interrupted by rapids, but from its mouth upward for a distance of 3300 miles (mostly in Brazil) there is no obstruction. From the sea to the Rio Negro, 750 miles in a straight line, the depth is nowhere less than 30 fathoms; up to the junction of the Ucayale there is depth sufficient for the largest vessels. The Amazonian water system affords some 50,000 miles of river suitable for navigation. The rapidity of the river is considerable, especially during the rainy season (January to June), when it is subject to floods; but there is no great fall in its course. The tides reach up as far as 400 miles from its mouth. The singular phenomenon of the bore, or as it is called on the Amazon the pororoca, occurs at the mouth of the river at springtides on a grand scale. The river swarms with alligators, turtles, and a great variety of fish. The country through which it flows is extremely fertile, and is mostly covered with immense forests; it must at some future time support a numerous population, and be the theater of a busy commerce. Steamers and other craft ply on the river, the chief center of trade being Para, at its mouth.

AMAZ'ONAS, the largest state of Brazil, traversed by the Amazon and its tributaries; area, 753,000 sq. miles; pop. 148,000.

AM'AZONS, according to an ancient Greek tradition, the name of a community of women, who permitted no men to reside among them, fought under the conduct of a queen, and long constituted a formidable state. They were said to burn off the right breast that it might not impede them in the use of the bow.

AMBA'LA, a town of India, in the Punjab. The military cantonment is several miles distant. Total pop. 78,638.

AMBAS'SADOR, a minister of the highest rank, employed by one prince or state at the court of another to manage the public concerns, or support the interests of his own prince or state, and representing the power and dignity of his sovereign or state. Ambassadors are ordinary when they reside perma-

nently at a foreign court, or extraordinary when they are sent on a special occasion. When ambassadors extraordinary have full powers, as of concluding peace, making treaties, and the like, they are called plenipotentiaries. Ambassadors are often called simply ministers. Envoys are ministers employed on special occasions, and are of less dignity than ambassadors. The term ambassador, however, is also used in a more general sense for any diplomatic agent or minister. An ambassador and his suite are not amenable to the laws of the country in which they are residing.

AM'BER, a semi-mineral substance of resinous composition, a sort of fossil resin, the produce of extinct Coniferæ. It is usually of yellow or reddish-brown color; brittle; yields easily to the knife; is translucent, and possessed of a resinous luster. Specific gravity, 1·065. It burns with a yellow flame, emitting a pungent aromatic smoke, and leaving a light carbonaceous residue, which is employed as the basis of the finest black varnishes. By friction it becomes strongly electric. It is found in masses from the size of coarse sand to that of a man's head, and occurs in beds of bituminous wood situated upon the shores of the Baltic and Adriatic Seas; also in Poland, France, Italy, and Demark. It is often washed up on the Prussian shores of the Baltic, and is also obtained by fishing for it with nets. Sometimes it is found on the east coast of Britain, in gravel pits round London, also in the United States.

AM'BERGRIS, a substance derived from the intestines of the sperm-whale, and found floating or on the shore; yellowish or blackish white; very light; melts at 140°, and is entirely dissipated on red-hot coals; is soluble in ether, volatile oils, and partially in alcohol, and is chiefly composed of a peculiar fatty substance. Its odor is very agreeable, and hence it is used as a perfume.

AMBIDEX'TROUS, having the faculty of using the left hand as effectively as the right.

AMBLYOP'SIS, a genus of blind fishes, containing only one species, found in the Mammoth Cave of Kentucky.

AMBOY'NA, AMBOINA, or **APON,** one of the Molucca Islands in the Indian Archipelago, close to the large island of Ceram; area, about 280 sq. miles. Its surface is generally hilly or mountainous, its general aspect beautiful, and its climate on the whole salubrious, but it is not infrequently visited by earthquakes. It affords a variety of useful trees, including the cocoanut and sago palms. Cloves and nutmegs are the staple productions. The soil in the valleys and along the shores is very fertile, but a large portion remains uncultivated. The natives are mostly of Malayan race. The capital, also called Amboyna, is situated on the Bay of Amboyna, and is well built and defended by a citadel. The streets are planted on each side with rows of fruit-trees. It is a free port. Pop. 10,500.

AM'BROSE, Saint, a celebrated father of the church; born in A.D. 333 or 334, probably at Treves, where his father was prefect; died in 397. His kindness and wisdom gained him the esteem and love of the people, and in 374 he was unanimously called to the bishopric of Milan, though not yet baptized. His writings, which are numerous, show that his theological knowledge extended little beyond an acquaintance with the works of the Greek fathers. He wrote Latin hymns, but the Te Deum Laudamus, which has been ascribed to him, was written a century later. He introduced the Ambrosian Chant, a mode of singing more monotonous than the Gregorian which superseded it. He also compiled a form of ritual known by his name.

AMBRO'SIA, in Greek mythology the food of the gods, as nectar was their drink.

AM'BULANCE, a hospital establishment which accompanies an army in its movements in the field for the purpose of providing assistance and surgical treatment to the soldiers wounded in battle. The name is often given to one of the carts, wagons, or litters used to transfer the wounded from the spot where they fell to the hospital. One form of ambulance wagon is a strong but light vehicle with an upright frame, from which two stretchers are slung from the top for the accommodation of those most severely wounded; seats before and behind are provided for those suffering from less serious wounds. The hospital chests, containing surgical instruments, bandages, splints, etc., are placed in the bottom of the wagon or lashed to its under surfaces. A thorough ambulance system in connection with armies in the field is of quite recent introduction. A training in ambulance work is now being recognized as of importance beyond the field of military affairs, and as being of the utmost service wherever serious accidents are likely to happen, as, for instance, in large cities and in connection with large industrial establishments.

AM'BUSH, a term of strategy used to designate the act of hiding and taking the enemy by surprise. An ambush may be large or small, involving only a few men or an entire army. It was this method of warfare which was used almost exclusively by the Boers in their recent war with England in South Africa.

AMEN (ā-men'), a Hebrew word, signifying "verily," "truly," transferred from the religious language of the Jews to that of the Christians, and used at the end of prayers as equivalent to "so be it," "may this be granted."

AMEND'MENT, a proposal brought forward in a meeting of some public or other body, either in order to get an alteration introduced on some proposal already before the meeting, or entirely to overturn such proposal. In parliament an amendment denotes an alteration made in the original draught of a bill while it is passing through the houses. Amendments may be made so as totally to alter the nature of the proposition; and this is a way of getting rid of a proposition, by making it bear a sense different from what was intended by the movers, who are thus compelled to abandon it.

AMENO'PHIS (or **AMENHOTEP**) **III.,** a king of ancient Egypt about 1500 B.C.; warred successfully against Syrians and Ethiopians, built magnificent temples and palaces at Thebes, where the so-called Memnon statue is a statute of this king.

AMENORRHŒ'A, absence or suspension of menstruation. The former may arise from general debility or from defective development, the latter from exposure to cold, from attacks of fever or other ailment, violent excitement, etc.

AMENTA'CEÆ, an order of plants having their flowers arranged in amenta or catkins; now broken up into several orders, the chief of which are the birch, the willow, the liquidambar, the plane, the nut.

AMEN'TUM, in botany, that kind of inflorescence which is commonly known as a catkin (as in the birch or willow), consisting of unisexual apetalous flowers in the axil of scales or bracts.

AMER'ICA, or the **NEW WORLD,** the largest of the great divisions of the globe except Asia, is washed on the west by the Pacific, on the east by the Atlantic, on the north by the Arctic Ocean, on the south tapers to a point. On the northwest it approaches within about 50 miles of Asia, while on the northeast the island of Greenland approaches within 370 miles of the European island Iceland; but in the south the distance between the American mainland and Europe or Africa is very great. America as a whole forms the two triangular continents of North and South America, united by the narrow Isthmus of Panama, and having an entire length of about 10,000 miles; a maximum breadth (in North America) of 3500 miles; a coast line of 44,000 miles; and a total area, including the islands, of nearly 16,000,000, of which N. America contains about 9,000,000 sq. miles. South America is more compact in form than N. America, in this respect resembling Africa, while N. America more resembles Europe. Between the two on the east side is the great basin which comprises the Gulf of Mexico, the Caribbean Sea, and the West India Islands. Like Europe also N. America possesses numerous islands, while those of S. America are less important and confined almost to the southern extremity.

Three-fourths of the area of America is comparatively flat, and this portion of the surface is bounded on the west by lofty mountain systems which stretch continuously from north to south between the extremities of the continent, generally at no great distance from the west shore. In North America the Rocky Mountains, a broad series of masses partly consisting of plateaux, form the most important portion of the elevated surface, being continued southward in the mountains and tableland of Mexico and the ranges of Central America. Separated by depressions from the Rocky Mountains proper, and running close to and parallel with the western coast, are several lofty ranges (Sierra Nevada, Cascade Mountains, etc.). Near the eastern coast, and forming an isolated mass, are the Appalachians, a system of much inferior magnitude. The loftiest mountains in N. America are Mount Logan (19,514

ft.), Mount St. Elias (18,017), both in N. W. Canada; and Popocatepetl (18,000 ft.). The depression of the Isthmus of Panama (about 260 ft.) forms a natural separation between the systems of the north and the south. In S. America the Andes form a system of greater elevation but less breadth than the Rocky Mountains, and consist of a series of ranges (cordilleras) closely following the line of the west coast from the Isthmus of Panama to Cape Horn. The highest summits seem to be Aconcagua (22,860 ft.), Sorata or Illampu (21,484), and Sahama (21,054). Volcanoes are numerous. Isolated mountain groups of minor importance are the highlands of Venezuela and of Brazil, the latter near the eastern coast, reaching a height of 10,000 feet.

The fertile lowlands which lie to the east of the Rocky Mountains and the Andes form a depression extending through both continents from the northern to the southern oceans. They have somewhat different features and different names in different portions; in N. America are prairies and savannahs, in S. America llanos, selvas and pampas.

Through these low grounds flow the numerous great rivers which form so characteristic a feature of America. The principal are the Mackenzie, Coppermine, and Great Fish rivers, entering the Northern Ocean; the Churchill, Nelson, Severn, and Albany, entering Hudson's Bay; the St. Lawrence, entering the Atlantic; Mississippi and Rio del Norte, entering the Gulf of Mexico (all these being in N. America); the Magdalena, Orinoco, Amazon, Paranahiba, Rio de la Plata, Colorado, and Rio Negro, entering the Atlantic (all in S. America); and the Yukon, Fraser, Columbia, San Joaquin, Sacramento, and Colorado, entering the Pacific. The rivers which flow into the Pacific, however, owing to the fact that the great backbone of the continent, the Rocky Mountains and the Andes, lies so near the west coast, are of comparatively little importance, in S. America being all quite small. Sometimes rivers traversing the same plains, and nearly on the same levels, open communications with each other, a remarkable instance being the Cassiquiari in S. America, which, branching off from the Rio Negro and joining the Orinoco, forms a kind of natural canal, uniting the basins of the Orinoco and the Amazon. The Amazon or Marañon in S. America, the largest river in the world, has a course of about 3500 miles, and a basin of 2,300,000 square miles; the Mississippi-Missouri, the largest river of North America, runs a longer course than the Amazon, but the area of its basin is not nearly so great. North America has the most extensive group of lakes in the world—Lakes Superior, Michigan, Huron, Erie, and Ontario, which through the St. Lawrence send their drainage to the Atlantic. Thus by means of lakes and rivers the interior of both N. and S. America is opened up and made accessible.

With regard to climate N. America naturally differs very much from S. America, and has more resemblance to the continents of Europe and Asia (regarded as a whole). In N. America, as in the older continent, the eastern parts are colder than the western, and hence the towns on the Atlantic coast have a winter temperature about 10° lower than those in corresponding latitudes of Europe. The winter temperature of the geater part of N. America is indeed severe, though the intense cold is less felt on account of the dryness of the air. There is no regular season of rainfall unless in the south. Although two-thirds of S. America lies within the tropics the heat is not so great as might be expected, owing to the prevailing winds, the influences of the Andes, and other causes. The highest temperature experienced is probably not more than 100° in the shade; at Rio de Janeiro the mean is about 74°, at Lima 72°. Over a great part of S. America there is a wet and dry season, varying in different regions; on the upper Amazon the rains last for ten months, being caused by the prevailing easterly winds bringing moisture from the Atlantic, which is condensed on the eastern slopes of the Andes. In each of the Americas there is a region in which little or no rain falls; in N. America it extends over a part of the United States and northern Mexico, in S. America over a part of the coast region of Peru and Chile.

America is rich in valuable minerals. It has supplied the world with immense quantities of gold and silver, which it still yields in no small amount, especially in the United States. It possesses inexhaustible stores of coal (U. States), with iron, copper, lead, tin, mercury, etc. Petroleum may be called one of its specialties, its petroleum wells having caused whole towns to spring into existence. Diamonds and other precious stones are found.

As regards vegetation America may be called a region of forests and verdure, vast tracts being covered by the grassy prairies, llanos, and pampas where the forests fail. In N. America the forests have been largely made use of by man; in S. America vast areas are covered with forests, which as yet are traversed only by the uncivilized Indian. In the north is the region of pines and firs; farther south come the deciduous trees, as the oak, beech, maple, elm, chestnut, etc. Then follow the evergreen forests of the tropical regions. The useful timber trees are very numerous; among the most characteristic of America are mahogany and other ornamental woods, and various dyewoods. In the tropical parts are numerous palms, cacti in great variety, and various species of the agave or American aloe. In the virgin forests of S. America the trees are often bound together into an impenetrable mass of vegetation by various kinds of climbing and twining plants. Among useful plants belonging to the American continent are maize, the potato, cacao, tobacco, cinchona, vanilla, Paraguay tea, etc. The most important plants introduced are wheat, rice, and other grains, sugar-cane, coffee, and cotton, with various fruits and vegetables. The vine is native to the continent, and both the American and introduced varieties are now largely cultivated.

The animals of America include, among carnivora, the jaguar or American tiger, found only in S. America; the puma or American lion, found mostly in S. America; the grizzly bear of N. America, fully as powerful an animal as either; the black bear, the skunk, the raccoon, the American or prairie wolf, several species of fox, etc. The rodents are represented by the beaver, the porcupine, and squirrels of several species; the marsupials by the opossum. Among ruminants are the bison, or, as it is commonly called, the buffalo, the moose or elk, the Virginian stag, the musk-ox; and in S. America the llama (which takes the place of the camel of the Old World), the alpaca, and the vicuña. Other animals most distinctive of S. America are sloths, fitted to live only in its dense and boundless forests; ant-eaters and armadillos; monkeys with prehensile tails, in this and other respects differing from those of the Old World; the condor among the heights of the Andes, the nandu, rhea or three-toed ostrich, beautiful parrots and hummingbirds. Among American reptiles are the boa-constrictor, the rattlesnake, the alligator or cayman, the iguana and other large lizards, large frogs and toads. The domestic animals of America, horses, cattle, and sheep, are of foreign origin. The electrical eel exists in the tropical waters.

The population of America consists partly of an aboriginal race or races, partly of immigrants or their descendants. The aboriginal inhabitants are the American Indians or red men, being generally of a brownish-red color, and now forming a very small portion of the total population, especially in N. America, where the white population has almost exterminated them. These people are divided into branches, some of which have displayed a considerable aptitude for civilization. When the Europeans became acquainted with the New World, Mexico, Central and part of S. America were inhabited by populations which had made great advances in many things that pertain to civilized life, dwelling in large and well-built cities under a settled form of government, and practicing agriculture and the mechanical arts. Ever since the discovery of America at the close of the 15th century Europeans of all nations have crowded into it; and the comparatively feeble native races have rapidly diminished, or lost their distinctive features by intermixtures with whites, and also with negroes brought from Africa to work as slaves. These mixed races are distinguished by a variety of names, as Mestizos, Mulattoes, Zambos, etc. In North America the white population is mainly of British origin, though to a considerable extent it also consists of Germans, Scandinavians, etc., and the descendants of such. In Central and South America the prevailing white nationality is the Spanish and Portuguese. In the extreme North are the Eskimos—a scattered and stunted race closely allied to some of the peoples of northern Asia. That the aboriginal inhabitants of America passed over from Asia is tolerably certain, but when and from what part we do not know.

The total population of the New World was estimated in 1900 at 135,000,000, of which perhaps 85,000,000 were whites, 26,000,000 mixed races, 13,000,000 negroes, and 11,000,000 Indians. As regards religion the bulk of the population of N. America is Protestant; of Central and S. America the religion is almost exclusively Roman Catholic. Several millions of the Indians are heathens.—The independent states of America are all republican in form of government, Brazil having become a republic in 1889. See North America, Central America, South America, West Indies, etc.

The merit of first unlocking the American continent to modern Europe belongs to the Genoese navigator Christopher Columbus, who discovered, in October, 1492, one of the Bahamas, and named it San Salvador. Europeans, however, had on different former occasions discovered the American coasts, and the coasts of Massachusetts and Rhode Island were visited by Northmen and named Vinland in the year 1000. Still these discoveries had no influence on the enterprise of Columbus, and cannot detract in the least from his merit; they were forgotten, and had never been made known to the inhabitants of the rest of Europe. Though Columbus was the first of his time who set foot on the New World, it has taken its name not from him, but from Amerigo Vespucci. The mainland was first seen in 1497 by Sebastian Cabot, who sailed under the patronage of Henry VII. of England. For further particulars of discovery see North America and South America.

The known history of America hardly goes beyond the period of its discovery by Columbus; but it possesses many monuments of antiquity that might take us many centuries backward, could we learn anything of their origin or of those by whom they were produced. Among such antiquities are great earthworks in the form of mounds, or of raised inclosures, crowning the tops of hills, river peninsulas, etc., and no doubt serving for defense. They inclose considerable areas, are surrounded by an exterior ditch, and by ramparts which are composed of mingled earth and stones, and are often of great extent in proportion to the area inclosed. They are always supplied either naturally or artificially with water, and give other indications of having been provided for a siege. Barrows and tumuli containing human bones, and which bear indications of having been used both as places of sepulture and as temples, are also numerous. They are in geometrical forms: circles, squares, parallelograms, etc. A mound on the plain of Cahokia in Illinois, opposite the city of St. Louis, is 700 feet long, 500 feet broad, and 90 feet high. Another class of earth mounds represent gigantic animal forms in bas-relief on the ground. One is a man with two heads, the body 50 feet long and 25 feet broad across the breast; another represents a serpent 1000 feet in length, with graceful curves. The monuments of Mexico, Central America, and Peru are of a more advanced state of civilization, approach nearer to the historical period, and make the loss of authentic information more severely felt. Here there are numerous ruined towns with most elaborate sculptures, lofty pyramidal structures serving as temples or forts, statues, picture writing, hieroglyphics, roads, aqueducts, bridges, etc. Some remarkable prehistoric remains discovered in recent years are what are known as the abodes of the "cliff-dwellers." These consist of habitations constructed on terraces and in caves high up the steep sides of cañons in Colorado and other parts of the western states of N. America. Some of these buildings are several stories high. See also Mexico, Peru, etc.

AMERICAN INDIANS. See Indians.

AMERICANISM, a term, phrase, or idiom peculiar to the English language as spoken in America, and not forming part of the language as spoken in England. The following is a list of a few of the more noteworthy Americanisms:

Approbate, to approve.

Around or round, about or near. To hang around is to loiter about a place.

Backwoods, the partially cleared forest regions in the western states.

Bee, an assemblage of persons to unite their labors for the benefit of an individual or family, or to carry out a joint scheme.

Bogus, false, counterfeit.

Boss, an employer or superintendent of laborers, a leader.

Bug, a coleopterous insect, or what in England is called a beetle.

Buggy, a four-wheeled vehicle.

Bulldoze, to; to intimidate voters.

Bunkum or buncombe, a speech made solely to please a constituency; talk for talking's sake, and in an inflated style.

Bureau, a chest of drawers; a dressing-table surmounted by a mirror.

Calculate, to suppose, to believe, to think.

Camp-meeting, a meeting held in the fields or woods for religious purposes, and where the assemblage encamp and remain several days.

Cane-brake, a thicket of canes.

Car, a carriage or wagon of a railway train. The Englishman "travels by rail" or "takes the train"; but the American takes or goes by the cars.

Carpet-bagger, a needy political adventurer who carries all his earthly goods in a carpet-bag.

Caucus, a private meeting of the leading politicians of a party to agree upon the plans to be pursued in an approaching election.

Chalk: a long chalk means a great distance, a good deal.

Chunk, a short thick piece of wood or any other material.

Clever, good-natured, obliging.

Cocktail, a stimulating drink made of brandy or gin mixed with sugar, and a very little water.

Corn, maize; in England, wheat, or grain in general.

Corn-husking, or corn-shucking, an occasion on which a farmer invites his neighbors to assist him in stripping the husks from his Indian corn.

Cowhide, a whip made of twisted strips of rawhide.

Creek, a small river or brook; not, as in England, a small arm of the sea.

Cunning, small and pretty, nice, as it was such a cunning baby.

Dander: to get one's dander raised, to have one's dander up, is to have been worked into a passion.

Dead-heads, people who have free admission to entertainments, or who have the use of public conveyances, or the like, free of charge.

Depot, a railway station.

Down east, in or into the New England States. A down-easter is a New Englander.

Drummer, a bagman or commercial traveler.

Dry goods, a general term for such articles as are sold by linen-drapers, haberdashers, hosiers, etc.

Dutch, the German language.—Dutchman, a German.

Fix, to; to put in order, to prepare, to adjust. To fix the hair, the table, the fire, is to dress the hair, lay the table, make up the fire.

Fixings, arrangements, dress, embellishments, luggage, furniture, garnishings of any kind.

Gerrymander, to arrange political divisions so that in an election one party may obtain an advantage over its opponent, even though the latter may possess a majority of votes in the state; from the deviser of such a scheme, named Gerry, governor of Massachusetts.

Given name, a Christian name.

Grit, courage, spirit, mettle.

Guess, to; to believe, to suppose, to think, to fancy; also used emphatically, as "Joe, will you liquor up?" "I guess I will."

Gulch, a deep abrupt ravine, caused by the action of water.

Happen in, to; to happen to come in or call.

Help, a servant.

High-falutin, inflated speech, bombast.

Hoe-cake, a cake of Indian meal baked on a hoe or before the fire.

Indian summer, the short season of pleasant weather usually occurring about the middle of November.

Johnny Cake, a cake made of Indian corn meal mixed with milk or water and sometimes a little stewed pumpkin; the term is also applied to a New Englander.

Julep, a drink composed of brandy or whisky with sugar, pounded ice, and some sprigs of mint.

Loafer, a lounger, a vagabond.

Log-rolling, the assembly of several parties of wood-cutters to help one of them in rolling their logs to the river after they are felled and trimmed; also employed in politics to signify a like system of mutual cooperation.

Lot, a piece or division of land, an allotment.

Lumber, timber sawed and split for use; as beams, joists, planks, staves, hoops, etc.

Lynch law, an irregular species of justice executed by the populace or a mob, without legal authority or trail.

Mail letters, to; to post letters.

Make tracks, to; to run away.

Mitten: to get the mitten is to meet with a refusal.

Mizzle, to; to abscond, or run away.

Mush, a kind of hasty-pudding.

Muss, a state of confusion.

Notions, a term applied to every variety of smallwares.
One-horse: a one-horse thing is a thing of no value or importance, a mean and trifling thing.
Picaninny, a negro child.
Pile, a quantity of money.

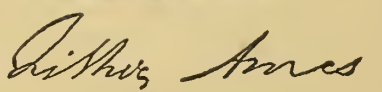
Amerigo Vespucci.

Planks, in a political sense, are the several principles which appertain to a party; platform is the collection of such principles.
Reckon, to; to suppose, to think.
Rile, to; to irritate, to drive into a passion.
Rock, a stone of any size; a pebble; as to throw rocks at a dog.
Rooster, the common domestic cock.
Scalawag, a scamp, a scapegrace.
Shanty, a mean structure such as squatters erect; a temporary hut.
Skedaddle, to; to run away; a word introduced during the civil war.
Skidoo, to get out.
Smart, often used in the sense of considerable, a good deal, as a smart chance.
Soft sawder, flattering, coaxing talk.
Span of horses, two horses as nearly as possible alike, harnessed side by side.
Spread-eagle style, a compound of exaggeration, bombast, mixed metaphor, etc.
Spry, active.
Stampede, the sudden flight of a crowd or number.
Store, a shop, as a bookstore, a grocery store.
Strike oil, to; to come upon petroleum: hence to make a lucky hit, especially financially.
Stump speech, a bombastic speech calculated to please the popular ear, such speeches in newly-settled districts being often delivered from stumps of trees.
Sun-up, sunset, sunrise.
Tall, great, fine (used by Shakespeare pretty much in the same sense); tall talk is extravagant talk.
Ticket: to vote the straight ticket is to vote for all the men or measures your party wishes.
Truck, the small produce of gardens; truck patch, a plot in which the smaller fruits and vegetables are raised.
Ugly, ill-tempered, vicious.
Vamose, to; to run off (from the Spanish vamos, let us go).
Wilt, to; to fade, to decay, to droop, to wither.

AMERIGO VESPUCCI (a-mer-ē'gō ves-pu'tchē), a maritime discoverer, after whom America has been named; born, 1451, at Florence, died, 1512, at Seville. In 1499 he coasted along the continent of America for several hundred leagues, and the publication of his narrative, while the prior discovery of Columbus was yet comparatively a secret, led to the giving of his name to the new continent.

AMES, Fisher, an American orator and congressman, born at Dedham, Mass., April 9, 1758. His efforts in favor of the Federal constitution in the Massachusetts convention of 1788 resulted in his election to congress, where he served for eight years. In his later years he served in the Massachusetts council, delivered a eulogy on Washington before the legislature, and produced a number of essays. In 1804 he declined the presidency of Harvard. He died July 4, 1808.

AMES, Nathan P., an American manufacturer, born in Massachusetts in 1803, died 1847. He was the owner of extensive cutlery and bronze works,



and cast a number of well-known public monuments.

AMES, Oaks, an American shovel manufacturer, railroad capitalist, and western pioneer. He was one of the builders of the Southern Pacific railroad, was a member of congress from Massachusetts, and filled other public offices. Mr. Ames was born in 1804, and died in 1873.

AMES, Oliver, American statesman, son of Oaks Ames. He was born in Massachusetts in 1831, died in 1895. He succeeded to his father's immense weath. In 1886 he was elected governor of Massachusetts, and was twice re-elected.

AMETAB'OLA, a division of insects, including only the apterous or wingless insects, as lice, spring-tails, etc., which do not undergo any metamorphosis, but which escape from the egg nearly under the same form which they preserve through life.

AM'ETHYST, a violet-blue or purple variety of quartz, generally occurring crystallized in hexahedral prisms or pyramids, also in rolled fragments, composed of imperfect prismatic cystals. It is wrought into various articles of jewelry. The oriental amethyst is a rare violet-colored gem, a variety of alumina or corundum, of much brilliance and beauty.

AMHERST (am'ėrst), a seaport of Lower Burmah, 31 miles south of Moulmein, a health resort of Europeans. Pop. 5000.—The district of Amherst has an area of 15,189 sq. miles; pop. 301,086.

AMHERST, Jeffery, Lord, born 1717, died 1797; distinguished British general who fought at Dettingen and Fontenoy, and commanded in America, where he took Louisburg, Ticonderoga, and Quebec, and restored the British prestige in Canada. He was raised to the peerage, became commander-in-chief, and ultimately field-marshal.

AMHERST, William Pitt, first earl, nephew of the above; Governor-general of India, 1823; prosecuted the first Burmese war, and suppressed the Barrackpore mutiny. Born 1773, died 1857.

AMICE (am'is), an oblong piece of linen with an embroidered apparel sewed upon it, worn under the alb by priests of the R. Cath. Church when engaged in the service of the mass.

AMIENS (à-mē-aṇ), a town of France, capital of the department of Somme, on the railway from Boulogne to Paris. Having water communication with the sea by the Somme, which is navigable for small vessels, it has a large trade and numerous important manufactures, especially cottons and woolens. It was taken by the Germans in 1870. Pop. 90,038.—The Peace of Amiens, concluded between Great Britain, France, Spain, and the Batavian Republic, March 27, 1802, put an end for a time to the great war which had lasted since 1793.

AMMERGAU (ȧm'er-gou), a district in Upper Bavaria, having its center in the villages of Ober and Unter Ammergau. The former village is famous on account of the Passion Play which is performed there, at intervals usually of ten years.

Ammon.

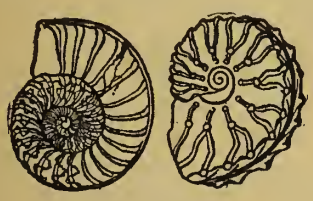
AM'MON, an ancient Egyptian diety, one of the chief gods of the country, identified by the Greeks with their supreme god Zeus, while the Romans regarded him as the representative of

Jupiter; represented as a ram, as a human being with a ram's head, or simply with the horns of a ram. There was a celebrated temple of Ammon in the Oasis of Siwah in the Libyan desert.

AMMO'NIA, an alkaline substance, which differs from the other alkalies by being gaseous, and is hence sometimes called the volatile alkali. It is a colorless pungent gas, composed of nitrogen and hydrogen. It was first procured in that state by Priestley, who termed it alkaline air. He obtained it from sal-ammoniac by the action of lime, by which method it is yet generally prepared. It is used for many purposes, both in medicine and scientific chemistry; not, however, in the gaseous state, but frequently in solution in water, under the names of liquid ammonia, aqueous ammonia, or spirits of hartshorn. It may be procured naturally from putrescent animal substances; artificially it is chiefly got from the distillation of coal and of refuse animal substances, such as bones, clippings and shavings of horn, hoof, etc. It may also be obtained from vegetable matter when nitrogen is one of its elements. Sal-ammoniac is the chloride of ammonium.

AMMONI'ACUM, a gum-resinous exudation from an umbelliferous plant. It has a fetid smell, is inflammable, soluble in water and spirit of wine; used as an antispasmodic, stimulant, and expectorant in chronic catarrh, bronchitic affections, and asthma; also used for plasters.

AM'MONITE, a fossil Cephalopod, belonging to the genus Ammonites, allied to the Nautilus, having a many-chambered shell, in shape like the



Ammonites.

curved horns on the ancient statues of Jupiter Ammon; characteristic of the Trias, Lias, and Oolite formations, and sometimes found in immense numbers and of great size.

AM'MONITES, a Semitic race frequently mentioned in Scripture, descended from Ben-Ammi, the son of Lot (Gen. xix. 38), often spoken of in conjunction with the Moabites. A predatory and Bedouin race, they inhabited the desert country east of Gad, their chief city being Rabbath-Ammon (Philadelphia). Wars between the Israelites and the Ammonites were frequent; they were overcome by Jephthah, Saul, David, Uzziah, Jotham, etc. They appear to have existed as a distinct people in the time of Justin Martyr, but have subsequently become merged in the aggregate of nameless Arab tribes.

AMMO'NIUM, the name given to the hypothetical base of ammonia, analogous to a metal as potassium. It has not been isolated, but it is believed to exist in an amalgam with mercury.

AMMUNI'TION, military stores generally; in modern usage confined to the articles used in the discharge of firearms and ordnance of all kinds, as powder, balls, shells, various kinds of shot, etc.

AM'NESTY, the releasing of a number of persons who have been guilty of political offenses from the consequence of these offenses.

AMŒ'BA, a microscopic genus of rhizopodous Protozoa, common in fresh-water ponds and ditches. It exists as a mass of protoplasm, and pushes its body

Amœba, or fresh-water proteus, showing some of the shapes which it assumes.

out into finger-like processes or pseudopodia, and by means of these moves about or grasps particles of food. There is no distinct mouth, and food is engulfed within any portion of the soft sarcode body. Reproduction takes place by fission, or by a single pseudopodium detaching itself from the parent body and developing into a separate amœba.

AMONTILLA'DO, a dry kind of sherry wine of a light color, highly esteemed.

AMOO-DARIA, a Russian territory of central Asia, on the east of the Amoo and southeast of the Sea of Aral; area, 40,000 sq. miles; pop. 220,000.

AMOOR', or **AMUR',** one of the largest rivers of eastern Asia, formed by the junction of the rivers Shilka and Argun; flows first in a southeastern and then in a northeastern direction till it falls into an arm of the Sea of Okhotsk, opposite the island of Saghalien, after a course of 1500 miles. It forms, for a large portion of its course, part of the boundary-line between the Russian and the Chinese dominions, and is navigable throughout for four months in the year.—Amoor Territory. In 1858 Russia acquired from China the territory on the left bank of the Upper and Middle Amoor, together with that on both banks of the Lower Amoor. The western portion of the territory was organized as a separate province, with the name of the Amoor (area, 173,559 sq. miles; pop. 87,700). The eastern portion was joined to the Maritime Province of eastern Siberia.

AM'ORITES, a powerful Canaanitish tribe at the time of the occupation of the country by the Israelites; occupied the whole of Gilead and Bashan, and formed two powerful kingdoms—a northern, under Og, who is called king of Bashan; and a southern, under Sihon, called king of the Amorites; first attacked and overthrown by Joshua; subsequently subdued, and made tributary or driven to mingle with the Philistines and other remnants of the Canaanitish nations.

AMORPHOUS ROCKS or **MINERALS,** those having no regular structure, or without crystallization, even in the minutest particles.

AMORPHOZO'A, a term applied to some of the lower groups of animals, as the sponges and their allies, which have no regular symmetrical structure.

AMOY', an important Chinese trading port, on a small island off the south-east coast opposite Formosa; has a safe and commodious harbor, and its merchants are among the wealthiest and most enterprising in China; one of the five ports opened to British commerce in 1843, now open to all countries. Pop. 95,600.

AMPERE (ȧn-pār), André-Marie, a celebrated French mathematician and philosopher, founder of the science of electrodynamics, born at Lyons in 1775, died at Marseilles in 1836. What is known as Ampère's Theory is that magnetism consists in the existence of electric currents circulating round the particles of magnetic bodies, being in different directions round different particles when the bodies are unmagnetized, but all in the same direction when they are magnetized.

AMPHIB'IA, a class of vertebrate animals, which in their early life breathe by gills or branchiæ, and afterward partly or entirely by lungs. The Frog, breathing in its tadpole state by gills and afterward throwing off these organs and breathing entirely by lungs in its adult state, is an example of the latter phase of amphibian existence. The Proteus of the underground caves of central Europe exemplifies forms in which the gills of early life are retained throughout life, and in which lungs are developed in addition to the gills. A second character of this group consists in the presence of two occipital "condyles," or processes by means of

Amphipoda.—1, Shore-jumper; 2, Portion showing the respiratory organs a a a.

which the skull articulates with the spine or vertebral column; Reptiles possessing one condyle only. The class is divided into four orders: the Ophiomorpha (or serpentiform), represented by the Blind-worms, in which limbs are wanting and the body is snake-like; the Urodela or "Tailed" Amphibians, including the Newts, Proteus, Siren, etc.; the Anoura, or Tailless Amphibia, represented by the Frogs and Toads; and the Labyrinthodontia, which includes the extinct forms known as Labyrinthodons.

AMPHI'ON, in Greek mythology, son of Zeus and Antiopē, and husband of Niobē; had miraculous skill in music, being taught by Mercury, or, according to others, by Apollo. In poetic legend he is said to have availed himself of his skill when building the walls of Thebes—the stones moving and arranging themselves in proper position at the sound of his lyre.

AMPHIP'ODA, an order of sessile-eyed crustaceans, with feet directed

partly forward and partly backward. Many species are found in springs and rivulets, others in salt water. The sand-hopper and shore-jumper are examples.

AMPHIP'ROSTYLE, in architecture, said of a structure having the form of an ancient Greek or Roman oblong rectangular temple, with a prostyle or portico on each of its ends or fronts, but with no columns on its sides or flanks.

AMPHISBÆ'NA, a genus of serpentiform, limbless, lacertilian reptiles; body cylindrical, destitute of scales, and divided into numerous annular segments; the tail obtuse, and scarcely to be distinguished from the head, whence the belief that it moved equally well with either end foremost. There are several species, found in tropical America. They feed on ants and earthworms, and were formerly, but erroneously, deemed poisonous.

AMPHITHE'ATER, an ancient Roman edifice of an oval form without a roof, having a central area (the arena) encompassed with rows of seats, rising higher as they receded from the center, on which people used to sit to view the combats of gladiators and of wild beasts, and other sports. The Colosseum at Rome is the largest of all the ancient amphitheaters, being capable of containing from 50,000 to 80,000 persons. That at Verona is one of the best examples remaining. Its dimensions are 502 feet by 401, and 98 feet high. The name means "both-ways theater," or "theater all round," the theater forming only a semicircular edifice.

AMPHITRI'TE, in Greek mythology, daughter of Oceänus and Tethys, or of Nereus and Doris, and wife of Poseidon (or Neptune), represented as drawn in a chariot of shells by Tritons, with a trident in her hand.

AMPHIU'MA, a genus of amphibians which frequent the lakes and stagnant waters of North America. The adults retain the clefts at which the gills of the tadpole projected.

AM'PHORA, a vessel used by the Greeks and Romans for holding liquids; commonly tall and narrow, with two handles and a pointed end which fitted

Filling an amphora.

into a stand or was stuck in the ground to enable them to stand upright; used also as a cinerary urn, and as a liquid measure.

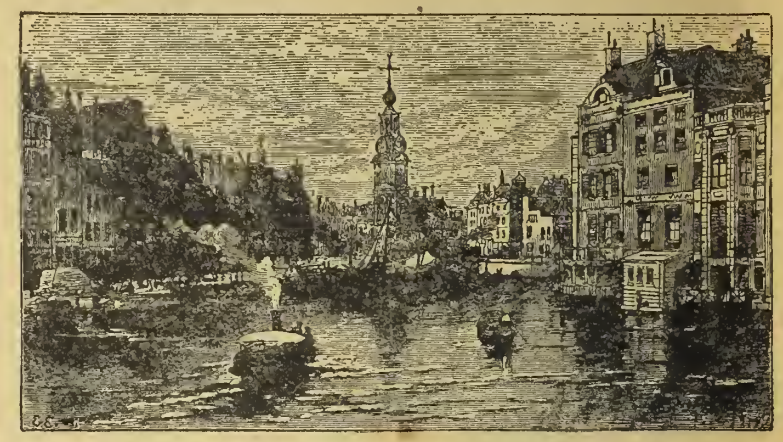
AM'PLITUDE, in astronomy, the distance of any celestial body (when referred by a secondary circle to the horizon) from the east or west points.

AMPUL'LA, in antiquity, a vessel bellying out like a jug, that contained unguents for the bath; also a vessel for drinking at table. The ampulla has also been employed for ceremonial purposes, such as holding the oil or chrism used in various church rites and for anointing monarchs at their coronation. The ampulla of the English sovereigns now in use is an eagle, weighing about 10 oz., of the purest chased gold, which passed through various hands to the Black Prince.

AMPUTA'TION, in surgery, that operation by which a member is separated from the body according to the rules of the science.

AM'RITSIR, or **AMRITSAR,** a flourishing commercial town of Hindustan, capital of a district of the same name, in the Punjab, the principal place of the religious worship of the Sikhs. It has considerable manufactures of shawls and silks; and receives its name from the sacred pond constructed by Ram Das, the apostle of the Sikhs, in which the Sikhs and other Hindus immerse themselves that they may be purified from all sin. Pop. 162,429.—The district of Amritsir has an area of 1601 miles. Pop. 992,697.

AM'STERDAM, one of the chief commerical cities of Europe, capital of Holland (but not the residence of the king), situated at the confluence of the Amstel with the Y or Ij (pronounced as eye), an arm of the Zuider-zee. On account of the lowness of the site of the city the greater part of it is built on piles. It is divided by numerous canals into about 90 islands, which are connected by nearly 300 bridges. Many of the streets have a canal in the middle with broad brick-paved quays on either side, planted with rows of trees; the houses are generally of brick, many of them six or seven stories high, with pointed gables turned to the streets. Among its numerous industries may be mentioned as a specialty the cutting and polishing of diamonds. The harbor, formed by the Y, lies along the whole of the north side of the city, and is surrounded by various docks and basins. The trade is very great, being much facilitated by the great ship-canal (15 m. long, 22-26 ft. deep, constructed 1865–76) which connects the Y directly with the North Sea.



Amsterdam—Scene on the Amstel.

Another canal, the North Holland Canal (46 m. long, 20 ft. deep), connects Amsterdam with the Helder. Between the harbor and the Zuider-zee the Y is now crossed by a great dam in which are locks to admit vessels and regulate the amount of water in the North Sea Canal. During the 17th and 18th centuries Amsterdam was one of the wealthiest and most flourishing cities in the world. Its forced alliance with France ruined its trade, but since 1813 its commerce has revived. Pop. 520,602.

AMSTERDAM, a town of New York state, U. S., on the Mohawk river, 33 miles n.w. of Albany; a busy manufacturing town. Pop. 23,000.

AM'ULET, a piece of stone, metal, etc., marked with certain figures or characters, which people in some countries wear about them, superstitiously deeming them a protection against diseases and enchantments.

AMUR'. See Amoor.

AMYG'DALOID, a term applied to an igneous rock, especially trap, containing round or almond-shaped vesicles or cavities partly or wholly filled with crystalline nodules of various minerals, particularly calcareous spar, quartz, agate, zeolite, chlorite, etc.

AM'YL, in chemistry, a hypothetic radical believed to exist in many compounds, especially the fusel-oil series,

and having the formula C_5H_{11}.—Amyl Nitrite, or Nitrite of Amyl, an amber-colored fluid, smelling and tasting like essence of pears, which has been employed as an anæsthetic and also in relieving cardiac distress, as in angina pectoris.

AM'YLENE, an ethereal liquid with an aromatic odor, prepared from fusel-oil. It possesses anæsthetic properties, and has been tried as a substitute for chloroform, but is very dangerous.

AMYL'IC ALCOHOL, one of the products of the fermentation of grain, etc., commonly known by the name of fusel-oil (which see).

AMYRIDA'CEÆ, a natural order of plants, consisting of tropical trees or shrubs, the leaves, bark, and fruit of which abound in fragrant resinous and balsamic juices. Myrrh, frankincense, and the gum-elemi of commerce are among their products.

ANABAP'TISTS, a name given to a Christian sect by their adversaries, because, as they objected to infant baptism, they rebaptized those who joined their body. The founder of the sect appears to have been Nicolas Storch, a disciple of Luther's, who seems to have aimed also at the reorganization of society based on civil and political equality. The application of the term Anabaptist to the general body of Baptists throughout the world is unwarranted, because these sects have nothing in common with the bodies which sprung up in various countries of Europe during the Reformation, except the practice of adult baptism. The Baptists themselves repudiate the name Anabaptist, as they claim to baptize according to the original institution of the rite, and never repeat baptism in the case of those who in their opinion have been so baptized.

ANAB'ASIS, the Greek title of Xenophon's celebrated account of the expedition of Cyrus the Younger against his brother Artaxerxes, king of Persia. The title is also given to Arrian's work which records the campaigns of Alexander the Great.

AN'ABLEPS, a genus of fishes of the perch family, found in the rivers of Guiana, consisting of but one species, remarkable for a peculiar structure of

Anableps.

the eyes, in which there is a division of the iris and cornea, by transverse ligaments forming two pupils, and making the whole eye appear double. The young are brought forth alive.

ANACANTHI'NI, an order of osseous fishes, including the cod, plaice, etc., with spineless fins, cycloid or ctenoid scales, the ventral fins either absent or below the pectorals, and ductless swim-bladder.

ANACH'RONISM, an error of chronology by which things are represented as coexisting which did not coexist; applied also to anything foreign to or out of keeping with a specified time. Thus it is an anachronism when Shakespeare, in Troilus and Cressida, makes Hector quote Aristotle.

ANACON'DA, the popular name of two of the largest species of the serpent tribe, viz., a Ceylonese species of the genus Python, said to have been met with 33 feet long; and a native of tropical America, allied to the boa-constrictor, and the largest of the serpent tribe, attaining the length of 40 feet. They frequent swamps and rivers, are destitute of poison fangs, and kill their victims by constriction.

ANACONDA, a city and county seat of Deer Lodge Co., Mont., 27 miles west by north of Butte, on the Northern Pacific, the Great Northern, and the Butte, Anaconda and Pacific railroads. The city is noted for its great copper-smelting works, which are among the largest in the world, having a daily capacity of some 5500 tons of ore. Railroad shops, foundries, machine shops, and brick works further represent the industrial interests. Pop. 12,000.

ANÆ'MIA, a medical term applied to an unhealthy condition of the body, in which there is a diminution of the red corpuscles which the blood should contain. The principal symptoms are paleness and general want of color in the skin, languor, emaciation, want of appetite, fainting, palpitation, etc.

ANÆSTHET'ICS, medical agents employed for the removal of pain, especially in surgical operations, by suspending sensibility either locally or generally. Various agents have been employed for both of these purposes from the earliest times, but the scientific use of anæsthetics may be said to date from 1800, when Sir Humphry Davy made experiments on the anæsthetic properties of nitrous oxide, and recommended its use in surgery. In 1818 Faraday established the anæsthetic properties of sulphuric ether, but this agent made no advance beyond the region of experiment, till 1844, when Dr. Wells, a dentist of Hartford, Connecticut, applied the inhalation of sulphuric ether in the extraction of teeth, but owing to some misadventure did not persevere with it. The example was followed in 1846 by Dr. Morton, a Boston dentist, who also extended the use of ether to other surgical operations. The practice was soon after introduced into England by Mr. Liston, and a London dentist, Mr. Robinson. A few weeks later Sir James Simpson made the first application of ether in a case of midwifery. This was early in 1847. Toward the end of the same year Simpson had his attention called to the anæsthetic efficacy of chloroform, and announced it as a superior agent to ether. This agent has since been the most extensively used anæsthetic, though the use of ether still largely prevails in the United States. In their general effects ether and chloroform are very similar; but the latter tends to enfeeble the action of the heart more readily than the former. For this reason great caution has to be used in administering chloroform where there is weak heart action from disease. Local anæsthesia is produced by isolating the part of the body to be operated upon, and producing insensibility of the nerves in that locality. Dr. Richardson's method is to apply the spray of ether, which, by its rapid evaporation, chills and freezes the tissues and produces complete anæsthesia. This mode of treatment, besides its use in minor surgical operations, has recently begun to have important remedial applications. A valuable local anæsthetic now employed is cocaine.

AN'AGRAM, the transposition of the letters of a word or words so as to form a new word or phrase, a connection in meaning being frequently preserved; thus, evil, vile; Horatio Nelson, Honor est a Nilo (honor is from the Nile).

AN'ALOGUE, in comparative anatomy, an organ in one species or group having the same function as an organ of different structure in another species or group, as the wing of a bird and that of an insect, both serving for flight. Organs in different animals having a similar anatomical structure, development, and relative position, independent of function or form, such as the arm of a man and the wing of a bird, are termed homologues.

ANAL'OGY is the mode of reasoning from resemblance to resemblance. When we find on attentive examination resemblances in objects apparently diverse, and in which at first no such resemblances were discovered, a presumption arises that other resemblances may be found by further examination in these or other objects likewise apparently diverse. It is on the belief in a unity in nature that all inferences from analogy rest. The general inference from analogy is always perfectly valid. Wherever there is resemblance, similarity or identity of cause somewhere may be justly inferred; but to infer the particular cause without particular proof is always to reason falsely. Analogy is of great use and constant application in science, in philosophy, and in the common business of life.

ANAL'YSIS, the resolution of an object, whether of the senses or the intellect, into its component elements. In philosophy it is the mode of resolving a compound idea into its simple parts, in order to consider them more distinctly, and arrive at a more precise knowledge of the whole. It is opposed to synthesis, by which we combine and class our perceptions, and contrive expressions for our thoughts, so as to represent their several divisions, classes, and relations.

Analysis, in mathematics, is, in the widest sense, the expression and development of the functions of quantities by calculation; in a narrower sense the resolving of problems by algebraic equations. The analysis of the ancients was exhibited only in geometry, and made use only of geometrical assistance, whereby it is distinguished from the analysis of the moderns, which extends to all measurable objects, and expresses in equations the mutual dependence of magnitudes. Analysis is divided into lower and higher, the lower comprising, besides arithmetic and algebra, the doctrines of functions, of series, combinations, logarithms, and curves, the higher comprising the differential and in-

tegral calculus, and the calculus of variations.

In chemistry, analysis is the process of decomposing a compound substance with a view to determine either (a) what elements it contains (qualitative analysis), or (b) how much of each element is present (quantitative analysis). Thus by the first process we learn that water is a compound of hydrogen and oxygen, and by the second that it consists of one part of hydrogen by weight to eight parts of oxygen.

ANAM', a country of Asia occupying the e. side of the Southeastern or Indo-Chinese Peninsula, along the China Sea, having a length of about 850 miles, with a breadth varying from over 400 miles in the n. to 100 in the middle. It is composed of three parts: Tonquin in the n.; Cochin-China in the s.; and the territory of the Laos tribes, s.w. of Tonquin (together, area, 170,000 square miles, pop. 15,000,000, 9,000,000 being in Tonquin).

AN'ANAS. See Pineapple.

AN'ARCHISTS, a revoluntionary sect or body setting forth as the social ideal the extreme form of individual freedom, and holding that all government is injurious and immoral, that the destruction of every social form now existing must be the first step to the creation of a new world. Their recognition as an independent sect may be dated from the secession of Bakunin and his followers from the Social Democrats at the congress of the Hague in 1872, since which they have maintained an active propaganda. Their principal journals have been La Révolte (Paris), the Freiheit (New York), Liberty (Boston), and the Anarchist (London). The congress at London in 1881 decided that all means were justifiable as against the organized forces of modern society.

Much disputation arises from the confusion of anarchists with nihilists and with socialists. On the other hand, philosophical anarchism is confounded with revolutionary anarchism. Anarchists of the latter type have during the past 25 years assassinated, or attempted to assassinate, numerous rulers or heads of government, but in every case they have paid the death penalty for the deed. The most notable anarchistic demonstration was that of the Haymarket Square riot of Chicago on May 4, 1886, in which 7 policemen were killed and 60 wounded. Philosophical anarchism does not countenance the use of violence, but holds that human society will eventually evolve into a state in which there will be no need of any kind of government. Its foremost apostle was Herbert Spencer.

ANARTHROP'ODA, one of the two great divisions (the Arthropoda being the other) of the Annulosa, or ringed animals, in which there are no articulated appendages. It includes the leeches, earthworms, tubeworms, etc.

A'NAS, a genus of web-footed birds, containing the true ducks.

ANATH'EMA, originally a gift hung up in a temple and dedicated to some god, a votive offering; but it gradually came to be used for expulsion, curse. The Roman Catholic Church pronounces the sentence of anathema against heretics, schismatics, and all who wilfully pursue a course of conduct condemned by the church. The subject of the anathema is declared an outcast from the church, all the faithful are forbidden to associate with him, and utter destruction is denounced against him, both body and soul.

ANAT'IDÆ, a family of swimming birds, including the ducks, swans, geese, etc.

ANAT'OMY, in the literal sense, means simply a cutting up, but is now generally applied both to the art of dissecting or artificially separating the different parts of an organized body (vegetable or animal) with a view to discover their situation, structure, and economy; and to the science which treats of the internal structure of organized bodies. The branch which treats of the structure of plants is called vegetable anatomy or phytotomy, and that which treats of the structure of animals animal anatomy or zootomy, a special branch of the latter being human anatomy or anthropotomy. Comparative anatomy is the science which compares the anatomy of different classes or species of animals, as that of man with quadrupeds, or that of quadrupeds with fishes; while special anatomy treats of the construction, form, and structure of parts in a single animal. The special anatomy of an animal may be studied from various standpoints: with relation to the succession of forms which it exhibits from its first stage to its adult form (developmental or embryotical anatomy), with reference to the general properties and structure of the tissues or textures (general anatomy, histology), with reference to the changes in structure of organs or parts produced by disease and congenital malformations (morbid or pathological anatomy), or with reference to the function, use, or purpose performed by the organs or parts (teleological or physiological anatomy). According to the parts of the body described the different divisions of human anatomy receive different names; as, osteology, the description of the bones; myology, of the muscles; desmology, of the ligaments and sinews; splanchnology, of the viscera or internal organs, in which are reckoned the lungs, stomach, and intestines, the liver, spleen, kidneys, bladder, pancreas, etc. Angiology describes the vessels through which the liquids in the body are conducted, including the blood-vessels, which are divided into arteries and veins, and the lymphatic vessels, some of which absorb matters from the bowels, while others are distributed through the whole body, collecting juices from the tissues and carrying them back into the blood. Neurology describes the system of the nerves and of the brain; dermatology treats of the skin.

Among the ancient writers or authorities on human anatomy may be mentioned Hippocrates the younger (460–377 B.C.), Aristotle (384–322 B.C.), Herophilus and Erasistratus of Alexandria (fl. about 300 B.C.), Celsus (53 B.C.–37 A.D.), and Galen of Pergamus (140–200), the most celebrated of all the ancient authorities on the science. From his time till the revival of learning in Europe in the 14th century anatomy was checked in its progress. In 1315 Mondino, professor at Bologna, first publicly performed dissection, and published a System of Anatomy, which was a text-book in the schools of Italy for about 200 years. In the 16th century Fallopio of Padua, Eustachi of Venice, Vesalius of Brussels, Varoli of Bologna, and many others, enriched anatomy with new discoveries. In the 17th century Harvey discovered the circulation of the blood, Asellius discovered the manner in which the nutritious part of the food is conveyed into the circulation, while the lymphatic system was detected and described by the Dane T. Bartoline. Among the renowned anatomists of later times we can only mention Malpighi, Boerhaave, William and John Hunter, the younger Meckel, Bichat, Rosenmüller, Quain, Sir A. Cooper, Sir C. Bell, Carus, Joh. Müller, Häckel, Gegenbaur, Owen, and Huxley.

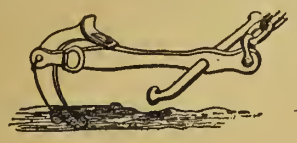
ANAXAG'ORAS, an ancient Greek philosopher of the Ionic school, born at Clazomenæ, in Ionia, probably about 500 B.C. When only about twenty years of age he settled at Athens, and soon gained a high reputation, and gathered round him a circle of renowned pupils, including Pericles, Euripides, Socrates, etc. At the age of fifty he was publicly charged with impiety and condemned to death, but the sentence was commuted to perpetual banishment. He thereupon went to Lampsacus, where he died about 428. Anaxagoras belonged to the atomic school of Ionic philosophers. He held that there was an infinite number of different kinds of elementary atoms, and that these, in themselves motionless and originally existing in a state of chaos, were put in motion by an eternal, immaterial, spiritual, elementary being, Nous (Intelligence), from which motion the world was produced. The stars were, according to him, of earthy materials; the sun a glowing mass, about as large as the Peloponnesus; the earth was flat; the moon a dark, inhabitable body, receiving its light from the sun; the comets wandering stars.

ANAXIMAN'DER, an ancient Greek (Ionic) philosopher, was born at Miletus in 611 B.C., and died 547. The fundamental principle of his philosophy is that the source of all things is an undefined substance infinite in quantity. The firmament is composed of heat and cold, the stars of air and fire. The sun occupies the highest place in the heavens, has a circumference twenty-eight times larger than the earth, and resembles a cylinder, from which streams of fire issue. The moon is likewise a cylinder, nineteen times larger than the earth. The earth has the shape of a cylinder, and is placed in the midst of the universe, where it remains suspended. Anaximander occupied himself a great deal with mathematics and geography. To him is credited the invention of geographical maps and the first application of the gnomon or style fixed on a horizontal plane to determine the solstices and equinoxes.

ANAXIMENES (an-aks-im'e-nēz) **OF MILETUS,** an ancient Greek philosopher, according to whom air was the first principle of all things. Finite things

were formed from the infinite air by compression and rarefaction produced by eternally existent motion; and heat and cold resulted from varying degrees of density of the primal element. He flourished about 550 B.C.

AN'CHOR, an implement for holding a ship or other vessel at rest in the water. In ancient times large stones or crooked pieces of wood heavily weighted with metal were used for this purpose. The



Anchor.

anchor now used is of iron, formed with a strong shank, at one extremity of which is the crown, from which branch out two arms, terminating in broad palms or flukes, the sharp extremity of which is the peak or bill; at the other end of the shank is the stock (fixed at right angles to the plane of the arms), behind which is the ring, to which a cable can be attached. The principal use of the stock is to cause the arms to fall so as one of the flukes shall enter the ground.

AN'CHORITES, in the early church a class of religious persons who generally passed their lives in cells, from which they never removed. Their habitations were, in many instances, entirely separated from the abodes of other men, sometimes in the depth of wildernesses, in pits or caverns; at other times several of these individuals fixed their habitations in the vicinity of each other, but they always lived personally separate. The continual prevalence of bloody wars, civil commotions, and persecutions at the beginning of the Christian era must have made retirement and religious meditation agreeable to men of quiet and contemplative minds. This spirit, however, as might have been expected, soon led to fanatical excesses; many anchorites went without proper clothing, wore heavy chains, and we find at the close of the 4th century Simeon Stylites passing thirty years on the top of a column without ever descending from it, and finally dying there. In Egypt and Syria, where Christianity became blended with the Grecian philosophy and strongly tinged with the peculiar notions of the East, the anchorites were most numerous; in Europe there were comparatively few, and on the development and establishment of the monastic system they completely disappeared.

ANCHOVY (an-chō'vi), a small fish of the Herring family. The common anchovy, so esteemed for its rich and peculiar flavor, is not much larger than the middle finger. It is caught in vast numbers in the Mediterranean, and frequently on the coasts of France, Holland, and the south of England, and pickled for exportation. A favorite sauce is made by pounding the pickled fish in water, simmering for a short time, adding a little cayenne pepper, and straining the whole through a hair-sieve.

ANCO'NA, a seaport of Italy, capital of the province of the same name, on the Adriatic, 130 miles n.e. of Rome, with harbor works begun by Trajan, who built the ancient mole or quay. A triumphal arch of white marble, erected in honor of Trajan, stands on the mole. The harbor, once the finest on the coast, has been recently improved; Ancona is now a station of the Italian fleet, and the commerce is increasing. The town is indifferently built, but has some remarkable edifices; among others, the cathedral. There is a colossal statue of Count Cavour. Pop. 56,825.—The province has an area of 740 square miles, and a population of 302,460.

ANDALU'SIA, a large and fertile district in the south of Spain, bounded n. by Estramadura and New Castile, e. by Murcia, s. by the Mediterranean Sea, and w. by Portugal and the Atlantic; area, about 33,650 sq. miles, including the modern provinces of Seville, Huelva, Cadiz, Jaen, Cordova, Granada, Almeria, and Malaga. It is traversed throughout its whole extent by ranges of mountains, the loftiest being the Sierra Nevada, many summits of which are covered with perpetual snow (Mulahacen is 11,678 feet). Minerals abound, and several mines have been opened by English companies, especially in the province of Huelva, where the Tharsis and Rio Tinto copper-mines are situated. The principal river is the Guadalquivir. The vine, myrtle, olive, palm, banana, carob, etc., grow abundantly in the valley of the Guadalquivir. Wheat, maize, barley, and many varieties of fruit grow almost spontaneously; besides which honey, silk, and cochineal form important articles of culture. The horses and mules are the best in the Peninsula; the bulls are sought for bull-fighting over all Spain; sheep are reared in vast numbers. Agriculture is in a backward state, and the manufactures are by no means extensive. The Andalusians are descended in part from the Moors, of whom they still preserve decided characteristics. Pop. 3,282,448.

AN'DAMANS, a chain of islands on the east side of the Bay of Bengal, the principal being the North, Middle, South, and Little Andamans. Middle Andaman is about 60 miles long, and 15 or 16 miles broad; North and South Andaman are each about 50 miles long. The inhabitants are about 10,000 in number, and are mostly in a state of nature, living almost naked in the rudest habitations. They are small, generally much less than 5 feet, well-formed, and active, skilful archers and canoeists, and excellent swimmers and divers. These islands have been used since 1858 as a penal settlement by the Indian government, the settlement being at Port Blair, on South Anadman.

ANDANTE (án-dán'tā), in music, denotes a movement somewhat slow, graceful, distinct, and soothing. The word is also applied substantively to that part of a sonata or symphony having a movement of this character.

AN'DERSEN, Hans Christian, a Danish novelist, poet, and writer of fairy tales, was born of poor parents at Odense, 2d April, 1805. In 1835 appeared the first volume of his Fairy Tales, of which successive volumes continued to be published year by year at Christmas, and which have been the most popular and wide-spread of his works. He died 4th August, 1875, having had the pleasure of seeing many of his works translated into most of the European languages.

ANDERSEN, Mary Antoinette, an American actress, born at Sacramento, Cal., in 1859, but reared in Kentucky. Educated in convents of the Roman Catholic Church, of which church she is a devout member. She made her debut as Juliet at Louisville in 1875. Her first visit to the East was made in 1877, and her success there was immediate. In 1884–5 she visited London and was well received. Her principal rôles were Rosalind in As You Like It, Julia in The Hunchback, Meg Merrilies, Perdita in Winter's Tale, Evadne, and Juliet. In 1890 she was married to Antonio Navarro de Viana and has since her marriage resided in England.

AN'DERSON, a city and railroad center, the county seat of Madison Co., Ind., 36 miles northeast of Indianapolis, on the west fork of the White River, and the Chicago and Southeastern, the Cleveland, Cincinnati, Chicago and St. Louis, and other railroads. An abundant supply of natural gas promotes the manufacturing industries, which include iron, steel, glass, wire nails, strawboards, tiles, etc. The city is the center of an extensive system of interurban electric railways. Near the city are the historic mounds of the so-called "mound builders." Pop. 23,000.

ANDERSON, Rasmus Björn, an American author and diplomat, born in Wisconsin in 1846. From 1875 to 1883 he taught Scandinavian languages and literature in the University of Wisconsin and from 1885 to 1889 was U. S. minister to Denmark. He has published several works on Scandinavian subjects.

ANDERSON, Robert, a Scotch author, born in 1750, died 1830. His principal work is a comprehensive compilation of the British poets.

ANDES (an'dēz), or, as they are called in Spanish South America, Cordilleras de los Andes, or simply Cordilleras, a range of mountains stretching along the whole of the west coast of South America, from Cape Horn to the Isthmus of Panama and the Caribbean Sea. In absolute length (4500 miles) no single chain of mountains approaches the Andes, and only a certain number of the higher peaks of the Himalayan chain rise higher above the sea-level; which peak is the highest of all is not yet settled. Several main sections of this huge chain are distinguishable. The Southern Andes present a lofty main chain, with a minor chain running parallel to it on the east, reaching from Tierra del Fuego and the Straits of Magellan, northward to about lat. 28° s., and rising in Aconcagua to a height of 22,860 feet. North of this is the double chain of the Central Andes, inclosing the wide and lofty plateaux of Bolivia and Peru, which lie at an elevation of more than 12,000 feet above the sea. The mountain system is here at its

broadest, being about 500 miles across. Here are also several very lofty peaks, as Illampu or Sorata (21,484 feet), Sahama (21,054), Illimani (21,024). Farther north the outer and inner ranges draw closer together, and in Ecuador. there is but a single system of elevated masses, generally described as forming two parallel chains. In this section are crowded together a number of lofty peaks, most of them volcanoes, either extinct or active. Of the latter class are Pichincha (15,918 feet), with a crater 2500 feet deep; Tunguragua (16,685 feet); Sangay (17,460 feet); and Cotopaxi (19,550 feet). The loftiest summit here appears to be Chimborazo (20,581 feet); others are Antisana (19,260 feet) and Cayambe (19,200 feet). Northward of this section the Andes break into three distinct ranges, the eastmost running northeastward into Venezuela, the westmost running northwestward to the Isthmus of Panama. In the central range is the volcano of Tolima (17,660 feet). The western slope of the Andes is generally exceedingly steep, the eastern much less so, the mountains sinking gradually to the plains. The whole range gives evidence of volcanic action, but it consists almost entirely of sedimentary rocks. Thus mountains may be found rising to the height of over 20,000 feet, and fossiliferous to their summits (as Illimani and Sorata or Illampu). There are about thirty volcanoes in a state of activity. The loftiest of these burning mountains seems to be Gualateiri, in Peru (21,960 feet). The heights of the others vary from 13,000 to 20,000 feet. All the districts of the Andes system have suffered severely from earthquakes, towns having been either destroyed or greatly injured by these visitations. Peaks crowned with perpetual snow are seen all along the range, and glaciers are also met with, more especially from Aconcagua southward. The passes are generally at a great height, the most important being from 10,000 to 15,000 feet. Railways have been constructed to cross the chain at a similar elevation. The Andes are extremely rich in the precious metals, gold, silver, copper, platinum, mercury, and tin all being wrought: lead and iron are also found. The llama and its congeners—the guanaco, vicuña, and alpaca—are characteristic of the Andes. Among birds, the condor is the most remarkable. The vegetation necessarily varies much according to elevation, latitude, rainfall, etc., but generally is rich and varied. Except in the south and north little rain falls on the western side of the range, and in the center there is a considerable desert area. On the east side the rainfall is heavy in the equatorial regions, but in the south is very scanty or altogether deficient. From the Andes rise two of the largest water systems of the world—the Amazon and its affluents, and the La Plata and its affluents. Besides which, in the north, from its slopes flow the Magdalena to the Caribbean Sea, and some tributaries to the Orinoco. The mountain chain pressing so close upon the Pacific Ocean, no streams of importance flow from its western slopes. The number of lakes is not great; the largest and most important is that of Titicaca on the Bolivian plateau. In the Andes are towns at a greater elevation than anywhere else in the world, the highest being the silver mining town of Cerro de Pasco (14,270 feet), the next being Potosi.

ANDIRON (and'ī-èrn), a horizontal iron bar raised on short legs, with an upright standard at one end, used to support pieces of wood when burning in an open hearth, one andiron being placed on each side of the hearth.

AN'DOVER, a town in Massachusetts, 25 miles n.n.w. of Boston, chiefly remarkable for its literary institutions—Phillip's Academy, founded in 1778; the Andover Theological Seminary, founded in 1807; and a female academy founded in 1829. Pop. 6142.

ANDRASSY (ân-drâ'shē), Count Julius, Hungarian statesman, born 1823; took part in the revolution of 1848, was condemned to death, but escaped and went into exile; appointed premier when self-government was restored to Hungary in 1867; became imperial minister for foreign affairs in 1871; retired from public life 1879; died 1890.

ANDRE (an'drā), Major John, adjutant-general in the British army during the American revolutionary war. Employed to negotiate the defection of the American general Arnold, and the delivery of the works at West Point, he

Major André.

was apprehended in disguise, September 23, 1780, within the American lines; declared a spy from the enemy, and hanged Oct. 2, 1780. His remains were taken to England in 1821 and interred in Westminster Abbey, where a monument has been erected to his memory.

AN'DREW, John Albion, governor of Massachusetts during the civil war. He was born in Maine in 1818, and became a lawyer in Boston. Having been elected governor in 1860, he perfected a state militia, so that when the war broke out Massachusetts was entirely prepared for the call. He retired in 1866, after being reelected for each succeeding term, and he died in 1867.

AN'DREW, St., brother of St. Peter, and the first disciple whom Christ chose. He is said to have preached in Scythia, in Thrace and Asia Minor, and in Achaia (Greece), and according to tradition he was crucified at Patræ, now Patras, in Achaia, on a cross of the form X. Hence such a cross is now known as a St. Andrew's cross. The Russians revere him as the apostle who brought the gospel to them; the Scots, as the patron saint of their country. The day dedicated to him is the 30th of November. The Russian order of St. Andrew, the highest of the empire, was instituted by Peter the Great in 1698. For the Scottish Knights of St. Andrew or the Thistle, see Thistle.

ANDREWS, Elisha Benjamin, an educator and present chancellor of the University of Nebraska. Born in New Hampshire, in 1844, he fought on the Union side during the civil war. He was educated at Brown University and at Newton Theological Institution, and, after teaching in numerous schools, Cornell University among them, he became president of Brown in 1889. In 1898 he resigned because of the hostility he aroused by his advocacy of free silver, and, after two years' service as superintendent of schools in Chicago, he was appointed to the chancellorship of the University of Nebraska. He is the author of several text-books.

AN'DREWS, St., an ancient city and parliamentary burgh in Fifeshire, Scotland, 31 miles northeast from Edinburgh; was erected into a royal burgh by David I. in 1140, and after having been an episcopal, became an archiepiscopal see in 1472, and was for long the ecclesiastical capital of Scotland. The cathedral, now in ruins, was begun about 1160, and took 157 years to finish. The old castle, founded about 1200, and rebuilt in the 14th century, is also an almost shapeless ruin. In it James III. was born and Cardinal Beaton assassinated, and in front of it George Wishart was burned. The University of St. Andrews, the oldest of the Scotch universities, founded in 1411, consists of the united colleges of St. Salvator and St. Leonard and the college of St. Mary, both at St. Andrews, and embraces also University College, Dundee. In 1579 the colleges of St. Salvator and St. Leonard were restricted to the teaching of arts and medicine, and that of St. Mary to theology. In 1747 the two former colleges were united by act of parliament. University College, Dundee, was founded in 1880. Pop. 7621.

AN'DREWS, William Draper, an American inventor, born in Massachusetts in 1818, died in 1896. He invented the centrifugal pump in 1844, and subsequently improved upon it, securing numerous patents, from which he derived a large revenue.

AN'DRIA, a town of South Italy, province of Bari, with a fine cathedral, founded in 1046; the church of Sant' Agostino, with a beautiful pointed Gothic portal; a college; manufactures of majolica, and a good trade. Pop. 37,192.

ANDROMACHE (an-drom'a-kē), in Greek mythology, wife of Hector, one of the most attractive female characters of Homer's Iliad. The passage describing her parting with Hector when he was setting out to his last battle is well known and much admired. Euripides and Racine have made her the chief character of tragedies.

ANDROM'EDA, in Greek mythology, daughter of the Ethiopian king Cepheus and of Cassiopeia. Cassiopeia having boasted that her daughter surpassed the

Nereids, if not Hēra (Juno) herself, in beauty, the offended goddesses prevailed on their father, Poseidōn (Neptune), to afflict the country with a horrid sea-monster, which threatened universal destruction. To appease the offended god, Andromeda was chained to a rock, but was rescued by Perseus; and after death was changed into a constellation.

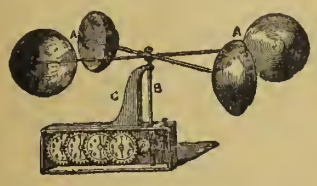
ANDRONI'CUS, the name of four emperors of Constantinople: **ANDRONICUS I.,** Comnenus, born 1110, murdered 1185.—**ANDRONICUS II.,** Palæologus, born 1258, died 1332. His reign is celebrated for the invasion of the Turks. —**ANDRONICUS III.,** Palæologus the Younger, born 1296, died 1341.—**ANDRONICUS IV.,** Palæologus, reigned in the absence of John IV. In 1373 he gave way to his brother Manuel, and died a monk.

ANDROS ISLANDS, a group of isles belonging to the Bahamas, lying southwest of New Providence, not far from the east entrance to the Gulf of Florida. The passages through them are dangerous.

AN'ECDOTE, originally some particular relative to a subject not noticed in previous works on that subject; now any particular or detached incident or fact of an interesting nature; a single passage of private life.

ANELEC'TRODE, the positive pole of a galvanic battery.

ANEMOM'ETER, an instrument for measuring the force and velocity of the wind. This force is usually measured by the pressure of the wind upon a square plate attached to one end of a



Anemometer.

spiral spring (with its axis horizontal), which yields more or less according to the force of the wind, and transmits its motion to a pencil which leaves a trace upon paper moved by clockwork. For indicating the velocity of the wind, the instrument which has yielded the best results consists of four hemispherical cups A attached to the ends of equal horizontal arms, forming a horizontal cross which turns freely about a vertical axis B, which is strengthened and supported at C. By means of an endless screw D carried by the axis a train of wheel-work is set in motion; and the indication is given by a hand which moves round a dial; or in some instruments by several hands moving round different dials like those of a gas-meter. It is found that the center of each cup moves with a velocity which is almost exactly one-third of that of the wind. There are various other forms of instruments, one of which is portable, and is especially intended for measuring the velocity of currents of air passing through mines, and the ventilating spaces of hospitals and other public buildings. The direction of the wind as indicated by a vane can also be made to leave a continuous record by various contrivances; one of the most common being a pinion carried by the shaft of a vane, and driving a rack which carries a pencil.

ANEM'ONE, wind-flower, a genus of plants belonging to the Buttercup family, containing many species, found in temperate regions.

ANEM'ONE, Sea. See Sea-anemone.

ANEROID BAROMETER. See Barometer.

AN'EURISM, the dilatation or expansion of some part of an artery. Aneurisms arise partly from the too violent motion of the blood, and partly from degenerative changes occurring in the coats of the artery diminishing their elasticity. They are therefore more frequent in the great branches; in particular, in the vicinity of the heart, in the arch of the aorta, and in the extremities, where the arteries are exposed to frequent injuries by stretching, violent bodily exertions, thrusts, falls, and contusions. An internal aneurism may burst and cause death.

ANGEL, one of those spiritual intelligences who are regarded as dwelling in heaven and employed as the ministers or agents of God. To these the name of good angels is sometimes given, to distinguish them from bad angels, who were originally created to occupy the same blissful abode, but lost it by rebellion. Scripture frequently speaks of angels, but with great reserve, Michael and Gabriel alone being mentioned by name in the canonical books, while Raphael is mentioned in the Apocrypha. The angels are represented in Scripture as in the most elevated state of intelligence, purity, and bliss, ever doing the will of God so perfectly that we can seek for nothing higher or better than to aim at being like them. There are indications of a diversity of rank and power among them, and something like angelic orders. They are represented as frequently taking part in communications made from heaven to earth, as directly and actively ministering to the good of believers, and shielding or delivering them from evils incident to their earthly lot. That every person has a good and a bad angel attendant on him was an early belief, and is held to some extent yet. Roman Catholics show a certain veneration or worship to angels, and beg their prayers and their kind offices; Protestants consider this unlawful.

ANGEL-FISH, a fish nearly allied to the sharks, very ugly and voracious, preying on other fish. It is from 6 to 8 feet long, and takes its name from its pectoral fins, which are very large, extending horizontally like wings when spread. This fish connects the rays with the sharks, but it differs from both in having its mouth placed at the extremity of the head. It is common on the south coasts of Britain, and is also called Monk-fish and Fiddle-fish.

ANGELICO (ȧn-jel'i-kō), Fra, the common appellation of Fra Giovanni da Fiesole, one of the most celebrated of the early Italian painters. Born 1387, he entered the Dominican order in 1407, and was employed by Cosmo de Medici in painting the monastery of St. Mark and the church of St. Annunziata with frescos. These pictures gained him so much celebrity that Nicholas V. invited him to Rome, to ornament his private chapel in the Vatican, and offered him the archbishopric of Florence, which was declined. He died at Rome 1455.

ANGELO (ȧn'je-lō), Michael. See Buonarotti.

AN'GELUS, in the Rom. Cath. Church, a short form of prayer in honor of the incarnation, consisting mainly of versicles and responses, the angelic salutation three times repeated, and a collect, so named from the word with which it commences, "Angelus Domini" (Angel of the Lord). Hence, also, the bell tolled in the morning, at noon, and in the evening to indicate the time when the angelus is to be recited.

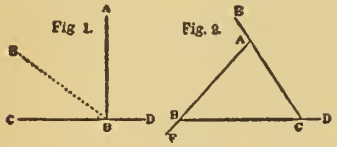
ANGER, an emotion of an aggressive, destructive, or vindictive character against the thing or person causing it. According to Bain the emotion is pleasant (except where it is introduced by too great a shock, or where the consciousness of moral obliquity counteracts the pleasantness) and develops by an expansion—both mental and physical —of the individual. As the agent of justice, the angered person acquires an amount of self-esteem, which is reflected in a tendency to muscular activity, deepened respiration, and aggressive postures. On the other hand, when anger is complicated by the emotions of fear, hatred, envy, or jealousy, or when it is baffled, it acquires a different character. It then becomes unpleasantly toned, is accompanied by choking and stuffiness, trembling and weakness, and a loss of muscular force. But even in anger which is intrinsically unpleasant, a successful termination of the attempt to injure the object of the emotion brings a moment of satisfaction and pleasure, as in the humiliation of a rival.

ANGERS (ȧn-zhā), a town and river-port of France, capital of the department of Maine-et-Loire, and formerly of the province of Anjou, on the banks of the Maine, 5½ miles from the Loire, 150 miles southwest of Paris. In the neighborhood are immense slate quarries. Pop. 82,966.

ANGINA PECTORIS (an-jī'na pek'to-ris), or **HEART-SPASM,** a disease characterized by an extremely acute constriction, felt generally in the lower part of the sternum, and extending along the whole side of the chest and into the corresponding arm, a sense of suffocation, faintness, and apprehension of approaching death: seldom experienced by any but those with organic heart-disease. The disease rarely occurs before middle age and is more frequent in men than in women. Those liable to attack must lead a quiet, temperate life, avoiding all scenes which would unduly rouse their emotions. The first attack is occasionally fatal, but usually death occurs as the result of repeated seizures. The paroxism may be relieved by opiates, or the inhalation, under due precaution, of anæsthetic vapors.

ANGLE, the point where two lines meet, or the meeting of two lines in a point. A plane rectilineal angle is

formed by two straight lines which meet each other, but are not in the same straight line; it may be considered the degree of opening or divergence of the two straight lines which thus meet each other. A right angle is an angle formed by a straight line falling on another perpendicularly, or an angle which is measured by an arc of 90 degrees. When a straight line, as A B (fig. 1), standing on another straight line C D, makes the two angles A B C and



Angle.

A B D equal to each other, each of these angles is called a right angle. An acute angle is that which is less than a right angle, as E B C. An obtuse angle is that which is greater than a right angle, as E B D. Acute and obtuse angles are both called oblique, in opposition to right angles. Exterior or external angles, the angles of any rectilineal figure without it, made by producing the sides; thus, if the sides A B, B C, C A of the triangle A B C (fig. 2) be produced to the points F D E, the angles C B F, A C D, B A E are called exterior or external angles. A solid angle is that which is made by more than two plane angles meeting in one point and not lying in the same plane, as the angle of a cube. A spherical angle is an angle on the surface of a sphere, contained between the arcs of two great circles which intersect each other.

ANGLER, also from its habits and appearance called Fishing-frog and Sea-devil, a remarkable fish often found on the British coasts. It is from 3 to 5 feet long; the head is very wide, depressed, with protuberances, and bearing long separate movable tendrils; the mouth is capacious, and armed with formidable teeth. Its voracity is extreme, and it is said to lie concealed in the mud, and attract the smaller fishes within its reach by gently waving the filamentous appendages on its head.

ANGLES, a Low German tribe who in the earliest historical period had their seats in the district about Angeln, in the duchy of Sleswig, and who in the 5th century and subsequently crossed over to Britain along with bands of Saxons and Jutes (and probably Frisians also), and colonized a great part of what from them has received the name of England, as well as a portion of the Lowlands of Scotland. The Angles formed the largest body among the Germanic settlers in Britain, and founded the three kingdoms of East Anglia, Mercia, and Northumbria.

ANGLESEY (ang'gl-sē), an island and county of North Wales, in the Irish Sea, separated from the mainland by the Menai Strait; 20 miles long and 17 miles broad; area, 193,511 acres. The Menai Strait is crossed by a magnificent suspension bridge, 580 feet between the piers and 100 feet above high-water mark, and also by the great Britannia Tubular Railway Bridge. Pop. 50,590.

ANGLICAN CHURCH, a term which strictly embraces only the Church of England and the Protestant episcopal churches in Ireland, Scotland, and the colonies, but is sometimes used to include also the episcopal churches of the United States. The doctrines of the Anglican Church are laid down in the Thirty-nine Articles, and its ritual is contained in the Book of Common Prayer. Within the body there is room for considerable latitude of belief and doctrine, and three sections are sometimes spoken of by the names of the High Church, Low Church, and Broad Church.

ANGLING, the art of catching fish with a hook or angle baited with worms, small fish, flies, etc.

ANGLOMA'NIA, the manner which affects to imitate the English. Anglomania has been common in Europe many times during the past three or four centuries. It was raging in France previously to the revolution, and has been very fashionable in Germany. In the United States Anglomania has had its exemplars from time out of mind Today, especially in Boston and New York, and in less degree in the cities of the middle west and west, an English manner and English accent are regarded as the very best form.

ANGLO-SAXONS, the name commonly given to the nation or people formed by the amalgamation of the Angles, Saxons, and Jutes, who settled in Britain in the 5th and 6th centuries after Christ, the Anglo-Saxons being simply the English people of the earlier period of English history. The tribes who were thus the ancestors of the bulk of the English-speaking nationalities came from north Germany, where they inhabited the parts about the mouths of the Elbe and Weser, and the first body of them who gained a footing in Britain are said to have landed in 449, and to have been led by Hengist and Horsa. From the preponderance of the Angles the whole country came to be called Engla-land, that is, the land of the Angles or English.

ANGO'LA, a Portuguese territory in western Africa, south of the Congo, the name being applied sometimes to the whole Portuguese territory here from about lat. 6° s. to lat. 17° s. (area, 300,000 sq. m.; pop. 2,000,000). The principal town is the seaport of St. Paul de Loanda, which was long the great Portuguese slave-mart. Exports ivory, palm-oil, coffee, hides, gum, wax, etc. Pop. 600,000.

ANGO'RA, a town in the interior of Asiatic Turkey, 215 miles e.s.e. of Constantinople. All the animals of this region are long-haired, especially the goats (see Goat), sheep, and cats. This hair forms an important export as well as the fabric called camlet here manufactured from it; other exports being goats' skins, dye-stuffs, gums, honey and wax, etc. A railway connects it with Skutari. Pop. 35,000.

ANGORA CAT, the large and long-haired white variety of the common cat, said to belong originally to Angora.

ANGORA GOAT, a variety of the common goat with long silky hair. See Goat.

ANGOSTURA BARK, the aromatic bitter medicinal bark obtained chiefly

Angostura-bark tree.

from a tree of 10 to 20 feet high, growing in the northern regions of South America. The bark is valuable as a tonic and febrifuge, and is also used for a kind of bitters.

ANGOULEME (äṇ-gō-lām), an ancient town of western France, capital of dep. Charente, on the Charente, 60 miles n.n.e. of Bordeaux, on the summit of a rocky hill. There are manufactures of paper, woolens, linens, distilleries, sugar-works, tanneries, etc. Pop. 34,647.

AN'HALT, a duchy of North Germany, lying partly in the plains of the Middle Elbe, and partly in the valleys and uplands of the Lower Harz, and almost entirely surrounded by Prussia; area, 906 sq. miles; pop. 316,027, almost all Protestants. The chief towns are Dessau, Bernburg, Köthen, and Zerbst.

AN'ILINE, a substance which has recently become of great importance, as being the basis of a number of brilliant and durable dyes. It is found in small quantities in coal tar, but the aniline of commerce is obtained from benzene or benzole, a constituent of coal-tar, consisting of hydrogen and carbon. Benzene, when acted on by nitric acid, produces nitrobenzene; and this substance again, when treated with nascent hydrogen, generally produced by the action of acetic acid upon iron-filings or scraps, produces aniline. It is a colorless oily liquid, somewhat heavier than water, with a peculiar vinous smell, and a burning taste. When acted on by arsenious acid, bichromate of potassium, stannic chloride, etc., aniline produces a great variety of compounds, many of which are possessed of very beautiful colors, and are known by the names of aniline purple, aniline green, roseine, violine, bleu de Paris, magenta, etc.

AN'ILISM, aniline poisoning, a name given to the aggregate of symptoms which often show themselves in those employed in aniline works, resulting from the inhalation of aniline vapors. It may be either acute or chronic. In a slight attack of the former kind, the lips, cheeks, and ears become of a bluish color, and the person's walk may be unsteady; in severe cases there is loss of consciousness. Chronic anilism is accompanied by derangement of the digestive organs and of the nervous

system, headaches, eruptions on the skin, muscular weakness, etc.

ANIMAL, an organized and sentient living being. Life in the earlier periods of natural history was attributed almost exclusively to animals. With the progress of science, however, it was extended to plants. In the case of the higher animals and plants there is no difficulty in assigning the individual to one of the two great kingdoms of organic nature, but in their lowest manifestations the vegetable and animal kingdoms are brought into such immediate contact that it becomes almost impossible to assign them precise limits and to say with certainty where the one begins and the other ends. From form no absolute distinction can be fixed between animals and plants. Many animals, such as the sea-shrubs, sea-mats, etc., so resemble plants in external appearance that they were, and even yet popularly are, looked upon as such. With regard to internal structure no line of demarkation can be laid down, all plants and animals being, in this respect, fundamentally similar; that is, alike composed of molecular, cellular, and fibrous tissues. Neither are the chemical characters of animal and vegetable substances more distinct. Animals contain in their tissues and fluids a larger proportion of nitrogen than plants, while plants are richer in carbonaceous compounds than the former. In some animals, moreover, substances almost exclusively confined to plants are found. Thus the outer wall of Sea-squirts contains cellulose, a substance largely found in plant-tissues; while chlorophyll, the coloring-matter of plants, occurs in Hydria and many other lower animals. Power of motion, again, though broadly distinctive of animals, cannot be said to be absolutely characteristic of them. Thus many animals, as oysters, sponges, corals, etc., in their mature condition are rooted or fixed, while the embryos of many plants, together with numerous fully developed forms, are endowed with locomotive power by means of vibratile, hair-like processes called cilia. The distinctive points between animals and plants which are most to be relied on are those derived from the nature and mode of assimilation of the food. Plants feed on inorganic matters, consisting of water, ammonia, carbonic acid, and mineral matters. They can only take in food which is presented to them in a liquid or gaseous state. The exceptions to these rules are found chiefly in the case of plants which live parasitically on other plants or on animals, in which cases the plant may be said to feed on organic matters, represented by the juices of their hosts. Animals, on the contrary, require organized matters for food. They feed either upon plants or upon other animals. But even carnivorous animals can be shown to be dependent upon plants for subsistence; since the animals upon which Carnivora prey are in their turn supported by plants. Animals, further, can subsist on solid food in addition to liquids and gases; but many animals (such as the Tapeworms) live by the mere imbibition of fluids which are absorbed by their tissues, such forms possessing no distinct digestive system. Animals require a due supply of oxygen gas for their sustenance, this gas being used in respiration. Plants, on the contrary, require carbonic acid. The animal exhales or gives out carbonic acid as the part result of its tissue-waste, while the plant taking in this gas is enabled to decompose it into its constituent carbon and oxygen. The plant retains the former for the uses of its economy, and liberates the oxygen, which is thus restored to the atmosphere for the use of the animal. Animals receive their food into the interior of their bodies, and assimilation takes place in their internal surfaces. Plants, on the other hand, receive their food into their external surfaces, and assimilation is effected in the external parts as are exemplified in the leaf-surfaces under the influence of sunlight. All animals possess a certain amount of heat or temperature which is necessary for the performance of vital action. The only classes of animals in which a constantly-elevated temperature is kept up are birds and mammals. The bodily heat of the former varies from 100° F. to 112° F., and of the latter from 96° F. to 104° F. The mean or average heat of the human body is about 99° F., and it never falls much below this in health. Below birds animals are named "cold-blooded," this term meaning in its strictly physiological sense that their temperature is usually that of the medium in which they live, and that it varies with that of the surrounding medium. "Warm-blooded" animals, on the contrary, do not exhibit such variations, but mostly retain their normal temperature in any atmosphere. The cause of the evolution of heat in the animal body is referred to the union (by a process resembling ordinary combustion) of the carbon and hydrogen of the system with the oxygen taken in from the air in the process of respiration.

ANIMAL CHEMISTRY, the department of organic chemistry which investigates the composition of the fluids and the solids of animals, and the chemical action that takes place in animal bodies. There are four elements, sometimes distinctively named organic elements, which are invariably found in living bodies, viz., carbon, hydrogen, oxygen, and nitrogen. To these may be added, as frequent constituents of the human body, sulphur, phosphorus, lime, sodium, potassium, chlorine, and iron. The four organic elements are found in all the fluids and solids of the body. Sulphur occurs in blood and in many of the secretions. Phosphorus is also common, being found in nerves, in the teeth, and in fluids. Chlorine occurs almost universally throughout the body; lime is found in bone, in the teeth, and in the secretions; iron occurs in the blood, in urine, and in bile; and sodium, like chlorine, is of almost universal occurence. Potassium occurs in muscles, in nerves, and in the blood-corpuscles. Minute quantities of copper, silicon, manganese, lead, and lithium are also found in the human body. The compounds formed in the human organism are divisible into the organic and inorganic. The most frequent of the latter is water, of which two-thirds (by weight) of the body are composed. The organic compounds may, like the foods from which they are formed, be divided into the nitrogenous and non-nitrogenous. Of the former the chief are albumen (found in blood, lymph, and chyle), casein (found in milk), myosin (in muscle), gelatin (obtained from bone), and others. The non-nitrogenous compounds are represented by organic acids, such as formic, acetic, butyric, stearic, etc.; by animal starches, sugar; and by fats and oils, as stearin and olein.

ANIMALCULE (an-i-mal'kūl), a general name given to many forms of animal life from their minute size.

ANIMAL HEAT. See Animal.

ANIMAL MAGNETISM. See Mesmerism.

ANIMALS, Cruelty to. See Cruelty.

ANIMAL WORSHIP, a practice found to prevail, or to have prevailed, in the most widely distant parts of the world, both the Old and the New, but nowhere to such an amazing extent as in ancient Egypt, notwithstanding its high civilization. Nearly all the more important animals found in the country were regarded as sacred in some part of Egypt, and the degree of reverence paid to them was such that throughout Egypt the killing of a hawk or an ibis, whether voluntary or not, was punished with death. The worship, however, was not, except in a few instances, paid to them as actual deities. The animals were merely regarded as sacred to the deities, and the worship paid to them was symbolical.

ANISE (an'is), an annual plant, a native of the Levant, and cultivated in Spain, France, Italy, Malta, etc., whence the fruit, popularly called aniseed, is imported. This fruit is ovate, with ten narrow ribs, between which are oil-vessels. It has an aromatic smell, and is largely employed to flavor liquors (aniseed or anisette), sweetmeats, etc.

ANISEED. See Anise.

ANJOU (äṅ-zhö), an ancient province of France, now forming the department of Maine-et-Loire, and parts of the departments of Indre-et-Loire, Mayenne, and Sarthe; area, about 3000 sq. miles.

ANKLE. See Foot.

ANKYLO'SIS, or **ANCHYLO'SIS,** stiffness of the joints caused by a more or less complete coalescence of the bones through ossification, often the result of inflammation or injury. False ankylosis is stiffness of a joint when the disease is not in the joint itself, but in the tendinous and muscular parts by which it is surrounded.

ANNA COMNE'NA, daughter of Alexius Comnenus I., Byzantine emperor. She was born 1083, and died 1148. After her father's death she endeavored to secure the succession to her husband, Nicephorus Briennius, but was baffled by his want of energy and ambition. She wrote (in Greek) a life of her father Alexius, which, in the midst of much fulsome panegyric, contains some valuable and interesting information. She

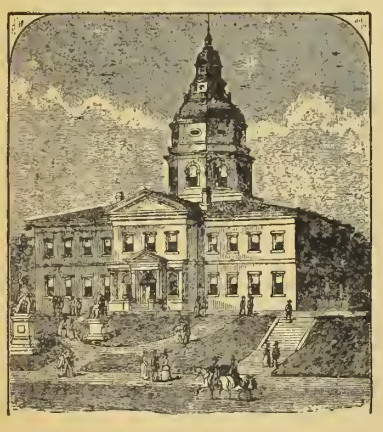
forms a character in Sir Walter Scott's Count Robert of Paris.

ANNA IVANOV'NA, Empress of Russia; born in 1693, the daughter of Ivan, the elder half-brother of Peter the Great. She was married in 1710 to the Duke of Courland, in the following year was left a widow, and in 1730 ascended the throne of the czars on the condition proposed by the senate, that she would limit the absolute power of the czars, and do nothing without the advice of the council composed of the leading members of the Russian aristocracy. But no sooner had she ascended the throne than she declared her promise null, and proclaimed herself autocrat of all the Russias. She chose as her favorite Ernest John von Biren or Biron, who was soon all-powerful in Russia, and ruled with great severity. Several of the leading nobles were executed, and many thousand men exiled to Siberia. In 1737 Anna forced the Courlanders to choose Biren as their duke, and nominated him at her death regent of the empire during the minority of Prince Ivan (of Brunswick). Anna died in 1740.

AN'NALS, a history of events in chronological order, each event being recorded under the year in which it occurred.

ANNAM'. See Anam.

ANNAP'OLIS, the capital of Maryland, on the Severn, near its mouth in Chesapeake Bay. It contains a college



State Capitol, Annapolis, Md.

(St. John's), a statehouse, and the United States naval academy. Pop. 9000.

ANN ARBOR, a town in Michigan, on the Huron river, about 40 miles west of Detroit; the seat of the state university, has flour-mills, and manufactures of woolens, iron, and agricultural implements. Pop. 16,000.

ANNE, Queen of Great Britain and Ireland, was born at Twickenham, near London, 6th February, 1664. She was the second daughter of James II., then Duke of York, and Anne, his wife, daughter of the Earl of Clarendon. After the death of William III. in 1702 she ascended the English throne. Her character was essentially weak, and she was governed first by Marlborough and his wife, and afterward by Mrs. Masham. Most of the principal events of her reign are connected with the war of the Spanish Succession. The only important acquisition that England made by it was Gibraltar, which was captured in 1704. Another very important event

Queen Anne.

of this reign was the union of England and Scotland under the name of Great Britain, which was accomplished in 1707. She seems to have long cherished the wish of securing the succession to her brother James, but this was frustrated by the internal dissensions of the cabinet. Grieved at the disappointment of her secret wishes, she fell into a state of weakness and lethargy, and died, July 20, 1714. The reign of Anne was distinguished not only by the brilliant successes of the British arms, but also on account of the number of admirable and excellent writers who flourished at this time, among whom were Pope, Swift, and Addison.

ANNE (of Austria), daughter of Philip III. of Spain, was born at Madrid in 1602, and in 1615 was married to Louis XIII. of France. Richelieu, fearing the influence of her foreign connections, did everything he could to humble her. In 1643 her husband died, and she was left regent, but placed under the control of a council. But the parliament overthrew this arrangement, and intrusted her with full sovereign rights during the minority of her son Louis XIV. She, however, brought upon herself the hatred of the nobles by her boundless confidence in Cardinal Mazarin, and was forced to flee from Paris during the wars of the Fronde. She ultimately quelled all opposition, and was able in 1661 to transmit to her son unimpaired the royal authority. She spent the remainder of her life in retirement, and died January 20, 1666.

ANNEALING (an-ēl'ing), a process to which many articles of metal and glass are subjected after making, in order to render them more tenacious, and which consists in heating them and allowing them to cool slowly. When the metals are worked by the hammer, or rolled into plates, or drawn into wire, they acquire a certain amount of brittleness, which destroys their usefulness, and has to be remedied by annealing. The tempering of steel is one kind of annealing. Annealing is particularly employed in glass-houses, and consists in putting the glass vessels, as soon as they are formed and while they are yet hot, into a furnace or oven, in which they are suffered to cool gradually. The toughness is greatly increased by cooling the articles in oil.

ANNEXA'TION, the act of a state in acquiring territory, near or remote, whether independent or belonging to another power. It has been recently decided by the Supreme Court of the United States, in the so-called insular cases (1901), that Porto Rico remained foreign territory, notwithstanding the destruction of the Spanish sovereignty and government and the occupation of the island by the military forces of the United States until the ratification of the treaty of peace with Spain in 1898, and that it was this act which extended the sovereignty of the United States over that island. Where the transfer of title is not acquiesced in by the former sovereign, there must be an effective occupation and a virtually complete destruction of the previously existing authority. But the annexation may be complete notwithstanding the active or passive opposition of the inhabitants of the territory affected.

AN'NUAL, in botany, a plant that springs from seed, grows up, produces seed, and then dies, all within a single year or season.

AN'NUAL, in literature, the name given to a class of publications which at one time enjoyed an immense yearly circulation, and were distinguished by great magnificence both of binding and illustration, which rendered them much sought after as Christmas and New Year presents. Their contents were chiefly prose tales and ballads, lyrics, and other poetry.

ANNU'ITY, a sum of money paid annually to a person, and continuing either a certain number of years, or for an uncertain period, to be determined by a particular event, as the death of the recipient or annuitant, or that of the party liable to pay the annuity; or the annuity may be perpetual. The payments are made at the end of each year, or semi-annually, or at other periods. An annuity is usually raised by the present payment of a certain sum as a consideration whereby the party making the payment, or some other person named by him, becomes entitled to an annuity, and the rules and principles by which this present value is to be computed have been the subjects of careful investigation. The present value of a perpetual annuity is evidently a sum of money that will yield an interest equal to the annuity, and payable at the same periods; and an annuity of this description, payable quarterly, will evidently be of greater value than one of the same amount payable annually, since the annuitant has the additional advantage of the interest on three of the quarterly payments until the expiration of the year. In other words, it requires a greater present capital to be put at interest to yield a given sum per annum, payable quarterly, than to yield the same annual sum payable at the end of each year The present value of an annuity for a limited period is a sum which, if put at interest, will at the end of that period give an amount equal to the sum of all the payments of the annuity and inter-

est; and, accordingly, if it be proposed to invest a certain sum of money in the purchase of an annuity for a given number of years the comparative value of the two may be precisely estimated, the rate of interest being given.

ANNUNCIATION, the declaration of the angel Gabriel to the Virgin Mary informing her that she was to become the mother of our Lord.—Annunciation or Lady Day is a feast of the R. C. church in honor of the annunciation, celebrated on the 25th of March.—There are two orders of nuns of the Annunciation, one originally French, founded in 1501 by Joanna of Valois, the other Italian, founded in 1604 by Maria Vittoria Fornari of Genoa.

AN'ODE, the positive pole of the voltaic current, being that part of the surface of a decomposing body which the electric current enters: opposed to cathode, the way by which it departs.

AN'ODYNE, a medicine, such as an opiate or narcotic, which allays pain.

ANOINTING, rubbing the body or some part of it with oil, often perfumed. From time immemorial the nations of the East have been in the habit of anointing themselves for the sake of health and beauty. The Greeks and Romans anointed themselves after the bath. Wrestlers anointed themselves in order to render it more difficult for their antagonists to get hold of them. In Egypt it seems to have been common to anoint the head of guests when they entered the house where they were to be entertained, as shown in the cut. In the Mosaic law a sacred character was attached to the anointing of the garments of the priests and things belonging to the ceremonial of worship. The Jewish priests and kings were anointed when inducted into office, and were called the anointed of the Lord, to show that their persons were sacred and their office from God. In the Old Testament

Egyptian anointing a guest.

also the prophecies respecting the Redeemer style him Messias, that is, the Anointed, which is also the meaning of his Greek name Christ. The custom of anointing still exists in the Roman Catholic Church in the ordination of priests and the confirmation of believers and the sacrament of extreme unction. The ceremony is also frequently a part of the coronation of kings.

ANOM'ALY, in astronomy, the angle which a line drawn from a planet to the sun has passed through since the planet was last at its perihelion or nearest distance to the sun. The anomalistic year is the interval between two successive times at which the earth is in perihelion, or 365 days 6 hours 13 minutes 45 seconds. In consequence of the advance of the earth's perihelion among the stars in the same direction as the earth's motion and of the precession of the equinoxes, which carries the equinoxes back in the opposite direction to the earth's motion, the anomalistic year is longer than the sidereal year, and still longer than the tropical or common year.

ANON'YMOUS, literally, "without name," applied to anything which is the work of a person whose name is unknown or who keeps his name secret. Pseudonym is a term used for an assumed name. The knowledge of the anonymous and pseudonymous literature is indispensable to the bibliographer, and large dictionaries given the titles and writers of such works have been published.

ANSO'NIA, a city in New Haven Co., Conn., 12 miles west by north of New Haven, on the Naugatuck river, and on the Berkshire and Nangatuck divisions of the New York, New Haven and Hartford Railroad. Ansonia is noted as a manufacturing center, the products including heavy machinery, rollers for paper-making and wheat-milling, copper, brass, and wire goods, electrical appliances, clocks, etc. Pop. 14,000.

ANSPACH (ăn'spăg). See Ansbach.

ANT, the common name of insects of various genera found in most temperate and tropical regions. They are small but powerful insects, and have long been noted for their remarkable intelligence and interesting habits. They live in communities regulated by definite laws, each member of the society bearing a well-defined and separate part in the work of the colony. Each community consists of males; of females much larger than the males; and of barren females, otherwise called neuters, workers, or nurses. The neuters are wingless, and the males and females only acquire wings for their "nuptial flight," after which the males perish, and the few females which escape the pursuit of their numerous enemies divest themselves of their wings, and either return to established nests, or become the foundresses of new colonies. The neuters perform all the labors of the ant-hill or abode of the community; they excavate the galleries, procure

Antananarivo.

food, and feed the larvæ or young ants, which are destitute of organs of motion. In fine weather they carefully convey them to the surface for the benefit of the sun's heat, and as attentively carry them to a place of safety either when bad weather is threatened or the ant-hill is disturbed. In like manner they watch over the safety of the nymphs or pupæ about to acquire their perfect growth. Some communities possess a special type of neuters, known as "soldiers," from the duties that specially fall upon them, and from their powerful biting jaws. There is a very considerable variety in the materials, size, and form of ant-hills, or nests, according to the peculiar nature or instinct of the species.

ANTAL'KALI, a substance which neutralizes an alkali, and is used medicinally to counteract an alkaline tendency in the system. All true acids have this power.

ANTANANARIVO (an-tan-an-a-rē'vō), the capital of Madagascar, situated in the central province of Imérina. Antananarivo is the residence of the French governor of Madagascar, and there is a strong French garrison. It has manufactures of metal work, cutlery, silk, etc. Pop. about 100,000.

ANTARCTIC (ant-ärk'tik), relating to the southern pole or to the region near it. The Antarctic Circle is a circle parallel to the equator and distant from the south pole 23° 28′, marking the area within which the sun does not set when on the tropic of Capricorn. The Antarctic Circle has been arbitrarily fixed on as the limits of the Antarctic Ocean, it being the average limit of the pack-ice; but the name is often extended to embrace a much wider area. The lands in or near the Antarctic

Circle are but imperfectly known, the work of exploration having been hitherto baffled by what seems an insurmountable ice-barrier. Sir James Ross in 1841–42, discovered Victoria Land (extending to about 79° s. lat.), with its volcanoes Erebus (12,400 ft.) and Terror (10,900 ft.). The South Shetland Islands, Enderby Land, Graham's Land, etc., have also been discovered in this ocean. Capt. Scott in 1902 reached 82° 17′ which is 532 miles from the pole.

ANT-EATER, a name given to mammals of various genera that prey chiefly on ants. The head is remarkably elongated, the jaws destitute of teeth, and the mouth furnished with a long, extensile tongue covered with glutinous saliva, by the aid of which the animals secure their insect prey. The eyes are particularly small, the ears short and round, and the legs, especially the anterior, very robust, and furnished with long, compressed, acute nails, admirably adapted for breaking into the ant-hills. The most remarkable species is the ant-bear, a native of the warmer parts of South America. It is from 4 to 5 feet in length from the tip of the muzzle to the origin of the black bushy tail, which is about two feet long. The body is covered with long hair, particularly along the neck and back. It is a harm-

Ant-bear.

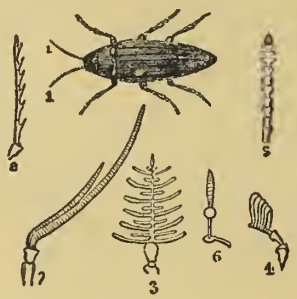
less and solitary animal, and spends most of its time in sleep. Some are adapted for climbing trees in quest of the insects on which they feed, having prehensile tails. All are natives of South America.

ANTECE'DENT, in grammar, the noun to which a relative or other pronoun refers; as, Solomon was the prince who built the temple, where the word prince is the antecedent of who.—In logic, that member of a hypothetical or conditional proposition which contains the condition, and which is introduced by if or some equivalent word or words; as, if the sun is fixed, the earth must move. Here the first and conditional proposition is the antecedent, the second the consequent.

ANTEDILU'VIAN, before the flood or deluge of Noah's time; relating to what happened before the deluge. In geology the term has been applied to organisms, traces of which are found in a fossil state in formations preceding the Diluvial, particularly to extinct animals such as the paleotherium, the mastodon, etc.

AN'TELOPE, the name given to the members of a large family of Ruminant Ungulata or Hoofed Mammalia, closely resembling the Deer in general appearance, but essentially different in nature from the latter animals. They are included with the Sheep and Oxen in the family of the Cavicornia or "Hollow-horned" Ruminants. Their horns, unlike those of the Deer, are not deciduous, but are permanent; are never branched, but are often twisted spirally, and may be borne by both sexes. They are found in greatest number and variety in Africa. Well-known species are the chamois (European), the gazelle, the addax, the eland, the koodoo, the gnu, the springbok, the sasin or Indian antelope, and the prongbuck of America.

ANTEN'NÆ, the name given to the movable jointed organs of touch and hearing attached to the heads of insects,



Antennæ.

1, 1, Filiform Antennæ of Cucujo Firefly of Brazil. 2, Denticulate Antenna; 3, Bipinnate; 4, Lamellicorn; 5, Clavate; 6, Geniculate; 7, Antenna and Antennule of Crustacean.

myriapods, etc., and commonly called horns or feelers. They present a very great variety of forms.

AN'THEM, originally a hymn sung in alternate parts; in modern usage, a sacred tune or piece of music set to words taken from the Psalms or other parts of the Scriptures, first introduced into church service in Elizabeth's reign; a developed motet. The anthem may be for one, two, or any number of voices, but seldom exceeds five parts, and may or may not have an organ accompaniment written for it.

ANTHE'MION, an ornament or ornamental series used in Greek and Roman decoration, which is derived from floral forms, more especially the honeysuckle.

Anthemion.

It was much used for the ornamentation of friezes and interiors, for the decoration of fictile vases, the borders of dresses, etc.

ANTHOL'OGY, the name given to several collections of short poems which have come down from antiquity.

AN'THONY, St., the founder of monastic institutions; born near Heraclea, in Upper Egypt, A.D. 251. Giving up all his property, he retired to the desert, where he was followed by a number of disciples, who thus formed the first community of monks. He died at the age of 105.—St. Anthony's Fire, a name given to erysipelas.

ANTHONY, Susan B., the founder of the woman suffrage movement in the United States. She was born in Massachusetts in 1820, partook in the abolitionist movement, and in 1868 founded The Revolution, a journal advocating woman's rights. She voted at the election of 1872 and was arrested and fined. She wrote several tracts and books, principally on woman's rights.

AN'THRACITE, glance or blind coal, a non-bituminous coal of a shining luster, approaching to metallic, and which burns without smoke, with a weak or no flame, and with intense heat. It consists of, on an average, 90 per cent carbon, 3 hydrogen, and 5 ashes. It has some of the properties of coke or charcoal, and, like that substance, represents an extreme metamorphism of coal under the influence of heat or of volcanic disturbance. It is found in England, Scotland, and Ireland, and in large quantities in the United States, chiefly in Pennsylvania.

AN'THRAX, a fatal disease to which cattle, horses, sheep, and other animals are subject, always associated with the presence of an extremely minute microorganism in the blood. It frequently assumes an epizootic form, and extends over large districts, affecting all classes of animals which are exposed to the exciting causes. It is also called splenic fever, and is communicable to man, appearing as carbuncle, malignant pustule, or wool-sorter's disease.

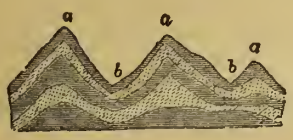
ANTHROPOL'OGY, the science of man and mankind, including the study of man's place in nature, that is, of the measure of his agreement with and divergence from other animals; of his physical structure and psychological nature, together with the extent to which these act and react on each other; and of the various tribes of men, determining how these may have been produced or modified by external conditions, and consequently taking account also of the advance or retrogression of the human race. It puts under contribution all sciences which have man for their object, as archæology, comparative anatomy, physiology, psychology, climatology, etc. See Ethnology.

ANTHROPOMOR'PHISM, the representation or conception of the Deity under a human form, or with human attributes and affections. Anthropomorphism is founded in the natural inaptitude of the human mind for conceiving spiritual things except through sensuous images, and in its consequent tendency to accept such expressions as those of Scripture when it speaks of the eye, the ear, and the hand of God, of his seeing and hearing, of his remembering and forgetting, of his making man in his own image, etc., in a too literal sense.

ANTHROPOPH'AGI, the name given to those individuals or tribes by whom human flesh is eaten: man-eaters, cannibals. The Caribs are said to have been cannibals at the time of the Spanish conquest of America, and the word "cannibal" is derived from their name.

AN'TICHRIST, a word occurring in the first and second epistles of St. John, and nowhere else in Scripture, in passages having an evident reference to a

personage real or symbolical mentioned or alluded to in various other passages both of the Old and New Testaments. In every age the church has held through all its sects some definite expectation of a formidable adversary of truth and righteousness prefigured under this name. Thus Roman Catholics have found Antichrist in heresy, and Protestants in Romanism. In one point the



a, a, a, Anticlinal line. b, b, Synclinal line.

sects have generally been agreed, namely in regarding the various intimations on this subject in the Old and New Testaments as a homogeneous declaration or warning, inspired by the spirit of prophecy, of danger to the true religion from some disaffection and revolt organized in the latter days by Satan. Most modern critics take a different view of the matter. They do not regard the various Scriptural writers who have dealt with this subject as having had any common inspiration or design. They believe that each writer from his own point of view, guided by mere human sagacity, gives expression in his predictions to his own individual apprehensions, or narrates as prediction what he already knows. It is the near political horizon which suggests the danger, or contemporary history the substance of the prophecy; thus the Antichrist of Daniel is Antiochus Epiphanes, that of St. John Nero, that of St. Paul some adversary of Christianity about to appear in the time of the Emperor Claudius.

ANTICLI'NAL LINE OR AXIS, in geology, the ridge of a wave-like curve made by a series of superimposed strata, the strata dipping from it on either side as from the ridge of a house: a synclinal line runs along the trough of such a wave.

ANTICOS'TI, an island of Canada, in the mouth of the St. Lawrence, 125 miles long by 30 miles broad. The interior is mountainous and wooded, but there is much good land, and it is well adapted for agriculture. The fisheries are valuable. The population is scanty, however.

AN'TIDOTE, a medicine to counteract the effects of poison.

ANTIETAM (an-tē'tam), a small stream in the United States which falls into the Potomac about 50 miles n.w. of Washington; scene of an indecisive battle between the Federal and Confederate armies, 17th Sept., 1862.

AN'TI-FED'ERALISTS, a certain political party in the United States. The Federalists believed in a national system of government, while the Anti-Federalists believed in a decentralized and strictly federal system of government. The Federalists had the advantages of possessing a positive program and of gaining the first two points in the conflict when the national constitution was adopted and when they committed the national government to the exercise of such extensive powers as the creation of a national bank. The Anti-Federalists were thus merely a party of political opposition to the party in power. When, however, the Federalists, in the Alien and Sedition Acts, seemed to encroach both upon the liberty of the individual and upon the jurisdiction of the States, the opposition of the Anti-Federalists became acute and their fundamental propositions were stated in the Virginia and Kentucky Resolutions. This crisis resulted in the triumph of the Anti-Federalists under the leadership of Jefferson in the election of 1800; but soon thereafter the leaders of the party began to abandon its original creed of the strict interpretation of the constitution and the narrow limitation of the powers of the national government. The first step in this direction was the purchase of Louisiana; and when finally the Federalists party was driven entirely out of existence, its characteristic principles remained effective as the chief principle of the Anti-Federalist party.

ANTIFRICTION METAL, a name given to various alloys of tin, zinc, copper, antimony, lead, etc., which oppose little resistance to motion, with great resistance to the effects of friction, so far as concerns the wearing away of the surfaces of contact.

ANTIGONE (an-tig'o-nē), in Greek mythology, the daughter of Œdipus and Jocasta, celebrated for her devotion to her father and to her brother Polynices, for burying whom against the decree of King Creon she suffered death.

ANTIGUA (an-te'ga), one of the British West Indies, the most important of the Leeward group; 28 miles long, 20 broad; area, 108 square miles. Discovered by Columbus, 1493. Its shores are high and rocky; the surface is varied and fertile. The capital, St. John, the residence of the governor of the Leeward Islands, stands on the shore of a well-sheltered harbor in the north-west part of the island. The staple articles of export are sugar, molasses, and rum. Pop. (including Barbuda), 56,175.

St. John, Antigua.

ANTILLES (an-til'ēz), another name for the West Indian Islands.

ANTIMACASS'AR, a covering for chairs, sofas, couches, etc., made of open cotton or worsted work, to preserve them from being soiled, as by the oil applied to the hair.

ANTI-MONOPOLY PARTY, a political party organized at Chicago May 14, 1884, with Benjamin F. Butler as its candidate for president. Its demands were an interstate commerce law, an income tax, free trade, and legalized labor unionism. It was afterward merged with the Greenback and Populist parties.

AN'TIMONY, a brittle metal of a bluish-white or silver-white color and a crystalline or laminated structure. It melts at 842° F., and burns with a bluish-white flame. The mineral called stibnite, or antimony-glance, is a trisulphide, and is the chief ore from which the metal is obtained. It is found in many places, including France, Spain, Hungary, Italy, Canada, Australia, and Borneo. The metal, or, as it was formerly called, the regulus of antimony, does not rust or tarnish when exposed to the air. When alloyed with other metals it hardens them, and is therefore used in the manufacture of alloys, such as Britannia-metal, type-metal, and pewter. In bells it renders the sound more clear; it renders tin more white and sonorous as well as harder, and gives to printing types more firmness and smoothness. The salts of antimony are very poisonous. The protoxide is the active base of tartar emetic and James's powder, and is justly regarded as a most valuable remedy in many diseases.—Yellow antimony is a preparation of antimony of a deep yellow color, used in enamel and porcelain painting. It is of various tints, and the brilliancy of the brighter hues is not affected by foul air.

ANTIN'OMY, the opposition of one law of rule to another law or rule; in the Kantian philosophy, that natural contradiction which results from the law of reason, when, passing the limits of experience, we seek to conceive the complex of external phenomena, or nature, as a world or cosmos.

ANTIOCH (an'ti-ok), a famous city of ancient times, the capital of the Greek kings of Syria, on the left bank of the Orontes, about 21 miles from the sea, in a beautiful and fertile plain;

founded by Seleucus Nicator in 300 B.C., and named after his father Antiochus. In Roman times it was the seat of the Syrian governors, and the center of a widely-extended commerce. It was called the "Queen of the East" and "The Beautiful." Antioch is frequently mentioned in the New Testament, and it was here that the disciples of our Savior were first called Christians (Acts xi. 26). There was another Antioch, in Pisidia, at which Paul preached on his first missionary journey.

ANTIOCHUS (an-tī'o-kus), a name of several Græco-Syrian kings of the dynasty of the Seleucidæ. **ANTIOCHUS I.,** called ("savior"), was son of Seleucus, general of Alexander the Great, and founder of the dynasty. He was born about B.C. 324. During the greater part of his reign he was engaged in a protracted struggle with the Gauls who had crossed from Europe, and by whom he was killed in battle B.C. 261.—**ANTIOCHUS II.,** surnamed Theos (god), succeeded his father, was murdered in

Medal of Antiochus Epiphanes.

B.C. 246 by Laodicē, his wife, whom he had put away to marry Berenīcē, daughter of Ptolemy.—**ANTIOCHUS III.,** surnamed the Great, grandson of the preceding, was born B.C. 242, succeeded in B.C. 223. Antiochus gained an important adviser in Hannibal, who had fled for refuge to his court; but he lost the opportunity of an invasion of Italy while the Romans were engaged in war with the Gauls, of which the Carthaginian urged him to avail himself. The Romans defeated him by sea and land, and he was finally overthrown by Scipio at Mount Sipylus, in Asia Minor, B.C. 190. He was killed while plundering a temple in Elymais to procure money to pay the Romans.—**ANTIOCHUS IV.,** called Epiphanes, youngest son of the above, is chiefly remarkable for his attempt to extirpate the Jewish religion, and to establish in its place the polytheism of the Greeks. This led to the insurrection of the Maccabees, by which the Jews ultimately recovered their independence. He died B.C. 164.

ANTIOQUIA (ân-tē-ō-kē'à), a town of S. America, in Colombia, on the river Cauca; founded in 1542. Pop. 10,000. It gives name to a department of the republic; area, 22,316 sq. miles; pop. 464,887. Capital, Medellin.

ANTIP'ATER, a general and friend of Philip of Macedon, father of Alexander the Great. On the death of Alexander, in 323 B.C., the regency of Macedonia was assigned to Antipater, who succeeded in establishing the Macedonian rule in Greece on a firm footing. He died in B.C. 317 at an advanced age.

ANTIP'ATHY, a special dislike exhibited by individuals to particular objects or persons, usually resulting from physical or nervous organization. An antipathy is often an unaccountable repugnance to what people in general regard with no particular dislike, as certain sounds, smells, articles of food, etc., and it may be manifested by fainting or extreme discomfort.

ANTIPODES (an-tip'o-dēz), the name given relatively to people or places on opposite sides of the earth, so situated that a line drawn from one to the other passes through the center of the earth and forms a true diameter. The longitudes of two such places differ by 180°. The difference in their time is about twelve hours, and their seasons are reversed.

AN'TIPOPE, the name applied to those who at different periods have produced a schism in the Roman Catholic Church by opposing the authority of the pope, under the pretense that they were themselves popes. The Roman Church cannot admit that there ever existed two popes; but the fact is, that in several cases both competitors for the papal chair (sometimes there were three or even four) were equally popes; that is to say, the claims of all were equally good. Each was frequently supported by whole nations, and the schism was nothing but the struggle of political interests.

ANTIPY'RIN, a drug obtained from coal-tar products, valuable in reducing fever and in relieving pain, being much used in nervous headache and neuralgia.

AN'TIQUARIES, those devoted to the study of ancient times through their relics, as old places of sepulcher, remains of ancient habitations, early monuments, implements or weapons, statues, coins, medals, paintings, inscriptions, books, and manuscripts, with the view of arriving at a knowledge of the relations, modes of living, habits, and general condition of the people who created or employed them. Societies or associations of antiquaries have been formed in all countries of European civilization.

ANTIQUES (an-tēks'), a term specifically applied to the remains of ancient art, as statues, paintings, vases, cameos, and the like, and more especially to the works of Grecian and Roman antiquity.

ANTI-RENTISM, a movement organized to uproot a kind of feudalism existing in certain counties in New York. It lasted from 1839 to 1847, during which time there were many evictions. The system of feudal tenures was broken up in 1846 by the insertion in the new constitution of New York of a clause abolishing all feudal tenures and limiting agricultural leases to twelve years.

ANTIRRHINUM (an-ti-rī'num), a genus of annual or perennial plants, commonly known as snapdragon, on account of the peculiarity of the blossoms, which, by pressing between the finger and thumb, may be made to open and shut like a mouth. They all produce showy flowers, and are much cultivated in gardens.

ANTI-SEMITISM, a term describing a movement in Russia, France, Austria, Germany, and other countries in Europe, by which it is sought to limit the influence of the Jews and otherwise harass them. In Germany the leaders of the movement have been among the most eminent of German scholars.

Since its organization in Germany the Anti-Semitic Party has been organized in Russia, Austria, Greece, and Holland. As the Jews in Russia are to a great extent kept out of the ordinary trades, many of them have resorted to the business of money lending, and by means of mortgages placed to secure loans they have obtained control of small landed properties. This fact, coupled with religious prejudice, caused the Anti-Semitic movement in Russia, about twenty years ago, to assume a most violent form. Laws preventing them from entering professions and from living in places other than towns and hamlets were vigorously enforced. In some cities, where a majority of the people were Jews, they were expelled without warning. The fierce persecution to which the Jews have been subjected in Russia and Roumania has caused an emigration on a vast scale to the United States.

ANTISEP'TIC, an agent by which the putrefaction of vegetable or animal matters is prevented or arrested. There are a great number of substances having this preservative property, among which are salt, alcohol, vegetable charcoal, creosote, corrosive sublimate, tannic acid, sulphurous acid, sulphuric ether, chloroform, arsenic, wood-spirit, aloes, camphor, benzine, aniline, etc. The packing of fish in ice, and the curing of herring and other fish with salt, are familiar antiseptic processes. The different antiseptics act in different ways. The term is applied in a specific manner to that mode of treatment in surgery by which air is excluded from wounds, or allowed access only through substances capable of destroying the germs in the atmosphere, on whose presence suppuration is assumed to depend.

ANTISPASMOD'IC, a medicine proper for the cure of spasms and convulsions; such belong largely to the class of ethers, as sulphuric ether, chloric ether, nitric ether, etc.

ANTISTHENES (an-tis'the-nēz), a Greek philosopher and the founder of the school of Cynics, born at Athens about B.C. 444. He was first a disciple of Gorgias and then of Socrates, at whose death he was present. His philosophy was a one-sided development of the Socratic teaching. He held virtue to consist in complete self-denial and in

Marie Antoinette.

disregard of riches, honor, or pleasure of every kind. He himself lived as a beggar. He died in Athens at an advanced age.

ANTITOX'IN, a substance secreted in the blood of animals which counteracts the effects of the toxin, or toxins (poisonous substances), produced in the animal by the germs which find their way into the body and multiply there. Natural antitoxins make the body immune to germ diseases, but although it has been impossible as yet to manufacture these substances except in the animal body, this method has been found quite efficatious in the treatment of disease. The germs of diphtheria, for example, are injected into a mule or a horse. The animal becomes infected, but recovers. On its recovery a second injection is given, and so on until further injections have no effect. The animal is then "immune." Serum taken from the body of the immunized animal is then injected into a human patient suffering with the disease, and recovery quickly follows. This art is called serum therapy, and it is believed that almost all germ diseases will eventually be conquered by it.

ANTITRINITA'RIANS, all who do not receive the doctrine of the divine Trinity, or the existence of three persons in the Godhead; especially applied to those who oppose such a doctrine on philosophical grounds, as contrasted with Unitarians, who reject the doctrine as not warranted by Scripture.

ANT-LION, the larva of an insect which in its perfect state greatly resembles a dragon-fly; curious on account of its ingenious method of catching the insects—chiefly ants—on which it feeds. It digs a funnel-shaped hole in the driest and finest sand it can find, and, when the pit is deep enough, and the sides are quite smooth and sloping, it buries itself at the bottom with only its formidable mandibles projecting, and waits till some luckless insect stumbles over the edge, when it is immediately seized, its juices sucked, and the dead body jerked from the hole.

ANTOINETTE (ân-twâ-net), Marie (Marie Antoinette Joseph Jeanne de Lorraine), Archduchess of Austria and Queen of France, the youngest daughter of the Emperor Francis I. and of Maria Theresa, was born at Vienna, 2d November, 1755; executed at Paris, 16th Oct. 1793. She was married at the age of fifteen to the Dauphin, afterward Louis XVI., but her manners were ill-suited to the French court, and she made many enemies among the highest families by her contempt for its ceremonies, which excited her ridicule. The freedom of her manners, indeed, even after she became queen, was a cause of scandal. The extraordinary affair of the diamond necklace, in which the Cardinal Louis de Rohan, the great quack Cagliostro, and a certain Countess de Lamotte were the chief actors, tarnished her name, and added force to the calumnies against her. Though it was proved in the examination which she demanded that she had never ordered the necklace, her enemies succeeded in casting a stigma on her, and the credulous people laid every public disaster to her charge. There is no doubt she had great influence over the king, and that she constantly opposed all measures of reform. The enthusiastic reception given her at the guards' ball at Versailles on 1st October, 1789, raised the general indignation to the highest pitch, and was followed in a few days by the insurrection of women, and the attack on Versailles. When practically prisoners in the Tuileries it was she who advised the flight of the royal family in June, 1791, which ended in their capture and return. On 10th August, 1792, she heard her husband's deposition pronounced by the Legislative Assembly, and accompanied him to the prison in the Temple, where she displayed the magnanimity of a heroine and the patient endurance of a martyr. In January, 1793, she parted with her husband, who had been condemned by the Convention; in August she was removed to the Conciergerie; and in October she was charged before the revolutionary tribunal with having dissipated the finances, exhausted the treasury, corresponded with the foreign enemies of France, and favored the domestic foes of the country. She defended herself with firmness, decision, and indignation; and heard the sentence of death pronounced with perfect calmness—a calmness which did not forsake her when the sentence was carried out the following morning. Her son, eight years of age, died shortly afterward, as was generally believed by poison, and her daughter was suffered to quit France, and afterward married her cousin the Duke of Angoulême.

ANTONI'NUS, Marcus Aurelius. See Aurelius.

ANTONI'NUS PIUS, Titus Aurelius Fulvus, Roman emperor, was born at Lavinium, near Rome, A.D. 86, died A.D. 161. In A.D. 120 he became consul, and he was one of the four persons of consular rank among whom Hadrian divided the supreme administration of Italy. He then went as proconsul to Asia, and after his return to Rome became more and more the object of Hadrian's confidence. In A.D. 138 he was selected by that emperor as his successor, and the same year he ascended the throne. The persecutions of the Christians he speedily abolished. He

Coin of Antoninus Pius.

carried on but a few wars. In Britain he extended the Roman dominion, and by raising a new wall put a stop to the invasions of the Picts and Scots. The senate gave him the surname Pius, that is, dutiful or showing filial affection, because to keep alive the memory of Hadrian he had built a temple in his honor. He was succeeded by Marcus Aurelius, his adopted son.

ANTO'NIUS, Marcus (Mark Antony), Roman triumvir, born 83 B.C., was connected with the family of Cæsar by his mother. Debauchery and prodigality marked his youth. To escape his creditors he went to Greece in 58, and from thence followed the consul Gabinius on a campaign in Syria as commander of the cavalry. He served in Gaul under Cæsar in 52 and 51. In 50 he returned to Rome to support the interests of Cæsar against the aristocratical party headed by Pompey, and was appointed tribune. When war broke out between Cæsar and Pompey, Antony led reinforcements to Cæsar in Greece, and in the battle of Pharsalia he commanded the left wing. He afterward returned to Rome with the appointment of master of the horse and governor of Italy (47). In B.C. 44 he became Cæsar's colleague in the consulship. Soon after Cæsar was assassinated, and Antony would have shared the same fate had not Brutus stood up in his behalf. Antony, by the reading of Cæsar's will, and by the oration which he delivered over his body, excited the people to anger and revenge, and the murderers were obliged to flee. After several quarrels and reconciliations with Octavianus, Cæsar's heir (see Augustus), Antony departed to Cisalpine Gaul, which province had been conferred upon him against the will of the senate. But Cicero thundered against him in his famous Philippics; the senate declared him a public enemy, and

intrusted the conduct of the war against him to Octavianus and the consuls Hirtius and Pansa. After a campaign of varied fortunes Antony fled with his troops over the Alps. Here he was joined by Lepidus, who commanded in Gaul, and through whose mediation Antony and Octavianus were again reconciled. It was agreed that the Roman world should be divided among the three conspirators, who were called triumvirs. Antony was to take Gaul; Lepidus, Spain; and Octavianus, Africa and Sicily. They decided upon the proscription of their mutual enemies, each giving up his friends to the others, the most celebrated of the victims being Cicero the orator. Antony and Octavianus departed in 42 for Macedonia, where the united forces of their enemies, Brutus and Cassius, formed a powerful army, which was, however, speedily defeated at Philippi. Antony next visited Athens, and thence proceeded to Asia. In Cilicia he ordered Cleopatra, queen of Egypt, to apologize for her insolent behavior to the triumviri. She appeared in person, and her charms fettered him forever. He followed her to Alexandria, where he bestowed not even a thought upon the affairs of the world, till he was aroused by a report that hostilities had commenced in Italy between his own relatives and Octavianus. A short war followed, which was decided in favor of Octavianus before the arrival of Antony in Italy. A reconciliation was effected, which was sealed by the marriage of Antony with Octavia, he sister of Octavianus. A new division of the Roman dominions was now made (in 40), by which Antony obtained the east, Octavianus the west. After his return to Asia Antony gave himself up entirely to Cleopatra, assuming the style of an Eastern despot, and so alienating many of his adherents and embittering public opinion against him at Rome. At length war was declared at Rome against the Queen of Egypt, and Antony was deprived of his consulship and government. Each party assembled its forces, and Antony lost, in the naval battle at Actium (B.C. 31), the dominion of the world. He followed Cleopatra to Alexandria, and on the arrival of Octavianus his fleet and cavalry deserted, and his infantry was defeated. Deceived by a false report which Cleopatra had disseminated of her death, he fell upon his own sword (B.C. 30).

ANTONY, Mark. See Antonius, Marcus.

AN'TRIM, a county of Ireland, province of Ulster, in the northeast of the island; area, 762,080 acres, of which about a third are arable. The eastern and nothern districts are comparatively mountainous, with tracts of heath and bog, but no part rises to a great height. The principal towns are Belfast, Ballymena, and Larne. Pop. 461,240.—The town of Antrim, at the north end of Lough Neagh, is a small place with a pop. of 1385.

ANT'WERP, the chief port of Belgium, and the capital of a province of the same name, on the Scheldt, about 50 miles from the open sea. The cathedral, with a spire 400 feet high, one of the largest and most beautiful specimens of Gothic architecture in Belgium, contains Rubens's celebrated masterpieces, the Descent from the Cross, the Elevation of the Cross, and The Assumption. The other churches of note are St. James's, St. Andrew's, and St. Paul's, all enriched with paintings by Rubens,

Antwerp cathedral, from the egg market.

Vandyck, and other masters. Antwerp is mentioned as early as the 8th century, and in the 11th and 12th it had attained a high degree of prosperity. In the 16th century it is said to have had a pop. of 200,000. The wars between the Netherlands and Spain greatly injured its commerce, which was almost ruined by the closing of the navigation of the Scheldt in accordance with the peace of Westphalia (1648). It was only in the 19th century that its prosperity revived.—Pop. 282,000. The province consists of a fertile plain 1100 sq. miles in area, and has a pop. of 825,156.

A'NUS, the opening at the lower or posterior extremity of the alimentary canal through which the excrement or waste products of digestion are expelled.

AN'VIL, an instrument on which pieces of metal are laid for the purpose of being hammered. The common smith's anvil is generally made of seven pieces; namely, the core or body; the four corners for the purpose of enlarging its base; the projecting end, which contains a square hole for the reception of a set or chisel to cut off pieces of iron; and the beak or conical end, used for turning pieces of iron into a circular form, etc. These pieces are each separately welded to the core and hammered so as to form a regular surface with the whole. When the anvil has received its due form it is faced with steel, and is then tempered in cold water. The smith's anvil is generally placed loose upon a wooden block. The anvil for heavy operations, such as the forging of ordnance and shafting, consists of a huge iron block deeply embedded, and resting on piles of masonry.

AOR'TA, in anatomy, the great artery or trunk of the arterial system, proceeding from the left ventricle of the heart, and giving origin to all the arteries except the pulmonary. It first rises toward the top of the breast-bone, when it is called the ascending aorta; then makes a great curve, called the transverse or great arch of the aorta, whence it gives off branches to the head and upper extremities; thence proceeding toward the lower extremities, under the name of the descending aorta, it gives off branches to the trunk; and finally divides into the two iliacs, which supply the pelvis and lower extremities.

APACHES (ă-pă'chez), a warlike race of Indians inhabiting the more unsettled parts of the United States adjoining Mexico, and also the north of Mexico. They live chiefly on horseback, support themselves by the chase and plunder, and they still maintain their independence and hostility to the whites.

AP'ANAGE, an allowance which the younger princes of a reigning house in some European countries receive from the revenues of the country, generally together with a grant of public domains, that they may be enabled to live in a manner becoming their rank.

APARTMENT HOUSES, houses built to accommodate a number of families each in its own set of rooms, which form a separate dwelling with an entrance of its own. The term is chiefly used in America, where such dwellings are of comparatively recent introduction. In New York, Chicago, and other American cities there are now great blocks of such houses, which provide excellent and commodious dwellings at a lower rent than if each were a separate building.

APE, a common name of a number of quadrumanous animals inhabiting the Old World (Asia and the Asiatic islands, and Africa), and including a variety of species. The word ape was formerly applied indiscriminately to all quadrumanous mammals; but it is now limited to the anthropoid or man-like monkeys. The family includes the chimpanzee, gorilla, orang-outang, etc., and has been divided into three genera, Troglodytes, Simia, and Hylobătes. See Chimpanzee, Gibbon, Gorilla, Orang, etc.

AP'ENNINES, a prolongation of the Alps, forming the "backbone of Italy." Beginning at Savona, on the Gulf of Genoa, the Apennines traverse the whole of the peninsula and also cross over into Sicily, the Strait of Messina being regarded merely as a gap in the chain. The average height of the mountains composing the range is about 4000 feet, and nowhere do they reach the limits of perpetual snow, though some summits exceed 9000 feet in height. Monte Corno, called also Gran Sasso d'Italia (Great Rock of Italy), which rises among the mountains of the Abruzzi, is the loftiest of the chain, rising to the height of 9541 feet, Monte Majella (9151) being next. Monte Gargano, which juts out into the Adriatic from the ankle of Italy, is a mountainous mass upward of 5000 feet high, completely separated from the main chain. On the Adriatic side the mountains descend more abruptly to the sea than on the western or Mediterranean side, and the streams are comparatively short and rapid. On the western side are the valleys of the Arno, Tiber, Garigliano, and Volturno, the

largest rivers that rise in the Apennines, and the only ones of importance in the peninsular portion of Italy. They consist almost entirely of limestone rocks, and are exceedingly rich in the finest marbles. On the south slopes volcanic masses are not uncommon. Mount Vesuvius, the only active volcano on the continent of Europe, is an instance. The lower slopes are well clothed with vegetation, the summits are sterile and bare.

APE'RIENT, a medicine which, in moderate doses, gently but completely opens the bowels: examples, castor-oil, Epsom salts, senna, etc.

APHA'SIA, in pathology, a symptom of certain morbid conditions of the nervous system, in which the patient loses the power of expressing ideas by means of words, or loses the appropriate use of words, the vocal organs the while remaining intact and the intelligence sound. There is sometimes an entire loss of words as connected with ideas, and sometimes only the loss of a few. In one form of the disease, called aphemia, the patient can think and write, but cannot speak; in another, called agraphia, he can think and speak, but cannot express his ideas in writing. In a great majority of cases, where post-mortem examinations have been made, morbid changes have been found in the left frontal convolution of the brain.

APHE'LION, that part of the orbit of the earth or any other planet in which it is at the point remotest from the sun.

APHO'NIA, in pathology, the greater or less impairment, or the complete loss of the power of emitting vocal sound. The slightest and less permanent forms often arise from extreme nervousness, fright, and hysteria. Slight forms of structural aphonia are of a catarrhal nature, resulting from more or less congestion and tumefaction of the mucous and submucous tissues of the larynx and adjoining parts. Severer cases are frequently occasioned by serious infiltration into the submucous tissue, with or without inflammation of the mucous membrane of the larynx and of its vicinity. The voice may also be affected in different degrees by inflammatory affections of the fauces and tonsils; by tumors in these situations; by morbid growths pressing on or implicating the larynx or trachea; by aneurisms; and most frequently by chronic laryngitis and its consequences, especially thickening, ulceration, etc.

APH'ORISM, a brief, sententious saying, in which a comprehensive meaning is involved, as "Familiarity breeds contempt"; "Necessity has no law."

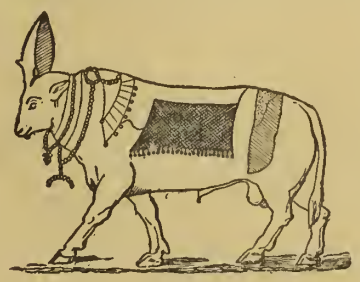
APHRODITE (af-ro-dī'tē), the goddess of love among the Greeks; usually regarded as equivalent to the Roman Venus. A festival called Aphrodisia was celebrated to her in various parts of Greece, but especially in Cyprus. See Venus.

APHTHÆ (af'thē), a disease occurring especially in infants, but occasionally seen in old persons, and consisting of small white ulcers upon the tongue, gums, inside of the lips, and palate, resembling particles of curdled milk: commonly called thrush or milk-thrush.

A'PIA, the chief place and trading center of the Samoa Islands, on the north side of the island of Upolu.

A'PIOS, a genus of leguminous climbing plants producing edible tubers on underground shoots. An American species has been used as a substitute for the potato, but its tubers, though numerous, are small.

A'PIS, a bull to which divine honors were paid by the ancient Egyptians, who regarded him as a symbol of Osiris. At Memphis he had a splendid residence, containing extensive walks and courts



Apis.

for his entertainment, and he was waited upon by a large train of priests, who looked upon his every movement as oracular. He was not suffered to live beyond twenty-five years, being secretly killed by the priests and thrown into a sacred well. Another bull, characterized by certain marks, as a black color, a triangle of white on the forehead, a white crescent-shaped spot on the right side, etc., was selected in his place. His birthday was annually celebrated, and his death was a season of public mourning.

A'PIUM, a genus of umbelliferous plants, including celery.

APLANAT'IC, in optics, a term specifically applied to reflectors, lenses, and combinations of them, capable of transmitting light without spherical aberration. An aplanatic lens is a lens constructed of different media to correct the effects of the unequal refrangibility of the different rays.

APOC'ALYPSE, the name frequently given to the last book of the New Testament, in the English version called The Revelation of St. John the Divine. It is generally believed that the Apocalypse was written by the apostle John in his old age (95–97 A.D.) in the Isle of Patmos, whither he had been banished by the Roman Emperor Domitian. Anciently its genuineness was maintained by Justin Martyr, Irenæus, Clement of Alexandria, Tertullian, and many others; while it was doubted by Dionysius of Alexandria, Cyril of Jerusalem, Chrysostom, and, nearer our own times, by Luther and a majority of the eminent German commentators. The Apocalypse has been explained differently by almost every writer who has ventured to interpret it, and has furnished all sorts of sects and fanatics with quotations to support their creeds or pretensions. The modern interpreters may be divided into three schools —namely, the historical school, who hold that the prophecy embraces the whole history of the church and its foes from the time of its writing to the end of the world; the Præterists, who hold that the whole or nearly the whole of the prophecy has been already fulfilled, and that it refers chiefly to the triumph of Christianity over Paganism and Judaism; and the Futurists, who throw the whole prophecy, except the first three chapters, forward upon a time not yet reached by the church—a period of no very long duration, which is immediately to precede Christ's second coming.

APOCALYPTIC NUMBER, the mystic number 666 found in Rev. xiii. 18. As early as the 2d century ecclesiastical writers found that the name Antichrist was indicated by the Greek characters expressive of this number. By Irenæus the word Lateinos was found in the letters of the number, and the Roman empire was therefore considered to be Antichrist. Protestants generally believe it has reference to the Papacy, and, on the other hand, Catholics connect it with Protestantism.

APOCAR'POUS, in botany, a term applied to such fruits as are the produce of a single flower, and are formed of one carpel, or a number of carpels free and separate from each other.

APOC'RYPHA, a term applied in the earliest churches to various sacred or professedly inspired writings, sometimes given to those whose authors were unknown, sometimes to those with a hidden meaning, and sometimes to those considered objectionable. The term is specially applied to the fourteen undermentioned books which were written during the two centuries preceding the birth of Christ: the first and second Books of Esdras, Tobit, Judith, the rest of the Book of Esther, the Wisdom of Solomon, the Wisdom of Jesus the son of Sirach, or Ecclesiasticus, Baruch the Prophet, the Song of the Three Children, Susanna and the Elders, Bel and the Dragon, the Prayer of Manasses, and the first and second Books of Maccabees.

AP'OGEE (-jē), that point in the orbit of the moon or a planet where it is at its greatest distance from the earth; properly this particular part of the moon's orbit.

APOLLINA'RIS WATER, a natural aërated water, belonging to the class of acidulated soda waters, and derived from the Apollinarisbrunnen, a spring in the valley of the Ahr, near the Rhine, in Rhenish Prussia, forming a highly esteemed beverage.

APOL'LO, son of Zeus (Jupiter) and Leto (Latona), who, being persecuted by the jealousy of Hera (Juno), after tedious wanderings and nine days' labor, was delivered of him and his twin sister, Artémis (Diana), on the island of Delos. Skilled in the use of the bow, he slew the serpent Python on the fifth day after his birth; afterward, with his sister Artémis, he killed the children of Niobē. He aided Zeus in the war with the Titans and the giants. He destroyed the Cyclopes, because they forged the thunderbolts with which Zeus killed his son and favorite Asklepios (Æsculapius). According to some traditions he invented the lyre, though this is generally ascribed to Hermes (Mercury). Apollo was originally the sun-god; and

though in Homer he appears distinct from Helios (the sun), yet his real nature is hinted at even here by the epithet Phœbus, that is, the radiant or beaming. In later times the view was almost universal that Apollo and Helios were identical. From being the god of light and purity in a physical sense he

Apollo, from a bas-relief at Rome.

gradually became the god of moral and spiritual light and purity, the source of all intellectual, social, and political progress. He thus came to be regarded as the god of song and prophecy, the god that wards off and heals bodily suffering and disease, the instigator and guardian of civil and political order, and the founder of cities. His worship was introduced at Rome at an early period, probably in the time of the Tarquins. Among the ancient statues of Apollo that have come down to us, the most remarkable is the one called the Apollo Belvidere, from the Belvidere Gallery in the Vatican at Rome. This statue was found in the ruins of Antium in 1503, and was purchased by Pope Julian II. It is now supposed to be a copy of a Greek statue of the third century B.C., and dates probably from the reign of Nero.

APOLOGUE (ap'o-log), a story or relation of fictitious events intended to convey some useful truths It differs from a parable in that the latter is drawn from events that pass among mankind, whereas the apologue may be founded on supposed actions of brutes or inanimate things. Æsop's fables are good examples of apologues.

APOL'OGY, a term at one time applied to a defense of one who is accused, or of certain doctrines called in question. Of this nature are the Apologies of Socrates, attributed respectively to Plato and Xenophon. The name passed over to Christian authors, who gave the name of apologies to the writings which were designed to defend Christianity against the attacks and accusations of its enemies, particularly the pagan philosophers, and to justify its professors before the emperors. Of this sort were those by Justin Martyr, Athenagoras, Tertullian, Tatian, and others.

APOPHTHEGM (ap'o-them), a short pithy sentence or maxim. Julius Cæsar wrote a collection of them, and we have a collection by Lord Bacon.

AP'OPLEXY, abolition or sudden diminution of sensation and voluntary motion, from suspension of the functions of the cerebrum, resulting from congestion or rupture of the blood-vessels of the brain and resulting pressure on this organ. In a complete apoplexy the person falls suddenly, is unable to move his limbs or to speak, gives no proof of seeing, hearing, or feeling, and the breathing is stertorous or snoring, like that of a person in deep sleep. The premonitory symptoms of this dangerous disease are drowsiness, giddiness, dulness of hearing, frequent yawning, disordered vision, noise in the ears, vertigo, etc. It is most frequent between the ages of fifty and seventy. A large head, short neck, full chest, sanguine and plethoric constitution, and corpulency are generally considered signs of predisposition to it; but the state of the heart's action, with a plethoric condition of the vascular system, has a more marked influence. Out of 63 cases carefully investigated only 10 were fat and plethoric, 23 being thin, and the rest of ordinary habit. Among the common predisposing causes are long and intense thought, continued anxiety, habitual indulgence of the temper and passions, sedentary and luxurious living, sexual indulgence, intoxication, etc. More or less complete recovery from a first and second attack is common, but a third is almost invariably fatal.

APOS'TASY, a renunciation of opinions or practices and the adoption of contrary ones, usually applied to renunciation of religious opinions. It is always an expression of reproach. What one party calls apostasy is termed by the other conversion. Catholics, also, call those persons apostates who forsake a religious order or renounce their religious vows without a lawful dispensation.

A POSTERIO'RI. See A priori.

APOS'TLES, the twelve men whom Jesus selected to attend him during his ministry, and to promulgate his religion. Their names were as follows: Simon Peter, and Andrew his brother; James, and John his brother, sons of Zebedee; Philip; Bartholomew; Thomas; Matthew; James, the son of Alpheus; Lebbeus his brother, called Judas or Jude; Simon, the Canaanite; and Judas Iscariot. To these were subsequently added Matthias (chosen by lot in place of Judas Iscariot) and Paul. The Bible gives the name of apostle to Barnabas also, who accompanied Paul on his missions (Acts xiv. 14). In a wider sense those preachers who first taught Christianity in heathen countries are sometimes termed apostles; for example, St. Denis, the apostle of the Gauls; St. Boniface, the apostle of Germany; St. Augustin, the apostle of England; Francis Xavier, the apostle of the Indies; Adalbert of Prague, apostle of Prussia Proper. During the life of the Savior the apostles more than once showed a misunderstanding of the object of his mission, and during his sufferings evinced little courage and firmness of friendship for their great and benevolent Teacher. After his death they received the Holy Ghost on the day of Pentecost, that they might be enabled to fulfil the important duties for which they had been chosen. Their subsequent history is only imperfectly known. According to one interpretation of Matthew xvi. 18 Christ seems to appoint St Peter the first of the apostles; and the pope claims supreme authority from the power which Christ thus gave to St. Peter, of whom all the popes, according to the Catholic dogma, are successors in an uninterrupted line.

APOSTLES' CREED, a well-known formula or declaration of Christian belief, formerly believed to be the work of the apostles themselves, but it can only he traced to the 4th century. See Creed.

APOS'TROPHE, a rhetorical figure by which the orator changes the course of his speech, and makes a short impassioned address to one absent as if he were present, or to things without life and sense as if they had life and sense. The same term is also applied to a comma when used to contract a word, or to mark the possessive case, as in "John's book."

APOTH'ECARY, in a general sense, one who keeps a shop or laboratory for preparing, compounding, and vending medicines, and for the making up of medical prescriptions.

APOTHEO'SIS, a solemnity among the ancients by which a mortal was raised to the rank of the gods.

APPALACHIAN MOUNTAINS (ap-pa-lā'chi-an), also called Alleghanies, a vast mountain range in N. America extending for 1300 miles from Cape Gaspé, on the Gulf of St. Lawrence, s.w. to Alabama. The system has been divided into three great sections: the northern (including the Adirondacks, the Green Mountains, the White Mountains, etc.), from Cape Gaspé to New York; the central (including a large portion of the Blue Ridge, the Alleghanies proper, and numerous lesser ranges), from New York to the valley of the New River; and the southern (including the continuation of the Blue Ridge, the Black Mountains, the Smoky Mountains, etc.), from the New River southward. The chain consists of several ranges generally parallel to each other, the altitude of the individual mountains increasing on approaching the south. The highest peaks rise over 6600 feet (not one at all approaching the snow-level), but the mean height is about 2500 feet. Lake Champlain is the only lake of great importance in the system, but numerous rivers of considerable size take their rise here. Magnetite, hematite, and other iron ores occur in great abundance, and the coal-measures are among the most extensive in the world. Gold, silver, lead, and copper are also found, but not in paying quantities, while marble, limestone, fire-clay, gypsum, and salt abound. The forests covering many of the ranges yield large quantities of valuable timber, such as sugar-maple, white birch, beech, ash, oak, cherry tree, white poplar, white and yellow pine, etc., while they form the haunts of large numbers of bears, panthers, wild cats, and wolves.

APPANAGE. See *Apanage.*

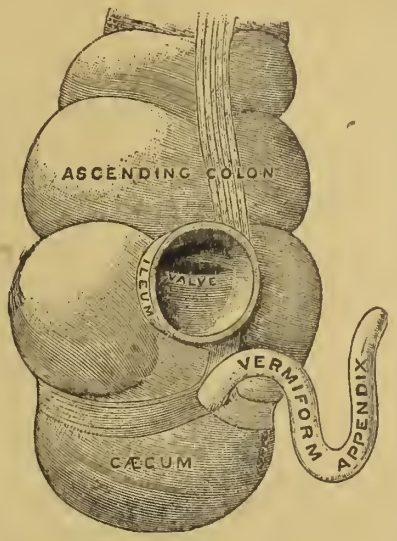
APPAR'ENT, among mathematicians and astronomers, applied to things as

they appear to the eye, in distinction from what they really are. Thus they speak of apparent motion, magnitude, distance, height, etc. The apparent magnitude of a heavenly body is the angle subtended at the spectator's eye by the diameter of that body, and this, of course, depends on the distance as well as the real magnitude of the body; apparent motion is the motion a body seems to have in consequence of our own motion, as the motion of the sun from east to west, etc.

APPARI'TION, according to a belief held by some, a disembodied spirit manifesting itself to mortal sight; according to the common theory an illusion involuntarily generated, by means of which figures or forms, not present to the actual sense, are nevertheless depictured with a vividness and intensity sufficient to create a temporary belief of their reality. Such illusions are now generally held to result from an overexcited brain, a strong imagination, or some bodily malady. In perfect health the mind not only possesses a control over its powers, but the impressions of the external objects alone occupy its attention, and the play of imagination is consequently checked, except in sleep, when its operations are relatively more feeble and faint. But in the unhealthy state of the mind, when its attention is partly withdrawn from the contemplation of external objects, the impressions of its own creation, or rather reproduction, will either overpower or combine themselves with the impressions of external objects, and thus generate illusions which in the one case appear alone, while in the other they are seen projected among those external objects to which the eyeball is directed. This theory explains satisfactorily a large majority of the stories of apparitions; still there are some which it seems insufficient to account for. In recent times, though the belief in ghosts of the old and orthodox class may be said to have almost died out, a new and kindred faith has arisen, that of Spiritualism.

APPEAL', in legal phraseology, the removal of a cause from an inferior tribunal to a superior, in order that the latter may revise, and if it seem needful reverse or amend, the decision of the former.

APPENDICI'TIS, an inflammation of the vermiform appendix. The V. appendix is found in all except a very few mammals, and varies in size from a mere rudiment to a large and very useful part of the intestine. It is smallest in flesh-eating animals, and in man is from three to six inches long, with a diameter about that of an ordinary lead pencil or less. It comes off the cæcum, or blind gut, of the large intestine and, in man, has no function whatsoever. As it opens upon the intestine, it sometimes receives foreign substances, including bacteria, the irritation from which sets up inflammation which is often followed by suppuration and perforation, necessitating an operation by which it is removed. Appendicectomy (the operation) is now commonplace and safe. Typical symptoms of appendicitis are pain in the region (right side of the abdomen below the navel), fever, constipation, and pain on pressure. These four symptoms usually accompany the disease. Early operation has saved thousands of lives which otherwise would have been lost through inflammation of the appendix.



Large intestine, showing the appendix.

Autopsies show that two-thirds of the human race are afflicted with appendicitis. The disease is comparatively rare in persons past middle life.

AP'PETITE, in its widest sense, means the natural desire for gratification, either of the body or the mind; but is generally applied to the recurrent and intermittent desire for food. A healthy appetite is favored by work, exercise, plain living, and cheerfulness; absence of this feeling, or defective appetite, indicates diseased action of the stomach, or of the nervous system or circulation, or it may result from vicious habits. Depraved appetite, or a desire for unnatural food, as chalk, ashes, dirt, soap, etc., depends often in the case of children on vicious tastes or habits; in grown up persons it may be symptomatic of dyspepsia, pregnancy, or chlorosis. Insatiable or canine appetite or voracity when it occurs in childhood is generally symptomatic of worms; in adults common causes are pregnancy, vicious habits, and indigestion caused by stomach complaints or gluttony, when the gnawing pains of disease are mistaken for hunger.

Construction of the Appian Way.

APPIAN WAY, the oldest and most renowned Roman road, was constructed during the censorship of Appius Claudius Cæcus (B.C. 313-310). It was built with large square stones on a raised platform, and was made direct from the gates of Rome to Capua, in Campania. It was afterward extended through Samnium and Apulia to Brundusium, the modern Brindisi. It was partially restored by Pius VI., and in 1850-53 it was excavated by order of Pius IX. as far as the eleventh milestone from Rome.

APPIUS CLAUDIUS, surnamed Cæcus, or the blind, an ancient Roman, elected censor B.C. 312, which office he held four years. While in this position he made every effort to weaken the power of the plebs, and constructed the road and aqueduct named after him. He was subsequently twice consul, and once dictator. In his old age he became blind, but in B.C. 280 he made a famous speech in which he induced the senate to reject the terms of peace fixed by Pyrrhus. He is the earliest Roman writer of prose and verse whose name we know.

APPIUS CLAUDIUS CRASSUS, one of the Roman decemvirs, appointed B.C. 451 to draw up a new code of laws. He and his colleagues plotted to retain their power permanently, and at the expiry of their year of office refused to give up their authority. The people were incensed against them, and the following circumstances led to their overthrow. Appius Claudius had conceived an evil passion for Virginia, the daughter of Lucius Virginius, then absent with the army in the war with the Æqui and Sabines. At the instigation of Appius, Marcus Claudius, one of his clients, claimed Virginia as the daughter of one of his own female slaves, and the decemvir, acting as judge, decided that in the meantime she should remain in the custody of the claimant. Virginius, hastily summoned from the army, appeared with his daughter next day in the forum, and appealed to the people; but Appius Claudius again adjudged her to Marcus Claudius. Unable to rescue his daughter, the unhappy father stabbed her to the heart. The decemvirs were deposed by the indignant people B.C. 449, and Appius Claudius died in prison or was strangled.

APPLE, the fruit of a well-known tree of the nat. order Rosaceæ, or the tree itself. The apple belongs to the temperate regions of the globe, over which it is almost universally spread and cultivated. The tree attains a moderate height, with spreading branches; the leaf is ovate; and the flowers are produced from the wood of the former year, but more generally from very short shoots or spurs from wood of two years' growth. The original of all the varieties of the cultivated apple is the wild crab, which has a small and extremely sour fruit, and is a native of most of the countries of Europe. The apple was probably introduced into Britain by the Romans. To the facility of multiplying varieties by grafting is to be ascribed the amazing extension of the sorts of apples. Many of the more marked varieties are known by general names, as pippins, codlins, rennets, etc. Apples for the table are characterized by a firm juicy pulp, a sweetish acid flavor, regular form, and beautiful

coloring; those for cooking by the property of forming by the aid of heat into a pulpy mass of equal consistency, as also by their large size and keeping properties; apples for cider must have a considerable degree of astringency, with richness of juice. The propagation of apple-trees is accomplished by seeds, cuttings, suckers, layers, budding, or grafting, the last being almost the universal practice. The tree thrives best in a rich deep loam or marshy clay, but will thrive in any soil provided it is not too wet or too dry. The wood of the apple-tree or the common crab is hard, close-grained, and often richly colored, and is suitable for turning and cabinet work. The fermented juice of the crab is employed in cookery and medicine.

APPLE OF DISCORD, according to the story in the Greek mythology, the golden apple thrown into an assembly of the gods by the goddess of discord (Eris), bearing the inscription "for the fairest." Aphrodītē (Venus), Hera (Juno), and Pallas (Minerva) became competitors for it, and its adjudication to the first by Paris so inflamed the jealousy and hatred of Hera to all of the Trojan race (to which Paris belonged)

Apricot.

that she did not cease her machinations till Troy was destroyed.

APPLE OF SODOM, a fruit described by old writers as externally of fair appearance, but turning to ashes when plucked; probably the fruit of Solānum sodomēum.

AP'PLETON, a city and the county seat of Outagamie Co., Wis., 100 miles n.w. of Milwaukee, on the Chicago and Northwestern, and Chicago, Milwaukee, and St. Paul railroads. It is situated on the falls of the Fox river, which by a series of dams is navigable for steamboats, and, with a fall of about fifty feet, supplies extensive water power for various manufactures, of which paper is the most important. Pop. 17,185.

APPOGGIATURA (ăp-poj-ă-tō'rà), in music, a small additional note of embellishment preceding the note to which it is attached, and taking away from the principal note a portion of its time.

APPOINT'MENT, a term in English law signifying the exercise of some power, reserved in a conveyance or settlement, of burdening, selling, or otherwise disposing of the lands or property conveyed. Such a reserved power is termed a power of appointment.

APPOMAT'TOX COURT-HOUSE, a village in Virginia, 20 miles e. of Lynchburg. Here, on 9th April, 1865, Gen. Lee surrendered to Gen. Grant, and thus virtually concluded the civil war.

APPOR'TIONMENT, the process by which congress, after each census, fixes the number of representatives to which the various states of the union are entitled. The first apportionment was fixed by the constitution, every 30,000 population being entitled to a representative. The number grew with each decade until now, with 45 states in the union, instead of 13, each constituency has 193,175 population, with a total of 386 representatives.

APPOSI'TION, in grammar, the relation in which one or more nouns or substantive phrases or clauses stand to a noun or pronoun, which they explain or characterize without being predicated of it, and with which they agree in case; as Cicero, the orator, lived in the first century before Christ; the opinion, that a severe winter is generally followed by a good summer, is a vulgar error.

APPRAIS'ER, a person employed to value property, and duly licensed to do so by license taken out every year. The valuation must be duly set down in writing, and there is a certain fixed scale of charges for the appraiser's services.

APPREHEN'SION, the seizing of a person as a criminal whether taken in the act or on suspicion, and with or without a warrant, a warrant being necessary when the person apprehending is not present at the commission of the offense. See Arrest.

APPREN'TICE, one bound by indenture to serve some particular individual or company of individuals for a specified time, in order to be instructed in some art, science, or trade.

APPROPRIA'TION, the act of designating a certain sum of money, or of other property, for a specific use, as an appropriation for the army, navy, police, etc. In the United States the constitution provides that "no money shall be drawn from the treasury but in consequence of appropriations made by law."

APPROXIMA'TION, a term used in mathematics to signify a continual approach to a quantity required, when no process is known for arriving at it exactly. Although, by such an approximation, the exact value of a quantity cannot be discovered, yet, in practice, it may be found sufficiently correct; thus the diagonal of a square, whose sides are represented by unity, is $\sqrt{2}$, the exact value of which quantity cannot be obtained; but its approximate value may be substituted in the nicest calculations.

A'PRICOT, a fruit of the plum genus which was introduced into Europe from Asia more than three centuries before Christ, and into England in the first half of the 16th century. It is a native of Armenia and other parts of Asia and also of Africa. The apricot is a low tree, of rather crooked growth, with somewhat heart-shaped leaves and sessile flowers. The fruit is sweet, more or less juicy, of a yellowish color, about the size of the peach, and resembling it in delicacy of flavor. The wood is coarsely grained and soft. Apricot-trees are chiefly raised aganist walls, and are propagated by budding and grafting.

APRIES (ā'pri-ēz), Pharaoh-Hophra of Scripture, the eighth king of the twenty-sixth Egyptian dynasty. He succeeded his father Psamuthius in 590 or 588 B.C. The Jews under Zedekiah revolted against their Babylonian oppressors and allied themselves with Apries, who was, however, unable to raise the siege of Jerusalem, which was taken by Nebuchadnezzar. A still more unfortunate expedition against Cyrene brought about revolt in his army, in endeavoring to suppress which Apries was defeated and slain about B.C. 569.

A'PRIL, the fourth month of the year. The strange custom of making fools on the 1st of April by sending people upon errands and expeditions which end in disappointment, and raise a laugh at the expense of the person sent, has been connected with the miracle plays of the middle ages, in which the Savior was represented as having been sent, at this period of the year, from Annas to Caiaphas and from Pilate to Herod.

A PRIO'RI ("from what goes before"), a phrase applied to a mode of reasoning by which we proceed from general principles or notions to particular cases, as opposed to a posteriori

Apteryx.

("from what comes after") reasoning, by which we proceed from knowledge previously acquired. Mathematical proofs are of the a priori kind; the conclusions of experimental science are a posteriori. It is also a term applied to knowledge independent of all experience.

AP'SIS, pl. **AP'SIDES** or **APSI'DES,** in astron. one of the two points of the orbit of a heavenly body situated at the extremities of the major axis of the ellipse formed by the orbit, one of the points being that at which the body is at its greatest and the other that at which it is at its least distance from its primary. In regard to the earth and the other planets, these two points correspond to the aphelion and perihelion; and in regard to the moon they correspond to the apogee and perigee. The line of the apsides has a slow forward angular motion in the plane of the planet's orbit, being retrograde only in Venus. This in the earth's orbit produces the anomalistic year. See Anomaly.

AP'TERYX, a nearly extinct genus of cursorial birds, distinguished from the

ostriches by having three toes with a rudimentary hallux, which forms a spur. They are natives of the South Island of New Zealand; are totally wingless and tailless, with feathers resembling hairs; about the size of a small goose; with long beak some- thing like that of a curlew. They are entirely nocturnal, feeding on insects, worms, and seeds.

APULEIUS, or **APPULEIUS** (ap-ū-lē'us), author of the celebrated satirical romance in Latin called the Golden Ass, born at Madaura, in Numidia, in the early part of the 2d century A.D.; the time of his death unknown.

APU'LIA, a department or division in the southeast of Italy, on the Adriatic, composed of the provinces of Foggia, Bari, and Lecce; area, 8539 sq. miles; pop. 1,949,423.

A'QUA, a word much used in pharmacy and old chemistry.—Aqua fortis (=strong water), a weak and impure nitric acid. It has the power of eating into steel and copper, and hence is used by engravers, etchers, etc.—Aqua marina, a fine varicty of beryl. See Aquamarine.—Aqua regia, or aqua regalis (= royal water), a mixture of nitric and hydrochloric acids, with the power of dissolving gold and other noble metals.—Aqua Tofana, a poisonous fluid made about the middle of the 17th century by an Italian woman Tofana or Toffania, who is said to have procured the death of no fewer than 600 individuals by means of it. It consisted chiefly, it is supposed, of a solution of crystallized arsenic. — Aqua vitæ (= water of life), or simply aqua, a name familiarly applied to the whisky of Scotland, corresponding in meaning with the usquebaugh of Ireland, the eau de vie (brandy) of the French.

AQUA FORTIS. See above article.

A'QUAMARINE', a name given to some of the finest varieties of beryl of a sea-green or blue color. Varieties of topaz are also so called.

AQUA'RIUM, a vessel or series of vessels constructed wholly or partly of glass and containing salt or fresh water in which are kept living specimens of marine or fresh-water animals along with aquatic plants.

AQUARIUS, the Water-bearer; a sign in the zodiac which the sun enters about the 21st of January: so called from the rains which prevail at that season in Italy and the East.

AQUATINT, a method of etching on copper by which a beautiful effect is produced, resembling a fine drawing in sepia or Indian ink. The special character of the effect is the result of sprinkling finely powdered resin or mastic over the plate, and causing this to adhere by heat, the design being previously etched, or being now traced out. The nitric acid (aqua fortis) acts only in the interstices between the particles of resin or mastic, thus giving a slightly granular appearance.

A'QUEDUCT, an artificial channel or conduit for the conveyance of water from one place to another: more particularly applied to structures for conveying water from distant sources for the supply of large cities. Aqueducts were extensively used by the Romans and, many of them still remain in different places on the Continent of Europe, some being still in use. The Pont du Gard in the south of France, 14 miles from Nîsmes, is still nearly perfect, and is a grand monument of the Roman occupation of this country. The ancient aqueducts were constructed of stone or brick, sometimes tunneled through hills, and carried over valleys and rivers on arches. The Pont du Gard is built of great blocks of stone; its height is 160 feet; length of the highest arcade, 882 feet. The aqueduct at Segovia, originally built by the Romans, has in some parts two tiers of arcades 100 feet high, is 2921 feet in length, and is one of the most admired works of antiquity. One of the most remarkable aqueducts of modern times is that constructed by Louis XIV. for conveying the waters of the Eure to Versailles. The extensive application of metal pipes has rendered the construction of aqueducts of the old type unnecessary; but what may be called aqueduct bridges are still frequently constructed in connection with water-works for the supply of towns, and where canals exist canal aqueducts are common, since the water in a canal must be kept on a perfect level. In the United States there are some important aqueducts, as the Croton, about 40½ miles long, bringing water to New York.

A'QUEOUS HUMOR, the limpid watery fluid which fills the space between the cornea and the crystalline lens in the eye.

AQUEOUS ROCKS, mechanically formed rocks, composed of matter deposited by water. Called also sedimentary or stratified rocks. See Geology.

AQUIFOLIA'CEÆ, a nat. order of plants; the holly tribe. The species consist of trees and shrubs, and the order includes the common holly and the Paraguayan tea tree.

AQUILA (ăk'wē-lă), a town in Italy, capital of the province of Aquila, 55 miles northeast of Rome. Pop. 14,720. —The province has an area of 2509 sq. miles, a population of 371,332.

AQUINAS (a-kwī'nas), St. Thomas, a celebrated scholastic divine, born about 1227, died in 1274; descended from the counts of Aquino, in the Kingdom of the Two Sicilies. He was educated at the Benedictine monastery of Monte Casino, and at the University of Naples, where he studied for six years. In 1257 he received the degree of doctor from the Sorbonne, and began to lecture on theology, rapidly acquiring the highest reputation. In 1263 he had been offered the archbishopric of Naples by Clement IV., but refused the offer. He died on his way to Lyons to attend a general council for the purpose of uniting the Greek and Latin Churches.

ARABESQUE (ar'a-besk), a species of ornamentation for enriching flat surfaces, often consisting of fanciful figures, human or animal, combined with floral forms. There may be said to be three periods and distinctive varieties of arabesque: (a) the Roman or Græco-Roman, introduced into Rome from the East when pure art was declining; (b) the Arabesque of the Moors as seen in the Alhambra, introduced by them into Europe in the middle ages; (c) Modern Arabesque, which took its rise in Italy in the Renaissance period of art. The arabesques of the Moors, who are prohibited by their religion from repre-

Renaissance Arabesque.

senting animal forms, consist essentially of complicated ornamental designs based on the suggestion of plant-growth, combined with extremely complex geometrical forms.

ARA'BI PASHA, Egyptian soldier and revolutionary leader, born 1837. In Sept., 1881, he headed a military revolt, and was for a time virtually dictator of Egypt. Britain interfered, and after a short campaign, beginning with the bombardment of Alexandria and ending with the defeat of Arabi and his army at Tel-el-Kebir, he surrendered, and was banished to Ceylon.

ARA'BIA, a vast peninsula in the s.w. of Asia, bounded on the n. by the great Syro-Babylonian plain, n.e. by the Persian Gulf and the Sea of Oman, s. or s.e. by the Indian Ocean, and s.w. by the Red Sea and Gulf of Suez. Its length from n.w. to s.e. is about 1800 miles, its mean breadth about 600 miles, it area rather over 1,000,000 sq. miles, its pop. probably not more than 6,000,000. Roughly described, it exhibits a central tableland surrounded by a series of deserts, with numerous scattered oases, while around this is a line of mountains parallel to and approaching the coasts, and with a narrow rim of low grounds between them and the sea. In its general features Arabia resembles the Sahara, of which it may be considered a continuation. Like the Sahara it has its wastes of loose sand, its stretches of bare rocks and stones, its mountains devoid of vegetation, its oases with their wells and streams, their palm-groves and cultivated fields—islands of green amid the surrounding desolation. Rivers proper there are none. The chief towns are Mecca, the birthplace of Mohammed; Medina, the place to which he fled from Mecca (A.D. 622), and where he is buried; Hodeida, a seaport exporting Mocha coffee; Aden, on the s.w. coast, a strongly fortified garrison belonging to Britain; Sana, the capital of Yemen; and Muscat, the capital of Oman, a busy port with a safe anchorage. The chief towns of the interior are Hail, the residence of the emir of northern Nejd; Oneizah, under the same ruler; and Riad, capital of southern Nejd. The most flourishing portions of Arabia are in Oman, Hadramaut, and Nejd. In the two former are localities with numerous towns and villages and settled industrious populations like that of Hindustan or Europe.

The climate of Arabia in general is marked by extreme heat and dryness. The date-palm furnishes the staple article of food; the cereals are wheat,

barley, maize, and millet; various sorts of fruit flourish; coffee and many aromatic plants and substances, such as gum-arabic, benzoin, mastic, balsam, aloes, myrrh, frankincense, etc., are produced. There are also cultivated in different parts of the peninsula, according to the soil and climate, beans, rice, lentils, tobacco, melons, saffron, colocynth, poppies, olives, etc. Sheep, goats, oxen, the horse, the camel, ass, and mule supply man's domestic and personal wants. Among wild animals are gazelles, ostriches, the lion, panther, hyena, jackal, etc. Among mineral products are saltpeter, mineral pitch, petroleum, salt, sulphur, and several precious stones, as the carnelian, agate, and onyx.

The Arabs, as a race, are of middle stature, of a powerful though slender build, and have a skin of a more or less brownish color; in towns and the uplands often almost white. Their features are well cut, the nose straight, the forehead high. They are naturally active, intelligent, and courteous; and their character is marked by temperance, bravery, and hospitality. The first religion of the Arabs, the worship of the stars, was supplanted by the doctrines of Mohammedanism, which succeeded rapidly in establishing itself throughout Arabia.

Bedouin Arabs.—1. 2, Of the Jordan. 3, Of the Haûran, 4, 5, Of the Desert.

The history of the Arabs previous to Mohammed is obscure. The earliest inhabitants are belived to have been of the Semitic race. Jews in great numbers migrated into Arabia after the destruction of Jerusalem, and, making numerous proselytes, indirectly favored the introduction of the doctrines of Mohammed. With his advent the Arabians uprose and united for the purpose of extending the new creed; and under the caliphs—the successors of Mohammed—they attained great power, and founded large and powerful kingdoms in three continents. (See Caliphs.) On the fall of the caliphate of Bagdad in 1258 the decline set in, and on the expulsion of the Moors from Spain the foreign rule of the Arabs came to an end. In the 16th century Turkey subjected Hejaz and Yemen, and received the nominal submission of the tribes inhabiting the rest of Arabia. The subjection of Hejaz has continued down to the present day; but Yemen achieved its independence in the 17th century, and maintained it till 1871, when the territory again fell into the hands of the Turks. In 1839 Aden was occupied by the British. Oman early became virtually independent of the caliphs, and grew into a well-organized kingdom. In 1507 its capital, Maskat or Muscat, was occupied by the Portuguese, who were not driven out till 1659. The Wahabis appeared toward the end of the 18th century, and took an important part in the political affairs of Arabia, but their progress was interrupted by Mohammed Ali, pasha of Egypt, and they suffered a complete defeat by Ibrahim Pasha. He extended his power over most of the country, but the events of 1840 in Syria compelled him to renounce all claims to Arabia. The Hejaz thus again became subject to Turkish sway. Turkey has since extended its rule not only over Yemen, but also over the district of El-Hasa on the Persian Gulf.

ARABIAN NIGHTS; or, THE THOUSAND AND ONE NIGHTS, a celebrated collection of Eastern tales, long current in the East, and supposed to have been derived by the Arabians from India, through the medium of Persia. They were first introduced into Europe in the beginning of the 18th century by means of the French translation of Antoine Galland. Of some of them no original MS. is known to exist; they were taken down by Galland from the oral communication of a Syrian friend. The story which connects the tales of the Thousand and One Nights is as follows: The Sultan Shahriyar, exasperated by the faithlessness of his bride, made a law that every one of his future wives should be put to death the morning after marriage. At length one of them, Shahrazad, the generous daughter of the grand-vizier, succeeded in abolishing the cruel custom. By the charm of her stories the fair narrator induced the sultan to defer her excution every day till the dawn of another, by breaking off in the middle of an interesting tale which she had begun to relate. In the form we possess them these tales belong to a comparatively late period, though the exact date of their composition is not known. Lane, who published a translation of a number of the tales, with valuable notes, is of opinion that they took their present form some time between 1475 and 1525. Two complete English translations have recently been printed, giving many passages that previous translators had omitted on the score of morality or decency.

ARABIC FIGURES, the characters 1, 2, 3, 4, 5, 6, 7, 8, 9, 0; of Indian origin, introduced into Europe by the Moors. They did not come into general use till after the invention of printing.

AR'ACK, a spirituous liquor manufactured in the East Indies from a great variety of substances. It is often distilled from fermented rice, or it may be distilled from the juice of the cocoanut and other palms. Pure arack is clear and transparent, with a yellowish or straw color, and a peculiar but agreeable taste and smell; it contains at least 52 to 54 per cent of alcohol.

AR'AGO, Dominique François, a French physicist, born in 1786; died at Paris in 1853. After studying in the Polytechnic School at Paris, he was appointed a secretary of the Bureau des Longitudes. In 1809 he was elected to the Academy of Sciences, and appointed a professor of the Polytechnic School. He distinguished himself by his researches in the polarization of light, galvanism, magnetism, astronomy, etc. His discovery of the magnetic properties of substances devoid of iron, made known to the Academy of Sciences in 1824, procured him the Copley medal of the Royal Society of London in 1825. A further consideration of the same subject led to the equally remarkable discovery of the production of magnetism by electricity.

ARAGON', Kingdom of, a former province or kingdom of Spain, now divided into the three provinces of Teruel, Huesca, and Saragossa; bounded on the n. by the Pyrenees, n.w. by Navarre, w. by Castile, s. by Valencia, and e. by Catalonia; length about 190 miles, average breadth 90 miles; area, 14,726 sq. miles. It was governed by its own monarchs until the union with Castile on the marriage of Ferdinand and Isabella (1469). Pop. 909,261.

A'RAM, Eugene, a self-taught scholar whose unhappy fate has been made the subject of a ballad by Hood and a romance by Lord Lytton, was born in Yorkshire, 1704, executed for murder, 1759.

ARAP'AHOES, a tribe of American Indians located near the head-waters of the Arkansas and Platte rivers, not now of any importance.

AR'ARAT, a celebrated mountain in Armenia, forming the point of contact of Russia with Turkey and Persia; an isolated volcanic mass showing two separate cones known as the Great and Little Ararat, resting on a common base and separated by a deep intervening depression. The elevations are: Great Ararat, 16,916 feet; Little Ararat, 12,840 feet; the connecting ridge, 8780 feet.

Vegetation extends to 14,200 feet. which marks the snow-line. According to tradition Mount Ararat was the resting-place of the ark when the waters of the flood abated.

ARBITRATION, the process by which a dispute over property, or other dispute, is settled without recourse to law, by judges selected and agreed upon by the disputants. The history of arbitration is quite old, and this method of settling disputes is really older than legal forms which are an outgrowth of it. In medieval times international disputes were arbitrated by the pope of Rome, and the vatican still is regarded, by Roman Catholic powers, as a permanent court of arbitration. Among the numerous cases more recently decided by arbitration are those of the Alabama claims (1871), of the Samoan dispute between Great Britain, Germany, and the United States in 1889, of the Delagoa Bay dispute and the Bering Sea dispute in in 1892, and of the Alaskan boundary dispute in 1897.

ARBOR DAY, a holiday, general in the United States, used for the planting of trees by school children. The day usually falls in early May. Its purpose is the encouragement of the idea of reforesting the country.

AR'BORICULTURE includes the culture of trees and shrubs, as well as all that pertains to the preparation of the soil, the sowing of the seeds, and the treatment of the plants in their young state, the preparation of the land previous to their final transplantation, their just adaptation to soil and situation, their relative growth and progress to maturity, their management during growth, and the proper season and period for felling them.

ARBOR VITÆ, the name of several coniferous trees allied to the cypress, with flattened branchlets, and small imbricated or scale-like leaves. The common Arbor Vitæ is a native of North America, where it grows to the height of 40 or 50 feet. The young twigs have an agreeable balsamic smell. The Chinese Arbor Vitæ, common in Britain, yields a resin which was formerly thought to have medicinal virtues.

AR'BUTUS, a genus of plants belonging to the Ericaceæ, or heath order, and comprising a number of small trees and shrubs, natives chiefly of Europe and N. America.

ARC, a portion of a curve line, especially of a circle. It is by means of circular arcs that all angles are measured. —Electric or Voltaic arc, the luminous arch of intense brightness and excessively high temperature which is formed by an electric current in crossing over the interval of space between the carbon points of an electric lamp. See Arc-light.

ARC, Jeanne d'. See Joan of Arc.

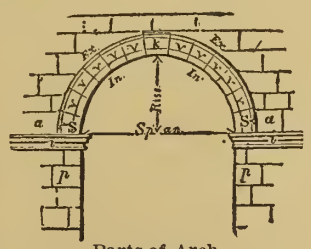
ARCADE, a series of arches supported on piers or pillars, used generally as a screen and support of a roof, or of the wall of a building, and having beneath the covered part an ambulatory as round a cloister, or a foot-path with shops or dwellings, as frequently seen in old Italian towns. Sometimes a porch or other prominent part of an important building is treated with arcades, as in the illustration.

Arcade.

Arcade.

ARCA'DIA, the central and most mountainous partion of the Peloponnesus, the inhabitants of which in ancient times were celebrated for simplicity of character and manners. Their occupation was almost entirely pastoral, and thus the country came to be regarded as typical of rural simplicity and happiness. At the present day Arcadia forms a nomarchy of the Kingdom of Greece. Area, 2028 sq. miles; pop. 148,600.

ARCH, a structure composed of separate pieces, such as stones or bricks,



Parts of Arch.

a, Abutments. *i*, Impost. *p*, Piers.
v, Voussoirs or arch-stones. *k*, Keystone.
S, Springers. *In.* Intrados. *Ex.* Extrados.

having the shape of truncated wedges, arranged on a curved line, so as to retain their position by mutual pressure.

ARCHÆAN (är-kē'an) **ROCKS,** the oldest rocks of the earth's crust, crystalline in character, and embracing granite, syenite, gneiss, mica-schist, etc., all devoid of fossil remains. These rocks underlie and are distinctly separate from the stratified and fossiliferous formations, which indeed have chiefly taken origin from them.

ARCHÆOL'OGY, the science which takes cognizance of the history of nations and peoples as evinced by the remains, architectural, implemental, or otherwise, which belong to the earlier epoch of their existence. In a more extended sense the term embraces every branch of knowledge which bears on the origin, religion, laws, language, science, arts, and literature of ancient peoples. It is to a great extent synonymous with prehistoric annals, as a large if not the principal part of its field of study extends over those periods in the history of the human race in regard to which we possess almost no information derivable from written records. Archæology divides the primeval period of the human race, more especially as exhibited by remains found in Europe, into the stone, the bronze, and the iron age, these names being given in accordance with the materials employed for weapons, implements, etc., during the particular period. The stone age has been subdivided into the palæolithic and neolithic, the former being that older period, in which the stone implements were not polished as they are in the latter and more recent period The bronze age, which admits of a similar subdivision, is that in which implements were of copper or bronze In this age the dead were burned and their ashes deposited in urns or stone chests, covered with conical mounds of earth or cairns of stones. Gold and amber ornaments appear in this age. The iron age is that in which implements, etc., of iron begin to appear, although stone and bronze implements are found along with them. The word age in this sense (as explained under Age) simply denotes the stage at which a people has arrived. The phrase stone age, therefore, merely marks the period before the use of bronze, the bronze age that before the employment of iron, among any specific people.

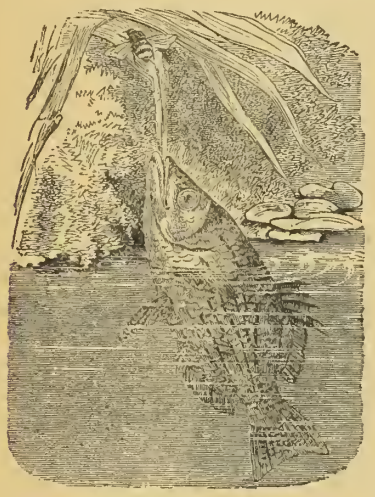
ARCHANGEL (ärk-ān'jel), an angel of superior or of the highest rank. The only archangel mentioned by name in Scripture is Michael in the Epistle of Jude.

ARCHANGEL (ärk-ān'jel), a seaport, capital of the Russian government of same name, on the right bank of the northern Dwina, about 20 miles above its mouth in the White Sea. The port is closed for six months by ice. Archangel, founded in 1584, was long the only port which Russia possessed. Pop. 19,540.—The province has an area of 331,490 sq. miles; pop. 311,673.

ARCHBISHOP (ärch-), a chief bishop, or bishop over other bishops; a metropolitan prelate. The establishment of this dignity is to be traced up to an early period of Christianity, when the bishops and inferior clergy met in the capitals to deliberate on spiritual affairs, and the bishop of the city where the meeting was held presided. In England there are two (Protestant) archbishops—those of Canterbury and York; the former styled Primate of all England, the latter Primate of England. The Archbishop of Canterbury is the first peer of the realm, having precedence before all great officers of the crown and all dukes not of royal birth. He crowns the sovereign, and when he is invested with his archbishopric he is said to be enthroned. He can grant special licenses to marry at any time or place, and can confer degrees otherwise to be obtained only from the universities

ARCHDEACON (ärch-), an ecclesiastical dignitary next in rank below a bishop, having a certain jurisdiction over a part of the diocese. From two to four archdeacons are appointed by the bishops, under whom they perform their duties, and they hold courts which decide cases subject to an appeal to the bishop.

ARCHER-FISH, a name given to a scaly-finned fish, about 6 inches long, inhabiting the seas around Java, which



Archer-fish.

has the faculty of shooting drops of water to the distance of 3 or 4 feet at insects, thereby causing them to fall into the water, when it seizes and devours them. The soft, and even the spiny portion of their dorsal fins are so covered with scales as to be scarcely distinguishable from the rest of the body.

ARCH'ERY, the art of shooting with a bow and arrow. The use of these weapons in war and the chase dates from the earliest antiquity. Ishmael, we learn from Gen. xxi., "became an archer."

Assyrian archer.

Egyptian archer, with arrow heads and stone-tipped reed arrow.

The Egyptians, Assyrians, Persians, Parthians, excelled in the use of the bow; and, while the Greeks and Romans themselves made little use of it, they employed foreign archers as mercenaries. Coming to much more recent times, we find the Swiss famous as archers, but they generally used the arbalist or cross-bow, and were no match for their English rivals, who preferred the long-bow. (See Bow.) The English victories of Cressy, Poitiers, and Agincourt, gained against apparently overwhelming odds, may be ascribed to the bowmen. Archery disappeared gradually as firearms came into use, and as an instrument of war or the chase the bow is now confined to the most savage tribes of both hemispheres. But, though the bow has been long abandoned among civilized nations as a military weapon, it is still cherished as an instrument of healthful recreation, encouraged by archery clubs or societies.

ARCHIMEDES (är-ki-mē'dēz), a celebrated ancient Greek physicist and geometrician, born at Syracuse, in Sicily, about 287 B.C. He devoted himself entirely to science, and enriched mathematics with discoveries of the highest importance, upon which the moderns have founded their admeasurements of curvilinear surface and solids. Archimedes is the only one among the ancients who has left us anything satisfactory on the theory of mechanics and on hydrostatics. He first taught the hydrostatic principle to which his name is attached, "that a body immersed in a fluid loses as much in weight as the weight of an equal volume of the fluid," and determined by means of it that an artist had fraudulently added too much alloy to a crown which King Hiero had ordered to be made of pure gold. He discovered the solution of this problem while bathing; and it is said to have caused him so much joy that he hastened home from the bath undressed, and crying out, Eurēka! Eurēka! "I have found it, I have found it!" Practical mechanics also received a great deal of attention from Archimedes, who boasted that if he had a fulcrum or standpoint he could move the world. He is the inventor of the compound pulley, probably of the endless screw, the archimedean screw, etc. During the siege of Syracuse by the Romans he is said to have constructed many wonderful machines with which he repelled their attacks, and he is stated to have set on fire their fleet by burning-glasses! At the moment when the Romans gained possession of the city by assault (212 B.C.) tradition relates that Archimedes was slain while sitting in the market-place contemplating some mathematical figures which he had drawn in the sand.

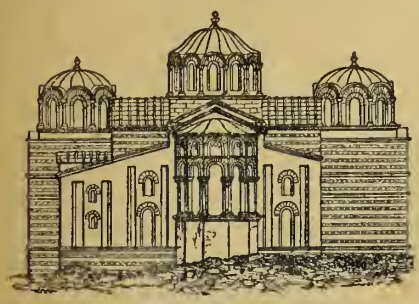
ARCHIPEL'AGO, a term originally applied to the Ægean, the sea lying between Greece and Asia Minor, then to the numerous islands situated therein, and latterly to any cluster of islands.

ARCHITEC'TURE, in a general sense, is the art of designing and constructing houses, bridges, and other buildings for the purposes of civil life; or, in a more limited but very common sense, that branch of the fine arts which has for its object the production of edifices not only convenient for their special purpose, but characterized by unity, beauty, and often grandeur.—The first habitations of man were such as nature afforded, or cost little labor to the occupant—caves, huts, and tents. But as soon as men rose in civilization and formed settled societies they began to build more commodious and comfortable habitations. The Egyptians are the most ancient nation known to us among whom architecture had attained the character of a fine art. Other ancient peoples among whom it had made great progress were the Babylonians, whose most celebrated buildings were temples, palaces, and hanging-gardens; the Assyrians, whose capital, Nineveh, was rich in splendid buildings; the Phœnicians, whose cities, Sidon, Tyre, etc., were adorned with equal magnificence; and the Israelities, whose temple was a wonder of architecture. But comparatively few acrhitectural monuments of these latter nations have remained till our day.

This is not the case with the architecture of Egypt, however, of which we possess ample remains in the shape of pyramids, temples, sepulchers, obelisks, etc. Egyptian chronology is far from certain, but the greatest of the architectural monuments of the country, the pyramids of Ghizeh, are at least as old as 2800 or 2700 B.C.

The earliest architectural remains of Greece are of unknown antiquity, and consist of massive walls built of huge blocks of stone. In historic times the Greeks developed an architecture of noble simplicity and dignity. This style is of modern origin compared with that of Egypt, and the earliest remains give indications that it was in part derived from the Egyptian. It is considered to have attained its greatest perfection in the age of Pericles, or about 460–430 B.C. The great masters of this period were Phidias, Ictinus, Callicrates, etc. All the extant buildings are more or less in ruins. The most remarkable public edifices of the Greeks were temples, of which the most famous is the Parthenon at Athens. Their theaters were semicircular on one side and square on the other, the semicircular part being usually excavated in the side of some convenient hill. This part, the auditorium, was filled with concentric seats, and might be capable of containing 20,000 spectators. A number exist in Greece, Sicily, and Asia Minor, and elsewhere. The Romans became acquainted with the architecture of the Greeks soon after 200 B.C., but it was not till about two centuries later that the architecture of Rome attained (under Augustus) its greatest perfection. Among the great works now erected were temples, aqueducts, amphitheaters, magnificent villas, triumphal arches,

monumental pillars, etc. The amphitheater differed from the theater in being a completely circular or rather elliptical building, filled on all sides with ascending seats for spectators and leaving only the central space, called the arena, for the combatants and

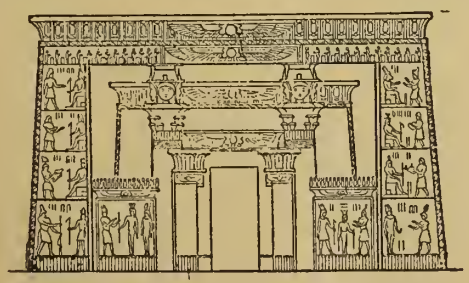


Byzantine—Church of Our Lady, at Constantinople.

public shows. The Colosseum is a stupenduos structure of this kind. The thermæ, or baths, were vast structures in which multitudes of people could bathe at once. Magnificent tombs were often built by the wealthy. Remains of private residences are numerous, and the excavations at Pompeii in particular have thrown great light on the internal arrangements of the Roman dwelling-house.

In Constantinople, after its virtual separation from the Western Empire, arose a style of art and architecture which was practiced by the Greek Church during the whole of the middle ages. This is called the Byzantine style. The church of St. Sophia at Constantinople, built by Justinian (reigned 527–565), offers the most typical specimen of the style, of which the fundamental principle was an application of the Roman arch, the dome being the most striking feature of the building. In the most typical examples the dome or cupola rests on four pendentives.

After the dismemberment of the Roman Empire the beautiful works of ancient architecture were almost entirely destroyed by the Goths, Vandals, and other barbarians in Italy, Greece, Asia, Spain, and Africa; or what was spared by them was ruined by the fanaticism of the Christians. A new style of architecture now arose, two forms of which

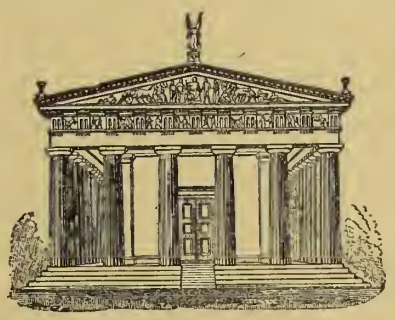


Egyptian—Front of Temple of Isis at Philæ.

the Lombard and the Norman Romanesque, form important phases of art. The Lombard prevailed in north Italy and south Germany from the 8th or 9th to the 13th century (though the Lombard rule came to an end in 774); the Norman Romanesque flourished, especially in Normandy and England, from the 11th to the middle of the 13th century. The semicircular arch is the most characteristic feature of this style. With the Lombard Romanesque were combined Byzantine features, and buildings in the pure Byzantine style were also erected in Italy, as the Church of St. Mark at Venice.

The Germans were unacquainted with architecture until the time of Charlemagne (or Charles the Great, 742–814). He introduced into Germany the Byzantine and Romanesque styles. Afterward the Moorish or Arabian style had some influence upon that of the western nations, and thus originated the mixed style which maintained itself till the middle of the 13th century.

The rise of the Renaissance style in Italy is the greatest event in the history of architecture after the introduction of the Gothic style. The Gothic style had been introduced into the country



Grecian Doric—Temple of Jupiter at Olympia.

and extensively employed, but had never been thoroughly naturalized. The Renaissance is a revival of the classic style based on the study of the ancient models; and, having practically commenced in Florence about the beginning of the 15th century, it soon spread with great rapidity over Italy and the greater part of Europe. The most illustrious architects of this early period of the style were Brunelleschi, who built at Florence the dome of the cathedral, the Pitti Palace, etc., besides many edifices at Milan, Pisa, Pesaro, and Mantua; Alberti, who wrote an important work on architecture, and erected many admired churches; Bramante, who began the building of St. Peter's, Rome, and Michael Angelo, who erected its magnificent dome. On St. Peter's were also employed Raphael, Peruzzi and San Gallo. The noblest building in this style of architecture in Britain is St. Paul's, London, the work of Sir Christopher Wren.

Within the past 17 years American architects (notably W. L. B. Jenney, of Chicago) invented a new method of

Romanesque—Cathedral of Worms.

construction for large private and public buildings, called "steel construction." This consists of erecting a skeleton of steel beams and joists, all securely riveted together, forming a great united steel cage, around which are placed solid casings of fire-proof tiles. This fire-proof skeleton is then enclosed within walls and the interior finish added. Steel buildings of this kind are fire-proof, tornado-proof, and earthquake-proof.

ARC-LIGHT, that species of the electric light in which the illuminating source is the current of electricity passing between two sticks of carbon kept

Arc-light: carbons magnified.

a short distance apart, one of them being in connection with the positive, the other with the negative terminal of a battery or dynamo.

AR'COT, two districts and a town of India, within the Presidency of Madras. North Arcot is an inland district with an area of 7256 sq. miles. The country is partly flat and partly mountainous, where intersected by the Eastern Ghâts. Pop. 1,817,814.—South Arcot lies on the Bay of Bengal, and has two seaports, Cuddalor and Porto Novo. Pop. 1,814,738.—The town Arcot is in North Arcot, on the Palar, about 70 miles w. by s. of Madras. Pop. 12,000.

ARCTIC (ärk'tik), an epithet given to the north pole from the proximity of the constellation of the Bear, in Greek called arktos. The Arctic Circle is an imaginary circle on the globe, parallel

to the equator, and 23° 28′ distant from the north pole. This and its opposite, the Antartic, are called the two polar circles.

ARCTIC OCEAN, that part of the water surface of the earth which surrounds the north pole, and washes the northern shores of Europe, Asia, and America; its southern boundary roughly coinciding with the Arctic Circle (lat. 66° 32′ n.). It incloses many large islands, and contains large bays and gulfs which deeply indent the northern shores of the three continents. Its great characteristic is ice, which is nearly constant everywhere.

ARCTIC REGIONS, the regions round the north pole, and extending from the pole on all sides to the Arctic Circle in lat. 66° 32′ n. The Arctic or North Polar Circle just touches the northern headlands of Iceland, cuts off the southern and narrowest portion of Greenland, crosses Fox's Strait north of Hudson's Bay, whence it goes over the American continent to Bering's Strait. Thence it runs to Obdorsk at the mouth of the Obi, then crossing northern Russia, the White Sea, and the Scandinavian Peninsula, returns to Iceland. Though much skill and heroism have been developed in the exploration of this portion of the earth, there is still an area round the pole estimated at 2,500,000 sq. miles, which is a blank to geographers. Many have adopted the belief in the existence of an open polar sea about the north pole. But this belief is not supported by any positive evidence. Valuable minerals, fossils, etc., have been discovered within the Arctic regions. In the archipelago north of the American continent excellent coal frequently occurs. The mineral cryolite is mined in Greenland. Fossil ivory is obtained in islands at the mouth of the Lena. In Scandinavia, parts of Siberia, and northwest America, the forest region extends within the Arctic Circle. The most characteristic of the natives of the Arctic regions are the Eskimos. The most notable animals are the white-bear, the musk-ox, the reindeer, and the whalebone whale. Fur-bearing animals are numerous. The most intense cold ever registered in those regions was 74° below zero Fahr. The aurora borealis is a brilliant phenomenon of Arctic nights. See Polar Exploration.

ARCTU'RUS, a fixed star of the first magnitude in the constellation of Boötes, and thought by some to be the nearest to our system of any of the fixed stars. It is one of the stars observed to have a motion of its own, and is a noticeable object in the northern heavens.

ARDECHE (ăr-dāsh'), a department in the south of France (Languedoc), on the west side of the Rhone, taking its name from the river Ardèche, which rises within it, and falls into the Rhone after a course of 46 miles; area, 2134 sq. miles. It is generally of a mountainous character, and contains the culminating point of the Cevennes. Silk and wine are produced. Annonay is the principal town, but Privas is the capital. Pop. 353,564.

ARDENNES (ăr-den'), a frontier department in the northeast of France; area, 2020 sq. miles, partly consisting of the Forest of Ardennes. Chief towns, Mézières (the capital), Rocroi, and Sedan. Pop. 315,589.

A'REA, the superficial content of any figure or space, the quantity of surface it contains in terms of any unit. See Mensuration.

ARE'NA, the inclosed space in the central part of the Roman amphitheaters, in which took place the combats of gladiators or wild beasts. It was usually covered with sand or sawdust to prevent the gladiators from slipping, and to absorb the blood.

ARE'OLAR TISSUE, an assemblage of fibers and laminæ pervading every part of the animal structure, and connected with each other so as to form innumerable small cavities, by means of which the various organs and parts of organs are connected together; called also Cellular Tissue and Connective Tissue.—In botany the term is sometimes applied to the non-vascular substance, composed entirely of untransformed cells, which forms the soft substance of plants.

AREOM'ETER, an instrument for measuring the specific gravity of liquids; a hydrometer (which see).

AREQUIPA (ä-rā-kē'pä), a city of Peru, 200 miles south of Cuzco, situated in a fertile valley, 7850 feet above sea-level. Pop. 30,000.

ARES (ā'rēz). See Mars.

AREZZO (ä-ret'sō), a city of central Italy, capital of a province of the same name in Tuscany, near the confluence of the Chiana with the Arno. It is the birthplace of Mæcenas, Petrarch, Pietro Aretino, Redi, and Vasari. Pop. 44,350. —The province of Arezzo contains 1276 sq. miles and 272,359 inhabitants.

AR'GAND LAMP, a lamp named after its inventor, Aimé Argand, a Swiss chemist and physician (born 1755, died 1803), the distinctive feature of which is a burner forming a ring or hollow cylinder covered by a chimney, so that the flame receives a current of air both on the inside and on the outside.

ARGEMONE (ăr-jem'o-nē), a small genus of ornamental American plants of the poppy order. From the seeds is obtained an oil very useful to painters.

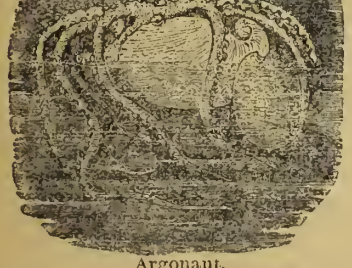
AR'GENTINE REPUBLIC, formerly called the United Provinces of La Plata, a vast country of South America, the extreme length of which is 2300 miles, and the average breadth a little over 500 miles, the total area exceeding 1,200,000 sq. miles. It is bounded on the n. by Bolivia; on the e. by Paraguay, Brazil, Uruguay, and the Atlantic; on the s. by the Antartic Ocean; and on the w. by the Andes. It comprises four great natural divisions: (1) the Andine region, containing the provinces of Mendoza, San Jaun, Rioja, Catamarca, Tucuman, Salta, and Jujuy; (2) the Pampas, containing the provinces of Santiago, Santa Fé, Cordova, San Luis, and Buenos Ayres; with the territories Formosa, Pampa, and Chaco; (3) the Argentine Mesopotamia, between the rivers Parana and Uruguay, containing the provinces of Entre Rios and Corrientes, and the territory Misiones; (4) Patagonia, including the eastern half of Tierra del Fuego. With the exception of the n.w., where lateral branches of the Andes run into the plain for 150 or 200 miles, and the province of Entre Rios, which is hilly, the characteristic feature of the country is the great monotonous and level plains called "pampas." In the north these plains are partly forest-covered, but all the central and southern parts present vast treeless tracts, which afford pasture to immense herds of horses, oxen, and sheep, and are varied in some places by brackish swamps, in others by salt steppes. The great water-course of the country is the Parana, having a length of fully 2000 miles from its source in the mountains of Goyaz, Brazil, to its junction with the Uruguay, where begins the estuary of La Plata. The Parana is formed by the union of the Upper Paranę and Paraguay rivers, near the n.e. corner of the state. Important tributaries are the Pilcomayo, the Vermejo, and the Salado. The Parana, Paraguay, and Uruguay are valuable for internal navigation. Many of the streams which tend eastward terminate in marshes and salt lakes, some of which are rather extensive. Not connected with the La Plata system are the Colorado and the Rio Negro, the latter formerly the southern boundary of the state, separating it from Patagonia. The source of the Negro is Lake Nahuel Huapi, in Patagonia (area, 1200 sq. miles), in the midst of magnificent scenery. The level portions of the country are mostly of tertiary formation, and the river and coast regions consist mainly of alluvial soil of great fertility. In the pampas clay have been found the fossil remains of extinct Mammalia, some of them of colossal size.

European grains and fruits, including the vine, have been successfully introduced, and are cultivated to some extent in most parts of the republic, but the great wealth of the state lies in its countless herds of cattle and horses and flocks of sheep, which are pastured on the pampas, and which multiply there very rapidly. Gold, silver, nickel, copper, tin, lead, and iron, besides marble, jasper, precious stones, and bitumen, are found in the mountainous districts of the n.w., while petroleum wells have been discovered on the Rio Vermejo; but the development of this mineral wealth has hitherto been greatly retarded by the want of proper means of transport. As a whole there are not extensive forests in the state except in the region of the Gran Chaco (which extends also into Bolivia), where there is known to be 60,000 square miles of timber. Thousands of square miles are covered with thistles, which grow to a great height in their season. Cacti also form great thickets. Peach and apple trees are abundant in some districts. The native fauna includes the puma, the jaguar, the tapir, the llama, the alpaca, the vicuña, armadillos, the rhea or nandu, a species of ostrich, etc. The climate is agreeable and healthful, 97° being about the highest temperature experienced. The rainfall is very scanty in some districts, and is nowhere very large.

The river La Plata was discovered in 1512 by the Spanish navigator Juan

Diaz de Solis, and the La Plata territory had been brought into the possession of Spain by the end of the 16th century. In 1810 the territory cast off the Spanish rule, and in 1816 the independence of the United States of the Rio de la Plata was formally declared, but it was long before a settled government was established. The present constitution dates from 1853, being subsequently modified. The executive power is vested in a president—elected by the representatives of the fourteen provinces for a term of six years. A national congress of two chambers—a senate and a house of deputies—wields the legislative authority, and the republic is making rapid advances in social and political life. The national revenue for 1901 amounted to about $65,000,000, while the expenditure amounted to fully $70,000,000; the public debt is about $390,000,000. There are about 11,000 miles of railway opened. The external commerce is important, the chief exports being wool, skins and hides, live animals, mutton, tallow, bones, corn, and flax. The imports are chiefly manufactured goods. The trade is largely with Britain and France, and is increasing rapidly, the exports having advanced from $45,000,000 in 1876 to $150,000,000 in 1901. The imports are over $100,000,000 annually. Buenos Ayres is the capital. Other towns are Cordova, Rosario, La Plata, Tucuman, Mendoza, and Corrientes. The population of the republic, which is rapidly increasing by immigration, was, in 1895, 4,092,990; of the capital, 690,000.

AR'GONAUT, a molluscous animal belonging to the dibranchiate or two-gilled cuttlefishes, distinguished by the females possessing a single-chambered external shell, not organically connected



Argonaut.

with the body of the animal. The males have no shell and are of much smaller size than the females. The shell is fragile, translucent, and boat-like in shape; it serves as the receptacle of the ova or eggs of the female, which sits in it with the respiratory tube or "funnel" turned toward the carina or "keel." This famed mollusc swims only by ejecting water from its funnel, and it can crawl in a reversed position, carrying its shell over its back like a snail. The argonaut, or paper-nautilus, must be carefully distinguished from the pearly-nautilus or nautilus proper.

ARGONAUTS, in the legendary history of Greece, those heroes who performed a hazardous voyage to Colchis, a far-distant country at the eastern extremity of the Euxine (Black Sea), with Jason in the ship Argo, for the purpose of securing a golden fleece, which was preserved suspended upon a tree, and under the guardianship of a sleepless dragon. By the aid of Medea, daughter of the king of Colchis, Jason was enabled to seize the fleece, and, after many strange adventures, to reach his home at Iolcos in Thessaly. Among the Argonauts were Hercules, Castor and Pollux, Orpheus and Theseus.

ARGO-NAVIS, the southern constellation of the Ship, containing 9 clusters, 3 nebulæ, 13 double and 540 single stars, of which about 64 are visible.

AR'GOS, a town of Greece, in the northeast of the Peloponnesus, between the gulfs of Ægina and Nauplia or Argos. This town and the surrounding territory of Argolis were famous from the legendary period of Greek history onward, the territory containing, besides Argos, Mycenæ, where Agamemnon ruled, with a kind of sovereignty, over all the Peloponnesus. Argolis forms a nomarchy of the Kingdom of Greece; pop. 80,695. The capital is Nauplia.

AR'GUMENT, a term sometimes used as synonymous with the subject of a discourse, but more frequently appropriated to any kind of method employed for the purpose of confuting or at least silencing an opponent.

AR'GUS, in Greek mythology, a fabulous being, said to have had a hundred eyes, placed by Juno to guard Io. Hence "argus-eyed," applied to one who is exceedingly watchful.

ARGUS-PHEASANT, a large, beautiful, and very singular species of pheasant, found native in the southeast of Asia, more especially in Sumatra and some of the other islands. The males measure from 5 to 6 feet from the tip of the beak to the extremity of the tail, which has two greatly elongated central feathers. The plumage is exceedingly beautiful, the secondary quills of the wings, which are longer than the primary feathers, being each adorned with a series of ocellated or eye-like spots (whence the name—see Argus) of brilliant metallic hues. The general body plumage is brown.

ARGYLE, or **ARGYLL** (ar-gīl'), an extensive county in the southwest of the Highlands of Scotland, consisting partly of mainland and partly of islands belonging to the Hebrides group. On the land side the mainland is bounded north by Inverness; east by Perth and Dumbarton; elsewhere surrounded by the Firth of Clyde and its connections and the sea; area, 3255 square miles (or over 2,000,000 acres), of which the islands comprise about 1000 square miles. The county is exceedingly mountainous, the chief summits being Bidean-nam-Bian (3766 ft.), Ben Laoigh (3708 ft.), Ben Cruachan (3611 ft.), Benmore, in Mull (3185 ft.), the Paps of Jura (2565 ft.), and Ben Arthur or the Cobbler (2891 ft.). There are several lakes, the principal of which is Loch Awe. The chief minerals are slate, marble, limestone, and granite. County town, Inveraray; others, Campbeltown, Oban, and Dunoon. Pop. (1901), 73,665.

ARGYLL, CAMPBELLS OF, a historic Scottish family, raised to the peerage in the person of Sir Duncan Campbell of Lochow, in 1445. The more eminent members are: (1) Archibald, 2d Earl, killed at the battle of Flodden, 1513.—Archibald, 5th Earl, who was the means of averting a collision between the Reformers and the French troops in 1559; died 1575.—Archibald, 8th Earl and Marquis, born 1598; created a marquis by Charles I. At the Restoration he was committed to the Tower, and afterward sent to Scotland, where he was tried for high treason, and beheaded in 1661.—Archibald, 9th Earl, son of the preceding, was excluded from the general pardon by Cromwell in 1654; beheaded in 1685.—Archibald, 10th Earl and 1st Duke, died 1703; took an active part in the Revolution of 1688–89, which placed William and Mary on the throne.—John, 2d Duke and Duke of Greenwich, born 1678, died 1743; served under Marlborough, and assisted at the sieges of Lisle and Ghent. He was long a supporter of Walpole, but his political career was full of intrigue. He is the Duke of Argyll in Scott's Heart of Midlothian.—George Douglas Campbell, K.T., K.G., etc., 8th Duke (of U. Kingdom, 1892), was born in 1823. In 1852 he became lord privy seal under Lord Aberdeen, and again under Lord Palmerston in 1859; postmaster-general in 1860; secretary for India from 1868 to 1874; again lord privy seal in 1880, but retired, being unable to agree with his colleagues on their Irish policy. He died in 1900. His eldest son, the Marquis of Lorne, married the Princess Louise, daughter of Queen Victoria, in 1871. See Lorne, Marquis of.

ARIA, in music. See Air.

ARIADNE (a-ri-ad'ne), in Greek mythology, a daughter of Minos, King of Crete. She gave Theseus a clue of thread to conduct him out of the labyrinth after his defeat of the Minotaur. Theseus abandoned her on the Isle of Naxos, where she was found by Bacchus, who married her.

ARIEGE (à-rē-āzh), a mountainous department of France, on the northern slopes of the Pyrenees, comprising the ancient countship of Foix and parts of Languedoc and Gascony. Area, 1890 sq. miles; pop. 219,641.

A'RIEL, the name of several personages mentioned in the Old Testament; in the demonology of the later Jews a spirit of the waters. In Shakespeare's Tempest, Ariel was the "tricksy spirit" whom Prospero had in his service.

ARIES (ā'ri-ēz), the Ram, a northern constellation of 156 stars, of which fifty are visible. It is the first of the twelve signs in the zodiac, which the sun enters at the vernal equinox, about the 21st of March. The first point in Aries is that where the equator cuts the ecliptic in the ascending node, and from which the right ascensions of heavenly bodies are reckoned on the equator, and their longitudes upon the ecliptic. Owing to the precession of the equinoxes the sign Aries no longer corresponds with the constellation Aries, which it did 2000 years ago.

AR'IL, ARIL'LUS, in some plants, as in the nutmeg, an extra covering of

the seed, outside of the true seed-coats, proceeding from the placenta, partially investing the seed, and falling off spontaneously. It is either succulent or cartilaginous, colored, elastic, rough, or knotted. In the nutmeg it is known as mace.

ARISTARCHUS (ar-is-tär'kus) an ancient Greek astronomer belonging to Samos, flourished between 280 and 264 B.C., and first asserted the revolution of the earth about the sun; also regarded as the inventor of the sun-dial.

ARISTIDES (ar-is-tī'dēz), a statesman of ancient Greece, for his strict integrity surnamed the Just. He was one of the ten generals of the Athenians when they fought with the Persians at Marathon, B.C. 490. Next year he was eponymous archon, and in this office enjoyed such popularity that he excited the jealousy of Themistocles, who succeeded in procuring his banishment by the ostracism (about 483). Three years after, when Xerxes invaded Greece with a large army, the Athenians hastened to recall him, and Themistocles now admitted him to his confidence and councils. In the battle of Platæa (479) he commanded the Athenians, and had a great share in gaining the victory. To defray the expenses of the Persian war he persuaded the Greeks to impose a tax, which should be paid into the hands of an officer appointed by the states collectively, and deposited at Delos. The confidence which was felt in his integrity appeared in their intrusting him with the office of apportioning the contribution. He died at an advanced age about B.C. 468, so poor that he was buried at the public expense.

ARISTOC'RACY, a form of government by which the wealthy and noble, or any small privileged class, rules over the rest of the citizens; now mostly applied to the nobility or chief persons in a state.

ARISTOPHANES (-tof'a-nēz), the greatest comic poet of ancient Greece, born at Athens probably about the year 444 B.C.; died not later than B.C. 380. Little is known of his life.

AR'ISTOTLE, a distinguished philosopher and naturalist of ancient Greece, the founder of the Peripatetic school of philosophy, was born in 384 B.C. at Stagīra, in Macedonia, died at Chalcis, B.C. 322. His father, Nicomachus, was physician to Amyntas II., king of Macedonia, and claimed to be descended from Æsculapius. Aristotle had lost his parents before he came, at about the age of seventeen, to Athens to study in the school of Plato. With that philosopher he remained for twenty years, became preeminent among his pupils, and was known as the "Intellect of the School." Upon the death of Plato, 348 B.C., he took up his residence at Atarneus, in Mysia, on the invitation of his former pupil Hermeias, the ruler of that city, on whose assassination by the Persians, 343 B.C., he fled to Mitylene with his wife Pythia, the niece of Hermeias. During his residence at Mitylene he received an invitation from Philip of Macedon to superintend the education of his son Alexander, then in his fourteenth year. This relationship between the great philosopher and the future conqueror continued for five or six years, during which the prince was instructed in grammar, rhetoric, poetry, logic, ethics, and politics, and in those branches of physics which had even then made some considerable progress. On Alexander succeeding to the throne Aristotle continued to live with him as his friend and councilor till he set out on his Asiatic campaign (334 B.C.). He returned to Athens and established his school in the Lyceum, a gymnasium attached to the temple of Apollo Lyceius, which was assigned to him by the state. He delivered his lectures in the wooded walks of the Lyceum while walking up and down with his pupils. From the action itself, or more probably from the name of the walks (peripatoi), his school was called Peripatetic. Pupils gathered to him from all parts of Greece, and his school became by far the most popular in Athens. It was during the time of his teaching at Athens that Aristotle is believed to have composed the great bulk of his works. On the death of Alexander a revolution occurred in Athens hostile to the Macedonian interests with which Aristotle was identified. He therefore retired to Chalcis, where he soon after died. According to Strabo he bequeathed all his works to Theophrastus, who, with other disciples of Aristotle, amended and continued them. They afterward passed through various hands, till, about 50 B.C., Andronicus of Rhodes put the various fragments together and classified them according to a systematic arrangement. Many of the books bearing his name are spurious, others are of doubtful genuineness.

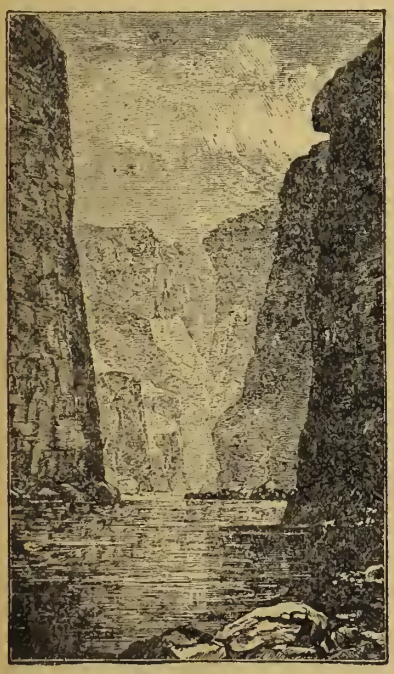
ARITH'METIC is primarily the science of numbers. As opposed to algebra it is the practical part of the science. Although the processes of arithmetical operations are often highly complicated, they all resolve themselves into the repetition of four primary operations: addition, subtraction, multiplication, and division. Of these the two latter are only complex forms of the two former, and subtraction again is merely a reversal of the process of addition. Little or nothing is known as to the origin and invention of arithmetic. Some elementary conception of it is in all probability coeval with the first dawn of human intelligence. In consequence of their rude methods of numeration, the science made but small advance among the ancient Egyptians, Greeks, and Romans, and it was not until the introduction of the decimal scale of notation and the Arabic, or rather Indian, numerals into Europe that any great progress can be traced. In this scale of notation every number is expressed by means of the ten digits, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, by giving each digit a local as well as its proper or natural value. The value of every digit increases in a tenfold proportion from the right toward the left; the distance of any figure from the right indicating the power of 10, and the digit itself the number of those powers intended to be expressed: thus $3464 = 3000 + 400 + 60 + 4 = 3 \times 10^3 + 4 \times 10^2 + 6 \times 10 + 4$. The earliest arithmetical signs appear to have been hieroglyphical, but the Egyptian hieroglyphics were too diffuse to be of any arithmetical value. The units were successive strokes to the number required, the ten an open circle, the hundred a curled palm-leaf, the thousand a lotus flower, ten thousand a bent finger. The letters of the alphabet afforded a convenient mode of representing figures, and were used accordingly by the Chaldeans, Hebrews, and Greeks. The first nine letters of the Hebrew alphabet represented the units, the second nine tens, the remaining four together with five repeated with additional marks, hundreds; the same succession of letters with added points was repeated for thousands, tens of thousands, and hundreds of thousands. The Greeks followed the same system up to tens of thousands. They wrote the different classes of numbers in succession as we do, and they transferred operations performed on units to numbers in higher places; but the use of different signs for the different ranks clearly shows a want of full perception of the value of place as such. They adopted the letter M as a sign for 10,000 and by combining this mark with their other numerals they could note numbers as high as 100,000,000. The Roman numerals which are still used in marking dates or numbering chapters were almost useless for purposes of computation. From one to four were represented by vertical strokes **I, II, III, IIII,** five by **V,** ten by **X,** fifty by **L,** one hundred by **C,** afterward **C,** five hundred by **D,** a thousand by **M.** These signs were derived from each other according to particular rules, thus **V** was the half of **X, Λ** being also used; **L** was likewise the half of **C. M** was artistically written **M** and cIↃ, and IↃ, afterward D, became five hundred. ccI represented 5000, ccIↃↃ 10,000, IↃↃↃ 50,000, cccIↃↃↃ 100,000. They were also compounded by addition and subtraction, thus **IV** stood for four, **VI** for six, **XXX** for thirty, **XL** for forty, **LX** for sixty. Arithmetic is divided into abstract and practical; the former comprehends notation, numeration, addition, subtraction, multiplication, division, measures and multiples, fractions, powers and roots: the latter treats of the combinations and practical applications of these and the so-called rules, such as reduction, compound addition, subtraction, multiplication, and division, proportion, interest, profit and loss, etc. Another division is integral and fractional arithmetic, the former treating of integers, or whole numbers, and the latter of fractions. Decimal fractions were invented in the 16th century, and logarithms, embodying the last great advance in the science, in the 17th century.

ARIZO'NA, a territory of the United States bounded by Utah, Mexico, New Mexico, California, and Nevada, in latitudes 31° 20′ and 37° n. and longitudes 109° 3′ and 114° 54′ w. It has an area of 113,020 sq. miles and a population (1908) of 200,000. It is believed that the country, now called Arizona, was formerly inhabited by a powerful race who built cities, constructed forts, and were civilized in a high degree. The first white men to explore this region were Marco de Nizan and his

companions, Spanish missionaries. Subsequent expeditions and settlement were discouraged by the Apaches, who have, until the present time, been a source of trouble to the white inhabitants. In 1848 Arizona, together with New Mexico, became part of the United

States, by the Gadsden purchase. On Feb. 24, 1813, it became a territory, In 1907 it was admitted with Oklahoma as the state of Oklahoma.

The territory is, in its southwestern part, of low elevation, and its northeastern portion consists of a high plateau. In the south are numerous high mountain peaks, many of them (Thomas, Ord, Bill Williams, and others) 10,000 feet high and higher. The northern table-



Marble cañon, Colorado river.

land at places is 8000 feet in altitude. The Colorado is the principal river, and its cañon reaches its most picturesque state in Arizona. The climate is mild, very dry, and very healthful, varying in temperature from excessive heat to a mean of 45°. The rainfall is from five to twenty inches yearly in various parts of the territory.

Owing to the lack of irrigation Arizona has been very backward in agriculture. The principal industries are stock-raising, alfalfa, wheat, and barley. Figs, raisin-grapes and nuts of excellent quality are grown, and cotton could be raised with adequate irrigation. The mineral resources of Arizona are probably richer than those of any other state or territory in the Union, but their development has been held back by poor and scanty transportation facilities. Copper (263,200,000 pounds in 1906), gold ($2,747,100 in 1906), and silver ($2,099,822 in 1906) are the chief mining products. Rich deposits of platinum, gypsum, mercury, salt, iron, nickel, tin, and precious stones abound.

Arizona has a total of 1881 miles of railway, eight national banks, and a good educational system.

ARK, the name applied in our translation of the Bible to the boat or floating edifice in which Noah resided during the flood or deluge; to the floating vessel of bulrushes in which the infant Moses was laid; and to the ark of the covenant, which was one of the most important parts of the furniture of the tabernacle, which the Israelites constructed in the wilderness, and afterwards of the temple built by Solomon at Jerusalem. A description of it is to be found in Exodus xxv., in the command given to Moses for its construction; and also in Exodus xxxvii, from which it appears it was a chest of shittim-wood, overlaid with gold within and without, two cubits and a half in length, one cubit and a half in breadth and in height —that is, according to the common estimate of the length of the cubit, three feet nine inches in length, and two feet three inches in breadth and height—the lid being formed entirely of pure gold, with a crown or raised border of pure gold round about. Within the ark was deposited the "testimony," consisting of "the two tables of the law," i. e., the stone tablets upon which the ten commandments were inscribed. The golden lid of the ark was called the *mercy-seat* or *propitiatory*, and above it were the *cherubims*, made of the same piece of gold with it, and between them was the place of the manifestation of the Divine presence.

ARKANSAS (är'kan-sa), one of the South Central states, bounded on the north by Missouri, by Louisiana on the south, the Mississippi river on the east, and by the Indian Territory and Texas on the west. It has an area of 53,850 sq. miles, a population (1906) of 1,750,000, and ranks twenty-third in size among the states.

The climate is, on the whole, delightful. The annual mean rainfall varies from 50 to 63 inches, the winters are mild, with light snowfall, and the summers are long. Arkansas takes its name from the Indians found there by the first explorers, who were French. In 1685 settlements were made in the southern and eastern parts, Arkansas then being a part of the general territory of Louisiana. In 1812 it became a part of Missouri Territory, then Arkansas Territory, and in 1836 it was admitted into the Union. The state seceded from the Union in 1861, but the people were fairly divided on the subject of secession, and with the taking of Little Rock in 1863 the confederate power failed. The state has generally voted the democratic ticket in national elections.

Although the mineral resources of Arkansas are varied they are not highly developed. The principal product is that of whetstones, the quality of which has made them famous. They are obtained from the mountains in the vicinity of Little Rock. These mountains are part of the Ozark range. The principal rivers are the Arkansas, the White, the Red, and the Black. These streams are fairly navigable, but lack of transportation facilities in general has cramped the development of the mining industry in Arkansas. The mineral products include zinc, manganese, iron, lead, and copper; marble, whet and hone stones, rock-crystal, paints, niter-earths, kaolin, granite, freestone, limestone, marls, greensand, marly limestones, grindstones, and slate. Of coal, anthracite and lignite, there are abundant supplies. A great number of mineral and thermal springs occur in various parts of the state, the most remarkable and most frequented groups lying to the south of the Arkansas in Hot Springs county. The heat of several attains 146° or 148° Fahr. There is a great variety of soil in Arkansas. Along the river "bottoms" the alluvium is dark, rich, and deep, and yields excellent crops. The chief crops cultivated are corn, wheat, cotton, and tobacco, as well as apples and other fruits. The trees and shrubs most frequently occurring are poplars, oaks, pines, sweet-gum, sycamore, black locust, ash, elm, hickory, dogwood, elder, palma-christi, black spice, pawpaw, mockernut, wild vine, etc. The fauna of Arkansas includes the buffalo, eland, red-deer, beaver, otter, hare, raccoon, wild turkey, goose and quail, as well as bears and wolves among the mountains. The climate of the lower districts is decidedly unhealthy, largely on account of the lack of wholesome water; but in the upper regions it is quite salubrious.

The material interests of the State are enjoying a high degree of prosperity. The products of the lumber and mining industries, have annually increased in volume, to meet the constantly growing demand there for

throughout the State and in other portions of the Southwest.

There is a total of 4,532 miles of railroad in the State, owned and maintained by the St. Louis, Arkansas and Texas; Iron Mountain; Little Rock and Fort Smith, and other roads and their branches.

The school system is well managed and sustained. It is under the direction of a state superintendent and subordinate officials. In addition to the school houses distributed throughout the various school districts in the state, a Normal school is conducted at Pine Bluff and an industrial university at Fayetteville. The curriculum of the latter embraces agriculture and mechanical courses, besides the regular classical and scientific departments. The State also maintains schools for the blind, and deaf and dumb, and has at present a total of about 1,200,000 acres of State lands of various descriptions remaining unsold.

The population by decades is as follows: 1820, 14,000; 1830, 30,000; 1840, 97,000; 1850, 209,000; 1860, 435,000; 1870, 484,000; 1880, 802,000; 1890, 1,128,000; 1908, 1,440,000. In 1820 Arkansas ranked twenty-sixth in order of population, and has since varied but little from this position, being twenty-fifth in 1900. The state ranks tenth in respect to negro population, the rate of increase for this class being greater than it is for the whites. In 1880 they numbered 210,000; in 1900, 366,000. In 1909 Little Rock, the capital, had a population of 60,000; Pine Bluff, 11,147; Fort Smith, 10,903; Hot Springs, 9,412. The state has invariably been Democratic.

ARKANSAS CITY, a rapidly growing city in the southern portion of Cowley county, Kansas, is situated at the junction of the Walnut and Arkansas rivers. The Atchison, Topeka and Santa Fe, Missouri Pacific, and St. Louis and San Francisco roads pass through the city and afford abundant facilities for shippers and travelers. It contains commercial and manufacturing enterprises in large number, many of the latter being operated by water power, of which an abundance is available. The city is lighted by gas and electricity, provided with water-works and is progressive. Population, 8,354.

ARKANSAS (är-kan'sas) **RIVER,** the second largest affluent of the Mississippi, the Missouri ranking first. It rises in central Colorado, flows through Kansas, Oklahoma and Indian Territories, and empties into the Mississippi. It is 2000 miles long and navigable for about 600 miles from its mouth.

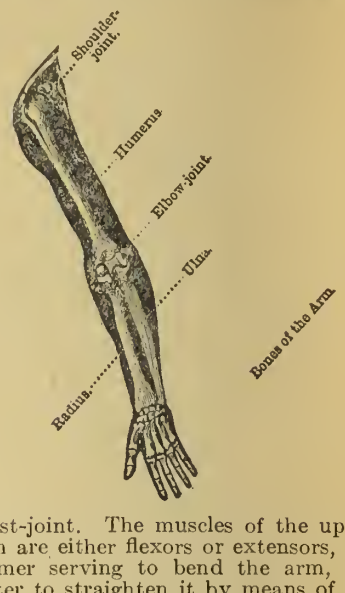
ARK'WRIGHT, Sir Richard, famous for his inventions in cotton-spinning, was born at Preston, in Lancashire, in 1732; died 1792. When about thirty-five years of age he gave himself up exclusively to the subject of inventions for spinning cotton. The thread spun by Hargreaves's jenny could not be used except as 'weft,' being destitute of the firmness or hardness required in the longitudinal threads or warp. But Arkwright supplied this deficiency by the invention of the spinning-frame, which spins a vast number of threads of any degree of fineness and hardness, leaving the operator merely to feed the machine with cotton and to join the threads when they happen to break. His invention introduced the system of spinning by rollers, the carding, or roving as it is technically termed (that is, the soft, loose strip of cotton), passing through one pair of rollers, and being received by a second pair, which are made to revolve with (as the case may be) three, four, or five times the velocity of the first pair. By this contrivance the roving is drawn out into a thread of the desired degree of tenuity and hardness. Having made several additional discoveries and improvements in the processes of carding, roving, and spinning, he took out a fresh patent for the whole in 1775, and thus completed a series of the most ingenious and complicated machinery. Notwithstanding a series of lawsuits in defense of his

Sir Richard Arkwright.

patent rights, and the destruction of his property by mobs, he amassed a large fortune. He was knighted by George III. in 1786.

ARLES, a town of southern France, dep. Bouches du Rhone, 17 miles southeast of Nismes. It was an important town at the time of Cæsar's invasion, and under the later emperors it became one of the most flourishing towns on the further side of the Alps. It still possesses numerous ancient remains, of which the most conspicuous are those of a Roman amphitheatre, which accommodated 24,000 spectators. Pop. 16,247.

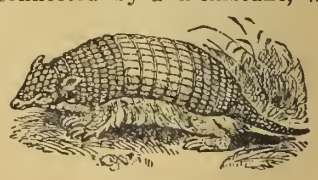
ARM, the upper limb in man, connected with the thorax or chest by means of the scapula or shoulder-blade, and the clavicle or collar-bone. It consists of three bones, the arm-bone (humerus), and the two bones of the fore-arm (radius and ulna), and it is connected with the bones of the hand by the carpus or wrist. The head or upper end of the arm-bone fits into the hollow called the glenoid cavity of the scapula, so as to form a joint of the ball-and-socket kind, allowing great freedom of movement to the limb. The lower end of the humerus is broadened out by a projection on both the outer and inner sides (the outer and inner condyles), and has a pulley-like surface for articulating with the fore-arm to form the elbow-joint. This joint somewhat resembles a hinge, allowing of movement only in one direction. The ulna is the inner of the two bones of the fore-arm. It is largest at the upper end, where it has two processes, the coronoid and the olecranon, with a deep groove between to receive the humerus. The radius—the outer of the two bones—is small at the upper and expanded at the lower end, where it forms part of the



wrist-joint. The muscles of the upper arm are either flexors or extensors, the former serving to bend the arm, the latter to straighten it by means of the elbow-joint. The main flexor is the biceps, the large muscle which may be seen standing out in front of the arm when a weight is raised. The chief opposing muscle of the biceps is the triceps. The muscles of the fore-arm are, besides flexors and extensors, pronators and supinators, the former turning the hand palm downward, the latter turning it upward. The same fundamental plan of structure exists in the limbs of all vertebrate animals.

ARMA'DA, the Spanish name for any large naval force; usually applied to the Spanish fleet the Invincible Armada, intended to act against England A.D. 1588. It consisted of 130 great war vessels, and carried 19,295 marines, 8460 sailors, 2088 slaves, and 2630 cannons.

ARMADIL'LO, an edentate mammal peculiar to South America, consisting of various species, belonging to a family intermediate between the sloths and ant-eaters. They are covered with a hard bony shell, divided into belts, composed of small separate plates like a coat of mail, flexible everywhere except on the forehead, shoulders, and haunches, where it is not movable. The belts are connected by a membrane, which



Yellow-footed armadillo.

enables the animal to roll itself up like a hedgehog. These animals burrow in the earth, where they lie during the daytime, seldom going abroad except at night. They are of different sizes; the largest being 3 feet

in length without the tail, and the smallest only 10 inches. They subsist chiefly on fruits and roots, sometimes on insects and flesh. They are inoffensive, and their flesh is esteemed good food.—There is a genus of isopodous Crustacea called Armadillo, consisting of animals allied to the wood-lice, capable of rolling themselves into a ball.

ARMAGEDDON (-ged'don), the great battlefield of the Old Testament, where the chief conflicts took place between the Israelites and their enemies—the tableland of Esdraelon in Galilee and Samaria, in the center of which stood the town Megiddo, on the site of the modern Lejjun: used figuratively in the Apocalypse to signify the place of "the battle of the great day of God."

ARMAGH (ar-mä'), a county of Ireland, in the province of Ulster; surrounded by Monaghan, Tyrone, Lough Neagh, Down, and Lowth; area, 328,086 acres, of which about a half is under tillage. Pop. 125,238.—The county town, Armagh, is situated partly on a hill, about half a mile from the Callan. It is the see of an archbishop of the Protestant-Episcopal Church, who is primate of all Ireland, and is a place of great antiquity. Pop. 8303.

AR'MATURE, a term applied to the piece of soft iron which is placed across the poles of permanent or electromagnets for the purpose of receiving and concentrating the attractive force. In the case of permanent magnets it is also important for preserving their magnetism when not in use, and hence it is sometimes termed the keeper. It produces this effect in virtue of the well-known law of induction, by which the armature, when placed near or across the poles of the magnet, is itself converted into a temporary magnet with reversed poles, and these, reacting upon the permanent magnet, keep its particles in a state of constant magnetic tension, or, in other words, in that constrained position which is supposed to constitute magnetism. A horseshoe magnet should therefore never be laid aside without its armature; and in the case of straight bar-magnets two should be placed parallel to each other, with their poles reversed, and a keeper or armature across them at both ends. The term is also applied to the core and coil of the electromagnet, which revolves before the poles of the permanent magnet in the magneto-electric machine.

ARMED NEUTRALITY, the condition of affairs when a nation assumes a threatening position, and maintains an armed force to repel any aggression on the part of belligerent nations between which it is neutral. The term is applied in history to a coalition entered into by the northern powers in 1780 and again in 1800.

ARMED SHIP, a ship which is taken into the service of a government for a particular occasion, and armed like a ship of war.

ARME'NIA, a mountainous country of western Asia, not now politically existing, but of great historical interest as the original seat of one of the oldest civilized peoples in the world. It is now shared between Turkey, Persia, and Russia. It has an area of about 137,000 square miles, and is intersected by the Euphrates, which divides it into the ancient divisions, Armenia Major and Armenia Minor. The country is an elevated plateau, inclosed on several sides by the ranges of Taurus and Anti-Taurus, and partly occupied by other mountains, the loftiest of which is Ararat. Several important rivers take their rise in Armenia, namely, the Kur or Cyrus, and its tributary the Aras or Araxes, flowing east to the Caspian Sea; the Halys or Kizil-Irmak, flowing north to the Black Sea; and the Tigris and Euphrates, which flow into the Persian Gulf. The chief lakes are Van and Urumiyah. The climate is rather severe. The soil is on the whole productive, though in many places it would be quite barren were it not for the great care taken to irrigate it. Wheat, barley, tobacco, hemp, grapes, and cotton are raised; and in some of the valleys apricots, peaches, mulberries, and walnuts are grown. The inhabitants are chiefly of the genuine Armenian stock, a branch of the Aryan or Indo-European race; but besides them, in consequence of the repeated subjugation of the country, various other races have obtained a footing. The total number of Armenians is estimated at 2,000,000, of whom probably one-half are in Armenia. The remainder, like the Jews, are scattered over various countries, and are generally engaged in commercial pursuits. They everywhere retain, however, their distinct nationality. Many thousands of them in Armenia have recently been massacred by the Turks.

Little is known of the early history of Armenia, but it was a separate state as early as the 8th century B.C., when it became subject to Assyria, as it also did subsequently to the Medes and the Persians. It was conquered by Alexander the Great in 325 B.C., but regained its independence about 190 B.C. Its king Tigranes, son-in-law of the celebrated Mithridates, was defeated by the Romans under Lucullus and Pompey about 69–66 B.C., but was left on the throne. Since then its fortunes have been various under the Romans, Parthians, Byzantine emperors, Persians, Saracens, Turks, etc. A considerable portion of it has been acquired by Russia in the 19th century, part of this in 1878.

The Armenians received Christianity as early as the 2d century. During the Monophysitic disputes they held with those who rejected the twofold nature of Christ, and being dissatisfied with the decisions of the Council of Chalcedon (451) they separated from the Greek Church in 536. The popes have at different times attempted to gain them over to the Roman Catholic faith, but have not been able to unite them permanently and generally with the Roman Church. There are, however, small numbers here and there of United Armenians, who acknowledge the spiritual supremacy of the pope, agree in their doctrines with the Catholics, but retain their peculiar ceremonies and discipline. But the far greater part are yet Monophysites, and have remained faithful to their old religion and worship. Their doctrine differs from the orthodox chiefly in their admitting only one nature in Christ, and believing the Holy Spirit to proceed from the Father alone. Their sacraments are seven in number. They adore saints and their images, but do not believe in purgatory. Their hierarchy differs little from that of the Greeks. The Catholicus, or head of the church, has his seat at Etchmiadzin, a monastery near Erivan, the capital of Russian Armenia, on Mount Ararat.

The Armenian language belongs to the Indo-European family of languages, and is most closely connected with the Iranic group. The Old Armenian or Haikan language, which is still the literary and ecclesiastical language, is distinguished from the new Armenian, the ordinary spoken language, which contains a large intermixture of Persian and Turkish elements. The most flourishing period of Armenian literature extended from the 4th to the 14th century. It then declined, but a revival began in the 17th century, and at the present day wherever any extensive community of Armenians have settled they have set up a printing-press. The Armenian Bible, translated from the Septuagint by Isaac or Sahak, the patriarch, early in the 5th century, is a model of the classic style.

ARMIN'IANS, a sect or party of Christians, so called from James Arminius or Harmensen, a Protestant divine of Leyden, who died in 1609. The Arminian doctrines are: (1) Conditional election and reprobation, in opposition to absolute predestination. (2) Universal redemption, or that the atonement was made by Christ for all mankind, though none but believers can be partakers of the benefit. (3) That man, in order to exercise true faith, must be regenerated and renewed by the operation of the Holy Spirit, which is the gift of God; but that this grace is not irresistible and may be lost, so that men may relapse from a state of grace and die in their sins.

AR'MISTICE, a temporary suspension of hostilities between two belligerent powers or two armies by mutual agreement, often concluded for only a few hours to bury the slain, remove the wounded, and exchange prisoners, as also sometimes to allow of a parley between the opposing generals. A general armistice is usually the preliminary of a peace.

ARMOR PLATE, steel plate used to protect vessels of war against the projectiles of an enemy. Although the idea is comparatively old, it was first brought into practical use by the engineer John Ericson, in the Monitor, which fought the iron-clad Merrimac during the war of emancipation. The object of having a hard face to armor is to break up projectiles by shock, or so to strain or deform them as to reduce their penetration. It is particularly effective on oblique impact (i.e. where the projectile strikes at an angle with the plate). To combine hardness with toughness was the aim of armor makers for a quarter of a century, and success was not obtained until the advent of nickel steel. Had not the improvement of projectiles and guns kept pace with

the development of armor, ships could now be made invulnerable; but both have improved so that the relation of guns and armor is now less favorable to the latter than at almost any time in its history. Nevertheless, armor is absolutely indispensable to the protection of ships and their crews against all classes of gunfire. The power of good Harvey nickel-steel armor to resist penetration is about equal to that of double the thickness of wrought iron, and the resisting power of Krupp armor is 10 to 15 per cent greater. These figures are for attack by ordinary armor-piercing projectiles. Projectiles of this type which are fitted with soft caps penetrate about as deeply in Krupp as in Harvey armor, and the gain by the use of caps is equal to a reduction in thickness of 8 to 10 per cent in Harvey armor and 15 to 20 in Krupp—that is to say, a capped projectile will perforate a Harvey plate 8 to 10 per cent thicker, or a Krupp plate 15 to 20 per cent thicker, than will a projectile not provided with a cap.

ARMS, COAT OF, or **ARMORIAL BEARINGS,** a collective name for the devices borne on shields, on banners, etc., as marks of dignity and distinction, and, in the case of family and feudal arms, descending from father to son. They were first employed by the Crusaders, and became hereditary in families at the close of the 12th century. They took their rise from the knights painting their banners or shields each with a figure or figures proper to himself, to enable him to be distinguished in battle when clad in armor. See Heraldry.

ARMS and ARMOR. The former term is applied to weapons of offense, the latter to the various articles of defensive covering used in war and military exercises, especially before the introduction of gunpowder. Weapons of offense are divisible into two distinct sections: firearms, and arms used without gunpowder or other explosive substance. The first arms of offense would probably be wooden clubs, then would follow wooden weapons made more deadly by means of stone or bone, stone axes, slings, bows and arrows with heads of flint or bone, and afterward various weapons of bronze. Subsequently a variety of arms of iron and steel were introduced, which comprised the sword, javelin, pike, spear or lance, dagger, ax, mace, chariot scythe, etc.; with a rude artillery consisting of catapults, ballistæ, and battering-rams. From the descriptions of Homer we know that almost all the Grecian armor, defensive and offensive, in his time was of bronze; though iron was sometimes used. The lance, spear, and javelin were the principal weapons of this age among the Greeks. The bow is not often mentioned. Among ancient nations the Egyptians seem to have been most accustomed to the use of the bow, which was the principal weapon of the Egyptian infantry. Peculiar to the Egyptians was a defensive weapon intended to catch and break the sword of the enemy. With the Assyrians the bow was a favorite weapon; but with them lances, spears, and javelins were in more common use than with the Egyptians. Most of the large engines of war, chariots with scythes projecting at each side from the axle, catapults, and ballistæ, seem to have been of Assyrian origin. During the historical age of Greece the characteristic weapon was a heavy spear from 21 to 24 feet in length. The sword used by the Greeks was short, and was worn on the right side. The Roman sword was from 22 to 24 inches in length, straight, two-edged, and obtusely pointed, and as by the Greeks was worn on the right side. It was used principally as a stabbing weapon. It was originally of bronze. The most characteristic weapon of the Roman legionary soldier, however, was the pilum, which was a kind of pike or javelin, some 6 feet or more in length. The pilum was sometimes used at close-quarters, but more commonly it was thrown. The favorite weapons of the ancient Germanic races were the battle-ax, the lance or dart, and the sword. The weapons of the Anglo-Saxons were spears, axes, swords, knives, and maces or clubs. The Normans had similar weapons, and were well furnished with archers and cavalry. The cross-bow was a comparatively late invention introduced by the Normans. Gunpowder was not used in Europe to discharge projectiles till the beginning of the 14th century. Cannon are first mentioned in England in 1338, and there seems to be no doubt that they were used by the English at the siege of Cambrai in 1339. The projectiles first used for cannon were of stone. Hand firearms date from the 15th century. At first they required two men to serve them, and it was necessary to rest the muzzle on a stand in aiming and firing. The first improvement was the invention of the match-lock, about 1476; this was followed by the wheel-lock; and about the middle of the 17th century by the flint-lock, which was in universal use until it was superseded by the percussion-lock, the invention of a Scotch clergyman early in the 19th century. The needle-gun dates from 1827. The only important weapon not a firearm that has been invented since the introduction of gunpowder is the bayonet, which is believed to have been invented about 1650. See Cannon, Musket, Rifle, etc.

A, Bascinet.
B, Jewelled orle round the bascinet.
C, Gorget, or gorgiere of plate.
D, Pauldrons.
E, Breastplate-cuirass.
F, Rere-braces.
G, Coudes or elbow-plates.
H, Gauntlets.
I, Vambrace.
J, Skirt of taces.
K, Military belt or cingulum richly jewelled.
L, Tuilles or tuillets.
M, Cuisses.
N, Genouilleres or knee-pieces.
O, Jambes.
P, Spur-straps.
Q, Sollerets.
R, Misericorde or dagger.
S, Sword, suspended by a transverse belt.

Armor, from the effigy of Sir Richard Peyton, in Tong Church, Shropshire.

Allecret (light-plate) armor, A.D., 1540.

Roman cuirass.

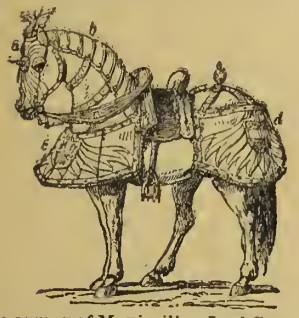
Greek armor.

Roman cuirass—Scale armor.

Chain armor.

Some kind of defensive covering was probably of almost as early invention as weapons of offense. The principal pieces of defensive armor used by the ancients were shields, helmets, cuirasses, and greaves. In the earliest ages of Greece the shield is described as of immense size, but in the time of the Peloponnesian war (about B.C. 420) it was much smaller. The Romans had two sorts of shields: the scutum, a large oblong rectangular highly convex shield, carried by the legionaries; and the parma, a small round or oval flat shield, carried by the light-armed troops and the cavalry. In the declining days of Rome the shields became larger and more varied in form. The helmet was

a characteristic piece of armor among the Assyrians, Greeks, Etruscans, and Romans. Like all other body armor it was usually made of bronze. The helmet of the historical age of Greece was distinguished by its lofty crest. The Roman helmet in the time of the early emperors fitted close to the head, and had a neckguard and hinged cheek-pieces fastened under the chin, and a small bar across the face for a visor.



Horse-armor of Maximilian I, of Germany. *a*, Chamfron. *b*, Manefaire. *c*, Poitrinal, poitrel or breastplate. *d*, Croupiere or buttock-piece.

Both Greeks and Romans wore cuirasses, at one time of bronze, but latterly of flexible materials. Greaves for the legs were worn by both, but among the Romans usually on one leg. The ancient Germans had large shields of plaited osier covered with leather, afterward their shields were small, bound with iron, and studded with bosses. The Anglo-Saxons had round or oval shields of wood, covered with leather, and having a boss in the center; and they had also corselets, or coats of mail, strengthened with iron rings. The Normans were well protected by mail; their shields were somewhat triangular in shape, their helmets conical. In Europe generally metal armor was used from the 10th to the 18th century, and at first consisted of a tunic made of iron rings firmly sewed flat upon strong cloth or leather. The rings were afterward interlinked one with another so as to form a garment of themselves, called chain-mail. Great variety is found in the pattern of the armor, and in some cases small pieces of metal were used instead of rings, forming what is called scale-armor. A suit of armor consisting of larger pieces of metal, called plate-armor, was now introduced, and the whole body came to be incased in a heavy metal covering. The various forms of ring or scale armor were gradually superseded by the plate-armor, which continued to be worn until long after the introduction of firearms and field-artillery.

ARMOUR, Philip Danforth, an American merchant, born at Stockbridge, N. Y., 1832, died in 1901. He received a public school education, and traveled as a youth to California, but settled in Milwaukee in 1852. In 1863 he founded the house of Armour, Plankington & Co., packers, the offices of which were removed to Chicago in 1870, where the house was soon reorganized as Armour & Co. Mr. Armour was not only a good business man, but a philanthropist as well. He founded the Armour Institute of Technology at Chicago, and the Armour Mission in the same city at an expense of $2,500,000.

ARMSTRONG, William George, Lord, engineer and mechanical inventor, born at Newcastle-on-Tyne, 10th Nov., 1810. He was trained as a solicitor, and practiced as such for some time, though his tastes scarcely lay in that direction. Among his early inventions were the hydro-electric machine, a powerful apparatus for producing frictional electricity, and the hydraulic crane. In 1847 the Elswick works, near Newcastle, were established for the manufacture of his cranes and other heavy iron machinery, and these works are now among the most extensive of their kind. Here the first rifled ordnance gun which bears his name was made in 1854. His improvements in the manufacture of guns and shells led to his being appointed engineer of rifled ordnance under government, and he was knighted in 1858. This appointment came to an end in 1863, since which time his ordnance has taken a prominent place in the armaments of different countries. He was raised to the peerage as Baron Armstrong in 1887. He died in 1901.

ARMSTRONG GUN, a kind of cannon, so called from its inventor, made of wought-iron, principally of spirally-coiled bars, so disposed as to bring the metal into the most favorable position for the strain to which it is to be exposed, and occasionally having an inner tube or core of steel, rifled with numerous shallow grooves. The size of these guns ranges from the smallest field-piece to pieces of the highest caliber. The projectile is coated with lead, and inserted into a chamber behind the bore. This the explosion drives forward, compressing its soft coating into the grooves, so as to give it a rotary motion, and at the same time obviate windage. Both breech-loading and muzzle-loading Armstrong guns have been made.

ARMY, an organized body of drilled and disciplined men, furnished with weapons of offense and defense, for the protection of a state against external attack, for making war on foreign states or other enemies, and for the preservation of order within the state itself.

War in savage communities is carried on by armies of the comparatively crude organization, and the ancient army was a succession of mere lines of men, shoulder to shoulder, the cavalry being organized on virtually the same plan. The introduction of the Macedonian phalanx by Philip and its use by Alexander the Great was the first step toward the modern mobile regiment. The phalanx was ground to powder by the Roman legion which superceded it, and the legion itself was brought to perfection by its subdivision into centuries, each with a captain, or centurion. This is the modern company, and the modern regiment is substantially the same thing as the Roman legion.

An army, in the modern sense, has four branches, each with its separate function, yet each of which may be brought into coordination with the others. These branches are the infantry, cavalry, artillery, and engineer corps. A fifth and sixth branch, that is, hospital corps and signal corps, are not fighting branches proper.

The unit of infantry is the battalion, consisting of about 1000 men, divided into companies of say 250 each. Three or four battalions go to make a regiment, and three regiments, in the United States, comprise a brigade. Certain European countries make use of a mounted infantry, particularly Great Britain, and others have recently organized infantry bodies for the use of machine and automatic guns which cannot properly be classified with artillery.

In the United States army the unit of cavalry is the squadron of 150 mounted men armed with sabers. The squadron is subdivided into four troops, each of 100 men, when complete. A regiment of cavalry consists of three squadrons, the brigade consists of three regiments.

The unit of artillery is, in the United States army, a battery. The field battery has 175 men and 250 horses, the horse battery has 165 men and 235 horses. Normally the battery has 6 guns, but the tendency is toward a reduction of this number. It is believed that four guns will be the number which will constitute the battery of the United States army in the future. A battalion of artillery consists of three or four batteries, and the artillery regiment of three or four battalions.

These various units combine together into larger units, such as the division consisting of two brigades, and the army corps, which consists of two divisions of infantry, one regiment of field artillery, and other services. In the United States the army corps is composed of three divisions, several regiments of cavalry, and artillery.

The engineer corps is organized into battalions of four companies each, the latter into regiments of two battalions each, including a balloon section. The organization of the engineer corps is substantially the same as that of the infantry.

The army of the United States has a signal corps which operates the field telegraph, the military balloons, wireless telegraphy, and the old-fashioned signaling by flag, torch, heliograph, etc. An army corps carries one company of signal corps, numbering 175 men.

The medical department of the army includes the hospital corps, the surgeons taking the rank of officers according to grade.

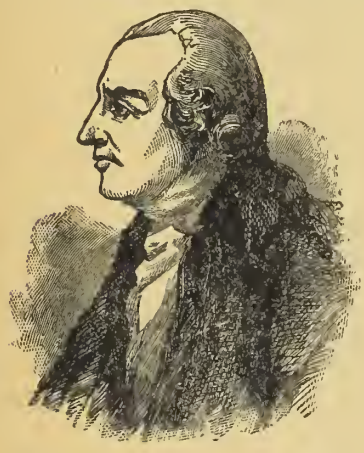
ARMY SCHOOLS. See Military Schools.

ARMY WORM, the very destructive larva of a moth, so called from its habit of marching in compact bodies of enormous number, devouring almost every green thing it meets. It is about 1½ inches long, greenish in color, with black stripes, and is found in various parts of the world, but is particularly destructive in North America.

ARN'HEM, or **ARNHEIM,** a town in Holland, prov. of Gelderland, 18 miles southwest of Zutphen, on the right bank of the Rhine. In 1795 it was stormed by the French, who were driven from it by the Prussians in 1813. Pop. 57,498.

AR'NICA, a genus of plants, consisting of some twelve species, one of which is found in central Europe, leopard's bane or mountain tobacco, but is not a native of Britain. It has a perennial root, a stem about 2 feet high, bearing on the summit flowers of a dark golden yellow. In every part of the plant there is an acrid resin and a volatile oil, and in the flowers an acrid bitter principle called arnicin. The root contains also a considerable quantity of tannin. A tincture of it is employed as an external application to wounds and bruises.

AR'NOLD, Benedict, a general in the American army during the war of independence, who rendered his name infamous by his attempt to betray the strong fortress of West Point, with all



B. Arnold M'Jen

the arms and immense stores which were there deposited, into the hands of the British. The project failed through the capture of Major André, when Arnold made his escape to the British lines. He received a commission as major-general in the British army, and took part in several marauding expeditions. He subsequently settled in the West Indies, and ultimately went to London, where he died in 1801, aged 61.

AR'NOLD, Edwin, K.C.I.E., poet, Sanskrit scholar, and journalist, born 1832. Educated at Oxford, where he took the Newdigate prize for a poem entitled The Feast of Belshazzar. He is author of Poems, narrative and lyrical, numerous translations from the Greek and Sanskrit; The Light of Asia, a poem presenting the life and teaching of Gautama, the founder of Buddhism. Died 1904.

AR'NOLD, Matthew, English critic, essayist, and poet, was born at Laleham, near Staines, 1822, being a son of Dr. Arnold, of Rugby. He was educated at Winchester, Rugby, and Oxford, and became a Fellow of Oriel College. He received the degree of LL.D. from both Oxford and Edinburgh, and lectured in Britain and in America. He died in 1888.

AR'NOLD, Thomas, head-master of Rugby School, and professor of modern history in the University of Oxford, born at Cowes, in the Isle of Wight, in 1795, died 1842. Not only did Rugby School become crowded beyond any former precedent, but the superiority of Dr. Arnold's system became so generally recognized that it may be justly said to have done much for the general improvement of the public schools of England.

ARNSBERG (ärnz'ber*h*), a town in Prussia, prov. of Westphalia, capital of the government of same name on the Ruhr. Pop. 8488.—The government of Arnsberg has an area of 2972 square miles, and a population of 1,851,319.

ARO'MA, the distinctive fragrance exhaled from spices, plants, etc., generally an agreeable odor, a sweet smell.

AROMAT'ICS, drugs, or other substances which yield a fragrant smell, and often a warm pungent taste, as calamus, ginger, cinnamon, cassia, lavender, rosemary, laurel, nutmegs, cardamoms, pepper, pimento, cloves, vanilla, saffron. Some of them are used medicinally as tonics, stimulants, etc.

AROMATIC VINEGAR, a very volatile and powerful perfume made by adding the essential oils of lavender, cloves, etc., and often camphor, to crystallizable acetic acid. It is a powerful excitant in fainting, languor, and headache.

ARPEGGIO (ar-pej'ō), the distinct sound of the notes of an instrumental chord; the striking the notes of a chord in rapid succession, as in the manner of touching the harp instead of playing them simultaneously.

AR'QUEBUS, a hand-gun; a species of fire-arm resembling a musket anciently used. It was fired from a forked rest, and sometimes cocked by a wheel, and carried a ball that weighed nearly two ounces. A larger kind used in fortresses carried a heavier shot.

AR'RAH, a town of British India, in Shahabad district, Bengal, rendered famous during the mutiny of 1857 by the heroic resistance of a body of twenty civilians and fifty Sikhs, cooped up within a detached house, to a force of 3000 sepoys, who were ultimately routed and overthrown by the arrival of a small European reinforcement. Pop. 46,905.

ARRAIGNMENT (ar-rān'-), the act of calling or setting a prisoner at the bar of a court to plead guilty or not guilty to the matter charged in an indictment or information.

ARRANGEMENT, in music, the adaptation of a composition to voices or instruments for which it was not originally written; also, a piece so adapted.

ARREST' is the apprehending or restraining of one's person, which, in civil cases, can take place legally only by process in execution of the command of some court or officers of justice; but in criminal cases any man may arrest without warrant or precept, and every person is liable to arrest without distinction, but no man is to be arrested unless charged with such a crime as will at least justify holding him to bail when taken. Magna Charta and the Habeas Corpus Act are the two great statutes for securing the liberty of the subject against unlawful arrests and suits.

ARREST OF JUDGMENT, in law, the staying or stopping of a judgment after verdict, for causes assigned. Courts have power to arrest judgment for intrinsic causes appearing upon the face of the record; as when the declaration varies from the original writ; when the verdict differs materially from the pleadings; or when the case laid in the declaration is not sufficient in point of law to found an action upon.

ARRONDISSEMENT (à-rōn-dēs-män), in France an administrative district, the subdivision of a department, or of the quarters of some of the larger cities.

ARROWHEAD, a genus of aquatic plants found in all parts of the world within the torrid and temperate zones, distinguished by possessing barren and fertile flowers, with a three-leaved calyx and three colored petals.

ARROW-ROOT, a starch largely used for food and for other purposes. Arrow-root proper is obtained from the rhizomes or rootstocks of several species of plants, and perhaps owes its name

Arrow-root plant. *a. a.* Rhizomes.

to the scales which cover the rhizome, which have some resemblance to the point of an arrow. Some, however suppose that the name is due to the fact of the fresh roots being used as an application against wounds inflicted by poisoned arrows, and others say that arrow is a corruption of ara, the Indian name of the plant. The species from which arrow-root is most commonly obtained is called the arrow-root plant. Brazilian arrow-root, or tapioca meal, is got from the large fleshy root, after the poisonous juice has been got rid of; East Indian arrow-root, from the large root-stalks; Chinese arrow-root, from the creeping rhizomes; English arrow-root, from the potato; and Oswego arrow-root, from Indian corn.

ARROWSMITH, Aaron, a distinguished English chartographer, born 1750, died 1823; he raised the execution of maps to a perfection it had never before attained. His nephew, John, born 1790, died 1873, was no less distinguished in the same field.

AR'SENAL, a royal or public magazine or place appointed for the making, repairing, keeping, and issuing of military stores. An arsenal of the first class should include factories for guns and gun-carriages, small-arms, small-arms ammunition, harness, saddlery, tents, and powder; a laboratory and large store-houses. In arsenals of the second class workshops take the place of the factories.

AR'SENIC, a metallic element of very common occurrence, being found in combination with many of the metals in a variety of minerals. It is of a dark-gray color, and readily tarnishes on exposure to the air, first changing to yellow, and finally to black. In hardness it equals copper; it is extremely brittle, and very volatile, beginning to sublime before it melts. It burns with a blue flame, and emits a smell of garlic. Its specific gravity is 5·76. It forms alloys with most of the metals. Combined with sulphur it forms orpiment and realgar, which are the yellow and red sulphides of arsenic. Orpiment is the true arsenicum of the ancients. With oxygen arsenic forms two compounds, the more important of which is arsenious oxide or arsenic trioxide (As_2O_3), which is the white arsenic, or simply arsenic of the shops. It is usually seen in white, glassy, translucent masses, and is obtained by sublimation from several ores containing arsenic in combination with metals, particularly from arsenical pyrites. Of all substances arsenic is that which has most frequently occasioned death by poisoning, both by accident and design. The best remedies against the effects of arsenic on the stomach are hydrated sesquioxide of iron or gelatinous hydrate of magnesia, or a mixture of both, with copious draughts of bland liquids of a mucilaginous consistence, which serve to procure its complete ejection from the stomach. Oils and fats generally, milk, albumen, wheat-flour, oatmeal, sugar or syrup, have all proved useful in counteracting its effect. Like many other virulent poisons it is a safe and useful medicine, especially in skin diseases, when judiciously em ployed. It is used as a flux for glass, and also for forming pigments. The arsenite of copper and a double arsenite and acetate of copper are largely used by painters; they are also used to color paper-hangings for rooms, a practice not unaccompanied with considerable danger, especially if flock-papers are used or if the room is a confined one. Arsenic has been too frequently used to give that bright green often seen in colored confectionery, and to produce a green dye for articles of dress and artificial flowers.

AR'SON, in English law, the malicious burning of a dwelling-house or outhouse of another man, which by the common law is felony, and which, if any person is therein, is capital. Also, the wilful setting fire to any church, chapel, warehouse, mill, barn, agricultural produce, ship, coal-mine, and the like.

ART, in its most extended sense, as distinguished from nature on the one hand and from science on the other, has been defined as every regulated operation or dexterity by which organized beings pursue ends which they knew beforehand, together with the rules and the result of every such operation or dexterity. In this wide sense it embraces what are usually called the useful arts. In a narrower and purely æsthetic sense it designates what is more specifically termed the fine arts, as architecture, sculpture, painting, music, and poetry. The useful arts have their origin in positive practical needs, and restrict themselves to satisfying them. The fine arts minister to the sentiment of taste through the medium of the beautiful in form, color, rhythm, or harmony. See Painting, Sculpture, etc.—In the middle ages it was common to give certain branches of study the name of arts. See Arts.

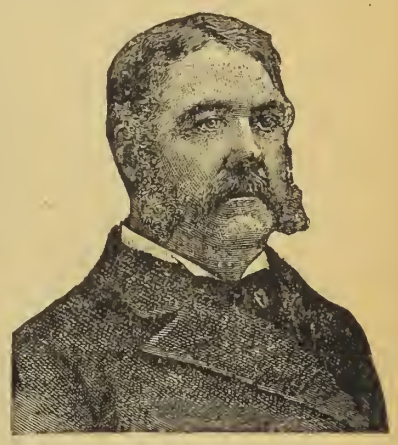
AR'TEMUS WARD. See Browne, Charles Farrar.

AR'TERIES, the system of cylindrical vessels or tubes, membranous, elastic, and pulsatile, which convey the blood from the heart to all parts of the body, by ramifications which as they proceed diminish in size and increase in number, and terminate in minute capillaries uniting the ends of the arteries with the beginnings of the veins. There are two principal arteries or arterial trunks: the aorta, which rises from the left ventricle of the heart and ramifies through the whole body, sending off great branches to the head, neck, and upper limbs and downward to the lower limbs, etc.; and the pulmonary artery, which conveys venous blood from the right ventricle to the lungs, to be purified in the process of respiration.

ARTERIOT'OMY, the opening or cutting of an artery for the purpose of blood-letting, as, for instance, to relieve pressure of the brain in apoplexy.

ARTE'SIAN WELLS, so called from the French province of Artois, where they appear to have been first used on an extensive scale, are perpendicular borings into the ground through which water rises to the surface of the soil, producing a constant flow or stream, the ultimate sources of supply being higher than the mouth of the boring, and the water thus rising by the well-known law. They are generally sunk in valley plains and districts where the lower pervious strata are bent into basin-shaped curves. The rain falling on the outcrops of these saturates the whole porous bed, so that when the bore reaches it the water by hydraulic pressure rushes up toward the level of the highest portion of the strata. The supply is sometimes so abundant as to be used extensively as a moving power, and in arid regions for fertilizing the ground, to which purpose artesian springs have been applied from a very remote period. Thus many artesian wells have been sunk in the Algerian Sahara which have proved an immense boon to the district. The water of most of these is potable, but a few are a little saline, though not to such an extent as to influence vegetation. The hollows in which London and Paris lie are both perforated in many places by borings of this nature. One of the most celebrated artesian wells is that of Grenelle near Paris, 1798 feet deep, completed in 1841, after eight years' work. An artesian well at Budapest has a depth of 3182 feet; another at St. Louis, Mo., is 3843 feet deep. As the temperature of water from great depths is invariably higher than that at the surface, artesian wells have been made to supply warm water for heating manufactories, greenhouses, hospitals, fishponds, etc. Petroleum wells are generally of the same technical description. Artesian wells are now made with larger diameters than formerly, and altogether their construction has been rendered much more easy in modern times. See Boring.

AR'THUR, Chester Alan, the twenty-first president of the United States. He was born at Fairfield, Vt., Oct. 5, 1830, and died at New York Nov. 18, 1886. After taking his degree at Union College, in 1848, Mr. Arthur taught in various schools for a number of years, studying law meanwhile, and when the civil war broke out he was quite prominent in politics. An earnest abolitionist, he sided with the republican party, or, rather, was one of the founders and original members of that party. Soon after the beginning of the war Mr. Arthur was entrusted by General Morgan with the armament and commissariat of the



Chester A. Arthur.

New York troops—a duty in which he displayed such ability that he was soon promoted to the positions of engineer-in-chief, inspector-general, and quartermaster general. From 1871 to 1878 he was collector of the port of the city of New York, and when during the canvass for the next election the republican party was split Mr. Arthur adopted the "Stalwart" side. In the convention that followed Grant was a strong candidate, but the anti-Stalwarts defeated him and nominated Garfield. Not desiring to cause disaffection at the polls Mr. Arthur was placed on the ticket as candidate for vice-president. Garfield was assassinated and Mr. Arthur succeeded to the presidency on Sept. 19, 1881. Although there were some misgivings as to his course, Mr. Arthur made an acceptable president. His administration was not marked by any particular event of importance and he was unsuccessful in his candidacy for nomination before the succeeding convention.

AR'THUR, Julia, an American actress, born at Hamilton, Ont., in 1869. She studied the stage abroad and her first American successes were with A. M. Palmer's companies. She has played in The Black Masque, Becket, A Lady of Quality, and other plays. She retired in 1900.

AR'THUR, King, an ancient British hero of the 6th century, son of Uther Pendragon and the Princess Igerna, wife of Gorlois, duke of Cornwall. He married Guinevere or Ginevra; estab-

lished the famous order of the Round Table; and reigned, surrounded by a splendid court, twelve years in peace. After this, as the poets relate, he conquered Denmark, Norway, and France, slew the giants of Spain, and went to Rome. From thence he is said to have hastened home on account of the faithlessness of his wife, and Modred, his nephew, who had stirred up his subjects to rebellion. He subdued the rebels, but died in consequence of his wounds, on the island of Avalon. The story of Arthur is supposed to have some foundation in fact, it is generally believed that Arthur was one of the last great Celtic chiefs who led his countrymen from the west of England to resist the settlement of the Saxons in the country. But many authorities regard him as a leader of the Cymry of Cumbria and Strath-Clyde against the Saxon invaders of the east coast and the Picts and Scots north of the Forth and the Clyde.

AR'THUR, Timothy Shay, an American writer born in New York in 1809, died in 1885. He is principally known for his story Ten Nights in a Bar room.

ARCTIC EXPLORATION. See Polar Exploration.

ARTICHOKE, a well-known plant, somewhat resembling a thistle, with large divided prickly leaves. The erect flower-stem terminates in a large round head of numerous imbricated oval spiny scales which surround the flowers. The fleshy bases of the scales with the large receptacle are the parts that are eaten.

ARTICLE, in grammar, a part of speech used before nouns to limit or define their application. In English a or an is usually called the indefinite article (the latter form being used before a vowel sound), and the, the definite article, but they are also described as adjectives. An was originally the same as one, and the as that. In Latin there were no articles, and Greek has only the definite article.

ARTICLES, The Thirty-nine, of the Church of England, a statement of the particular points of doctrine, thirty-nine in number, maintained by the English Church; first promulgated by a convocation held in London in 1562–63, and confirmed by royal authority; founded on and superseding an older code issued in the reign of Edward VI. They were ratified anew in 1604 and 1628. All candidates for ordination must subscribe these articles. This formulary is now accepted by the Episcopal Churches of Scotland, Ireland, and America.

ARTICULA'TA, the third great section of the animal kingdom according to the arrangement of Cuvier, including all the invertebrates with the external skeleton forming a series of rings articulated together and enveloping the body, distinct respiratory organs, and an internal ganglionated nervous system along the middle line of the body. They are divided into five classes, viz. Crustacea, Arachnida, Insecta, Myriapoda, and Annelida. The first four classes are now commonly placed together under the name of Arthropoda, and the whole are sometimes called Arthrozoa.

ARTICULA'TION, in anatomy a joint; the joining or juncture of the bones. This is of three kinds: (1) a movable connection, such as the ball-and-socket joint; (2) immovable connection, as by suture, or junction by serrated margins; (3) union by means of another substance, by a cartilage, tendon, or ligament.

ARTIFICIAL LIMBS, legs or arms of wood, cork, or other material, made to replace the natural members which have been lost by disease or accident. The art of making artificial limbs is almost as old as history. Legs of bronze, ivory, and wood have been found on skeletons exhumed from tombs which date back to the fourth century before Christ. Artificial hands, feet and limbs were common during the middle ages. The earliest American invention in this line was the leg patented in 1846 by B. F. Palmer, which at once superseded all others of its kind. Other Americans followed Palmer, and the most serviceable legs and arms manufactured today are those made from American patents. The arm is usually mounted with a rubber hand, which is often of immense service to the wearer. Artificial legs consist of a hollow sheath or bucket, accurately fitting the stump and provided with a "pin" to reach the ground. This structure is fitted with a rubber foot, and, simple as the structure may appear, it admirably supplies the place of the natural member.

ARTIL'LERY, all sorts of great guns, cannon, or ordnance, mortars, howitzers, machine-guns, etc., together with all the apparatus and stores thereto belonging, which are taken into the field, or used for besieging and defending fortified places. The improvements and alterations in artillery and projectiles have of late years been extraordinary, there being in the British service alone over 100 patterns of modern guns. Of these the largest is the 111-ton gun intended for ships and fortresses, the next largest being the 100-ton gun for land service, and the 80-ton gun for land and sea service. The most important modern improvements in artillery, besides the increase in size, is the general adoption of rifled ordnance, breech-loaders, and machine-guns. See Cannon, and other articles.—The name Park of Artillery is given to the entire train of artillery accompanying a military force, with the apparatus, ammunition, etc., as well as the battalion appointed for its service and defense.

ARTILLERY COMPANY, the Ancient and Honorable, of Boston, a historical company of artillery, the oldest military company of America, dating to 1637. Its functions today are social.

ARTILLERY CORPS, the entire artillery branch of the United States army. It consists of a commanding chief, 14 colonels, 13 lieutenant-colonels, 39 majors, 195 captains, 48 sergeants, 31 batteries field, and 126 batteries coast artillery. Total, 18,920 men and 651 officers.

ARTILLERY SCHOOL, a military school of the United States at Fort Monroe, Va., for the teaching of the theory and practice of artillery work.

ARTIODAC'TYLA, a section of the Ungulata or hoofed mammals, comprising all those in which the number of the toes is even (two or four), including the ruminants, such as the ox, sheep, deer, etc., and also a number of non-ruminating animals, as the hippopotamus and the pig.

ARTS, the name given to certain branches of study in the middle ages, originally called the "liberal arts" to distinguish them from the "servile arts" or mechanical occupations. These arts were usually given as grammar, dialectics, rhetoric, music, arithmetic, geometry, and astronomy. Hence originated the terms "art classes," "degrees in arts," "Master of Arts," etc., still in common use in universities, the faculty of arts being distinguished from those of divinity, law, medicine, or science.

ART STUDENTS' LEAGUE, an American art society with a membership of 1000 and headquarters at New York. It was an offshoot from the academy of design, and was founded in 1878. A fee of $30 to $70 is charged, and the member is instructed by competent teachers. Scholarships and prizes are awarded annually.

ASAFET'IDA, ASAFŒTIDA, a fetid inspissated sap from central Asia. It is used in medicine as an anti-spasmodic, and in cases of flatulency, in hysteric paroxysms, and other nervous affections. Notwithstanding its very disagreeable odor it is used as a seasoning in the East, and sometimes in Europe. An inferior sort is the product of certain species of Ferula.

ASBES'TOS, ASBESTUS, a remarkable and highly useful mineral, a fibrous variety of several members of the hornblende family, composed of separable filaments, with a silky luster. The fibers are sometimes delicate, flexible, and elastic; at other times stiff and brittle. It is incombustible, and anciently was wrought into a soft, flexible cloth, which was used as a shroud for dead bodies. In modern times it has been manufactured into incombustible cloth, gloves, felt, paper, etc.; is employed in gas-stoves; is much used as a covering to steam boilers and pipes; is mixed with metallic pigments, and used as a paint on wooden structures, roofs, partitions, etc., to render them fire-proof, and is employed in various other ways, the manufacture having recently greatly developed. Some varieties are compact and take a fine polish, others are loose, like flax or silky wool.

ASCENSION, Right, of a star, in astronomy, the arc of the equator intercepted between the first point of Aries and that point of the equator which comes to the meridian at the same instant with the star.

ASCENSION DAY, the day on which the ascension of the Savior is commemorated, often called Holy Thursday, a movable feast, always falling on the Thursday but one before Whitsuntide.

ASCET'ICS, a name given in ancient times to those Christians who devoted themselves to severe exercises of piety and strove to distinguish themselves

from the world by abstinence from sensual enjoyments and by voluntary penances. Ascetics and asceticism have played an important part in the Christian church, but the principle of striving after a higher and more spiritual life by subduing the animal appetites and passions has no necessary connection with Christianity. Thus there were ascetics among the Jews previous to Christ, and asceticism was inculcated by the Stoics, while in its most extreme form it may still be seen among the Brahmas and Buddhists. Monasticism was but one phase of asceticism.

AS'COLI, or **ASCOLI PICENO,** capital of the province of the same name, on the Tronto, 14 miles above its embouchure in the Adriatic. Pop. 11,199.—The province has an area of 809 sq. miles, a pop. of 222,146.

ASH, a genus of deciduous trees having imperfect flowers and a seed-vessel prolonged into a thin wing at the apex. There are many varieties of it, as the weeping-ash, the curled-leaved ash, the entire-leaved ash, etc. Among American species are the white ash, with lighter bark and leaves; the red or black ash, with a brown bark; the black ash, the blue ash, the green ash, etc. They are all valuable trees. The mountain-ash or rowan belongs to a different order.

ASH, ASHES, the incombustible residue of organic bodies (animal or vegetable) remaining after combustion; in common usage, any incombustible residue of bodies used as fuel; as a commercial term, the word generally means the ashes of vegetable substances, from which are extracted the alkaline matters called potash, pearl-ash, kelp, barilla, etc.

ASHANTEE', a kingdom of western Africa, in the interior of the Gold Coast, and to the north of the river Prah, with an area of about 70,000 sq. miles. It is in great part hilly, well-watered, and covered with dense tropical vegetation. The country round the towns, however, is carefully cultivated. The crops are chiefly rice, maize, millet, sugar-cane, and yams, the last forming the staple vegetable food of the natives. The domestic animals are cows, horses of small size, goats, and a species of hairy sheep. The larger wild animals are the elephant, rhinoceros, giraffe, buffalo, lion, hippopotamus, etc. Birds of all kinds are numerous, and crocodiles and other reptiles abound. Gold is abundant, being found either in the form of dust or in nuggets. The Ashantees are warlike and ferocious, with a love of shedding blood amounting to a passion, human sacrifices being formerly common. Polygamy is practiced by them to an enormous extent. They make excellent cotton cloths, articles in gold, and good earthenware, tan leather, and make sword-blades of superior workmanship. The government is a monarchy, and is now carried on under British supervision, Ashantee having become a protectorate of Britain in 1896. The chief town is Coomassie, said to have from 70,000 to 100,000 inhabitants.

ASHEVILLE (ash'vil), a city and county seat of Buncombe Co., N. C., 262 miles by rail northeast of Atlanta, Ga.; at the junction of the Swannanoa and the French Broad rivers and on the Southern Railway. It is finely situated, at an elevation of 2300 feet in a mountainous region, and is widely celebrated as a health resort, both summer and winter. Pop. 15,000.

ASH'BURTON, Alexander Baring, Lord, a British statesman and financier, born 1774, died 1848. After serving in parliament for many years he was raised to the peerage in 1835, after being a member of Peel's government (1834–35).

ASH'BURTON TREATY, a treaty concluded at Washington, 1842, by Alexander Baring, Lord Ashburton, and the President of the United States; it defined the boundaries between the States and Canada, etc.

ASH'ES. See Ash.

ASH'LAND, a city and county seat of Ashland Co., Wis., 185 miles northeast of Saint Paul, Minn., on Chequamegon Bay, one of the finest harbors on Lake Superior. Steamers connect it with lake ports, and it is on the Wisconsin Central, the Chicago, Saint Paul, Minneapolis, and Omaha, the Northern Pacific, and the Chicago and Northwestern railroads. Ashland is one of the most important ports on the Great Lakes, the point from which the product of the iron mines of the Gogebic Range is shipped. Lumber, brown-stone, and the principal manufactured products also constitute extensive shipments. Pop. 15,000.

ASHLEY, Lord. See Shaftesbury, First Earl of.

ASHTABU'LA, a city in Ashtabula Co., Ohio, on a river of the same name, 3 miles from Lake Erie, and 54 miles east by north of Cleveland, on the Lake Shore and Michigan Southern, the New York, Chicago, and St. Louis, and the Pittsburg, Youngstown, and Ashtabula railroads. Pop. 14,000.

ASH-WEDNESDAY, the first day of Lent, so called from a custom in the Western Church of sprinkling ashes that day on the heads of penitents, then admitted to penance. The period at which the fast of Ash-Wednesday was instituted is uncertain. In the R. Catholic Church the ashes are now strewn on the heads of all the clergy and people present. In the Anglican Church Ash-Wednesday is regarded as an important fast day.

ASIA, the largest of the great divisions of the earth; length, from the extreme southwestern point of Arabia, at the strait of Babel-Mandeb, to the extreme northeastern point of Siberia—East Cape, or Cape Vostochni, in Bering's strait—6900 miles; breadth, from Cape Chelyuskin, in northern Siberia, to Cape Romania, the southern extremity of the Malay Peninsula, 5300 miles; area estimated at 17,296,000 square miles, about a third of all the land of the earth's surface. On three sides, n., e., and s., the ocean forms its natural boundary, while in the w. the frontier is marked mainly by the Ural Mountains, the Ural River, Caspian Sea, the Caucasus, the Black Sea, the Mediterranean, the Suez Canal, and the Red Sea. There is no proper separation between Asia and Europe, the latter being really a great peninsula of the former. Asia, though not so irregular in shape as Europe, is broken in the s. by three great peninsulas, Arabia, Hindustan, and Farther India, while the east coast presents peninsular projections and islands, forming a series of sheltered seas and bays, the principal peninsulas being Kamtchatka and Corea. The principal islands are those forming the Malay or Asiatic Archipelago, which stretch round in a wide curve on the s.e. of the continent. Besides the larger islands—Sumatra, Java, Borneo, Celebes, Mindanao, and Luzon (in the Philippine group)—there are countless smaller islands grouped round these. Other islands are Ceylon, in the s. of India; the Japanese islands and Sakhalin on the east of the continent; Formosa, s.e. of China; Cyprus, s. of Asia Minor; and New Siberia and Wrangell Land, in the Arctic Ocean.

The mountain systems of Asia are of great extent, and their culminating points are the highest in the world. The greatest of all is the Himalayan system, which lies mainly between lon. 70° and 100° e. and lat. 28° and 37° n. It extends, roughly speaking, from northwest to southeast, its total length being about 1500 miles, forming the northern barrier of Hindustan. The loftiest summits are Mount Everest, 29,002 feet high, Godwin-Austen, 28,265, and Kanchinjinga, 28,156. The principal passes, which rise to the height of 18,000 to 20,000 feet, are the highest in the world. A second great mountain system of central Asia, connected with the northwestern extremity of the Himalayan system by the elevated region of Pamir (about lon. 70°–75° e., lat. 37°–40° n.), is the Thian-Shan system, which runs northeastward for a distance of 1200 miles. In this direction the Altai, Sayan, and other ranges continue the line of elevations to the northeastern coast. A northwestern continuation of the Himalayas is the Hindu Kush, and farther westward a connection may be traced between the Himalayan mass and the Elburz range (18,460 feet), south of the Caspian, and thence to the mountains of Kurdistan, Armenia, and Asia Minor.

There are vast plateaux and elevated valley regions connected with the great central mountain systems, but large portions of the continent are low and flat. Of the deserts of Asia the largest is that of Gobi (lon. 90°–120° e., lat. 40°–48° n.), large portions of which are covered with nothing but sand or display a surface of bare rock. An almost continuous desert region may also be traced from the desert of North Africa through Arabia (which is largely occupied by bare deserts), Persia, and Beluchistan to the Indus.

Some of the largest rivers of Asia flow northward to the Artic Ocean—the Obi, the Yenisei, and the Lena. The Hoang-Ho and Yang-tse, and the Amoor, are the chief of those which flow into the Pacific. The Ganges, Brahmaputra, Irawaddy, and Indus empty into the Indian Ocean. The Persian Gulf receives the united waters of the Euphrates and the Tigris. There are several systems of inland drainage, large rivers falling into lakes which have no outlet. The largest lake of Asia (partly

also European) is the Caspian Sea, which receives the Kur from the Caucasus (with its tributary the Aras from Armenia), and the Sefid Rud and other streams from Persia (besides the Volga from European Russia, and the Ural, which is partly European, partly Asiatic). The Caspian lies in the center of a great depression, being 83 feet below the level of the Sea of Azof. East from the Caspian is the Sea of Aral, which, like the Caspian, has no outlet, and is fed by the rivers Amoo Daria (Oxus) and Syr Daria. Still farther east, to the north of the Thian-Shan Mountains, and fed by the Ili and other streams, is Lake Balkash, also without an outlet, and very salt. Other lakes having no communication with the ocean are Lob Nor, in the desert of Gobi, receiving the river Tarim, and the Dead Sea, far below the level of the Mediterranean, and fed by the Jordan. The chief freshwater lake is Lake Baikal, in the south of Siberia, between lon. 104° and 110° e., a mountain lake from which the Yenisei draws a portion of its waters.

Active volcanoes are only met with in the extreme east (Kamtchatka) and in the Eastern Archipelago. From the remotest times Asia has been celebrated for its mineral wealth. In the Altai and Ural Mountains gold, iron, lead, and platinum are found; in India and other parts rubies, diamonds, and other gems are, or have been, procured; salt in central Asia; coal in China, India, central Asia, etc.; petroleum in the districts about the Caspian and in Burmah; bitumen in Syria; while silver, copper, sulphur, etc., are found in various parts.

Every variety of climate may be experienced in Asia, but as a whole it is marked by extremes of heat and cold and by great dryness, this in particular being the case with vast regions in the center of the continent and distant from the sea.

The plants and animals of northern and western Asia generally resemble those of similar latitudes in Europe (which is really a prolongation of the Asiatic continent), differing more in species than in genera. The principal mountain trees are the pine, larch, and birch; the willow, alder, and poplar are found in lower grounds. In the central region European species reach as far as the western and central Himalayas, but are rare in the eastern. They are here met by Chinese and Japanese forms. The lower slopes of the Himalayas are clothed almost exclusively with tropical forms. Higher up, between 4000 and 10,000 feet, are found all the types of trees and plants that belong to the temperate zone, there being extensive forests of conifers. Here is the native home of the deodar cedar. The southeastern region, including India, the eastern Peninsula, and China, with the islands, contains a vast variety of plants useful to man and having here their original habitat, such as the sugar-cane, rice, cotton, and indigo; pepper, cinnamon, cassia, clove, nutmeg, and cardamoms; banana, cocoanut, areca, and sago palms; the mango and many other fruits; with plants producing a vast number of drugs, caoutchouc, and gutta-percha. The forests of India and the Malay Peninsula contain oak, teak, sâl, and other timber woods, besides bomboos, palms, sandalwood, etc. The palmyra palm is characteristic of Southern India; while the talipot palm flourishes on the western coast of Hindustan, Ceylon, and the Malay Peninsula. The cultivated plants of India and China include wheat, barley, rice, maize, millet, sorghum, tea, coffee, indigo, cotton, jute, opium, tobacco, etc. In north China and the Japanese Islands large numbers of deciduous trees occur, such as oaks, maples, limes, walnuts, poplars, and willows, the genera being European, but the individual species Asiatic. Among cultivated plants are wheat, and in favorable situations rice, cotton, the vine, etc. Coffee, rice, maize, etc., are extensively grown in some of the islands of the Asiatic Archipelago. In Arabia and the warmer valleys of Persia, Afghanistan, and Beluchistan, aromatic shrubs are abundant. Over large parts of these regions the date-palm flourishes and affords a valuable article of food. Gum-producing acacias are, with the date-palm, the commonest trees in Arabia. African forms are found extending from the Sahara along the desert region of Asia.

Nearly all the mammals of Europe occur in northern Asia, with numerous additions to the species. Central Asia is the native land of the horse, the ass, the ox, the sheep, and the goat. Both varieties of the camel, the single and the double humped, are Asiatic. To the inhabitants of Tibet and the higher plateaux of the Himalayas the yak is what the reindeer is to the tribes of the Siberian plain, almost their sole wealth and support. The elephant, of a different species from that of Africa, is a native of tropical Asia. The Asiatic lion, which inhabits Arabia, Persia, Asia Minor, Beluchistan, and some parts of India, is smaller than the African species. Bears are found in all parts, the white bear in the far north, and other species in the more temperate and tropical parts. The tiger is the most characteristic of the larger Asiatic Carnivora. It extends from Armenia across the entire continent, being absent, however, from the greater portion of Siberia and from the high tableland of Tibet; it extends also into Sumatra Java, and Bali. In southeastern Asia and the islands we find the rhinoceros, buffalo, ox, deer, squirrels, porcupines, etc. In birds nearly every order is represented. Among the most interesting forms are the hornbills, the peacock, the Impey pheasant, the tragopan or horned pheasant, and other gallinaceous birds, the pheasant family being very characteristic of southeastern Asia. It was from Asia that the common domestic fowl was introduced into Europe. The tropical parts of Asia abound in monkeys, of which the species are numerous. Some are tailed, others, such as the orang, are tailless, but none have prehensile tails like the American monkeys. In the Malay Archipelago marsupial animals, so characteristic of Australia, first occur in the Moluccas and Celebes, while various mammals common in the western part of the Archipelago are absent. A similar transition toward the Australian type takes place in the species of birds. Of marine mammals the dugong is peculiar to the Indian Ocean; in the Ganges is found a peculiar species of dolphin. At the head of the reptiles stands the Gangetic crocodile, frequenting the Ganges and other large rivers. Among the serpents are the cobra da capello, one of the most deadly snakes in existence; there are also large boas and pythons besides sea and freshwater snakes. The seas and rivers produce a great variety of fish. The Salmonidæ are found in the rivers flowing into the Arctic Ocean. Two rather remarkable fishes are the climbing perch and the archer-fish. The well-known goldfish is a native of China.

Asia is mainly peopled by races belonging to two great ethnographic types, the Caucasic or fair type, and the Mongolic or yellow. To the former belong the Aryan or Indo-European, and the Semitic races, both of which mainly inhabit the southwest of the continent; to the latter belong the Malays and Indo-Chinese in the s.e., as well as the Mongolians proper (Chinese, etc.), occupying nearly all the rest of the continent. To these may be added certain races of doubtful affinities, as the Dravidians of southern India, the Cingalese of Ceylon, the Ainos of Yesso, and some negro-like tribes called Negritos, which inhabit Malacca and the interior of several of the islands of the Eastern Archipelago. The total population is estimated at about 800,000,000, or more than half that of the whole world. The chief independent states are the Chinese Empire (pop. 360,250,000), Japan (pop. 40,000,000), Siam (pop. 6,000,000), Afghanistan (5,000,000), Beluchistan, Persia (pop. 7,000,000), and the Arabian states (3,000,000). The most important of the religions of Asia are the Brahmanism of India, the creeds of Buddha, Confucius, and Lao-tse in China, and the various forms of Mohammedanism in Arabia, Persia, India, etc. Probably more than a half of the whole population profess some form of Buddhism. Several native Christian sects are found in India, Armenia, Kurdistan, and Syria.

Asia is generally regarded as the cradle of the human race. It possesses the oldest historical documents, and next to the immediately contiguous kingdom of Egypt the oldest historical monuments in the world. At present the forms of government in Asia range from the primitive rule of the nomad sheik to the despotism of China. India has been brought by Britain directly under European influence, and Japan is freely modeling her institutions on those of the West.

ASIA, Central, a designation loosely given to the regions in the center of Asia east of the Caspian, also called Turkestan, and formerly Tartary. The eastern portion belongs to China, the western now to Russia. Russian Central Asia comprises the Kirghiz Steppe (Uralsk, Turgai, Akmolinsk, Semipalatinsk, etc.), and what is now the government-general of Turkestan, besides the territory of the Turkomans, or Transcaspia and Merv. Russia has thus absorbed the old khanate of Kho-

kand and part of Bokhara and Khiva, and controls the vassal territories of Bokhara and Khiva, the southern boundary being the Persian and Afghan frontiers.

ASIA MINOR, the most westerly portion of Asia, being the peninsula lying west of the Upper Euphrates, and forming part of Asiatic Turkey. It forms an extensive plateau, with lofty mountains rising above it, the most extensive ranges being the Taurus and Anti-Taurus, which border it on the south and southeast, and rise to over 10,000 feet. There are numerous salt and fresh-water lakes. The chief rivers are the Kizil-Irmak (Halys), Sakaria (Sangarius), entering the Black Sea; and the Sarabat (Hermus) and Menderes (Mæander), entering the Ægean. The coast regions are generally fertile, and have a genial climate; the interior is largely arid and dreary. Valuable forests and fruit-trees abound. Smyrna is the chief town. Anatolia is an equivalent name.

ASP, a species of viper found in Egypt, resembling the cobra da capello or spectacle-serpent of the East Indies, and having a very venomous bite.

Asp, from ancient Egyptian monument.

When approached or disturbed it elevates its head and body, swells out its neck, and appears to stand erect to attack the agressor. Hence the ancient Egyptians believed that the asps were guardians of the spots they inhabited, and the figure of this reptile was adopted as an emblem of the protecting genius of the world.

ASPAR'AGUS, a plant, the young shoots of which, cut as they are emerging from the ground, are a favorite culinary vegetable. The plants should remain three years in the ground before they are cut; after which, for several years, they will continue to afford a regular annual supply. The beds are protected by straw or litter in winter. Its diuretic properties are ascribed to the presence of a crystalline substance found also in the potato, lettuce, etc.

ASPA'SIA, a celebrated lady of ancient Greece, was born at Miletus, in Ionia, but passed a great part of her life at Athens, where her house was the general resort of the most distinguished men in Greece. She won the affection of Pericles, who united himself to Aspasia as closely as was permitted by the Athenian law, which declared marriage with a foreign woman illegal. In 432–1 B.C. she was accused of impiety, and was only saved from condemnation by the eloquence and tears of Pericles. She had a son by Pericles, who was legitimated (B.C. 430) by a special decree of the people.

ASPHALT, ASPHAL'TUM, the most common variety of bitumen; also called mineral pitch. Asphalt is a compact, glossy, brittle, black or brown mineral, which breaks with a polished fracture, melts easily with a strong pitchy odor when heated, and when pure burns without leaving any ashes. It is found in the earth in many parts of Asia, Europe, and America, and in a soft or liquid state on the surface of the Dead Sea, which from this circumstance was called Asphaltītes. It is of organic origin, the asphalt of the great Pitch Lake of Trinidad being derived from bituminous shales, containing vegetable remains in the process of transformation. Asphalt is produced artificially in making coal-gas. During the process much tarry matter is evolved and collected in retorts. If this be distilled, naphtha and other volatile matters escape, and asphalt is left behind. It is sometimes called Jew's Pitch.

ASPHYX'IA, literally, the state of a living animal in which no pulsation can be perceived, but the term is more particularly applied to a suspension of the vital functions from causes hindering respiration. The normal accompaniments of death from asphyxia are dark fluid blood, a congested brain and exceedingly congested lungs, the general engorgement of the viscera, and an absence of blood from the left cavities of the heart while the right cavities and pulmonary artery are gorged. The restoration of asphyxiated persons has been successfully accomplished at long periods after apparent death. The attempt should be made to maintain the heat of the body and to secure the inflation of the lungs as in the case of the apparently drowned.

AS'PINWALL. See Colon.

AS'PIRATE, a name given to any sound like our h, to the letter h itself, or to any mark of aspiration.

ASS, a species of the horse genus, supposed by Darwin to have sprung from the wild variety found in Abyssinia, by some writers to be a descendant of the wild ass, inhabiting the mountainous deserts of Tartary, etc., and by others to have descended from the kiang of southwestern Asia. Both in color and size the ass is exceedingly variable, ranging from dark gray and reddish brown to white, and from the size of a Newfoundland dog in North India to that of a good-sized horse. In the southwestern countries of Asia and in Egypt, in some districts of southern Europe, as in Spain, and in Kentucky and Peru, great attention has been paid to selection and interbreeding, with a result no less remarkable than in the case of the horse. The male ass is mature at two years of age, the female still earlier. The she-ass carries her young eleven months. The teeth of the young ass follow the same order of appearance and renewal as those of the horse. The life of the ass does not usually exceed thirty years. It is in general much healthier than the horse, and is maintained in this condition by a smaller quantity and coarser quality of food; it is superior to the horse in its ability to carry heavy burdens over the most precipitous roads, and is in no respect its inferior in intelligence, despite the reputation for stupidity which it has borne from very ancient times. The skin is used as parchment to cover drums, etc., and in the East is made into shagreen. The hybrid offspring of the horse and the female ass is the hinny, that of the ass and the mare is the mule; but the latter is by far the larger and more useful animal. Asses' milk, long celebrated for its sanative qualities, more closely resembles that of a woman, than any other. It is very similar in taste, and throws up an equally fluid cream, which is not convertible into butter.

ASSAM', a chief commissionership or province of British India, on the northeast border of Bengal, bounded on the north by the Himalayas, on the east and south mainly by Burmah; area, 49,004 sq. miles. Pop. 6,126,343, 3,429,459 of whom are Hindus, 1,581,317 Mohammedans, 35,969 Christians, 8911 Buddhists, the rest being chiefly hill tribes of aboriginal faiths.

Assamese.

AS'SAPAN, the flying-squirrel of N. America, an elegant little animal with folds of skin along its sides which enable it to take leaps of 40 or 50 yards.

ASSASSINA'TION, an act by which life is taken in a treacherous or unexpected manner, usually for the furtherance of a political or social purpose. The term is not customarily applied to murder accomplished for purely personal reasons in the manner of assassination, but rather to the murder of some public official or important person. The term "spadassin," used during the French revolution, is of kindred origin and meaning.

ASSASS'INS, an Asiatic order or society having the practice of assassination as its most distinctive feature, founded by Hassan Ben Sabbah, a dai or missionary of the heterodox Mohammedan sect the Ismaelites.

ASSAULT AND BATTERY, in law, an attempt or offer, with force and violence, to do a corporal hurt to another, as by striking at him with or without a weapon. If a person lift up or stretch forth his arm and offer to strike another, or menace any one with any staff or weapon, it is an assault in law. Assault, therefore, does not necessarily imply a hitting or blow,

because in trespass for assault and battery a man may be found guilty of the assault and acquitted of the battery. But every battery includes an assault.

ASSAYING, the estimation of the amount of pure metal, and especially of the precious metals, in an ore or alloy. In the case of silver the assay is either by the dry or by the wet process. The dry process is called cupellation from the use of a small and very porous cup, called a cupel, formed of well-burned and finely-ground bone-ash made into a paste with water. The cupel, being thoroughly dried, is placed in a fire-clay oven about the size of a drain-tile, with a flat sole and arched roof, and with slits at the sides to admit air. This oven, called a muffle, is set in a furnace, and when it is at a red heat the assay, consisting of a small weighed portion of the alloy wrapped in sheet-lead, is laid upon the cupel. The heat causes the lead to volatilize or combine with the other metals, and to sink with them into the cupel, leaving a bright globule of pure metallic silver, which gives the amount of silver in the alloy operated on. In the wet process the alloy is dissolved in nitric acid, and to the solution are added measured quantities of a solution of common salt of known strength, which precipitates chloride of silver. The operation is concluded when no further precipitate is obtained on the addition of the salt solution, and the quantity of silver is calculated from the amount of salt solution used. An alloy of gold is first cupelled with lead as above, with the addition of three parts of silver for every one of gold. After the cupellation is finished the alloy of gold and silver is beaten and rolled out into a thin plate, which is curled up by the fingers into a little spiral or cornet. This is put into a flask with nitric acid, which dissolves away the silver and leaves the cornet dark and brittle. After washing with water the cornet is boiled with stronger nitric acid to remove the last traces of silver, well washed, and then allowed to drop into a small crucible, in which it is heated, and then it is weighed. The assay of gold, therefore, consists of two parts: cupellation, by which inferior metals (except silver) are removed; and quartation, by which the added silver and any silver originally present are got rid of. The quantity of silver added has to be regulated to about three times that of the gold. If it be more the cornet breaks up, if it be less the gold protects small quantities of the silver from the action of the acid. Where, as in some gold manufactured articles, these methods of assay cannot be applied, a streak is drawn with the article upon a touchstone consisting of coarse-grained Lydian quartz saturated with bituminous matter, or of black basalt. The practiced assayer will detect approximately the richness of the gold from the color of the streak, which may be further subjected to an acid test.

ASSAY OFFICE, a laboratory conducted by the United States government for the valuation of gold and silver deposited for coinage. The principal mints have assay offices attached to them, and there is an assay office at Seattle, Wash. The largest in the country is that at New York.

AS'SEGAI, a spear used as a weapon among the Kaffirs of S. Africa, made of hard wood tipped with iron, and used for throwing or thrusting.

ASSESS'OR, a person appointed to ascertain and fix the amount of taxes, rates, etc.; or a person who sits along with the judges in certain courts, and assists them with his professional knowledge.

AS'SETS, property or goods available for the payment of a bankrupt or deceased person's obligations. Assets are personal or real, the former comprising all goods, chattels, etc., devolving upon the executor as saleable to discharge debts and legacies. In commerce and bankruptcy the term is often used as the antithesis of "liabilities," to designate the stock in trade and entire property of an individual or an association.

ASSIGNEE', a person appointed by another to transact some business, or exercise some particular privilege or power. Formerly the persons appointed under a commission of bankruptcy, to manage the estate of the bankrupt on behalf of the creditors, were so called, but now trustees.

ASSIGN'MENT is a transfer by deed of any property, or right, title, or interest, in property, real or personal. Assignments are usually given for leases, mortgages, and funded property.

ASSINIBOI'A, the smallest of the four districts into which a portion of the northwestern territories of Canada was divided in 1882. It lies immediately to the west of Manitoba, with Saskatchewan and Alberta as its northern and western boundaries. It is intersected by the Saskatchewan (south branch) and the Qu'Appelle river, and contains much good wheat land. Some coal is mined. Area, 89,535 sq. miles. Pop. 67,385. Capital, Regina, on the Canadian Pacific Railway, which intersects the district.

ASSINIBOINE, a river of Canada, which flows through Manitoba and joins the Red river at Winnipeg, about 40 miles above the entrance of the latter into Lake Winnipeg, after a somewhat circuitous course of about 500 miles from the west and northwest. Steamers ply on it for over 300 miles.

ASSOCIATION OF IDEAS, the term used in psychology to comprise the conditions under which one idea is able to recall another to consciousness. Psychologists have been disposed to classify these conditions under two general heads: the law of contiguity, and the law of association. The first states the fact that actions, sensations, emotions, and ideas, which have occurred together, or in close succession, tend to suggest each other when any one of them is afterward presented to the mind. The second indicates that present actions, sensations, emotions, or ideas tend to recall their like from among previous experiences. Other laws have at times been enunciated, but they are reducible to these; thus, the "law of contrast or contrariety" is properly a case of contiguity. On their physical side the principles of association correspond with the physiological facts of re-excitation of the same nervous centers, and in this respect they have played an important part in the endeavor to place psychology upon a basis of positive science. The laws of association, taken in connection with the law of relativity, are held by many to be a complete exposition of the phenomena of intellect.

ASSUMP'SIT, in English law, an action to recover compensation for the non-performance of a parole promise; that is, a promise not contained in a deed under seal. Assumpsits are of two kinds, express and implied. The former are where the contracts are actually made in word or writing; the latter are such as the law implies from the justice of the case; e.g. employment to do work implies a promise to pay.

ASSUMPTION, the ecclesiastical festival celebrating the miraculous ascent into heaven of the Virgin Mary's body as well as her soul, kept on the 15th of August. The legend first appeared in the 3d or 4th century, and the festival was instituted some three centuries later.

ASSURANCE. See Insurance.

ASSYR'IA, an ancient monarchy in Asia, intersected by the upper course of the Tigris, and having the Armenian mountains on the north and Babylonia on the south; area, probably about 100,000 sq. miles; surface partly mountainous, hilly, or undulating, partly a portion of the fertile Mesopotamian

Assyrian soldiers.

plain. The numerous remains of ancient habitations show how thickly this vast flat must have once been peopled; now, for the most part, it is a mere wilderness. The chief cities of Assyria in the days of its prosperity were Nineveh, the site of which is marked by mounds opposite Mosul (Nebi Yunus and Koyunjik), Calah or Kalakh (the modern Nimrud), Asshur or Al Asur (Kalah Sherghat), Sargina (Khorsabad), and Arbela (Arbil).

Much light has been thrown on the history of Assyria by the decipherment of the cuneiform inscriptions obtained by excavation. About 1120 B.C. Tiglath-Pileser I., one of the greatest of the sovereigns of the first Assyrian monarchy, ascended the throne, and carried his conquests to the Mediterranean on the one side and to the Caspian and the Persian Gulf on the other. At his death there ensued a period of decline, which lasted over 200 years. Under Assur-nazir-pal, who reigned from 884 to 859

B.C., Assyria once more advanced to the position of the leading power in the world, the extent of his kingdom being greater than that of Tiglath-Pileser. The magnificent palaces, temples, and other buildings of his reign prove the advance of the nation in wealth, art, and luxury. In 859 he was succeeded by his son Shalmaneser II., whose career of conquest was equally successful. Sargon (722–705), a usurper, claimed descent from the ancient Assyrian kings. After taking Samaria and leading over 27,000 people captive, he overthrew the combined forces of Elam (Susiana) and Babylon. He defeated the King of Hamath, who along with other princes had revolted, took him prisoner, and flayed him alive, advanced through Philistia and captured Ashdod; then pushing southward totally defeated the forces of Egypt and Gaza at Raphia (719). The revolted Armenians had also more than once to be put down. In 710 Merodach-baladan was driven out of Babylonia by Sargon, after holding it for twelve years as an independent king, and being supported by the rulers of Egypt and Palestine; his allies were also crushed, Judah was overrun, and Ashdod leveled to the ground. Sargon latterly crossed over and took Cyprus, where he left an inscription telling of his expedition.

Hunting wild bull, from monuments at Nineveh.

He spent the latter years of his reign in internal reforms, in the midst of which he was murdered, being succeeded by Sennacherib, one of his younger sons, in 705. Sennacherib at once had to take up arms against Merodach-baladan, who had again obtained possession of Babylon. In 701 fresh outbreaks in Syria led him in that direction. He captured Zidon and Askelon, and defeated Hezekiah and his Egyptian and Ethiopian allies, and forced him to pay tribute, after which he returned to Assyria to overawe the Babylonians, Elamites, and the northern hill tribes. A second expedition into Syria is briefly recorded in 2 Kings xix., where we are told that, as his army lay before Libnah, in one night the angel of Jehovah went out, and smote in the camp of the Assyrians 185,000 men (2 Kings xix. 35). In 681 he was murdered by his two sons, Adrammelech and Sharezer, but they were defeated by their brother Esar-haddon, who then mounted the throne. In 652 a general insurrection broke out, headed by Sammughes, governor of Babylonia, Assur-bani-pal's own brother, and including Babylonia, Egypt, Palestine, and Arabia. Egypt was the only power, however, which regained its independence; fire, sword, and famine reduced the rest to submission. In 640 the Medes revolted, and latterly made themselves independent. Though the king's character was marked by cruelty and sensuality, he was a zealous patron of the arts and learning. He died in 625, and was succeeded by his son Assur-emid-ilin (or Sarakos), under whom Babylon definitely threw off the Assyrian yoke. The country continued rapidly to decline, fighting hard for existence until the capital Nineveh was captured and burned by the allied forces of the Medes and Babylonians, about 607 or 606 B.C. The story of Sardanapalus associated with this event is a mere myth or legend. Assyria now fell partly to Media, partly to Babylonia, and afterwards formed with Babylonia one of the satrapies of the Persian empire. In 312 B.C. it became part of the kingdom of the Seleucidæ; later on it came under Parthian rule, and was more than once a Roman possession. For a long period it was under the caliphs of Bagdad. In 1638 the Turks wrested it from the Persians, and it has continued under their dominion since that date.

The Assyrians were far advanced in art and industry, and in civilization in general. They constructed large buildings, especially palaces, of a most imposing character, the materials being brick, burned or sun-dried, stone, alabaster slabs for lining and adorning the walls internally and externally, and timber for pillars and roofs. These alabaster slabs were elaborately sculptured with designs serving to throw much light on the manners and customs of the people. A most characteristic feature of the palaces were gigantic figures of winged, human-headed bulls, placed at gateways (often arched over) or other important points; figures of lions, etc., were also similarly employed. The palaces were raised on high terraces, and often comprised a great number of apartments; there were no windows, light being obtained by carrying the walls up to a certain height and then raising on them pillars to support the roof and admit light and air. The cities of Nineveh, Assur, and Arbela had each their royal observatories, superintended by astronomers-royal, who had to send in their reports to the king twice a month. At an early date the stars were numbered and named; a calendar was formed, in which the year was divided into twelve months (of thirty days each), called after the zodiacal signs, but as this division was found to be inaccurate an intercalary month was added every six years. The week was divided into seven days, the seventh being a day of rest; the day was divided into twelve periods of two hours each, each of these being subdivided into sixty minutes, and these again into sixty seconds. The Assyrians employed both the dial and the clepsydra. Eclipses were recorded from a very remote epoch, and their recurrence roughly determined. The principal astronomical work, called the Illumination of Bel, was inscribed on seventy tablets, and went through numerous editions, one of the latest being in the British Museum. It treats among other things of comets, the polar star, the conjunction of the sun and moon, and the motions of Venus and Mars.

ASTAR'TE, a Syrian goddess, probably corresponding to the Semĕlē of the Greeks and the Ashtaroth of the Hebrews, and representing the productive power of nature. She was a moon-goddess. Some regard her as corresponding with Hera (Juno), and others with Aphrodītē. See Ashtaroth.

AS'TER, a genus of plants, comprehending several hundred species, mostly natives of North America, although others are widely distributed. Many are cultivated as ornamental plants. Asters generally flower late in the season, and some are hence called Michælmas or Christmas Daisies. The China Aster is a very showy annual, of which there are many varieties.

ASTE'RIA, a name applied to a variety of corundum, which displays an opalescent star of six rays of light when cut with certain precautions; and also to the cat's-eye, which consists of quartz, and is found especially in Ceylon.

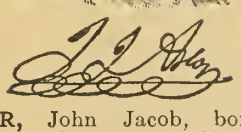
AS'TERISK, the figure of a star, thus *, used in printing and writing, as a reference to a passage or note in the margin, or to fill the space when a name, or the like, is omitted.

AS'TEROIDS, or **PLANETOIDS,** a numerous group of very small planets revolving round the sun between the orbits of Mars and Jupiter, remarkable for the eccentricity of their orbits and the large size of their angle of inclination to the ecliptic. The diameter of the largest is not supposed to exceed 450 miles, while most of the others are very much smaller. They number over 400, and new members are being constantly discovered. Ceres, the first of them, was discovered 1st January, 1801, and within three years more Pallas, Juno, and Vesta were seen. The extraordinary smallness of these bodies, and their nearness to each other, gave rise to the opinion that they were but the fragments of a planet that had formerly existed and had been brought to an end by some catastrophe. For nearly forty years investigations were carried on, but no more planets were discovered till 8th December, 1845, when a fifth planet in the same region was discovered. The rapid succession of discoveries that followed was for a time taken as a corroboration of the disruptive theory, but the breadth of the

zone occupied makes the hypothesis of a shattered planet more than doubtful. Their mean distances from the sun vary between 200,000,000 and 300,000,000 miles; the periods of revolution between 1191 days (Flora) and 2868 (Hilda). Their eccentricities and inclinations are on the average greater than those of the earth, but their total mass does not exceed one-fourth that of the earth.

ASTHMA (ast'mȧ), difficulty of respiration, returning at intervals, with a sense of stricture across the chest and in the lungs, a wheezing, hard cough at first, but more free toward the close of each paroxysm, with a discharge of mucus, followed by a remission. Asthma is essentially a spasm of the muscular tissue which is contained in the smaller bronchial tubes. It generally attacks persons advanced in years, and seems, in some instances, to be hereditary. The exciting causes are various —accumulation of blood or viscid mucus in the lungs, noxious vapors, a cold and foggy atmosphere, or a close, hot air, flatulence, accumulated fæces, violent passions, organic diseases in the thoracic viscera, etc. By far the most important part of the treatment consists in the obviating or removing the several exciting causes. It seldom proves fatal except as inducing dropsy, consumption, etc.

ASTIG'MATISM, a malformation, congenital or accidental, of the lens of the eye, in consequence of which the individual does not see objects in the same plane, although they may really be so. It is due to the degree of convexity of the horizontal and vertical meridians being different, so that corresponding rays, instead of converging into one point, meet at two foci.



ASTOR, John Jacob, born near Heidelberg, Germany, 1763; died at New York 1848. In 1783 he emigrated to the United States, settled at New York, and became extensively engaged in the fur trade. In 1811 the settlement of Astoria, founded by him, near the mouth of the Columbia river, was formed to serve as a central depot for the fur trade between the lakes and the Pacific. He subsequently engaged in various speculations, and died worth $30,000,000, leaving $350,000 to found the Astor Library in New York. This institution is contained in a splendid building, enlarged in 1859 at the cost of his son, and comprises about 260,000 volumes.

ASTOR, John Jacob, an American millionaire, and fourth of that name. Born in New York in 1864. Died 1890.

ASTOR, William Waldorf, a famous millionaire, born in New York in 1848, and great-grandson of the first John Jacob Astor. Defeated as a candidate for congress in 1881, he was American minister to Italy from 1882 to 1885. In 1890 he removed to England and became a British subject. His income is derived from a fortune of $200,000,000 in the United States.

ASTRAKHAN (ȧs-trȧ-*ȟȧn'*), a Russian city, capital of government of same name, on an elevated island in the Volga, about 30 miles above its mouth in the Caspian, communicating with the opposite banks of the river by numerous bridges. Pop. 113,001, composed of various races. — The government has an area of 85,000 square miles. It consists almost entirely of two vast steppes, separated from each other by the Volga, and forming for the most part arid sterile deserts. Pop. 994,775.

ASTRAKHAN, a name given to sheepskins with a curled woolly surface obtained from a variety of sheep found in Bokhara, Persia, and Syria; also a rough fabric with a pile in imitation of this.

ASTRAL SPIRITS, spirits formerly believed to people the heavenly bodies or the aërial regions. In the middle ages they were variously conceived as fallen angels, souls of departed men, or spirits originating in fire, and belonging neither to heaven, earth, nor hell. Paracelsus regarded them as demoniacal in character.

ASTRIN'GENT, a medicine which contracts the organic textures and canals of the body, thereby checking or diminishing excessive discharges. The chief astringents are the mineral acids, alum, lime-water, chalk, salts of copper, zinc, iron, lead, silver; and among vegetables catechu, kino, oak-bark, and galls.

ASTROL'OGY, literally, the science or doctrine of the stars. The name was formerly used as equivalent to astronomy, but is now restricted in meaning to the pseudo-science which pretends to enable men to judge of the effects and influences of the heavenly bodies on human and other mundane affairs, and to foretell future events by their situations and conjunctions. As usually practiced the whole heavens, visible and invisible, was divided by great circles into twelve equal parts, called houses. As the circles were supposed to remain immovable every heavenly body passed through each of the twelve houses every twenty-four hours. The portion of the zodiac contained in each house was the part to which chief attention was paid, and the position of any plant was settled by its distance from the boundary circle of the house, measured on the ecliptic. The houses had different names and different powers, the first being called the house of life, the second the house of riches, the third of brethren, the sixth of marriage, the eighth of death, and so on. The part of the heavens about to rise was called the ascendant, the planet within the house of the ascendant being the lord of the ascendant. The different aspects of the planets were of great importance. To cast a person's nativity (or draw his horoscope) was to find the position of the heavens at the instant of his birth, which being done the astrologer, who knew the various powers and influences possessed by the sun, the moon, and the planets, could predict what the course and termination of that person's life would be. The temperament of the individual was ascribed to the planet under which he was born, as saturnine from Saturn, jovial from Jupiter, mercurial from Mercury, etc.— words which are now used with little thought of their original meaning. The virtues of herbs, gems, and medicines were supposed to be due to their ruling planets.

ASTRON'OMY is that science which investigates the motions, distances, magnitudes, and various phenomena of the heavenly bodies. That part of the science which gives a description of the motions, figures, periods of revolution, and other phenomena of the heavenly bodies is called descriptive astronomy; that part which teaches how to observe the motions, figures, periodical revolutions, distances, etc., of the heavenly bodies, and how to use the necessary instruments, is called practical astronomy; and that part which explains the causes of their motions, and demonstrates the laws by which those causes operate, is termed physical astronomy. Recent years have added two new fields of investigation which are full of promise for the advancement of astronomical science. The first of these—celestial photography—has furnished us with invaluable light-pictures of the sun, moon, and other bodies, and has recorded the existence of myriads of stars invisible even by the best telescopes; while the second, spectrum analysis, now at work in many hands, reveals to us a knowledge of the physical constituents of the universe, telling us for instance that in the sun (or his atmosphere) there exist many of the elements familiar to us on the earth. It has also been applied to the determination of the velocity with which stars are approaching to, or receding from, our system; and to the measurement of movements taking place within the solar atmospheric envelopes. From analysis of some of the unresolved nebulæ the inference is drawn that they are not star-swarms but simply cosmical vapor; whence a second inference results favorable to the hypothesis of the gradual condensation of nebulæ, and the successive evolutions of suns and systems.

The most remote period to which we can go back in tracing the history of astronomy refers us to a time about 2500 B.C., when the Chinese are said to have recorded the simultaneous conjunction of Saturn, Jupiter, Mars, and Mercury with the moon. The Arabs began to make scientific astronomical

observations about the middle of the 8th century, and for 400 years they prosecuted the science with assiduity. Ibn-Yunis (1000 A.D) made important observations of the disturbances and eccentricities of Jupiter and Saturn. In the 16th century Nicholas Copernicus, born in 1473, introduced the system that bears his name, and which gives to the sun the central place in the solar system, and shows all the other bodies, the earth included, revolving around him. This arrangement of the universe (see Copernicus) came at length to be generally received on account of the simplicity it substitued for the complexities and contradictions of the theory of Ptolemy. The observations and calculations of Tycho Brahe, a Danish astronomer, born in 1546, continued over many years, were of the highest value, and claim for him the title of regenerator of practical astronomy. His assistant and pupil, Kepler, born in 1571, was enabled, principally by the aid he received from his master's labors, to arrive at those laws which have made his name famous: 1. That the planets move, not in circular, but in elliptical orbits, of which the sun occupies a focus. 2. That the radius vector, or imaginary straight line joining the sun and any planet, moves over equal spaces in equal times. 3. That the squares of the times of the revolutions of the planets are as the cubes of their mean distances from the sun. Galileo, who died in 1642, advanced the science by his observations and by the new revelations he made through his telescopes, which established the truth of the Copernican theory. Newton, born in 1642, carried physical astronomy suddenly to comparative perfection. The splendid analytical researches of Lalande, Lagrange, Delambre, and Laplace, mark the same period. The 19th century opened with the discovery of the first four minor planets; and the existence of another planet (Neptune), more distant from the sun than Uranus, was, in 1845, simultaneously and independently predicted by Leverrier and Adams. Of late years the sun has attracted a number of observers, the spectroscope and photography having been especially fruitful in this field of investigation. From recent transit observations the former calculated distance of the sun has been corrected, and is now given as 92,560,000 miles. An interesting recent discovery is that of the two satellites of Mars. The existence of an intra-Mercurial planet, which has been named Vulcan, has not yet been verified. Much valuable work has of late been accomplished in ascertaining the parallax of fixed stars.

The objects with which astronomy has chiefly to deal are the earth, the sun, the moon, the planets, the fixed stars, comets, nebulæ, and meteors. The stellar universe is composed of an unknown host of stars, many millions in number, the most noticeable of which have been formed into groups called constellations. The nebulæ are cloud-like patches of light scattered all over the heavens. Some of them have been resolved into star-clusters, but many of them are but masses of incandescent gas. The observation of meteors has recently attracted much attention. They most frequently occur in the autumn, and have been supposed to be the debris of comets. See articles Earth, Sun, Moon, Planet, Comet, Stars, Mercury, Venus, Mars, Jupiter, Saturn, Asteroids, etc.

ASTRO-PHOTOGRAPHY, the art of photographing heavenly bodies. It has been particularly useful in bringing out nubulæ, stars, star-clusters, and other bodies of that kind which remain invisible in the most powerful telescopes. Several important discoveries have been made by the use of the camera. Among these may be mentioned the planet Eros, the earth's nearest neighbor (excepting the moon), and a number of comets. Various large observatories in all countries are now engaged in making a complete atlas of all the stars down to the 11th magnitude by means of the photographic camera.

AS'WAIL, the native name for the sloth-bear of the mountains of India, an uncouth, unwieldy animal, with very long black hair, inoffensive when not attacked.

ASY'LUM, a sanctuary or place of refuge, where criminals and debtors sheltered themselves from justice, and from which they could not be taken without sacrilege. Temples were anciently asylums, as were Christain churches in later times. (See Sanctuary.) The term is now usually applied to an institution for receiving, maintaining, and, so far as possible, ameliorating the condition of persons laboring under certain bodily defects or mental maladies; sometimes also a refuge for the unfortunate.

ATACAMA (ä-tä-kä'mä), a desert region on the west coast of S. America belonging to Chile, comprised partly in the province of Atacama, partly in the territory of Antofagasta. It forms the chief mining district of Chile, there being here rich silver mines, while gold is also found, as well as argentiferous lead, copper, nickel, cobalt, and iron; with guano on the coast. The northern portion till recently belonged to Bolivia. The Chilean province of Atacama has an area of 39,000 sq. miles and a pop. of 84,000.

ATACA'MITE, a mineral consisting of a combination of the protoxide and chloride of copper, occurring abundantly in some parts of South America, as at Atacama, whence it has its name. It is worked as an ore in South America, and is exported to the United States.

ATALAN'TA, in the Greek mythology, a famous huntress of Arcadia. She was to be obtained in marriage only by him who could outstrip her in a race, the consequence of failure being death. One of her suitors obtained from Aphrodītē (Venus) three golden apples, which he threw behind him, one after another, as he ran. Atalanta stopped to pick them up, and was not unwillingly defeated. There was another Atalanta belonging to Bœotiȧ, who cannot very well be distinguished, the same stories being told about both.

AT'AVISM, in biology, the tendency to reproduce the ancestral type in animals or plants which have become considerably modified by breeding or cultivation; the reversion of a descendant to some peculiarity of a more or less remote ancestor.

ATAXY, ATAXIA, in medicine, irregularity in the animal functions, or in the symptoms of a disease. See Locomotor ataxia.

ATCH'ISON, a city of Kansas, on the Missouri river, about 30 miles from Leavenworth, an important railway center, with an increasing trade. Pop. 18,785.

ATHABAS'CA, a river, lake, and district of Canada. The Athabasca river rises on the eastern slopes of the Rocky Mountains in the district of Alberta, flows in a n.e. direction through the district of the same name, and falls into Lake Athabasca after a course of about 600 miles.—Lake Athabasca, or Lake of the Hills, is about 190 miles s.s.e. of the Great Slave Lake, with which it is connected by means of the Slave river, a continuation of the Peace. It is about 200 miles in length from east to west, and about 35 miles wide at the broadest part, but gradually narrows to a point at either extremity.—The district of Athabasca, formed in 1882, lies immediately e. of British Columbia and n. of Alberta; area about 251,300 sq. miles. It is intersected by the Athabasca and the Peace river, and as yet has a scanty population. The name is also given to a family of Indians.

A'THEISM, the disbelief of the existence of a God or supreme intelligent being; the doctrine opposed to theism or deism. The term has been often loosely used as equivalent with infidelity generally, with deism, with pantheism, and with the denial of immortality.

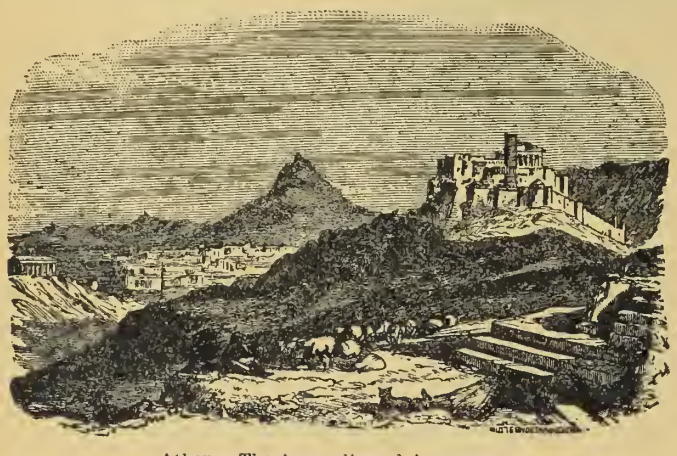
ATH'ELING, a title of honor among the Anglo-Saxons, meaning one who is of noble blood. The title was gradually confined to the princes of the blood royal, and in the 9th and 10th centuries is used exclusively for the sons or brothers of the reigning king.

ATHE'NA, or **ATHENE,** a Greek goddess, identified by the Romans with Minerva, the representative of the intellectual powers; the daughter of Zeus (Jupiter) and Mētis (that is, wisdom or cleverness). According to the legend, which is perhaps allegorical, before her birth Zeus swallowed her mother, and Athena afterwards sprang from the head of Zeus with a mighty war shout and in complete armor. In her character of a wise and prudent warrior she was contrasted with the fierce Ares (Mars). In the wars of the giants she slew Pallas and Enceladus. She is also represented as the patroness of the arts of peace. The sculptor, the architect, and the painter, as well as the philosopher, the orator, and the poet, considered her their tutelar deity. She is also represented among the healing gods. In all these representations she is the symbol of the thinking faculty, the goddess of wisdom, science, and art. As a warrior she is represented completely armed, her head covered with a gold helmet. As the goddess of peaceful arts she appears in the dress of a Grecian matron. All Attica, but particularly

Athens, was sacred to her, and she had numerous temples there.

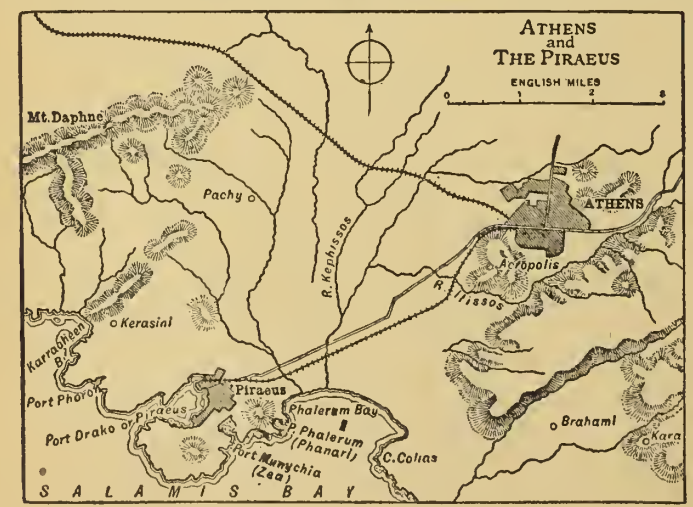
ATHENÆ'UM, the temple of Athena or Minerva, at Athens, frequented by poets, learned men, and orators. In modern times the same name is given to literary clubs and establishments connected with the sciences.

ATH'ENS, anciently the capital of Attica and center of Greek culture, now the capital of the Kingdom of Greece.



Athens—The Acropolis and Areopagus.

It is situated in the central plain of Attica, about 4 miles from the Saronic Gulf or Gulf of Ægina, an arm of the Ægean Sea running in between the mainland and the Peloponnesus. It is said to have been founded about 1550 B.C. by Cecrops, the mythical Pelasgian hero, and to have borne the name Cecropia until under Erechtheus it received the name of Athens in honor of Athēnē. The Acropolis, an irregular



oval crag 150 ft. high, with a level summit 1000 feet long by 500 in breadth, was the original nucleus of the city, which according to tradition was extended by Theseus when Athens became the head of the confederate Attic states. Under Pericles the highest point of artistic development was reached. An Odeium was erected on the east of the Dionysiac theater for the recitations of rhapsodists and musicians; and with the aid of the architects Ictinus and Mnesicles and of the sculptor Phidias the Acropolis was perfected. Covering the whole of the western end rose the Propylæa, of Pentelic marble and consisting of a central portico with two wings in the form of Doric temples. Within, to the left of the entrance, stood the bronze statue of Athena Promachus, and beyond it the Erechtheum, containing the statue of Athena Polias; while to the right, on the highest part of the Acropolis, was the marble Parthenon or temple of Athena, the crowning glory of the whole. About 420 A.D. paganism was totally annihilated at Athens, and when Justinian closed even the schools of the philosophers, the reverence for buildings associated with the names of the ancient deities and heroes was lost. The Parthenon was turned into a church of the Virgin Mary, and St. George stepped into the place of Theseus. Finally, in 1456, the place fell into the hands of the Turks. The Parthenon became a mosque, and in 1687 was greatly damaged by an explosion at the siege of Athens by the Venetians. Enough, however, remains of it and of the neighboring structures to abundantly attest the splendor of the Acropolis; while of the other buildings of the city the Theseum and Horologium, or Temple of the Winds, are admirably preserved, as also are the Pnyx, Panathenaic stadium, etc. Soon after the commencement of the war of liberation in 1821 the Turks surrendered Athens, but captured it again in 1826–27. It was then abandoned until 1830. In 1835 it became the royal residence, and made rapid progress. The modern city mostly lies northward and eastward from the Acropolis, and consists mainly of straight and well-built streets. Among the principal buildings are the royal palace, a stately building with a façade of Pentelic marble (completed 1843), the university, the academy, public library, theater, and obervatory. The university was opened in 1836, and has 3000 students. There are valuable museums, in particular the National Museum and that in the Polytechnic School, which embraces the Schliemann collection, etc. These are constantly being added to by excavations. There are four foreign archæological schools or institutes, the French, German, American, and British. Tramways have been made in the principal streets, and the city is connected by railway (6 miles) with its port, the Piræus. Pop. 128,735.

ATHENS, the name of many places in the U. States, the chief being in Georgia, and containing the Georgia University. Pop. 10,245.

ATHERTON, Gertrude Franklin, an American novelist born in California in 1859. She is the author of several novels, among which The Aristocrats, The Conqueror, American Wives and English Husbands, and Senator North are popular in America and England. She removed to England in 1895.

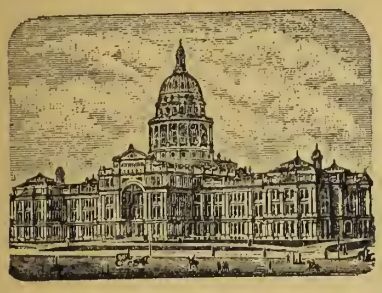
ATHLETES (ath'lēts), combatants who took part in the public games of Greece. The profession was an honorable one; tests of birth, position, and character were imposed, and crowns, statues, special privileges, and pensions were among the rewards of success.—Athletic sports, if they do not hold such an honorable position today as they did in antiquity, are still practiced with great enthusiasm and excite the keenest interest in their patrons. Among them are running, jumping, rowing, swimming, baseball, cricket, football, wrestling, throwing the hammer, "putting" the shot, etc.

ATKINSON, Edward, an American economist, born in Massachussetts in 1827. He was for many years engaged in business, and meanwhile was a hard student of various sciences. He is the author of several works on economic subjects and of The Science of Nutrition, which has run through several editions.

ATKINSON, George Francis, an American botanist and educator, born in Michigan in 1854. He filled several chairs in various institutions till 1892, when he became professor of botany at Cornell University.

ATLAN'TA, a city in the United States, capital of Georgia, on an elevated ridge, 7 miles southeast of the Chattahoochee river. It is an important railway center; carries on a large trade in grain, paper, cotton, flour, and especially tobacco, and possesses flour-mills, paper-

mills, iron-works, etc. Here are Atlanta University for colored male and female students, a theological college, a medical



State capitol, Atlanta, Ga.

college, etc. Atlanta suffered severely during the civil war. Pop. 150,000.

ATLANTIC CITY, a fashionable watering-place on the coast of New Jersey. Pop. 27,838. During the summer the transient population varies between 250,000 and 300,000.

ATLANTIC OCEAN, the vast expanse of sea lying between the west coasts of Europe and Africa and the east coasts of North and South America, and extending from the Arctic to the Antarctic Ocean; greatest breadth, between the west coast of northern Africa and the east coast of Florida, 4150 miles; least breadth, between Norway and Greenland, 930 miles; superficial extent, 25,000,000 square miles. The principal inlets and bays are Baffin's and Hudson's Bays, the Gulf of Mexico, the Caribbean Sea, the North Sea or German Ocean, the Bay of Biscay, and the Gulf of Guinea. The principal islands north of the equator are Iceland, the Faroe and British Islands, the Azores, Canaries, and Cape de Verd Islands, Newfoundland, Cape Breton, and the West India Islands; and, south of the equator, Ascension, St. Helena, and Tristan da Cunha.

The great currents of the Atlantic are the Equatorial Current (divisible into the Main, Northern, and Southern Equatorial Currents), the Gulf-stream, the North African and Guinea Current, the Southern Connecting Current, the Southern Atlantic Current, the Cape Horn Current, Rennel's Current, and the Arctic Current. The current system is primarily set in motion by the trade-winds which drive the water of the intertropical region from Africa toward the American coasts. The Main Equatorial Current, passing across the Atlantic, is turned by the S. American coast, along which it runs at a rate of 30 to 50 miles a day, till, having received part of the North Equatorial Current, it enters the Gulf of Mexico. Issuing thence between Florida and Cuba under the name of the Gulf-stream, it flows with a gradually expanding channel nearly parallel to the coast of the United States. It then turns northeastward into the mid-Atlantic, the larger proportion of it passing southward to the east of the Azores to swell the North African and Guinea Current created by the northerly winds off the Portuguese coast. The Guinea Current, which takes a southerly course, is divided into two on arriving at the region of the northeast trades, part of it flowing east to the Bight of Biafra and joining the South African feeder of the Main Equatorial, but the larger portion being carried westward into the North Equatorial drift. Rennel's Current, which is possibly a continuation of the Gulf-stream, enters the Bay of Biscay from the west, curves round its coast, and then turns northwest toward Cape Clear. The Arctic Current runs along the east coast of Greenland (being here called the Greenland Current), doubles Cape Farewell, and flows up toward Davis' Strait; it then turns to the south along the coasts of Labrador and the United States, from which it separates the Gulf-stream by a cold band of water. Immense masses of ice are borne south by this current from the Polar seas. In the interior of the North Atlantic there is a large area comparatively free from currents, called the Sargasso Sea, from the large quantity of seaweed which drifts into it. A similar area exists in the South Atlantic. In the South Atlantic, the portion of the Equatorial Current which strikes the American coast below Cape St. Roque flows southward at the rate of from 12 to 20 miles a day along the Brazil coast under the name of the Brazil Current. It then turns eastward and forms the South Connecting Current, which, on reaching the South African coast, turns northward into the Main and Southern Equatorial Currents. Besides the surface currents, an under current of cold water flows from the poles to the equator, and an upper current of warm water from the equator toward the poles.

The greatest depth as yet discovered is north of Porto Rico, in the West Indies, namely 27,360 feet. Cross-sections of the North Atlantic between Europe and America show that its bed consists of two great valleys lying in a north-and-south direction, and separated by a ridge, on which there is an average depth of 1600 or 1700 fathoms, while the valleys on either side sink to the depth of 3000 or 4000 fathoms. A ridge, called the Wyville-Thomson Ridge, with a depth of little more than 200 fathoms above it, runs from near the Butt of Lewis to Iceland, cutting off the colder water of the Arctic Ocean from the warmer water of the Atlantic. The South Atlantic, of which the greatest depth yet found is over 3000 fathoms, resembles the North Atlantic in having an elevated plateau or ridge in the center with a deep trough on either side. The saltness and specific gravity of the Atlantic gradually diminish from the tropics to the poles, and also from within a short distance of the tropics to the equator. In the neighborhood of the British Isles the salt has been stated at one thirty-eighth of the weight of the water. The North Atlantic is the greatest highway of ocean traffic in the world. It is also a great area of submarine communication, by means of the telegraphic cables that are laid across its bed.

AT'LAS, an extensive mountain system in North Africa, starting near Cape Nun on the Atlantic Ocean, traversing Morocco, Algiers, and Tunis, and terminating on the coast of the Mediterranean; divided generally into two parallel ranges, running w. to e., the Greater Atlas lying toward the Sahara and the Lesser Atlas toward the Mediterranean. The principal chain is about 1500 miles long, and the principal peaks rise above or approach the line of perpetual congelation; Miltsin in Morocco being 11,400 feet high, and Tizi Likumpt being 13,150. The highest elevation is perhaps Tizi Tamyurt, estimated at fully 15,000 feet. Silver, antimony, lead, copper, iron, etc., are among the minerals. The vegetation is chiefly European in character, except on the low grounds and next the desert.

ATLAS, in Greek mythology, the name of a Titan whom Zeus condemned to bear the vault of heaven.—The same name is given to a collection of maps and charts, and was first used by Gerard Mercator in the 16th century, the figure of Atlas bearing the globe being given on the title-pages of such works.

ATONEMENT, DAY OF, a Jewish fast day observed on the tenth day of the seventh month. Its origin goes back to the Mosaic law, and in ancient times it was observed with much ceremony in the temple at Jerusalem. Today the fast of the atonement is kept by the orthodox among the Jews, who do without food from sunset to sunset, the fast being accompanied by appropriate services in the temple of the congregation.

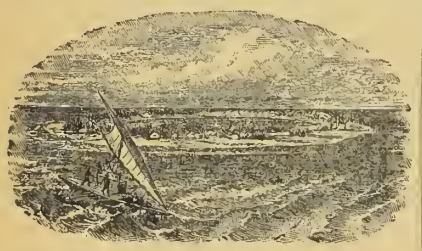
AT'MOSPHERE, primarily the gaseous envelope which surrounds the earth; but the term is applied to that of any orb. The atmosphere of the earth consists of a mass of gas extending to a height variously estimated at from 45 to 212 miles, and pressing on every part of the earth's surface with a pressure of about 15 (14·73) lbs. per square inch. The existence of this atmospheric pressure was first proved by Torriculli, who thus accounted for the rush of a liquid to fill a vacuum, and who, working out the idea, produced the first barometer. The average height of the mercurial column counterbalancing the atmospheric weight at the sea-level is a little less than 30 inches; but the pressure varies from hour to hour, and, roughly speaking, diminishes geometrically with the arithmetical increase in altitude. Of periodic variations there are two maxima of daily pressure occurring, when the temperature is about the mean of the day, and two minima, when it is at its highest and lowest respectively; but the problems of diurnal and seasonal oscillations have yet to be fully solved. The pressure upon the human body of average size is no less than 14 tons, but as it is exerted equally in all directions no inconvenience is caused by it. It is customary to take the atmospheric pressure as the standard for measuring other fluid pressures; thus the steam pressure of 30 lbs. per square inch on a boiler is spoken of as a pressure of two atmospheres.

The atmosphere, first subjected to analysis by Priestley and Scheele in the latter part of the 18th century, consists of a mixture of oxygen and nitrogen in the almost constant proportion of 20·81 volumes of oxygen to

79·19 volumes of nitrogen, or, by weight, 23·01 parts of oxygen to 76·99 of nitrogen. The gases are associated together, not as a chemical compound, but as a mechanical mixture. Upon the oxygen present depends the power of the atmosphere to support combustion and respiration, the nitrogen acting as a diluent to prevent its too energetic action. Besides these gases, the air contains the recently-discovered gas argon, aqueous vapor in variable quantity, ozone, carbonic acid gas, traces of ammonia, nitric acid, and, in towns, sulphuretted hydrogen and sulphurous acid gas. In addition to its gaseous constituents the atmosphere is charged with minute particles of organic and inorganic matter.

ATMOSPHERIC RAILWAY. See Pneumatic Despatch.

ATOLL', the Polynesian name for coral islands of the ringed type inclosing a lagoon in the center. They are found



Bird's-eye view of an atoll.

chiefly in the Pacific in archipelagoes, and occasionally are of large size. Suadiva Atoll is 44 miles by 34; Rimsky is 54 by 20. See Coral.

ATOM, until the last decade supposed to be the smallest particle of matter in existence, but since the wonderful discoveries of Becquerel and Thomson, regarded as a whole universe in itself. Recent theories and discoveries regarding the nature of the atom have so altered the views of scientists that today it is believed that in the future man will be able to replace all kinds of power in industry and elsewhere with a force so great that a reservoir a foot or so big will generate enough power to run a railroad train or a steamship; and of such infinite quantity that the bare contemplation of it staggers the intellect. These discoveries lead to the conviction that matter comes into existence out of force and goes back again into force; in other words, that the universe did not exist as matter at one time, and that the time will come when it will cease to exist as matter, but that the universal force will still contain the potentiality of issuing in matter, and so on forever.

The atom of the chemists, then, has been changed into a marvelous world of electromagnetic energy, which is made up of bodies so small as to be simply inconceivable. The atom itself is so small that countless billions of them are required to make up the smallest visible bit of matter; and in one of these atoms exist thousands of these smaller bodies, called "corpuscles" by the English physicists and "electrons" by the French school. The atom breaks down, or disintegrates, when the electrons composing it are attracted to other corpuscles to form new atoms. This implies that the old idea that the elements were the simplest bodies is false. The energy bound up in a cubic inch of iron, or any other element, is so vast that it cannot be imagined. If all the atoms in a cubic inch of iron were dissociated, or broken up, the power obtained would be enormous. If man could once discover a way of producing and controlling such a disintegration, the effect on human society could not be pictured by the most gigantic imagination. Scientists everywhere are working on this problem and the great secret may be discovered at any time.

ATOMIC THEORY, a theory as to the existence and properties of atoms (see Atoms); especially, in chemistry, the theory accounting for the fact that in compound bodies the elements combine in certain constant proportions, by assuming that all bodies are composed of ultimate atoms, the weight of which is different in different kinds of matter. It is associated with the name of Dalton, who systematized and extended the imperfect results of his predecessors. On its practical side the atomic theory asserts three Laws of Combining Proportions: (1) The Law of Constant or Definite Proportions, teaching that in every chemical compound the nature and proportion of the constituent elements are definite and invariable; thus water invariably consists of 8 parts by weight of oxygen to 1 part by weight of hydrogen; (2) The Law of Combination in Mutiple Proportions, according to which the several proportions in which one element unites with another invariably bear toward each other a simple relation; thus 1 part by weight of hydrogen unites with 8 parts by weight of oxygen to form water, and with 16 parts (i.e. 8×2) parts of oxygen to form peroxide of hydrogen; (3) The Law of Combination in Reciprocal Proportions, that the proportions in which two elements combine with a third also represent the proportions in which, or in some simple multiple of which, they will themselves combine; thus in olefiant gas hydrogen is present with carbon in the proportion of 1 to 6, and in carbonic oxide oxygen is present with carbon in the proportion of 8 to 6;1 to 8 being also the proportions in which hydrogen and oxygen combine with each other. The theory that these proportional numbers are, in fact, nothing else but the relative weights of atoms so far accounts for the phenomena that the existence of these laws might have been predicted by the aid of the atomic hypothesis long before they were actually discovered by analysis. In themselves, however, the laws do not prove the theory of the existence of ultimate particles of matter of a certain relative weight; and although many chemists, even without expressly adopting the atomic theory itself, have followed Dalton in the use of the terms atom and atomic weight, in preference to proportion, combining proportion, equivalent, and the like, yet in using the word atom it should be held in mind that it merely denotes the proportions in which elements unite. These will remain the same whether the atomic hypothesis which suggested the employment of the term be true or false. Dalton supposed that the atoms of bodies are spherical, and invented certain symbols to represent the mode in which he conceived they might combine together.

ATOMISTS. See Atoms.

ATOMS, according to the hypothesis of some philosophers, the primary parts of elementary matter not further divisible. The principal theorists of antiquity upon the nature of atoms were Moschus of Sidon, Leucippus (510 B.C.), Democritus, Epicurus, and Lucretius. These philosophers explained all phenomena on the theory of the existence of atoms possessing various properties and motions, and are hence sometimes called Atomists. Among the moderns, Gassendi illustrated the doctrine of Epicurus. Descartes formed from this his system of the vortices. Newton and Boerhaave supposed that the original matter consists of hard, ponderable, impenetrable, inactive, and immutable particles, from the variety in the composition of which the variety of bodies originates. According to Boscovich every atom is an indivisible point possessing position, mass, and potential force or capacity for attraction and repulsion. Upon the discovery of Helmholtz that a vortex in a perfect liquid possesses certain permanent characteristics, Sir W. Thomson (Lord Kelvin) has based a theory that atoms are vortices in a homogeneous, incompressible, and frictionless fluid. As to chemical atoms, see Atomic Theory.

ATONEMENT, in Christian theology, the special work of Christ effected by his life, sufferings, and death. The first explicit exposition of the evangelical doctrine of the atonement is ascribed to Anselm, Archbishop of Canterbury, in 1093.

AT'ROPHY, a wasting of the flesh due to some interference with the nutritive processes. It may arise from a variety of causes, such as permanent, oppressive, and exhausting passions, organic disease, a want of proper food or of pure air, suppurations in important organs, copious evacuations of blood, saliva, semen, etc., and it is also sometimes produced by poisons; for example, arsenic, mercury, lead, in miners, painters, gilders, etc. In old age the whole frame except the heart undergoes atrophic change, and it is of frequent occurrence in infancy as a consequence of improper, unwholesome food, exposure to cold, damp, or impure air, etc. Single organs or parts of the body may be affected irrespective of the general state of nutrition; thus local atrophy may be superinduced by palsies, the pressure of tumors upon the nerves of the limbs, or by artificial pressure, as in the feet of Chinese ladies.

AT'ROPIN, AT'ROPINE, a crystalline alkaloid obtained from the deadly nightshade. It is very poisonous, and produces persistent dilatation of the pupil.

AT'ROPOS, the eldest of the Fates, who cuts the thread of life with her shears.

ATTACHE (at-a-shā'), a junior member of the diplomatic service attached to an embassy or legation.

ATTACH'MENT, in English law, a taking of the person, goods, or estate by virtue of a writ or precept. It is distinguished from an arrest by proceeding out of a higher court by precept or writ, whereas the latter proceeds out of an inferior court by precept only. An arrest lies only against the body of a man, whereas an attachment lies often against the goods only, and sometimes against the body and goods. It differs from a distress in that an attachment does not extend to lands, while a distress cannot touch the body.

ATTAIN'DER, the legal consequences of a sentence of death or outlawry pronounced against a person for treason or felony, the person being said to be attainted. It resulted in forfeiture of estate and "corruption of blood," rendering the party incapable of inheriting property or transmitting it to heirs; but these results now no longer follow. Formerly persons were often subjected to attainder by a special bill or act passed in parliament.

AT'TAR, in the East Indies, a general term for a perfume from flowers; in Europe generally used only of the attar or otto of roses, an essential oil made from the hundred-leaved or cabbage-rose, or damask-rose, or musk-rose, etc., 100,000 roses yielding only 180 grains of attar. Cashmere, Shiraz, and Damascus are celebrated for its manufacture, and there are extensive rose farms in the valley of Kezanlik in Roumelia and at Ghazipur in Benares. The oil is at first greenish, but afterwards it presents various tints of green, yellow, and red. It is concrete at all ordinary temperatures, but becomes liquid about 84° Fahr. It consists of two substances, a hydrocarbon and an oxygenated oil, and is frequently adulterated with the oils of rhodium, sandalwood, and geranium, with the addition of camphor or spermaceti.

ATTIC, an architectural term variously used. An Attic base is a peculiar kind of base, used by the ancient architects in the Ionic order and by Palladio and some others in the Doric. An Attic story is a low story in the upper part of a house rising above the main portion of the building. In ordinary language an attic is an apartment lighted by a window in the roof.

AT'TICA, a state of ancient Greece, the capital of which, Athens, was once the first city in the world. According to tradition the earliest inhabitants of Attica lived in a savage manner until the time of Cecrops, who came, B.C. 1550, with a colony from Egypt, taught them all the essentials of civilization, and founded Athens. The period from the Persian war to the time of Alexander (B.C. 500 to 336) was most remarkable for the development of the Athenian constitution. Attica appears to have contained a territory of nearly 850 square miles, with some 500,000 inhabitants, 360,000 of whom were slaves, while the inhabitants of the city numbered 180,000. Cimon and Pericles (B.C. 444) raised Athens to its point of greatest splendor, though under the latter began the Peloponnesian war, which ended with the conquest of Athens by the Lacedæmonians. The attempts at revolt after the death of Alexander were crushed, and in 260 B.C. Attica was still under the sway of Antigonus Gonatas, the Macedonian king. A period of freedom under the shelter of the Achæan League then ensued, but their support of Mithridates led in B.C. 146 to the subjugation of the Grecian states by Rome. After the division of the Roman Empire Attica belonged to the empire of the East until in A.D. 396 it was conquered by Alaric the Goth and the country devastated. Attica now forms a nome or province of the Kingdom of Greece, with a population of 255,978.

AT'TILA, the famous leader of the Huns, was the son of Mundzuk, and the successor, in conjunction with his brother Bleda, of his uncle Rhuas. The rule of the two leaders extended over a great part of northern Asia and Europe, and they threatened the Eastern Empire, and twice compelled the weak Theodosius II. to purchase an inglorious peace. Attila caused his brother Bleda to be murdered (444), and in a short time extended his dominion over all the peoples of Germany and exacted tribute from the eastern and western emperors. The Vandals, the Ostrogoths, the Gepidæ, and a part of the Franks united under his banners, and he speedily formed a pretext for leading them against the Empire of the East. He laid waste all the countries from the Black to the Adriatic Sea, and in three encounters defeated the Emperor Theodosius, but could not take Constantinople. Thrace, Macedonia, and Greece all submitted to the invader, who destroyed seventy flourishing cities; and Theodosius was obliged to purchase a peace. Attila went back to Hungary, and died on the night of his marriage with Hilda or Ildico (453), either from the bursting of a blood-vessel or by her hand.

ATTOR'NEY, a person appointed to do something for and in the stead and name of another. An attorney may have general powers to act for another; or his power may be special, and limited to a particular act or acts. A special attorney is appointed by a deed called a power or letter of attorney, specifying the acts which he is authorized to do. An attorney-at-law is a person qualified to appear for another before a court of law to prosecute or defend any action on behalf of his client. In the United States the term attorney, or attorney-at-law is used to designate a practicing lawyer of any kind. Qualifications for the profession are fixed, generally, by statute. The attorney must have studied law either in a college or in the offices of a lawyer, must pass an examination, and must be a man of good moral character. He takes, upon admission to the bar, an oath that he will demean himself uprightly and will support the constitution of the United States.

ATTORNEY-GENERAL, in the United States an officer of the president's cabinet, the chief of the law department of the government. He receives a salary of $8000 a year. The attorney-general of the several states has a function similar to that of his federal prototype.

ATTORNEY, POWER OF, the power given by one person to another enabling him to act, generally or specifically, as the agent of the principal.

ATTORNEY, WARRANT OF, authority given to a lawyer to appear in court as representative for a client.

ATTRAC'TION, the tendency of all material bodies, whether masses or particles, to approach each other, to unite, and to remain united. It was Newton that first adopted the theory of a universal attractive force, and determined its laws. When bodies tend to come together from sensible distances the tendency is termed either the attraction of gravitation, magnetism, or electricity, according to circumstances; when the attraction operates at insensible distances it is known as adhesion with respect to surfaces, as cohesion with respect to the particles of a body, and as affinity when the particles of different bodies tend together. It is by the attraction of gravitation that all bodies fall to the earth when unsupported.

AT'TRIBUTE, in philosophy, a quality or property of a substance, as whiteness or hardness. A substance is known to us only as a congeries of attributes. —In the fine arts an attribute is a symbol regularly accompanying and marking out some personage. Thus the caduceus, purse, winged hat, and sandals are attributes of Mercury, the trampled dragon of St. George.

ATWOOD, Charles B., an American architect, born in 1849, died in 1895. He is known as the designer of the Art Building at the Chicago World's Fair, and of W. H. Vanderbilt's residence in New York City.

AUBE (ōb), a northeastern French department; area, 2351 sq. miles; pop. 257,374. The surface is undulating, and watered by the Aube, etc. Troyes is the capital.—The river Aube, which gives name to the department, rises in Haute-Marne, flows n.w., and after a course of 113 miles joins the Seine.

AU'BURN, the name of many places in America, the chief being a city of New York state, at the north end of Owasco Lake. It is chiefly famous for its state prison, large enough to receive 1000 prisoners. In the town or vicinity various manufactures are carried on. Pop. 32,000.

AUBURN, a city, and the county seat of Androscoggin Co., Maine, 34 miles north of Portland, on the Maine Central and Grand Trunk railroads. Pop. 12,951.

AUCK'LAND, a town of New Zealand, in the North Island, founded in 1840. It has a large and increasing trade, there being connection with the chief places on the island by rail, and regular communication with the other ports of the colony, Australia, and Fiji by steam. It was formerly the capital of the colony. Pop., (including suburbs), 67,226. —The provincial district of Auckland forms the northern part of North Island, with an area of 25,746 sq. miles; pop. 175,854.

AUCKLAND ISLANDS, a group of islands about 180 miles s. of New Zealand, discovered in 1806, and belonging to Britain. They are of volcanic origin and fertile; and the largest, which is 30 miles by 15, has two good harbors. No settled inhabitants.

AUCTION is a public sale to the party offering the highest price where the buyers bid upon each other, or to the bidder who first accepts the terms offered by the vendor where he sells by reducing his terms until some one accepts them.

AUDE (ōd), a maritime department in the s. of France; area, 2437 sq. miles; Carcassonne is the capital; other towns are Narbonne and Castelnaudary. Pop. 332,080.—The river Aude rises in the eastern Pyrenees, and flowing nearly parallel to the canal du Midi falls into the Mediterranean, after a course of 130 miles.

AU'DIPHONE, an acoustic instrument by means of which deaf persons are enabled to hear. It consists essentially of a fan-shaped plate of hardened caoutchouc, which is bent to a greater or less degree by strings, and is very sensitive to sound-waves. When used the up edge is pressed against the upper front teeth, with the convexity outward, and the sounds being collected are conveyed from the teeth to the auditory nerve without passing through the external ear.

AU'DIT, an examination into accounts or dealings with money or property, along with vouchers or other documents connected therewith, especially by proper officers, or persons appointed for the purpose. Also the occasion of receiving the rents from the tenants on an estate.

AUDITORY NERVES. See Ear.

AU'DUBON, John James, an American naturalist of French extraction, born near New Orleans in 1775. In 1798 he settled in Pennsylvania, but having a great love for ornithology he set out in 1810 with his wife and child, descended the Ohio, and for many years roamed the forests in every direction, drawing the birds which he shot. In 1826 he exhibited his drawings in Liverpool, Manchester, and Edinburgh, and finally published them in an unrivaled work of double-folio size, with 435 colored plates of birds the size of life (The Birds of America, 4 vols., 1827–39), with an accompanying text (Ornithological Biography, 5 vols. 8vo, partly written by Prof. Macgillivray). On his final return to America he labored with Dr. Bachman on a finely illustrated work entitled The Quadrupeds of America (1843–50, 3 vols.). He died at New York in 1851.

AUGEAS (a-jē'as), a fabulous king of Elis, in Greece, whose stable contained 3000 oxen, and had not been cleaned for thirty years. Hercules undertook to clear away the filth in one day in return for a tenth part of the cattle, and executed the task by turning the river Alphēus through it. Augeas, having broken the bargain, was deposed and slain by Hercules.

AUGER (a'gėr), an instrument for boring holes considerably larger than those bored by a gimlet, used by carpenters and joiners, shipwrights, etc.

AUGITE (a'jīt), or **PYROXENE,** a mineral of the hornblende family, an essential component of many igneous rocks, such as basalt, greenstone, and porphyry. When crystallized it assumes the form of short, slightly rhombic prisms, with their lateral edges replaced, and terminated at one or both extremities by numerous planes.

AUGSBURG (ougz'burh), a city of Bavaria, at the junction of the Wertach and Lech. Augsburg was a renowned commercial center in the middle ages, and is still an important emporium of South German and Italian trade. It early took a conspicuous part in the Reformation. In 1806 it was incorporated in Bavaria. Pop. 88,700.

AUGSBURG CONFESSION, a document which was presented by the Protestants at the Diet of Augsburg, 1530, to the Emperor Charles V. and the diet, and being signed by the Protestant states was adopted as their creed. Luther made the original draught; but as its style appeared too violent it was given to Melanchthon for amendment. The original is to be found in the imperial Austrian archives. Afterwards Melanchthon arbitrarily altered some of the articles, and there arose a division between those who held the original and those who held the altered Augsburg Confession. The former is received by the Lutherans, the latter by the German Reformed.

AU'GUST, the eighth month from January. It was the sixth of the Roman year, and hence was called Sextīlis till the Emperor Augustus affixed to it his own name.

AUGUS'TA, capital of Maine, United States, on the river Kennebec, which is crossed by a bridge and is navigable for small vessels 43 miles from its mouth, while a dam enables steamboats to ply for 20 miles farther up and furnishes immense water-power. Pop. 11,683.

State capitol, Augusta, Me.

AUGUSTA, the capital of Richmond Co., Georgia, United States, on the left bank of the Savannah river, 231 miles from its mouth; well built, and connected with the river by high-level canals; an important manufacturing center, having cotton-mills, machine-shops, and railroad works, etc. Pop. 39,441.

AU'GUSTINE (Aurelius Augustinus), St., a renowned father of the Christian Church, was born at Tagaste, in Africa, in 354, his mother Monica being a Christian, his father Patricius a Pagan. Of his various works his Confessions is most secure of immortality. He died August 28, 430. He was a man of great enthusiasm, self-devotion, zeal for truth, and powerful intellect, and though there have been fathers of the church more learned, none have wielded a more powerful influence. His writings are partly autobiographical (as the Confessions), partly polemical, homiletic, or exegetical.

AU'GUSTINE, or **AUSTIN,** St., the Apostle of the English, flourished at the close of the 6th century, was sent with forty monks by Pope Gregory I. to introduce Christianity into Saxon England,

and was kindly received by Ethelbert, king of Kent, whom he converted, baptizing 10,000 of his subjects in one day. In acknowledgment of his tact and success Augustine received the archiepiscopal pall from the pope, with instructions to establish twelve sees in his province, but he could not persuade the British bishops in Wales to unite with the new English Church. He died in 604 or 605.

AUGUS'TUS, Caius Julius Cæsar Octavianus, originally called Caius Octavius, Roman Emperor, was the son of Caius Octavius and Atia, a daughter of Julia, the sister of Julius Cæsar. He was born

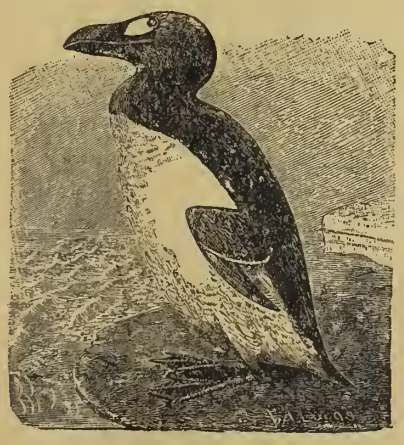
Emperor Augustus.

63 B.C., and died A.D. 14. Octavius was at Apollonia, in Epirus, when he received news of the death of his uncle (B.C. 44), who had previously adopted him as his son. He returned to Rome to claim Cæsar's property and avenge his death, and now took, according to usage, his uncle's name with the surname Octavianus. He was aiming secretly at the chief power, but at first he joined the republican party, and assisted at the defeat of Antony at Mutĭna. He got himself chosen consul in 43. Soon after the first triumvirate was formed between him and Antony and Lepidus, and this was followed by the conscription and assassination of three hundred senators and two thousand knights of the party opposed to the triumvirate. Next year Octavianus and Antony defeated the republican army under Brutus and Cassius at Philippi. The victors now divided the Roman world between them, Octavianus getting the West, Antony the East, and Lepidus Africa. Sextus Pompeius, who had made himself formidable at sea, had now to be put down; and Lepidus, who had hitherto retained an appearance of power, was deprived of all authority (B.C. 36) and retired into private life. Antony and Octavianus now shared the empire between them; but while the former, in the East, gave himself up to a life of luxury, and alienated the Romans by his alliance with Cleopatra and his adoption of Oriental manners, Octavianus skilfully cultivated popularity, and soon declared war ostensibly against the Queen of Egypt. The naval victory of Actium, in which the fleet of Antony and Cleopatra was defeated, made Octavianus master of the world, B.C. 31. He returned to Rome B.C. 29, celebrated a splendid triumph, and caused the temple of Janus to be closed in token of peace being restored. Gradually all the highest offices of state, civil and religious, were united in his hands, and the new title of Augustus was also assumed by him, being formally conferred by the senate in B.C. 27. Great as was the power given to him, he exercised it with wise moderation, and kept up the show of a republican form of government. He adorned Rome in such a manner that it was said, "He found it of brick, and left it of marble." The people erected altars to him, and, by a decree of the senate, the month Sextĭlis was called Augustus (our August). He was a patron of literature; Virgil and Horace were befriended by him, and their works and those of their contemporaries are the glory of the Augustan Age. His death, which took place at Nola, plunged the empire into the greatest grief.

AUGUSTUS II., or **FREDERICK-AUGUSTUS I.,** Elector of Saxony and King of Poland, second son of John George III., elector of Saxony, was born at Dresden in 1670, died at Warsaw 1733. He succeeded his brother in the electorate in 1694, and the Polish throne having become vacant, in 1696, by the death of John Sobieski, Augustus presented himself as a candidate for it and was successful. His wife left him one son. The Countess of Königsmark bore him the celebrated commander Marshal Saxe (Maurice of Saxony).

AUGUSTUS III., or **FREDERICK-AUGUSTUS II.,** Elector of Saxony and King of Poland, son of Augustus II., born at Dresden 1696, succeeded his father as elector in 1733, and was chosen King of Poland through the influence of Austria and Russia. He died in 1763. His son, Frederick Christian, succeeded him as Elector of Saxony, and Stanislaus Poniatowski as King of Poland.

AUK, a name of certain swimming birds, including the great auk, the little auk, the puffin, etc. The great auk or gair-fowl, a bird about 3 feet in length, used to be plentiful in northerly regions,



Great auk.

and also visited the British shores, but has become extinct. Some seventy skins, about as many eggs, with bones representing perhaps a hundred individuals, are preserved in various museums. Though the largest species of the family, the wings were only 6 inches from the carpal joint to the tip, totally useless for flight, but employed as fins in swimming, especially under water. The tail was about 3 inches long; the beak was high, short, and compressed; the head, neck, and upper parts were blackish; a large spot under each eye, and most

Razor-bill auk.

of the under parts white. Its legs were placed so far back as to cause it to sit nearly upright. The razor-bill is about 15 inches in length, and its wings are sufficiently developed to be used for flight. It is found in numbers on some parts of the British shores, as the Isle of Man.

AURE'LIAN, Lucius Domitius Aurelianus, Emperor of Rome, of humble origin, was born about 212 A.D., rose to the highest rank in the army, and on the death of Claudius II. (270) was chosen emperor. He delivered Italy from the barbarians, and conquered the famous Zenobia, queen of Palmyra. He followed up his victories by the reformation of abuses, and the restoration throughout the empire of order and regularity. He lost his life, A.D. 275, by assassination, when heading an expedition against the Persians.

AURE'LIUS ANTONI'NUS, Marcus, often called simply Marcus Aurelius, Roman emperor and philosopher, son-in-law, adopted son, and successor of Antoninus Pius, born A.D. 121, succeeded to the throne 161, died 180. He voluntarily shared the government with Lucius Verus, whom Antoninus Pius had also adopted. Brought up and instructed by Plutarch's nephew, Sextus, the orator Herodes Atticus, and L. Volusius Mecianus, the jurist, he had become acquainted with learned men, and formed a particular love for the Stoic philosophy. A war with Parthia broke out in the year of his accession, and did not terminate till 166. A confederacy of the northern tribes now threatened Italy, while a frightful pestilence, brought from the East with the army, raged in Rome itself. Both emperors set out in person against the rebellious tribes. In 169 Verus died, and the sole command of the war devolved on Marcus Aurelius, who prosecuted it with the utmost rigor, and nearly exterminated the Marcomanni. After this victory the Marcomanni, the Quadi, as well as the rest of the barbarians, sued for peace. The sedition of the Syrian governor Avidius Cassius, with whom Faustina, the empress, was in treasonable communication, called off the emperor from his conquests, but before he reached Asia the rebel was assassinated. Aurelius returned to Rome,

after visiting Egypt and Greece, but soon new incursions of the Marcomanni compelled him once more to take the field. He defeated the enemy several times, but was taken sick at Sirmium, and died at Vindobona (Vienna) in 180. His only extant work is the Meditations, written in Greek, and which has been translated into most modern languages. This may be regarded as a manual of practical morality, in which wisdom, gentleness, and benevolence are combined in the most fascinating manner. Many believe it to have been intended for the instruction of his son Commodus. Aurelius was one of the best emperors ever Rome saw, although his philosophy and the magnanimity of his character did not restrain him from the persecution of the Christians, whose religious doctrines he was led to believe were subversive of good government.

AU'RENGZEBE (-zēb), one of the greatest of the Mogul emperors of Hindustan, born in Oct., 1618 or 1619. In his twentieth year he raised a body of troops by his address and good fortune, and obtained the government of the Deccan. He murdered his relatives one after the other, and in 1659 ascended the throne. Two of his sons, who endeavored to form a party in their own favor, he caused to be arrested and put to death by slow poison. He carried on many wars, conquered Golconda and Bijapur, and drove out, by degrees, the Mahrattas from their country. After his death in 1707 the Mogul Empire declined.

AURICULAR CONFESSION. See Confession

AURO'RA, in classical mythology, the goddess of the dawn, daughter of Hyperion and Theia, and sister of Helios and Selēnē (Sun and Moon). She was represented as a charming figure, "rosy-fingered," clad in a yellow robe, rising at dawn from the ocean and driving her chariot through the heavens.

AURO'RA, a city of Kane Co., Illinois, on the Fox river, 40 miles w. by s. of Chicago; it has flourishing manufactories, railway works, and a considerable trade. Pop. 21,000.

AURO'RA BOREA'LIS, a luminous meteoric phenomenon appearing in the north, most frequently in high latitudes, the corresponding phenomenon in the southern hemisphere being called Aurora Australis, and both being also called Polar Light, Streamers, etc. The northern aurora has been far the more observed and studied. It usually manifests itself by streams of light ascending toward the zenith from a dusky line of cloud or haze a few degrees above the horizon, and stretching from the north toward the west and east, so as to form an arc with its ends on the horizon, and its different parts and rays are constantly in motion. Sometimes it appears in detached places; at other times it almost covers the whole sky. It assumes many shapes and a variety of colors, from a pale red or yellow to a deep red or blood color; and in the northern latitudes serves to illuminate the earth and cheer the gloom of the long winter nights. The appearance of the aurora borealis so exactly resembles the effects of artificial electricity that there is every reason to believe that their causes are identical. When electricity passes through rarefied air it exhibits a diffused luminous stream which has all the characteristic appearance of the aurora, and hence is is highly probable that this natural phenomenon is occasioned by the passage of electricity through the upper regions of the atmosphere. The influence of the aurora upon the magnetic needle is now considered as an ascertained fact, and the connection between it and magnetism is further evident from the fact that the beams or coruscations issuing from a point in the horizon west of north are frequently observed to run in the magnetic meridian. What are known as magnetic storms are invariably connected with exhibitions of the aurora, and with spontaneous galvanic currents in the ordinary telegraph wires; and this connection is found to be so certain that, upon remarking the display of one of the three classes of phenomena, we can at once assert that the other two are also observable. The aurora borealis is said to be frequently accompanied by sound, which is variously described as resembling the rustling of pieces of silk against each other, or the sound of wind against the flame of a candle. The aurora of the southern hemisphere is quite a similar phenomenon to that of the north.

Aurora borealis, as seen when crossing the polar circle.

AUS'TEN, Jane, English novelist, born 1775, at Steventon, in Hants. Her principal novels are Sense and Sensibility; Pride and Prejudice; Mansfield Park; and Emma. She died in 1817.

AUS'TERLITZ, a town with 3452 inhabitants, in Moravia, 10 miles e. of Brünn, famous for the battle of the 2d of December, 1805, fought between the French (70,000 in number) and the allied Austrian and Russian armies (95,000). The decisive victory of the French led to the Peace of Pressburg between France and Austria.

AUS'TIN, capital of the state of Texas, on the Colorado, about 200 miles from its month, and accessible to steamboats during certain seasons. There is a state university and other institutions, and a splendid capitol built of red granite. Pop. 25,000.

State capitol, Austin, Tex.

AUSTRALASIA, a division of the globe usually regarded as comprehending the islands of Australia, Tasmania, New Zealand, New Caledonia, the New Hebrides, the Solomon Islands, New Ireland, New Britain, the Admiralty Islands, New Guinea, and the Arru Islands, besides numerous other islands and island groups; estimated area, 3,400,000 sq. miles; pop. 6,000,000. It forms one of three portions into which some geographers have divided Oceania, the other two being Maylasia and Polynesia.

AUSTRALIA, the largest island in the world, a sea-girt continent, lying between the Indian and Pacific Oceans, s.e. of Asia; between lat. 10° 39′ and 39° 11′ s.; lon. 113° 5′ and 153° 16′ e.; greatest length, from w. to e., 2400 miles; greatest breadth, from n. to s., 1700 to 1900 miles. It is separated from New Guinea on the north by Torres Strait, from Tasmania on the south by Bass Strait. It is divided into two unequal parts by the Tropic of Capricorn, and consequently belongs partly to the South Temperate, partly to the Torrid Zone. It is occupied by five British colonies; namely, New South Wales, Victoria, and Queensland in the east; South Australia in the middle, stretching from sea to sea; and Western Australia in the west. Their area and popu-

lation are as follows (but authorities differ as to the areas):

	Area in sq. m.	Pop.
N. S. Wales.....	310,700	1,459,943
Victoria.....	87,884	1,341,506
Queensland.....	668,497	503,266
South Australia...	903,425	402,604
Western Australia.	975,920	192,553
	2,946,426	3,899,872

Sydney, Melbourne, Adelaide, Brisbane, and Perth are the chief towns. The population of the Commonwealth of Australia, which includes the above colonies or states and also Tasmania, was 4,282,347

The interior, so far as explored, is largely composed of rocky tracts and barren plains with little or no water. The whole continent forms an immense plateau, highest in the east, low in the center, and with a narrow tract of land usually intervening between the elevated area and the sea.

The rivers of Australia are nearly all subject to great irregularities in volume, many of them at one time showing a channel in which there is merely a series of pools, while at another they inundate the whole adjacent country. The chief is the Murray, which, with its affluents the Murrumbidgee, Lachlan, and Darling, drains a great part of the interior west of the Dividing Range, and falls into the sea on the south coast (after entering Lake Alexandrina). Its greatest tributary is the Darling, which may even be regarded as the main stream. On the east coast are the Hunter, Clarence, Brisbane, Fitzroy, and Burdekin; on the west, the Swan, Murchison, Gascoyne, Ashburton, and De Grey; on the north, the Fitzroy, Victoria, Flinders, and Mitchell. The Australian rivers are of little service in facilitating internal communciation. Many of them lose themselves in swamps or sandy wastes of the interior. A considerable river of the interior is Cooper's Creek, or the Barcoo, which falls into Lake Eyre, one of a group of lakes on the south side of the continent having no outlet, and accordingly salt. The principal of these are Lakes Eyre, Torrens, and Gairdner, all of which vary in size and saltness according to the season. Another large salt lake of little depth, Lake Amadeus, lies a little west of the center of Australia. Various others of less magnitude are scattered over the interior.

The climate of Australia is generally hot and dry, but very healthful.

Australia is a region containing a vast quantity of mineral wealth. Foremost come its rich and extensive deposits of gold, which, since its discovery in 1851, have produced a total of more than two billion dollars. The greatest quantity has been obtained in Victoria, but New South Wales and Queensland have also yielded a considerable amount. Rich stores of gold have recently been discovered in W. Australia. Australia also possesses silver, copper, tin, lead, zinc, antimony, mercury, plumbago, etc., besides coal (now worked to a considerable extent in New South Wales) and iron. Various precious stones are found, as the garnet, ruby, topaz, sapphire, and even the diamond. Of building stone there are granite, limestone, marble, and sandstone.

The Australian flora presents peculiarities which mark it off by itself in a very decided manner. Many of its most striking features have an unmistakable relation to the general dryness of the climate. The trees and bushes have for the most part a scanty foliage, presenting little surface for evaporation, or thick leathery leaves well fitted to retain moisture. The most widely spread types of Australian vegetation are the various kinds of gum-tree, the shea-oak, the acacia or wattle, the grass-tree, and a great number of ferns and tree-ferns. Of the gum-tree there are found upward of 150 species, many of which are of great value. Individual specimens of the "peppermint" have been found to measure from 480 to 500 feet in height. As timber-trees the most valuable members of this genus are the red-gum, the timber of

Australian aboriginals.

which is hard, dense, and almost indestructible. A number of the gum-trees have deciduous bark. The wattle or acacia includes about 300 species, some of them of considerable economic value, yielding good timber or bark for tanning. The most beautiful and most useful is that known as the golden wattle, which in spring is adorned with rich masses of fragrant yellow blossom. Palms—of which there are 24 species, all except the coco-palm peculiar to Australia—are confined to the north and east coasts. Beautiful flowering plants are numerous. Australia also possesses great numbers of turf-forming grasses, such as the kangaroo-grass, which survives even a tolerably protracted drought. The native fruit-trees are few and unimportant, and the same may be said of the plants yielding roots used as food; but exotic fruits and vegetables may now be had in the different colonies in great abundance and of excellent quality. The vine, the olive, and mulberry thrive well, and quantities of wine are now produced. The cereals of Europe and maize are extensively cultivated, and large tracts of country, particularly in Queensland, are under the sugar-cane.

The Australian fauna is almost unique in its character. Its great feature is the nearly total absence of all the forms of Mammalia which abound in the rest of the world, their place being supplied by a great variety of marsupials—these animals being nowhere else found, except in the opossums of America. There are about 110 kinds of marsupials (of which the kangaroo, wombat, bandicoot, and phalangers or opossums, are the best-known varieties), over twenty kinds of bats, a wild dog (the dingo), and a number of rats and mice. Two extraordinary animals, the platypus, or water-mole of the colonist, and the porcupine ant-eater, constitute the lowest order of mammals, and are confined to Australia. Their young are produced from eggs. Australia now possesses a large stock of the domestic animals of Britain, which thrive there remarkably well. The breed of horses is excellent. Horned cattle and sheep are largely bred, the first attaining a great size, while the sheep improve in fleece and their flesh in flavor. There are upward of 650 different species of birds, the largest being the emu, or Australian ostrich, and a species of cassowary. Peculiar to the country are the black-swan, the honey-sucker, the lyre-bird, the brush-turkey, and other mound-building birds, the bower-birds, etc. The parrot tribe preponderate over most other groups of birds in the continent. There are many reptiles, the largest being the alligator, found in some of the northern rivers. There are upwards of 60 different species of snakes, some of which are very venomous. Lizards, frogs, and insects are also numerous in various parts. The seas, rivers, and lagoons abound in fish of numerous varieties, and other aquatic animals, many of them peculiar. Whales and seals frequent the coasts. On the n. coasts are extensive fisheries of trepang, much visited by native traders from the Indian Archipelago. Some animals of European origin, such as the rabbit and the sparrow, have developed into real pests in several of the colonies.

The natives belong to the Australian negro stock, and are sometimes considered the lowest as regards intelligence in the whole human family, though this is doubtful. They number about 60,000, exclusive of those in the unexplored parts, and are of a dark-brown or black color, with jet-black curly but not woolly hair, of medium size, but inferior muscular development. In the settled parts of the continent they are inoffensive, and rapidly dying out.

Till recently each of the colonies was quite independent of the others. Latterly for a number of years there had been a movement in favor of Australian federation and a Federal Convention sat at Adelaide in 1897–98 and drafted a Constitution Bill for the formation of an Australian Commonwealth, which in 1900 was actually established by act of the British Parliament. The colonies

or states included in the Commonwealth comprise Tasmania as well as the five Australian colonies proper. The colonies have a considerable defensive force of militia and volunteers, also a number of gun-boats, torpedo-boats, etc., besides which there is always a squadron of British men-of-war on the Australian station. Education is well provided for, instruction in the primary schools being in some cases free and compulsory, and the higher education being more and more attended to. There are flourishing universities in Melbourne, Sydney, and Adelaide. Newspapers are exceedingly numerous, and periodicals of all kinds are abundant. There is as yet no native literature of any distinctive type, but names of Australian writers of ability both in prose and poetry are beginning to be known beyond their own country.

Pastoral and agricultural pursuits and mining are the chief occupations of the people, though manufactories and handicrafts also employ large numbers.

It is doubtful when Australia was first discovered by Europeans. Between 1531 and 1542 the Portuguese published the existence of a land which they called Great Java, and which corresponded to Australia, and probably the first discovery of the country was made by them early in the 16th century. The first authenticated discovery is said to have been made in 1601, by a Portuguese named Manoel Godinh de Eredia. In 1606 Torres, a Spaniard, passed through the strait that now bears his name, between New Guinea and Australia. Between this period and 1628 a large portion of the coast-line of Australia had been surveyed by various Dutch navigators. In 1664 the continent was named New Holland by the Dutch government. In 1688 Dampier coasted along part of Australia, and about 1700 explored a part of the w. and n.w. coasts. In 1770 Cook carefully surveyed the e. coast, named a number of localities, and took possession of the country for Britain. He was followed by Bligh in 1789, who carried on a series of observations on the n.c. coast, adding largely to the knowledge already obtained of this new world. Colonists had now arrived on the soil, and a penal settlement was formed (1788) at Port Jackson. In this way was laid the foundation of the future colony of New South Wales. The Moreton Bay district (Queensland) was settled in 1825; in 1835 the Port Phillip district. In 1851 the latter district was erected into a separate colony under the name of Victoria. Previous to this time the colonies both of Western Australia and of South Australia had been founded—the former in 1829, the latter in 1836. The latest of the colonies is Queensland, which only took an independent existence in 1859.

July 9, 1900, the British Parliament passed an act empowering the six provinces of Australia to form a federal union and Jan. 1 1901, the new commonwealth was proclaimed at Sydney, N. S. W. Its first parliament was opened May 9, 1901. In 1903 Bombala, N. S. W., was chosen as the permanent capital.

AUSTRIA, or AUSTRIA-HUNGARY, an extensive duplex monarchy in central Europe, inhabited by several distinct nationalities, and consisting of two semi-independent countries, each with its own parliament and government, but with one common sovereign, army, and system of diplomacy, and also with a common parliament. The Austrian Empire now has a total area of about 240,000 sq. miles, and is bounded s. by Turkey, the Adriatic, and Italy; w. by Switzerland, Bavaria, and Saxony; n. by Prussia and Russian Poland; and e. by Russia and Rumania. On the shores of the Adriatic, along the coasts of Dalmatia, Croatia, Istria, etc., lies its only sea frontage, which is of comparatively insignificant extent. Pop. about 43,000,000. The largest cities are Vienna, Budapest, Prague, Trieste, Lemberg, Gratz, Brunn, Szegedin, Maria Theresiopol, Cracow. Bosnia and Herzegovina, formerly Turkish, now administered by Austria, have an area of 19,728 sq. miles. Pop. 1,591,036.

The prevailing character of the Austrian dominions is mountainous or hilly, the plains not occupying more than a fifth part of the whole surface. The loftiest ranges belong to the Alps, and are found in Tyrol, Styria, Salzburg, and Carinthia, the highest summits being the Ortlerspitzen (12,814 feet) on the western boundary of Tyrol, and the Grossglockner (12,300) on the borders of Salzburg, Tyrol, and Carinthia. Another great range is that of the Carpathians, bounding Hungary on the north. The most extensive tracts of low or flat land, much of which is very fertile, occur in Hungary, Galicia, and Slavonia, the great Hungarian plain having an area of 36,000 sq. miles. They stretch along the courses of the rivers, of which the chief are the Danube, with its tributaries the Save, the Drave, the Theiss, the Maros, the Waag, the March, the Raab, the Inn; also the Elbe and Moldau and the Dniester. The Danube for upward of 800 miles is navigable for pretty large vessels; the tributaries also are largely navigable. The lakes are numerous and often picturesque, the chief being Lake Balaton on the Plattensee. The climate is exceedingly varied, but generally good. The principal products of the north are wheat, barley, oats, and rye; in the center vines and maize are added; and in the south olives and various fruits. The cereals grow to perfection, Hungarian wheat and flour being celebrated. Other crops are hops, tobacco, flax, and hemp. Wine is largely made, but the wines are inferior on the whole, with exception of a few kinds, including Tokay. The forests cover 70,000 sq. miles, or one-third of the productive soil of the empire. Sheep and cattle are largely reared.—Wild deer, wild swine, chamois, foxes, lynxes, and a species of small black bear are found in many districts, the fox and lynx being particularly abundant. Herds of a small native breed of horses roam wild over the plains of Hungary.—In mineral productions Austria is very rich, possessing, with the exception of platinum, all the useful metals, the principal being coal, salt, and iron.

Manufactures are in the most flourishing condition in Bohemia, Moravia, Silesia, and Lower Austria; less so in the eastern provinces, and insignificant in Dalmatia, Bukowina, Herzegovina, etc. Among the most important manufactures are those of machinery and metal goods, Austria holding a high place for the manufacture of musical and scientific instruments, gold and silver plate and jewelry; of stone and china-ware, and of glass, which is one of the oldest and most highly developed industries in Austria; of chemicals; of sugar from beet; of beer, spirits, etc., and especially the manufactures of woolen, cotton, hemp, and flax. The manufacture of tobacco is a state monopoly. Tanning is carried on to a great extent, and in the production of gloves (in Vienna and Prague) Austria stands next to France.

None of the European states, except Russia, exhibits such a diversity of race and language as the Austrian Empire. The Slavs—who differ greatly, however, among themselves in language and civilization—amount to above 17,000,000, or 45 per cent of the total population, and form the great mass of the population of Bohemia, Moravia, Carniola, Galicia, Dalmatia, Croatia, and Slavonia, and northern Hungary, and half of the population of Silesia and Bukowina. The Germans, about 10,600,000, form almost the sole population of the archduchy of Austria, Salzburg, the greatest portion of Styria and Carinthia, almost the whole of Tyrol and Vorarlberg, large portions of Bohemia and Moravia, the whole of West Silesia, etc.; and they are also numerous in Hungary and Transylvania. The Magyars or Hungarians (7,400,000) form the bulk of the inhabitants of the Kingdom of Hungary and eastern Transylvania. Of the Italic or western Romanic stock there are about 700,000, and in the southeast about 2,800,000 of the Rumanian or eastern Romanic stock. The number of Jews is above 1,000,000; and there are other races, such as the Gypsies (150,000), who are most numerous in Hungary and Transylvania, and the Albanians in Dalmatia and the adjacent parts. The population, generally speaking, decreases in density from west to east.

The state religion of Austria is the Roman Catholic, but the civil power exercises supreme control in all ecclesiastical matters. In 1900 there were in the Austrian portion of the monarchy 20,660,279 Roman Catholics, 3,136,535 Greek Catholics united to the Roman Church, 606,764 non-united, 494,011 Protestants, and 1,224,899 Jews. In Hungary and Transylvania there were 9,919,913 Roman Catholics, 1,854,143 Greek united and 2,815,713 non-united, 3,730,084 Protestants, and 851,378 Jews.

The intellectual culture of the people is highest in the German provinces, but in some of the other provinces the illiterates number as many as 80 to 90 per cent. Yet for a number of years attendance on the elementary schools has been compulsory on all children from their sixth to the end of their twelfth year; and there are higher

schools on which attendance is compulsory for young people of thirteen to fifteen years (not elsewhere educated). There are numerous gymnasia and "real-schools," the gymnasia being intended chiefly to prepare pupils for the universities, while in the real-schools a more practical end is kept in view, and modern languages and physical science form the groundwork of the educational course; also agricultural, commercial, industrial, art, music, and other special schools. There are eleven universities, viz. in Vienna, Prague (2), Budapest, Gratz, Cracow, Lemberg, Innsbruck, Klausenburg, Agram, and Czernowitz. Most of these have four faculties—Catholic theology, law and politics, medicine, and philosophy.

The ruler of the Austro-Hungarian monarchy has the title of emperor so far as concerns his Austrian dominions, but he is only king of Hungary. All matters affecting the joint interests of the two divisions of the empire, such as foreign affairs, war, and finance, are dealt with by a supreme body known as the Delegations—a parliament of 120 members, one-half of whom are chosen by and represent the legislature of German Austria and the other half that of Hungary. The legislative center of the Austrian division of the empire is the Reichsrath, or council of the realm, consisting of an upper house (Herrenhaus), composed of princes of the imperial family, nobles with the hereditary right to sit, archbishops and life-members nominated by the emperor; and a lower house (Abgeordnetenhaus) of 353 elected deputies. There are seventeen provincial diets or assemblies, each provincial division having one. In the Hungarian division of the empire the legislative power is vested in the king and the diet or Reichstag conjointly, the latter consisting of an upper house or house of magnates and of a lower house or house of representatives, the latter elected by all citizens of full age paying direct taxes to the amount of 16s a year. The powers of the Hungarian Reichstag correspond to those of the Reichsrath of the Cisleithan provinces. There being three distinct parliaments in the empire, there are also three budgets, that, viz., for the whole empire, that for Cisleithan, and that for Transleithan Austria. A small portion of the imperial revenue of Austria is derived from customs and other sources, 70 per cent of the remainder being made up by the Cisleithan and 30 per cent by the Transleithan divisions of the empire.

Military service is obligatory on all citizens capable of bearing arms who have attained the age of twenty. The period of service is twelve years, of which three are passed in the line, seven in the reserve, and two in the landwehr. The army numbers over 290,000 men (including officers) on the peace-footing and over 1,500,000 on the war-footing. The most important portion of the Austrian navy comprises 12 iron-clads, of from 5 to 14-inch armor, the largest having a tonnage of over 7000, and carrying 27-ton guns; besides gun-boats, torpedo vessels, and other vessels, mostly small and intended for coast defense. The crews number about 10,000 officers and men.

In 791 Charlemagne drove the Avars from the territory between the Ens and the Raab, and united it to his empire under the name of the Eastern Mark (that is March or boundary land); and from the establishment by him of a margraviate in this new province the present empire took its rise. The present imperial family descends from Rudolph von Hapsburg, and the house of Hapsburg furnished 24 sovereigns from Albert I. (1282) to Maria Theresa (1740). With the marriage of the latter to Stephen, Duke of Lorraine, the house of Hapsburg-Lorraine acceded to the throne in the person of Joseph III. in 1780. The succession then fell to Leopold II. (1790), Franz I. (1792), Ferdinand I. (1835), and Franz Joseph I., the present emperor (1848).

In the troubled period following the French revolution of 1830 insurrections took place in Modena, Parma, and the Papal States (1831–32), but were suppressed without much difficulty; and though professedly neutral during the Polish insurrections Austria clearly showed herself on the side of Russia, with whom her relations became more intimate as those between Great Britain and France grew more cordial. The death of Francis I. (1835) and accession of his son Ferdinand I. made little change in the Austrian system of government, and much discontent was the consequence. In 1846 the failure of the Polish insurrection led to the incorporation of Cracow with Austria. In Italy the declarations of Pio Nono in favor of reform increased the difficulties of Austria, and in Hungary the opposition under Kossuth and others assumed the form of a great constitutional movement. In 1848, when the expulsion of Louis Philippe shook all Europe, Metternich found it impossible any longer to guide the helm of the state, and the government was compelled to admit a free press and the right of citizens to arms. Apart from the popular attitude in Italy and in Hungary, where the diet declared itself permanent under the presidency of Kossuth, the insurrection made equal progress in Vienna itself, and the royal family, no longer in safety, removed to Innsbruck. After various ministerial changes the emperor abdicated in favor of his nephew, Francis Joseph; more vigorous measures were adopted; and Austria, aided by Russia, reduced Hungary to submission.

The year 1855 is memorable for the Concordat with the pope, which put the educational and ecclesiastical affairs of the empire entirely into the hands of the Papal see. In 1859 the hostile intentions of France and Sardinia against the possessions of Austria in Italy became so evident that she declared war by sending an army across the Ticino; but after disastrous defeats at Magenta and Solferino she was compelled to cede Milan and the northwest portion of Lombardy to Sardinia. In 1864 she joined with the German states in the war against Denmark, but a dispute about Schleswig-Holstein involved her in a war with her allies (1866), while at the same time Italy renewed her attempts for the recovery of Venice. The Italians were defeated at Custozza and driven back across the Mincio; but the Prussians, victorious at Königgrätz (or Sadowa), threatened Vienna. Peace was concluded with Prussia on Aug. 23 and with Italy on Oct. 3, the result of the war being the cession of Venetia through France to Italy and the withdrawal of Austria from all interference in the affairs of Germany.

Since 1866 Austria has been occupied chiefly with the internal affairs of the empire. Hungarian demands for self-government were finally agreed to, and the Empire of Austria divided into the two parts already mentioned—the Cisleithan and the Transleithan. This settlement was consummated by the coronation of the Emperor Francis Joseph I., at Budapest, as King of Hungary, on the 8th of June, 1867. In the same year the Concordat of 1855 came up for discussion, and measures were passed for the reestablishment of civil marriage, the emancipation of schools from the domination of the church, and the placing of different creeds on a footing of equality. The fact of the Austro-Hungarian dominions comprising so many different nationalities has always given the central government much trouble, both in regard to internal and to external affairs. In regard to the "Eastern Question," for instance, the action of Austria has been hampered by the sympathies shown by the Magyars for their blood relations, the Turks, while the Slavs have naturally been more favorable to Russia. During the war between Russia and Turkey in 1877–78 Austria remained neutral; but at its close, in the middle of 1878, it was decided, at the Congress of Berlin, that the provinces of Bosnia and Herzegovina should in future be administered by Austria-Hungary instead of Turkey. Since that time the external history of the Austro-Hungarian monarchy has been uneventful, but in internal affairs there has been considerable friction between the different nationalities and the numerous political parties. The language question has been a fruitful source of controversy.

AU'TOCRAT, an absolute or uncontrolled ruler; the head of a state who is not controlled by any constitutional limitations; such as the Emperor of Russia.

AUTO DE FE (Spanish); **AUTO DA FE** (Portuguese), lit. "act of faith." See Inquisition.

AU'TOGRAPH, a person's own handwriting; an original manuscript or signature, as opposed to a copy. The practice of collecting autographs or signatures dates at least from the 16th century, among the earliest collections known being those of Loménie de Brienne and Lacroix du Maine.

AUTOM'ATON, a self-moving machine performing actions like those of a living being, and often shaped like one. The walking statues of Dædalus, the flying dove of Archytas, the brazen head of Friar Bacon, the iron fly of Regiomontanus, the door-opening figure of Albertus Magnus, the parading knights of the clock presented to Charlemagne by Harun al Rashid, the toy carriage and

attendants constructed by Camus for Louis XIV., the flute-player, tambour-player, and duck of Vaucanson, and the writing child of the brothers Droz are among the more noteworthy of traditional automata.

AUTOMOBILE (ą-tō-mō-bēl'), a self-propelling vehicle for use on streets or roads for conveying passengers or freight. The earliest automobile was the crude vehicle invented by the Englishman, Hancock, and patented in 1827. Other early automobile inventors, none of whom, however, were successful, were Sir Charles Dance, Guldeworthy Gurney, W. A. Summers, Nathaniel Ogle, Macerone and Squire, Henry James, Scott Russell, and Robert Griffith, whose patents date between 1827 and 1836. These inventions were regarded as curiosities only, and it was not until 1885 when Gottlieb Daimler invented his small powerful gas-engine that the modern automobile became possible.

The first American self-propelling road vehicle was made by Oliver Evans in 1786, at which time he planned a steam wagon that could be made to transport merchandise at less expense than the same work could be done by horses.

It was not, however, until recent years, that any widespread interest was manifested in the subject of horseless vehicles. All such machines may be classified, according to their motor power, under the following general heads: 1. Steam vehicles with boilers and engines burning coal, oil, etc. 2. Machines driven by oil or vapor engines, gasoline, naphtha, etc. 3. Machines driven by compressed air (liquid air being a possibility.) 4. Machines run by electricity.

The equipment of the modern electric automobile consists of a storage battery for supplying the current, the motor for transforming this current into mechanical power, and the controller for regulating the speed of the motor. In most electric vehicles two motors or a double motor drive are employed, the motor being either supported on the rear axle or on the reach. The battery is either placed in a case hung under the body of the vehicle or else inside the body. The motors and other moving parts are placed in dust-proof cases. The efficiency of the battery is of course the most important consideration, and its deterioration with service has to be borne in mind in such commercial applications as automobiles. In 1908 the batteries then in use were considered to be good for 5000 miles by observing ordinary precautions in charging and use. In the United States electric power has been applied to a great variety of vehicles, including, besides pleasure carriages of various types, delivery wagons, cabs, omnibuses, and trucks.

Since 1900 in the United States 20-passenger omnibuses and heavy trucks with double electric motor drives have been constructed and are in active use.

The most popular motor is some form of oil engine. The number and variety of these motors makes description of them impossible. In the internal combustion motor the propulsive power is given to the piston by the explosion of vaporized oil, such as benzine or gasoline in the cylinder. The mechanism comprises, besides the engine and its connections, a carbureter for vaporizing and feeding the oil to the cylinder, and a cooler, by which water is kept in circulation around the cylinder. The engine transmits its power to a crank-shaft , from which it is led off by a chain drive or gearing to the driving shaft of the vehicle. These motors are made with one, two and four cylinders, and are of various powers, They will not start up of themselves under load, and cannot be reversed. Backing the carriage is effected by gears, and a steady movement of the engine is produced by a fly-wheel. The gasoline motor is unable to run under overload, but on the other hand consumes less fuel, and on this account has a greater radius of action.

The speed attained by the automobiles has been and is being enormously increased, and it is in this respect that there have been the most remarkable developments. These have progressed from time to time, so that at present the horseless carriage rivals modern express trains in the speed of its travel, while it is also able to operate for long distances, requiring supplies of fuel and water in a manner similar to the railway locomotive. If a machine is constructed to run comparatively short distances on a level and well-surfaced road, a mile may be accomplished in from 40 to 60 seconds.

The years 1907 and 1908 were the most successful in the history of the automobile industry. There were in use in the United States 175,000 pleasure vehicles of various models and horse power and 18,000 commercial vehicles, both gasoline and electric. The estimated valuation of all types of motor-driven vehicles in use is $370,000,000.

The estimated production of automobiles of the entire industry in the United States is placed at 55,000 machines. The approximate value of this output is $110,000,000. The capital employed in the automobile industry is approximately $90,000,000.

There are about fifty companies engaged exclusively or partially in the manufacture of motor vehicles for business purposes. A decided change is noticeable in the attitude of those who are using horses in their business toward the possible adoption of the motor. The failure of some of the earliest installations, owing largely to exorbitant claims made for them, somewhat retarded the development for a time, but the prejudice so born has been largely overcome, and with the much improved vehicle and the more rational demands as to what it should do, the machine is beginning steadily to replace the animal as it has in every field where they have come in conflict so far, and naturally always will. The much greater working capacity of the motor vehicle—owing to its speed and ability to work for indefinite periods of time—is its chief advantage. Economy of use usually results through this feature rather than through reduced cost of operation, although the relative value of the latter item increases rapidly in favor of the motor with the number of vehicles employed, it being capable of displacing a greater number of horse-drawn vehicles. It is generally conceded by those who should know that the best field for the electric commercial vehicle is in the lines where the length of the runs to be made is relatively short and the number of stops great. The gasoline vehicle is coming rapidly to the front in all other lines, and, in many cases, is doing well in this one, too. Very little has been done with steam, except that one company has built a number of ambulances, although it seems to have great possibilities.

The taximeter cab service now in operation in the large cities opens a new field for the American automobile. These motor cabs will carry taximeters to determine the fares, and promise to be popular throughout the country, and seems destined to shortly replace the horse-drawn cab.

Federal statistics show there are more than 2,151,570 miles of public highways in the United States. Of this mileage 108,232.9 miles are surfaced with gravel, 38,621.7 miles with stone, and 6,809.7 miles with special materials, such as shells, sand, clay, oil and brick, making in all 153,664.3 miles of improved road. From this it follows that 7.14 per cent, of all the roads in this country have been improved.

Automobile speed may be judged by a study of the record table which shows that the fastest mile ever recorded is the :28 1-5 made by F. H. Marriott in a Stanley steamer at Ormond, Fla., in 1906. The fastest average pace for a middle-distance race was made at Ormond, March 5, 1908, when Maurice Bernin, in a sixty-horse power Renault, traveled 100 miles in 1:12:56 1-5, an average of 82.26 miles per hour. At the same meet Emanuel Cedrino, in the sixty-horse power Fiat Cyclone, established a 300-mile record of 3:53:44, an average of 77.02 miles per hour. Greater speed than even this is reported to have been made by Nazzaro in a Fiat in a match race at Brooklands, England, it being said he showed 120 miles an hour for two and three-quarter miles, but these figures never were officially accepted. On the road the fastest average pace was made in the Florio cup race in Italy, in 1908, by Nazzaro in a Fiat, who averaged 74.27 miles per hour.

The world's record for twenty-four hours is 1,581 miles 1,310 yards, an average pace of 65.9 miles an hour, made June 28-29, 1907, by S. F. Edge in a six-cylinder Napier on the three and one-quarter mile cement track at Weybridge, England. During the year there were run in the United States ten twenty-four-hour races, five of them single car events and the other five relay or team races in which two cars of the same make constituted a team.

Motor-bicycles and quadricycles were built in New York in 1895. Gasoline

motors provided the propelling force. The former weighs only sixty pounds. A naphtha tank is fastened on top of the frame between the saddle and the handles. It feeds down through the frame to the cylinders, one on each side of the rear wheel. The drops of naphtha are exploded by an electric spark from a small battery hung to the frame, thus giving impulse to the pistons. The speed depends upon the amount of oil let down. The machine is started by pedals, and the rotation of the wheels, together with the turning of the switch, sets the motor to working.

AUTONOMY, the power of a state, institution, etc., to legislate for itself.

AUTOP'SY, literally, personal observation or inspection, commonly restricted to post-mortem examination.

AUTOSUGGES'TION, in hypnotism, the power of suggesting thought or action to one's self. It is used largely in medicine under the name suggestive therapeutics, by which the patient, being given an inert remedy, suggests a cure to himself.

AU'TOTYPE, a species of photographic print. A thin sheet of gelatine on paper is rendered sensitive to light by treatment with bichromate of potash, and then exposed under an ordinary photographic negative. The portions of gelatine affected by the light become insoluble, the remainder of the gelatine is then washed away, and the picture remains reproduced in the gelatine, there being slight elevations and depressions corresponding with the distribution of light and shade. This may be printed from, but it is more often made use of to obtain electrotypes or other reverses, from which impressions can more easily be taken.

AUTUMN, the season between summer and winter, in the northern hemisphere often regarded as embracing August, September, and October, or three months about that time. The beginning of the astronomical autumn is September 22, the autumnal equinox; and the end is December 21, the shortest day. The autumn of the southern hemisphere takes place at the time of the northern spring.

AUTUN ō-tŭn; ancient *Bibracte*, later *Augustodunum*) a town, Southeastern France, department of Saône-e-Loire. It has two Roman gates of exquisite workmanship, the ruins of an amphitheater and of several temples, the cathedral of St. Lazare, a fine Gothic structure of the eleventh century; manufactures of carpets, woolens, cotton, velvet, hosiery, etc., Pop. 14,066.

AUVERGENE (ō-vâr-nyē), a province, Central France, now merged into departments Cantal and Puy-de-Dôme, and an arrondissement of Haute-Loire. The Auvergne Mountains, separating the basins of the Allier, Cher and Creuse from those of the Lot and Dordogne, contain the highest points of Central France: Mount Dor, 6188 feet; Captal, 6093 feet, and Puy-de-Dôme, 4806 feet. The number of extinct volcanoes and general geologic formation make the district one of great scientific interest. The minerals include iron, coal, copper and lead, and there are warm and cold mineral springs. Auvergne contributes a large supply to the labor markets of Paris and Belgium, there being in Paris alone some 50,000 Auvergnats.

AUXERRE (ō-sâr), a town, France, department of Yonne, 110 miles southeast of Paris, Principal edifices: A fine Gothic cathedral, unfinished; the abbey of St. Germain, with curious crypts; and an old Episcopal palace, now the Hotel de-Prefecture; it manufactures woolens, hats, casks, leather, earthern ware, violin strings, etc.; trade chiefly in wood and wines, of which the best known is white Chablis. Pop. 20,236.

AUXOM'ETER, an instrument to measure the magnifying powers of an optical apparatus.

AUXONNE (ō-son; anc. *Aussona*) a town, France, department of Côte-d'Or (Burgundy), on the Saône; a fortified place with some manufactures. Pop. 5911.

A'VA, a town in Asia, formerly the capital of Burmah, on the Irrawady, now almost wholly in ruins.

AVA-AVA, Arva, Kava or Yava, plant of the nat. order Piperaceæ (pepper family), so called by the inhabitants of Polynesia, who make an intoxicating drink out of it. Its leaves are chewed with betel in Southeastern Asia.

AV'ALANCHES, large masses of snow or ice precipitated from the mountains, and distinguished as wind or dust avalanches, when they consist of freshfallen snow whirled like a dust storm into the valleys; as sliding avalanches, when they consist of great masses of snow sliding down a slope by their own weight; and as glacier or summer avalanches, when ice-masses are detached by heat from the high glaciers.

AVELLINO (â-vel-lē'nō), a town in southern Italy, capital of the province of Avellino, 29 miles east of Naples, the seat of a bishop. Avellino nuts were celebrated under the Romans. Pop. 16,376.—Area of the province, 1409 sq. miles; pop. 419,688.

A'VE MARI'A, the first two words of the angel Gabriel's salutation (Luke i. 28), and the beginning of the very common Latin prayer to the Virgin in the Roman Catholic Church. Its lay use was sanctioned at the end of the 12th century, and a papal edict of 1326 ordains the repetition of the prayer thrice each morning, noon, and evening, the hour being indicated by sound of bells called the Ave Maria or Angelus Domini. The prayers are counted upon the small beads of the rosary, as the Paternosters are upon the largest ones.

AV'ERAGE, in maritime law, any charge or expense over and above the freight of goods, and payable by their owner.—*General average* is the sum falling to be paid by the owners of ship, cargo and freight, in proportion to their several interests, to make good any loss or expense intentionally incurred for the general safety of ship and cargo, *e. g.* throwing goods overboard, cutting away masts, port dues in cases of distress, etc.—*Particular average* is the sum falling to be paid for unavoidable loss when the general safety is not in question, and therefore chargeable on the individual owner of the property lost. A policy of insurance generally covers both general and particular average, unless specially excepted.

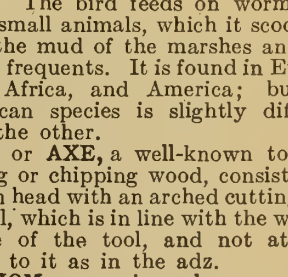
AVESTA. See Zendavesta.

AVEYRON (â-vā-rōn), a department occupying the southern extremity of the central plateau of France, traversed by mountains belonging to the Cevennes and the Cantal ranges; principal rivers, Aveyron, Lot, and Tarn, the Lot alone being navigable. The climate is cold, and agriculture is in a backward state, but considerable attention is paid to sheep-breeding. It is noted for its "Roquefort cheese." It has coal, iron and copper mines, besides other minerals. Area, 3340 sq. miles; capital, Rhodez. Pop. 377,559.

AVIGNON (â-vē-nyōn), an old town of s.e. France, capital of department Vaucluse, on the left bank of the Rhone; inclosed by lofty battlemented and turreted walls, well built, but with rather narrow streets. The silk manufacture and the rearing of silk-worms are the principal employments in the district. Here Petrarch lived several years, and made the acquaintance of Laura, whose tomb is in the Franciscan church. From 1309 to 1376 seven popes in succession, from Clement V. to Gregory XI., resided in this city. After its purchase by Pope Clement VI. in 1348 Avignon and its district continued, with a few interruptions, under the rule of a vice-legate of the pope's till 1791, when it was formally united to the French Republic. Pop. 46,209.

AVILA (ä'vē-lâ), town of Spain, capital of province of Avila, a modern division of Old Castile. Pop., town, 11,885; province, 197,164.

AV'OSET, a bird about the size of a lapwing. The bill is long, slender, elastic, and bent upward toward the tip, the legs long, the feet webbed, and the plumage variegated with black and



Avoset.

white. The bird feeds on worms and other small animals, which it scoops up from the mud of the marshes and fens that it frequents. It is found in Europe, Asia, Africa, and America; but the American species is slightly different from the other.

AX, or **AXE,** a well-known tool for cutting or chipping wood, consisting of an iron head with an arched cutting edge of steel, which is in line with the wooden handle of the tool, and not at right angles to it as in the adz.

AX'IOM, a universal proposition, which the understanding must perceive to be true as soon as it perceives the meaning of the words, and therefore called a self-evident truth: e.g., A is A. In mathematics axioms are those propositions which are assumed without proof, as being in themselves independ-

ent of proof, and which are made the basis of all the subsequent reasoning; as, "The whole is greater than its part"; "Things that are equal to the same thing are equal to one another."

AXIS, the straight line, real or imaginary, passing through a body or magnitude, on which it revolves, or may be supposed to revolve; especially a straight line with regard to which the different parts of a magnitude, or several magnitudes, are symmetrically arranged; e g., the axis of the world, the imaginary line drawn through its two poles.

In botany the word is also used, the stem being termed the ascending axis, the root the descending axis.

In anatomy the name is given to the second vertebra from the head, that on which the atlas moves. See Atlas.

AYE-AYE (ī'ī), an animal of Madagascar, so called from its cry, now referred to the lemur family. It is about the size of a hare, has large flat ears and a bushy

Aye-aye.

tail; large eyes; long sprawling fingers, the third so slender as to appear shriveled; color, musk-brown, mixed with black and gray ash; feeds on grubs, fruits, etc.; habits, nocturnal.

AYR (ār), a town of Scotland, a royal and parl. burgh, and capital of Ayrshire, at the mouth of the river Ayr, on the Firth of Clyde. The house in which Burns was born stands within 1½ miles of the town, between it and the church of Alloway ("Alloway's auld haunted kirk"), and a monument to him stands on a height between the kirk and the bridge over the Doon. Pop. 28,697.—The county has a length along the Firth of Clyde and North Channel of 80 miles; area, 735,262 acres. It is divided into the districts of Carrick in the south, Kyle in the middle, and Cunningham in the north. Chief towns, Ayr, Kilmarnock, and Irvine. North Ayrshire and South Ayrshire each returns one member to parliament. Pop. (1901), 254,436.

AZA'LEA, a genus of plants remarkable for the beauty and fragrance of their flowers, and distinguished from the rhododendrons chiefly by the flowers having five stamens instead

Azalea.

of ten. Many beautiful rhododendrons with deciduous leaves are known under the name of azalea in gardens. The azaleas are common in North America.

AZAMGARH, a town of India, United Provinces, capital of dist. of same name. Pop. 18,528.—The district has an area of 2418 sq. miles; a pop. of 1,728,625.

AZERBĪJAN (ä-zer-bī-jän'), a province of northwestern Persia; area, 40,000 sq. miles; pop. estimated at 2,000,000. It consists generally of lofty mountain ranges, some of which rise to a height of between 12,000 and 13,000 feet. Principal rivers: the Aras or Araxes, and the Kizil-Uzen, which enter the Caspian; smaller streams discharge themselves within the province into the great salt lake of Urumiyah.

AZORES (a-zōrz' or a-zō'res) or **WESTERN ISLANDS,** a group belonging to and 900 miles west of Portugal, in the North Atlantic Ocean. The total area is about 900 sq. miles; São Miguel (containing the capital Ponta Delgada), Pico, and Terceira are the largest. The islands, which are volcanic and subject to earthquakes, are apparently of comparatively recent origin, and are conical, lofty, precipitous, and picturesque. The most remarkable summit is the peak of Pico, about 7600 feet high. There are numerous hot springs. They are covered with luxuriant vegetation, and diversified with woods, corn-fields, vineyards, lemon and orange groves, and rich open pastures. When first visited they were uninhabited, and had scarcely any other animals except birds, particularly hawks, to which, called in Portuguese acores, the islands owe their name. Pop. 256,615.

AZ'TECS, a race of people who settled in Mexico early in the 14th century, ultimately extended their dominion over a large territory, and were still extending their supremacy at the time of the arrival of the Spaniards, by whom they were speedily subjugated. Their most celebrated ruler was Montezuma, who was reigning when the Spaniards arrived, about the middle of the 15th century. It is inferred that considerable numbers of them lived in large communal residences, and that land was held and cultivated upon the communal principle. Slavery and polygamy were both legitimate, but the children of slaves were regarded as free. Although ignorant of the horse, ox, etc., they had a considerable knowledge of agriculture, maize and the agave being the chief produce. Silver, lead, tin, and copper were obtained from mines, and gold from the surface and river beds, but iron was unknown to them, their tools being of bronze and obsidian. In metal-work, feather-work, weaving, and pottery, they possessed a high degree of skill. To record events they used an unsolved hieroglyphic writing, and their lunar calendars were of unusual accuracy. Two special deities claimed their reverence: Hintzilopochtli, the god of war, propitiated with human sacrifices; and Quetzalcoatl, the beneficent god of light and air, with whom at first the Aztecs were disposed to identify Cortez. Their temples, with large terraced pyramidal bases, were in the charge of an exceedingly large priesthood, with whom lay the education of the young. As a civilization of apparently independent origin, yet closely resembling in many features the archaic oriental civilizations, the Aztec civilization is of the first interest, but in most accounts of it a large speculative element has to be discounted.

B

B is the second letter and the first consonant in the English and most other alphabets. It is a mute and labial, pronounced solely by the lips, and is distinguished from p by being sonant, that is, produced by the utterance of voice as distinguished from breath.

B, in music, the seventh note of the model diatonic scale or scale of C. It is called the leading note, as there is always a feeling of suspense when it is sounded until the key-note is heard.

BA'AL, BEL, a Hebrew and general Semitic word, which originally appears to have been generic, signifying simply lord, and to have been applied to many different divinities, or, with qualifying epithets, to the same divinity regarded in different aspects and as exercising different functions. Thus in Hos. ii. 16 it is applied to Jehovah himself, while Baal-berith (the Covenant-lord) was the god of the Shechemites, and Baal-zebub (the Fly-god) the idol of the Philistines at Ekron.

BABBITT, Isaac, an American inventor, born in Massachusetts in 1799, died 1862. He invented the amalgam known as Babbitt metal, for which congress gave him a grant of $20,000 and a gold medal.

BABBITT-METAL, a soft metal resulting from alloying together certain proportions of copper, tin, and zinc or antimony, used with the view of as far as possible obviating friction in the bearings of journals, cranks, axles, etc., invented by Isaac Babbitt (1799–1862), a goldsmith of Taunton, Massachusetts.

BABCOCK, James Francis, an American chemist, born in Boston in 1844, died there in 1897. His principal distinction, aside from his teaching career,

was his invention of a useful fire-extinguisher.

BABCOCK, Stephen Moulton, an American chemist, born in New York in 1843 He invented the Babcock milk-tester, which he did not patent, so that its benefits would be free to the public In 1893 he was made professor of agricultural chemistry in the University of Wisconsin.

BA'BEL, TOWER OF, according to the 11th chapter of Genesis, a structure in the Plain of Shinar, Mesopotamia, commenced by the descendants of Noah subsequent to the deluge, but which was not allowed to proceed to completion. It has commonly been identified with the great temple of Belus or Bel that was one of the chief edifices in Babylon, and the huge mound called Birs Nimrud is generally regarded as its site, though another mound, which to this day bears the name of Babil, has been assigned by some as its site. Babel means literally "gate of God." The meaning "confusion" assigned to it in the Bible really belongs to a word of similar form. See Babylon.

BABOON', a common name applied to a division of old-world apes and monkeys. They have elongated abrupt muzzles like a dog, strong tusks or canine teeth, usually short tails, cheek-

Baboon mother and infant.

pouches, small deep eyes with large eyebrows, and naked callosities on the buttocks. Their hind and fore feet are well proportioned, so that they run easily on all fours, but they do not maintain themselves in an upright posture with facility. They are generally of the size of a moderately large dog, but the largest, the mandrill, is, when erect, nearly of the height of a man. They are almost all African, ugly, sullen, fierce, lascivious, and gregarious, defending themselves by throwing stones, dirt, etc. They live on fruits and roots, eggs and insects.

BAB'YLON, the capital of Babylonia, on both sides of the Euphrates, one of the largest and most splendid cities of the ancient world, now a scene of ruins, and earth-mounds containing them. Babylon was a royal city sixteen hundred years before the Christian era; but the old city was almost entirely destroyed in 683 B.C. A new city was built by Nebuchadnezzar nearly a century later. This was in the form of a square, each side 15 miles long, with walls of such immense height and thickness as to constitute one of the wonders of the world. It contained splendid edifices, large gardens and pleasure-grounds, especially the "hanging-gardens," a sort of lofty terraced structure supporting earth enough for trees to grow, and the celebrated tower of Babel or temple of Belus, rising by stages to the height of 625 feet. After the city was taken by Cyrus in 538 B.C., and Babylonia made a Persian province, it began to decline, and had suffered severely by the time of Alexander the Great. He intended to restore it, but was prevented by his death, which took place here in 323 B.C., from which time its decay was rapid. Interesting discoveries have been made on its site in recent times, more especially of numerous and valuable inscriptions in the cuneiform or arrow-head character. The modern town of Hillah is believed to represent the ancient city, and the plain here for miles round is studded with vast mounds of earth and brick and imposing ruins. The greatest mound is Birs Nimrud, about 6 miles from Hillah. It rises nearly 200 feet, is crowned by a ruined tower, and is commonly believed to be the remains of the ancient temple of Belus. Another great ruin-mound, called Mujellibeh, has also been assigned as its site.

BABYLONIA, an old Asiatic empire occupying the region watered by the lower course of the Euphrates and the Tigris, and by their combined stream. The inhabitants, though usually designated Babylonians, were sometimes called Chaldeans, and it is thought that the latter name represents a superior caste who at a comparatively late period gained influence in the country. At the earliest period of which we have record the whole valley of the Tigris and Euphrates was inhabited by tribes of Turanian or Tatar origin. Along with these, however, there early existed an intrusive Semitic element, which gradually increased in number till at the time the Babylonians and Assyrians (the latter being a kindred people) became known to the western historians they were essentially Semitic peoples. The great city Babylon (which see), or Babel, was the capital of Babylonia, which was called by the Hebrews Shinar. The country was, as it still is, exceedingly fertile, and must have anciently supported a dense population. The chief cities, besides Babylon, were Ur, Calneh, Erech, and Sippara. Babylonia and Assyria were often spoken of together as Assyria.

The discovery and interpretation of the cuneiform inscriptions have enabled the history of Babylonia to be carried back to about 4000 B.C., at which period the inhabitants had attained a considerable degree of civilization, and the country was ruled by a number of kings or princes each in his own city. About 2700 B.C. Babylonia came under the rule of a single monarch. Latterly it had serious wars with neighboring nations, and for several hundred years previous to 2000 B.C. Babylonia was subject to the neighboring Elam. It then regained its independence, and for a thousand years it was the foremost state of western Asia in power, as well as in science, art, and civilization. The rise of the Assyrian empire brought about the decline of Babylonia, which latterly was under Assyrian domination, though with intervals of independence. Tiglath-Pileser II. of Assyria (745–727) made himself master of Babylonia; but the conquest of the country had to be repeated by his successor, Sargon, who expelled the Babylonian king, Merodach-baladan, and all but finally subdued the country, the complete subjugation being effected by Sennacherib. After some sixty years the second or later Babylonian empire arose under Nabopolassar, who, joining the Medes against the Assyrians, freed Babylon from the superiority of the latter power, 625 B.C. The new empire was at its height of power and glory under Nabopolassar's son, Nebuchadnezzar (604–561), who subjected Jerusalem, Tyre, Phœnicia, and even Egpyt, and carried his dominion to the shores of the Mediterranean and northward to the Armenian mountains. The capital, Babylon, was rebuilt by him, and then formed one of the greatest and most magnificent cities the world has ever seen. He was succeeded by his son Evil-merodach, but the dynasty soon came to an end, the last king being Nabonetus or Nabonadius, who came to the throne in B.C. 555, and made his son, Belshazzar, co-ruler with him. Babylon was taken by Cyrus the Persian monarch in 538, and the second Babylonian empire came to an end, Babylonia being incorporated in the Persian empire. Its subsequent history was similar to that of Assyria.

BABYLONISH CAPTIVITY, a term usually applied to the deportation of the two tribes of the kingdom of Judah to Babylon by Nebuchadnezzar, 585 B.C. The duration of this captivity is usually reckoned seventy years, though strictly speaking it lasted only fifty-six years. A great part of the ten tribes of Israel had been previously taken captive to Assyria.

BABYROUSSA (bab-i-rus'á), a species of wild hog, a native of the Indian Archipelago. From the outside of the upper jaw spring two teeth 12 inches long, curving upward and backward

Babyroussa.

like horns, and almost touching the forehead. The tusks of the lower jaw also appear externally, though they are not so long as those of the upper jaw. Along the back are some weak bristles, and on the rest of the body only a sort of wool. These animals live in herds, feed on herbage, are

sometimes tamed, and their flesh is well flavored.

BAC'CARAT, a gambling game of French origin, played by any number of players, or rather betters, and a banker. The latter deals two cards to each player and two to himself, and covers the stakes of each with an equal sum. The cards are then examined, and according to the scores made the players take their own stake and the banker's, or the latter takes all or a certain number of the stakes.

BACCHANA'LIA, feasts in honor of Bacchus, characterized by licentiousness and revelry, and celebrated in ancient Athens. In the processions were bands of Bacchantes of both sexes, who, inspired by real or feigned intoxication, wandered about rioting and dancing. They were clothed in fawn-skins, crowned with ivy, and bore in their hands thyrsi, that is spears entwined with ivy, or having a pine-cone stuck on the point. These feasts passed from the Greeks to the Romans, who celebrated them with still greater dissoluteness till the senate abolished them B.C. 187

BACCHUS (bak'us), the god of wine, son of Zeus (Jupiter) and Sĕmĕlē. He first taught the cultivation of the vine and the preparation of wine. To spread the knowledge of his invention he traveled over various countries and received in every quarter divine honors. Drawn by lions (some say panthers, tigers, or lynxes), he began his march, which resembled a triumphal procession Those who opposed him were severely punished, but on those who received him hospitably he bestowed rewards. His love was shared by several; but Ariadne, whom he found deserted upon Naxos, alone was elevated to the dignity of a wife, and became a sharer of his immortality.

BACH (bäh), Johann Sebastian, one of the greatest of German musicians, was born in 1685, at Eisenach; died in 1750, at Leipzig. Being the son of a musician he was early trained in the art, and soon distinguished himself. In 1703 he was engaged as a player at the court of Weimar, and subsequently he was musical director to the Duke of Anhalt-Köthen, and latterly held an appointment at Leipzig. He paid a visit to Potsdam on the invitation of Frederick the Great. As a player on the harpsichord and organ he had no equal among his contemporaries; but it was not till a century after his death that his greatness as a composer was fully recognized. His compositions breathe an original inspiration, and are largely of the religious kind. They include pieces, vocal and instrumental, for the organ, piano, stringed and keyed instruments; church cantatas, oratorios, masses, passion music, etc.

BACH'ELOR, a term applied anciently to a person in the first or probationary stage of knighthood who has not yet raised his standard in the field. It also denotes a person who has taken the first degree in the liberal arts and sciences, or in divinity, law, or medicine, at a college or university; or a man of any age who has not been married.

BACHELOR'S DEGREE, an academic degree given at the end of the first stage of collegiate education, preliminary to the master's or doctor's degree. A.B. is the abbreviation of bachelor of arts, S.B. of bachelor of science, Ph.B. of bachelor of philosophy, LL.B. of bachelor of laws, D.B. of bachelor of divinity, Litt.B. of bachelor of letters, and so on.

BACHELOR'S BUTTONS, the double-flowering buttercup, with white or yellow blossoms, common in gardens.

BACIL'LUS, the name applied to certain minute rod-like miscroscopic organisms (Bacteria) which often appear in putrefactions, and one of which is believed to hold a constant causative relation to tubercule in the lung, and to be present in all cases of phthisis. Others are alleged to be connected with anthrax, typhoid fever, erysipelas, etc. See Bacteria.

BACKGAM'MON, a game played by two persons upon a table or board made for the purpose, with pieces or men, dice-boxes, and dice. The table is in two parts, on which are twenty-four black and white spaces called points. Each player has fifteen men of different colors for the purpose of distinction. The movements of the men are made in accordance with the numbers turned up by the dice.

BACON, Delia Salter, an American author and a conspicuous contributor to the literature in which is discussed the probability that Sir Francis Bacon was the author of Shakespeare's plays. She was born in Ohio in 1811 and died in London in 1859. She published several stories, and in 1857 the Philosophy of the Plays of Shakespeare Unfolded, for which Nathaniel Hawthorne wrote the preface.

BACON, Francis, Baron of Verulam, Viscount St. Albans, and Lord High Chancellor of England; was born at London in 1561, died at Highgate in

Francis Bacon.

1626. He was educated at Trinity College, Cambridge, and in 1575 was admitted to Gray's Inn. In 1584 he became member of parliament for Melcombe Regis, and soon after drew up a Letter of Advice to Queen Elizabeth, an able political memoir. In 1586 he was member for Taunton, in 1589 for Liverpool. A year or two after he gained the Earl of Essex as a friend and patron. Bacon's talents and his connection with the lord-treasurer Burleigh, who had married his mother's sister, and his son Sir Robert Cecil, first secretary of state, seemed to promise him the highest promotion; but he had displeased the queen, and when he applied for the attorney-generalship, and next for the solicitor-generalship (1595), he was unsuccessful. Essex endeavored to indemnify him by the donation of an estate in land. Bacon, however, forgot his obligations to his benefactor, and not only abandoned him as soon as he had fallen into disgrace, but without being obliged took part against him on his trial, in 1601, and was active in obtaining his conviction. He had been chosen member for the county of Middlesex in 1593, and for Southampton in 1597, and had long been a queen's counsel. The reign of James I. was more favorable to his interest. He was assiduous in courting the king's favor, and James, who was ambitious of being considered a patron of letters, conferred upon him in 1603 the order of knighthood. In 1604 he was appointed king's counsel; in 1606 he married; in 1607 he became solicitor-general, and six years after attorney-general. In 1617 he was made lord-keeper of the seals; in 1618 Lord High Chancellor of England and Baron Verulam. In this year he lent his influence to bring a verdict of guilty against Raleigh. In 1621 he was made Viscount St. Albans. Soon after this his reputation received a fatal blow. A new parliament was formed in 1621, and the lord-chancellor was accused before the house of bribery, corruption, and other malpractices. It is difficult to ascertain the full extent of his guilt; but he seems to have been unable to justify himself, and handed in a "confession and humble submission," throwing himself on the mercy of the Peers. In 1597 he published his celebrated Essays, which immediately became very popular, were successively enlarged and extended, and translated into Latin, French, and Italian. The treatise on the Advancement of Learning appeared in 1605; The Wisdom of the Ancients in 1609; his great philosophical work, the Novum Organum, in 1620; and the De Augmentis Scientiarum, a much enlarged edition of the Advancement, in 1623. His New Atlantis was written about 1614–17; Life of Henry VII. about 1621. Bacon was great as a moralist, a historian, a writer on politics, and a rhetorician; but it is as the father of the inductive method in science, as the powerful exponent of the principle that facts must be observed and collected before theorizing, that he occupies the grand position he holds among the world's great ones.

BACON, Nathaniel, an American colonist of Virginia. He was a remote cousin of Sir Francis Bacon, and educated for the law. He took part in the Indian wars of 1675–6, and was carried off by dysentery in the midst of political strife. He was born in 1648.

BACON, Roger, an English monk, and one of the most profound and original

thinkers of his day, was born about 1214, near Ilchester, Somersetshire; died at Oxford in 1294. His most important work is his Opus Majus, where he discusses the relation of philosophy to religion, and then treats of language, metaphysics, optics, and experimental science. He was undoubtedly the earliest philosophical experimentalist in Britain; he made signal advances in optics; was an excellent chemist; and in all probability discovered gunpowder. He was intimately acquainted with geography and astronomy, as appears by his discovery of the errors of the calendar, and their causes, and by his proposals for correcting them, in which he approached very near to truth.

BACTE'RIA, minute vegetable organisms, a few species of which are productive of disease when introduced into the animal organism. The vast majority of bacteria are harmless and many of them

A. 1, single bacilli; 2, bacilli, forming threads and developing spores. The bright oval body in the center of each bacillus is a spore. B. 1, ordinary form without spores; 2, with spores; 3, free spores; 4, a mass of spores. (After Klein.)

are useful to the human economy. Poisonous bacteria are called "pathogenic," or disease-producing; the innocuous ones are called "non-pathogenic." "Microbes," "disease germs," "microorganisms," or simply "germs" are other names for bacteria. Bacteria abound everywhere. Millions of them exist in a glassful of ordinary drinking water. They stream through the purest kind of air and are drawn in and cast out with every breath. The atmosphere of cities especially is crowded with them, and it is a growing belief that all diseases are caused by their presence and multiplication in the body. Experiments, however, give the hope that most of these diseases will be conquered, as bacteriology develops methods of immuning the human body to the multiplication of these organisms in the blood and other tissues. (See Antitoxin.) Bacteria are classified as bacilli, spirilli, and cocci. These names are used because they describe the shape of the different bacteria to which they are applied. Bacillus means a little rod, and bacilli are rod-shaped. Spirillum means a spiral, and spirilli are spiral-like, while coccus means a berry, and cocci are little round bodies. These three main divisions are subdivided into numerous species. The average size of bacteria is so small as to surpass comprehension. For example, 2000 of them in a row, side by side, would hardly stretch across the head of a pin. Pneumonia is caused by a coccus, tuberculosis by a bacillus, and bacteriology has positively proved that various other diseases are produced by these germs.

BADAKSHAN', a territory of central Asia, tributary to the Ameer of Afghanistan. It has the Oxus on the north, and the Hindu Kush on the south; and has lofty mountains and fertile valleys; the chief town is Faizabad. The inhabitants profess Mohammedanism. Pop. 100,000.

BADEN (bä'dĕn), Grand-duchy of, one of the more important states of the German Empire, situated in the s.w. of Germany, to the west of Würtemberg. It is divided into four districts, Constance, Freiburg, Karlsruhe, and Mannheim; has an area of 5824 sq. miles, and a pop. of 1,866,584. It is mountainous, being traversed to a considerable extent by the lofty plateau of the Schwarzwald or Black Forest, which attains its highest point in the Feldberg (4904 feet). The nucleus of this plateau consists of gneiss and granite. In the north it sinks down toward the Odenwald, which is, however, of different geological structure, being composed for the most part of red sandstone. The whole of Baden, except a small portion in the s.e., in which the Danube takes its rise, belongs to the basin of the Rhine, which bounds it on the south and west. Numerous tributaries of the Rhine intersect it, the chief being the Neckar. Lakes are numerous, and include a considerable part of the Lake of Constance. The climate varies much. The hilly parts, especially in the east, are cold and have a long winter, while the valley of the Rhine enjoys the finest climate of Germany. The principal minerals worked are coal, salt, iron, zinc, and nickel. The number of mineral springs is remarkably great, and of these not a few are of great celebrity. The vegetation is peculiarly rich, and there are magnificent forests. The cereals comprise wheat, oats, barley, and rye. Potatoes, hemp, tobacco, wine, and sugar-beet are largely produced. Several of the wines, both white and red, rank in the first class. Baden has long been famous for its fruits also. Of the total area 42 per cent is under cultivation, 37 per cent under forest, and 17 per cent under meadows and pastures. The farms are mostly quite small. The manufactures are important. Among them are textiles, tobacco, and cigars, chemicals, machinery, pottery ware, jewelry (especially at Pforzheim), wooden clocks, confined chiefly to the districts of the Black Forest, musical boxes and other musical toys. The capital is Carlsruhe, about 5 miles from the Rhine; the other chief towns are Mannheim, Freiburg-im-Breisgau, with a Roman Catholic university; Baden, and Heidelberg. Baden has warm mineral springs, which were known and used in the time of the Romans. Heidelberg has a university (Protestant), founded in 1386, the oldest in the present German Empire. The railways have a length of 850 miles, and are nearly all state property. In the time of the Roman Empire southern Baden belonged to the Roman province of Rhætia. Under the old German Empire it was a margraviate, which in 1533 was divided into Baden-Baden and Baden-Durlach, but reunited in 1771. The title of grand-duke was conferred by Napolean in 1806, and in the same year Baden was extended to its present limits. The executive power is vested in the grand-duke, the legislative in the house of legislature, consisting of an upper and a lower chamber.

BADEN (or Baden-Baden, to distinguish it from other towns of the same name), a town and watering-place, Grand-duchy of Baden, 18 miles s.s.w. Carlsruhe, built in the form of an amphitheater on a spur of the Black Forest, overhanging a valley, through which runs a little stream Oosbach. Baden has been celebrated from the remotest antiquity for its thermal baths; and it used also to be celebrated for its gaming saloons. Pop. 15,731.

BADGER (baj'ĕr), a plantigrade, carnivorous mammal, allied both to the bears and to the weasels, of a clumsy make, with short thick legs, and long claws on the fore-feet. The common badger is as large as a middling-sized

Badger

dog, but much lower on the legs, with a flatter and broader body, very thick tough hide, and long coarse hair. It inhabits the north of Europe and Asia, burrows, is indolent and sleepy, feeds by night on vegetables, small quadrupeds, etc. Its flesh may be eaten, and its hair is used for artists' brushes in painting. The American badger belongs to a separate genus.

BAFFIN BAY, on the n.e. of North America between Greenland and the islands that lie on the n. of the continent; discovered by Baffin in 1616.

BAGDAD', capital of a Turkish pashalic of the same name (70,000 sq miles, 1,300,000 inhabitants), in the southern part of Mesopotamia. The greater part of it lies on the eastern bank of the Tigris, which is crossed by a bridge of boats; old Bagdad, the residence of the caliphs (now in ruins), was on the western bank of the river. Manufactures: leather, silks, cottons, woolens, carpets, etc. Steamers ply on the river between Bagdad and Bassorah, and the town exports wheat, dates, galls, gum, mohair, carpets, etc., to Europe. Bagdad is inhabited by Turks, Arabs, Persians, Armenians, Jews, etc., and a small number of Europeans. Estimated pop. over 100,000. Bagdad was founded in 762, by the Caliph Almansur, and raised to a high degree of splendor in the 9th century by Harun Al Rashid. It is the scene of a number of the tales of the "Arabian Nights."

BAGGAGE, goods carried by a traveler while on the road. In the United States the term is used in a restricted sense to designate certain necessary articles to be used by the person traveling. Railroads as a rule limit the weight of the baggage to be carried

free The carrier is liable for actual baggage, but not for merchandise carried by the passenger. If the carrier, knowing the nature of the merchandise, however, accepts them, he becomes liable for their loss through negligence of his own.

Bagdad, from the south.

BAGGAGE, Military, all the goods carried by an army except those which are attached to the persons of the fighting men, such as guns and ammunition. But arms and ammunition carried in bulk are military baggage. All officers are allowed a certain weight of baggage.

BAGHELKAND, a tract of country in central India, occupied by a collection of native states (Rewah being the chief), under the governor-general's agent for central India; area, 11,323 sq. miles; pop. 1,737,095.

BAGIRMI (bà-gir'mē) or **BAGHERMI,** a Mohammedan negro state in central Africa, situated between Bornu and Waday, to the south of Lake Tchad. It is mostly a plain; has an area of about 56,000 sq miles, and about 1,500,000 inhabitants

BAGPIPE, a musical wind-instrument of very great antiquity, having been used among the ancient Greeks, and being a favorite instrument over Europe generally in the 15th century. It still continues in use among the country people of Poland, Italy, the south of France, and in Scotland and Ireland. Though now often regarded as the national instrument of Scotland, especially Celtic Scotland, it is only Scottish by adoption, being introduced into that country from England. It consists of a leathern bag, which receives the air from the mouth, or from bellows; and of pipes, into which the air is pressed from the bag by the performer's elbow. In the common or Highland form one pipe (called the chanter) plays the melody; of the three others (called drones) two are in unison with the lowest A of the chanter, and the third and longest an octave lower, the sound being produced by means of reeds.

BAHA'MA ISLANDS, or **LUCAYOS,** a group of islands in the West Indies, forming a colony belonging to Britain, lying n.e. of Cuba and s.e. of the coast of Florida, the Gulf-stream passing between them and the mainland. They extend a distance of upward of 600 miles, and are said to be twenty-nine in number, besides keys and rocks innumerable. The principal islands are Grand Bahama, Great and Little Abaco, Andros Islands, New Providence, Eleuthera, San Salvador, Great Exuma, Watling Island, Long Island, Crooked Island, Acklin Island, Mariguana Island, Great Inagua. Of the whole group about twenty are inhabited, the most populous being New Providence, which contains the capital, Nassau, the largest being Andros, 100 miles long, 20 to 40 broad. They are low and flat, and have in many parts extensive forests. Total area, 5400 sq. miles. The soil is a thin but rich vegetable mold, and the principal product is pineapples, which form the most important export. The islands are a favorite winter resort for those afflicted with pulmonary diseases. San Salvador, or Cat Island, is generally believed to be the same as Guanahani, the land first touched on by Columbus (October 12, 1492) on his first great voyage of discovery. Pop. 53,735, including 14,000 whites.

BAHA'WALPUR, a town of India, capital of state of same name in the Punjab, 2 miles from the Sutlej; surrounded by a mud wall and containing the extensive palace of the Nawab. Pop. 18,700.—The state has an area of 17,285 sq. miles, of which 10,000 is desert, the only cultivated lands lying along the Indus and Sutlej. Pop. 650,042.

BAHIA (bà-ē'à), a town of Brazil, on the Bay of All Saints, province of Bahia It consists of a lower town, which is little more than an irregular, narrow, and dirty street, stretching about 4 miles along the shore; and an upper town, with which it is connected by a steep street, much better built. The harbor is one of the best in South America; and the trade, chiefly in sugar, cotton, coffee, tobacco, hides, piassava, and tapioca, is very extensive. Pop. 162,000—Area of the province (or state), 164,590 sq. miles; pop. 1,821,089.

BAIKAL (bī'kàl), a large fresh-water lake in eastern Siberia, 360 miles long, and about 50 in extreme breadth, interspersed with islands; in the line of the great Siberian Railway. It is surrounded by rugged and lofty mountains: contains seals, and many fish, particularly salmon, sturgeon, and pike. Its greatest depth is over 4000 feet. It receives the waters of the Upper Angara Selenga, Barguzin, etc., and discharges its waters by the Lower Angara. It is frozen over in winter.

BAIL, the person or persons who procure the release of a prisoner from custody by becoming surety for his appearance in court at the proper time: also, the security given for the release of a prisoner from custody

Entrance to Port Nassau, Bahama Islands.

BAILIFF, a civil officer or functionary subordinate to some one else. There are several kinds of bailiffs, whose offices widely differ, but all agree in this, that

the keeping or protection of something belongs to them.

BAILLY (bà-yē), Jean Sylvain, French astronomer and statesman, born at Paris, 1736. After some youthful essays in verse he was induced by Lacaille to devote himself to astronomy, and on the death of the latter in 1753, being admitted to the Academy of Sciences, he published a reduction of Lacaille's observations on the zodiacal stars. In 1784 the French Academy elected him a member. The revolution drew him into public life. Paris chose him, May 12, 1789, first deputy of the tiers-état, and in the assembly itself he was made first president, a post occupied by him on June 20, 1789, in the session of the Tennis Court, when the deputies swore never to separate till they had given France a new constitution. As mayor of Paris his moderation and impartial enforcement of the law failed to commend themselves to the people, and his forcible suppression of mob violence, July 17, 1791, aroused

Jean Sylvain Bailly.

a storm which led to his resignation and retreat to Nantes. In 1793 he attempted to join Laplace at Melun, but was recognized and sent to Paris, where he was condemned by the revolutionary tribunal, and executed on Nov. 12th.

BAINBRIDGE, William, an American naval officer, born in Princeton, N. J., in 1744, died in 1833. He became lieutenant in the navy in 1798, was captured by the French near Guadaloupe, and caused the passage of an act against French subjects captured at sea. He served in the war against Tripoli and captured the Moorish ship Meshboha in 1803, was himself taken by the Tripolitans on having run aground, and held prisoner until the end of the war. He took part in the war of 1812 and captured the British frigate Java. In 1815 he commanded the squadron sent against Algiers and on his return founded the school for naval officers at Boston. His last years were spent in command of the navy yards at Philadelphia and Charlestown.

BAIRD, Sir David, a distinguished British commander, was born in Edinburghshire in 1757, and entered the army in 1772. He distinguished himself as a captain in the war against Hyder Alí, was wounded and taken prisoner, and confined in the fortress of Seringapatam for nearly four years. He received a colonelcy in 1795, went in 1797 to the Cape of Good Hope as brigadier-general, and in 1798, on his appointment as major-general, returned to India. In 1799 he commanded the storming party at the

assault of Seringapatam. Being appointed in 1800 to command an expedition to Egypt, he landed at Kosseir in June, 1801, crossed the desert, and, embarking on the Nile, descended to Cairo, and thence to Alexandria, which he reached a few days before it surrendered to General Hutchinson. With the rank of lieutenant-general he commanded an expedition in 1805 to the Cape of Good Hope, and in 1806, after defeating the Dutch, he received the surrender of the colony. He commanded a division at the seige of Copen-

Sir David Baird.

hagen, and after a short period of service in Ireland sailed with 10,000 men for Corunna, where he formed a junction with Sir John Moore. He commanded the first division of Moore's army, and in the battle of Corunna lost his left arm. By the death of Sir John Moore Sir David succeeded to the chief command, receiving for the fourth time the thanks of parliament, and a baronetcy. In 1814 he was made a general. He died in 1829.

BAIRD, Spencer Fullerton, American naturalist, born 1823, died 1887. He was long assistant secretary, and latterly secretary, of the Smithsonian Institution, and was also chief government commissioner of fish and fisheries. He wrote much on natural history, his chief works being The Birds of N. America (in conjunction with John Cassin); The Mammals of N. America; Review of American Birds in the Smithsonian Institution; and (with Messrs. Brewer and Ridgeway) History of N. American Birds.

BAK'ARGANJ, a maritime district and town in Bengal; chief rivers, Ganges, Brahmaputra, and Meghna. Area, 3649 sq. miles; pop. 2,153,965.—The town now lies in ruins. Pop. 7060.

BAKER, Sir Samuel White, a distinguished English traveler, born in 1821. He resided some years in Ceylon; in 1861 began his African travels, which lasted several years, in the Upper Nile regions, and resulted, among other discoveries, in that of Albert Nyanza lake in 1864, and of the exit of the White Nile from it. In Africa he encountered Speke and Grant after their discovery of the Victoria Nyanza. On his return home he was received with great honor and was knighted. In 1869 he returned to Africa as head of an expedition sent by the Khedive of Egypt to annex and open up to trade a large part of the newly explored country, being raised to the dignity of pasha. He returned in 1873, having finished his work, and was succeeded by the celebrated Gordon. His writings include The Rifle and the Hound in Ceylon; Eight Years' Wanderings in Ceylon; The Albert Nyanza, Etc.; The Nile Tributaries of Abyssinia; Ismailia: a Narrative of the Expedition to Central Africa; Cyprus as I Saw It in 1879; also, Cast Up by the Sea, a story published in 1869. He died Dec. 30, 1893.

BAKHUISEN. See Backhuysen.

BAKING, a term used in various senses. For the baking of bread, see Bread. A common application of the term is to a mode of cooking food in a close oven, baking in this case being opposed to roasting or broiling, in which an open fire is used. The oven should not be too close, but ought to be properly ventilated. Baking is also applied to the hardening of earthenware or porcelain by fire.

BAKING POWDER, a mixture of bicarbonate of soda and tartaric acid, usually with some flour added. The water of the dough causes the liberation of carbonic acid, which makes the bread "rise."

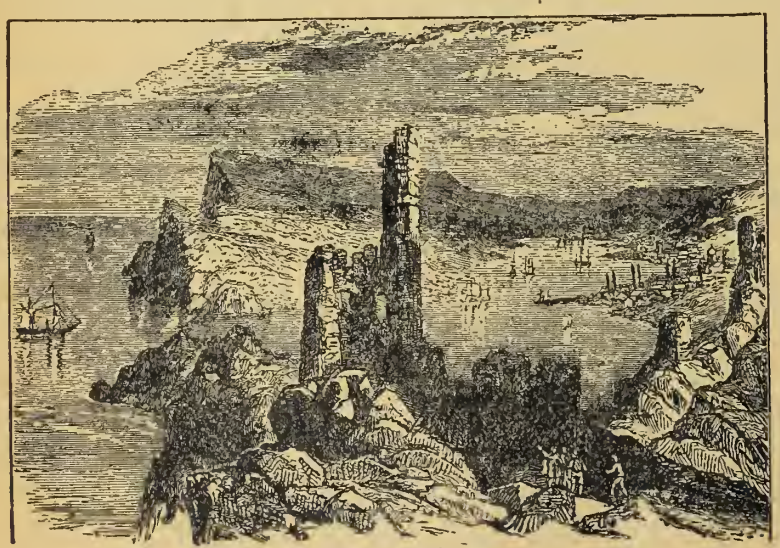
BAKU (bä-kö'), a Russian port on the western shore of the Caspian, occupying part of the peninsula of Apsheron. The naphtha or petroleum springs of Baku have long been known; and the Field of Fire, so called from emitting inflammable gases, has long been a place of pilgrimage with the Guebres or Fire-worshipers. Recently, from the development of the petroleum industry, Baku has greatly increased, and is now a large and flourishing town. About 400 oil-wells are in operation, producing immense quantities of petroleum, much of which is led direct in pipes from the

wells to the refineries in Baku, and it is intended to lay a pipe for its conveyance all the way to the Black Sea at Batoum, which is already connected with Baku by railway. Some of the wells have had such an outflow of oil as to be unmanageable, and the Baku petroleum now competes successfully with any other in the markets of the world. Baku is the station of the Caspian fleet, is strongly fortified, and has a large shipping trade. Pop. 112,253.

BAKU'NIN, Michael, Russian socialist, the founder of Nihilism, born 1814 of rich and noble family, entered the army, but threw up his commission after two years' service, and studied philosophy at Moscow. Having adopted Hegel's system as the basis of a new revolution, he went in 1841 to Berlin, and thence to Dresden, Geneva, and Paris, as the propagandist of anarchism. His extreme views, however, led to a quarrel with Marx and the International; and, having fallen into disrepute with his own party in Russia, he died suddenly and almost alone at Berne, in 1878.

BALAAM (bā'lam), a heathen seer, invited by Balak, king of Moab, to curse the Israelites, but compelled by miracle to bless them instead (Numbers xxii.–xxiv.). In another account he is represented as aiding in the perversion of the Israelites to the worship of Baal, and as being, therefore, slain in the Midianitish war (Numbers xxxi.; Joshua xiii.).

BALAKLAVA (bå-lå-klä'vå), a small seaport in the Crimea, 8 miles s.s.e. of Sevastopol, consisting for the most part of houses perched upon heights, with



Balaklava harbor.

an old Genoese castle on an almost inaccessible elevation. The harbor has a very narrow entrance, and though deep, is not capacious. In the Crimean war it was captured by the British, and a heroically fought battle took place here (Oct. 25, 1854), ending in the repulse of the Russians by the British. The "charge of the Light Brigade" was at this battle.

BAL'ANCE, an instrument employed for determining the quantity of any substance equal to a given weight.

BALANCE OF POWER, a political principle which first came to be recognized in modern Europe in the 16th century, though it appears to have been also acted on by the Greeks in ancient times, in preserving the relations between their different states. The object in maintaining the balance of power is to secure the general independence of nations as a whole, by preventing the aggressive attempts of individual states to extend their territory and sway at the expense of weaker countries.

BALANCE OF TRADE, the difference between the stated money values of the exports and imports of a country. The balance is erroneously said to be "in favor" of a country when the value of the exports is in excess of that of the imports and "against it" when the imports are in excess of the exports. The phrases date from the days of the mercantile system, the characteristic doctrine of which alleged the desirability of regulating commerce with a view to amassing treasure by exporting produce largely, importing little merchandise in return, and receiving the balance in bullion.

BALBO'A, Vasco Nuñez de, one of the early Spanish adventurers in the New World; born 1475. Having dissipated his fortune, he went to America, and was at Darien with the expedition of Francisco de Enciso in 1510. An insurrection placed him at the head of the colony, but rumors of a western ocean and of the wealth of Peru led him to cross the isthmus. On Sept. 25, 1513, he saw for the first time the Pacific, and after annexing it to Spain, and acquiring information about Peru, returned to Darien. Here he found himself supplanted by a new governor, Pedrarias Davila, with much consequent grievance on the one side, and much jealousy on the other. Balboa submitted, however, and in the following year was appointed viceroy of the South Sea. Davila was apparently reconciled to him, and gave him his daughter in marriage, but shortly after, in 1517, had him beheaded on a charge of intent to rebel. Pizarro, who afterward completed the discovery of Peru, served under Balboa.

BAL'CONY, in architecture, is a gallery projecting from the outer wall of a building, supported by columns or brackets, and surrounded by a balustrade. Balconies were not used in Greek and Roman buildings, and in the East the roof of the house has for centuries served similar purposes on a larger scale. Balconies properly so styled came into fashion in Italy in the middle ages, and were apparently introduced into Britain in the 16th century.

BALDNESS, loss of the hair, complete or partial, usually the latter, and due to various causes. Most commonly it results as one of the changes belonging to old age, due to wasting of the skin, hair sacs, etc. It may occur as a result of some acute disease, or at an unusually early age, without any such cause. In both the latter cases it is due to defective nourishment of the hair, owing to lessened circulation of the blood in the scalp. The best treatment for preventing loss of hair seems to consist in such measures as bathing the head with cold water and drying it by vigorous rubbing with a rough towel and brushing it well with a hard brush. Various stimulating lotions are also recommended, especially those containing cantharides. But probably in most cases senile baldness is unpreventable. When extreme scurfiness of the scalp accompanies loss of the hair an ointment that will clear away the scurf will prove beneficial.

BALDWIN, Evelyn Briggs, an American arctic explorer, born in Missouri in 1862, was a teacher until 1892, when he was appointed observer of the U. States Weather Bureau. In 1893–4 he accompanied Peary to North Greenland as meteorologist, and also went in the same capacity with Wellman in 1898–9.

BALE (bäl). See Basel.

BALEAR'IC ISLANDS, a group of five islands southeast of Spain, including Majorca, Minorca, Iviza, and Formentera. The popular derivation of the ancient name Baleares has reference to the repute of the inhabitants for their skill in slinging, in which they distinguished themselves both in the army of Hannibal and under the Romans, by whom the islands were annexed in 123 B.C. After being taken by the Vandals, under Genseric, and in the 8th century by the Moors, they were taken by James I., King of Arragon, 1220–34, and constituted a kingdom, which in 1375 was united to Spain. The islands now form a Spanish province, with an area of 1860 square miles, and 300,473 inhabitants. See separate articles.

BALFE (balf), Michael William, composer, was born in Dublin 15th May, 1808. In his seventh year he performed in public on the violin, and at sixteen took the part of the Wicked Huntsman in Der Freischütz at Drury Lane. In 1825 he went to Italy, wrote the music for a ballet La Peyrouse for the Scala at Milan, and in the following year sang at the Théâtre-Italien, Paris, with

modern success. He returned to Italy, and at Palermo was given his first opera, I Rivali (1829). For five years he continued singing and composing operas for the Italian stage. In 1835 he went to England, and composed a number of operas, among others The Bohemian Girl (1843), Rose of Castile (1857), Satanella (1858), and the Talisman (first performed in 1874). He died Oct. 20, 1870. His operas are melodious and many of the airs are excellent.

BAL'FOUR, Right Hon. Arthur James, LL.D., F.R.S., etc., son of Mr. Balfour of Whittinghame, Haddingtonshire, was born July 15, 1848, and educated at Eton and Trinity College, Cambridge. He acted as private secretary to his uncle, the Marquis of Salisbury, at the Foreign Office during 1878–80, and since 1885 has been a distinguished member of the Conservative party. He showed much ability as Chief Secretary for Ireland during Lord Salisbury's administration in 1887–91. He was leader of the House of Commons and first lord of the treasury in 1891–92, and again from 1895. On the retirement of Lord Salisbury in 1902 he became prime minister. He has published a Defence of Philosophic Doubt (1879), Essays and Addresses (1893), and The Foundations of Belief (1895).

BALFROOSH', or **BARFURUSH',** a town, Persia, province of Mazanderan, about twelve miles from the Caspian, a great emporium of the trade between Persia and Russia. Pop. estimated from 50,000 to 100,000.

BA'LI, an island of the Indian Archipelago east of Java, belonging to Holland; greatest length, 85, greatest breadth, 55 miles; area, about 2260 sq. miles. It consists chiefly of a series of volcanic mountains, of which the loftiest, Agoong (11,326 feet), became active in 1843 after a long period of quiescence. Principal products, rice, cocoa, coffee, indigo, cotton, etc. The people are akin to those of Java and are mostly Brahmans in religion. It is divided into eight provinces under native rajahs, and forms one colony with Lombok, the united pop. being 1,363,000, of whom about 500,000 belong to Bali.

BAL'IOL, or **BALLIOL,** John de, of Barnard Castle, Northumberland, father of king John Baliol, a great English baron in the reign of Henry III. In 1263 he laid the foundation of Balliol College, Oxford, which was completed by his widow Devorguila or Devorgilla. She was daughter and co-heiress of Allan of Galloway, a great baron of Scotland, by Margaret, eldest daughter of David, Earl of Huntingdon, brother of William the Lion. It was on the strength of this genealogy that his son John Baliol became temporary King of Scotland. He died 1269.

BAL'IOL, or **BALLIOL,** John, King of Scotland; born about 1249, died 1315. On the death of Margaret, the Maiden of Norway and grandchild of Alexander III., Baliol claimed the vacant throne by virtue of his descent from David, Earl of Huntingdon, brother of William the Lion, King of Scotland. Robert Bruce (grandfather of the king) opposed Baliol; but Edward I.'s decision was in favor of Baliol, who did homage to him for the kingdom, Nov. 20, 1292. Irritated by Edward's harsh exercise of authority, Baliol concluded a treaty with France, then at war with England; but after the defeat at Dunbar he surrendered his crown into the hands of the English monarch. He was sent with his son to the Tower, but by the intercession of the pope in 1297, obtained liberty to retire to his Norman estates, where he died.—His son, Edward, in 1332 landed in Fife with an armed force, and having defeated a large army under the regent Mar (who was killed) got himself crowned king, but was driven out in three months.

BAL'KAN, a rugged chain of mountains extending from Cape Emineh, on the Black Sea, in Eastern Roumelia, westward to the borders of Servia, though the name is sometimes used to include the whole mountain system from the Black Sea to the Adriatic, the region south of Austria and Russia, or south of the Danube and Save, forming the Balkan Peninsula. The range, which is over 200 miles in length, forms the water-shed between the streams flowing northward into the Danube and those flowing southward to the Ægean, the chief of the latter being the Maritza. The average height is not more than 5000 feet, but the highest point, Tchatal-dagh, is 8340 feet. As a political boundary it divides Bulgaria from Eastern Rumelia.

BALKAN FREE STATES, Bulgaria, Eastern Roumelia, Rumania, and Servia.

BALKH (bälk or bäl*h*), a city in the north of Afghanistan, in Afghan Turkestan, at one time the emporium of the trade between India, China, and western Asia. It was long the center of Zoroastrianism, and was also an important Buddhist center. In 1220 it was sacked by Genghis Khan, and again by Timur in the 14th century. The remains of the ancient city extend for miles. The town is now merely a village, but a new town has risen up an hour's journey north of the old, the residence of the Afghan governor, with a pop. of about 20,000.—The district, which formed a portion of ancient Bactria, lies between the Oxus and the Hindu-Kush, with Badakshan to the east and the desert to the west. In the vicinity of the Oxus, where there are facilities for irrigation, the soil is rich and productive, and there are many populous villages.

BAL'KIS, the Arabian name of the Queen of Sheba who visited Solomon. She is the central figure of innumerable Eastern legends and tales.

BALL, a spherical implement originally of war, later of sports and games which are the degenerated forms of war. The ball was freely used by the Romans and Greeks, and playing with a ball dates farther back than history. Tennis, racquet, football, baseball, golf, in short all games using a ball, have an origin so old as to be lost in antiquity. The term ball is often used to designate projectiles from firearms generally.

BALL, Thomas, an American sculptor, born in 1819 at Charlestown, Mass. He made busts of Jenny Lind, of Daniel Webster (1852), and a life-sized figure of the latter. He is the sculptor of the Washington statue at Boston, of the statue of Webster in Central Park, N. Y., and of the group "Emancipation" at Washington.

BAL'LAD, a term loosely applied to various poetic forms of the song type, but in its most definite sense a poem in which a short narrative is subjected to simple lyrical treatment. The ballad is probably one of the earliest forms of rhythmic poetic expression, constituting a species of epic in miniature, out of which by fusion and remolding larger epics were sometimes shaped. As in the folk-tales, so in the ballads of different nations, the resemblances are sufficiently numerous and close to point to the conclusion that they have often had their first origin in the same primitive folklore or popular tales. But in any case, excepting a few modern literary ballads of a subtler kind, they have been the popular expression of the broad human emotions clustering about some strongly outlined incidents of war, love, crime, superstition, or death.

BALLADE (bal-ăd'), the earlier and modern French spelling of ballad, but now limited in its use to a distinct verse-form introduced into English literature of late years from the French and chiefly used by writers of vers-de-société. It consists of three stanzas of eight lines each, with an envoy or closing stanza of four lines. The rhymes, which are not more than three, follow each other in the stanzas thus: a, b, a, b; b, c, b, c, and in the envoy, b, c, b, c, and the same line serves as a refrain to each of the stanzas and to the envoy. There are other varieties, but this may be regarded as the strictest, according to the precedent of Villon and Marot.

BALLARAT', or **BALLAARAT,** an Australian town in Victoria, chief center of the gold-mining industry of the colony, and next in importance to Melbourne, from which it is distant w.n.w. about sixty miles direct. Gold was first discovered in 1851, and the extraordinary richness of the field soon attracted hosts of miners. The surface diggings having been exhausted the precious metal is now got from greater depths, and there are mines as deep as some coal-pits, the gold being obtained by crushing the auriferous quartz. Pop. about 43,000.

BAL'LAST, a term applied (1) to heavy matter, as stone, sand, iron, or water placed in the bottom of a ship or other vessel to sink it in the water to such a depth as to enable it to carry sufficient sail without oversetting. (2) The sand placed in bags in the car of a balloon to steady it and to enable the aëronaut to lighten the balloon by throwing part of it out. (3) The material used to fill up the space between the rails on a railway in order to make it firm and solid.

BALL-COCK, a kind of self-acting stop-cock opened and shut by means of a hollow sphere or ball of metal attached to the end of a lever connected with the cock. Such cocks are often employed to regulate the supply of water to cisterns. The ball floats on the water in the cistern by its buoyancy, and rises and sinks as the water rises and sinks, shutting off the water in the one case and letting it on in the other.

BALLET (bal'ā), a species of dance usually forming an interlude in theatrical performances, but principally confined to opera. Its object is to represent, by mimic movements and dances, actions, characters, sentiments, passions, and feelings, in which several dancers perform together. The ballet is an invention of modern times, though pantomimic dances were not unknown to the ancients. The dances frequently introduced into operas seldom deserve the name ballet, as they usually do not represent any action, but are destined only to give the dancers an opportunity of showing their skill, and the modern ballet in general, from an artistic point of view, is a very low-class entertainment.

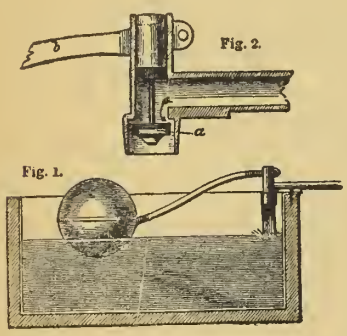


Fig. 1, Cistern with ball-cock attached.
Fig. 2, Internal structure of cock.
a, Valve shown open so as to admit water.
b, Arm of lever, which being raised shuts the valve.

BALLIS'TIC PENDULUM, an apparatus for ascertaining the velocity of military projectiles, and consequently the force of fired gunpowder. A piece of ordnance is fired against bags of sand supported in a strong case or frame suspended so as to swing like a pendulum. The arc through which it vibrates is shown by an index, and the amount of vibration forms a measure of the force or velocity of the ball.

BALLOON'. See Airship.

BAL'LOT, Voting by, signifies literally voting by means of little balls (called by the French ballottes), usually of different colors, which are put into a box in such a manner as to enable the voter, if he chooses, to conceal for whom or for what he gives his suffrage. The method is adopted by most clubs in the election of their members—a white ball indicating assent, a black ball dissent. Hence, when an applicant is rejected, he is said to be blackballed. The term voting by ballot is also applied in a general way to any method of secret voting, as, for instance, when a person gives his vote by means of a ticket bearing the name of the candidate whom he wishes to support. In this sense vote by ballot is the mode adopted in electing the members of legislative assemblies in most countries, as well as the members of various other bodies.

BALM (bäm), a plant formerly in great repute for its medicinal virtues. A native of the south of Europe. It is a herbaceous perennial, with an erect branching stem about 2 feet high. The leaves arise with the flower-stems from a thick joint at the extremity of the stalk. The flowers are whitish; they are produced in a round terminal umbel, and appear in June. The stems and leaves are slightly stimulating and tonic. They contain an essential oil of a yellowish color and with a fragrant smell, called oil of balm.

BALM OF GILEAD, the exudation of a tree, a native of Arabia Felix. The leaves of the former tree yield when bruised a strong aromatic scent; and the

Balm of Gilead.

balm of Gilead of the shops, or balsam of Mecca or of Syria, is obtained from it by making an incision in its trunk. It has a yellowish or greenish color, a warm, bitterish, aromatic taste, and an acidulous fragrant smell. It is valued as an odoriferous unguent and cosmetic by the Turks. It is frequently adulterated for market.—The balm of Gilead fir, which produces a turpentine called Canada balsam, is the Abies balsamifĕra, a North American species, whose range is from Virginia to Canada.

BALSAM, an aromatic, resinous substance, flowing spontaneously or by incision from certain plants. A great variety of substances pass under this name. But in chemistry the term is confined to such vegetable juices as consist of resins mixed with volatile oils, and yield the volatile oil on distillation. The resins are produced from the oils by oxidation. A balsam is thus intermediate between a volatile oil and a resin. It is soluble in alcohol and ether, and capable of yielding benzoic acid. The balsams are either liquid or more or less solid; as, for example, the balm of Gilead, and the balsams of copaiba, Peru, and Tolu. Benzoin, dragon's-blood, and storax are not true balsams, though sometimes called so. The balsams are used in perfumery, medicine, and the arts.

BALTIC PROVINCES, a term commonly given to the Russian governments of Courland, Livonia, and Esthonia.

BALTIC SEA, an inland sea or large gulf connected with the North Sea, washing the coasts of Denmark, Germany, Russia, and Sweden; nearly 900 miles long, extending to 200 broad; superficial extent, together with the Gulfs of Bothnia and Finland, 171,743 sq. miles. Its greatest depth is 126 fathoms; mean, 44 fathoms.

BALTIMORE, the sixth most populous city of the United States, the chief city of Maryland. It has an area of 31.5 sq. miles, and is situated on the Patapsco river, at the head of navigation 14 miles from Chesapeake Bay. The city is divided into two parts by a small stream called Jones' Falls, which separates the business and manufacturing from the residence portion of the town. The names of Monumental City, or City of Monuments, which Baltimore bears, is not derived from the number of its public monuments, but from the early date at which Washington Monument, in Mount Vernon Place—a marble shaft rising 164 feet, surmounted by a heroic figure of Washington—and Battle Monument, in Monument Square, were erected.

The city is one of the foremost educational influences of the country. A graded system of public schools provides free instruction in kindergarten, primary, secondary, collegiate, and normal studies, and in manual training.

Baltimore is the seat of the Johns Hopkins University, opened for instruction in 1876, and distinguished for its graduate courses. The institution owes its foundation to the beneficenee of a Baltimore merchant, who left a large fortune for the endowment of a university and a hospital. Among the professional schools are the law

and medical departments of the University of Maryland, College of Physicians and Surgeons, Baltimore Medical College, Baltimore University, Woman's Medical College, Maryland College of Pharmacy, and Baltimore College of Dental Surgery. The last named, founded in 1839, is the oldest dental college in the world. The Peabody institute, endowed by George Pea-

body, who laid the foundation of his great fortune in Baltimore and entertained a strong friendship for its people, contains a valuable library of 143,000 volumes, an interesting art gallery, and a well-organized conservatory of music.

Natural situation, favorable trade connections, and unusual harbor facilities constitute Baltimore's chief commercial advantages. Regular communication between Baltimore and foreign ports is afforded by the North German Lloyd to Bremen, the Neptune Line to Rotterdam, the Atlantic Transport Line to London, and a number of other lines offering frequent service. The city is the largest corn exporting port in the United States. Other important articles of local export are wheat, flour, cotton, tobacco, copper, and coal. Importing activity centers about iron ore, bananas, pineapples, cocoanuts, sugar, and general merchandise.

The manufacturing enterprises of Baltimore are most varied, scarcely a single important industry being unrepresented. It is the largest manufacturing center in the United States for ready-made clothing, shirts, fertilizers, straw goods, cotton duck, fruit canning, and oyster packing, while in other important fields its operations are of absolutely greater magnitude.

The twelfth census (1900) of the United States gives the total population of Baltimore as 508,957; 243,280 are males and 265,677 are females; 440,357 are native born and 68,600 are foreign born. The total number of whites is 429,218, and of colored 79,739. Of the whites 361,278 are native born, 67,940 are foreign; 236,053 of the native whites have native parents and 125,225 have foreign parents. The total illiterate population ten years and over is 29,148, of whom 12,111 are white and 17,037 are colored. Estimated by the mayor of the city Jan. 1, 1909, 650,000.

Baltimore was founded July 14, 1729, and passed through the vicissitudes of the revolutionary war, that of 1812, and likewise of the civil war. It has several times been a sufferer from destructive fires, but has always recovered without assistance from outside sources.

BALTIMORE, George Calvert, Lord, born in Yorkshire about 1580; died in London, 1632. He was for some time secretary of state to James I., but this post he resigned in 1624 in consequence of having become a Roman Catholic. Notwithstanding this he retained the confidence of the king, who in 1625 raised him to the Irish peerage, his title being from Baltimore, a fishing village of Cork. He had previously obtained a grant of land in Newfoundland, but as this colony was much exposed to the attacks of the French, he left it and obtained another patent for Maryland. He died before the charter was completed, and it was granted to his son Cecil, who deputed the governorship to his brother Leonard (1606-47).

BALTIMORE BIRD, an American bird. It is a migratory bird, and is known also by the names of "golden robin," "hang-bird," and "fire-bird." It is about 7 inches long; the head and upper parts are black; the under parts of a brilliant orange hue. It builds a pouch-like nest, very skilfully constructed of threads deftly interwoven, suspended from a forked branch and shaded by overhanging leaves. It feeds on insects, caterpillars, beetles, etc. Its song is a clear, mellow whistle.

BALUCHISTAN (ba-lō'chi-stän), a country in Asia, the coast of which is continuous with the northwestern seaboard of India, bounded on the north by Afghanistan, on the west by Persia,

Baluchis on the lookout.

on the south by the Arabian Sea, and on the east by Sind. It has an area of about 160,000 sq. miles, and a population estimated at 400,000. The general surface of the country is rugged and mountainous, with some extensive intervals of barren sandy deserts, and there is a general deficiency of water. The country is almost entirely occupied by pastoral tribes under semi-independent sirdars or chiefs. The Baluchis in general have tall figures, long visages, and prominent features; the Brahuis, on the contrary, have short, thick bodies, with round faces and flat lineaments, with hair and beards frequently brown. Both races are zealous Mohammedans, hospitable, brave, and capable of enduring much fatigue.

BAL'USTER, a small column or pilaster, of various forms and dimensions, often adorned with mouldings, used for balustrades.

BALUSTRADE', a range of balusters, together with the cornice or coping which they support, used as a parapet for bridges or the roofs of buildings, or as a mere termination to a structure; also serving as a fence or enclosure for altars, balconies, terraces, staircases, etc.

BALUZE, (bà-lüz), Etienne, French historian and miscellaneous writer, born 1630, died 1718. For more than 30 years he was librarian to M. de Colbert, and was appointed professor of canon law in the royal college, but displeasing Louis XIV. with his Histoire generale de la maison d'Auvergne, he was thrown into prison and his property confiscated. He recovered his liberty in 1713, but did not regain his position. He left some 1500 MSS. in the national library of Paris, besides 45 printed works, including Regum Francorum Capitularia, two vols. and Miscellanea, seven volumes.

BALZAC (bàl-zàk), Honoré de, a celebrated French novelist, was born at Tours in 1799, died 1850. Before completing his twenty-fourth year he had published a number of novels under various assumed names, but the success attending all was very indifferent; and it was not till 1829, by the publication of Le Dernier Chouan, a tale of La Vendée, and the first novel to which Balzac appended his name, that the attention of the public was diverted to the extraordinary genius of the author. A still greater popularity attended his Physiologie de Mariage, a work full of piquant and caustic observations on human nature. He wrote a large number of novels, all marked by a singular knowledge of human nature and distinct delineation of character, but apt to be marred by exaggeration. Among his best-known works are Scènes de la Vie de Province; Scènes de la Vie Parisienne; Le Père Goriot; Eugénie Grandet; and Le Médecin de Campagne. The publication of this last, in 1835, led to a correspondence between Balzac and the Countess Eveline de Hanska, a Polish lady whom, after about fifteen years, he visited and married. A collected edition of his works under the title La Comédie Humaine was published in 45 vols., Paris, 1856-59.

BAMBA, a district of the Congo, west coast of Africa, lying to the south of the River Ambriz. It is thickly populated, and is rich in gold, silver, copper, salt, etc.

BAMBAR'RA, a territory of western Africa, on the Upper Niger, first visited by Mungo Park, now in the French portion of the Soudan. The country is generally very fertile, producing wheat, rice, maize, yams, etc. The inhabitants are of negro or mixed race, and partly Mohammedans. Excellent cotton cloth is made. The chief town is Sego. Pop. estimated at. 2,000,000.

BAMBINO, (bám-bê-nō; Ital., an infant), the figure of our Savior represented as an infant in swaddling-clothes. The Santissimo Bambino in the church of Ara Cæli at Rome, a richly decorated figure carved in wood, is believed to have a miraculous virtue in curing diseases. Bambinos are set up for the adoration of the faithful in many places in Catholic countries.

BAMBOO', the common name of arborescent grasses. There are many species, belonging to the warmer parts of Asia, Africa, and America, and growing from a few feet to as much as 100, requiring much moisture to thrive properly. The best-known species is common in tropical and sub-tropical regions. From the creeping underground rhizome, which is long, thick, and jointed, spring several round jointed stalks, which send out from their joints several shoots, the stalks also being armed at their joints with one or

two sharp rigid spines. The oval leaves 8 or 9 inches long, are placed on short footstalks. The flowers grow in large panicles from the joints of the stalk. Some stems grow to 8 or 10 inches in diameter, and are so hard and durable

1, Bamboo, showing the mode of growth. 2, Flowers, leaves, and stem on a larger scale.

as to be used for building purposes The smaller stalks are used for walking-sticks, flutes, etc.; and indeed the plant is used for innumerable purposes in the East Indies, China, and other Eastern countries. Cottages are almost wholly made of it; also, bridges, boxes, water-pipes, ladders, fences, bows and arrows, spears, baskets, mats, paper, masts for boats, etc.

BANA'NA, a plant of the genus Musa. It is originally indigenous to the East Indies, and a herbaceous plant with an underground stem. The apparent stem, which is sometimes as high as 30 feet, is formed of the closely compacted sheaths of the leaves. The leaves are 6 to 10 feet long and 1 or more broad, with a strong midrib, from which the veins are given off at right angles; they are used for thatch, basket-making, etc., besides yielding a useful fiber. The spikes of the flowers grow nearly 4 feet long, in bunches, covered with purple-colored bracts. The fruit is 4 to 10 or 12 inches long, and 1 inch or more in diameter; it grows in large bunches, weighing often from 40 to 80 lbs. The pulp is soft and of a luscious taste; when ripe it is eaten raw or fried in slices. The banana is cultivated in tropical and sub-tropical countries, and is an important article of food. Manila hemp is the product of a species of banana.

BAN'CROFT, George, American historian, born near Worcester, Mass., 1800, died 1891. He was educated at Harvard and in Germany, where he made the acquaintance of many literary men of note. In 1823 he published a translation of Heeren's Politics of Ancient Greece, and a small volume of poems, and was also meditating and collecting materials for a history of the United States. Between 1834 and 1840 three volumes of his history were published. In 1845 he was appointed secretary of the navy, and effected many reforms and improvements in that department. He was American ambassador to Britain from 1846 to 1849, when the University of Oxford conferred on him the honorary degree of D.C.L. He took the opportunity while in Europe to perfect his collections on American history. He returned to New York in 1849, and began to prepare for the press the fourth and fifth volumes of his history, which appeared in 1852. The sixth appeared in 1854, the seventh in 1858, the eight soon after, but the ninth did not appear till 1866. From 1867 to 1874 he was minister plenipotentiary at the court of Berlin. The tenth and last volume of his great work appeared in 1874. An additional section appeared first as a separate work in 1882—History of the Formation of the Constitution of the U. States—and the whole came out in 6 vols. in 1884-5. He has also published many essays in the North American Review and other periodicals, a selection from which was published in 1855 under the title of Miscellanies.

BANCROFT, Hubert Howe, an American historian, born in Ohio in 1832. He embarked in business on the Pacific coast, became interested in its history, and decided to devote his life to that work. He made numerous expeditions, spending large sums of money in the work of investigation, and has published several volumes of the history of the Western States. He has also published histories of Mexico, Central America, British Columbia, and other western and southern parts of America.

BAND, a number of musicians organized for the production of marching or concert music. Mere drum and fife can hardly be dignified by the name band, which is usually confined to an organization consisting of brass and reed instruments, drums, etc. The military band is the highest form of band, and takes its origin from the time of Louis XIV. All the courts of Europe had their bands, but the modern military or marine (naval) band is a recent development, and verges closely on the orchestra. Its principal instruments are tubas, cornets, clarionets, trombones, saxophones, oboes, bass horns, snare, bass, and kettle drums, and tympani. The number of instruments is unlimited.

BANDA, a town and district of India, in the United Provinces. The town stands on a plain on the right bank of the Ken river, 95 miles s.w. from Allahabad, and is a considerable cotton-mart. Pop. 22,565.—Area of district 3060 sq. miles; pop. 705,832.

BANDAGE, a surgical wrapper of some kind applied to a limb or other portion of the body to keep parts in position, exert a pressure, or for other purpose. To be able to apply a bandage suitably in the case of an accident is a highly useful accomplishment, which, through the teaching of ambulance surgery now so common, may be easily acquired.

BANDA ISLANDS, a group belonging to Holland, Indian Archipelago, south of Ceram; Great Banda, the largest, being 12 miles long by 2 broad. They are beautiful islands, of volcanic origin, yielding quantities of nutmeg. Goenong Api, or Fire Mountain, is a cone-shaped volcano which rises 2320 feet above the sea. Pop. 6700.

BAN'DICOOT, the largest known species of rat, attaining the weight of 2 or 3 lbs., and the length, including the tail, of 24 to 30 inches. It is a native of India, and is very abundant in Ceylon. Its flesh is said to be delicate and to resemble young pork, and is a favorite article of diet with the coolies. It is destructive to rice fields and gardens.—The name is also given to a family of Australian marsupials. The most common species, the long-nosed bandicoot, measures about 1½ feet from the tip of the snout to the origin of the tail, and in general appearance bears a considerable resemblance to a large overgrown rat.

BAN'DIT, originally an exile, banished man, or outlaw, and hence, as persons outlawed frequently adopted the profession of brigand or highwayman, the word came to be synonymous with brigand, and is now applied to members of the organized gangs which infest some districts of Italy, Sicily Spain, Greece, and Turkey.

BAND OF HOPE, a name given to societies of young persons pledged to teetotalism.

BANFF (bamf), county town of Banffshire, Scotland, a seaport on the Moray Firth at the mouth of the Deveron. Pop. of parl. burgh, which includes Macduff, 7148; Banff portion, 3730.—The county has an area of 410,112 acres. In the south it is mountainous, but the northern part is comparatively low and fertile; principal rivers, the Spey and Deveron; principal mountains, Cairngorm (4095 feet) and Ben Macdhui (4296 feet), on its southern boundary. Little wheat is raised, the principal crops being barley, oats, turnips, and potatoes. Fishing is an important industry; as is also the distilling of whisky. Serpentine abounds in several places, especially at Portsoy, where it is known as "Portsoy marble," and Scotch topazes or cairngorm stones are found on the mountains in the south. Pop. 61,487.

BANGALORE', a town of Hindustan, capital of Mysore, and giving its name to a considerable district in the east of Mysore state. There are manufactures of silks, cotton cloth, carpets, gold and silver lace, etc. Pop. 159,046.—The Bangalore district has an area of 2559 square miles, of which more than half represent cultivable land. Pop. 802,994.

BANGKOK', the capital of the Kingdom of Siam, extending for several miles on both sides of the Menam, which falls into the Gulf of Siam about 15 miles below The trade, both inland and foreign, is very extensive, the exports consisting chiefly of rice, sugar, silk, cotton, tobacco, pepper, sesame, ivory, aromatic wood, cabinet woods, tin, hides, etc.; and the imports consisting chiefly of cotton, woolen, and other goods. Pop. estimated at 500,000, of whom about a half are Chinese.

BAN'GOR, a port of the United States, in Maine, on the west side of Penobscot river, a flourishing and pleasantly situated town, and one of the largest lumber depots in the world. The river is navigable to the town for vessels of the largest size. Pop. 22,000

BANGS, John Kendrick, an American humorist and verse writer, born in New York in 1862. He has been editor of Harper's Weekly, and has published several volumes of humor and verse, among them The Idiot, and Coffee and Repartee.

BAN'JO, the favorite musical instrument of the negroes of the Southern States of America. It is six-stringed, has a body like a tambourine and a neck like a guitar, and is played by stopping the strings with the fingers of the left hand and twitching or striking them with the fingers of the right. The upper or octave string, however, is never stopped.

BANK, primarily an establishment for the deposit, custody, and repayment on demand, of money, and obtaining the bulk of its profits from the investment of sums thus derived and not in immediate demand. Banks are among the oldest institutions in the world. There is evidence of their existence in Assyria thousands of years before the Christian era, and banks were used in ancient Athens and Rome. Modern banking begins in 1587 with the famous bank of Venice, which had itself been preceded by private banks in the great Venetian republic. Other medieval banks were the Bank of Amsterdam and the Bank of Hamburg. It was not until the 18th century that the distinctly modern features of banking arose—the issue of notes not covered by coin and the granting of accounts on the mere credit of borrowers. Bank notes were known in China 1200 years ago, but the first European bank notes were those issued by the Bank of Sweden in 1661. In the 17th century the Bank of England arose and the bank note became substantially what it is today.

Modern banks have three functions, deposits, discounts and issue. Primarily the bank was a safe place for the keeping of money, but its present function is the collection of small sums of capital which might otherwise be idle, and which are loaned to those who need capital and who can give sufficient security to justify the loan. Loans to the bank are called deposits; loans by the bank are called discounts. Banks of issue are those which issue bank notes which circulate as currency. In the United States the only banks of issue are those under the National Banking Law.

The deposit and discount functions of the bank have made it the chief factor in the credit upon which nine tenths of the business of the world is said to be done. Most of the deposits are made in the bank in the form of checks which the bank charges itself with the responsibility of collecting. If these checks are drawn on the bank of deposit, the bank simply deducts the amount from the account of the drawer and credits it to the account of the depositor. If the check is drawn on another bank, payment is made through the clearing house which keeps account of the orders upon the various banks or in their favor, much in the same way as the bank does for individual depositors, and settlements of the actual balances between the banks are made in cash or drafts.

The interest paid by banks upon deposits varies in proportion to the extent of control of its funds that is surrendered by the depositors. In ordinary commercial banking no interest is paid upon deposits unless there is a large balance that is practically stationary. In savings banks where interest is paid all depositors, it is usual to require a notice of one month for withdrawal of funds, although this is not always insisted upon. While deposits for a specified time, called time deposits, receive still greater rates of interest. The interest rates paid by the bank and the demand period of their deposits practically govern the character of the loans which they make, thus the commercial banks paying little or no interest, must loan their money only on easily negotiable paper or collateral, such as bonds or stock which is readily converted into cash. The savings bank not finding it necessary that all of its assets may be instantly converted into cash, finds it is possible to loan money upon mortgages. Bank loans are divided between time loans for a definite period of days and nights and call loans upon which payment can be demanded at will. While either form of loan can be made upon the personal credit of the borrower, this is exceptional and safe banking disapproves of such loans except to persons of exceptional credit. Safe banking requires that the security shall be at the best, not only at the sacrifice of a possible higher rate of interest, but that an adequate reserve shall be maintained to meet the demand of the depositors in the case of a run, even though such run may be eminent. This reserve consists of either cash or assets easily convertable into cash, such as government bonds. Obviously the greater the reserve, the smaller the amount of the bank's deposit available for loans at interest, and hence the great temptation for the bankers to keep a reserve which will not be adequate in the event of a run. It is this failure to maintain a sufficient reserve which causes most of the failures of banks. The amount of this reserve except in the case of national banks, is practically at the discretion of the banker. The National Banking Laws require a minimum reserve of 25 per cent of the amount of deposit in certain large cities named in the law, and 15 per cent of the deposits in smaller cities. In New York, Chicago and St. Louis, the entire reserve must be in currency. In the other principal cities, one-half of the reserve may be deposits in the three large cities named, but at least one-half must be in currency. In the smaller cities, two-fifths of the reserve must be in cash, while the balance may be deposited in any of the reserve cities.

Banks of issue are those which issue their own bank notes which pass as currency. The exercise of this function is regulated in different nations, and in some, as France, there is a single bank possessing this power. In England and Germany the power is vested almost entirely in one certain bank which is gradually obtaining a practical monopoly. In these and most other countries the right of note issue is based upon the amount of cash and other assets held by the bank. Until the passing of the currency act of 1908, the note issue of the United States was given to banks chartered under the federal laws only upon the security of government bonds, this provision having been made after the civil war in order to provide a means for the marketing of the unusual amount of government bonds in existence at that time. The demand for a more elastic system of currency dependent upon the actual needs of business instead of upon the amount of money that the United States government owed, led to the passage of the Aldrich-Vreeland currency act of 1908. This act provided for the formation of National Currency Associations which should authorize their members under certain conditions to issue notes to 75 per cent of the value of securities or commercial paper, or 90 per cent of the market value of state, city, town, county or other municipal bonds, but in no case shall circulated notes based on commercial paper, exceed 30 per cent of the unimpared capital and surplus of a bank. The notes, however, cannot be issued unless the Secretary of the Treasury shall deem it advisable. All of the banks in each National Currency Association are made responsible for the notes of their members. Besides these National Currency Associations, the right is given under certain conditions to banks to issue notes on bonds other than those of the United States, of a certain character after approval by the Secretary of the Treasury. In order to prevent an increase of circulation that is not justified by actual demands of business, it is provided that the additional circulation authorized by the law, shall pay for the first month, a tax at the rate of 5 per cent a year, upon the average amount of such notes in circulation as are based upon the deposit of such authorized securities, and afterwards an additional tax of one per cent a year for each month until the tax of ten per cent a year is reached.

Although banking operations on a considerable scale appear to have been conducted by the ancients, modern banking must be regarded as having had an independent origin in the reviving civilization of the middle ages. In the 12th century almost the whole trade of Europe was in the hands of the Italian cities, and it was in these that the need of bankers was first felt. The earliest public bank, that of Venice, established in 1171 and existing down to the dissolution of the republic in 1797, was for some time a bank of deposit only, the government being responsible for the deposits, and the whole capital being in effect a public loan. In the early periods of the operations of this bank deposits could not be withdrawn, but the depositor had a

credit at the bank to the amount deposited, this credit being transferable to another person in place of money payment. Subsequently deposits were allowed to be withdrawn, the original system proving inconvenient outside the Venetian boundaries. It was, however, less from the Bank of Venice than from the Florentine bankers of the 13th and 14th centuries that modern banking specially dates, the magnitude of their operations being indicated by the fact that between 1430 and 1433, 76 bankers of Florence issued on loan nearly 5,000,000 gold florins.

The Bank of England, the most important banking establishment in the world, was projected by William Paterson, who was afterwards the promoter of the disastrous Darien scheme. It was the first public bank in the United Kingdom, and was chartered in 1694 by an act which, among other things, secured certain recompenses to such persons as should advance the sum of £1,500,000 towards carrying on the war against France. Subscribers to the loan became, under the act, stockholders, to the amount of their respective subscriptions, in the capital stock of a corporation, denominated the *Governor and Company of the Bank of England.* The company thus formed, advanced to the government £1,200,000 at an interest of 8 per cent—the government making an additional bonus or allowance to the bank of £4,000 annually for the management of this loan (which in fact, constituted the capital of the bank), and for settling the interest and making transfers, etc., among the various stockholders. This bank, like that of Venice, was thus originally an engine of the government, and not a mere commercial establishment. Its capital has been added to from time to time, the original capital of £1,200,000 having increased to £14,553,000 in 1816, since which no further augumentation has taken place. There exists, besides, however, a variable 'rest' of over £3,000,000.

Citizens of Philadelphia were originators of the first bank organized in the United States, without charter, June 17, 1780. In 1781 Robert Morris, superintendent of finance, introduced to Congress a plan for establishing the Bank of North America at Philadelphia; Dec. 31 a perpetual charter was granted to that institution. On Jan. 2, 1782, the bank opened for business. Feb. 7, 1784, was incorporated the Massachusetts Bank by the legislature of that state; this was followed March 21, 1791, by the charter of the Bank of New York, which, however, had been doing business since 1784, under 'articles of association' drawn up by Alexander Hamilton, a member of its original board of directors. All of the above, converted into national banks, are still in a prosperous condition.

Savings banks began to attract attention in the United States shortly after their inauguration in England, the first being organized in New York, 1816, but the first one to go into practical operation was in Philadelphia, of the same year. Boston was the first to have an incorporated savings bank, this being effected Dec. 13, 1816, business being begun in 1817; the United States thus anticipated Britain in throwing about these banks the protection and sanction of law. From that time these examples have been rapidly followed. There is no uniform plan of organization. In some states there is a large number of incorporators who elect trustees and directors from among their members; again other corporators are limited in number and are themselves the trustees and managers. In the northeast trustees manage the savings banks for the depositors; elsewhere they are mostly under the control of corporations with capital stock.

An important feature in connection with the banking system is that of the *Clearing House*, which, in the United States, was first put in operation in New York, Oct. 11, 1853. Since that time this plan has been adopted in every important money center and city. Each bank in its daily dealings receives large amounts of, and checks on, other banks; thus at the close of the day's business each one has various sums due it by other banks; it is likewise the debtor of other banks who have received bills, checks and drafts drawn upon it. The settlement by means of the clearing house is simultaneously and quickly effected. The banks now having no direct business with each other save through this medium, which enables them to settle with each other every day, and with but little trouble brings each officer into intimate relations with the others, enabling them by united action to strengthen and aid each other in times of panic and financial danger.

Bank Guarantee: Law of Oklahoma making all banks liable for deposits in insolvent banks. Indorsed by Democratic national platform of 1908.

BANK BILLS, or **BANK NOTES,** paper money issued by banks, either with or without the protection of the state. Bank notes are promises to pay, but differ from ordinary notes in that they are payable on demand, never become overdue, and may be reissued when taken up.

BANK HOLIDAYS, days on which banks close their doors. In the United States banks do not transact business on regular holidays. Certain holidays are not observed by banks, although the custom of closing banks on days of local festivities, etc., is a growing one in the United States.

BANKRUPT, a person whom the law does or may take cognizance of as unable to pay his debts. Properly it is of narrower signification than insolvent, an insolvent person simply being unable to pay all his debts. Under the present bankruptcy acts in England and in the United States, proceedings in bankruptcy may be instituted by the debtor or by creditors. The former is called a voluntary, the latter an involuntary, proceeding. Each is begun by filing a petition. The debtor's petition must state that he is unable to pay his debts, and is willing to surrender all of his property to the use of his creditors. Whether a person is liable to be adjudged a bankrupt upon the petition of creditors does not depend upon his ability or inability to pay his debts, but upon his having committed an act of bankruptcy. Such at least is the English doctrine; but it is modified to some extent in the United States. The United States Bankruptcy Statute of 1898 enumerates five classes of acts of bankruptcy. First, conveying, transferring, concealing, or removing, or permitting to be concealed or removed, any of his porperty with the intent to hinder, delay, or defraud any of his creditors. Second, transferring, while insolvent, any of his property with intent to prefer a creditor or creditors over others. Third, suffering, while insolvent, any creditor to obtain a preference through legal proceedings, and not securing the vacating or discharge of such preference. Fourth, making a general assignment for the benefit of creditors. Fifth, admitting in writing his inability to pay his debts, and his willingness to be adjudged a bankrupt on that ground. After the debtor is adjudicated a bankrupt, a trustee is appointed by the creditors (subject to some supervision by the Board of Trade in England, by the bankruptcy court in this country), who becomes vested not only with all the property in possession of the debtor at the time when he was adjudged a bankrupt, but with all that he had transferred in violation of the statute or in fraud of creditors. It is quite important that the trustee's title should relate back of the adjudication. Otherwise a failing debtor could always defeat one of the main purposes of the bankruptcy statute—that of securing a ratable division of all his estate among all his creditors—by turning over his property to one or more favored creditors.

BANKS, Nathaniel Prentiss, an American soldier, born in Massachusetts in 1816. He studied law, served as legislator of Massachusetts, and was chairman of the state constitutional convention. He was governor of Massachusetts from 1857–9, and speaker of the House of Representatives of congress. He served as major-general of Union volunteers in the civil war, and suffered many defeats. In 1864 he retired from the army and was elected to congress, where he served almost continuously until 1877. He died in 1894.

BAN'NER, a piece of drapery, usually bearing some warlike or heraldic device or national emblem, attached to the upper part of a pole or staff, and indicative of dignity, rank, or command.

BANNS OF MATRIMONY, public notice of the intended celebration of a marriage given either by proclamation, viva voce, by a clergyman, session-clerk, or precentor in some religious assembly, or by posting up written notice in some public place.

BANNU, a district in the northwest of Hindustan, traversed by the Indus; area, 3847 sq. miles; pop. 372,276, nearly half being Afghans.

BANSHEE', BENSHI', a weird hag believed in Ireland and some parts of Scotland to attach herself to a particu-

lar house, and to appear or make her presence known by wailing before the death of one of the family.

BAN'TAM FOWL, a small but spirited breed of domestic fowl, first brought from the East Indies, supposed to derive its name from Bantam in Java. Most of the subvarieties have feathered legs; but these are not to be preferred. In point of color the black and nankeen varieties take the palm. A well-bred bantam does not weigh more than a pound.

BANTU (bän-tö'), the ethnological name of a group of African races below about 6° n. latitude, and including the Kaffirs, Zulus, Bechuanas, the tribes of the Loango, Congo, etc., but not the Hottentots.

BANU. See Bannu.

BAN'YAN, or **BAN'IAN,** a tree of India, of the fig genus. The most peculiar feature of this tree is its method of throwing out, from the horizontal branches, supports which take root as soon as they reach the ground, enlarge into trunks, and extending branches in their turn, soon cover a prodigious extent of ground. A celebrated banyan-tree has been known to shelter 7000

Banyan trees.

men beneath its shade. The wood is soft and porous, and from its white glutinous juice bird-lime is sometimes prepared. Both juice and bark are regarded by the Hindus as valuable medicines.

BA'OBAB, or **MONKEY-BREAD TREE** is one of the largest of trees, its trunk sometimes attaining a diameter of 30 feet; and as the profusion of leaves and drooping boughs sometimes almost hides the stem, the whole forms a hemispherical mass of verdure 140 to 150 feet. in diameter and 60 to 70 feet high. It is a native of western Africa, and is found also in Abyssinia; it is cultivated in many of the warmer parts of the world. The roots are of extraordinary length, a tree 77 feet in girth having a tap-root 110 feet in length. The leaves are deep green, divided into five unequal parts lanceolate in shape, and radiating from a common center. The flowers resemble the white poppy, having snowy petals and violet-colored stamens; and

Baobab tree.

the fruit, which is large and of an oblong shape, is said to taste like gingerbread, with a pleasant acid flavor. The wood is pale-colored, light, and soft. The tree is liable to be attacked by a fungus which, vegetating in the woody part, renders it soft and pith-like.

BAP'TISM, a rite which is generally thought to have been usual with the Jews even before Christ, being administered to proselytes. From this baptism, however, that of St. John the Baptist differed, because he baptized Jews also as a symbol of the necessity of perfect purification from sin. Christ himself never baptized, but directed his disciples to administer this rite to converts (Mat. xxviii. 19); and baptism, therefore, became a religious ceremony among Christians, taking rank as a sacrament with all sects which acknowledge sacraments. Since the Reformation there have been various Protestant sects called Baptists, holding that baptism should be administered only by immersion, and to those who can make a personal profession of faith. The Roman and Greek Catholics consecrate the water of baptism, but Protestants do not. The act of baptism is accompanied only with the formula that the person is baptized in the name of the Father, Son, and Holy Ghost; but, among most Christians, it is preceded by a confession of faith made by the person to be baptized if an adult, and by his parents or sponsors if he be a child.

BAP'TISTS, a Protestant sect, distinguished by their opinions respecting the mode and subjects of baptism. With regard to the mode, they maintain the necessity of immersion, and with regard to the subjects, they consider that baptism ought not to be administered to children at all, nor to adults in general, but to those only who profess repentance and faith. The Baptists as a whole adopt the Independent or Congregational form of church government, and their ecclesiastical assemblies are held for the purpose of mutual stimulus and intercourse, and not for the general government of the body, or for interference with individual churches.

BAR, in law, the railing that incloses the place which council occupy in courts of justice; hence the phrase, at the bar of the court, that is, in open court. Hence also persons duly admitted as pleaders or advocates before the courts are denominated barristers, and the whole body of such barristers or advocates are called the bar. The inclosed place or dock in which persons accused of crimes stand in court is also called the bar.

BAR, in music, is a line drawn through the stave to mark the rhythm of small portions; the notes composing these are also called a bar.

BARBA'DOES, or **BARBADOS,** the most eastern of the West India Islands, first mentioned in 1518, and occupied by the British in 1625. Length 21 miles, breadth 13; area, 106,470 acres or 166 sq. miles; mostly under cultivation. It is more densely peopled than almost any spot in the world, the population in 1901 being 195,588, or about 1200 to the square mile. The climate is very hot, though moderated by the constant trade-winds; and the island is subject to dreadful hurricanes. The surface is broken, now without forests, and with few streams; the highest point is 1145 feet above the sea-level. There are few indigenous mammals or birds. The black lowland soil gives great returns of sugar in favorable seasons. The chief exports, besides sugar, are molasses and rum; imports: rice, salt meat, corn, butter, flour, etc. It is the headquarters of the British forces in the West Indies.

BARBARIAN, a name given by the Greeks, and afterward by the Romans, to every one who spoke an unintelligible language; and hence coming to connote the idea of rude, illiterate, uncivilized.

BAR'BARY, a general name for the most northerly portion of Africa, extending about 2600 miles from Egypt to the Atlantic, with a breadth varying from about 140 to 550 miles; comprising Morocco, Fez, Algeria, Tunis, and Tripoli (including Barca and Fezzan). The principal races are the Berbers, the original inhabitants, from whom the country takes its name; the Arabs, who conquered an extensive portion of it during the times of the caliphs; the Bedouins, Jews, Turks, and the French colonists of Algeria, etc. The country, which was prosperous under the Carthaginians, was, next to Egypt, the richest of the Roman provinces, and the Italian states enriched themselves by their intercourse with it. In the 15th century, however, it became infested with adventurers who made the name of Barbary corsair a terror to commerce, a condition of things finally removed by the French occupation of Algeria.

BARBARY APE, a species of ape, or tailless monkey, with greenish-brown hair, of the size of a large cat, remarkable for docility, also called the magot. It is common in Barbary and other parts of Africa, and some used to live formerly on Gilbraltar Rock, being the only European monkey, though probably not indigenous. It has been the "showman's ape" from time immemorial.

BAR'BECUE, a word of West Indian origin, meaning a hog, or other large animal, roasted whole.

BARBER, one whose occupation is to shave or trim the beard, or to cut and dress hair. The practice of surgery was

formerly a part of the craft, and by an act of Henry VIII. the Company of Barbers was incorporated with the Company of Surgeons—the company being then known as the Barber-surgeons—with the limitation, however, that the surgeons were not to shave or practice "barbery," and the barbers were to perform no higher surgical operation than blood-letting and tooth-drawing. This continued till the time of George II. The signs of the old profession—the pole which the patient grasped, its spiral decoration in imitation of the bandage, and the basin to catch the blood—are still retained.

BARBERS' ITCH, a disease of the skin of the face caused by the infection of the hair follicles. It is due to a fungus, the growth of which produces ringworm. The disease yields readily to treatment. It is generally acquired from contact with the brush, lather, or hands of the barber, or the barber's towel.

BAR'BERRY, a genus of shrubs having bunches of small beautiful red berries, somewhat oval; serrated and pointed leaves; thorns, three together, upon the branches; and hanging clusters of yellow flowers. The berries nearly approach the tamarind in respect of acidity, and when boiled with sugar make an agreeable preserve, rob, or jelly. They are also used as a dry sweetmeat, and in sugar-plums or comfits; are pickled with vinegar, and are used for the garnishing of dishes. The bark is said to have medicinal properties, and the inner bark and roots with alum yield a fine yellow dye. The shrub was originally a native of Eastern countries, but is now generally diffused in Europe, as also in North America.

BAR'CA, a division of N. Africa, between the Gulf of Sidra and Egypt, a vilayet of the Turkish Empire, capital Bengazi. It formed a portion of the ancient Cyrenaica, and from the time of the Ptolemies was known as Pentapolis from its five Greek cities. Next to Bengazi the seaport of Derna is the chief town. The pop. probably does not exceed 300,000.

BARCELONA (bär-thel-ō'nȧ), one of the largest cities of Spain, chief town of the province of Barcelona, and formerly capital of the kingdom of Catalonia; finely situated on the northern portion of the Spanish Mediterranean coast. Barcelona was, until the 12th century, governed by its own counts, but was afterward united with Arragon. In 1640, with the rest of Catalonia, it placed itself under the French crown; in 1652 it submitted again to the Spanish government; in 1697 it was taken by the French, but was restored to Spain at the Peace of Ryswick. Pop. 509,589.—The province has an area of 2968 sq. miles; pop. 902,970.

BAR'CLAY, Robert, the celebrated apologist of the Quakers, born in 1648, at Gordonstown, Moray, and educated at Paris, where he became a Roman Catholic. Recalled home by his father, he followed the example of the latter and became a Quaker. In his travels with William Penn and George Fox through England, Holland, and Germany, to spread the opinions of the Quakers, he was received everywhere with the highest respect. The last of his productions, On the Possibility and Necessity of an Inward and Immediate Revelation, was not published in England till 1686; from which time Barclay lived quietly with his family. He died, after a short illness, at his own house of Ury, Kincardineshire, in 1690. He was a friend of and had influence with James II.

BAR'COO. See Cooper's Creek.

BARD, one of an order among the ancient Celtic tribes, whose occupation was to compose and sing verses in honor of the heroic achievements of princes and brave men, generally to the accompaniment of the harp. Their verses also frequently embodied religious or ethical precepts, genealogies, laws, etc.

BARDWAN', or **BURDWAN',** a division of Bengal, upon the Hugli, comprising the six districts of Bardwan, Hugli, Howrah, Midnapur, Bankura, and Birbhum. Area, 13,956 sq. miles; pop. 7,688,818.—The district Bardwan has an area of 2697 sq. miles, and a pop. of 1,391,823.

BAREBONE, or **BARBONE,** Praise-God, the name of a leather seller in Fleet Street, London, who obtained a kind of lead in the convention which Cromwell substituted for the Long Parliament, and which was thence nicknamed the Barebone Parliament. After its dissolution he disappears till 1660, when he presented a petition to Parliament against the restoration of the monarchy. In 1661 he was committed to the Tower for some time, but his subsequent history is unknown.

BAREILLY (ba-rā'li), a town of Hindustan in the United Provinces, capital of a district of same name, on a pleasant and elevated site. On the outbreak of the Indian Mutiny the native garrison took possession of the place, but it was retaken by Lord Clyde in May, 1858. Pop. 131,208.—The district has an area of 1595 sq. miles; pop. 1,040,691.

BARGAIN AND SALE, a legal term denoting the contract by which lands, tenements, etc., are transferred from one person to another.

BARGE, a term similar in origin to barque, but generally used of a flat-bottomed boat of some kind, whether used for loading and unloading vessels, or as a canal-boat, or as an ornamental boat of state or pleasure.

BARI (bä'rē), a seaport, S. Italy, on a small promontory of the Adriatic capital of the province Terra di Bari. It was a place of importance as early as the 3d century B.C., and has been thrice destroyed and rebuilt. Pop. about 70,000.—The province has an area of 2280 sq. miles, and is fertile in fruit, wine, oil, etc.; pop. 679,000.

BARIL'LA, the commercial name for the impure carbonate and sulphate of soda imported from Spain and the Levant. It is the Spanish name of a plant, from the ashes of which and from those of others of the same genus the crude alkali is obtained. On the shores of the Mediterranean the seeds of the plants from which it is obtained are regularly sown near the sea, and these, when at a sufficient state of maturity, are pulled up, dried, and burned in bundles in ovens or in trenches. The ashes, while hot, are continually stirred with long poles, and the saline matter they contain forms, when cold, a solid mass, almost as hard as stone. To obtain the carbonate of soda it is only requisite to lixiviate the barilla in boiling water, and evaporate the solution. British barilla or kelp is a still more impure alkali obtained from burning seaweeds. Soda is now obtained for the most part from common salt.

BARINGS (bā'ring), one of the greatest commercial houses in the world. Its founder was John Baring, a German who settled in a small business in Exeter, England, in the first half of the 18th century. Two of his sons, Francis and John, established in London, in 1770, a banking-house.

In November, 1890, owing to the continued failures of the Argentine Republic to pay the interest due upon its debt, which had been guaranteed by the Barings, the firm was threatened with suspension, but was saved by the action of the Bank of England, which, in conjunction with the firm of Brown, Shipley & Co., advanced the sum of $65,000,000 to tide over the crisis. The house of the Barings has since been reorganized as a limited company for carrying on a regular banking business, though on a less extensive scale than before.

BAR'ITONE, or **BAR'YTONE,** a male voice, the compass of which partakes of those of the common bass and the tenor, but does not extend so far downward as the one, nor to an equal height with the other. Its best tones are from the lower A of the bass clef to the lower F in the treble.—Also, a person having a voice of such range.

BA'RIUM, the metallic basis of baryta, which is an oxide of barium; it is only found in compounds, such as the common sulphate and carbonate, and was isolated by Davy for the first time in 1808. It is a yellow, malleable metal, which readily oxidizes, decomposes water, and fuses at a low temperature. Its nitrate and chlorate are used in pyrotechny.

BARK, the exterior covering of the stems of exogenous plants. It is composed of cellular and vascular tissue, is separable from the wood, and is often regarded as consisting of four layers: 1st, the epidermis or cuticle, which, however, is scarcely regarded as a part of the true bark; 2d, the epiphlœum, or outer cellular layer of the true bark or cortex; 3d, the mesophlœum or middle layer, also cellular; 4th, an inner vascular layer, the liber or endophlœum, commonly called bast. Endogenous plants have no true bark. Bark contains many valuable products, as gum, tannin, etc.; cork is a highly useful substance obtained from the epiphlœum; and the strength and flexibility of bast make it of considerable value. Bark used for tanning is obtained from oak, hemlock-spruce, species of acacia growing in Australia, etc. Angostura bark, Peruvian or cinchona bark, cinnamon, cascarilla, etc., are useful barks.

BARK, PERUVIAN, is the bark of various species of trees of the genus Cinchona, found in many parts of South

America, but more particularly in Peru, and having medicinal properties. It was formerly called Jesuit's bark, from its having been introduced into Europe by Jesuits. Its medicinal properties depend upon the presence of quinine, which is now extracted from the bark, imported, and prescribed in place of nauseous mouthfuls of bark. See Cinchona.

BARKER', Jacob, an American lawyer and financier, born in Maine in 1779, died in 1871. In the war of 1812 he secured a loan of $5,000,000 for the government. In 1815 he founded the Exchange Bank of New York, and, having removed to New Orleans, he was elected to the United States senate by the state of Louisiana at the close of the civil war, but, owing to the state not having been readmitted, he did not take his seat. He published a work on the civil war entitled The Rebellion (1866).

BAR'LEY, the name of several cereal plants, yielding a grain used as food and also for making malt, from which are prepared beer, porter, and whisky. Barley has been known and cultivated from remote antiquity, and beer was made from it among the Egyptians. The species principally cultivated are two-rowed barley, four-rowed barley, and six-rowed, of which the small variety is the sacred barley of the ancients. The varieties of the four- and six-rowed species are generally coarser than those of the two-rowed, and adapted for a poorer soil and more exposed situation. Some of these are called bere or bigg. In Britain barley occupies about the same area as wheat, but in N. America the extent of it as a crop is comparatively small, being in Canada, however, relatively greater than in the United States, and the Canadian barley is of very high quality. Barley is better adapted for cold climates than any other grain, and some of the coarser varieties are cultivated where no other cereal can be grown. Pearl barley is the grain polished and rounded and deprived of husk and pellicle. Patent barley is the farina obtained by grinding pearl barley. Barley-water, a decoction of pearl barley, is used in medicine as possessing emollient, diluent, and expectorant qualities.

BARLEY-SUGAR, pure sugar melted and allowed to solidify into an amorphous mass without crystallizing.

BAR'MEN, a German city on the Wupper, in the Prussian Rhine Province, government of Düsseldorf, and forming a continuation of the town of Elberfeld, in the valley of Barmen. Pop. 141,947.

BAR'NABAS, the surname given by the apostles to Joses, a fellow-laborer of Paul, and, like him, ranked as an apostle. He is said to have founded at Antioch the first Christian community, to have been first bishop of Milan, and to have suffered martyrdom at Cyprus. His festival is held on the 11th of June.

BARNABAS, Saint, Epistle of, an epistle in twenty-one chapters unanimously ascribed to Barnabas by early Christian writers, but without any support of internal evidence. It was probably written between 119 and 126 B.C., by one who was not a Jew, and under the influence of Alexandrian Judaistic thought.

BAR'NACLE, the name of a family of marine crustaceous animals. They are enveloped by a mantle and shell, composed of five principal valves and several smaller pieces, joined together by a membrane attached to their circumference; and they are furnished with a long, flexible, fleshy stalk or peduncle, provided with muscles by which they attach themselves to ships' bottoms, submerged timber, etc. They feed on small marine animals, brought within their reach by the water and secured by their tentacula. Some of the larger species are edible. According to an old fable these animals produced barnacle geese.

BARNACLE GEESE, summer visitants of the northern seas, in size rather smaller than the common wild goose, and having the forehead and cheeks white, the upper body and neck black.

BARNARD, Henry, an American educator, born in Connecticut in 1811, died in 1900. From 1837 to 1840 he was a member of the Connecticut legislature and interested himself in prison reform, meanwhile filling numerous educational positions. He was (1857–59) president of the University of Wisconsin, president of St. John's College, Annapolis (1865–66), and first U. S. commissioner of education (1867–70). He published many works on the subject of education, and was the first to use the term "tainted money" with reference to college endowments. Dr. Barnard is often called the "father of American education."

BARNATO, Barnett, known as "Barney Barnato, King of the Kaffirs," an English-African diamond mine owner, promoter of the Kimberley mines. He was reputed to be the richest man in the world. He was born of Hebrew stock in London, and committed suicide at sea in 1897.

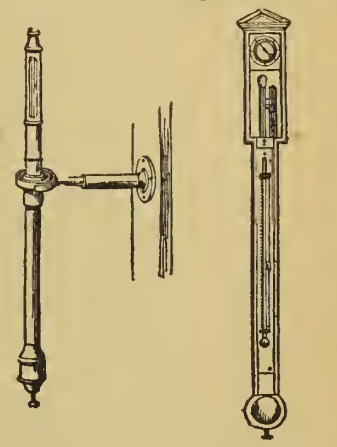
BARNAVE (bår-näv), Antoine-Pierre-Joseph-Marie, a distinguished French revolutionist, who successfully maintained against Mirabeau the right of the National Assembly as against that of the king to declare for peace or war, but afterward asserted the inviolability of the king's person, was impeached, condemned, and guillotined. Born 1761, died 1793.

BARNES, Alfred Smith, an American publisher, endower of Barnes Hall at Cornell, and publisher of numerous text-books and other educational publications. He was born in Connecticut in 1817 and died in 1888.

BARNUM, Phineas Taylor, a noted proprietor of museums and circus shows, famous the world over for his ingenuity in originating rare entertainments. He was born in Bethel, Conn., in 1810, and as a lad he edited a newspaper. At twenty-four he originated his first great sham show, in the person of a woman whom he advertised as the old nurse of George Washington. His first large venture was the American Museum in New York, the chief feature of which was "General" Tom Thumb, the dwarf. In 1847 he imported Jenny Lind, and, after becoming bankrupt several times, through fire and other causes, he brought out his "Greatest Show on Earth," a traveling circus and menagerie. He died in 1891. His motto "Wait for Barnum" became a household word.

BARO'DA, a non-tributary state, but subordinate to the Indian government; situated in the north of the Bombay presidency. Area, 8226 sq. miles; pop. 1,952,692.—Baroda, the capital, is the third city in the Bombay presidency. Pop. 103,790 (including troops in the adjoining cantonment).

BAROM'ETER, an instrument for measuring the weight or pressure of the atmosphere, and thus determining changes in the weather, the height of mountains, and other phenomena. It



Marine barometer. Common upright barometer.

had its origin about the middle of the 17th century in an experiment of Torricelli, an Italian, who found that if a glass tube about 3 feet in length, open at one end only, and filled with mercury, were placed vertically with the open end in a cup of the same fluid metal, a portion of the mercury descended into the cup, leaving a column only about 30 inches in height in the tube. He inferred, therefore, that the atmospheric pressure on the surface of the mercury in the cup forced it up the tube to the height of 30 inches, and that this was so because the weight of a column of air from the cup to the top of the atmosphere was only equal to that of a column of mercury of the same base and 30 inches high. Pascal confirmed the conclusion in 1645; six years afterward it was found by Perrier that the height of the mercury in the Torricellian tube varied with the weather; and, in 1665, Boyle proposed to use the instrument to measure the height of mountains.

The common or cistern barometer, which is a modification of the Torricellian tube, consists of a glass tube 33 inches in length and about one-third of an inch in diameter, hermetically sealed at the top, and having the lower end resting in a small vessel containing mercury, or bent upward and terminating in a glass bulb partly occupied by the mercury and open to the atmosphere. The tube is first filled with purified mercury, and then inverted, and there is affixed to it a scale to mark the height of the mercurial column, which com-

paratively seldom rises above 31 or sinks below 28 inches. In general the rising of the mercury presages fair weather, and its falling the contrary, a great and sudden fall being the usual presage of a storm. The weather-points

Siphon barometer.

Wheel barometer.

on the ordinary barometric scale are as follows: At 28 inches, stormy weather; 28½, much rain or snow; 29, rain or snow; 29½, changeable; 30, fair or frost; 30½, settled fair or frost; 31, very dry weather or hard frost. Certain attendant signs, however, have also to be noted: thus, when fair or foul weather follows almost immediately upon the rise or fall of the mercury, the change is usually of short duration; while, if the change of weather be delayed for some days after the variation in the mercury, it is usually of long continuance. The direction of the wind has also to be taken into account.

The siphon barometer consists of a bent tube, generally of uniform bore, having two unequal legs, the longer closed, the shorter open. A sufficient quantity of mercury having been introduced to fill the longer leg, the instrument is set upright, and the mercury takes such a position that the difference of the levels in the two legs represents the pressure of the atmosphere.

The wheel barometer is the one that is most commonly used for domestic purposes. It is far from being accurate, but it is often preferred for ordinary use on account of the greater range of its scale, by which small differencs in the height of the column of mercury are more easily observed. It usually consists of a siphon barometer, having a float resting on the surface of the mercury in the open branch, a thread attached to the float passing over a pulley, and having a weight as a counterpoise to the float at its extremity. As the mercury rises and falls the thread and weight turn the pulley, which again moves the index of the dial.

The mountain barometer is a portable mercurial barometer with a tripod support and a long scale for measuring the altitude of mountains.

In the aneroid barometer, as its name implies, no fluid is employed, the action being dependent upon the susceptibility to atmospheric pressure shown by a flat circular metallic chamber from which the air has been partially exhausted, and which has a flexible top and bottom of corrugated metal plate. By an ingenious arrangement of springs and levers the depression or elevation of the surface of the box is registered by an index on the dial, by which means it is also greatly magnified, being given in inches to correspond with the mercurial barometer.

BAR'ON, originally, in the feudal system, the vassal or immediate tenant of any superior; but the term was afterward restricted to the king's barons, and again to the greater of these only, who attended the Great Council, or who, at a later date, were summoned by writ to Parliament. It was the second rank of nobility, until dukes and marquises were introduced and placed above the earls, and viscounts also set above the barons, who, therefore, now hold the lowest rank in the British peerage. The present barons are of three classes: (1) barons by prescription, whose ancestors have immemorially sat in the Upper House; (2) by patent; (3) by tenure, i.e. holding the title as annexed to land. The coronet is a plain gold circle with six balls or large pearls on its edge, the connected cap being of crimson velvet. —Baron and feme, a term used for husband and wife in the English law.— Baron of beef, two sirloins not cut asunder.

BAR'ONET, a hereditary dignity in Great Britain and Ireland, next in rank to the peerage, originally instituted by James I. in 1611. A baronet has the title of "Sir" prefixed to his Christian and surname, and his wife is "Lady" so-and-so. Baronets rank before all knights.

BAR'RA, or **BAR,** a small kingdom in Africa, near the mouth of the Gambia. The Mandingoes, who form a considerable part of the inhabitants, are Mohammedans and the most civilized people on the Gambia. Pop. 200,000. The coast here belongs to Britain.

BARRAS (bà-rä), Paul François Jean Nicholas, Comte de, member of the French national convention and of the executive directory, born in Provence 1755, died 1829. He took part in the attack upon the Bastille and upon the Tuileries, and voted for the death of Louis XVI. In the subsequent events he displeased Robespierre, and on this account joined the members of the committee, who foresaw danger awaiting them, and being intrusted with the chief command of the forces of his party he made himself master of Robespierre. On Feb. 4, 1795, he was elected president of the convention, and on Oct. 5, when the troops of the sections which favored the royal cause approached, Barras for a second time received the chief command of the forces of the convention. On this occasion he employed General Bonaparte, for whom he procured the chief command of the army of the interior, and afterward the command of the army in Italy. From the events of the 18th Fructidor (Sept. 4, 1797) he governed absolutely until June 13th, 1799, when Siéyès entered the directory, and in alliance with Bonaparte procured his downfall in the revolution of the 18th Brumaire (Nov. 9, 1799). He afterward resided at Brussels, Marseilles, Rome, and Montpellier under surveillance, returning to Paris only after the restoration of the Bourbons.

BARREL, a well-known variety of wooden vessel; but the term is also used as a definite measure and weight. A barrel of beer is 36 gals., of flour 196 lbs., of beef or pork 200 lbs.

BARRETT, Lawrence, an American player, one of the most forceful and polished actors of the American stage, born in New Jersey in 1838, died in 1891. He made his début at Detroit (1853) as Murad, in The French Spy. He subsequently appeared in the cities of the East, fought on the Union side in the civil war, and later became an associate of Edwin Booth. He was partner with John McCullough in the California Theater, San Francisco, and in 1875 played Cassius (his best rôle) in company with Booth. His visit to England in 1884 was entirely successful. On his return he and Booth joined forces and toured the country with splendid success in every aspect of their enterprise. His chief parts were Hamlet, Lear, Richelieu, and Shylock.

BARRETT, Wilson, an English player, born in 1846. His first London appearance was in 1879, and soon afterward he became manager of the Court Theater. He produced The Lights o' London, The Silver King, and other plays, and his rendition of Hamlet, Othello, and other tragic parts has been regarded with high favor. Mr. Barrett visited America in 1886, 1888, 1889, 1893, and 1897, and in 1898 Australia.

BARREL-ORGAN, a musical instrument usually carried by street musicians, in which a barrel studded with pegs or staples, when turned round, opens a series of valves to admit air to a set of pipes, or acts upon wire strings like those of the piano, thus producing a fixed series of tunes.

BARRIE, J. M., born in 1860, at Kirriemuir, Forfarshire; studied at Edinburgh University, graduating as M.A. in 1882. He was for a time connected with a Nottingham journal, and then removed to London, writing chiefly for the St. James's Gazette. His first book, Better Dead, a satire on London life, appeared in 1887. It was followed in 1888 by the highly successful Auld Licht Idylls, and When a Man's Single. In 1889 he published A Window in Thrums; in 1890 My Lady Nicotine; in 1891 The Little Minister; in 1896, Sentimental Tommy.

BAR'RISTER, in England and Ireland, a pleader or advocate who has been admitted to plead at the bar. In the United States the term counselor-at-law is the equivalent of the British barrister.

BAR'ROW-IN-FUR'NESS, a seaport, parl. and county borough of Lancashire, in the district of Furness, opposite the island of Walney, a town that has increased from a fishing hamlet with 100 inhabitants in 1848 to a town of 57,584 inhabitants in 1901. Its prosperity is due to the mines of red hematite iron-ore which abounds in the district.

BAR'ROWS, mounds of earth or stones raised to mark the resting-place of the dead, and distinguished, according to their shape, as long, bowl, bell, cone, broad barrows. The practice of

barrow-burial is of unknown antiquity and almost universal, barrows being found all over Europe, in northern Africa, Asia Minor, Afghanistan, western India, and in America. In the earliest barrows the inclosed bodies were simply laid upon the ground, with stone

Bowl barrow. Long barrow. Twin barrow.

or bone implements and weapons beside them. In barrows of later date the remains are generally inclosed in a stone cist. Frequently cremation preceded the erection of the barrow, the ashes being inclosed in an urn or cist. A detailed description of an ancient barrow-burial is given in the Anglo-Saxon poem Beowulf.

BARTHELMY-SAINT-HILAIRE (bär-tāl-mē-saṇ-tē-lār), Jules, French scholar and statesman, born 1805, died in 1895. He was professor of Greek and Latin philosophy in the College of France, but resigned the chair after the coup d'état of 1852 and refused to take the oath; was reappointed 1862; in 1869 was returned to the Corps Législatif; after the revolution was a member of the National Assembly; was elected senator for life in 1875.

BARTHOLDI (bär-tol'dē), Auguste, French sculptor, born 1833; best known as the artist of the colossal statue of Liberty now overlooking the harbor of New York. Died 1904.

BARTHOL'OMEW, the apostle, is probably the same person as Nathanael, mentioned in the Gospel of St. John as an upright Israelite and one of the first disciples of Jesus. He is said to have taught Christianity in the south of Arabia, into which, according to Eusebius, he carried the Gospel of St. Matthew in the Hebrew language; and to have suffered martyrdom. The ancient church had an apocryphal gospel bearing his name, of which nothing has been preserved. A festival is held to his memory on August 24th.

BARTHOLOMEW'S DAY, St., a feast of the Christian Church, celebrated (August 24) in honor of St. Bartholomew. What is known as the Massacre of St. Bartholomew was the slaughter of the French Protestants, which began on August 24th, 1572, by secret orders from Charles IX., at the instigation of his mother, Catharine de Medici, and in which, according to Sully, 70,000 Huguenots, including women and children, were murdered throughout the country. During the minority of Charles and the regency of his mother a long war raged in France between the Catholics and Huguenots, the leaders of the latter being the Prince of Condé and Admiral Coligny. In 1570 overtures were made by the court to the Huguenots, which resulted in a treaty of peace. This treaty blinded the chiefs of the Huguenots, particularly the Admiral Coligny, who was wearied with civil war. The king appeared to have entirely disengaged himself from the influence of the Guises and his mother; he invited Coligny to his court, and honored him as a father. The most artful means were employed to increase this delusion. The sister of the king was married to the Prince de Béarn (Aug. 18, 1572) in order to allure the most distinguished Huguenots to Paris. On Aug. 22 a shot from a window wounded the admiral. The king hastened to visit him, and swore to punish the author of the villainy; but on the same day he was induced by his mother to believe that the admiral had designs on his life. "God's death!" he exclaimed, "kill the admiral; and not only him, but all the Huguenots; let none remain to disturb us." The following night Catharine held the bloody council, which fixed the execution for the night of St. Bartholomew, August 24, 1572. After the assassination of Coligny a bell from the tower of the royal palace at midnight gave to the assembled companies of burghers the signal for the general massacre of the Huguenots. The Prince of Condé and the King of Navarre saved their lives by going to mass and pretending to embrace the Catholic religion. By the king's orders the massacre was extended throughout the whole kingdom; and the horrible slaughter continued for thirty days in almost all the provinces.

BARTLETT, John, an American editor, widely known from his compilation, Bartlett's Familiar Quotations. He was born at Plymouth, Mass., 1820, and has been for many years partner in the house of Little, Brown & Co., of Boston.

BARTLETT, John Russell, an American ethnologist and author, born at Providence, R. I., in 1805. In 1850–54 he surveyed the boundary line between the United States and Mexico, and was secretary of state for Rhode Island (1855–72). He is the author of several works on ethnological subjects, and has published valuable lexicons and histories of American countries. He died in 1886.

BARTLETT, Josiah, an American statesman, born at Amesbury, Mass., in 1729. He was a delegate to the continental congress in 1775, was chief justice of New Hampshire court of common pleas (1779), justice of the state supreme court (1784), and chief justice (1778). He was the first governor of New Hampshire. He died in 1795.

BARTLETT, Paul Wayland, an American sculptor, born at New Haven, Conn., 1865. He is the sculptor of the McClellan statue in Philadelphia, of the Warren statue in Boston, and of the statue of Lafayette presented to France by the school children of the United States.

BARTON, Clara, president of the American Red Cross Society and its founder. She was born in Massachusetts in 1830, entered the hospital service in the civil war, and did much good work. She was visiting Europe at the outbreak of the Franco-Prussian war, and served in the hospital service of the German army. She was decorated with the Iron Cross of Germany and the Gold Cross of Baden. Miss Barton represented the United States Red Cross Society in several international meetings, did relief work in America in 1896, and in the late Spanish war and the Anglo-Boer war in Africa. She has published two histories of the Red Cross movement.

BARTRAM, John, an American botanist, born in Pennsylvania in 1699. He became distinguished as a botanist early in life and was a correspondent of Linné, who praised him as the greatest natural botanist in the world. His works were printed in the Transactions of the Philosophical Society, and also in the form of books. He died in 1777.

BARTRAM, William, son of John Bartram, and, like his father, a botanist of distinction. He was born in Pennsylvania in 1739 and died in 1823. He published a list of American birds, in addition to his botanical studies.

BARY'TA, oxide of barium, called also heavy earth, from its being the heaviest of the earths. It is generally found in combination with sulphuric and carbonic acids, forming sulphate and carbonate of baryta, the former of which is called heavy-spar. Baryta is a gray powder, has a sharp, caustic, alkaline taste, and a strong affinity for water, and forms a hydrate with that element. It forms white salts with the acids, all of which are poisonous except the sulphate. Several mixtures of sulphate of baryta and white-lead are manufactured, and are used as white pigments, or it may be used alone. Carbonate of baryta, which in the natural state is known as witherite, is also used as the base of certain colors. The nitrate is used in pyrotechny, in the preparation of green fireworks.

BASALT (ba-salt'), a well-known igneous rock occurring in the ancient trap and the recent volcanic series of rocks, but more abundantly in the former. It is a fine-grained heavy crystalline rock, consisting of felspar, augite, and magnetic iron, and sometimes contains a little olivine. Basalt is amorphous, columnar, tabular, or globular. The columnar form is straight or curved, perpendicular or inclined, sometimes nearly horizontal; the diameter of the columns from 3 to 18 inches, sometimes with transverse semispherical joints, in which the convex part of one is inserted in the concavity of another; and the height from 5 feet to 150. The forms of the columns generally are pentagonal, hexagonal, or octagonal. When decomposed it is found also in round masses, either spherical or compressed and lenticular. These rounded masses are sometimes composed of concentric layers, with a nucleus, and sometimes of prisms radiating from a center. Fingal's Cave, in the island of Staffa, furnishes a remarkable instance of basal-

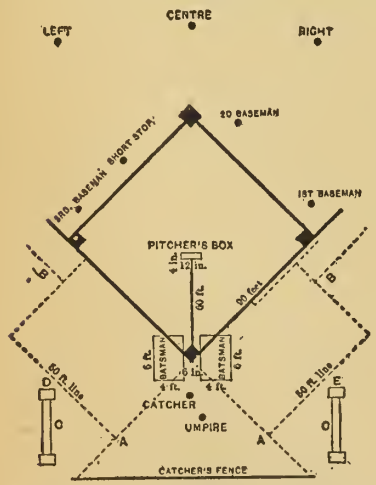
tic columns. The pillars of the Giant's Causeway, Ireland, composed of this stone, and exposed to the roughest sea for ages, have their angles as perfect as

Basalt—Lot's wife, St. Helena.

those at a distance from the waves. Basalt often assumes curious and fantastic forms, as for example Lot's wife near the south coast of St. Helena.

BASE, in architecture, that part of a column which is between the top of the pedestal and the bottom of the shaft; where there is no pedestal, the part between the bottom of the column and the pavement. The term is also applied to the lower projecting part of the wall of a room, consisting of a plinth and its moldings.

BASE'BALL, the national field game of the United States, a development of



A A, ground reserved for batsman, umpire, and catcher; B B, for captain and assistant; C C, players' benches; D, bat-rack for visiting players; E, for home players.

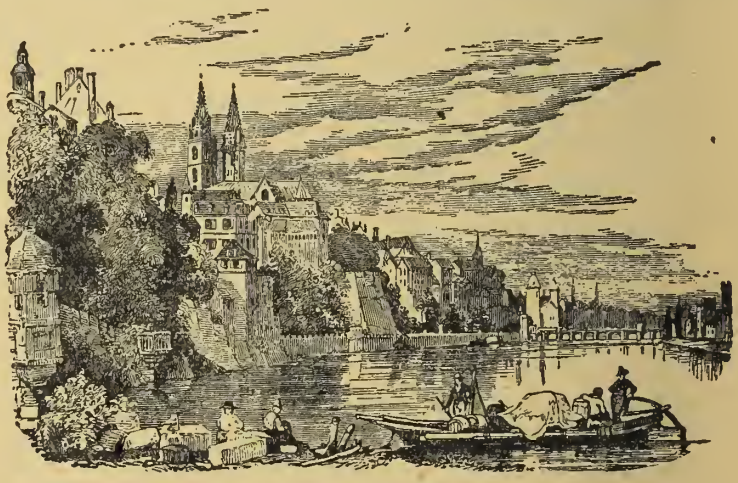
the old English game of "rounders." It is played by two teams of 9 men each, with an elastic ball about 9 inches in circumference. The field consists of a level ground, part of which is laid out in a "diamond," 90 feet square, with bases, or goals, at each corner. One is called the home base, the others from right to left of home are called first, second, and third bases. The three last named bases are guarded by the first, second, and third basemen. A player called the shortstop guards the space between second and third bases. These four are the infield. The outfield consists of three players, right, center, and left, placed at some distance from the bases. The pitcher stands 55 feet from the home base and delivers the ball over that base to the catcher, who stands just behind the base. This is the make-up of the team "in the field." The men of the team that has the "innings" come to bat one after another. The batsman tries to hit the ball and to reach first base before the ball can be "fielded" to first base, or before one of the opposing team can touch him with it. If the ball reaches the first baseman and is held by him, or if the batsman is touched before reaching the first base, he is retired from the play and is "out" of the game, and another batsman takes his place. If the batsman knocks the ball into the air and it is caught and held before touching the ground; or if the batsman strikes three times at the ball and misses it, the ball being caught by the catcher on the last missed strike; or if the striker doesn't try to hit the ball when the ball is judged to have been delivered over the home base according to rule, the striker is out.

The batsman becomes a base-runner after three strikes are called; when he makes a fair hit, the ball traveling between the above-mentioned lines until after it passes first or third base; after four balls have been called by the umpire, a "ball" being a pitched ball which is not touched by the bat and which passes outside the limits required for a strike; if he is hit by the ball, unless he has made no effort to avoid it; after the umpire calls a "balk"; and if prevented from striking by the interference of the catcher. In the last four cases he cannot be put out before reaching first base. He is put out when his third strike is held by the catcher; when a ball hit by him is caught by a fielder before it touches the ground; when touched with the ball in the hands of a fielder while between bases; when, if forced to run to any base, the ball is held by a fielder on that base before the runner reaches it; and when hit by a batted ball.

When three men are out the side is out and the team in the field becomes batsmen. The object of the base-runner is to reach in succession first, second, third and home base without being "put out." He then "scores a run." Nine innings constitute a game and the side having most runs at the end of the ninth inning is the winner.

Baseball is played in the United States by several large professional leagues and innumerable small amateur leagues, associations, and clubs. Several millions of dollars are invested in the business.

BASEL (bä'zl), a canton and city of Switzerland. The canton borders on Alsace and Baden, has an area of 176 sq. miles, and a population of 180,697, nearly all speaking German. It is divided into two half-cantons, Basel city and Basel country At Basel was signed the treaty of peace between France and Prussia, April 5, and that between France and Spain, July 22, 1795. Pop. (with suburbs), 111,009.



Basel, from above the town.

BASE'MENT, the lowest story of a dwelling-house or other building. The basement in America is usually lower than the level of the ground, the first story being higher than the ground level. In medieval Europe all great houses were built with a basement, called in England the "ground floor." This was level with the ground and was used for servants quarters, offices, etc.

BASE OF OPERATIONS, the place in which an army keeps its main stores and supplies when in war, and from which the campaign is carried on against an enemy. The invaders of a country often find the maintenance of a base of operations a serious matter, for properly to guard it requires large numbers of men. Lines leading from the base must also be guarded; and these necessities make it more or less easy for a small number of men to defeat and drive out a large invading army.

BASHI-BAZOOKS', irregular troops in the Turkish army. They are mostly Asiatics, and have had to be disarmed several times by the regular troops on account of the barbarities by which they have rendered themselves infamous.

BASH'KIRS, a tribe of Finnish or of Tatar origin, inhabiting the Russian goverments of Ufa, Orenburg, Perm, and Samara. They are rude and warlike and partially nomadic. They number about 500,000.

BASIC SLAG, the slag or refuse matter which is got in making basic steel, and which from the phosphate of lime it contains is a valuable fertilizer.

BASIC STEEL. See Steel.

BASIL, St., called the Great, one of the Greek fathers, was born in 329, and made in 370 Bishop of Cæsarea in Cappadocia, where he died in 379. He was distinguished by his efforts for the regulation of clerical discipline, and, above all, his endeavors for the promotion of monastic life. The Greek Church honors him as one of its most illustrious saints, and celebrates his festival January 1. The vows of obedience, chastity, and poverty framed by St. Basil are essentially the rules of all the orders of Christendom.

BASIL'ICA, originally the name applied by the Romans to their public halls, either of justice, of exchange, or other business. The plan of the basilica was usually a rectangle divided into aisles by rows of columns, the middle aisle being the widest, with a semicircular apse at the end, in which the tribunal was placed. The ground-plan of these buildings was generally followed in the early Christian churches, which, therefore, long retained the name of basilica, and it is still applied to some of the churches in Rome by way of distinction, and sometimes to other churches built in imitation of the Roman basilicas.

BASILICA'TA, also called **POTENZA**, an Italian province, extending north from the Gulf of Taranto, and corresponding pretty closely with the ancient Lucania. Area, 4122 sq. miles; pop. 524,485.

BAS'ILISK, a fabulous creature formerly believed to exist, and variously regarded as a kind of serpent, lizard, or dragon, and sometimes identified with the cockatrice. It inhabited the deserts of Africa, and its breath and even its look was fatal.

BA'SIN, in physical geography, the whole tract of country drained by a river and its tributaries. The line dividing one river basin from another is the water-shed; and by tracing the various water-sheds we divide each country into its constituent basins. The basin of a loch or sea consists of the basins of all the rivers which run into it.—In geology a basin is any dipping or disposition of strata toward a common axis or center, due to upheaval and subsidence.

BASKET, a vessel or utensil of wickerwork, made of interwoven osiers or willows, rushes, twigs, grasses, etc. The process of basket-making is very simple, and appears to be well known among the very rudest peoples. The ancient Britons excelled in the art, and their baskets were highly prized in Rome.

BASKET-BALL, a game played with an inflated bladder 30 inches in circumference and weighing about 20 ounces. Goals, consisting of nets, are placed at either end of the field, and are suspended from metal rings. The teams consist of five players each—left and right guard, center, and right forward—and the object is to put the ball in the opposing team's goal-basket. The ball must be thrown or batted with the hands. No tackling, kicking, pushing, etc., are allowed. The penalty is a free throw at 15 feet for the basket by the opposing team. A goal thus made counts one point; a goal from the field, 15. The game was invented by James Naismith, of Plainfield, Mass.

BASKING-SHARK, a species of shark, so named from its habit of basking in the sun at the surface of the water. It reaches the length of 40 feet, and its liver yields a large quantity of oil. It frequents the northern seas, and is known also as the sail-fish or sun-fish.

BASQUES (bǎsks), or **BISCAYANS**, a remarkable race of people dwelling partly in the southwest corner of France, but mostly in the north of Spain adjacent to the Pyrenecs. They are probably descendants of the ancient Iberi, who occupied Spain before the Celts. They preserve their ancient language, former manners, and national dances, and make admirable soldiers, especially in guerrilla warfare. Their language is highly polysynthetic, and no connection between it and any other language has as yet been made out. There are four principal dialects, which are not only distinguished by their pronunciation and grammatical structure, but differ even in their vocabularies. The Basques, who number about 600,000, occupy in Spain the provinces of Biscay, Guipuzcoa, and Alăva; in France parts of the departments of the Upper and Lower Pyrenees, Ariége, and Upper Garonne.

BAS-RELIEF (bä'rē-lēf or bas'rē-lēf), **BASS-RELIEF**, low-relief, a mode of sculpturing figures on a flat surface, the figures having a very slight relief or projection from the surface. It is distinguished from haut-relief, or high-relief, in which the figures stand sometimes almost entirely free from the ground. Bas-relief work has been described as "sculptured painting" from the capability of disposing of groups of figures and exhibiting minor adjuncts, as in a painting.

Bas-relief, from the Elgin Marbles.

BASS (bās), in music, the lowest part in the harmony of a musical composition, whether vocal or instrumental. According to some it is the fundamental or most important part, while others regard the melody or highest part in that light. Next to the melody, the bass part is the most striking, the freest and boldest in its movements, and richest in effect.

BASS (bǎs), the name of a number of fishes of the perch family, distinguished from the true perches by having the tongue covered by small teeth and the preoperculum smooth. The only British species, called sea-dace, and from its voracity sea-wolf, resembles somewhat the salmon in shape, and is much esteemed for the table, weighing about 15 lbs. Striped bass, an American species, weighing from 25 to 30 lbs., is much used for food, and is also known as rock-fish. Two species of black bass, American fresh-water fishes, are excellent as food and give fine sport to the angler. The former is often called the large-mouthed black bass, from the size of its mouth. Both make nests and take great care of their eggs and young.

BASS (bās) **DRUM**, a musical instrument of percussion. It has a cylindrical body of wood, over both ends of which a membrane is stretched tightly by means of hoops. The bass drum is played by beating either one or both heads with sticks having soft, padded knobs at their ends. See Drum.

BASSEIN (bas-sān'), a town in Lower Burmah, province of Pegu, on both banks of the Bassein river, one of the mouths of the Irrawaddy, and navigable for the largest ships. Pop. 31,864.—Bassein District has an area of 6848 sq. miles and a pop. of 475,002.

BAS'SETT, James, an American missionary, born in 1834, near Hamilton, Ont. In 1871 he became a missionary for the Presbyterian Board and traveled widely throughout Europe, spending many years in Turkey and Persia. He is believed to have been the first American to penetrate as far east as the tomb of Harun-al-Rashid at Meshed, eastern Khorassan. He founded the mission in eastern and central Persia, and did much to effect the appointment of a United States legation to Persia.

BASSOON', a musical wind-instrument of the reed order, blown with a bent metal mouthpiece, and holed and keyed like the clarinet. Its compass comprehends three octaves rising from B flat below the bass-staff.

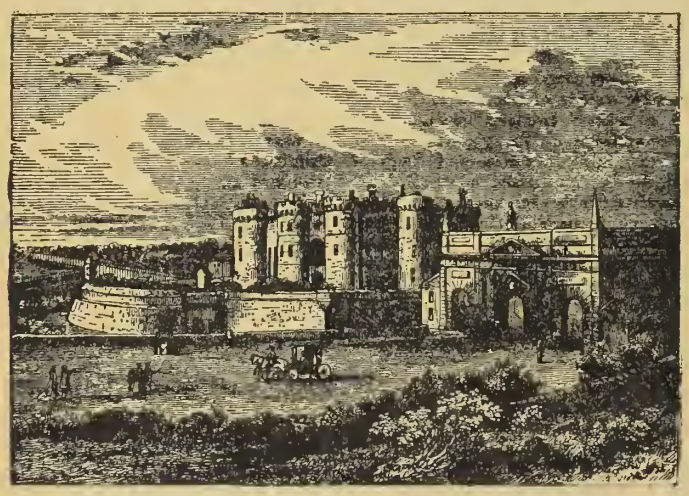
BASS'ORA, or **BASRAH**, a city in Astiatic Turkey, on the west bank of the Shat-el-Arab (the united stream of the Tigris and Euphrates), about 50 miles from its mouth, and nearly 300 southeast of Bagdad. Thirty years ago the inhabitants were estimated at 5000; they are now about 40,000; but in the 18th century they were said to number 150,000. The ruins of the ancient and more famous Bassora—founded by Caliph Omar in 636, at one time a center of Arabic literature and learning and regarded as "the Athens of the East"—lie about 9 miles southwest of the modern town.

BASSWOOD, BASS, the American lime-tree or linden, common in North

America, yielding a light, soft timber.

BAS'TARD, a child begotten and born out of wedlock; an illegitimate child. By the civil and canon laws, and by the law of Scotland (as well as of some of the United States), a bastard becomes legitimate by the intermarriage of the parents at any future time. But by the laws of England a child, to be legitimate, must at least be born after the lawful marriage; it does not require that the child shall be begotten in wedlock, but it is indispensable that it should be born after marriage, no matter how short the time, the law presuming it to be the child of the husband. The only incapacity of a bastard is that he cannot be heir or next of kin to any one save his own issue. In England the maintenance of a bastard in the first instance devolves on the mother, while in Scotland it is a joint burden upon both parents. The mother is entitled to the custody of the child in preference to the father, and the father may be required to support the child.

BASTILLE (bâs-tēl'), a French name for any strong castle provided with towers, but as a proper name the state prison and citadel of Paris, which was built about 1370 by Charles V. It was



The Bastille, as in time of Louis XV.

ultimately used chiefly for the confinement of persons of rank who had fallen victims to the intrigues of the court or the caprice of the government. The capture of the Bastille by the Parisian mob, 14th July, 1789, was the opening act of the revolution. On that date the Bastille was surrounded by a tumultuous mob, who first attempted to negotiate with the governor Delaunay, but, when these negotiations failed, began to attack the fortress. For several hours the mob continued their siege without being able to effect anything more than an entrance into the outer court of the Bastille; but at last the arrival of some of the Royal Guard with a few pieces of artillery forced the governor to let down the second drawbridge and admit the populace. The governor was seized, but on the way to the hôtel de ville he was torn from his captors and put to death. The next day the destruction of the Bastille commenced. Not a vestige of it exists, but its site is marked by a column in the Place de la Bastille.

BASTINA'DO, an Eastern method of corporal punishment, consisting of blows upon the soles of the feet, applied with a stick.

BASU'TOLAND, a native province and British South African possession, inclosed between Orange River Colony, Natal, Griqualand East, and Cape Colony. The Basutos belong chiefly to the great stem of the Bechuanas, and have made greater advances in civilization than perhaps any other South African race. Basutoland has an area of about 10,300 sq. miles, much of it covered with grass, and there is but little wood. The climate is pleasant. The natives keep cattle, sheep, and horses, culitvate the ground, and export grain. It is divided into four districts, each presided over by a magistrate. Pop. (Europ.), 578; (native), 250,000.

BAT, one of the group of wing-handed, flying mammals, having the fore-limb peculiarly modified so as to serve for flight. Bats are animals of the twilight and darkness, and are common in temperate and warm regions, but are most numerous and largest in the tropics. All European bats are small, and have a mouse-like skin. The body of the largest British species is less than that of a mouse, but its wings stretch about 15 inches. During the day it remains in caverns, in the crevices of ruins, hollow trees, and such-like lurking-places, and flits out at evening in search of food, which consists of insects. Several species of the same genus are common in North America. Many bats are remarkable for having a singular nasal cutaneous appendage, bearing in some cases a fancied resemblance to a horseshoe. Bats may be conveniently divided into two sections: the insectivorous or carnivorous, comprising all European and most African and American species; and the fruit-eating, belonging to tropical Asia and Australia, with several African forms. An Australian fruit-eating bat, commonly known as the kalong or flying-fox, is the largest of all the bats; it does much mischief in orchards. At least two species of South American bats are known to suck the blood of other mammals, and thence are called "vampire-bats." As winter approaches, in cold

Great horseshoe bat.

climates bats seek shelter in caverns, vaults, ruinous and deserted buildings, and similar retreats, where they cling together in large clusters, hanging head downward by the feet; and remain in a torpid condition until the returning spring recalls them to active exertions. Bats generally bring forth two young, which, while suckling, remain closely attached to the mother's teats, which are two, situated upon the chest. The parent shows a strong degree of attachment for her offspring, and, when they are captured, will follow them, and even submit to captivity herself rather than forsake her charge.

BATA'VIA, a city and seaport of Java, on the north coast of the island, the capital of all the Dutch East Indies. Its inhabitants are chiefly Malay, with a considerable admixture of Chinese and a small number of Europeans. Pop. 115,600.

BATAVIANS, an old German nation which inhabited a part of the present Holland, especially the island called Batavia, formed by that branch of the Rhine which empties itself into the sea near Leyden, together with the Waal and the Meuse. Tacitus asserts them to have been a branch of the Catti. They were subdued by Germanicus, and were granted special privileges for their faithful services to the Romans, but revolted under Vespasian. They were, however, again subjected by Trajan and Adrian, and at the end of the 3d century the Salian Franks obtained possession of the island of Batavia.

BATEMAN, Kate Josephine, an American actress, born in Baltimore, 1842, and appeared at twenty as Juliet, Julia, Pauline, Lady Macbeth, and other tragic rôles. She visited England in 1863, married George Crowe, retired until 1868, and reappeared as Medea in 1872. In 1875 Miss Bateman appeared with Irving in Macbeth.

BATES, Arlo, an American author and poet, born in Maine in 1850. He has been editor of the Boston Courier and professor of English in the Massachusetts Institute of Technology. He has published The Pagans, The Wheel of Fire, The Philistines, The Puritans, and Love in a Cloud. His poems appeared in 1886, 1887, and 1891.

BATES, Blanche, an American actress, born at Portland, Oregon, 1873. She made her first appearance in San Francisco. She has played leading parts in The Senator, The Charity Ball, A Doll's House, The Great Ruby, The

Three Musketeers, and Under Two Flags

BATES, Charlotte Fiske, an American author, born in New York in 1838. She has published several volumes of poetry (1879, 1881, and 1882). She married (1891) M. Adolphe Rogé.

BATH (bâth), a city of England in Somersetshire, on the Avon, which is navigable for barges from Bristol. Bath is remarkable for its medicinal waters, the four principal springs yielding no less than 184,000 gallons of water a day; and the baths are both elegant and commodious. The temperature of the springs varies from 109° to 117° Fahrenheit. They contain carbonic acid, chloride of sodium and of magnesium, sulphate of soda, carbonate and sulphate of lime, etc. Pop. 52,751.

BATH, a town in Maine, on the west side and at the head of the winter navigation of the Kennebec, 12 miles from the sea. Chief industries: ship-building and allied crafts. Pop. 10,477.

BATH, the immersion of the body in water, or an apparatus for this purpose. The use of the bath as an institution, apart from occasional immersion in rivers or the sea, is, as might be anticipated, an exceedingly old custom. Homer mentions the bath as one of the first refreshments offered to a guest; thus, when Ulysses enters the palace of Circe, a bath is prepared for him, and he is anointed after it with costly perfumes. No representation, however, of a bath as we understand it is given upon the Greek vases, bathers being represented either simply washing at an elevated basin, or having water poured over them from above. In later times, rooms, both public and private, were built expressly for bathing, the public baths of the Greeks being mostly connected with the gymnasia. Apparently, by an inversion of the later practice, it was customary in the Homeric epoch to take first a cold and then a hot bath; but the Lacedemonians substituted the hot-air sudorific bath, as less enervating than warm water, and in Athens at the time of Demosthenes and Socrates the warm bath was considered by the more rigorous as an effeminate custom. With respect to modern baths, that commonly in use in Russia consists of a single hall, built of wood, in the midst of which is a powerful metal oven, covered with heated stones, and surrounded with broad benches, on which the bathers take their places. Cold water is then poured upon the heated stones, and a thick, hot steam rises, which causes the sweat to issue from the whole body. The bather is then gently whipped with wet birch rods, rubbed with soap, and washed with luke-warm and cold water; of the latter, some pailfuls are poured over his head; or else he leaps, immediately after this sweating-bath, into a river or pond, or rolls in the snow. The Turks, by their religion, are obliged to make repeated ablutions daily, and for this purpose there is, in every city, a public bath connected with a mosque. A favorite bath among them, however, is a modification of the hot-air sudorific-bath of the ancients introduced under the name of "Turkish" into other than Mohammedan countries. A regular accompaniment of this bath, when properly given, is the operation known as "kneading," generally performed at the close of the sweating process, after the final rubbing of the bather with soap, and consisting in a systematic pressing and squeezing of the whole body, stretching the limbs, and manipulating all the joints as well as the fleshy and muscular parts.

Public free baths have been opened in several cities of the United States with reasonable success. Public baths (for the payment of a fee) are operated in all the cities of America, and some of them are superior to the best establishments in Europe. The Sutro baths at the Cliff House in San Francisco, which were not damaged by the recent earthquake, are the finest baths in the world, surpassing in size and luxury the greatest of the ancient Roman baths. Salt water is let in directly from the Pacific Ocean and a huge amphitheater seating several thousand spectators surrounds the pools. The most famous bathing springs in America are those at Hot Springs, Ark., and Mount Clemens, Mich., which are regarded as a cure for rheumatism and other diseases.

BA'THOS, a Greek word meaning depth, now used to signify a ludicrous sinking from the elevated to the mean in writing or speech. First used in this sense by Pope.

BATHYBI'IUS, the name given by Huxley to what was regarded as masses of animal matter found covering the sea-bottom at great depths, and in such abundance as to form in some places deposits of 30 feet or more in thickness. It has been described as a tenacious, viscid, slimy substance, exhibiting under the microscope a network of granular, mucilaginous matter, which expands and contracts spontaneously, and thus forms an organism of the utmost simplicity corresponding in every respect to protoplasm. But the existence of such a substance has been a matter of dispute among scientists.

BA'TON, a short staff or truncheon, in some cases used as an official badge, as that of a field-marshal. The conductor of an orchestra has a baton for the purpose of directing the performers as to time, etc.

BAT'ON ROUGE (rözh), the capital of Louisiana, on the left bank of the Mississippi, with an arsenal, barracks, military hospital, state-house, state university, etc. On Aug. 5, 1862, the Confederates under General Breckenridge suffered a severe defeat before it. Pop. 12,000.

BATRACHIANS (ba-trā'ki-anz), the fourth order in Cuvier's arrangement of the class Reptilia, comprising frogs, toads, newts, salamanders, and sirens. The term is now often employed as synonymous with amphibia, but is more usually restricted to the order Anura or tailless amphibia.

BATTAL'ION, the tactical unit of command in infantry, supposed to be of the maximum strength to be efficiently handled by one officer.

BATTERING-RAM, an engine for battering down the walls of besieged places. The ancients employed two different engines of this kind—one suspended in a frame, the other movable on wheels or rollers. They consisted of a beam or spar with a massive metal head, and were set in motion either by a direct application of manual force or

Battering-ram.

by means of cords passing over pulleys. Some are said to have been 120 feet or more in length, and to have been worked by 100 men. One is described as being 180 feet long, and having a head weighing 1½ tons. They were generally covered with a roof or screen for the protection of the workers.

BAT'TERSEA, a municipal borough of London, in Surrey. Pop. in 1901, 168,896.

BAT'TERY, as a military term, (1) any number of guns grouped in position for action; (2) any work constructed as a position for such guns; (3) the tactical unit of field-artillery, more properly described as a field-battery.

BATTERY, in physics, a combination of several jars or metallic plates, to increase the effect of electricity and galvanism.

BATTERY, in criminal law, an assault by beating or wounding another. The least touching or meddling with the person of another against his will may be held to constitute a battery.

BATTERY, The, a small park at the extreme southern point of Manhattan (New York City), which was formerly in Dutch times a fortified place. In early New York the Battery was the most aristocratic residence portion of the city.

BATTLE-AX, a weapon much used in war in the early part of the middle ages among knights. It is a weapon which affords hardly any guard, and the heavier the blow given with it the more the fighter is exposed; but its use was to some extent necessitated by the resistance of iron armor to all but heavy blows. In England and Scotland the battle-ax was much employed, the Lochaber-ax remaining a formidable implement of destruction in the hands of the Highlanders to a recent period.

BATTLE CREEK, a town in Michigan, at the junction of the Kalamazoo and Battle Creek, with a college, and manufactures of agricultural implements, health foods, etc. Pop. 20,000.

BAT'TLEMENT, a notched or indented parapet of a fortification, formed by a series of raised parts called cops or merlons, separated by openings called crenelles or embrasures, the soldier sheltering himself behind the merlon while he fires through the embrasure. Battlements were originally military, but were afterward used freely in ecclesiastical and civil buildings by way of ornament, on parapets, cornices, tabernacle work, etc.

BAUXITE (bāk'sīt), a clay found at Baux, near Arles in France, and exported from the north of Ireland, containing a large proportion of alumina, and used as a lining for furnaces that have to support an intense heat, and as a source of aluminium.

BAVA'RIA, a kingdom in the south of Germany, the second largest state of the empire, composed of two isolated portions, the larger comprising about eleven-twelfths of the monarchy, having the Austrian territories on the east, and Würtemberg, Baden, etc., on the west, while the smaller portion, the Pfalz or Palatinate, is separated from the other by Würtemberg and Baden, and lies west of the Rhine; total area, 29,657 sq. miles. The main political divisions are: Upper Bavaria (pop. 1,319,985; chief town, Munich, the capital of the kingdom, pop. 499,959); Lower Bavaria (677,973); Palatinate (830,948); Upper Palatinate and Regensburg (555,204); Upper Franconia (607,308); Middle Franconia (814,294); Lower Franconia and Aschaffenburg (650,624); Schwaben and Neuburg (712,056); total 6,168,392.

As regards soil Bavaria is one of the most fertile countries in Germany, producing the various cereals in abundance, the best hops in Germany, fruit, wine, tobacco, etc., and having extensive forests. Lower Franconia (the Main valley) and the Palatinate are the great vine-growing districts. The celebrated Steinwein and Leistenwein are the produce of the slopes of the Steinberg and Marienberg at Würzburg (on the Main). The forests of Bavaria, chiefly fir and pine, yield a large revenue; much timber being annually exported, together with potash, tar, turpentine, etc. The principal mineral products are salt, coal, and iron, some of the mining works belonging to the state. The minerals worked include copper, quicksilver, manganese, cobalt, porcelain clay, alabaster, graphite. Large numbers of horses and cattle are reared, as also sheep and swine. The manufactures are individually mostly on a small scale. The principal articles manufactured are linens, woolens, cottons, leather, paper, glass, earthen and iron ware, jewelry, etc. The optical and mathematical instruments made are excellent. A most important branch of industry is the brewing of beer, for which there are upward of 7000 establishments, producing over 260 millions of gallons a year.

Education is in a less satisfactory condition than in most German states. There are about 7000 elementary schools, on which attendance is compulsory up to fourteen years of age. There are three universities, two of which (Munich and Würzburg) are Roman Catholic, and one (Erlangen) Protestant. In art Bavaria is best known as the home of the Nürnberg school, founded about the middle of the 16th century by Albert Dürer. Hans Holbein is also claimed as a Bavarian; and to these have to be added the eminent sculptors Kraft and Vischer, both born about the middle of the 15th century. The restoration of the reputation of Bavaria in art was chiefly the work of Ludwig I., under whom the capital became one of the most prominent seats of the fine arts in Europe.

The Bavarian crown is hereditary in the male line. The executive is in the hands of the king. The legislature consists of two chambers.

The Bavarians take their name from the Boii, a Celtic tribe whose territory was occupied by a confederation of Germanic tribes, called after their predecessors Boiarii. These were made tributary first to the Ostrogoths, and then to the Franks; and on the death of Charlemagne his successors governed the country by lieutenants with the title of margrave, afterward converted (in 921) into that of duke. In 1070 Bavaria passed to the family of the Guelphs, and in 1180 by imperial grant to Otho, count of Wittelsbach, founder of the still reigning dynasty. In 1623 the reigning duke was made one of the electors of the empire. Elector Maximilian II. joined in the war of the Spanish succession on the side of France, and this led, after the battle of Blenheim, 1704, to the loss of his dominions for the next ten years. His son, Charles Albert, likewise lost his dominions for a time to Austria, but they were all recovered again by Charles's son, Maximilian III. (1745). In the wars following the French revolution Bavaria was in a difficult position between France and Austria, but latterly joined Napoleon, from whom its elector Maximilian IV. received the title of king (1805), a title afterward confirmed by the treaties of 1814 and 1815. King Maximilian I. was succeeded by his son, Ludwig (or Louis) I., under whom various circumstances helped to quicken a desire for political change. Reform being refused, tumults arose in 1848, and Ludwig resigned in favor of his son, Maximilian II., under whom certain modifications of the constitution were carried out. At his death in 1864 he was succeeded by Ludwig II. In the war of 1866 Bavaria sided with Austria, and was compelled to cede a small portion of its territory to Prussia, and to pay a war indemnity of $12,500,000. Soon after Bavaria entered into an alliance with Prussia, and in 1867 joined the Zollverein. In the Franco-German war of 1870–71 the Bavarians took a prominent part, and it was at the request of the King of Bavaria, on behalf of all the other princes and the senates of the free cities of Germany, that the King of Prussia agreed to accept the title of Emperor of Germany. Since Jan., 1871, Bavaria has been a part of the German Empire, and is represented in the Bundesrath by six, and in the Reichstag by forty-eight members. The eccentricity early displayed by Ludwig II. developed to such an extent that in June, 1886, he was placed under control, and a regency established under Prince Liutpold (Leopold). The change was almost immediately followed by the suicide of the king, and as Prince Otto, the brother and heir of the late king, was insane, the regency was continued.

BAY, in geography, an indentation of some size into the shore of a sea or lake, generally said to be one with a wider entrance than a gulf.

BAYARD, Thomas Francis, an American diplomat and statesman, born in Wilmington, Del., 1828, died 1898. He was early engaged in commerce, but later studied law, and began practice in 1851. In 1869 he became U. S. senator, and represented Delaware in the senate until he became secretary of state in Cleveland's first cabinet. He was several times an unsuccessful candidate for nomination to the presidency in democratic national conventions, and was appointed ambassador to England by Cleveland in 1893, serving until 1897. He was given the degree of Doctor of Civil Law by both Oxford and Cambridge Universities.

BAYARD (bā-yär), Pierre du Terrail, Seigneur de, the Chevalier sans peur et sans reproche (knight without fear and without reproach), born in 1476 in Castle Bayard, near Grenoble, in southern France. At the age of eighteen he accompanied Charles VIII. to Italy, and in the battle at Verona took a standard. When Francis I. ascended the throne he sent Bayard into Dauphiné to open a passage over the Alps and through Piedmont. Prosper Colonna lay in wait for him, but was made prisoner by Bayard, who immediately after further distinguished himself in the battle of Marignano. After his defense of Mézières against the invading army of Charles V. he was saluted in Paris as the savior of his country, receiving the honor paid to a prince of the blood. His presence reduced the revolted Genoese to obedience, but failed to prevent the expulsion of the French after the capture of Lodi. In the retreat the safety of the army was committed to Bayard, who, however, was mortally wounded by a stone from a blunderbuss in protecting the passage of the Sesia. He kissed the cross of his sword, confessed to his squire, and died, April 30, 1524. He was buried in a church of the Minorites, near Grenoble.

BAY CITY, a city in Michigan on the e. side of Saginaw river, near its mouth in Saginaw Bay, Lake Huron. Chief articles of trade, lumber and salt. Pop. 30,000.

BAYEUX TAPESTRY, so called because it was originally found in the cathedral of Bayeux, in the public library of which town it is still preserved. It is supposed to have been worked by Matilda, queen of William the Conqueror, and to have been presented by Odo, bishop of Bayeux, the half-brother of William, to the church in which it was found. It is 214 feet in length and 20 inches in breadth, and is divided into seventy-two compartments, the subject of each scene being indicated by a Latin inscription These scenes give a pictorial history of the invasion and conquest of England by the Normans, beginning with Harold's visit to the Norman court, and ending with his death at Hastings.

BAYNES (bānz), Thomas Spencer, LL.D., born at Wellington, Somerset, in 1823, died suddenly in London, 1887. In 1873 he became editor of the ninth edition of the Encyclopædia Britannica.

BAY'ONET, a straight, sharp-pointed weapon, generally triangular, intended to be fixed upon the muzzle of a rifle or

musket, which is thus transformed into a thrusting weapon: probably invented about 1640, in Bayonne. About 1690 the bayonet began to be fastened by means of a socket to the outside of the barrel, instead of being inserted as formerly in the inside. A variety of the bayonet, called the sword-bayonet, is now pretty widely used in European armies, especially for the short rifles of the light infantry, the carbines of the artillery, etc.

The coronation of Harold—Men wonder at the star—Harold on the throne.

The battle of Hastings—Portion of the Bayeux tapestry.
BAYEUX TAPESTRY.

BAYONNE CITY, a city in Hudson Co., New Jersey. Pop. 32,722.

BAYOU (bā-yō′), in the S. States, a stream which flows from a lake or other stream: frequently used as synonymous with creek or tidal channel.

BAY RUM, a spirit obtained by distilling the leaves of Myrica acris, or other West Indian trees of the same genus. It is used for toilet purposes, and as a liniment in rheumatic affections.

BAY-SALT, a general term for coarse-grained salt, but properly applied to salt obtained by spontaneous or natural evaporation of sea-water in large shallow tanks or bays.

BAY-WINDOW, a window forming a recess or bay in a room, projecting outward, and rising from the ground or basement on a plan rectangular, semi-octagonal, or semi-hexagonal, but always straight-sided. The term is, however, also often employed to designate a bow-window, which more properly forms the segment of a circle, and an oriel-window, which is supported on a kind of bracket, and is usually on the first floor.

BAZAINE (bà-zān), François Achille, French general, b. 1811, d. 1888. He served in Algeria, in Spain against the Carlists, in the Crimean war, and joined the Mexican expedition as general of division in 1862, and in 1864 was made a marshal of France. He commanded the third army corps in the Franco-German war, when he capitulated at Metz, after a seven weeks' siege, with an army of 175,000 men. For this act he was tried by court-martial in 1871, found guilty of treason, and condemned to death. This sentence was commuted to twenty years' seclusion in the Isle St. Marguerite, from which he escaped and retired to Spain.

BAZAR′, or **BAZAAR′,** in the East an exchange, market-place, or place where goods are exposed for sale, usually consisting of small shops or stalls in a narrow street or series of streets. These bazar-streets are frequently shaded by a light material laid from roof to roof, and sometimes are arched over. Marts for the sale of miscellaneous articles, chiefly fancy goods, are now to be found

The great bazar, Constantinople.

in most European cities bearing the name of bazars. The term bazar is also applied to a sale of miscellaneous articles, mostly of fancy work, and contributed gratuitously, in furtherance of some charitable or other purpose.

BEACON (bē′kon), an object visible to some distance, and serving to notify the presence of danger: commonly applied to a fire-signal set on a height to spread the news of hostile invasion or other great event; and also applied to a mark or object of some kind placed conspicuously on a coast or over a rock or shoal at sea for the guidance of vessels, often an iron structure of considerable height.

BEACONSFIELD, Benjamin Disraeli, Earl of, an eminent English statesman and novelist, of Jewish extraction; eldest son of Isaac D'Israeli, author of the Curiosities of Literature; born in London in 1804, died there in 1881, buried at Hughenden. In 1826 he published Vivian Grey, his first novel; and subsequently traveled for some time, visiting Italy, Greece, Turkey, and Syria, and gaining experiences which were afterward reproduced in his books. His travels and impressions are embodied in a volume of letters addressed to his sister and his father. In 1837 he gained an entrance to the House of Commons, being elected for Maidstone. His first speech in the house was treated with ridicule; but he finished with the prophetic declaration that the time

Lord Beaconsfield.

would come when they would hear him. During his first years in parliament he was a supporter of Peel; but when Peel pledged himself to abolish the corn-laws Disraeli became the leader of the protectionists. Having acquired the manor of Hughenden in Buckinghamshire, he was in 1847 elected for this county, and he retained his seat till raised to the peerage nearly thiry years later. His first appointment to office was in 1852, when he became chancellor of the exchequer under Lord Derby. The following year, however, the ministry was defeated. He remained out of office till 1858, when he again became chancellor of the exchequer, and brought in a reform bill which wrecked the government. During the time the Palmerston government was in office Mr. Disraeli led the opposition in the lower house with conspicuous ability and courage. In 1866 the Liberals resigned, and Derby and Disraeli came into power, the latter being again chancellor of the exchequer. They immediately brought in, and carried, after a violent and bitter struggle, a Reform Bill on the basis of household suffrage. In 1868 he became premier on the resignation of Lord Derby, but his tenure of office was short.

In 1874 he again became prime-minister with a strong Conservative majority, and he remained in power for six years. This period was marked by his elevation to the peerage in 1876 as Earl of Beaconsfield, and by the prominent part he took in regard to the Eastern question and the conclusion of the Treaty of Berlin in 1878. In 1880 parliament was rather suddenly dissolved, and, the new parliament showing an overwhelming Liberal majority, he resigned office, though he still retained the leadership of his party. Within a few months of his death the publication of a novel called Endymion (his last, Lothair, had been published ten years before) showed that his intellect was still vigorous.

BEAD (bēd), originally a prayer; then a small perforated ball of gold, pearl, amber, glass, or the like, to be strung on a thread, and used in a rosary by Roman Catholics in numbering their prayers, one bead being passed at the end of each ejaculation or short prayer.

BEAD-SNAKE, a beautiful snake of North America, inhabiting cultivated grounds, especially plantations of the sweet-potato, and burrowing in the ground. It is finely marked with yellow, carmine, and black. Though it possesses poison-fangs it never seems to use them.

BEAGLE (bē′gl), a small hound, formerly kept to hunt hares, now almost superseded by the harrier, which sometimes is called by its name. The beagle is smaller than the harrier, compactly built, smooth-haired, and with pendulous ears. The smallest of them are little larger than the lap-dog.

BEAM, a long straight and strong piece of wood, iron, or steel, especially when holding an important place in some structure, and serving for support or consolidation; often equivalent to girder. In a balance it is the part from the ends of which the scales are suspended. In a loom it is a cylindrical piece of wood on which weavers wind the warp before weaving; also, the cylinder on which the cloth is rolled as it is woven. In a ship one of the strong transverse pieces stretching across from one side to the other to support the decks and retain the sides at their proper distance; hence a ship is said to be "on her beam ends" when lying over on her side.

BEAN, a name given to several kinds of leguminous seeds and the plants producing them. The common bean is cultivated both in fields and gardens as food for man and beast. Beans are very nutritious, containing 36 per cent of starch and 23 per cent of nitrogenous matter called legumin, analogous to the casein in cheese. The bean is an annual from 2 to 4 feet high. The flowers are beautiful and fragrant. The kidney-bean, French bean, or haricot is a well-known culinary vegetable. There are two principal varieties, annual dwarfs and runners. The scarlet-runner bean, a native of Mexico, is cultivated on account of its long rough pods and its scarlet flowers.

BEAR, the name of several large carnivorous mammals. The teeth are forty-two in number, as in the dog, but there is no carnassial or sectorial tooth, and the molars have a more tubercular character than in other carnivores. The eyes have a nictitating membrane, the nose is prominent and mobile, and the tail very short. The true bears are about ten in number, natives chiefly of Europe, Asia, and N. America. They generally lie dormant in their den during

Brown bear.

the winter months. The brown or black bear is a native of almost all the northern parts of Europe and Asia, and was at one time common in the British islands. It feeds on fruits, roots, honey, ants, and, in case of need, on mammals. It sometimes reaches the length of 7 feet, the largest specimens being found farthest to the north. It lives solitarily. The American black bear, with black shining hair, is rarely above 5 feet in length. It is a great climber, is less dangerous than the brown bear, and is hunted for its fur and flesh. It is very amusing in captivity. The grizzly bear is an inhabitant of the

Grizzly bear.

Polar bear.

Rocky Mountains; it is a ferocious animal, sometimes 9 feet in length, and has a bulky and unwieldy form, but is nevertheless capable of great rapidity of motion. The extinct cave-bear seems to have been closely akin to the grizzly. The Siberian bear is perhaps a variety of the brown bear. The polar or white bear is an animal possessed of great strength and fierceness. It lives in the polar regions, frequents the sea, feeds on fish, seals, etc., and usually is 7 to 8 feet in length. The Malayan or coconut palm bear is perhaps the smallest of the bears. It inhabits Cochin-China, Nepaul, the Sunda Islands, etc., lives exclusively on vegetable food, and is an expert climber. It is called also sun-bear and bruang. The Indian black bear or sloth-bear of India and Ceylon is reputed to be a fierce and dangerous animal.

BEAR, Great and Little, the popular name of two constellations in the northern hemisphere. The Great Bear (Ursa Major) is situated near the pole. It is remarkable for its well-known seven stars, by two of which, called the Pointers, the pole-star is always readily found. The Little Bear (Ursa Minor) is the constellation which contains the pole-star. This constellation has seven stars placed together in a manner resembling those in the Great Bear.

BEAR-BAITING, the sport of baiting bears with dogs, formerly one of the established amusements, not only of the common people, but of the nobility and even royalty itself. The places where bears were publicly baited were called bear-gardens.

BEARD, the hair round the chin, on the cheeks, and the upper lip, which is a distinction of the male sex and of manhood. It differs from the hair on the head by its greater hardness and its form. Some nations have hardly any, others a great profusion. The latter generally consider it as a great ornament; the former pluck it out; as, for instance, the American Indians. The beard has often been considered as a mark of the sage and the priest. Moses forbade the Jews to shave their beards. With the ancient Germans the cutting off another's beard was a high offense. Even now the beard is regarded as a mark of great dignity among many nations in the East, as the Turks. Alexander the Great introduced shaving among the Greeks, by ordering his soldiers to wear no beards; among the Romans it was introduced in B.C. 296. The custom of shaving is said to have come into use in modern times during the reigns of Louis XIII. and XIV. of France, both of whom ascended the throne without a beard. Till then fashion had given divers forms of moustaches and beards. It is only in comparatively recent times that beards and moustaches have again become common.

BEARD, George Miller, an American physician, born in Connecticut in 1839. He is known for several works dealing with the nervous system. Died 1883.

BEARD, James Henry, an American artist, born at Buffalo in 1814. He painted portraits of Clay, J. Q. Adams, William Henry Harrison, President Taylor, and others, and a number of pictures, among which are The Long Bill, Out All Night, and The Land Speculator. He died in 1893.

BEARING, the direction or point of the compass in which an object is seen, or the situation of one object in regard to another, with reference to the points of the compass. Thus, if from a certain

situation an object is seen in the direction of northeast, the bearing of the object is said to be n.e. from the situation.—To take bearings, to ascertain on what point of the compass objects lie.

BEAR'S-GREASE, the fat of bears esteemed as of great efficacy in nourishing and promoting the growth of hair. The ungents sold under this name, however, are in a great measure made of hog's lard or veal fat, or a mixture of both, scented and slightly colored.

BEARDSLEY, Aubrey, a British artist who gained reputation about 1892 by his fantastic studies in highly contrasted black and white. He was born in 1874 and died in 1898.

BEAT, in music, the beating or pulsation resulting from the joint vibrations of two sounds of the same strength, and all but in unison. Also a short shake or transient grace-note struck immediately before the note it is intended to ornament.

BEATIFICATION, in the Roman Catholic Church, an act by which the pope declares a person beatified or blessed after his death. It is the first step to canonization, that is, the raising one to the honor and dignity of a saint. No person can be beatified till fifty years after his or her death. All certificates or attestations of virtues and miracles, the necessary qualifications for saintship, are examined by the congregation of Rites. This examination often continues for several years; after which his holiness decrees the beatification, and the corpse and relics of the future saint are exposed to the veneration of all good Christians.

BEATRICE PORTINARI (bā-à-trē'-chā por-tē-nä'rē), the poetical idol of Dante; born about 1266, died 1290; the daughter of a wealthy citizen of Florence, and wife of Simone de Bardi. She was but eight years of age, and Dante nine, when he met her first at the house of her father. He altogether saw her only once or twice, and she probably knew little of him. The story of his love is recounted in the Vita Nuova, which was mostly written after her death.

BEAUFORT SCALE, a measure of the velocity of the wind, taking its name from Admiral Beaufort, who introduced it into the British Navy. The following table indicates the value, in miles per hour, of the terms used in the scale:

Designation of Wind.	Approximate Wind Velocity in Miles per Hour.
Calm	3 or less
Light air	8 "
Light breeze	13 "
Gentle "	18 "
Moderate "	23 "
Fresh "	28 "
Strong "	34 "
Moderate gale	40 "
Fresh "	48 "
Strong "	56 "
Whole "	65 "
Storm "	75 "
Hurricane "	90 "

BEAUHARNAIS (bō-ar-nā), Alexandre, Viscount, was born in 1760 in Martinique. He married Joséphine Tascher de la Pagerie, who was afterward the wife of Napoleon. At the breaking out of the French revolution he was chosen a member of the National Assembly, of which he was for some time president. In 1792 he was general of the army of the Rhine. He was falsely accused of having promoted the surrender of Mainz, and was sentenced to death July 23, 1794.

BEAUHARNAIS, Eugène de, Duke of Leuchtenberg, Prince of Eichstädt, and Viceroy of Italy during the reign of Napoleon, was born 1781, died at Munich 1824. He was the son of Alexandre Beauharnais and Joséphine, afterward wife of Napoleon and Empress of France. He accompanied Napoleon to Egypt in 1798; rose rapidly in the army; was appointed viceroy of Italy in 1805; and married a daughter of the King of Bavaria in 1806. To him and to Ney France was mainly indebted for the preservation of the remains of her army during the retreat from Moscow. After the battle of Lützen of May 2, 1813, where, by surrounding the right wing of the enemy, he decided the fate of the day, he went to Italy, which he defended against the Austrians until the deposition of Napoleon. After the fall of Napoleon he concluded an armistice, by which he delivered Lombardy and all Upper Italy to the Austrians. He then went immediately to Paris, and thence to his father-in-law at Munich, where he afterward resided.—His sister Hortense Eugénie, Queen of Holland, was born in 1783, died in 1837. She became Queen of Holland by marrying Louis Bonaparte, and after Louis's abdication of the throne she lived apart from him. She wrote several excellent songs, and composed some deservedly popular airs. Napoleon III. was her third and youngest son.

BEAUMARCHAIS (bō-mär-shā), Pierre Augustin Caron de, a French wit and dramatist, was born at Paris in 1732, died 1799. He early gave striking proofs of his mechanical and also of his musical talents; attained proficiency as a player on the guitar and harp, and was appointed harp-master to the daughters of Louis XV. In the meantime he occupied himself with literature, and published two dramas—Eugénie in 1767 and Les Deux Amis in 1770. He first really distinguished himself by his Mémoires (Paris, 1774), or statements in connection with a lawsuit, which by their wit, satire, and liveliness entertained all France. The Barber of Seville (1775) and the Marriage of Figaro (1784) have given him a permanent reputation.

BEAUMONT (bō'mont), Francis, and **FLETCHER,** John, two eminent English dramatic writers, contemporaries of Shakespeare, and the most famous of literary partners. The former was born at Grace-Dieu, in Leicestershire, in 1584; died in 1616, and was buried in Westminster Abbey. — John Fletcher was born at Rye, Sussex, in 1579. He died in London of the plague, August, 1625, and was buried at St. Saviour's, Southwark. The friendship of Beaumont and Fletcher, like their literary partnership, was singularly close; they lived in the same house, and are said to have even had their clothes in common. The works that pass under their names consist of over fifty plays, a masque, and some minor poems. It is believed that all the minor poems except one were written by Beaumont. After the death of Beaumont, Fletcher continued to write plays alone or with other dramatists. It is now difficult, if not indeed impossible, to determine with certainty the respective shares of the two poets in the plays passing under their names.

BEAUMONT, William, an American surgeon, born in Connecticut in 1785, died 1853. He was the first to publish the digestive power of the stomach through observations made on the stomach of Alexis St. Martin, an opening into which had been made by a bullet wound which never healed. Beaumont's observations, even yet, are regarded as authoritative.

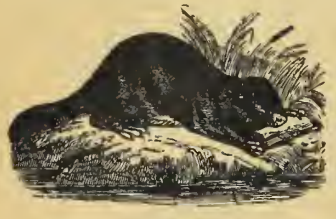
BEAUREGARD (bō'rē-gârd), Peter Gustavus Toutant, a general of the Confederate troops in the American civil war; born in 1818 near New Orleans. He studied at the military academy,

P. G. T. Beauregard.

West Point, and left it as artillery lieutenant in 1838. He served in the Mexican war, and on the outbreak of the civil war joined the Confederates. He commanded at the bombardment of Fort Sumter, gained the battle of Bull Run, lost that of Shiloh, assisted in the defense of Charleston, and aided Lee in that of Richmond. He was regarded as one of the greatest if not the greatest of Confederate generals. He died in 1893.

BEAVER, a rodent quadruped, about 2 feet in length exclusive of the tail, at one time common in the northern regions of both hemispheres, but now found in considerable numbers only in North America, living in colonies, but occurring solitary in central Europe and Asia. It has short ears, a blunt nose, small fore-feet, large webbed hind-feet, with a flat ovate tail covered with scales on its upper surface. It is valued for its fur, which used to be largely employed in the manufacture of hats, but for which silk is now for the most part substituted, and for an odoriferous secretion named castor, at one time in high repute, and still largely used in some parts of the world as an anti-spasmodic medicine. The food of the beaver consists of the bark of trees, leaves, roots, and berries. Their favorite haunts are rivers and lakes which are bordered by forests. In winter they live in houses, which are 3 to 4 feet high, are built on the water's edge, and being substantial

structures with the entrance under water afford them protection from wolves and other wild animals. These dwellings are called beaver "lodges," and accommodate a single family. They also live in burrows. They can gnaw



Beaver.

through large trees with their strong teeth, this being done partly to obtain food, partly to get materials for houses or dam-building. When they find a stream not sufficiently deep for their purpose they throw across it a dam constructed with great ingenuity of wood, stones, and mud.

BEAVER FALLS, a town in Beaver Co., Pennsylvania, 31 miles northwest of Pittsburg; on the Beaver river, near its confluence with the Ohio, and on railroads of the Pennsylvania and Erie systems. Pop. 12,000.

BEBEL, Ferdinand August, a German socialist, born at Cologne in 1840. In 1867 he, as a turner, joined in the labor agitation, and was one of the founders of the social democratic party in 1869. He was imprisoned (1872) for treason against the Kingdom of Saxony and of lèse majesti against the emperor. Since 1871 he has been a member of the German Reichstag. He has written several widely known works on socialism.

BECHUANAS, BETCHUANAS (bech-wan'az), a widely spread race of people inhabiting the central region of South Africa north of Cape Colony. They belong to the great Kaffir stem, and are divided into tribal sections. They live chiefly by husbandry and cattle rearing, and they work with some skill in iron, copper, ivory, and skins. They were led to seek British protection owing to the encroachments of the Boers. The southern portion of their territory was first placed under British protection in 1885, and subsequently the whole Bechuana country up to the Zambesi was annexed. In 1895 the southern portion (then a crown colony) was united to the Cape Colony; the remainder is still a protectorate partly under the rule of native chiefs. The area is about 386,000 sq. miles. Bechuanaland lies between the Transvaal and Matabeleland on the east and the German territory on the west. It is generally speaking flat or only slightly undulating, and is essentially a grass country, all the grasses being of a substantial and nutritious quality which stands well against drought. Surface water is scarce, but there is abundance underground which yet may be turned to account. Some parts are wooded and well watered. Gold, coal, and copper have been found.

BECK'ET, Thomas (the form à Becket is also common), archbishop of Canterbury, born in London 1117 or 1119, assassinated in Canterbury Cathedral, 29th Dec., 1170. In 1158 Henry II. appointed him high-chancellor and preceptor to his son, Prince Henry—the first instance after the Conquest of a high office being filled by a native Englishman. At this period he was a complete courtier, conforming in every respect to the humor of the king. He was, in fact, the king's prime companion, held splendid levees, and courted popular applause. On the death of Theobald, 1162, he was consecrated archbishop, when he affected an extraordinary austerity of character, and appeared as a zealous champion of the church against the aggressions of the king, whose policy was to have the clergy in subordination to the civil power. Becket was forced to assent to the "Constitutions of Clarendon," but a series of bitter conflicts with the king followed, ending in Becket's flight to France, when he appealed to the pope, by whom he was supported. After much negotiation a sort of reconciliation took place in 1170, and Becket returned to England, resumed his office, and renewed his defiance of the royal authority. A rash hint from the king induced four barons, Reginald Fitz-Urse, William de Tracy, Hugh de Morville, and Richard Breto, to go to Canterbury and murder the archbishop while at vespers in the cathedral. He was canonized in 1172, and the splendid shrine erected at Canterbury for his remains was, for three centuries, a favorite place of pilgrimage.

BECQUEREL (bek-rel), Antoine César, French physicist, born 1788, died 1878. He served as an officer of engineers, and retired in 1815, after which he devoted himself to the study of electricity, especially electro-chemistry. He refuted the "theory of contact" by which Volta explained the action of his pile or battery. Becquerel may be considered one of the creators of electro-chemistry.

BED, BEDSTEAD, an article of furniture to sleep or rest on. The term bed properly is applied to a large flat bag filled with feathers, down, wool, or other soft material, and also to a mattress supported on spiral springs or form of elastic chains or wirework which is raised from the ground on a bedstead. The term, however, sometimes includes the bedstead or frame for supporting the bed. The forms of beds are necessarily very various—every period and country having its own form of bed. Air-beds and water-beds are much used by invalids.

BED, in geol., a layer or stratum, usually a stratum of considerable thickness.

BEDBUG. See Bug.

BED'FORD, a parl. and municip. borough, England, county town of Bedfordshire, on the Ouse. John Bunyan was born at Elstow, a village near the town, and it was at Bedford that he lived, preached, and was imprisoned. Bedford sends one member to parliament. Pop. 35,144.—Bedfordshire, or Beds, the county, is bounded by Northampton, Bucks, Herts, Cambridge, and Huntingdon; area, 295,509 acres, of which 260,000 are under tillage or in permanent pasture. Chalk hills, forming a portion of the Chilterns, cross it on the s.; n. of this is a belt of sand. Pop. 171,249.

BED'LAM, a corruption of Bethlehem (Hospital), the name of a religious house in London, converted, after the general suppression by Henry VIII., into a hospital for lunatics. The lunatics were at one time treated as little better than wild beasts, and hence Bedlam came to be typical of any scene of wild confusion.

BEDOUINS (bed-ụ-ēnz'), a Mohammedan people of Arab race inhabiting chiefly the deserts of Arabia, Syria, Egypt, and North Africa. They lead a nomadic existence in tents, huts, caverns, and ruins, associating in families under sheiks or in tribes under emirs.

Bedouin Arabs.

In respect of occupation they are only shepherds, herdsmen, and horse-breeders, varying the monotony of pastoral life by raiding on each other and plundering unprotected travelers whom they consider trespassers. They are ignorant of writing and books, their knowledge being purely traditional and mainly genealogical. They are lax in morals, and unreliable even in respect of the code of honor attributed to them in poetry and fiction. In stature they are undersized, and, though active, they are not strong. The ordinary dress of the men is a long shirt girt at the loins, a black or red and yellow handkerchief for the head, and sandals; of the women, loose drawers, a long shirt, and a large dark-blue shawl covering the head and figure. The lance is the favorite weapon.

BEDSTEAD. See Bed.

BEE, the common name given to a large family of winged insects, of which the most important is the common hive or honey bee. It belongs to the warmer parts of the eastern hemisphere, but is now naturalized in the western. A hive commonly consists of one mother or queen, from 600 to 800 males or drones, and from 15,000 to 20,000 working bees, formerly termed neuters, but now known to be imperfectly-developed females. The last-mentioned, the smallest, have twelve joints to their antennæ, and six abdominal rings, and are provided with a sting; there is, on the outside of the hind-legs, a smooth hollow, edged with hairs, called the basket, in which the kneaded pollen or bee-bread, the food of the larvæ, is stored for transit. The queen has the same characteristics, but is of larger size, especially in the abdomen; she has also a sting. The males, or drones, differ from both the

preceding by having thirteen joints to the antennæ; a rounded head, with larger eyes, elongated and united at the summit; and no stings. According to Huber the working-bees are themselves divisible into two classes: one, the cirières, devoted to the collection of provisions, etc.; the other, smaller and more delicate, employed exclusively within the hive in rearing the young. The mouth of the bee is adapted for both masticatory and suctorial purposes, the honey being conveyed thence to the anterior stomach or crop, communicating with a second stomach, in which alone a digestive process can be traced. The queen, whose sole office is to propagate the species, has two large ovaries, consisting of a great number of small cavities, each containing sixteen or seventeen eggs. The inferior half-circles, except the first and last, on the abdomen of working-bees, have each on their inner surface two cavities, where the wax, secreted by the bee from its saccharine food, is formed in layers, and comes out from between the abdominal rings. Respiration takes place by means of air-tubes which branch out to all parts of the body, the bee being exceedingly sensitive to an impure atmosphere. Of the organs of sense the most important are the antennæ, deprivation of these resulting in a species of derangement. The majority of entomologists regard their function as in the first place auditory, but they are exceedingly sensitive to tactual impressions, and are apparently the principal means of mutual communication. Bees undergo perfect metamorphosis, the young appearing first as larvæ, then changing to pupæ, from which the imagos or perfect insects spring. Whether the offspring are to be female or male is said to be dependent upon the contact or absence of contact of the egg with the impregnating fluid received from the male and stored in a special sac communicating with the oviduct, unfertilized eggs producing males. The further question whether the offspring shall be queens or workers is resolved by the influence of environment upon function. The enlargement of a cell to the size of a royal chamber and the nourishment of its inmate with a special kind of food appear to be sufficient to transform an ordinary working-bee larva into a fully-developed female or queen-bee. The season of fecundation occurs about the beginning of summer, and the laying begins immediately afterward, and continues until autumn; in the spring as many as 12,000 eggs may be laid in twenty-four days. Those laid at the commencement of fine weather all belong to the working sort, and hatch at the end of four days. The larvæ acquire their perfect state in about twelve days, and the cells are then immediately fitted up for the reception of new eggs. The eggs for producing males are laid two months later, and those for the females immediately afterward. This succession of generations forms so many distinct communities, which, when increased beyond a certain degree, leave the parent hive to found a new colony elsewhere. Thus three or four swarms sometimes leave a hive in a season. A good swarm is said to weigh at least 6 or 8 pounds. See Apiary.

The humble-bees, or bumble-bees, of which about forty species are found in Britain and over sixty in N. America, are almost world-wide in their distribution. Of these species solitary females which have survived the winter commence constructing small nests when the weather begins to be warm enough; some of them going deep into the earth in dry banks, others preferring heaps of stone or gravel, and others choosing always some bed of dry moss. In the nest the bee collects a mass of pollen and in this lays some eggs. The cells in these nests are not the work of the old bee, but are formed by the young insects similarly to the cocoons of silk-worms; and when the perfect insect is released from them by the old bee, which gnaws off their tops, they are employed as honey-cups. The humble-bees, however, do not store honey for the winter, those which survive till the cold weather leaving the nest and penetrating the earth, or taking up some other sheltered position, and remaining there till the spring. The first brood consists of workers, and successive broods are produced during the summer.

BEECH, the common name of trees well known in various parts of the world. The wood is hard and brittle, and if exposed to the air liable soon to decay. It is, however, peculiarly useful to cabinet-makers and turners, carpenters' planes, furniture, sabots, etc., being made of it; and it is durable under water for piles and mill-sluices.

BEECHER (bē'chèr), Henry Ward, an eminent American preacher, born in Connecticut 1813; was minister at Lawrenceburg, Ind., 1837, and of Plymouth Congregational Church, Brooklyn, New York, in 1847. The latter pulpit he continued to occupy till his death in 1887, though in 1882 he ceased his formal connection with the Congregationalists on the ground of disbelief in eternal punishment. From 1861 to 1863 he was editor of the Independent, and for about ten years after 1870, of the Christian Union. He was also the author of a considerable number of works, of which his Lectures to Young Men (1850), Life Thoughts (1858), Lectures on Preaching (1872–74), and the weekly issues of his sermons, commanded wide circulation. Few contemporary preachers appealed to as large and diverse a public. His brothers Charles, Edward, and Thomas have all distinguished themselves as Congregational clergymen. His sister Catherine Esther (born 1800, died 1878) did much for the education of women, and wrote on this subject and on domestic economy and kindred subjects. Another sister is still better known as Mrs. Beecher-Stowe. See Stowe.

Henry Ward Beecher.

BEEFSTEAK CLUBS, certain noted clubs of London in the 18th century, particularly the Sublime Society of Steaks, founded in 1735, to which belonged Thornhill, Hogarth, Garrick, and other celebrities of the day. There is a Beefsteak Club at present in London. The New York Beefsteak Club and the Gridiron Club of Washington were founded by newspaper and periodical writers.

BEEF TEA, a drink made from an extract of beef, formerly believed to be quite nutritious but no longer considered so. It is made by placing chopped lean beef in a mason jar, closing the same, and placing the jar in cold water which is brought to boiling and kept there until the meat is reduced to liquid. Beef tea is sometimes made from solid beef extracts, but its food value is problematical.

BEE-KEEPING, the art of hiving honey bees and securing the honey. The bee hive to be successful should be located in a place near to flowers or clover; glass, wood, and straw are good materials for the hive; facilities for increasing the space should be regarded; care should be taken that the swarm should not roam away and be lost; twenty pounds of honey should be left in the hive for the winter food of the bees, although ale boiled with sugar is a good substitute. In removing the honey gloves and veils should be worn as protection from the insects' stings.

BEER MONEY. A peculiar payment to non-commissioned officers and soldiers in the British Army, established in the year 1800, at the suggestion of the Duke of York. It consisted of one penny per day for troops when on home service, as a substitute for an issue of beer and spirits. It continued as an addition to the daily pay until 1873, when, the stoppages for rations having been abolished, the opportunity was taken to consolidate beer money and pay proper.

BEELZEBUB (bē-el'zē-bub), the supreme god of the Syro-Phœnician peoples, in whose honor the Philistines had a temple at Ekron. With his name may be compared the epithet "averter of flies" applied to Zeus and later to Hercules. The use of Beelzebul in the New Testament has been the subject of much discussion, some asserting it to be an opprobrious form of Beelzebub, meaning the "lord of dung," others translating it "lord of the dwelling," and others again finding in the change from b to l only a natural linguistic modification.

BEER. See Ale and Brewing.

BEERSHE'BA, the place where Abraham made a covenant with Abimelech, and in common speech representative of the southernmost limit of Palestine, near which it is situated. It is now a mere heap of ruins near two large and five smaller wells, though it was a place of some importance down to the period of the Crusades.

BEESWAX, a solid fatty substance secreted by bees, and containing in its purified state three chemical principles —myricin, cerin, and cerolein. It is not collected from plants, but elaborated from saccharine food in the body of the bee. It is used for the manufacture of candles, for modeling, and in many minor processes.

BEET, a genus of plants, distinguished by its fruit being inclosed in a tough woody or spongy five-lobed enlarged calyx. Two species only are known in general cultivation, namely, the sea-beet and the garden beet. The former is a tough-rooted perennial, sometimes cultivated for its leaves, which are an excellent substitute for spinach. Of the garden beet, which differs from the last in being of only biennial duration and in forming a tender fleshy root, two principal forms are known to cultivators, the chard beet and the common beet. In the chard beet the roots are small, white, and rather tough, and the leaves are furnished with a broad, fleshy midrib, employed as a vegetable by the French, who dress the ribs like sea-kale under the name of poirée. The common beet includes all the fleshy-rooted varieties, such as red beet (with a fleshy large carrot-shaped root), yellow beet, sugar-beet, mangel-wurzel, etc. For garden purposes the best is the red beet. The beet requires a rich light soil. Red beet is principally used at table, but if eaten in great quantity is said to be injurious. The beet may be taken out of the ground for use about the end of August, but it does not attain its full size and perfection till the month of October.

BEET SUGAR. See Sugar.

BEETHOVEN (bā'tō-vn), Ludwig von, a great German musical composer, born at Bonn, 16th Dec., 1770, studied under his father (a tenor singer), Pfeiffer, Van der Eden, and Neefe;

Ludwig von Beethoven.

began to publish in 1783; became assistant court organist in 1785; and was sent by the Elector of Cologne to Vienna in 1792, where he was the pupil of Haydn and Albrechtsberger, and acquired a high reputation for pianoforte extemporization before the merit of his written compositions was fully understood. In or near Vienna almost all his subsequent life was spent, his artistic tour in North Germany in 1796 being the most important break. He died March 27, 1827. His later life was rendered somewhat morbid by his deafness, of which the first signs appeared in 1797. He had the head of Jove on the body of Bacchus, and there was in him a strong dash of what in a lesser man would be termed insanity, with an alternation between the highest elevation of genius and the conduct of a fool or buffoon. His best works were published after 1800, two periods being observable: the first from 1800 to 1814, comprising Symphonies 2–8; the opera Fidelio (originally Leonore), the music to Goethe's Egmont, and the overtures to Prometheus, Coriolanus, King Stephen and Fidelio; the second (in which the poetic school of musicians find the germs of the subsequent development through Schumann, Wagner, and Liszt) comprising the 9th Symphony, the Missa Solemnis, and the Sonatas Op. 101, 102, 106, 109, 110, and 111.

BEETLE, a name often used as synonymous with the term Coleoptera, but restricted by others to include all those insects that have their wings protected by hard cases or sheaths, called elytra. Beetles vary in size from a mere point to the bulk of a man's fist, the largest, the elephant beetle of S. America, being 4 inches long. The so-called "black beetles" of kitchens and cellars are not properly beetles at all, but cockroaches, and of the order Orthoptera.

BEETLE-STONE, a nodule of coprolitic ironstone, so named from the resemblance of the inclosed coprolite to the body and limb of a beetle.

BEET-ROOT. See Beet.

BEGGARS. See Vagrants.

BEGO'NIA, an extensive genus of succulent-stemmed herbaceous plants, order Begoniaceæ, with fleshy oblique leaves of various colors, and showy unisexual flowers, the whole perianth colored. They readily hybridize, and many fine varieties have been raised from the tuberous-rooted kinds. From the shape of their leaves they have been called elephant's ear. Almost all the plants of the order are tropical, and they have mostly pink or red flowers.

BEHAR', a province of Hindustan, in Bengal, area 44,139 sq. miles. It is the most densely peopled province of India; pop. 24,284,370. Patna is the capital.

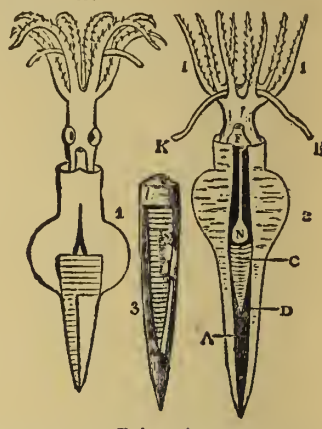
BEHEADING. See Capital Punishment.

BEHE'MOTH, the animal described in Job xl. The description is most applicable to the hippopotamus, and the word seems to be of Egyptian origin and to signify "water-ox"; but it has been variously asserted to be the ox, the elephant, the crocodile, etc.

BEH'RING. See Bering.

BELASCO, David, an American manager and playwright, born in San Francisco in 1862. He began his career as a player and began writing soon thereafter, his first successful venture being Hearts of Oak. While manager of the Lyceum Theater, New York, he wrote (with Henry C. De Mille) The Wife, The Charity Ball, and Lord Chumley. Other plays to which he has contributed are The Girl I Left Behind Me, The Heart of Maryland, Zaza, May Blossom, Men and Women, La Belle Russe, Valérie, and Du Barry.

BEL'EMNITE, a name for straight, solid, tapering, dart-shaped fossils, popularly known as arrow-heads, thunderbolts, finger-stones, etc., but in reality the internal shell or skeleton of a molluscous animal allied to the squid or sepia, and the type of an extinct family, Belemnitidæ.



Belemnites.

1. Belemnoteuthis antique—ventral side.
2. Belemnites Owenii (restored). A, Guard. C, Phragmacone. D, Muscular tissue of mantle. F, Infundibulum. I, Uncinated arms. K, Tentacula. N, Ink-bag.
3. Belemnite—British Museum.

BELFAST', a seaport and municipal and parliamentary borough of Ireland (in 1888 declared a city), principal town of Ulster, and county town of Antrim. Belfast is the center of the Irish linen trade, and has the majority of spinning-mills and power-loom factories in Ireland. Previous to about 1830 the cotton manufacture was the leading industry of Belfast, but nearly all the mills have been converted to flax-spinning. The iron ship-building trade is also of importance, and there are breweries, distilleries, flour-mills, oil-mills, foundries, print-works, tan-yards, chemical works, rope-works, etc. The commerce is large. An extensive direct trade is carried on with British North America, the Mediterranean, France, Belgium, Holland, and the Baltic, besides the regular traffic with the principal ports of the British islands. Belfast is comparatively a modern town, its prosperity dating from the introduction of the cotton trade in 1777. It has suffered severely at various times from faction-fights between Catholics and Protestants, the more serious having been in the years 1864, 1872, and 1886. It returns four members to the Imperial Parliament. Pop. 348,965.

BELFORT, a small fortified town and territory of France. Belfort, with the district immediately surrounding it, is the only part of the department of Haut Rhin which remained to France on the cession of Alsace to Germany. Pop. of territory, 91,765.

BEL'FRY, a bell-tower or bell-turret. A bell-tower may be attached to another building, or may stand apart; a bell-turret usually rises above the roof of a building, and is often placed above the top of the western gable of a church. The part of a tower containing a bell or bells is also called a belfry.

BELGAUM (bel-gä'um), a town and fortress in Hindustan, Bombay Presidency, district of Belgaum, on a plain

2500 feet above the sea-level. In 1818 the fort and town were taken by the British, and from its healthful situation selected as a permanent military station. Pop. of town (including the cantonment), 36,878. The area of the district is 4657 sq. miles, with a population of 1,013,261.

BELGIUM (bel'jum), a European kingdom, bounded by Holland, the North Sea or German Ocean, France, and Germany; greatest length, 165 miles; greatest breadth, 120 miles; area, 11,366 sq. miles. For administrative purposes it is divided into nine provinces — Antwerp, Brabant, East Flanders, West Flanders, Hainaut, Liége, Limburg, Luxemburg, and Namur; total pop. 6,815,054. Brabant, the metropolitan province, occupies the center. The capital is Brussels; other chief towns are Antwerp, Ghent, and Liége. The country may be regarded roughly as an inclined plain, falling away in height from the southern district of the Ardennes until in the n. and w. it becomes only a few feet above sea-level.

The industrial products of Belgium are very numerous, and are mostly of high character. The chief are those connected with linen, wool, cotton, metal, and leather goods. In respect of manufactures the fine linens of Flanders, and lace of South Brabant, are of European reputation. Scarcely less celebrated are the carpets and porcelain of Tournay, the cloth of Verviers, the extensive foundries, machine-works, and other iron establishments of Liége. The commerce of Belgium is large and increasing. Apart from the value of her own products, she is admirably situated for the transit trade of central Europe, to which her fine harbor of Antwerp and excellent railway and canal system minister.

The Belgian population is the densest of any European state (539 per square mile), and is composed of two distinct races—Flemish, who are of German, and Walloons, who are of French extraction. The former, by far the more numerous, have their principal locality in Flanders; but also prevail throughout Antwerp, Limburg, and part of South Brabant. The latter are found chiefly in Hainaut, Liége, Namur, and part of Luxemburg. The Flemings speak a dialect of German, and the Walloons a corruption of French, with a considerable infusion of words and phrases from Spanish and other languages. French is the official and literary language, though Flemish is also successfully employed in literature. Almost the entire population is Roman Catholic, and there are over 1500 convents, with nearly 25,000 inmates. Protestantism is fully tolerated, but cannot count more than 15,000 adherents. Improved means of education are now at the disposal of the people, every commune being bound to maintain at least one school for elementary education, the government paying one-sixth, the province one-sixth, and the commune the remainder of the expenditure. In all the large towns colleges have been established; while a complete course for the learned professions is provided by four universities, two of them, at Ghent and Liége, established and supported by the state; one at Brussels, the Free University, founded by voluntary association; and one at Louvain, the Catholic University, founded by the clergy.

By the Belgian constitution the executive power is vested in a hereditary king; the legislative, in the king and two chambers—the senate and the chamber of representatives—the former elected for eight years, and the latter for four, but one-half renewable respectively every four years and every two years. There is now a system of proportional representation both for the senate and the chamber. Representatives are elected on the principle of manhood suffrage, but certain property or educational qualifications may give a voter three votes. The senators are partly elected directly, partly indirectly by provincial councils. Senators must be forty years of age, deputies and electors twenty-five. The army is raised partly by enlistment, partly by the ballot, to which every man who has completed his nineteenth year is liable. The peace strength is about 51,500 officers and men; in time of war, 163,000. Besides this standing army, there is a garde civique numbering 40,000 partly active, partly non-active men. The navy is confined to a few steamers and a small flotilla of gun-boats.

The territory now known as Belgium originally formed only a section of that known to Cæsar as the territory of the Belgæ, extending from the right bank of the Seine to the left bank of the Rhine, and to the ocean. This district continued under Roman sway till the decline of the empire; subsequently formed part of the kingdom of Clovis; and then of that of Charlemagne, whose ancestors belonged to Landen and Herstal on the confines of the Ardennes. After the breaking up of the empire of Charlemagne Belgium formed part of the kingdom of Lotharingia under Charlemagne's grandson, Lothaire; Artois and Flanders, however, belonging to France by the treaty of Verdun.

For centuries this kingdom was contended for by the kings of France and the emperors of Germany. In 1384 Flanders and Artois fell to the house of Burgundy, which in less than a century acquired the whole of the Netherlands.

The Seven Years' War (1756–63) did not affect Belgium, and in that period, and during the peace which followed, she regained much of her prosperity under Maria Theresa and Charles of Lorraine.

In 1815 Belgium was united by the Congress of Vienna to Holland, both countries together now forming one state, the Kingdom of the Netherlands. This union lasted till 1830, when a revolt broke out among the Belgians, and soon attained such dimensions that the Dutch troops were unable to repress it. A convention of the great powers, assembled in London, favored the separation of the two countries, and drew up a treaty to regulate it; the National Congress of Belgium offering the crown, on the recommendation of England, to Leopold, prince of Saxe-Coburg, who acceded to it under the title of Leopold I., on July 21, 1831. Leopold II. succeeded his father in 1865. In recent years the chief feature of Belgian politics has been a keen struggle between the clerical and the liberal party. In 1893 a bill giving an extension of the franchise was passed. Recent years have been marked by socialistic movements and labor troubles.

BELGRADE (bel-grād'), capital of Servia, on the right bank of the Danube in the angle formed by the junction of the Save with that river, consists of the citadel or upper town, on a rock 100 feet high; and the lower town, which partly surrounds it. Being the key of Hungary, it was long an object of fierce contention between the Austrians and the Turks, remaining, however, for the most part in the hands of the Turks until its evacuation by them in 1867. Since the treaty of Berlin (July, 1878) it has been the capital of an independent state. Pop. 69,097.

BE'LIAL, a word which by the translators of the English Bible is often treated as a proper name, as in the expressions 'son of Belial," "man of Belial." In the Old Testament, however, it ought not to be taken as a proper name, but it should be translated "wickedness" or "worthlessness." To the later Jews Belial seems to have become what Pluto was to the Greeks, the name of the ruler of the infernal regions; and in 2 Cor. vi. 15 it seems to be used as a name of Satan, as the personification of all that is bad.

BELISA'RIUS (Slavonic, Beli-tzar, White Prince), the general to whom the Emperor Justinian chiefly owed the splendor of his reign; born in Illyria about 505 A.D. He served in the body-guard of the emperor, soon after obtained the chief command of an army on the Persian frontiers, and in 530 gained a victory over a superior Persian army. The next year, however, he lost a battle, and was recalled. In the year 532 he checked the disorders in Constantinople arising from the Green and Blue factions; and was then sent with 15,000 men to Africa to recover the territories occupied by the Vandals. He took Carthage and led Gelimer, the Vandal king, in triumph through Constantinople. Dissensions having arisen in the Ostrogothic kingdom, he was sent to Italy, and though ill supplied with money and troops, stormed Naples, held Rome for a year, took Ravenna, and led captive Vitiges, the Gothic king. He died in 565.

BELL, a hollow, somewhat cup-shaped sounding-instrument of metal. The metal from which bells are usually made (by founding) is an alloy, called bell-metal, commonly composed of eighty parts of copper and twenty of tin. The proportion of tin varies, however, from one-third to one-fifth of the weight of the copper, according to the sound required, the size of the bell, and the impulse to be given. The clearness and richness of the tone depend upon the metal used, the perfection of its casting, and also upon its shape; it having been shown by a number of experiments that the well-known shape with a thick lip is the best adapted to give a perfect sound. The depth of

the tone of a bell increases in proportion to its size. A bell is divided into the body or barrel, the ear or cannon, and the clapper or tongue. The lip or sound-bow is that part where the bell is struck by the clapper. Among the more famous bells are the bell of Cologne, 11 tons, 1448; of Dantzic, 6 tons, 1453; of Halberstadt, 7½, 1457; of Rouen, 16, 1501; of Breslau, 11, 1507; of Lucerne, 7½, 1636; of Oxford, 7½, 1680; of Paris, 12½, 1680; of Bruges, 10¼, 1680; of Vienna, 17¾, 1711; of Moscow (the monarch of all bells), 193, 1736; three other bells at Moscow ranging from 16 to 31 tons, and a fourth of 80 tons cast in 1819; the bell of Lincoln (Great Tom), 5½, 1834; of York Minster (Great Peter), 10¾, 1845; of Montreal, 13½, 1847; of Westminster (Big Ben), 15½, 1856, (St. Stephen), 13½, 1858; the Great Bell of St. Paul's, 17½, 1882. Others are the bells of Ghent (5), Görlitz (10¾), St. Peter's, Rome (8), Antwerp (7½), Olmutz (18), Sacred Heart, Paris (27), Novgorod (31), Pekin (53½).

Besides their use in churches bells are employed for various purposes, the most common use being to summon attendants or domestics in private houses, hotels, etc.

Bells, as the term is used on shipboard, are the strokes of the ship's bell that proclaim the hours. Eight bells, the highest number, are rung at noon and every fourth hour afterward, i.e. at 4, 8, 12 o'clock, and so on. The intermediary periods are indicated thus: 12:30, one bell; 1 o'clock, 2 bells; 1:30, 3 bells, etc., until the eight bells announce 4 o'clock, when the series recommences 4:30, one bell; 5 o'clock, two bells, etc. The even numbers of strokes thus always announce hours, the odd numbers half-hours.

BELL, Alexander Graham, an American inventor, born at Edinburgh, Scotland, in 1847, and educated at London university. In 1870 he came to Canada with his father and assisted him in the

Alexander Graham Bell.

instruction of the deaf and dumb. In 1872, while teaching vocal physiology in Boston University, he began the experiments that led up to the invention, by him, of the Bell telephone. His claims were disputed by other inventors, but the Supreme court of the United States upheld him and he has since that time enjoyed a monopoly of the telephone in the United States. He is a member of numerous learned societies and has published many important papers on phonetics and acoustics.

Mr. Bell has visited Europe a number of times, and has been received with much honor by foreign societies and distinguished individuals. His inventions, other than the telephone, have been mainly of scientific interest. Personally, he is a most courteous, suave, and considerate man, democratic and willing to speak freely of his great achievements.

BELL, Sir Charles, anatomist and surgeon, was born at Edinburgh in 1774. In 1804 he went to London, and soon distinguished himself as a lecturer on anatomy and surgery. In 1814 he was appointed surgeon to the Middlesex Hospital, and in 1821 he communicated to the Royal Society a paper on the nervous system, containing among other things the important discovery that the nerve-filaments of sensation are distinct from those of motion. It at once attracted general attention and established his reputation. He died suddenly in 1842.

BELL, Henry, the first successful applier of steam to the purposes of navigation in Europe, was born in Linlithgowshire 1767, died at Helensburgh 1830. In 1798 he turned his attention specially to the steamboat, the practicability of steam navigation having been already demonstrated. In 1812 the Comet, a small thirty-ton vessel built at Glasgow under Bell's directions, and driven by a three horse-power engine made by himeslf, commenced to ply between Glasgow and Greenock, and continued to run till she was wrecked in 1820. This was the beginning of steam navigation in Europe. It has been asserted that Fulton, who started a steamer on the Hudson in 1807, obtained his ideas from Bell in the previous year. Bell is also credited with the invention of the "discharging machine" used by calico-printers. A monument has been erected to his memory at Dunglass Point on the Clyde.

BELL, John, an American statesman, born at Nashville, Tenn., 1797, died 1869. In 1860 he was nominated for the presidency by the constitutional Union party, and subsequently took sides with the Confederacy.

BELLADON'NA, or deadly nightshade. It is native in Britain. All parts of the plant are poisonous, and the incautious eating of the berries has often produced death. The inspissated juice is commonly known by the name of extract of belladonna. It is narcotic and poisonous, but is of great value in medicine, especially in nervous ailments. It has the property of causing the pupil of the eye to dilate. The fruit of the plant is a dark brownish-black shining berry. The name signifies "beautiful lady," and is said to have been given from the use of the plant as a cosmetic.

BELLAMY, Edward, an American socialist, author of Looking Backward (1888), and Equality (1897). He was born at Chicopee Falls, Mass., in 1850, and died there 1898. He began his career as a journalist. The publication of Looking Backward familiarized the American people with the central doctrine of socialism, and attempt was made to propogate the doctrine by means of nationalist clubs, but failed.

BELLARY (bel-ā'ri), a town in India, presidency of Madras, capital of a district of the same name, 280 miles northwest of Madras; a military station, with a fort crowning a lofty rock, and other fortifications. Pop. (incl. cantonment) 58,247.—The district was ceded to the British in 1800. Area, 5975 square miles; pop. 900,126.

BELL, BOOK, AND CANDLE, a solemn mode of excommunication used in the R. Cath. Ch. After the sentence was read, the book was closed, a lighted candle thrown to the ground, and a bell tolled as for one dead.

BELL-CRANK, in machinery, a rectangular lever by which the direction of motion is changed through an angle of 90°, and by which its velocity-ratio and range may be altered at pleasure by making the arms of different lengths. It is much employed in machinery, and is named from its being the form of crank employed in changing the direction of the bell-wires of house-bells.

BELLE-ISLE (bel-īl'), a rocky island, 9 miles long, at the eastern entrance to the Straits of Belle-Isle, the channel, 15 miles wide, between Newfoundland and the coast of Labrador. Steamers from Glasgow and Liverpool to Quebec round the north of Ireland commonly go by this channel in summer as being the shortest route.

BELL-RINGING, the art by which large bells are rung so as to produce pleasant sounds, successions of such sounds, or a vast assemblage of simultaneous sounds. By pulling the bell rope to different lengths a change is made in the sound, depending on the swing of the bell and the force with which the clapper strikes it. Rope-ringing has been abandoned in the great churches in the United States, such as St. Patrick's, New York, and other cathedrals. These bells are now rung by electricity, but the effect is not half so stirring as by the old method. The art made rapid progress, and rings of bells increased from five or six to ten or twelve, the latter being the greatest number ever rung in peal. The variety of changes increases enormously with the increase in the number of bells. Six changes can be rung on three bells; on four, four times as many; and so on until with twelve bells the enormous number of 479,001,600 different changes can be rung. Bell-ringing has an interesting system of nomenclature. The simplest peals are those called grandsire on an odd number of bells, and bob on an even number. Changes on three bells are called rounds; on four, changes or singles; on five, doubles or grandsires; on six, bobs minor; on seven, grandsire triples; on eight, bobs major; on nine, grandsire caters; on ten, bobs royal; on eleven, grandsire cinques; on twelve, bobs maximus. A bell is set when its mouth is turned upward; at hand stroke when set up so far that

only the tuffing or sallic is held by the ringer; at back stroke when rung so far round that the end of the rope is held. The treble bell is the highest, the tenor the lowest of a set. Five thousand changes are a peal; any smaller number constitutes a touch or flourish, i.e. a practice rather than a performance.

BELLES-LETTRES (bel-let-r), polite or elegant literature: a word of somewhat vague signification Rhetoric, poetry, fiction, history, and criticism, with the languages in which the standard works in these departments are written, are generally understood to come under the head of belles-lettres.

BELLEVILLE (bel-vil'), a city in Illinois, county seat of St. Clair Co., with important manufactures, and a large rolling-mill. Pop. 19,000.

BELLEW, Harold Kyrle, a British player, born in England in 1857. He was at first a sailor, then a journalist and lecturer, and in Australia became an actor. His success, after his return to England, was speedy. In 1885 he first came to America, and appeared at Wallack's, New York, in In His Power. Two years later he began his connection with Mrs. James Brown Potter. Together they played Hero and Leander (written by Mr. Bellew), Charlotte Corday, Romeo and Juliet, and other plays. He has several times visited Australia.

BELLIG'ERENT, a term denoting that a government or state is waging war. Belligerency is a technical term in international law and is recognized by other states when the belligerents have proved that they are capable of carrying on a war. A community need not be independent to be recognized as belligerent, as in the case of Cuba, the American colonies, and other communities who fought for and won their independence. Belligerent rights are often accorded to the two powers at war, as in the case of the American civil war when the United States and the Confederacy were both recognized with prejudice by European powers.

BELLINI (bel-ē'nē), Jacopo, and his two sons, Gentile and Giovanni, the founders of the Venetian school of painting. The father excelled in portraits, but very little of his work is extant. He died about 1470. Gentile was born in 1421, and in 1479 went to Constantinople, Mohammed II. having sent to Venice for a skilful painter; died at Venice in 1501. Giovanni was born about 1424, and died about 1516.

BELLINI (bel-ē'nē), Vincenzo, a celebrated composer, born at Catania in Sicily in 1802, died 1835. His most celebrated works are I Montecchi e Capuleti (1829); La Sonnambula (1831); Norma, his best and most popular opera; and I Puritani (1834).

BEL'LOWS, an instrument or machine for producing a strong current of air, and principally used for blowing fires, either in private dwellings or in forges, furnaces, mines, etc. It is so formed as, by being dilated and contracted, to inhale air by an orifice which is opened and closed with a valve, and to propel it through a tube upon the fire. It is an ancient contrivance, being known in Egypt, India, and China many ages ago, while forms of it are used among savage tribes in Africa.

BELLUNO (bel-lō'nō), a city of northern Italy, capital of a province of the same name, on the Piave, 48 miles north of Venice. Pop. 16,000.—The province has an area of 1271 sq. miles, and a pop. of 195,419.

BEL'MONT, a village in Missouri, opposite Columbus, Ky., on the Mississippi, noted for being the spot where General Ulysses S. Grant won his first battle in the American civil war. Grant's force was 3000, against 7000 Confederates. The casualties on the Union side were 485, Confederate 642.

BELMONT, August, an American capitalist, born 1816 in Germany, died 1890. He was prominent as a banker, sportsman, and diplomatist.

BELMONT, Perry, an American financier and politician, son of August Belmont. He was born in New York in 1851, was democratic member of congress 1881–87, and United States minister to Spain 1887–88.

BELOIT, a city in Rock Co., Wis., 91 miles northwest of Chicago, Ill., on Rock river, and on the Chicago, Milwaukee and Saint Paul, and the Chicago and Northwestern railroads. Pop. 12,000.

BELSHAZ'ZAR, the last of the Babylonian kings, who reigned conjointly with his father Nabonadius. He perished B.C. 538, during the successful storming of Babylon by Cyrus. This event is recorded in the book of Daniel; but it is difficult to bring the particulars there given into harmony with the cuneiform inscriptions.

BELT, BELTING, a flexible endless band, or its material, used to transmit motion or power from one wheel, roller, or pulley to another, and common in various kinds of machinery. Driving belts are usually made of leather or india-rubber, or some woven material, but ropes and chains are also used for the same purpose.

BELT, The Great and Little, two straits connecting the Baltic with the Cattegat, the former between the islands of Zealand and Funen, about 18 miles in average width; the latter between Funen and the coast of Schleswig, at its narrowest part not more than a mile in width.

BELUGA (be-lō'ga), a kind of whale or dolphin, the white whale or white fish, found in the northern seas of both hemispheres. It is from 12 to 18 feet in length, and is pursued for its oil (classed as "porpoise oil") and skin. In swimming the animal bends its tail under its body like a lobster, and thrusts itself along with the rapidity of an arrow. A variety of sturgeon found in the Caspian and Black Sea is also called beluga.

BELZO'NI, Giovanni Battista (John Baptist), an enterprising traveler, was born at Padua in 1778, and died near Benin 1823. In 1803 he emigrated to England. In 1815 he visited Egypt, where he made a hydraulic machine for Mehemet Ali. He then devoted himself to the exploration of the antiquities of the country, being supplied with funds by Mr. Salt, the British consul-general. He succeeded in transporting the bust of Memnon (Rameses II.) from Thebes to Alexandria, from whence it came to the British Museum; explored the great temple of Rameses II. at Abu-Simbel; opened the tomb of Seti I., from which he obtained the splendid alabaster sarcophagus bought by Sir John Soane; and he also succeeded in opening the second (King Chephren's) of the pyramids of Ghizeh. He afterward visited the coasts of the Red Sea, the city of Berenice, Lake Mœris, the Lesser Oasis, etc. The narrative of his discoveries and excavations in Egypt and Nubia was received with general approbation. He died during a projected journey to Timbuctoo.

BEN, a prepositive syllable signifying in composition "son of," found in many Jewish names, as Bendavid, Benasser, etc.—Beni, the plural, occurs in several modern names and in the names of many Arabian tribes.

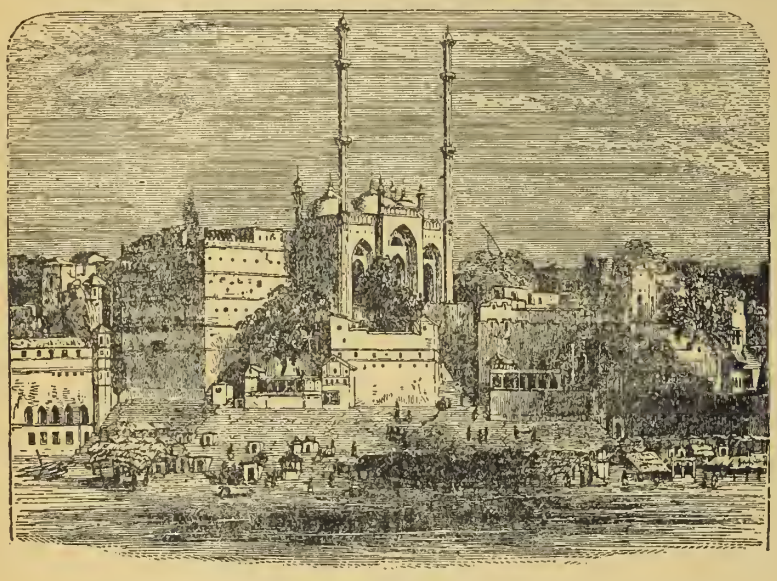
BENARES (be-nä'rez), a town in Hindustan, in the United Provinces, administrative headquarters of a district and division of the same name, on the left bank of the Ganges, from which it rises like an amphitheater, presenting a splendid panorama of temples, mosques, palaces, and other buildings with their domes, minarets, etc. Fine ghauts lead down to the river. It is one of the most sacred places of pilgrimage in all India, being the headquarters of the Hindu religion. The principal temple is dedicated to Siva, whose sacred symbol it contains. It is also the seat of government and other colleges, and of the missions of various societies. Benares carries on a large trade in the produce of the district and in English goods, and manufactures silks, shawls, embroidered cloth, jewelry, etc. The population, including the neighboring cantonments, at Sikraul (Secrole), in 1901, was 209,331. The commissionership or division has an area of 10,414 sq. miles, and a pop. of 5,032,669, of whom 76.53 per cent depend on agriculture. —The district has an area of 1099 sq. miles, and a pop. of 882,972.

BENCH WARRANT, a warrant for the arrest of an indicted person, issued by a court of record. The process, in most of the United States, is regulated by statute. It is often used for the arrest of persons who have been adjudged guilty of contempt.

BENEDIC'ITE, the canticle in the Book of Common Prayer in the morning service, also called the Song of the Three Holy Children: "O, all ye works of the Lord, bless ye the Lord." It comes from the Septuagint version of Daniel.

BEN'EDICT, the name of fourteen popes, the first of the name succeeding to the papal chair on the death of John III. in 574. The first deserving of notice is Benedict IX., who succeeded John XIX. in 1033, being placed on the papal throne as a boy of twelve years. His licentiousness caused him to be ignominiously expelled by the citizens, who elected Sylvester III. Six months after he regained the ascendency, and excommunicated Sylvester; but, finding the general detestation too strong to permit him to resume his chair, sold it to John Gratianus, who assumed the title of Gregory VI. There was thus a

trio of popes, and the emperor, Henry III., to put an end to the scandal, deposed all the three. He died in 1054.—Benedict XIII., a learned and well-disposed man, originally Cardinal Orsini and Archbishop of Benevento, became



Benares, from the river.

pope in 1724. He bestowed his confidence on Cardinal Coscia, who was unworthy of it, and abused it in gratifying his avarice. He died in 1730, and was succeeded by Clement XII.—Benedict XIV., Prospero Lambertini, born at Bologna in 1675, died 1758, a man of superior talents, passionately fond of learning, of historical researches, and monuments of art. Benedict XIII. made him, in 1727, bishop of Ancona; in 1728 cardinal; and in 1732 archbishop of Bologna. In every station he fulfilled his duties with the most conscientious zeal. He succeeded Clement XII. in 1740, and showed himself a liberal patron of literature and science. He was the author of several esteemed religious works.

BENEDICT, St., the founder of the first religious order in the West; born at Nursia, in the province of Umbria, Italy, A.D. 480, died 543. In early youth he renounced the world and passed some years in solitude, acquiring a great reputation for sanctity. His Regula Monachorum, in which he aimed, among other things, at repressing the irregular lives of the wandering monks, gradually became the rule of all the western monks. Under his rule the monks, in addition to the work of God (as he called prayer and the reading of religious writings), were employed in manual labor, in the instruction of the young, and in copying manuscripts, thus preserving many literary remains of antiquity. See Benedictines.

BENEDIC'TINE, a liquor prepared by the Benedictine monks of the abbey of Fécamp, in Normandy, consisting of spirit (fine brandy) containing an infusion of the juices of plants, and said to possess digestive, antispasmodic, and other virtues, and to have prophylactic efficacy in epidemics. Made in the same way since 1510.

BENEDICTINES, members of the most famous and widely-spread of all the orders of monks, founded at Monte Casino, about half-way between Rome and Naples, in 529, by St. Benedict. No religious order has been so remarkable for extent, wealth, and men of note and learning as the Benedictines. Among the branches of the order the chief were the Cluniacs, founded in 910 at Clugny in Burgundy; the Cistercians, founded in 1098, and reformed by St.

Benedictine monk.

Bernard in 116; and the Carthusians from the Chartreuse, founded by Bruno about 1080. The order was probably introduced into England about 600 by St. Augustine of Canterbury, and a great many abbeys, and all the cathedral priories of England, save Carlisle, belonged to it. In Britain the Benedictines were called Blackfriars, from the color of their habit, which consisted of a loose black gown with large wide sleeves, and a cowl on the head ending in a point. The Benedictines have produced many valuable literary works. The fraternity of St. Maur, founded in 1618, had in the beginning of the 18th century 180 abbeys and priories in France, and acquired by means of its learned members, such as Mabillon Montfaucon, and Martène, merited distinction. They published the celebrated chronological work L'Art de Verifier les Dates, and edited many ancient authors.

BENEDIC'TION, the ceremony of calling a divine blessing upon an individual, a thing, a place, a community, or an undertaking. Invoking a blessing is one of the oldest of customs, and has been practiced by pagans as well as Christians. The pontifical blessing is a special benediction given by the pope of Rome.

BENEFIT SOCIETIES, organizations for the purpose of securing a cheap, mutual life insurance, to pay funeral expenses, to provide for old age, or other beneficent end. Many labor unions have benefit funds which are applied to members during illness or other specified incapacity. These organizations are more numerous in the United States than elsewhere, and are regarded as an evidence of prosperity.

BENEVEN'TO, a city of southern Italy, the see of an archbishop, in a province of same name, on a hill between the rivers Sabato and Calore, occupying the site of the ancient Beneventum, and largely built of its ruins. Few cities have so many remains of antiquity, the most perfect being a magnificent triumphal arch of Trajan, built in 114. The cathedral is a building of the 12th century in the Lombard-Saracenic style. Pop. 21,631.—The province has an area of 680 sq. miles, and a pop. of 238,425.

BENEV'OLENCES, a means of raising money by forced loans or contributions, first adopted by Edward IV., and employed frequently down to the time of James I.

BENGAL (ben-gal'), a name formerly given to one of the three "presidencies" of British India which included the whole of British India except what was under the governors of Madras and Bombay. Latterly in this sense the term had no administrative meaning except as regards the army. By Bengal is now usually understood the Lieutenant-governorship of Bengal, the most important of the local governments of British India. It comprises the united deltas of the Ganges and Brahmaputra, and stretches north to Nepaul and Sikkim, west to the United Provinces, east to Assam, and south to the Bay of Bengal. The divisions of which it is made up are the Presidency (Calcutta, etc.), Dacca, Chittagong, Rajeshahye, Bhaugulpore, Patna, Burdwan, Chota Nagpur, and Orissa; total area, 151,185 sq. miles; pop. 74,744,866. The feudatory states connected with it have an aggregate area of 38,652 sq. miles, and a pop. of 3,748,544.

As a whole Bengal consists of plains, there being few remarkable elevations, though it is surrounded with lofty mountains. It is intersected in all di-

rections by rivers, mostly tributaries of its two great rivers the Ganges and Brahmaputra, which annually, in June and July, inundate a large part of the region. These annual inundations render the soil extremely fertile, but in those tracts where this advantage is not enjoyed the soil is thin, seldom exceeding a few inches in depth.

The climate is variable, the heat being often extreme and great humidity prevailing The seasons are called hot (March to June), rainy (June to October), and cold (the remainder of the year). In eastern Bengal there is an annual fall of 100 inches of rain. Products are rice, fruits, indigo, opium, sugar, tobacco, cotton, jute, tea, and cinchona. Forests abound. Wild animals of numerous variety are found in them. The minerals are iron, coal, and salt. Manufactures, cotton piece goods, jute, and silk. The people of Bengal are principally Hindus and Burmese. Hinduism and Mohammedanism are the religions.

The first of the East India Company's settlements in Bengal were made early in the 17th century. The rise of Calcutta dates from the end of the same century. The greater part of Bengal came into the hands of the East India Company in consequence of Clive's victory at Plassy in 1757, and was formerly ceded to the Company by the Nabob of Bengal in 1765. Chittagong had previously been ceded by the same prince, but its government under British administration was not organized till 1824. Orissa came into British hands in 1803. In 1858 the country passed to the crown, and since then the history of Bengal has been, on the whole, one of steady and peaceful progress.

BENGAL, BAY OF, that portion of the Indian Ocean which lies between Hindustan and Farther India, or Burmah, Siam, and Malacca, and may be regarded as extending south to Ceylon and Sumatra. It receives the Ganges, Brahmaputra, and Irrawadi. Calcutta, Rangoon, and Madras are the most important towns on or near its coasts.

BENGA'LI, one of the vernacular languages of India, spoken by about 50,000,000 people in Bengal, akin to Sanskrit and written in characters that are evidently modified from the Devanâgari (Sanskrit). Its use as a literary language began in the 14th century with poetry. Large numbers of Bengali books are now published, as also newspapers. A large number of words are borrowed from Sanskrit literature.

BENGUELA (ben-gā'lâ), a district belonging to the Portuguese on the w. coast of South Africa; area, perhaps 150,000 sq. miles. The country is mountainous in the interior, and thickly intersected by rivers and streams. Its vegetation is luxuriant, including every description of tropical produce, and animal life is equally abundant. Copper, silver, iron, salt. sulphur, petroleum, and other minerals are found. The natives are mostly rude and barbarous. Pop. estimated at 2,000,000.

BENJAMIN, Judah Pnilip, an American statesman, born in the West Indies in 1811, died 1884. He was educated at Yale, was, in 1840, a member of the law firm of Slidell, Benjamin, and Conrad, at New Orleans. He became famous for his ability as a lawyer, and declined a seat on the United States Supreme bench. From 1852 to 1861 he was United States senator from New Orleans, but in the latter year resigned to join with the confederacy, becoming attorney-general, secretary of war, and secretary of state in President Davis's cabinet. After the war he fled to England and was called to the English bar in 1866, and soon acquired a great reputation and a very large practice. He was known as "the brains of the Confederacy."

BENJAMIN, Park, an American lawyer and authority on patents. He was born in New York in 1849, entered the navy, resigned in 1869, studied law, and was associate editor of The Scientific American from 1872 to 1878. Since that time he has practiced law and written numerous sketches and books on scientific and pseudo-scientific subjects.

BEN'NETT, James Gordon, an American journalist, born in Banffshire, Scotland, 1795, and educated at Aberdeen. He emigrated to Halifax, Nova Scotia, in 1819 as a teacher, and went thence to Boston as a proof-reader. In 1822 he went to New York, and, after being connected with various papers, started the New York Herald in 1835. By his enterprise and not very scrupulous conduct of the journal it speedily became an enormous success, its yearly profit at his death being estimated at from a half to three-quarters of a million dollars. It was the first paper which published a daily money article and stock lists. The expedition of Stanley to Africa in 1871 in search of Livingstone was projected and supported by Bennett, who, however, died in the following year.

BENT, Silas, an American naval officer, born at St. Louis in 1820, died in 1889. He entered the navy in 1836 and served 25 years as hydrographer and meteorologist. He took part in the Seminole war and was captain under Commodore Perry in Japanese waters. He was the first to describe the Pacific stream.

BENTHAM (ben'tham), Jeremy, a distinguished writer on politics and jurisprudence, born at London in 1749; educated at Westminster and Oxford; entered Lincoln's Inn 1763. He was called to the bar, but did not pratice, and, having private means, devoted himself to the reform of civil and criminal legislation. A criticism on a passage in Blackstone's Commentaries, published under the title A Fragment on Government, 1776, brought him into notice; and it was followed by a long list of works, of which the more important were: The Hard Labour Bill, 1778; Principles of Morals and Legislation, 1780; A Defence of Usury, 1787; Introduction to the Principles of Morals and Legislation, 1789; Discourses on Civil and Penal Legislation, 1802; Treatise on Judicial Evidence, 1813; Paper relative to Codification and Public Instruction, 1817; and the Book of Fallacies, 1824. His mind, though at once subtle and comprehensive, was characterized by something of the Coleridgean defect in respect of method and sense of proportion; and he is, therefore, seen at his best in works that underwent revision at the hands of his disciples. Of these M. Dumont, by his excellent French translations and rearrangements, secured for Bentham at an early date a European reputation and influence, and his editions are still the most satisfactory. In England James Mill, Romilly, John Stuart Mill, Burton, and others of independent genius, have been among his exponents. In ethics he must be regarded as the founder of modern utilitarianism; in polity and criminal law he anticipated or suggested many practical reforms; and his whole influence was stimulating and humanizing.

BENT'LEY, Richard, an English classical scholar and critic, born 1662, died 1742. He was noted as a controversialist, and his Dissertation on the Epistles of Phalaris is a great classic in controversial style.

BENTON, James Gilchrist, an American inventor and soldier, born in New Hampshire in 1820, died 1881. He graduated from West Point and entered the army in 1842. In 1853 he perfected a gun-carriage for seacoast service, and during the civil war had charge of arsenals. He invented many devices for the perfection of firearms, the Springfield rifle being chiefly of his invention.

BENTON, Thomas Hart, an American statesman, author of Thirty Years' View (of the United States senate). He was born in North Carolina in 1782, and in 1815 settled at St. Louis and established The Missouri Inquirer. He fought several duels, killing one man, and in 1820 was chosen United States senator. He opposed the United States Bank, favored election of the President by direct popular vote, and generally allied himself with the West. Senator Benton was an advocate of abolition. He died in 1858

BEN'ZINE, a liquid hydrocarbon obtained from coal-tar and petroleum. It may also be got by distilling 1 part of crystallized benzoic acid intimately mixed with 3 parts of slaked lime. It is quite colorless, of a peculiar, ethereal, agreeable odor, is used by manufacturers of india-rubber and gutta-percha, on account of its great solvent powers, in the preparation of varnishes, and for cleaning gloves, removing grease-spots from woolen and other cloths, etc., on account of its dissolving fats and resins. It is highly inflammable.

BENZO'IC ACID, a vegetable acid obtained from benzoin and other resins and balsams, as those of Peru and Tolu. It forms light feathery needles; taste pungent and bitterish; odor slightly aromatic.

BENZOIC ETHER, a colorless oily liquid, with a feeble aromatic smell and a pungent aromatic taste, obtained by distilling together 4 parts alcohol, 2 of crystallized benzoic acid, and 1 of concentrated hydrochloric acid.

BEN'ZOIN("Javanese incense"), a solid, brittle, vegetable substance, the concrete resinous juice flowing from incisions in the stem or branches of a tree 70 or 80 feet high. In commerce several varieties are distinguished, of which the yel-

low, the Siam, the amygdaloidal—the last containing whitish tears of an almond shape—and Sumatra firsts are the finest. It is imported from Siam, Singapore, Bombay, and occasionally from

Benzoin tree.

Calcutta; it is found also in South America. The pure benzoin consists of two principal substances, viz., a resin, and an acid termed benzoic. It has little taste, but its smell is fragrant when rubbed or heated, and it is used as incense in the Greek and Roman Catholic Churches. It is insoluble in water, but soluble in alcohol, in which form it is used as a cosmetic and in pharmacy. Benzoin may be produced by the contact of alkalies with the commercial oil of bitter almonds. It is also known as benjamin, or gum benjamin.

BERANGER (bā-rän-zhā), Pierre Jean de, French lyric poet, born in Paris 19th August, 1780. Reduced to extremity, he applied in 1804 to Lucien Bonaparte for assistance, and succeeded in obtaining from him, first, a pension of 1000 francs, and five years later a university clerkship. Although as yet unprinted, many of his songs had become extremely popular, and in 1815 the first collection of them was published. A second collection, published in 1821, made him obnoxious to the Bourbon government, and in addition to being dismissed from his office in the university he was

Béranger.

sentenced to three months' imprisonment and a fine of 500 francs. A third collection appeared in 1825, and in 1828 a fourth, which subjected him to a second state prosecution, an imprisonment of nine months, and a fine of 10,000 francs. In 1833 he published his fifth and last collection, thereafter remaining silent till his death. Shortly after the revolution of February, 1848, he was elected representative of the department of the Seine in the constituent assembly, but sent in his resignation in the month of May of same year. He died at Paris on July 16, 1857.

BERAR', otherwise known as the Hyderabad Assigned Districts, a province of India, in the Deccan, under the British resident at Haidarabad; area, 17,711 sq. miles, consisting chiefly of an elevated valley at the head of a chain of ghauts. It is watered by several affluents of the Godavari and by the Tapti, and has a fertile soil, producing some of the best cotton, millet, and wheat crops in India. The two principal towns of Berar are Amràoti (pop. 39,511) and Khamgaon (12,390). Coal and iron ore are both found in the province, the pop. of which is 2,754,016. Exports, $17,281,740; imports, $10,504,515. Berar was assigned by the Nizam to the British government in 1853 in security of arrears due.

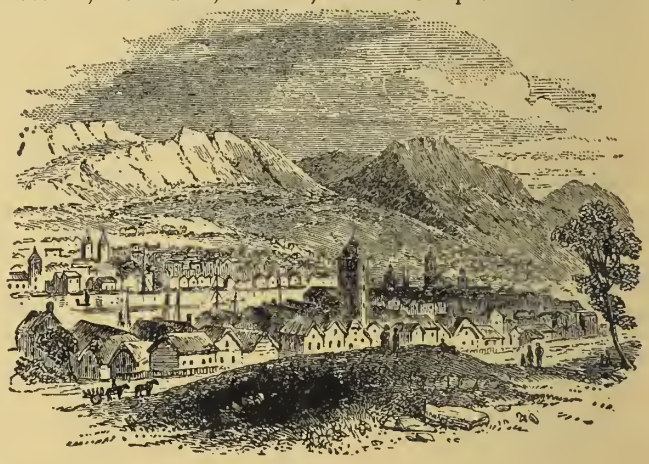
BER'BERS, a people spread over nearly the whole of northern Africa, from whom the name Barbary is derived. The chief branches into which the Berbers are divided are, first, the Amazirgh or Amazigh, of northern Morocco, numbering from 2,000,000 to 2,500,000. They are for the most part quite independent of the Sultan of Morocco. Second, the Shuluh, Shillooh, or Shellakah, who number about 1,450,000, and inhabit the south of Morocco. They are more highly civilized than the Amazirgh. Third, the Kabyles in Algeria and Tunis, who are said to number 960,000 souls; and fourth, the Berbers of the Sahara, who inhabit the oases. Among the Sahara Berbers the most remarkable are the Beni-Mzâb and the Tuaregs. To these we may also add the Guanches of the Canary Islands, now extinct, but undoubtedly of the same race. The Berbers generally are about the middle height; their complexion is brown, and sometimes almost black, with brown and glossy hair. They are sparely built, but robust and graceful; the features approach the European type. Their language has affinities to the Semitic group, but Arabic is spoken along the coast. They are believed to represent the ancient Mauritanians, Numidians, Gætulians, etc. The Berbers live in huts or houses, and practice various industries.

BER'DITCHEF, a city of European Russia, gov. of Kiev, with broad streets, well-built houses, numerous industrial establishments, and a very large trade, having largely-attended fairs. Pop. 78,287, including many Jews.

BERENICE (ber-e-nī'sē), the name of several distinguished women of antiquity; in particular the wife of Ptolemy Euergĕtes, king of Egypt. When her husband went to war in Syria she made a vow to devote her beautiful hair to the gods if he returned safe. She accordingly hung it in the temple of Venus, from which it disappeared, and was said to have been transferred to the skies as the constellation Coma Berenices. Also the wife of Mithridates the Great, king of Pontus; put to death by her husband (about 71 B.C.) lest she should fall into the hands of Lucullus.

BER'GAMO, a town of North Italy, capital of the province of Bergamo (1028 sq. miles, 390,775 inhabitants), consists of two parts, the old town situated on hills and having quite an ancient appearance, and the new town almost detached and on the plain.

BER'GAMOT, a fruit-tree, a variety or species of the genus Citrus, variously classed with the orange, Citrus Aurantium, the lime, Citrus Limetta, or made a distinct species as Citrus Bergamia.



Bergen, from the northwest.

It is probably of eastern origin, though now grown in southern Europe, and bears a pale-yellow pear-shaped fruit with a fragrant and slightly acid pulp. Its essential oil is in high esteem as a perfume.—Bergamot is also a name given to a number of different pears.

BERGEN (ber'gen), a seaport on the w. coast of Norway, the second town of the kingdom, about 25 miles from the open sea, on a bay of the Byfiord, which forms a safe harbor, shut in by hills which encircle the town on the land side, and promote perpetual rains. The trade is large, timber, tar, train-oil, cod-liver oil, hides, and particularly dried fish (stock-fish) being exported in return for corn, wine, brandy, coffee, cotton, woolens, and sugar. Pop. 72,179.

BERGH, Henry, an American philanthropist, founder of the Socicty for the Prevention of Cruelty to Children, and of the Society for the Prevention of Cruelty to Animals. He was born in New York in 1820, and died there in 1888.

BER'IBERI, a disease endemic in parts of India, Ceylon, etc., characterized by paralysis, numbness, difficult

breathing, and often other symptoms, attacking strangers as well as natives, and generally fatal.

BERING, or **BEHRING** (bā'ring), Vitus, a famous navigator, born in 1680 at Horsens, Jutland. The courage displayed by him as captain in the navy of Peter the Great during the Swedish wars led to his being chosen to command a voyage of discovery in the Sea of Kamtchatka. In 1728 and subsequently he examined the coasts of Kamtchatka, Okhotsk, and the north of Siberia, ascertaining the relation between the northeastern Asiatic and northwestern American coasts. Returning from America in 1741, he was wrecked upon the desert island of Awatska (Bering's Island), and died there.

BERING'S STRAIT, SEA, and **ISLAND.** The strait is the channel separating the continents of Asia and America, and connecting the North Pacific with the Arctic Ocean; breadth at the narrowest part, between Cape Prince of Wales and East Cape, about 36 miles; depth in the middle, from 29 to 30 fathoms. It is frozen in winter, and seldom free from fog or haze. Though named after Vitus Bering, it was only fully explored by Cook in 1778.—Bering's Sea, sometimes called the Sea of Kamtchatka, is that portion of the North Pacific Ocean lying between the Aleutian Islands and Bering's Strait.—Bering's Island, the most westerly of the Aleutian chain, off the east coast of Kamtchatka. It is uninhabited, and is without wood.

Bering Sea and its fisheries have been the occasion of a long dispute between the United States and Great Britain because of the seal poaching of unlicensed Canadian fishers. Seals are abundant in these waters, and the fisheries have been leased by the United States to the North American Commercial Company, a limit of 100,000 being placed on the annual catch, and $10 a hide royalty being paid to the government. Canadian fishing schooners have frequently been seized by American war vessels. Protests from Britain followed and a court of arbitration met in 1893 at Paris to settle the dispute. Restrictions were agreed to, but the agreement was without effect. In 1897 the Bering Sea seal treaty was signed, which will do much to prevent the slaughter of the seals.

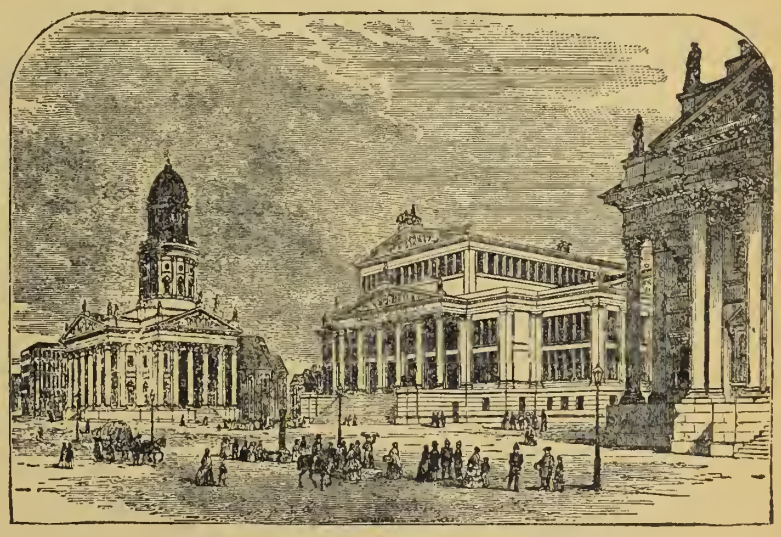
BERKELEY (bėrk'li) a city in Alameda Co., Cal., 5 miles north of Oakland, the county seat; on the California and Nevada and the Southern Pacific railroads. Pop. 15,000.

BERKELEY (bėrk'li), Dr. George, Bishop of Cloyne in Ireland, celebrated for his ideal theory. He maintains that the belief in the existence of an exterior material world is false and inconsistent with itself; that those things which are called sensible material objects are not external but exist in the mind, and are merely impressions made on our minds by the immediate act of God, according to certain rules termed laws of nature, from which he never deviates; and that the steady adherence of the Supreme Spirit to these rules is what constitutes the reality of things to his creatures, and so effectually distinguishes the ideas perceived by sense from such as are the work of the mind itself or of dreams, that there is no more danger of confounding them together on this hypothesis than on that of the existence of matter. He was born in 1685, died 1753.

BERK'HAMPSTEAD, Great, a town in England, Hertfordshire, with manufactures of straw-plait and wooden ware. Birthplace of Cowper. Pop. 5219.

BERKSHIRE, or **BERKS,** a county of England, between Oxfordshire, Buckinghamshire, Surrey, Hampshire, and Wilts; area, 450,132 acres, of which eight-ninths are cultivated or under timber. A range of chalk hills, entering from Oxfordshire, crosses Berkshire in a westerly direction. The western and central parts are the most productive in the county, which contains rich pasturage and excellent dairy farms, and is especially suited for barley and wheat crops. The Thames skirts the county on the north, and connects the towns of Abingdon, Wallingford, Reading, Henley, Maidenhead, and Windsor with the metropolis. Pop. 254,931.

BERLIN', the largest town in Germany; capital of the Prussian dominions and of the German Empire, in the province of Brandenburg. It has water communication to the North Sea by the Spree, which flows into the Havel, a tributary of the Elbe, and to the Baltic by canals connecting with the Oder. Of the numerous bridges, the finest is the Castle (Schloss) Bridge, 104 feet wide, and having eight piers surmounted by colossal groups of sculpture in marble. The principal and most frequented street, Unter den Linden ("under the lime-trees"), is about two-thirds of a mile in length and 160 feet wide, the center being occupied by a double avenue of lime-trees. At the e. end of this street, and round the Lustgarten, a square with which it is connected by the Schloss Bridge, are clustered the principal public buildings of the city, such as the royal palace, the palace of the crown-prince, the arsenal, the university, the museums, royal academy, etc.; while at the w. end is the Brandenburg Gate, regarded as one of the finest portals in existence. One of the most remarkable of modern monuments is that erected in 1851 to Frederick the Great in the Unter den Linden. The literary institutions of the city are numerous and excellent; they include the university, having an educational staff of nearly 360 professors and teachers, and attended by over 5000 students, exclusive of 5000 others who do not matriculate; the academy of sciences; the academy of fine arts; and the technical high school or academy of architecture and industry. The oldest parts of the city were originally poor villages, and first rose to some importance under Markgraf Albert (1206–20), yet about two centuries ago Berlin was still a place of little consequence, the first important improvement being made by the great Elector Frederick William, who planted the Unter den Linden, and in whose time it already numbered 20,000 inhabitants. Under his successors Frederick I. and Frederick the Great the city was rapidly enlarged and improved, the population increasing fivefold in the hundred years preceding the death of Frederick the Great and tenfold in the century succeeding it. Pop. 1,884,151.



Berlin—Royal theater and new church in the Gensdarmenmarkt.

Treaty of Berlin, the treaty, signed 13th July, 1878, at the close of the Berlin Congress, which was constituted by the representatives of the six great powers and Turkey. The treaty of San Stefano previously concluded between Turkey and Russia was modified by the Berlin treaty, which resulted in the division of Bulgaria into two parts, Bulgaria proper and Eastern Roumelia, the cession of parts of Armenia to Russia and Persia, the independence of Rumania, Servia, and Montenegro, the transference of Bosnia and Herzegovina to Austrian administration, and the retrocession of Bessarabia to Russia. Greece was also to have an accession of territory. The British representatives were Beaconsfield, Salisbury, and Lord

Odo Russell. By a separate arrangement previously made between Britain and Turkey the former got Cyprus to administer.

BERMU'DA GRASS, a grass cultivated in the West Indies, United States, etc., a valuable fodder grass in warm climates.

BERMU'DAS, or **SOMERS ISLANDS,** a cluster of small islands in the Atlantic Ocean belonging to Britain, and numbering about 400, set within a space of about 20 miles long and 6 wide; area, 20 sq. miles or 12,000 acres; 18 or 20 only inhabited. They were first discovered by Juan Bermudez, a Spaniard, in 1522; in 1609 Sir George Somers, an Englishman, was wrecked here, and, after his shipwreck, formed the first settlement. The most considerable are St. George, Bermuda or Long Island (with the chief town Hamilton, the seat of the governor), Somerset, St. David's, and Ireland. They form an important British naval and military station. An immense iron floating-dock, capable of receiving a vessel of 3000 tons, was towed from London to the Bermudas in 1868. The climate is generally healthful and delightful, but they have been sometimes visited by yellow fever. Numbers of persons from the U. States and Canada now pass the colder months of the year in these islands. About 4000 acres are cultivated. The military stationed here usually number about 1500. Pop. 17,535.

BERN, a town in Switzerland, capital of the canton Bern, and, since 1848, of the whole Swiss Confederation. Among the public buildings are the great Gothic cathedral, built between 1421 and 1502; the Church of the Holy Spirit; the federal-council buildings (or parliament house), commanding a splendid view of the Alps; the university; the town-house, a Gothic edifice of the 15th century; the mint; several fine bridges; etc. It has an excellent public and other libraries, museum, etc. Bern became a free city of the empire in 1218. In 1353 it entered the Swiss Confederacy. Pop. 63,994.—The canton of Bern has an area of 2660 sq. miles. The northern part belongs to the Jura mountain system, the southern to the Alps; between these being an elevated undulating region where is situated the Emmenthal, one of the richest and most fertile valleys in Switzerland. The southern part of the canton forms the Bernese Oberland (Upperland). The lower valleys here are fertile and agreeable; higher up are excellent Alpine pastures; and above them rise the highest mountains of Switzerland (Finsteraarhorn, Schreckhorn, Wetterhorn, Eiger, and Jungfrau). The canton is drained by the Aar and its tributaries; the chief lakes are those of Brienz, Thun, and Bienne. Of the surface over 58 per cent is under cultivation or pasture. Agriculture and cattle-raising are the chief occupations; manufactures embrace linen, cotton, silk, iron, watches, glass, pottery, etc. Bienne and Thun are the chief towns after Bern. Pop. (1900), 586,918, 87 per cent being Protestants, and nearly as many German-speaking.

BERNADOTTE (ber-nà-dot), Jean-Baptiste-Jules, a French general, afterward raised to the Swedish throne, was the son of an advocate of Pau; born in 1764. In 1798 he married Mademoiselle Clary, sister-in-law of Joseph Bonaparte. The following year he became for a short time minister of war, and on the establishment of the empire was raised to the dignity of marshal of France, and the title of Prince of Ponte-Corvo. On the death of the Prince of Holstein-Augustenburg the heir apparency to the Swedish crown was offered to the Prince of Ponte-Corvo, who accepted with the consent of the emperor, went to Sweden, abjured Catholicism, and took the title of Prince Charles John. In the maintenance of the interests of Sweden a serious rupture occurred between him and Bonaparte, followed by his accession in 1812 to the coalition of sovereigns against Napoleon. At the battle of Leipzig he contributed effectually to the victory of the allies. At the close of the war strenuous attempts were made by the Emperor of Austria and other sovereigns to restore the family of Gustavus IV. to the crown; but Bernadotte, retaining his position as crown-prince, became King of Sweden on the death of Charles XIII. in 1818, under the title of Charles XIV. During his reign agriculture and commerce made great advances, and many important public works were completed. He died 8th March, 1844, and was succeeded by his son Oscar.

BER'NARD, Great St., a celebrated Alpine pass in Switzerland, canton Valais, on the mountain-road leading from Martigny in Switzerland to Aosta in Piedmont, and rising to a height of 8150 feet. On the e. side of the pass is Mount Velan, and on the w. the Pointe de Dronaz. Almost on the very crest of the pass, near a small lake on which ice sometimes remains throughout the year, is the famous Hospice, next to Etna Observatory the highest inhabited spot in Europe. It is a massive stone building, capable of accommodating seventy or eighty travelers with beds, and of sheltering 300, and is tenanted by ten or fifteen brethren of the order of St. Augustine, who have devoted themselves by vow to the aid of travelers crossing the mountains. The institution is chiefly supported by subscriptions and donations. The severest cold recorded is 29° below zero Fah., but it has often been 18° and 20° below zero; and few of the monks survive the period of their vow. The dogs kept at St. Bernard, to assist the brethren in their humane labors, are well known. The true St. Bernard dog was a variety by itself, but this is now extinct, though there are still descendants of the last St. Bernard crossed with a Swiss shepherd's dog. The color of these is yellowish, or white with yellow-gray or brown spots; head large and broad, muzzle short, lips somewhat pendulous, hanging ears. A pagan temple formerly stood on the pass, and classic remains are found in the vicinity. The hospice was founded in 962 by St. Bernard of Menthon, an Italian ecclesiastic, for the benefit of pilgrims to Rome. In May, 1800, Napoleon led an army of 30,000 men, with its artillery and cavalry, into Italy by this pass.

BERNARD, Little St., a mountain, Italy, belonging to the Graian Alps, about 10 miles s. of Mont Blanc. The pass across it, one of the easiest in the Alps, is supposed to be that which Hannibal used. Elevation of Hospice, 7192 feet.

BER'NARD, Saint, of Clairvaux, one of the most influential ecclesiastics of the middle ages, born at Fontaines, Burgundy, 1091, of a noble family. His austerities, tact, courage, and eloquence speedily gave him a wide reputation; and when, on the death of Honorius III. (1130), two popes, Innocent and Anaclete, were elected, the judgment of Bernard in favor of the former was accepted by nearly all Europe. In 1140 he secured the condemnation of Abelard for heresy; and after the election of his pupil, Eugenius III., to the papal chair, he may be said to have exercised supreme power in the church. He died Aug. 20, 1153. Seventy-two monasteries owed their foundation or enlargement to him; and he left no fewer than 440 epistles, 340 sermons, and 12 theological and moral treatises. He was canonized in 1174.

BER'NARDINE MONKS, a name given in France to the Cistercians, after St. Bernard. See Cistercians.

BERNESE ALPS, the portion of the Alps which forms the northern side of the Rhone Valley, and extends from the Lake of Geneva to that of Brienz, comprising the Finsteraarhorn, Schreckhorn, Jungfrau, Monk, etc.

BERNHARDT (ber-nàr), Rosine Sara, a French actress, born at Paris 1844. Of Jewish descent, her father French, her mother Dutch, her early life was spent largely in Amsterdam. In 1858 she entered the Paris Conservatoire and gained prizes for tragedy and comedy in 1861 and 1862; but her début at the Théâtre Français in Iphigénie and Scribe's Valérie was not a success. After a brief retirement she reappeared at the Gymnase and the Porte Saint-Martin in burlesque, and in 1867 at the Odéon in higher drama. Her success in Hugo's Ruy Blas led to her being recalled to the Théâtre Français, since which she has abundantly proved her dramatic genius. In 1879 she visited London, and again in 1880, about which time she severed connection with the Comédie Française under heavy penalty. In 1882 she married M. Damala, a Greek. Her tours both in Europe and America have as yet never failed to be successful, despite a somewhat painful eccentricity. She has several times visited the United States.

BERNICIA, an ancient Anglian kingdom stretching from the Firth of Forth to the Tees, and extending inland to the borders of Strathclyde. Is was united with Deira, and became part of the kingdom of Northumbria.

BERNICLE GOOSE. See Barnacle Goose.

BERNINI (ber-nē'nē), Giovanni Lorenzo, Italian painter, sculptor, and architect, born 1598. His marble group, Apollo and Daphne, secured him fame at the age of eighteen, and he was em-

ployed by Urban VIII. to prepare plans for the embellishment of the Basilica of St. Peter's. He declined Mazarin's invitation to France in 1644. After his return to Rome he was charged with the decoration of the bridge of St. Angelo, the tomb of Alexander VII., etc. He died in 1680.

BERRY, a succulent fruit, in which the seeds are immersed in a pulpy mass inclosed by a thin skin. The name is usually given to fruits in which the calyx is adherent to the ovary and the placentas are parietal, the seeds finally separating from the placenta and lying loose in the pulp. The term, however, is frequently used to include fruits in which the ovary is free and the placentas central, as the grape. Popularly it is applied to fruits like the strawberry, bearing external seeds on a pulpy receptacle, but not strictly berries.

BERSERK'ER, a Scandinavian name for warriors who fought in a sort of frenzy or reckless fury, dashing themselves on the enemy in the most regardless manner. The name is probably derived from the bear-sark or bearskin shirt worn by early warriors.

BERTHIER (bert-yā), Alexander, prince of Neufchâtel and Wagram, marshal, vice-constable of France, etc.; born 1753. In all Napoleon's expeditions he was one of his closest companions, on several occasions rendering valuable services, as at Wagram in 1809, when he gained the title of Prince of Wagram. He left a son, Alexander (b. 1810, d. 1887), one of the most zealous adherents of Napoleon III.

BERTHOLLET (ber-to-lā), Claude Louis, Count, an eminent French chemist, born 1748; studied medicine; became connected with Lavoisier; was admitted in 1780 member of the Academy of Sciences at Paris. His chief chemical discoveries were connected with the analysis of ammonia, the use of chlorine in bleaching, the artificial production of niter, etc. He died in Paris 1822.

BERTILLON SYSTEM, a method of identifying individuals, originated by Dr. Alphonse Bertillon of Paris in 1885, and widely used by the police of Europe and America. The criminal, when captured, is carefully measured as follows: height, outstretched arms, finger tips to finger tips, trunk (height sitting), length and width of head, and of right ear; length of left foot, left middle finger, left little finger, left forearm. Each description is placed on a card, the cards classified according to size of head, etc., and suspects are readily tested. The system is founded on absolutely sure scientific data, but general description and marks of identification, such as scars, etc., are also used with Bertillon's plan.

BERWICK (ber'ik), or, more fully, **BERWICK-ON-TWEED,** a seaport town of England. In the beginning of the 12th century, during the reign of Alexander I., Berwick was part of Scotland, and the capital of the district called Lothian. In 1216 the town and castle were stormed and taken by King John; Bruce retook them in 1318; but, after undergoing various sieges and vicissitudes, both were surrendered to Edward IV. in 1482, and have ever since remained in possession of England. Pop. 13,378.—The county of Berwick, the most eastern border-county of Scotland, is bounded by the German Ocean, East Lothian, Roxburgh, Peebles, the river Tweed, and the English borders. Total area, 297,161 acres, of which two-thirds are productive. The principal rivers are the Tweed, the Leader, the Eye, the Whiteadder, and Blackadder. Pop. 30,816.

BER'YL, a colorless, yellowish, bluish, or less brilliant green variety of emerald, the prevailing hue being green of various shades, but always pale, the want of color being due to absence of chromium, which gives to the emerald its deep rich green. Its crystals, which are six-sided, are usually longer and larger than those of the precious emerald, and its structure more distinctly foliated. The best beryls are found in Brazil, in Siberia, and Ceylon, and in Dauria, on the frontiers of China. Beryls are also found in many parts of the U. States. Some of the finer and transparent varieties of it are often called aquamarine.

BERYLL'IUM, a metal occurring in beryl and other minerals, of a color similar to zinc.

BESANT', Sir Walter, English novelist, born 1836, educated in London and at Christ's College, Cambridge, where he graduated with mathematical honors. He is best known by his novels, a number of which were written in partnership with Mr. James Rice, including Ready-Money Mortiboy; The Golden Butterfly; The Monks of Thelema; etc. After Mr. Rice's death (1882) he wrote All Sorts and Conditions of Men; The World Went Very Well Then; etc. He died in 1901.

BESSARA'BIA, a Russian province stretching in a northwesterly direction from the Black Sea, between the Pruth and Danube and the Dniester. In the north the country is hilly, but in the south flat and low. It is fertile in grain, but is largely used for pasturage. Capital, Kishenef. Pop., chiefly Walachians, Gypsies, and Tatars, 1,933,436.

BES'SEL, Friedrich Wilhelm, a German astronomer, born in 1784; appointed in 1810 director of the observatory at Königsberg. In 1840 he called attention to the probable existence of a planetary mass beyond Uranus, resulting in the discovery of Neptune. He died in 1846.

BES'SEMER, Sir Henry, English engineer and inventor, was born in Hertfordshire in 1813. He is celebrated for his new and cheap process of rapidly making steel from pig-iron by blowing a blast of air through it when in a state of fusion, so as to clear it of all carbon, and then adding just the requisite quantity of carbon to produce steel—a process which has introduced a revolution in the steel-making trade, cheap steel being now made in vast quantities and used for many purposes in which its price formerly prohibited its application. He was knighted in 1879. He died in 1898.

BET'EL, a species of pepper, a creeping or climbing plant, native of the East Indies. The leaves are employed to inclose a piece of the areca or betel-nut and a little lime into a pellet, which is extensively chewed in the East. The pellet is hot and acrid, but has aromatic and astringent properites. It tinges the saliva, gums, and lips a brick-red, and blackens the teeth.

BETEL-NUT, the kernel of the fruit of a beautiful palm found in India and the East, and named from being chewed

Leaf, flowers, and nut of betel palm.

along with betel-leaf. When ripe it is of the size of a cherry, conical in shape, brown externally, and mottled internally like a nutmeg. Ceylon alone exports 70,000 cwt. annually.

BETH'ANY, now called El'Azariyeh or Lazarieh, a village of Palestine at the base of Mount Olivet, about 2 miles e. of Jerusalem, formerly the home of Martha, Mary, and Lazarus, and the place near which the ascension of our Lord took place.

BETH'LEHEM, the birthplace of Christ; a village, formerly a town, in Palestine, a few miles south from Jerusalem. Pop. about 3000, chiefly Christians, who make rosaries, crucifixes, etc., for pilgrims. There are three convents for Catholics, Greeks, and Armenians. A richly adorned grotto lighted with silver and crystal lamps, under the choir of the fine church built by Justinian, is shown as the actual spot where Jesus was born.

BETHLEHEM, a town of the United States, founded by Moravians in 1741 in Pennsylvania, on the Lehigh, across which is a bridge connecting it with S. Bethlehem, the seat of Lehigh University. Pop. of both together, 17,064.

BETROTH'MENT, a mutual promise or contract between two parties, by which they bind themselves to marry. It was anciently attended with the interchange of rings, joining hands, and kissing in presence of witnesses; and formal betrothment is still the custom on the continent of Europe, being either solemn (made in the face of the church) or private (made before witnesses out of the church). As betrothments are contracts, they are valid only between persons whose capacity is recognized by law, and the breach of them may be the subject of litigation.

BETTING, the staking or pledging of money or property upon a contingency or issue. The processes of betting may be best illustrated in connection with horse-racing, which furnishes the members of the betting fraternity with their best markets. Betters are divided into two classes—the backers of horses, and the book-makers or professional betters, who form the betting ring, and make a living by betting against horses ac-

cording to a methodical plan. By the method adopted by the professional better the element of chance is as far as possible removed from his transactions, so that he can calculate, with a reasonable prospect of having his calculations verified, on making more or less profit as the result of a season's engagements. Instead of backing any particular horse, the professional better lays the same sum against every horse that takes the field, or a certain number of them, and in doing so he has usually to give odds, which are greater or less according to the estimate formed of the chance of success which each of the horses has on which the odds are given. In this way, while in the event of the race being won (as is usually the case) by any of the horses entered in the betting-book of a professional better, the latter has always a certain fixed sum (say $5000) to pay, he receives from the backers of the losers sums which vary in proportion to the odds given. Thus, if a book-maker is making a $5000 book, and the odds against some horse is 4 to 1, he will, if that horse wins, have to pay $5000, while, if it loses, he will receive $1250. It usually depends upon which horse it is that wins a race whether the book-maker gains or loses. If the first favorite wins it is evidently the worst thing that could happen for the book-maker, for, as he is bound to receive the sum of the amounts to which all the horses except one have been backed, the largest deduction must be made from his total receipts on account of the first favorite. Very frequently the receipts of the book-maker are augmented by sums paid on account of horses which have been backed and never run at all. Sometimes, although not often, the odds are given upon and not against a particular horse. Books may also be made up on the principle of betting against any particular horse getting a place among the first three. The odds in this case are usually one-fourth of the odds given against the same horse winning. Another mode of betting is that called a sweepstake, in which a number of persons join in contributing a certain stake, after which each of those taking part in the sweepstake has a horse assigned to him (usually by lot), which he backs, and the backer of the winning horse gains the whole stakes. If there are more persons taking part in the sweepstake than there are horses running some of them must draw blanks, in which case of course their stakes are at once lost.

BEVERIDGE, Albert J., an American lawyer and politician, born in Ohio in 1862. In 1899 he was elected United States senator from Indiana.

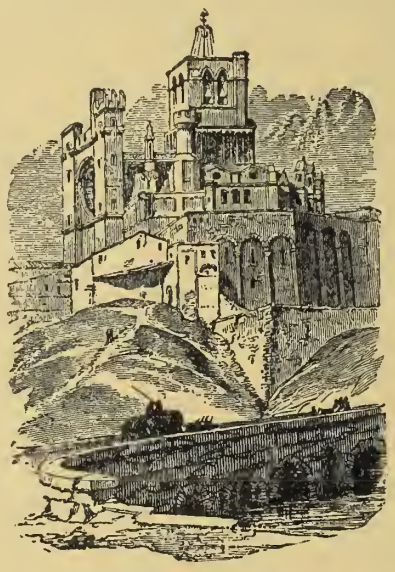
BEVERIDGE, Kühne, an American sculptor, born in 1877 at Springfield, Ill. She has won considerable fame in England and France by her clever work.

BEVERLY, a city in Essex Co., Mass., 18 miles northeast of Boston; on the Boston and Maine Railroad. It is situated on a narrow coast inlet, which is spanned by a bridge connecting with the city of Salem. Pop. 15,884.

BEY. See Beg.

BEYROUT (bī-röt'), or **BEIRUT,** the chief seaport of Syria, 60 miles n.w. of Damascus (89 by railway); pop. 120,000, largely Christians. Ancient Beyrout was an important Phœnician city. The Byzantine emperor Theodosius II. raised it to the rank of a metropolis, and it again rose to importance during the Crusades. In later times it was long in the possession of the Druses. It was bombarded and taken by the British in 1840.

BEZIERS (bā-zyār), a town in southern France, dep. Hérault, beautifully situated on a height and surrounded by old walls, its chief edifice being the cathedral, a Gothic structure crowning



The cathedral of Béziers.

the height on which the town stands. Manufactures, woolens, hosiery, liquors, chemicals, etc., with a good trade in spirits, wool, grain, oil, verdigris, and fruits. Pop. 49,186.

BEZIQUE (be-zēk'), a simple game of cards most commonly played by two persons with two packs. It was a favorite game at the French court in the 18th century.

BHAGALPUR (bhä-gal-pör'), a city in Bengal, capital of a district and division of the same name, on the right bank of the Ganges, here seven miles wide. Pop. 75,760.—The division of Bhagalpur has an area of 20,511 sq. miles, and a pop. (chiefly Hindus and Mohammedans) of 8,582,490.—The district has an area of 4226 sq. miles; pop. 2,088,565.

BHOOJ. See Bhuj.

BHOPAL (bho-päl'), a native state of central India under British protection, on the Nerbudda, in Malwah. Area, 6874 sq. miles. Pop. 1,094,800.—The capital of above state, also called Bhopal, is on the boundary between Malwah and Gundwana. Pop. 77,023.

BHURTPORE', a native state, India, in Rajputâna, bounded e. by Agra, s. and w. by the Rajput States. Area, 1974 sq. miles. Pop. 640,620.—The capital, which has the same name, is a fortified place, and was formerly of great strength. The rajah's palace is a large building of red and yellow freestone presenting a picturesque appearance. Pop. 43,601.

The rajah's palace Bhurtpore.

BIBLE, the collection of the Sacred Writings or Holy Scriptures of the Christians. Its two main divisions, one received by both Jews and Christians, the other by Christians only, are improperly termed Testaments, owing to the confusion of two meanings of the Greek word diathēkē, which was applied indifferently to a covenant and to a last will or testament. The Jewish religion being represented as a compact between God and the Jews, the Christian religion was regarded as a new compact between God and the human race; and the Bible is, therefore, properly divisible into the Writings of the Old and New Covenants. The books of the Old Testament received by the Jews were divided by them into three classes: 1. The Law, contained in the Pentateuch or five books of Moses. 2. The Prophets, comprising Joshua, Judges, I. and II. Samuel, I. and II. Kings, Isaiah, Jeremiah, Ezekiel, and the twelve minor prophets. 3. The Ketubim, or Hagiographa (holy writings), containing the Psalms, the Proverbs, Job, in one division; Ruth, Lamentations, Ecclesiastes, Esther, the Song of Solomon, in another division; Daniel, Ezra, Nehemiah, I. and II. Chronicles, in a third. These books are extant in the Hebrew language; others, rejected from the canon as apocryphal by Protestants, are found only in Greek or Latin.

The books of Moses were deposited, according to the Bible, in the tabernacle, near the ark, the other sacred

writings being similarly preserved. They were removed by Solomon to the temple, and on the capture of Jerusalem by Nebuchadnezzar probably perished. According to Jewish tradition Ezra, with the assistance of the great synagogue, collected and compared as many copies as could be found, and from this collation an edition of the whole was prepared, with the exception of the writings of Ezra, Malachi, and Nehemiah, added subsequently, and certain obviously later insertions in other books. When Judas Maccabæus repaired the temple, which had been destroyed by Antiochus Epiphanes, he placed in it a correct copy of the Hebrew Scriptures, whether the recension of Ezra or not is not known. This copy was carried to Rome by Titus. The exact date of the determination of the Hebrew canon is uncertain, but no work known to be written later than about 100 years after the captivity was admitted into it by the Jews of Palestine. The Hellenistic or Alexandrian Jews, however, were less strict, and admitted many later writings, forming what is now known as the Apocrypha, in which they were followed by the Latin Church. The Protestant churches at the Reformation gave in their adherence to the restricted Hebrew canon, though the Apocrypha was long included in the various editions of the Bible. The division into chapters and verses, as it now exists, is of comparatively modern origin, though divisions of some kind were early introduced. Cardinal Hugo de Sancto Caro, in the 13th century, divided the Latin translation known as the Vulgate into chapters for convenience of reference, and similar divisions were made in the Hebrew text by Rabbi Mordecai Nathan in the 15th century. About the middle of the 16th century the verses in Robert Stephanus's edition of the Vulgate were for the first time marked by numbers.

The earliest and most famous version of the Old Testament is the Septuagint, or Greek translation, executed by Alexandrian Greeks, and completed probably before 130 B.C., different portions being done at different times. This version was adopted by the early Christian church and by the Jews themselves, and has always held an important place in regard to the interpretation and history of the Bible. The Syriac version, the Peshito, made early in the 2d century after Christ, is celebrated for its fidelity. The Coptic version was made from the Septuagint in the 3d or 4th century. The Gothic version, by Ulphilas, was made from the Septuagint in the 4th century; but mere insignificant fragments of it are extant. The most important Latin version is the Vulgate, executed by Jerome, partly on the basis of the original Hebrew and completed in 405 A.D.

The books of the New Testament were all written in Greek, unless it be true, as some critics suppose, that the Gospel of St. Matthew was originally written in Hebrew. Most of these writings have always been received as canonical; but the Epistle to the Hebrews, commonly ascribed to St. Paul, that of St. Jude, the second of Peter, the second and third of John, and the Apocalyse, have been doubted. The three oldest MSS. are: (1) the Sinaitic MS., discovered by Tischendorf in a convent on Mount Sinai in 1859, assigned to the middle of the 4th century; (2) the Vatican MS. at Rome of similar date; (3) the Alexandrine MS. in the British Museum, assigned to the middle of the 5th century. Each MS. contains also the Septuagint Greek of the Old Testament in great part. The Vulgate of Jerome embraces a Latin translation of the New as well as of the Old Testament, based on an older Latin version. The division of the text of the New Testament into chapters and verses was introduced later than that of the Old Testament; but it is not precisely known when or by whom. The Greek text was first printed in the Complutenisian Polyglot, in 1514; in 1516 an edition of it was published at Basel by Erasmus. Among recent valuable editions are those of Lachmann, Tischendorf, Tregelles, and Westcott and Hort.

Of translations of the Bible into modern languages the English and the German are the most celebrated. Considerable portions were translated into Anglo-Saxon, including the Gospels and the Psalter. Wycliffe's translation of the whole Bible (from the Vulgate) begun about 1356, was completed shortly before his death, which took place in 1384. The first printed version of the Bible in English was the translation of William Tindall or Tyndale, whose New Testament was printed in quarto at Cologne in 1525, a small octavo edition appearing at the same time at Worms. The Pentateuch was published by Tindall in 1530, and he also translated some of the prophetical books. A translation of the entire Bible was published by Miles Coverdale in 1535. It was undertaken at the instance of Thomas Cromwell, and being made from German and Latin versions was inferior to Tindall's. After the death of Tindall John Rogers undertook the completion of his translation and the preparation of a new edition. In this edition the latter part of the Old Testament (after II. Chronicles) was based on Coverdale's version. A revised edition was published in 1539 under the superintendence of Richard Taverner. In the same year as Taverner's another edition appeared, printed by authority, with a preface by Cranmer, and hence called Cranmer's Bible. This was the first Bible printed by authority in England. This continued, with various revisions, to be the authorized version till 1568. In 1557–60 an edition appeared at Geneva, based on Tindall's—the work of Whittington, Coverdale, Goodman, John Knox, and other exiles — and commonly called the Geneva, or Breeches Bible (from "breeches" standing instead of "aprons" in Gen. iii. 7.) This version, for sixty years the most popular in England, was allowed to be printed in England under a patent of monopoly in 1561. It was the first printed in Roman letters, and was also the first to adopt the plan previously adopted in the Hebrew of a division into verses. It omitted the Apocrypha, left the authorship of the Epistle to the Hebrews open, and put words not in the original in italics. The Bishop's Bible, published 1568 to 1572, was based on Cranmer's, and revised by Archbishop Parker and eight bishops. It succeeded Cranmer's as the authorized version, but did not commend itself to scholars or people. In 1582 an edition of the New Testament, translated from the Latin Vulgate, appeared at Rheims, and in 1609–10 the Old Testament was published at Douay. This is the version recognized by the Roman Catholic Church.

In the reign of James I. a Hebrew scholar, Hugh Broughton, insisted on the necessity of a new translation, and at the Hampton Court Conference (1604) the suggestion was accepted by the king. The work was undertaken by forty-seven scholars divided into six companies, two meeting at Westminster, two at Oxford, and two at Cambridge, while a general committee meeting in London revised the portions of the translation finished by each. The revision was begun in 1607, and occupied three years, the completed work being published in folio in 1611. By the general accuracy of its translation and the purity of its style it superseded all other versions. In response, however, to a widely-spread desire for a translation even yet more free from errors, the Convocation of Canterbury in 1870 appointed a committee to consider the question of revising the English version. Their report being favorable two companies were formed, one for the Old Testament and one for the New, consisting partly of members of Convocation and partly of outside scholars. Two similar companies were also organized in America to work along with the British scholars. The result was that the revised version of the New Testament was issued in 1881; that of the Old Testament in 1885. The revision has been carried out in a spirit of reverence toward the older version, and few alterations have been admitted but such as have been called for on the score of accuracy, clearness, and uniformity.

In Germany some seventeen translations of the Bible, partly in the High German partly in the Low German dialect, appeared between the invention of printing and the Reformation, but they had all to make way for Luther's great translation—the New Testament in 1522, and the whole Bible in 1534.

BIBLE CHRISTIANS, a small sect founded by a Cornish Methodist preacher called O'Bryan, who profess to follow only the doctrines of the Bible and reject all human authority in religion. Called also Bryanites.

BIBLE COMMUNISTS. See Perfectionists.

BIBLICAL CRITICISM, a term by which is designated any investigation of the Old or New Testament. "Text criticism" of the Bible seeks to establish the true texts of the Bible, that is, to decide what has been added to the original documents. The so-called higher criticism has for its function the establishment of the historical accuracy of the Scriptures and the genuineness of the authorship. The critic relies on what is called internal and external evidence, checking the historical accu-

racy of the statements in the text, the agreements of the texts among themselves, and the alleged authorship by the contents of the texts and the known facts of history as found in profane history. Modern criticism began in the latter part of the 18th century and culminated with the "Tuebingen school," some of the members of which denied the divinity of Jesus.

BIBLE SOCIETIES, societies formed for the distribution of the Bible or portions of it in various languages, either gratuitously or at a low rate. Since the formation of the British and Foreign Bible Society it has circulated over 340 versions of the whole or parts of the Scriptures in 298 different languages. In more than thirty instances languages have for the first time been reduced to a written form in order to translate into them and circulate among the people the Bibles of this society. The total issues now amount to about 100,000,000 copies, while about 70,000,000 additional copies have been distributed by the kindred societies which have sprung out of it. In the United States the great American Bible Society, formed in 1816, acts in concert with auxiliary societies in all parts of the Union. Its total issue since its organization has been over 40,000,000.

BIB'LIA PAU'PERUM, the name for block-books common in the middle ages, and consisting of a number of rude pictures of Biblical subjects with short explanatory text accompanying each picture.

BIBLIOG'RAPHY, the knowledge of books, in reference to the subjects discussed in them, their different degrees of rarity, curiosity, reputed and real value, the materials of which they are composed, and the rank which they ought to hold in the classification of a library. The subject is sometimes divided into general, national, and special bibliography, according as it deals with books in general, with those of a particular country, or with those on special subjects or having a special character (as early printed books, anonymous books). A subdivision of each of these might be made into material and literary, according as books were viewed in regard to their mere externals or in regard to their contents.

BIBLIOMA'NIA, a passion for possessing curious books, which has reached its highest development in France and England, though originating in Holland toward the close of the 17th century. The true bibliomanist is determined in the purchase of books, less by the value of their contents, than by certain accidental circumstances attending them, as that they belong to particular classes, are made of singular materials, or have something remarkable in their history.

BICARBONATE, a carbonate derived from carbonic acid by replacing one of the atoms of hydrogen by a metal. Bicarbonate of sodium is used as an antacid, and effervescing liquors are usually produced by mixing it with tartaric acid. It is also the chief ingredient of baking-powder.

BI'CEPS, the large muscle in front of the upper arm. See Arm.

BI'CYCLE, a light vehicle impelled by the rider, consisting of two wheels placed one before the other, and of connecting bars or framework. The vehicle is driven by the pressure of the rider's feet either directly applied to two cranks attached to the axle of the front wheel, or to cranks in the frame driving the after-wheel by a chain and sprockets. The rider sits upon a saddle generally placed above and between the two wheels, and steers the machine by a handle, which turns the front wheel in in any required direction. It is kept in an upright position by the action of the rider's body and legs, by the steering power, and also by its own momentum. The speed attained by an expert rider is considerable, 30 miles or more an hour having been covered.

BIDDEFORD (bid'e-ford), a town in Maine, on the Saco, with which it is connected by several bridges. The river falls, 42 feet high, affording valuable water-power. Pop. 16,145.

BIDDLE, John, father of the modern Unitarians, born in 1615 at Wotton-under-Edge, in Gloucestershire, died in prison 1662. He was repeatedly imprisoned for his anti-Trinitarian views. A general act of oblivion in 1652 restored him to liberty, when he immediately disseminated his opinions both by preaching and by the publication of his Twofold Scripture Catechism. He was again imprisoned. Cromwell banished him to St. Mary's Castle, Scilly, and assigned him a hundred crowns annually. Here he remained three years, until the Protector liberated him in 1658. He then continued to preach his opinions till the death of Cromwell, and also after the Restoration, when he was committed to jail in 1662, and died a few months after.

BIEL (bēl). See Bienne.

BIELA'S (bē'la) **COMET,** discovered by M. Biela (1782–1856), an Austrian officer, in 1826. Its periodic time was determined as 6 years 38 weeks. It returned in 1832, 1839, 1846, and 1852. On the latter two occasions it was in two parts, each having a distinct nucleus and tail. It has not since been seen as a comet; but in 1872, 1879, and 1885, when the earth passed through the comet's track, immense flights of meteors were seen, which have been connected with the broken-up and dispersed comet.

BIEN'NIAL, a plant that requires two seasons to come to maturity, bearing fruit and dying the second year, as the turnip, carrot, wallflower, etc.

BIERSTADT, Albert, an American landscape painter, born at Düsseldorf, Germany, 1830, died in 1902. His principal paintings are of the Rocky Mountain regions.

BIGAMY, the act or state of having more wives or husbands than one. It is regarded as an offense in most countries, and in the U. States it is a felony, punishable by a term in the penitentiary, the length of the term varying in different states. To be guilty of bigamy the offender must have knowledge of the fact that his or her spouse is living, and the second or other marriage must be solemnized by form of law or church, or other formal ceremonial, and not merely a personal agreement or contract. Bigamy may be committed by persons of either sex.

BIG HORN, a river of the U. States rising in the Rockies and flowing through Montana into the Yellowstone river. It is 460 miles long.

BIG HORN, a popular name for the celebrated Rocky Mountain sheep, which, in its several species, is found along the whole course of the Rocky Mountain system to the Arctic regions. The common species is 3 feet 4 inches high, brownish in color, with a dark line along the spine. The horns of the ram are massive, spiral-like, and often measure 45 inches in length. The big horn is a marvelous jumper, scaling great heights almost perpendicular, and one of the hardiest of the wild animals of America. It is called also Rocky Mountain goat.

BIGELOW, Erastus Brigham, an American inventor, born in Massachusetts in 1814, died 1879. His principal inventions are weaving apparatus. He founded the Bigelow Carpet Company of Clinton, Mass., and was one of the founders of the Massachusetts Institute of Technology.

BIGELOW, Poultney, an American writer, traveler, and critic. He was born in 1855, and was educated at Yale and abroad. He has been editor of Outing, and correspondent of numerous publications. He has published several books of travel and criticism on foreign countries.

BIGNO'NIA, a genus of plants of many species, inhabitants of hot climates, usually climbing shrubs furnished with tendrils; flowers mostly in terminal or axillary panicles; corolla trumpet-shaped, hence the name of trumpet-flower commonly given to these plants. All the species are splendid plants when in blossom, and many of them are cultivated.

BIKANER', a native state of Rajputana, India. Area, 23,090 sq. miles; pop. 584,712.—Bikaner, the capital, has a fort, containing the rajah's palace. Pop. 53,075

BILASPUR (bi-läs-pōr'), a district in the chief commissionership of the Central Provinces of India. Area 8341 sq. miles; pop. 1,164,158.

BILBA'O, a city in northern Spain, capital of the province of Biscay on the navigable Nervion, 6 miles from the sea. It has a cathedral and fine public buildings; flourishing industries: iron-works, steel-works, foundries, shipyards, etc.; excellent harbor accommodation, and exports much iron ore. Pop. 83,306.

BILBERRY. See Whortleberry.

BILE, a yellow bitter liquor, separated from the blood by the primary cells of the liver, and collected by the biliary ducts, which unite to form the hepatic duct, whence it passes into the duodenum, or by the cystic duct into the gall-bladder, to be retained there till required for use. The most obvious use of the bile in the animal economy is to aid in the digestion of fatty substances and to convert the chyme into chyle. It appears also to aid in exciting the peristaltic action of the intestines. The natural color of the fæces seems to be owing to the presence of bile. The

chemical composition varies with the animal which yields it, but every kind contains two essential constituents, the bile salts and the bile coloring matter associated with small quantities of cholesterine, fats, and certain mineral salts, chiefly chloride of sodium, phosphates, and iron. Some of the constituents of the bile return into the blood by absorption, the coloring matters and cholesterine being the principal excrementitious substances. When bile is not secreted in due quantity from the blood the unhealthy condition of biliousness results.

BILGE, the breadth of a ship's bottom, or that part of her floor which approaches to a horizontal direction, on which she would rest if aground.—Bilge-water, water which enters a ship and lies upon her bilge or bottom; when not drawn off it becomes dirty and offensive.—Bilge ways, planks of timber placed under a vessel's bilge on the building-slip to support her while launching.

BIL'IARY CAL'CULUS, a concretion which forms in the gall-bladder or bile-ducts; gall-stone. It is generally composed of a peculiar crystalline fatty matter which has been called cholesterine.

BILL, a written or printed paper containing a statement of any particulars. In common use a tradesman's account, or a printed proclamation or advertisement, is thus called a bill. In legislation a bill is a draft of a proposed statute submitted to a legislative assembly for approval, but not yet enacted or passed and made law. When the bill has passed and received the necessary assent, it becomes an act.

BILL OF ATTAINDER, a bill introduced in a legislature fixing a penalty or punishment on an individual by enactment of the legislature. Bills of attainder are forbidden by the constitution of the United States. This provision was prompted by the abuses wrought in England by this method of punishment.

BILL OF COSTS, a statement of the costs of a lawsuit, fixed to the judgment, and chargeable to the defeated party to the suit.

BILL OF CREDIT, a letter of credit. In the United States constitution the term "bills of credit" means no more than paper money. The states are forbidden to issue bills of credit; that is, no state can issue paper money, this function being a federal one.

BILL OF EXCEPTIONS, a statement of the exceptions taken to the ruling of a court in a cause. The bill of exceptions is used for purposes of appeal.

BILL OF EXCHANGE, a written order to pay a sum of money to a third party. The order may be to pay at sight or after a certain number of days. If the person on whom the order is made accepts it, by signing it he is liable for its payment.

BILL IN EQUITY, a petition filed in a court of chancery stating all the circumstances of the case in dispute and asking the chancery judge, or chancellor, to decide the points at issue. The custom arose from the old English method of appealing directly to the conscience of the king.

BILL OF HEALTH, a statement of the condition of the health of the crew and passengers of a ship, made by the ship's surgeon or the captain. A clean bill of health reports no infection on ship board; a foul bill reports passengers unfit to land; a suspected bill reports infection at the place whence the ship sailed.

BILL OF INDEMNITY, a bill passed by congress justifying the action of an official who, under stress of circumstance, has exceeded his authority.—Also a bill to reimburse one who has spent his own money in the service of the state.

BILL OF LADING, an agreement or contract made by a common carrier with a shipper providing for the transportation of the goods or freight mentioned, the rate of transportation, and the liabilities of both parties. Bills of lading are made out in duplicate, the latter being sent to the consignee. Bills of lading are not negotiable, but are often so used, and some states have even tried to make them negotiable by law.

BILL OF RIGHTS, the name given to the ten first amendments to the constitution of the United States.

BILL OF SALE, a conveyance of property from one person to another, containing the description of the property and transferring the title of the property to the buyer.

BILLIARDS, a game played with three or four ivory balls and a stick, called a "cue," on a large table the sides of which are banked with rubber, the whole being covered with green baize. Considerable difference exists between the English and the French game, the latter being the game played in the U. States. The English table is 6x12 feet, has six pockets and three balls, two white and a red being used. In the U. States pockets are not used. The American table is about 6x12, the cue is ash or maple with a leather tip, the balls ivory, 2⅜ inches in diameter, the color being two white and one red. The object of the player is so to strike his own ball that it will, after leaving his cue, come into contact with the two remaining balls. The rebound from the first ball is called a carom, and when both balls are hit the play counts one point. By playing along the cushions (banked sides of the table) a skilful player can count points indefinitely. To prevent this the game called "the balk-line game" was invented. In this game four lines are drawn parallel with the cushion at an agreed upon distance and the player is allowed to make but one shot, or an agreed-upon number of shots, when one or both balls lie between the line and the cushion. The three-ball game without the balk-line is called the straight-rail game. The following is a list of high runs made since 1880: Straight rail—highest run for match play (3 balls, on regulation 5x10 table) 1531 points, Maurice Vignaux, Paris, 1880. Highest average for match play, 333⅓, by Jacob Schaefer, Chicago, 1879. Cushion caroms—highest run for tournament play, 85 points, Frank C. Ives, Boston, 1896. Highest average for tournament play, 10 (in 200 points), Jacob Schaefer, Chicago, 1887. Highest average (with "anchor nurse" allowed), 100, Jacob Schaefer, New York, 1893, and Frank C. Ives, Chicago, 1894. Highest average (with "anchor nurse" barred), 63 2-10, Frank C. Ives, New York, 1894. 18-inch balk-line—highest run for tournament play, 290 points (with 5 shots allowed in "anchor" spaces), Frank C. Ives, New York, 1896; 140 (with the "anchor nurse" barred), Frank C. Ives, New York, 1897. Highest average for tournament play, 50 (with 5 shots allowed in "anchor" spaces), Frank C. Ives, New York, 1896; 40 (with "anchor nurse" barred), Jacob Schaefer, Chicago, 1898. In 1906 Jacob Schaefer made a run of 100 in an 18.1 match, which is the highest in a championship match.

BILLINGS, John Shaw, an American surgeon, born in Indiana in 1837. He was surgeon in the Union army during the civil war, and curator of the military museum at Washington from 1864. In 1896 he became librarian of the New York City Public Library. He has published several scientific works and catalogues and is a member of numerous learned societies.

BILLINGS, JOSH. See Henry W. Shaw.

BIL'LINGSGATE, the principal fish-market of London, on the left bank of the Thames, a little below London Bridge. From the character, real or supposed, of the Billingsgate fish-dealers, the term Billingsgate is applied generally to coarse and violent language.

BIL'LION, in Britain and Germany the designation for a million of millions; among the French and in America a thousand millions. A similar difference of usage exists in regard to trillion, quadrillion, etc.

BI'MANA, animals having two hands: a term applied by Cuvier to the highest order of Mammalia, of which man is the type and sole genus. By some naturalists man is classified as a sub-division of the order Primates, which includes also the apes, monkeys, and lemurs.

BIMET'ALLISM, that system of coinage which recognizes coins of two metals (silver and gold) as legal tender to any amount; or, in other words, the concurrent use of coins of two metals as a circulating medium, the ratio of value between the two being arbitrarily fixed by law. It is contended by advocates of the system that by fixing a legal ratio between the value of gold and silver, and using both as legal tender, fluctuations in the value of the metals are avoided, while the prices of commodities are rendered steadier.

BINARY, twofold; double.—Binary compound, in chemistry, a compound of two elements, or of an element and a compound performing the function of an element, or of two compounds performing the function of elements, according to the laws of combination. The term is now little used.—Binary theory of salts, the theory which regarded all salts as being made up of two oxides, an acid oxide and a basic oxide; thus sodium carbonate as made up of soda and carbon dioxide.—Binary star, a double star

whose members revolve round a common center of gravity.

BING'HAMPTON, a town in New York, at the junction of the Chenango and Susquehanna rivers, with numerous manufactures and an extensive flour and lumber trade. Pop. 47,000.

BINOC'ULAR, a field-glass or opera-glass, or a microscope suited for viewing objects with both eyes at once.

BI'OBIO, a Chilean river, rises in Lake Huchueltui, flows in a n.w. direction for 180 miles, and falls into the Pacific at the city of Concepcion. It gives name to a province of the country, with 100,000 inhabitants; area, 4158 sq. miles.

BIOGEN'ESIS, the history of life development generally; specifically, that department of biological science which speculates on the mode by which new species have been introduced; often restricted to that view which holds that living organisms can spring only from living parents.

BIOG'RAPHY, that department of literature which treats of the individual lives of men or women; and also a prose narrative detailing the history and unfolding the character of an individual written by another. When written by the individual whose history is told it is called an autobiography. This species of writing is as old as literature itself. In the first century after Christ Plutarch wrote his Parallel Lives; Cornelius Nepos, the Lives of Military Commanders; and Suetonius, the Lives of the Twelve Cæsars. Modern biographical literature may be considered to date from the 17th century, since which time individual biographies have multiplied enormously. Dictionaries of biography have proved extremely useful, Moréri's Dictionnaire Historique et Critique, 1671, being perhaps the first of this class. During the 19th century have been published the Biographie Universelle, 85 vols., 1811–62; Nouvelle Biographie Générale, 46 vols., 1852–66; Chalmer's General Biographical Dictionary, 32 vols., 1812–17; Rose's Biographical Dictionary, 12 vols., 1848–50; the admirable Dictionary of National Biography, 63 vols., the first published in 1885, the last in 1900, with Supplement of other 3 vols. (1901); and Appleton's Cyclopædia of American Biography, 6 vols. (1887–1889).

BIOL'OGY, a comprehensive term for those departments of science which treat of living beings, including under this head both animals and plants. It therefore comprehends both botany and zoology in all their branches and details.

BI'PED, an animal having two feet: applied to man and birds, indicating their mode of progression rather than the mere possession of two limbs.

BIRCH, a genus of trees which comprises only the birches and alders, which inhabit Europe, northern Asia, and North America. The common birch is indigenous throughout the north, and on high situations in the south of Europe. It is extremely hardy, and only one or two other species of trees approach so near to the north pole. The wood of the birch, which is light in color, and firm and tough in texture, is used for chairs, tables, bedsteads, and the woodwork of furniture generally, also for fish-casks and hoops, and for smoking hams and herrings, as well as for many small articles. In France wooden shoes are made of it. The bark is whitish in color, smooth and shining, separable in thin sheets or layers. Fishing-nets and sails are steeped with it to preserve them. In some countries it is made into hats, shoes, boxes, etc. In Russia the oil extracted from it is used in the preparation of of Russian leather, and imparts the well-known scent to it. In Lapland bread has been made from it. The sap, from the amount of sugar it contains, affords a kind of agreeable wine, which is produced by the tree being tapped during warm weather in the end of spring or beginning of summer, when the sap runs most copiously. The dwarf birch, a low shrub, two or three feet high at most, is a native of all the most northerly regions. The cherry-birch of America, and also the black birch, produce valuable timber, as do other American species. The largest of these is the yellow birch, which attains the height of 80 feet. It is named from its bark being of a rich yellow color. The paper birch of America has a bark that may readily be divided into thin sheets almost like paper. From it the Indian bark canoes are made.

BIRD, a great class of vertebrate animals, warm-blooded, covered with feathers and ordinarily capable of flight. They have existed since early times, exhibit an interesting evolution within very compact and well-defined limits, dwell in every part of the globe, are exceedingly diverse in size, form, ability, and appearance, adapted to every sort of climate and food, show mental qualities of a high order, are of great importance in their economic relations with man, and in most cases are beautiful in outline and color and possessed of melodious voices.

Birds are classified between the reptiles (regarded as inferior to them) and the mammals (regarded as superior in general organization). Birds differ from mammals, broadly, in being clothed with feathers instead of hairs, and in the absence of milk-glands, and by sundry differences in anatomy and methods of existence, such as the hatching externally of eggs, and the devotion of the fore limbs to flight. They differ from reptiles in having a covering of feathers instead of scales; a complete double circulation of warm blood; no more than three digits in the manus, long legs, etc. The differences noted are, however, of much less importance than those which separate them from mammals, and the structural resemblance is so close that some anatomists, notably Huxley, have included reptiles and birds in a single group, the Sauropsida, comparable to Fishes or Mammals, and completing, with them, the three divisions of the Vertebrata. This grouping was founded upon the fact that birds and reptiles were alike in being oviparous or ovoviviparous; in having a cloaca; in the incompleteness of the diaphragm, and of a corpus callosum in the brain; in having only one occipital condyle; in the presence of a movable quadrate bone and other peculiarities of the skull; and in the fact that the ankle-joint is between two sets of tarsal bones. The close relationship thus implied has been confirmed by the disclosures of paleontology, which show that birds have a reptilian ancestry, and are an offshoot of the same stock as modern reptiles.

All the species of birds now inhabiting the earth are the descendents of ancient ancestors long since vanished, some of which have, however, left remains behind from which zoologists have reconstructed skeletons of these animals quite accurate in their general features. Tracks have been found in the sandstones of Connecticut which are believed to be of ancient gigantic birds with three toes and a stride of seven feet.

BIRD-CALL, an instrument for imitating the cry of birds in order to attract them so that they may be caught.

BIRD-CATCHING SPIDER, a name applied to a gigantic spider which preys upon insects and small birds which it hunts for and pounces on. It is about two inches long, very hairy, and almost black; its feet when spread out occupy a surface of nearly a foot in diameter.

BIRD-CHERRY, a species of cherry, a very ornamental tree in shrubberies from its purple bark, its bunches of white flowers, and its berries, which are successively green, red, and black. Its fruits is nauseous to the taste, but is greedily eaten by birds. The wood is much used for cabinet-work. It is common in the native woods of Sweden and Scotland.

BIRD-LIME, a viscous substance used for entangling birds so as to make them easily caught, twigs being for this purpose smeared with it at places where birds resort. It is prepared from holly-bark, being extracted by boiling; also from the viscid berries of the mistletoe.

BIRDS. See Ornithology.

BIRD OF PARADISE, the name for members of a family of birds of splendid plumage allied to the crows, inhabiting New Guinea and the adjacent islands. The family includes eleven or twelve genera and a number of species, some of them remarkably beautiful. The largest species is over 2 feet in length. The king bird of paradise is possibly the most beautiful species, but is rare. It has a magnificent plume of feathers, of a delicate yellow color, coming up from under the wings, and falling over the back like a jet of water. The feathers are those chiefly worn in plumes. These splendid ornaments are confined to the male bird.

BIRD-SEED, seed for feeding cage-birds, especially the seed of canary-grass.

BIRD'S-EYE MAPLE, curled maple, the wood of the sugar-maple when full of little knotty spots somewhat resembling birds' eyes, much used in cabinet-work.

BIRD'S-EYE VIEW, the representation of any scene as it would appear if seen from a considerable elevation right above.

BIRDS'-NESTS, Edible, the nests of the salangane and other species of swifts found in the Indian seas. They are particularly abundant in the larger islands of the Eastern Archipelago. The nest has the shape of a common swallow's nest, is found in caves, particularly on the sea-shore, and has the appearance of fibrous, imperfectly concocted isinglass.. When procured before the eggs are laid the nests are of a waxy whiteness and are then esteemed most valuable; when the bird has laid her eggs they are of second quality; when the young are fledged and flown, a third quality. They appear to be composed of a mucilaginous substance secreted by special glands, and not, as was formerly thought, made form a glutinous marine fucus or seaweed. The Chinese consider the nests as a great stimulant and tonic, and it is said that about 8½ millions of them are annually imported into Canton.

Bird of paradise.

BIRDS OF PASSAGE, birds which migrate with the season from a colder to a warmer, or from a warmer to a colder climate, divided into summer birds of passage and winter birds of passage. Such birds always breed in the country to which they resort in summer, i.e. in the colder of their homes.

BIRDS OF PREY, the Accipitres or Raptores, including vultures, eagles, hawks or falcons, buzzards, and owls.

BIR'KENFELD (-felt), an outlying principality belonging to Oldenburg, surrounded by the Rhenish districts of Coblentz and Treves; area 194 sq. miles; pop. 53,409.

BIR'KENHEAD, a parl., county, and municipal borough of England, in Cheshire, on the estuary of the Mersey, opposite Liverpool. Its commerce is in all respects a branch of that of Liverpool. The communication with Liverpool is by large steamboats and by a railway tunnel under the bed of the Mersey 4½ miles long including the approaches, 21 feet high, 26 feet wide, the roof being about 30 feet below the bed of the river. Pop. 110,926.

BIRMAH. See Burmah.

BIR'MINGHAM, a great manufacturing city of England, situated on the small river Rea near its confluence with the Tame, in the n.w. of Warwickshire, with suburbs extending into Staffordshire and Worcestershire; 112 miles n.w. of London, and 97 s.e. of Liverpool. It is the principal seat of the hardware manufacture in Britain, producing metal articles of all kinds from pins to steam-engines. It manufactures firearms in great quantities, swords, jewelry, buttons, tools, steel-pens, locks, lamps, bedsteads, gas-fittings, sewing-machines, articles of papier-maché, railway-carriages, etc. The quantity of solid gold and silver plate manufactured is large, and the consumption of these metals in electroplating is very great. Japanning, glass manufacturing, and glass-staining or painting form important branches of industry, as also does the manufacture of chemicals. At Soho and Smethwick in the vicinity of the town were the famous works founded by Boulton and Watt, who there manufactured their first steam-engines, where gas was first used, plating perfected, and numerous novel applications tried and experiments made. The principal educational institutions are: The University (opened in 1900), which has developed from the Mason University College, founded by Sir Josiah Mason in 1875, opened in 1880 and united with Queen's College (as the medical department) in 1892; a Roman Catholic college (at Oscott); King Edward's Grammar School; and a school of art and design. Pop. 522,182.

BIRMINGHAM, a city and the county seat of Jefferson Co., Ala., and an important manufacturing center, 97 miles northwest of Montgomery, on the Central Railroad of Georgia, the Louisville and Nashville, the Southern, the Alabama Great Southern, and the Kansas City, Memphis, and Birmingham railroads. The chief industry is the manufacture of iron and steel in various forms. Besides pig-iron furnaces, foundries, engine and boiler works, machine-shops, and car-wheel works, it has cotton-factories, packing-houses, cottonseed-oil mills, and extensive iron and coal mining and lumber interests. Pop. 42,000.

BIRS NIMRUD, a famous mound in Babylonia, on the west side of the Euphrates, 6 miles s.w. of Hillah, generally identified as the remains of the Tower of Babel.

BIRTH, or **LABOR,** in physiology, is the act by which a female of the class Mammalia brings one of her own species into the world. When the fœtus has remained its due time in the womb, and is in a condition to carry on a separate existence, it is extruded from its place of confinement, in order to live the life which belongs to its species, independently of the mother. The period of gestation is very different in different animals, but in each particular species it is fixed with much precision. At the end of the thirty-ninth or the beginning of the fortieth week, the human child has reached its perfect state, and is capable of living separate from the mother; hence follows in course its separation from her, that is, the birth. Contractions of the womb gradually come on, which are called, from the painful sensations accompanying them, labor-pains. The contractions of the womb take place in the same order as the enlargement had previously done, the upper part of it first contracting, while the mouth of the womb enlarges and grows thin, and the vagina becomes loose and distensible. By this means the fœtus, as the space within the womb is gradually narrowed, descends with a turning motion toward the opening, and some time after the head of the child appears and the rest of the body soon follows. An artificial birth is that which is accomplished by the help of art, with instruments or the hands of the attendant. Premature birth is one which happens some weeks before the usual time, namely, after the seventh and before the end of the ninth month. Late birth is a birth after the usual period of forty weeks. Although this is considered the usual time for legitimate births, the practice of the English law courts is to allow a longer time when the opinions of the faculty, or the peculiar circumstances of the case, are in favor of a protracted gestation. In Scotland a child born after the tenth month is accounted illegitimate. Abortion and miscarriage take place when a fœtus is brought forth so immature that it cannot live. They happen from the beginning of pregnancy to the seventh month, but most frequently in the third month.

BIRTH MARK. See Nævus.

BIRTH'RIGHT, any right or privilege to which a person is entitled by birth, such as an estate descendible by law to an heir, or civil liberty under a free constitution. See Primogeniture.

BIS'CAY, a province of Spain near its northeast corner, one of the three Basque provinces (the other two being Alava and Guipuzcoa), area 850 sq. miles. The surface is generally mountainous; the most important mineral is iron, which is extensively worked; capital, Bilbao. Pop. 290,222.

BISCAY, BAY OF, that part of the Atlantic which lies between the projecting coasts of France and Spain, extending from Ushant to Cape Finisterre, celebrated for its dangerous navigation.

BISCUIT (bis'kĕt), a kind of hard, dry bread which is not liable to spoil when kept. Biscuits are either fermented or unfermented, the kinds in ordinary use being generally fermented, while the unfermented biscuit is much used at sea, and hence called sea-biscuit.

BISHOP, the highest of the three orders in the Christian ministry—bishops, priests, and deacons—in such churches as recognize three grades. Originally in the Christian church, the name was used interchangeably with presbyter or elder for the overseer or pastor of a congregation; but at a comparatively early period a position of special authority was held by the pastors of the Christian communities belonging to certain places, and the name of bishop became limited to these by way of distinction. There is much that is doubtful or disputed in regard to the history of the episcopal office. Roman

Catholics and many others hold that it is of divine ordination and existed already in apostolic times; and they maintain the doctrine of the apostolical succession, that is to say, the doctrine of the transmission of the ministerial authority in uninterrupted succession from Christ to the apostles, and through these from one bishop to another. Presbyterians deny that the office was of divine or apostolic origin, and hold that it was an upgrowth of subsequent times easily accounted for, certain of the presbyters or pastors acquiring precedence as bishops over others, just as the bishops of the chief cities (Jerusalem, Antioch, Alexandria, Constantinople, Rome) obtained precedence among the bishops and received the title of metropolitan bishops; while the Bishop of Rome came to be regarded as the head of the church and the true successor of Peter. At present in the R. Catholic Church the bishop is usually elected by the presbyters of the diocese, subject to the approbation of the pope and of the secular power. When the monarch is Roman Catholic a bishopric may be in the royal gift, subject to papal approval. The bishop comes next in rank to the cardinal. His special insignia are the miter and crosier or pastoral staff, a gold ring, the pallium, dalmatica, etc. He guards the purity of doctrine in his diocese, appoints professors in the clerical colleges, licenses books on religious subjects, ordains and appoints the clergy, consecrates churches, takes charge of the management of funds for ecclesiastical or pious purposes, etc. The bishops of the Greek Church have similar functions but on the whole less authority. They are always selected from the monastic orders.

In the Church of England bishops are nominated by the sovereign, who, upon request of the dean and chapter for leave to elect a bishop, sends a congé d'élire, or license to elect, with a letter missive, nominating the person whom he would have chosen. The election, by the chapter, must be made within twelve days, or the sovereign has a right to appoint whom he pleases.

In the U. States there are 24 archbishops, and 86 bishops of the Roman Catholic Church, and upward of a hundred bishops of the Protestant Episcopal Church. The Methodist Episcopal Church (North) has 28 bishops, and the Methodist Episcopal Church (South) has twelve. The African Methodist Episcopal in the U. States has 13 bishops, and the Reformed Episcopal Church has seven. There is also a bishop of the Polish Catholic Church, one of the Old Catholic Church, one of the Greek Orthodox Church, and one of the Syrian Greek Orthodox Church in the U. States.

Bishops in partibus infidelium (in part occupied by the infidels) are held to be successors of ancient bishops whose dioceses became extinct. Suffragan bishops fill the function of assistants to bishops.

BISMARCK, (bis'märk), the capital of North Dakota, and county seat of Burleigh Co., on the Missouri river, and on the Northern Pacific Railroad. In 1883 it was made the capital of Dakota Territory, and in 1889 was chosen as the state capital of North Dakota.

State capitol, Bismarck, N. D.

BISMARCK - SCHONHAUSEN (bis'märk-sh*eun*'hou-zĕn), Otto Eduard Leopold, Prince; born of a noble family of the "Mark" (Brandenburg), at Schönhausen, April 1, 1815; studied at Göttingen, Berlin, and Greifswald; entered the army and became lieutenant in the Landwehr. After a brief interval devoted to his estates and to the office of inspector of dikes, he became in 1846 a member of the provincial diet of Saxony, and in 1847 of the Prussian diet. In 1851 he was appointed repre-

Prince Bismarck.

sentative of Prussia in the diet of the German Federation at Frankfort, where with brief interruptions he remained till 1859, exhibiting the highest ability in his efforts to checkmate Austria and place Prussia at the head of the German states. From 1859–62 he was ambassador at St. Petersburg, and in the latter year, after an embassy to Paris of five months' duration, was appointed first minister of the Prussian crown. The Lower House persistently refusing to pass the bill for the reorganization of the army, Bismarck at once dissolved it (Oct., 1862), closing it for four successive sessions until the work of reorganization was complete. When popular feeling had reached its most strained point the Schleswig-Holstein question acted as a diversion, and Bismarck—by the skilful manner in which he added the duchies to Prussian territory, checkmated Austria, and excluded her from the new German confederation, in which Prussia held the first place—became the most popular man in Germany. As chancellor and president of the Federal Council he secured the neutralization of Luxembourg in place of its cession by Holland to France; and, though in 1868 he withdrew for a few months into private life, he resumed office before the close of the year. A struggle between Germany and France appearing to be sooner or later inevitable, Bismarck, having made full preparations, brought matters to a head on the question of the Hohenzollern candidature for the Spanish throne. Having carried the war to a successful issue, he became chancellor and prince of the new German empire. Subsequently, in 1872, he alienated the Roman Catholic party by promoting adverse legal measures and expelling the Jesuits. He then resigned his presidency for a year, though still continuing to advise the emperor. Toward the close of 1873 he returned to power, retaining his position until, in March, 1890, he disagreed with the emperor and tendered his resignation. In 1878 he presided at the Berlin Congress, in 1880 at the Berlin Conference, and in 1884 at the Congo Conference. His life was twice attempted—at Berlin in 1866, and at Kissingen in 1874. He died in 1898.

BIS'MUTH, a metal of a yellowish or reddish-white color, and a lamellar texture. It is somewhat harder than lead and not malleable, when cold being so brittle as to break easily under the hammer, so as to be reducible to powder. Its internal face or fracture exhibits large shining plates variously disposed. It fuses at 476° Fahr., and expands considerably as it hardens. It is often found in a native state, crystallized in rhombs or octahedrons, or in the form of dendrites, or thin laminæ investing the ores of other metals, particularly cobalt. Bismuth is used in the composition of pewter, in the fabrication of printers' types, and in various other metallic mixtures. The subnitrate or basic nitrate of bismuth is used as a paint and as a cosmetic, and is known as Pearl White or Pearl Powder.

BI'SON, the name applied to two species of ox. One of these, the European bison or aurochs, is now nearly extinct, being found only in the forests of Lithuania and the Caucasus. The other, or American bison, improperly

American bison.

termed buffalo, was formerly found over a wide region in the U. States and western Canada, where it was wont to wander in immense herds, but may now be considered as extinct in the wild state,

having been ruthlessly slaughtered. The two species closely resemble each other; the American bison, however, being for the most part smaller, and with shorter and weaker hind-quarters. The bison is remarkable for the great hump or projection over its fore-shoulders, at which point the adult male is almost six feet in height; and for the long, shaggy, rust-colored hair over the head, neck, and fore-part of the body. In summer, from the shoulders backward, the surface is covered with a very short hair, smooth and soft as velvet. The tail is short and tufted at the end. The American bison used to be much hunted for sport as well as for its flesh and skin. Its flesh is rather coarser grained than that of the domestic ox, but was considered by hunters and travelers as superior in tenderness and flavor. The hump is highly celebrated for its richness and delicacy. Their skins, especially that of the cow, dressed in the Indian fashion, with the hair on, make admirable defenses against the cold, and are known as buffalo robes; the wool has been manufactured into hats, and a coarse cloth. The American bison has been found to breed readily with the common ox, the issue being fertile among themselves.

BISQUE (bisk), a kind of unglazed white porcelain used for statuettes and ornaments.

BIT'TERN, the name of several grallatorial birds. There are two British species, the common bittern, and the little bittern, a native of the south, and only a summer visitor to Britain. Both, however, are becoming rare. The common bittern is about 28 inches in length, about 44 in extent of wing; general color, dull yellowish-brown, with spots and bars of black or dark brown; feathers on the breast long and loose; tail short; bill about 4 inches long. It is remarkable for its curious booming or bellowing cry. The eggs (greenish-brown) are four or five in number. The little bittern is not more than 15 inches in length. The American bittern has some resemblance to the common European bittern, but is smaller.

BIT'TERN, the syrupy residue from evaporated sea-water after the common salt has been taken out of it. It is used in the preparation of Epsom salt (sulphate of magnesia), of Glauber's salt (sulphate of soda), and contains also chloride of magnesium, iodine, and bromine.

BITTER-NUT, a tree of N. America, of the walnut order, or swamp-hickory, which produces small and somewhat egg-shaped fruits, with a thin fleshy rind; the kernel is bitter and uneatable.

BITTER-ROOT, a plant of Canada and part of the U. States, so called from its root being bitter though edible, and indeed esteemed as an article of food by whites as well as Indians. From the root, which is long, fleshy, and tapering, grow clusters of succulent green leaves, with a fleshy stalk bearing a solitary rose-colored flower rising in the center, and remaining open only in sunshine. Flower and leaves together, the plant appears above ground for only about six weeks.

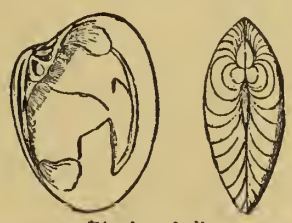
BITTERS, a liquor (frequently spirituous), in which bitter herbs or roots have been steeped. Gentian, quassia, angelica, bogbean, chamomile, hops, centaury, etc., are all used for preparations of this kind. The well-known Angostura bitters have aromatic as well as bitter properties.

BITU'MEN, a mineral substance of a resinous nature, composed principally of hydrogen and carbon, and appearing in a variety of forms which pass into each other and are known by different names, from naphtha, the most fluid, to pertoleum and mineral tar, which are less so, thence to maltha or mineral pitch, which is more or less cohesive, and lastly to asphaltum and elastic bitumen (or elaterite), which are solid. It burns like pitch, with much smoke and flame. It consists of 84 to 88 of carbon and 12 to 16 of hydrogen, and is found in the earth, occurring principally in the secondary, tertiary, and alluvial formations. It is a very widely spread mineral, and is now largely employed in various ways. As the binding substance in mastics and cements it is used for making roofs, arches, walls, cellar-floors, etc., water-tight, for street and other pavements, and in some of its forms for fuel and for illuminating purposes. The bricks of which the walls of Babylon were built are said to have been cemented with bitumen, which gave them unusual solidity.

BITUMINOUS COAL. See Coal.

BITUMINOUS SHALE, or **SCHIST,** an argillaceous shale impregnated with bitumen and very common in the coal-measures. It is largely worked for the production of paraffin, etc.

BI'VALVES, molluscous animals having a shell consisting of two halves or



Bivalve shell.

valves that open by an elastic hinge and are closed by muscles; as the oyster, mussel, cockle, etc.

BIVOUAC (biv'u-ak), the encampment of soldiers in the open air without tents, each remaining dressed and with his weapons at hand. It was the regular practice of the French revolutionary armies, but is only desirable where great celerity of movement is required.

BJÖRNSON, Björnstjerne, a celebrated Norwegian poet, born at Kvikne in 1832. He first tried journalism, but that failing wrote in 1858 his first drama, Between the Battles, and also in that year his first novel, Trust and Trial. He became a theatrical manager in 1860, traveled much, was a leader of Norwegian republicans, and helped to carry the revolution of 1901. His poems chiefly celebrate the folk lore of Scandinavia, and his plays deal largely with so-called moral and social problems. In 1880 he visited the U. States, where he delivered a course of lectures and was well received. His principal plays and novels have been translated into English.

BLACK, the negation of all color, the opposite of white. There are several black pigments, such as ivory-black, made from burned ivory or bones; lamp-black, from the smoke of resinous substance; Spanish-black, or cork-black, from burned cork, etc.

BLACK, Jeremiah Sullivan, an American jurist, born in Pennsylvania in 1810, admitted to the bar in 1831, and from 1842 to 1851 was judge of district courts in Pennsylvania. He was supreme court justice of Pennsylvania from 1851 to 1857, attorney-general in President Buchanan's cabinet, secretary of state in 1860, counsel for President Johnson in 1868, and counsel for Tilden before the electoral commission in the contest of Hayes's election in 1877. He died in 1883.

BLACK, William, novelist, born in Glasgow in 1841. His first novel, Love or Marriage, 1867, was only moderately successful, but his In Silk Attire, Kilmeny, The Monarch of Mincing Lane, and especially A Daughter of Heth (1871), gained him an increasingly wide circle of readers. He died in 1898. Other works: The Strange Adventures of a Phaeton (1872), A Princess of Thule (1873), The Maid of Killeena, etc. (1874), Three Feathers (1875), Madcap Violet (1876), Green Pastures and Piccadilly (1877), Macleod of Dare (1878), White Wings (1880), Sunrise (1881), The Beautiful Wretch (1882), Shandon Bells (1883), Judith Shakespeare (1884), White Heather (1885), The Strange Adventures of a House-boat (1888), In Far Lochaber (1889), The New Prince Fortunatus (1890), etc.

BLACK-BEETLE, a popular name for the cockroach.

BLACK'BERRY, a popular name of the bramble-berry or the plant itself.

BLACK'BIRD, called also the merle, a well-known species of thrush. It is larger than the common thrush, its length being about 11 inches. The color of the male is a uniform deep black, the bill being an orange-yellow; the female is of a brown color, with blackish-brown bill. The nest is usually in a thick bush, and is built of grass, roots,

The crow-blackbird.

twigs, etc., strengthened with clay. The eggs, generally four or five in number, are of a greenish-blue, spotted with various shades of brown. The song is rich, mellow, and flute-like, but of no great variety of compass. Its food is insects, worms, snails, fruits, etc. The

blackbirds or crow-blackbirds of America are quite different from the European blackbird, and are more nearly allied to the starlings and crows. See Crow-blackbird. The red-winged blackbird, belonging to the starling family, is a familiar American bird that congregates in great flocks.

BLACK'BURN, a municipal county, and parliamentary borough of England, Lancashire, 21 miles n.n.w. from Manchester. Blackburn is one of the chief seats of the cotton manufacture, there being upward of 140 mills, as well as works for making cotton machinery and steam-engines. Pop. 127,527.

BLACK DEATH. See Plague.

BLACK DRAUGHT, sulphate of magnesia and infusion of senna, with aromatics to make it palatable.

BLACKFEET INDIANS, a tribe of American Indians, partly inhabiting the U. States, partly Canada, from the Yellowstone to Hudson's Bay.

BLACKFISH, a fish caught on the American coast, especially in the vicinity of Long Island, whence large supplies are obtained for the New York market. Its back and sides are of a

Blackfish.

bluish or crow black, the under parts, especially in the males, are white. It is plump in appearance, and much esteemed for the table, varying in size from 2 to 12 lbs.

BLACK FOREST, a chain of European mountains in Baden and Würtemberg, running almost parallel with the Rhine for about 85 miles. The Danube, Neckar, Kinzig, and other streams, rise in the Black Forest, which is rather a chain of elevated plains than of isolated peaks; highest summit, Feldberg, 4900 feet. The skeleton of the chain is granite, its higher points covered with sandstone. The principal mineral is iron, and there are numerous mineral springs. The forests are extensive, chiefly of pines and similar species, and yield much timber. The manufacture of wooden clocks, toys, etc., is the most important industry, employing about 40,000 persons. The inhabitants of the forest are quaint and simple in their habits, and the whole district preserves its old legendary associations.

BLACK FRIARS, friars of the Dominican order; so called from their habit.

BLACK FRIDAY, the name given to Friday, Sept. 24, 1869, or Friday, Sept. 19, 1873, on both of which days Wall Street, New York, was stricken with money panics. The first panic was caused by the Fisk-Gould attempt to corner gold; the second was the financial smash which was part of the general panic of 1873.

BLACK GUM, an American tree, yielding a close-grained, useful wood; fruit a drupe of blue-black color, whence it seems to get its name of "black"; it has no gum about it. It is called also pepperidge, and has been introduced into Europe as an ornamental tree.

BLACK HAWK, a historic Indian, chief of the Sacs, who repudiated his father's sale of the land of the Sacs and Foxes east of the Mississippi and made war on the Americans in 1812. In 1830 Black Hawk opened war a second time and was defeated at the Wisconsin river by Dodge, July 21, 1832. On Aug. 1 he surrendered and was confined in Fortress Monroe until 1833. He died Oct. 18, 1838.

BLACK HILLS, a part of the Rocky Mountains Range in South Dakota. They cover a total area of about 6000 sq. miles, 1893 sq. miles of which have been set apart by the U. States government as a forest reserve. They are drained and nearly surrounded by the two main forks of the Cheyenne river. Their altitude ranges from between 2500 and 3000 feet at their base, to the summit of Harney Peak, 7216 feet in height. The mountains were formed by a local uplift, which raised the Archæan and later formations into a concentrie fold. The Black Hills district was first partly explored in 1874 by an expedition under General Custer, when gold was discovered. In 1876, after some hostilities, a treaty made with the Sioux Indians opened the country to settlement, and Deadwood, Central City, Lead City, and other towns grew up very rapidly. The Black Hills constitute one of the richest gold-mining districts in the U. States.

BLACK HOLE OF CALCUTTA, a small chamber, 20 feet square, in the old fort of Calcutta, in which, after their capture by Surajah Dowlah, the whole garrison of 146 men were confined during the night of June 21, 1756. Only twenty-three survived. The spot is now marked by a monument.

BLACKING, for boots and shoes, etc., usually contains for its principal ingredients oil, vinegar, ivory or bone black, sugar or molasses, strong sulphuric acid, and sometimes caoutchouc and gum-arabic. It is used either liquid or in the form of paste, the only difference being that in making the paste a portion of the vinegar is withheld.

BLACK LEAD. See Graphite.

BLACKLEG, a disease which afflicts cattle, sheep, swine, and horses, but from which man is immune. It is caused by a germ which produces tumors in the muscles and various systemic symptoms which end almost always in death. It is chiefly prevalent in Kansas, Texas, Colorado, and South Dakota. Blackleg may be prevented by vaccination.

BLACK-LETTER, the name commonly given to the Gothic characters which began to supersede the Roman characters in the writings of western Europe toward the close of the 12th century. The first types were in black-letter, but these were gradually modified in Italy until they took the later Roman shape introduced into most European states during the 16th century.

BLACKLIST, a term applied to a number of persons who are deemed obnoxious by the maker of the list and against whom he warns his associates, and with whom he refuses to have any kind of business dealings, either as employer or trader. Black lists have been used in almost every kind of business. The alleged black list of the railroads against those who took part in the Pullman and other strikes, and the notorious baseball black list of the baseball organizations under the famous "national agreement" of a few years ago, are notable instances of this process in the U. States.

BLACKMAIL, a certain rate of money, corn, cattle, or the like, anciently paid in the north of England and in Scotland, to certain men who were allied to robbers, to be protected by them from pillage. Blackmail was levied in the districts bordering the Highlands of Scotland till the middle of the 18th century.

The term now generally survives as the designation of an attempt to extort money, or other things, by threats, usually of exposure or calumny. In many states blackmail by written threat is deemed actionable.

BLACKMORE, Richard Doddridge, novelist, born at Longworth, Berkshire, 1825, died in 1900. His greatest success was Lorna Doone, a Romance of Exmoor (1869), one of the best of modern romances.

BLACK MOUNTAINS, the group which contains the highest summits of the Appalachian system, Clingman's Peak being 6701 feet, Guyot's Peak 6661. See Appalachian Mountains.

BLACK SEA, a sea situated between Europe and Asia, and mainly bounded by the Russian and Turkish dominions, being connected with the Mediterranean by the Bosporus, Sea of Marmora, and Dardanelles, and by the Strait of Kertsch with the Sea of Azov, which is, in fact, only a bay of the Black Sea; area of the Black Sea and the Sea of Azov about 175,000 square miles, with a depth in the center of more than 150 fathoms and few shoals along its shores. The water is not so clear as that of the Mediterranean, and is less salt on account of the many large rivers which fall into it — the Danube, Dniester, Dnieper, Don, etc. Though not tidal, there are strong currents. The tempests on it are very violent, as the land which confines its agitated waters gives to them a kind of whirling motion, and in the winter it is scarcely navigable. During January and February the shores from Odessa to the Crimea are ice-bound. It contains few islands, and those of small extent. The most important ports are those of Odessa, Kherson, Nicolaiev, Sebastopol, Batum, Trebizond, Samsun, Sinope, and Varna.

BLACKSNAKE, a common snake reaching a length of 5 or 6 feet, and so agile and swift as to have been named the racer, with no poison fangs, and therefore comparatively harmless. It feeds on small quadrupeds, birds, and the like, and is especially useful in killing rats.

BLACK'STONE, Sir William, an eminent jurist, born in London in 1723; educated at the Charter House and Pembroke College, Oxford. In 1743 he was elected fellow of All-Souls College, Oxford, and in 1746 was called to the bar; but, having attended the Westminster law-courts for seven years without success, he retired to Oxford

Here he gave lectures on law, which suggested to Mr. Viner the idea of founding a professorship at Oxford for the study of the common law; and Blackstone was in 1758 chosen the first Vinerian professor. In 1761 he was elected M.P. for Hindon, made king's counsel and solicitor-general to the queen. In 1765 he published the first volume of his famous Commentaries on the Laws of England, the other three volumes being produced at intervals during the next four years. Its merits as an exposition made it for a long period the principal text-book of English law. In 1770 he was knighted and made one of the justices of Common Pleas, continuing in office until his death in 1780.

BLACKTAIL, an American deer, so called because of its black tail. Similar in its general characters to the mule deer, it occupies the coast region from central California to Alaska. Its color is brown-gray mottled with black, and it has a black stripe along the spine.

BLACK TIN, tin ore when dressed, stamped, and washed ready for smelting, forming a black powder.

BLACK VOMIT, the dark substance thrown up in yellow fever; hence a name of this disease.

BLACK WADD, an ore of manganese, used as a drying ingredient in paints.

BLACKWELL, Elizabeth, the first woman who ever obtained the degree of M.D. She was born in England in 1821, and settled in America with her parents in 1831. After numerous difficulties she was admitted into the College of Geneva, N. Y., and graduated M. D. in 1849.

BLADDER, Urinary, a musculo-membranous bag or pouch present in all Mammalia, destined to receive and retain for a time the urine which is secreted by the kidneys. It occupies the anterior and median portion of the pelvis, and in the male of the human subject is situated behind the pubis and above and in front of the rectum; in the female above and in front of the vagina and uterus. The urine secreted by the kidneys is conveyed into this reservoir by means of two tubes called the ureters, which open near the neck or lower part of the bladder in an oblique direction, by which means they prevent the reflux of the urine. When empty it forms a rounded, slightly conoid mass about the size of a small hen's egg. As it gradually fills with urine its walls become distended in all directions except in front, and it then rises above the pelvis proper into the abdomen. It is held in its place by two lateral ligaments, one on each side, and an anterior ligament. The contents are carried off by the urethra, which, as well as the neck of the bladder, is surrounded by a structure called the prostate gland.

BLADDERWORT, the common name of slender aquatic plants, species of which are natives of Britain, the United States, etc., growing in ditches and pools. They are named from having little bladders or vesicles, that fill with air at the time of flowering and raise the plant in the water, so that the blossoms expand above the surface.

BLAINE, James Gillespie, American statesman, born 1830. He entered Washington College, Pa., at the age of thirteen, graduated in 1847, studied law, acted as a teacher, and then having gone to Augusta, Maine, was for several years newspaper editor. He was sent to congress by Maine as a republican in 1862, and was repeatedly reelected. He was several times speaker of the House of Representatives. In 1876 he entered the senate; in 1884 he was nominated for the presidency, but was defeated by Mr. Cleveland. In 1884 appeared the first volume of his Twenty Years of Congress, a work which has had a very favorable reception. He died in January, 1893.

BLAIR, Francis Preston, an American politician and writer, born in 1791, at Abingdon, Va., died 1876. He supported Abraham Lincoln for the presidency and took part in the famous peace conference at Hampton Roads, Feb. 3, 1865.

BLAIR, Francis Preston, an American statesman, soldier and jurist, born in Lexington, Ky., in 1821, died 1875. He settled in St. Louis, took the federal side during the civil war, after which he became a democrat and was candidate for vice-president in 1868.

BLAIR, John Insley, an American philanthropist, born in New Jersey in 1802, died 1899. He founded Blair Hall at Princeton University and gave large endowments to other schools and colleges. He was one of the builders of the Delaware, Lackawanna & Western Railroad.

BLAIR, Montgomery, an American jurist and statesman, born in Kentucky in 1813, died 1883. He settled in St. Louis, and was counsel for the defendant in the famous Dred Scott case. He was postmaster-general in Lincoln's cabinet and introduced the money-order system in the American postal service. He subsequently joined the democratic party and was a supporter of Tilden in the Tilden-Hayes controversy.

BLAKE, Eli Whitney, an American inventor, born at New Haven, Conn., in 1795, died in 1886. His principal invention was the famous stone-crusher called by his name.

BLAKE, Lillie Devereaux, an American reformer, born at Raleigh, N. C., in 1835. She became known as a novelist in the early sixties and for 20 years, until 1890, served as president of the New York State Woman's Suffrage Association. She is also known as a most capable lecturer.

BLAKE, Robert, a celebrated British admiral, was born at Bridgewater in 1599, died at the entrance of Plymouth Sound 1657. He was elected member for Bridgewater in the parliament of 1640. This being soon dissolved he lost his election for the next, and sought to advance the parliamentary cause in a military capacity in the war which then broke out. He soon distinguished himself, and in 1649 he was sent to command the fleet with Colonels Deane and Popham. His greatest achievements were in the Dutch war which broke out in 1652. In November, 1654, he was sent with a strong fleet to enforce a due respect to the British flag in the Mediterranean. He sailed first to Algiers, which submitted, and then demolished the castles of Goletta and Porto Ferino, at Tunis, because the dey refused to deliver up the British captives. A squadron of his ships also blocked up Cadiz, and intercepted a Spanish Plate

Admiral Blake.

fleet. In April, 1657, he sailed with twenty-four ships to Santa Cruz, in Teneriffe; and, notwithstanding the strength of the place, burned the ships of another Spanish Plate fleet which had taken shelter there, and by a fortunate change of wind came out without loss.

BLAKE, William, mystic artist and poet, author of many exquisite lyrics, and of designs mainly allegorical or symbolical, was the son of a London hosier, and was born in 1757. Failing to find a publisher for his work Songs of Innocence, he invented a process by which he was both printer and illustrator of his own poems. Some of his best-known works are: Gates of Paradise, Book of Thel, Marriage of Heaven and Hell, Songs of Experience, Book of Urizen, Song of Los, Book of Ahania, etc. He died in 1828.

BLANCHARD, Thomas, an American inventor, born in 1788, died in 1864. His principal inventions were a tack-making machine, a lathe for turning gun-barrels, and several contrivances for steamboat navigation.

BLANCHE OF CASTILE, daughter of Alphonso IX., queen of Louis VIII., king of France, and mother of St. Louis, born 1187, died 1252 or 1253. On the death of Louis VIII. she procured the coronation of her son, and during his minority held the reins of government in his name with distinguished success. In 1244, when St. Louis left for the Holy Land, she again became regent, and gave new proofs of her abilities and firmness as a ruler.

BLANC - MANGE (blė-mänzh'), in cookery, a name of different preparations of the consistency of a jelly, variously composed of dissolved isinglass, arrow-root, maize-flour, etc., with milk and flavoring substances.

BLAND, Richard Parks, an American statesman, born in Kentucky in 1835, died in 1899. He settled in Missouri. He served as congressman from that state from 1872 till his death. He was an ardent supporter of the silver movement, and introduced the celebrated Bland Act of 1878 for the coinage of silver. In 1896 he was a prominent

candidate for the presidential nomination at the Chicago convention.

BLANKET, a woolen covering for the bed or for the person. Blanket manufacture in the U. States has grown vastly since the war of 1812, and the industry is chiefly in New England. Excellent blankets are made by the natives of India, and also by the N. American Indians. In recent years the industry has grown considerably in California and Oregon.

BLANK VERSE, verse without rhyme, first introduced into English poetry (from the Italian) by the Earl of Surrey. The most common form of English blank verse is the decasyllabic, such as that of Milton's Paradise Lost, or of the dramas of Shakespeare. From Shakespeare's time it has been the kind of verse almost universally used by dramatic writers, who often employ an additional syllable, making the lines not strictly decasyllabic. The first use of the term blank verse is said to be in Hamlet, ii. 2: "The lady shall say her mind freely, or the blank verse shall halt for't." The term is not applied to the Anglo-Saxon and Early English alliterative unrhymed verse.

BLAR'NEY, a village in Ireland, 4 miles n.w. of the city of Cork, with Blarney Castle in its vicinity. A stone called the Blarney Stone, near the top of the castle, is said to confer on those who kiss it the peculiar kind of persuasive eloquence alleged to be characteristic of the natives of Ireland.

BLAS'PHEMY is the denying of the existence of God, assigning to him false attributes, or denying his true attributes; contumelious reproaches of our Savior; profane scoffing at the Holy Scriptures, or exposing them to ridicule and contempt. In Catholic countries it also includes the speaking contemptuously or disrespectfully of the Holy Virgin or the saints.

BLAST-FURNACE, the name given to the common smelting-furnace used for obtaining iron from its ores with the aid of a powerful blast of air. This air-blast, which is propelled by a powerful blowing-engine and is now invariably heated to a high temperature (600° to 900° F.), is injected by pipes called tuyeres, situated as shown at A in the annexed vertical section, in the lowest part of the furnace, near to the hearth B. The conical part C next above the hearth is termed the boshes, and the interior is continued upward, sometimes, as in the annexed cut, in a tapered body or cone D, sometimes as a perpendicular cylinder, which is surmounted by an opening for the introduction of the materials from an external gallery F. The exterior consists of massive masonry of stone or firebrick, the body part being lined with two shells of firebricks separated by a thin space to allow for expansion, this space being generally filled with sand, ground fire-clay, or the like, to hinder the radiation of heat to the outside. When the body rises in the form of a perpendicular cylinder it is called the barrel. The cone or barrel is sometimes clasped round on the outside by numerous strong iron hoops, or is cased with iron plates fastened to the masonry by iron bolts. The boshes C are lined with firebrick or firestone, and the hearth B is built with large blocks of refractory stone. The charging of the furnace goes on all day and night, one charge consisting of a barrow-load of coal and

Section of blast furnace.

a barrow-load of ore, char, and lime, the last mineral acting as a flux. These charges are constantly passing downward and undergoing a change as they come nearer the hotter parts of the furnace. Toward the lower part the earthy matter of the ore unites with the limestone and forms a slag, which finally escapes at an opening below the tuyeres, and the molten metal drops down and fills the lower part at B, to be drawn off at stated periods. This is done usually twice in the twenty-four hours by means of a round hole called a tap. The furnace is constantly kept filled to within about 2 feet of the top. The ore put in at the top takes about thirty-six hours before it comes out as iron. Hematite yields on an average about 55 per cent of metal, and blackband about 40 to 50. In the newer forms of furnaces the top is closed, and the gases formerly burned at the top are conveyed by pipes G to be utilized as fuel in heating the blast and in raising steam for the blowing-engine. The principle adopted is to close the top by a bell-and-cone arrangement E, which is opened and shut at pleasure by hydraulic or other machinery. The height of furnaces varies from 50 to 80, and even in some cases to upward of 100 feet, and the greatest width is about one-third of this.

BLASTING, the operation of breaking up masses of stone or rock in situ by means of gunpowder or other explosive. In ordinary operations holes are bored into the rock from 1 to 6 inches in diameter, by means of a steel-pointed drill, by striking it with hammers or allowing it to fall from a height. After the hole is bored to the requisite depth it is cleaned out, the explosive is introduced, the hole is "tamped" or filled up with broken stone, clay, or sand, and the charge exploded by means of a fuse or by electricity. In larger operations mines or shafts of considerable diameter take the place of the holes above described. Shafts are sunk from the top of the rock to various depths, sometimes upward of 60 feet. This shaft joins a heading, or gallery, driven in from the face, if possible along a natural joint; and from this point other galleries are driven some distance in various directions, with headings at intervals, returning toward the face of the rock and terminating in chambers for the charges. Enormous charges are frequently made use of, upward of twenty tons of gunpowder having been fired in a single blast. One of the greatest blasting operations ever attempted was the removal of the reefs in the East River, near New York, known as Hellgate. An entrance-shaft was sunk on the Long Island shore, from which the reef projected. From this shaft nearly twenty tunnels were bored in all directions, extending from 200 to 240 feet, and connected by lateral galleries. Upward of 52,000 lbs. of dymanite, rend-rock, and powder were used, and millions of tons of rock were dislodged. Numerous important improvements have been made in blasting by the substitution of rock-boring machines for hand labor. Of such machines, in which the "jumper" or drill is repeatedly driven against the rock by compressed air or steam, being also made to rotate slightly at each blow, there are many varieties.

BLATCHFORD, Samuel, an American jurist, born in 1820 at New York City, died in 1893. In 1882 he was appointed an associate justice of the United States Supreme court, and served in that capacity until his death.

BLEACHING, the act or art of freeing textile fibers and fabrics and various other substances (such as materials for paper, ivory, wax, oils) from their natural color, and rendering them perfectly white, or nearly so. The ancient method of bleaching by exposing the fabrics, etc., to the action of the sun's rays, and frequently wetting them, has been nearly superseded, at least where the business is carried on on the large scale, more complicated processes in connection with powerful chemical preparations being now employed. Among the latter the chief are chlorine and sulphurous acid, the latter being employed more especially in the case of animal fibers (silk and wool), while cotton, flax, and other vegetable fibers are operated upon with chlorine, the bleaching in both cases being preceded by certain cleansing processes. The use of chlorine as a bleaching agent was first proposed by Berthollet in 1786, and shortly afterward introduced into Great Britain, where it was first used simply dissolved in water, afterward dissolved in alkali, and then in the form of bleaching-powder, commonly called chloride of lime. In modern calico bleaching the preliminary process is singeing by passing the fabric over red-hot plates or through a gas-flame to remove the downy pile and short threads from the surface of the cloth. The goods next pass to the liming process

when they are uniformly and thoroughly impregnated with a supersaturated solution of lime. The next process is the bowking or boiling for several hours, after which they are washed. They are then soured by being passed through a solution of hydrochloric acid for the purpose of dissolving any traces of free lime which may have been left in the washing, and to decompose the calcareous soap formed by the bowking process. After boiling in kiers with a solution of soda-ash and rosin and another washing, the cloth is ready for the processes of chemicking or liquoring with bleaching-powder, and white-souring with a very dilute sulphuric acid. Another thorough washing concludes the operations of bleaching proper, after which the cloth goes through various finishing processes. Modifications of the same processes are adopted in bleaching linen, wool, silk, etc.

BLEACHING-POWDER, chloride of lime, made by exposing slaked lime to the action of chlorine. It is regarded as a double salt of the chloride of calcium and hypochlorite of calcium. It is much used as a disinfectant, besides its use in bleaching.

BLENHEIM DOG, a variety of spaniel, bearing a close resemblance to the King Charles breed, but somewhat smaller, so named from having been originally bred by one of the Dukes of Marlborough. It has a short muzzle, long silky hair without any curl, and long pendulous ears.

BLEN'NERHAS'SET, Harman, a large Anglo-American land-owner and emigrant who became noted for his association with the Aaron Burr conspiracy. He was born in England in 1764 and died in 1831. Coming to America in 1797 he settled in Virginia, and soon grew very rich, subsequently becoming a cotton planter in Mississippi. His wife, née Adeline Agnew, published several novels which were popular in her day.

BLESSING, or **BENEDICTION,** a prayer or solemn wish imploring happiness upon another; a certain holy action which, combined with prayer, seeks for God's grace for persons, and, in a lower degree, a blessing upon things, with a view whether to their efficiency or safety. The lifting up of the hands is an inseparable adjunct of the act of blessing. In the Roman Catholic Church the sign of the cross is made, and the thumb and the two first fingers of the right hand are extended, the two remaining fingers turned down. In the Greek Church the thumb and the third finger of the same hand are conjoined, the other fingers being stretched out. Some see in this position a representation of the sacred monogram in Greek letters of our Lord's name.—In the English liturgy there are two blessings or benedictions; in the service of the Scotch Church there is only one.

BLESSINGTON, Margaret, Countess of, was born near Clonmel, Ireland, 1789, died at Paris 18 9. At the age of fifteen she married Captain Farmer, who died in 1817; and a few months after his death married Charles John Gardiner, earl of Blessington. In 1822 they went abroad, and continued to reside on the Continent till the earl's death in 1829, when Lady Blessington took up her abode in Gore House, Kensington. Her residence became the fashionable resort for all the celebrities of the time. She contributed to the New Monthly Magazine, Conversations with Lord Byron; wrote numerous novels, including The Belle of a Season, The Two Friends, Strathern, and the Victims of Society; and acted as editress for several years of Heath's Book of Beauty, the Keepsake, and the Gems of Beauty.

BLIGHT, a generic name commonly applied to denote the effects of disease or any other circumstance which causes plants to wither or decay. It has been vaguely applied to almost every disease of plants whether caused by the condition of the atmosphere or of the soil, the attacks of insects, parasitic fungi, etc. The term is frequently limited to disease in cereal crops.

BLIND, a screen of some sort to prevent too strong a light from shining in at a window, or to keep people from seeing in. Venetian blinds are made of slats of wood, so connected as to overlap each other when closed, and to show a series of open spaces for the admission of light and air when in the other position.

BLIND, The, those who want, or are deficient in, the sense of sight. Blindness may vary in degree from the slightest impairment of vision to total loss of sight; it may also be temporary or permanent. It is caused by defect, disease, or injury to the eye, to the optic nerve, or to that part of the brain connected with it. Old age is sometimes accompanied with blindness, occasioned by the drying up of the humors of the eye, or by the opacity of the cornea, the crystalline lens, etc. There are several causes which produce blindness from birth. Sometimes the eyelids adhere to each other, or to the eyeball itself, or a membrane covers the eyes; sometimes the pupil of the eye is closed, or adheres to the cornea, or is not situated in the right place, so that the rays of light do not fall in the middle of the eye; besides other defects. The blind are often distinguished for a remarkable mental activity, and a wonderful development of the intellectual powers. Their touch and hearing, particularly, become very acute.

There are now comparatively few large cities that do not possess a school or institution of some kind for the blind. The occupations in which the blind are found capable of engaging are such as the making of baskets and other kinds of wicker-work, brushmaking, rope and twine making, the making of mats and matting, knitting, netting, fancy work of various kinds, cutting fire-wood, the sewing of sacks and bags, the carving of articles in wood, etc. Piano-tuning is also successfully carried on by some, and the cleaning of clocks and watches has even been occasionally practiced by them.

Various systems have been devised for the purpose of teaching the blind to read, some of which consist in the use of the ordinary Roman alphabet, with more or less modification, and some of which employ types quite arbitrary in form.

BLIND-FISH, the name of several species of fish, inhabiting the American cave-streams. They are all small, the largest not exceeding five inches. In the typical species, of the Mammoth Cave of Kentucky, the eyes are reduced to a useless rudiment hidden under the skin, the body is translucent and colorless, and the head and body are covered with numerous rows of sensitive papillæ, which form very delicate organs of touch.

BLIND TOM, a celebrated musical prodigy. He was born in 1850 near Columbus, Ga., and his performances on the piano were incredible. He could repeat, after a single hearing, exceedingly complex compositions. He was exhibited for many years, but his mental infirmities finally caused his withdrawal. He was perfectly blind, and almost idiotic. Of late he is said to have lived in New York City. Died in 1908.

BLISS, Cornelius Newton, an American merchant and politician, born at Fall River, Mass., in 1833. He has been chairman of the republican state committee of New York and treasurer of the republican national committee for several terms. In President McKinley's cabinet he was secretary of the interior.

BLISTER, a topical application which, when applied to the skin, raises the cuticle in the form of a vesicle, filled with serous fluid, and so produces a counter-irritation. The Spanish fly-blister operates with most certainty and expedition, and is commonly used for this purpose, as well as mustard, hartshorn, etc.

BLIZ'ZARD, a fierce storm of frosty wind with fine powdery snow, occurring in some parts of N. America and often causing loss of life through suffocation and cold.

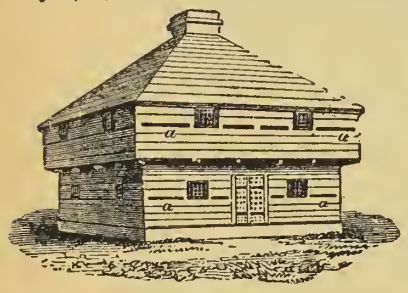
BLOCK, a mechanical contrivance consisting of one or more grooved pulleys mounted in a casing or shell which is furnished with a hook, eye, or strap, by which it may be attached to an object, the function of the apparatus being to transmit power or change the direction of motion by means of a rope or chain passing round the movable pulleys. Blocks are single, double, treble, or fourfold, according as the number of sheaves or pulleys is one, two, three, or four. A running block is attached to the object to be raised or moved; a standing block is fixed to some permanent support. Blocks also receive different denominations from their shape, purpose, and mode of application. They are sometimes made of iron as well as of wood. Blocks to which the name of dead-eyes has been given are not pulleys, being unprovided with sheaves.

BLOCKADE', is the rendering of intercourse with the seaports of an enemy unlawful on the part of neutrals, and it consists essentially in the presence of a sufficient naval force to make such intercourse difficult. It must be declared or made public, so that neutrals may have notice of it. If a blockade is instituted by a sufficient authority, and maintained by a sufficient force, a neutral is so far affected by it that an

attempt to trade with the place invested subjects vessel and cargo to confiscation by the blockading power. The term is also used to describe the state of matters when hostile forces sit down around a place and keep possession of all the means of access to it, so as to cut off entirely its communication with the outside world, and so compel surrender from want of supplies.

BLOCK-BOOKS, before and for a short time after the invention of printing, books printed from wooden blocks each the size of a page and having the matter to be reproduced, whether text or picture, cut in relief on the surface.

BLOCKHOUSE, a fortified edifice of one or more stories, constructed chiefly of blocks of hewn timber. Blockhouses are supplied with loopholes for musketry (*a a*) and sometimes with em-



Block-house.

brasures for cannon, and when of more than one story the upper ones are made to overhang those below, and are furnished with machicolations or loopholes in the overhung floor, so that a perpendicular fire can be directed against the enemy in close attack. Blockhouses are often of great advantage, and in wooded localities readily constructed.

BLOCK-SYSTEM, a system of working the traffic on railways according to which the line is divided into sections of 3 or 4 miles, each section generally stretching from one station to the next, with a signal and telegraphic connection at the end of each section. The essential principle of the system is that no train is allowed to enter upon any one section till the section is signaled wholly clear, so that between two successive trains there is not merely an interval of time, but also an interval of space.

BLOCK-TIN, tin at a certain stage of refinement, but not quite pure.

BLOIS (blwä), capital of the French dep. Loir-et-Cher, 99 miles s.s.w. Paris,

Court of the Castle of Blois.

on the Loire. The castle was long occupied by the counts of the name; and became a favorite residence of the kings of France. Louis XII. was born, Francis I., Henry II., Charles IX., and Henry III. held their courts in it Pop. 21,077.

BLOOD, the fluid which circulates through the arteries and veins of the human body and that of other animals, which is essential to the preservation of life and nutrition of the tissues. This fluid is more or less red in vertebrates, except in the lowest fishes. In insects and in others of the lower animals there is an analogous fluid which may be colorless, red, bluish, greenish, or milky. The venous blood of mammals is a dark red, but in passing through the lungs it becomes oxidized and acquires a bright scarlet color, so that the blood in the arteries is of a brighter hue than that in the veins. The central organ of the blood circulation is the heart (which see). The specific gravity of human blood varies from 1·045 to 1·075, and its normal temperature is 99° Fahr. 1000 parts contain 783·37 of water, 2·83 fibrin, 67·25 albumen, 126·31 blood corpuscles, 5·16 fatty matters, 15·08 various animal matters and salts. When ordinary blood stands for a time it separates into two portions, a red coagulated mass consisting of the fibrin, corpuscles, etc., and a yellowish watery portion, the serum. The blood corpuscles or globules are characteristic of the fluid. These are minute red and white bodies floating in the fluid of the blood. The red ones give color to the fluid, and are flattish discs, oval in birds and reptiles, and round in man and most mammals. In man they average $\frac{1}{3200}$th inch in diameter, and in the Proteus, which has them larger than any other vertebrate, $\frac{1}{400}$th inch in length and $\frac{1}{727}$th in breadth. The white or colorless corpuscles are the same as the lymph or chyle corpuscles, and are spherical or lenticular, nucleated, and granulated, and rather larger than the red globules. See Harvey William.

BLOOD, Avenger of, in Scripture, the nearest relation of any one that had died by manslaughter or murder, so called because it fell to him to punish the person who was guilty of the deed.

BLOOD FEUD, the right of private vengeance for injuries done by violence. The feud is generally found a legal or acknowledged right in primitive societies only. The right passes to the nearest of kin to the injured or murdered person. It persists today in Corsica and other places, and in the U. States it is practiced by the mountaineers of Kentucky.

BLOODHOUND, a variety of dog with long smooth and pendulous ears, remarkable for the acuteness of its smell, and employed to recover game or prey which has escaped wounded from the hunter, by tracing the lost animal by the blood it has spilt; whence the name of the dog. There are several varieties of this animal, as the English, the Cuban, and the African bloodhound. In some places bloodhounds have not only been trained to the pursuit of game, but also to the chase of man. In America they used to be employed in hunting fugitives slaves.

BLOOD-LETTING. See Phlebotomy.

BLOOD-RAIN, showers of grayish and reddish dust mingled with rain which occasionally fall usually in the zone of the earth which extends on both sides of the Mediterranean westwardly over the Atlantic, and eastwardly to central Asia. The dust is largely made up of microscopic organisms, especially the shells of diatoms; the red color being owing to the presence of a red oxide of iron.

Blood-hound.

BLOODROOT, a plant of Canada and the U. States, belonging to the poppy order, and so named from its root-stock yielding a sap of a deep orange color. Its leaves are heart-shaped and deeply lobed, the flower grows on a scape and is white or tinged with rose. The plant has acrid narcotic properties, and has been found useful in various diseases. Geum canadense, another American plant used as a mild tonic, is also known as bloodroot.

BLOOD-STAINS, the stains left by blood, and of importance in criminal trials. Until recently it was impossible positively to identify a blood-stain, old or new, as human blood, because the crystals formed by chemical tests are indistinguishable as between man and some other animals. A positive test, however, has recently been discovered. The stain is extracted with a double strength of salt solution and filtered. Small quantities of human blood are then injected daily for six days into the peritoneal cavity of a rabbit. Some of the rabbit's serum is then added to the clear filtrate of the suspected blood, and if the latter be human a light flocculent precipitate will fall.

BLOOD-VESSELS are the tubes or vessels in which the blood circulates. See Arteries, Veins, Heart.

BLOODY ASSIZES, those held by Judge Jeffreys in 1685, after the suppression of Monmouth's rebellion. Upward of 300 persons were executed after short trials; very many were whipped, imprisoned, and fined; and nearly 1000 were sent as slaves to the American plantations.

BLOODY MARY, a name given to Queen Mary of England, daughter of Henry VIII., whose reign from 1553 to 1558 was marked by persecution of the Protestants.

BLOODY TOWER, a name given to the tower in the Tower of London, in which Richard III. had murdered the young sons of Edward IV.

BLOOMER, Amelia Jenks, the inventor of the bloomer costume for women She was a native of New York, born in 1818, died in 1894. She was a general reformer and temperance advocate. See Bloomers.

BLOOMER COSTUME, a style of dress adopted about the year 1849 by Mrs. Bloomer, of New York, who proposed

thereby to effect a complete revolution in female dress, and add materially to the health and comfort of women. It consisted of a jacket with close sleeves, a skirt reaching a little below the knee, and a pair of Turkish pantaloons secured by bands round the ankles. See Bloomer, Amelia Jenks.

BLOOMFIELD-ZEISLER, Fanny, an American pianist, born in Austria in 1866. She was educated in Chicago and abroad and made her first appearance in 1883. She ranks among the greatest of living pianists.

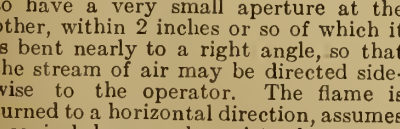
BLOOM'INGTON, a thriving city, in the state of Illinois, 60 miles n.n.e. of Springfield. It has several important educational institutions, including the Illinois Wesleyan University, a college for women, and the state Normal University in the vicinity. Has coal-mines, iron industries, railway works, etc., and a large trade. Pop. 24,000.

BLOUSE (blouz), a light loose upper garment, resembling a smock-frock, made of linen or cotton, and worn by men as a protection from dust or in place of a coat. A blue linen blouse is the common dress of French workmen.

BLOW-FLY, a name for a species of two-winged flies that deposit their eggs on flesh, and thus taint it.

BLOWING-MACHINE, any contrivance for supplying a current of air, as for blowing glass, smelting iron, renewing the air in confined spaces, and the like. This may consist of a single pair of bellows, but more generally two pairs are combined to secure continuity of current. The most perfect blowing-machines are those in which the blast is produced by the motion of pistons in a cylinder, or by some application of the fan principle. For smelting and refining furnaces, where a blast with a pressure of 3 or 4 lbs. to the square inch is required, blowing-engines of large size and power, worked by steam, are employed.

BLOW-PIPE, an instrument by which a current of air or gas is driven through the flame of a lamp, candle, or gas jet, and that flame directed upon a mineral substance, to fuse or vitrify it, an in-



Blow-pipe.—*a*, Ball to catch moisture from the mouth.

tense heat being created by the rapid supply of oxygen and the concentration of the flame upon a small area. In its simplest form it is merely a conical tube of brass, glass, or other substance, usually 7 inches long and ⅛ inch in diameter at one end, and tapering so as to have a very small aperture at the other, within 2 inches or so of which it is bent nearly to a right angle, so that the stream of air may be directed sidewise to the operator. The flame is turned to a horizontal direction, assumes a conical shape, and consists of two parts of different colors. The greatest heat is obtained at the tip of the inner blue flame. Here the substance subjected to it is burned or oxidized, a small piece of lead or copper, for instance, being converted into its oxide. Hence the name of the oxidizing flame. By shifting the substance to the interior blue flame, which is wanting in oxygen, this element will be abstracted from the substance, and a metallic oxide, for instance, will give out its metal; hence this is called a reducing flame. The blow-pipe is largely used in the manufacture of glass, jewelry, and other commodities.

BLUBBER, the fat of whales and other large sea animals, from which train-oil is obtained. The blubber lies under the skin and over the muscular flesh. It is eaten by the Eskimo and the sea-coast races of the Japanese islands, the Kuriles, etc. The whole quantity yielded by one whale ordinarily amounts to 40 or 50, but sometimes to 80 or more cwts.

BLUCHER (blü'*her*), Gebhard Leberecht von, distinguished Prussian general, born at Rostock 1742, died at Krieblowitz, in Silesia, 1819. He entered the Swedish service when fourteen

Blücher.

years of age and fought against the Prussians, but was taken prisoner in his first campaign, and was induced to enter the Prussian service. He became a major in 1793 and in 1794 major-general of the army of observation. After the Peace of Tilsit he labored in the department of war at Königsberg and Berlin. He then received the chief military command in Pomerania, but at the instigation of Napoleon was afterward, with several other distinguished men, dismissed from the service. In the campaign of 1812, when the Prussians assisted the French, he took no part; but no sooner did Prussia rise against her oppressors than Blücher, then seventy years old, engaged in the cause with all his former activity, and was appointed commander-in-chief of the Prussians and the Russian corps under General Winzingerode. His heroism in the battle of Lützen (May 2, 1813) was rewarded by the Emperor Alexander with the order of St. George. The battles of Bautzen and Hanau, those on the Katzbach and Leipzig, added to his glory. He was now raised to the rank of field-marshal, and led the Prussian army which invaded France early in 1814. After a period of obstinate conflict the day of Montmartre crowned this campaign, and, March 31, Blücher entered the capital of France. His king, in remembrance of the victory which he had gained at the Katzbach, created him Prince of Wahlstadt, and gave him an estate in Silesia. On the renewal of the war in 1815 the chief command was again committed to him, and he led his army into the Netherlands. June 15 Napoleon threw himself upon him, and Blücher, on the 16th, was defeated at Ligny. In the battle of the 18th Blücher arrived at the most decisive moment upon the ground, and taking Napoleon in the rear and flank assisted materially in completing the great victory of Waterloo. He was a rough and fearless soldier, noted for his energy and rapid movements, which had procured him the name of "Marshal Vorwärts" (Forward).

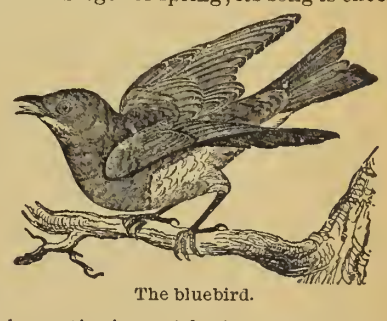
BLUE, one of the seven colors into which the rays of light divide themselves when refracted through a glass prism, seen in nature in the clear expanse of the heavens; also a dye or pigment of this hue. The substances used as blue pigments are of very different natures, and derived from various sources; they are all compound bodies, some being natural and others artificial. They are derived almost entirely from the vegetable and mineral kingdoms.

BLUEBEARD, the hero of a well-known tale, originally French, founded, it is believed, on the enormities of a real personage, Gilles de Laval, Count de Retz, a great nobleman of Brittany, put to death for his crimes in 1440.

BLUEBELL, a name given to the wild hyacinth and to the harebell.

BLUEBERRY, an American species of whortleberry.

BLUEBIRD, a small bird, very common in the U. States. The upper part of the body is blue, and the throat and breast of a dirty red. It makes its nest in the hole of a tree or in the box that is so commonly provided for its use by the friendly farmer. The bluebird is the harbinger of spring; its song is cheer-



The bluebird.

ful, continuing with little interruption from March to October, but is most frequently heard in the serene days of the spring. It is also called blue robin or blue redbreast, and is regarded with the same sort of sentiments as the robin of Europe.

BLUE-BOOKS, the official reports, papers, and documents printed for the British government and laid before the Houses of Parliament. They are so called simply from being stitched up in dark-blue paper wrappers, and include bills presented to and acts passed by the houses; all reports and papers moved for by members or granted by government on particular subjects; the reports of committees; statistics of the trade, etc., of the country and of the colonies; and ambassadorial and consular reports from foreign countries and ports.

BLUE-BOTTLE FLY, a large blue species of blow-fly.

BLUEFISH, a species of sea-fish widely distributed on the U. States coasts and highly prized as an article of diet. The size of the fish varies from 3 to 25 pounds, 10 pounds being considered a heavy fish. The color is greenish or bluish. The production of bluefish runs up into millions of pounds annually.

BLUE-GRASS, a species of grass of the same order as meadow grass. It is common in the U. States, Europe, and Asia. It grows to its greatest perfection in Kentucky and Tennessee and is often called, for that reason, Kentucky blue-grass.

BLUE-GRASS REGION, a part of Kentucky famous for its excellent pastures of blue-grass and its fine horses.

BLUE LAWS, a term applied to certain Puritan enactments, particularly in Connecticut, and concerned with Sabbath breaking. The term is now generally applied to any stringent laws of religious or moral force.

BLUE LIGHT, a brilliant light used for signaling at sea. It is produced by the ignition of a fine powder composed principally of antimony. For that reason the fumes of the combustion are poisonous when inhaled in considerable quantity.

BLUE RIDGE, the most easterly ridge of the Alleghany or Appalachian Mountains. The most elevated summits are the peaks of Otter (4000 feet) in Virginia.

BLUESTOCKING, a literary lady: applied usually with the imputation of pedantry. The term arose in connection with certain meetings held by ladies in the days of Dr. Johnson for conversation with distinguished literary men. One of these literati was a Mr. Benjamin Stillingfleet, who always wore blue stockings, and whose conversation at these meetings was so much prized that his absence at any time was felt to be a great loss, so that the remark became common, "We can do nothing without the blue stockings"; hence these meetings were sportively called blue-stocking clubs, and the ladies who attended them blue-stockings.

BLUEWING, a genus of American ducks, so called from the color of the wing-coverts. One species is brought in great quantities to market, the flesh being highly esteemed for its flavor.

BLUFFS, the name in America for the steep banks of a stream or lake forming prominent headlands, and often extending inland as plateau .

BLUN'DERBUSS, a short gun with a very wide bore, capable of holding a number of slugs or bullets, and intended to do execution at a limited range without exact aim.

BLUSHING, a physiological process by which the blood flows in larger quantities to certain parts of the body, as the breast, face, and neck. It is customarily produced by some mental shock, as of shame, modesty, chagrin, etc., and its connection with the brain is not understood. It is known, however, that such mental shocks cause a a sudden dilation of the small blood-vessels in the parts mentioned.

BOA, a genus of serpents having the jaws so constructed that these animals can dilate the mouth sufficiently to swallow bodies thicker than themselves. They are also distinguished by having a hook on each side of the vent; the tail prehensile; the body compressed and largest in the middle, and with small scales, at least on the posterior part of the head. The genus includes some of the largest species of serpents, reptiles endowed with immense muscular power. They seize sheep, deer, etc., and crush them in their folds, after which they swallow the animal whole. The boas are peculiar to the hot parts of S. America. The Boa constrictor is not one of the largest members of the genus, rarely exceeding 20 feet in length; but the name boa or boa constrictor is often given popularly to any of the large serpents of similar habits, and so as to include the Pythons of the Old World and the Anaconda and other large serpents of America.

BOADICE'A, Queen of the Iceni, in Britain, during the reign of Nero. Having been treated in the most ignominious manner by the Romans, she headed a general insurrection of the Britons, attacked the Roman settlements, reduced London to ashes, and put to the sword all strangers to the number of 70,000. Suetonius, the Roman general, defeated her in a decisive battle (A.D. 62), and Boadicea, rather than fall into the hands of her enemies, put an end to her own life by poison.

BOAR, the male of swine not castrated. See Hog.

BOARD, a number of persons having the management, direction, or superintendence of some public or private office or trust; often an office under the control of an executive government, the business of which is conducted by officers specially appointed for that purpose.

BOARD OF EDUCATION, a department of a city government which has control of primary, secondary, and high school education.

BOARD OF TRADE. See Trade, Board of.

BOARDING-HOUSE, a private business concern which feeds and lodges guests but which differs from a hotel or inn because the proprietor reserves the right to reject applicants for keep. The keeper is responsible for the goods of his guest and in common law has no lien for debt on those goods.

BOAT, a small open vessel or water craft usually moved by oars or rowing. The forms, dimensions, and uses of boats are very various, and some of them carry a light sail. Large vessels, whether ships of war or merchantmen, carry with them a number of boats; and since steam has become so common as a propelling power, it has also been employed in ships' boats. A ship of war has now usually several large boats propelled by steam, with others that are rowed, as a barge, pinnace, yawl, cutter, jolly-boat, and gig.

BOAT'SWAIN (commonly pronounced bō'sn), a warrant-officer in the navy who has charge of the sails, rigging, colors, anchors, cables, and cordage. His office is also to summon the crew to their duty, to relieve the watch, etc. In the merchant service one of the crew who has charge of the rigging and oversees the men.

BOB'BIN, a reel or other similar contrivance for holding thread. It is often a cylindrical piece of wood with a head, on which thread is wound for making lace; or a spool with a head at one or both ends, intended to have thread or yarn wound on it, and used in spinning machinery (when it is slipped on a spindle and revolves therewith) and in sewing-machines (applied within the shuttle).

BOBBINET, a machine-made cotton net, originally imitated from the lace made by means of a pillow and bobbins.

BOBOLINK, one of the most interesting song-birds of North America, found wherever plains, prairie meadows, or cultivated fields offer it a suitable home. The length is about 7 inches, of

The bobolink.

which 2¾ inches go to the tail; the spring or breeding plumage of the adult male is black, with the hindhead and nape, scapulars, rump, and upper tail-coverts buff, inclining to ochraceous on the neck and ashy toward the tail; the female is protectively denied this gay suit, and is clothed in neutral yellowish brown, much streaked; and the young of both sexes wear a similar dress until the males mature. The female constructs on the ground a nest of grasses in which are laid four or five eggs, dull white, flecked and marbled with Vandyke brown, upon which she sits very closely for about a fortnight.

During the nuptial season — from May until mid-July—the male is driving from the vicinity every intruder he can frighten away, especially rivals of his own kind.

BOBRUISK, a fortified town of Russia, gov. Minsk. Pop. 58,056.

BOCCACCIO (bok-kät'chō), Giovanni, Italian novelist and poet, was born 1313, in Certaldo, died there 1375. In 1341 Boccaccio fell in love with Maria, an illegitimate daughter of King Robert, who returned his passion with equal

ardor, and was immortalized as Fiammetta in many of his best creations. In 1344 he returned to Naples, where Giovanna, the granddaughter of Robert, who had succeeded to the throne, received him with distinction. Between 1344 and 1350 most of the stories of the Decameron were composed at her desire or at that of Fiammetta. This work, on which his fame rests, consists of 100 tales represented to have been related in equal portions in ten days by a party of ladies and gentlemen at a country house near Florence while the plague was raging in that city. The stories in this wonderful collection range from the highest pathos to the coarsest licentiousness. On the death of his father Boccaccio returned to Florence, where he was greatly honored, and was sent on several public embassies. Among others he was sent to Padua to communicate to Petrarch the tidings of his recall from exile and the restoration of his property. From this time an intimate friendship grew up between them which continued for life. They both contributed greatly to the revival of the study of classical literature. In 1373 he was chosen by the Florentines to occupy the chair which was established for the exposition of Dante's Divina Commedia. His lectures continued till his death.

BOCHUM (bo*h*'um), a Prussian town, prov. of Westphalia, 5 miles e.n.e. of Essen; manufactories of iron, steel, hardware, etc. Pop. 65,554

BOCK, BOCKBIER, a variety of German beer made with more malt and less hops than ordinary German beer, and therefore sweeter and stronger.

BODLEIAN LIBRARY at Oxford, founded by Sir Thomas Bodley in 1598, opened 1602. It claims a copy of all works published in Britain, and for rare works and MSS. it is said to be second only to the Vatican. It contains about 500,000 books.

BODLEY, Sir Thomas, the founder of the Bodleian Library at Oxford, was born at Exeter in 1544, died in London 1612. He was educated partly at Geneva, whither his parents, who were Protestants, had retired in the reign of Queen Mary. On the accession of Elizabeth they returned home, and he completed his studies at Magdalen College, Oxford. He traveled much on the Continent, and was employed in various embassies to Denmark, Germany, France, and Holland. In 1597 he returned home, and dedicated the remainder of his life to the reestablishment and augmentation of the public library at Oxford. He expended a very large sum in collecting rare and valuable books, besides leaving an estate for the support of the library. He was knighted at the accession of James I.

BODY-SNATCHING, an ancient practice in vogue previous to the recognition by law of the science of anatomy and the legal provision of material for dissection. Body-snatching, or grave-robbing, is a general offense in common law, no matter what may be the purpose of the theft. It is seldom practiced nowadays except in the commission of crime. Jerry Cruncher, in Dickens's Tale of Two Cities, was a professional body-snatcher.

BŒO'TIA, a division of ancient Greece, lying between Attica and Phocis, had an area of 1119 sq miles. The whole country is surrounded by mountains. The country originally had a superabundance of water, but artificial drainage works made it one of the most fertile districts of Greece. The inhabitants were of the Æolian race, most of the towns formed a kind of republic, of which Thebes was the chief city. Epaminondas and Pelopidas raised Thebes for a time to the highest rank among Grecian states. Refinement and cultivation of mind never made such progress in Bœtia as in Attica, and the term Bœotian was used by the Athenians as a synonym for dulness, but somewhat unjustly, since Hesiod, Pindar, the poetess Corinna, and Plutarch were Bœotians. Bœotia now forms a nomarchy of the kingdom of Greece, with a population of 57,091; capital, Livadia.

BOERS (börz), the farmers of Dutch origin in South Africa. In 1836–37 many Boers, being dissatisfied with the British government in Cape Colony, migrated beyond the Orange river, and a number found their way to what is now Natal. Here there had been British settlements for some years, and the British formally annexed the country in 1843. Subsequently the Boers were allowed to establish the Orange Free State as an independent republic, and several other small republics, which finally were combined into one—the South African Republic, or Transvaal. In 1877 the Transvaal was annexed by Britain, according to the wish of many of the people, but war broke out in 1880, British forces suffered more than one defeat, and in 1881 the country was accorded a modified independence. Henceforth it was a common feeling among the Boers that they and not the British must be predominant in South Africa, and in October, 1899, after an insolent ultimatum, the united forces of the Transvaal and Orange State invaded Natal. The war which followed with Britain was concluded by the final surrender of the Boers in May, 1902; the two states having been declared British territory in 1900. See Transvaal, Natal, etc.

BOG, a piece of wet, soft, and spongy ground, where the soil is composed mainly of decaying and decayed vegetable matter. Such ground is valueless for agriculture until reclaimed, but often yields abundance of peat for fuel.

BOGAR'DUS, James, an American inventor, born in 1800, died in 1874. Among his inventions were the "ring-flyer" or "ring-spinner" used in cotton manufacture (1828), the eccentric mill (1829), an engraving machine (1831), and the first dry gas-meter (1832). In 1839 he gained the reward offered for the best plan for carrying out the penny postage system by the use of stamps. In 1847 he built the first complete cast-iron structure in the world, and the first wrought-iron beams were made from his design. His delicate pyrometer and deep-sea sounding machine were valuable additions to scientific instruments.

BOGOTA', a city of South America, capital of Colombia and of the state or department of Cundinamarca, and seat of an archbishopric, situated on an elevated plain 8863 feet above the sea, at the foot of two lofty mountains, with a healthful though moist climate, and a temperature rarely exceeding 59° Fahr. Bogota being subject to earthquakes, the houses are low, and strongly built of sun-dried brick. The inhabitants are mostly Creoles. Bogota is an emporium of internal trade, and has manufactures of soap, cloth, leather, etc., not of great importance. It was founded in 1538. Pop. about 100,000.

BO'GUS, an Americanism meaning counterfeit, and applied to any spurious or counterfeit object; as, a bogus government, a bogus law. The origin of the term is uncertain.

BOHE'MIA, a province with the title of kingdom belonging to the Austro-Hungarian monarchy, bounded by Bavaria, Saxony, the Prussian province of Silesia, Moravia, and the archduchy of Austria; area, 20,223 sq. miles; pop. 6,318,280, of whom more than 2,000,000 are Germans, the rest mostly Czechs. The prevailing religion is the Roman Catholic, the country being an archbishopric with three bishoprics. The language of the country is the Czech dialect of the Slavonic (see Czech language); in some districts, and in most of the cities, German is spoken. Bohemia is surrounded on all sides by mountains, and has many large forests. The chief rivers are the Elbe and its tributary the Moldau, which is even larger. All sorts of grain are produced in abundance, as also large quantities of potatoes, pulse, sugar-beet, flax, hops (the best in Europe), and fruits. The raising of sheep, horses, swine, and poultry is carried on to a considerable extent. The mines yield silver, copper, lead, tin, zinc, iron, cobalt, arsenic, uranium, antimony, alum, sulphur, plumbago, and coal. There are numerous mineral springs, but little salt. Spinning and weaving of linen, cotton, and woolen goods are extensively carried on; manufactures of lace, metal, and wood work, machinery, chemical, products, beet-root sugar, pottery, porcelain, etc., are also largely developed. Large quantities of beer (Pilsener) are exported. The glassware of Bohemia, which is known all over Europe, employs 50,000 workers. The trade, partly transit, is extensive, Prague, the capital, being the center of it. The largest towns are Prague, Pilsen, Reichenberg, Budweis, Teplitz, Aussig, and Eger. The educational establishments include the Prague University and upward of 4000 ordinary schools. The province sends 92 representatives to the Austrian parliament; the provincial diet consists of 241 members.

Bohemia was named after a tribe of Gallic origin, the Boii, who were expelled from this region by the Marcomans at the commencement of the Christian era. The latter were in turn obliged to give place to the Germans, and these to the Czechs, a Slavic race who had established themselves in Bohemia by the middle of the 5th century, and still form the bulk of the population. The country

was at first divided into numerous principalities. Christianity was introduced about 900. In 1092 Bohemia was finally recognized as a kingdom under Wratislas II. In 1230 the monarchy, hitherto elective, became hereditary. The monarchs received investiture from the German emperor, held one of the great offices in the imperial court, and were recognized as among the seven electors of the empire. Frequently at strife with its neighbors, Bohemia was successively united and disunited with Hungary, Silesia, Moravia, etc., according to the course of wars and alliances.

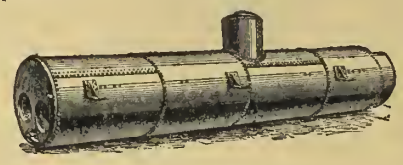
BOIES, Horace, an American statesman, born in New York in 1827. He settled in Iowa and was elected governor of that state in 1889 and 1891. He is well known for his opposition to protective tariff.

BOIL, to heat a fluid up to the point at which it is converted into vapor. The conversion takes place chiefly at the point of contact with the source of heat, and the bubbles of vapor rising to the surface, and breaking there, produce the commotion called ebullition. At the ordinary atmospheric pressure ebullition commences at a temperature which is definite for each liquid. The escape of the heated fluid in the form of vapor prevents any further rise of temperature in an open vessel when the boiling-point has been reached. The exact definition of the boiling-point of a liquid is "that temperature at which the tension of its vapor exactly balances the pressure of the atmosphere." The influence of this pressure appears from experiments. In an exhausted receiver the heat of the human hand is sufficient to make water boil; while, on the contrary, in Papin's digester, in which it is possible to subject the water in the boiler to a pressure of three or four atmospheres, the water may be heated far above the normal boiling-point without giving signs of ebullition. From this relation between the ebullition of a liquid and atmospheric pressure the heights of objects above sea-level may be calculated by comparing the actual boiling-point at any place with the normal boiling-point. (See Heights, Measurement of.) The boiling-point of water as marked on Fahrenheit's thermometer is 212°; on the Centigrade, 100°; on the Réaumur, 80°. Ether boils at about 96°, mercury at 662°.

BOIL, a small painful swelling of a conical shape on the surface of the body. Its base is hard, while its apex is soft and of a whitish color. Boils are generally indicative of depressed health, intemperate habits, or disorder of the digestive organs.

BOILER, a vessel constructed of wrought iron or steel plates riveted together, with needful adjuncts, in which steam is generated from water for the purpose of driving a steam-engine, or for other purposes.

The shell of the boiler, or outer part, is of iron or steel plates. The steam chest or dome, on the upper side of the boiler, is a reservoir, whence the steam is supplied to the engine by the steam-pipe, which is fitted with a stop-valve. The furnace is the chamber for the combustion of the fuel. The flues or conduits for the burnt gases are either external or internal; cylindrical metal flues are flue-tubes, and they are fixed at the ends into tube-plates. The manhole is the entrance to the boiler for inspection, etc.; and it is closed by a manhole door or lid. Mudholes are placed at or near the bottom of the



Double-flue boiler.

boiler, for the discharge of sediment, etc. The water is supplied by the feed-apparatus; its level is indicated by a float. The water-gauge also shows the level of the water; it may be a glass tube at the front of the boiler, connected to it by two horizontal tubes, one at the upper end and one at the lower end of the glass tube; or it may be a series of two or three gauge-cocks, connected at different levels. The boiler is emptied by the blow-off cock; the surface of the water is cleared by the scum-cock. Brine-pumps may be used instead of blow-off cocks to draw off the brine from marine boilers. Surplus steam escapes by the safety-valves. Vacuum valves admit air into the boiler, when the pressure is less than that of the atmosphere. Fusible plugs are inserted in the boiler, over the fire, which melt and give vent to the steam when the pressure and temperature of the steam in the boiler become excessive and dangerous. The degree of pressure is indicated by the pressure-gauge. The boiler is strengthened by stays, which may consist of rods, bolts, or gussets. The boiler is covered with clothing or cleading. The fire-grate carries the fuel, and it consists of grate-bars or fire-bars, usually of cast-iron, supported by cross-bearers or bar-frames. The mouthpiece is the entrance to the furnace, and it rests on the dead-plate. The fire-door or pair of fire-doors are fitted to and hung by it. The heating surface is the surface of the boiler exposed to the flame and burned gases from the furnace.

Boilers are of two types: shell boilers, consisting of a large shell, usually cylindrical with flat ends, containing the water and steam, so that the whole of the shell is exposed to the full pressure of the steam; and water-tube boilers, in which the water flows through a large number of tubes of small diameter, while the products of combustion flow over the outsides of the tubes.

BOISE CITY, capital of the state of Idaho. Pop. 5957.

BOJOL (bo-hol'), one of the Philippine Islands, north of Mindanao, about 40 miles by 30 miles. Woody and mountainous. Pop. 187,000.

BOKHARA, BOCHARA, (bo-*hä*'rä), a khanate of central Asia, vassal to Russia, bounded north by Russian Turkestan, west by Khiva and the Transcaspian Territory of Russia, south by Afghanistan, and east by Chinese Turkestan; area about 93,000 square miles. The country in the west is to a great extent occupied by deserts; in the east are numerous ranges of mountains Cultivation is mainly confined to the valleys of the rivers. The climate is warm in summer, but severe in winter; there is very little rain, and artificial irrigation is necessary. Besides cereals, cotton and tobacco are cultivated, and also a good deal of fruit. The total population, about 2,000,000.—Bokhara, the capital of the khanate, is 8 or 9 miles in circuit, and is surrounded by a mud wall. Pop 70,000.

BOLAN' PASS, a celebrated defile in the Hala Mountains, n.e. of Beluchistan, on the route between the Lower Indus (Scinde) and the tableland of Afghanistan. It is about 60 miles long, hemmed in on all sides by lofty precipices, and

In the Bolan pass.

in parts so narrow that a regiment could defend it against an army. It is traversed by the Bolan river. The crest of the pass is 5800 feet high.

BOLAS, a form of missile used by the Paraguay Indians, the Patagonians, and especially by the Gauchos of the Argentine Republic. It consists of a rope or line having at either end a stone, ball of metal, or lump of hardened clay. When used it is swung round the head by one end, and then hurled at an animal so as to entangle it.

BOLER'O, a popular Spanish dance of the ballet class for couples, or for a single female dancer. The music, which is in triple measure, is generally marked by rapid changes of time, and the dancers mostly accompany the music with castanets. The interest of these dances largely depends upon the pantomine of passion, which forms an essential part of them.

BOLEYN (bul'in), Anne, second wife of Henry VIII. of England, eldest daughter of Sir Thomas Boleyn and Elizabeth Howard, daughter of the Duke of Norfolk; born, according to some accounts, in 1507, but more probably about 1501. She attended Mary, sister of Henry, on her marriage with Louis XII., to France, as lady of honor, returning to England about 1522, and becoming lady of honor to Queen

Catherine. The king, who soon grew passionately enamored of her, without waiting for the official completion of his divorce from Catherine, married Anne in January, 1533, having previously created her Marchioness of Pembroke. When her pregnancy revealed the secret, Cranmer declared the first marriage void and the second valid, and Anne was crowned at Westminster with

Anne Boleyn.

unparalleled splendor. On Sept. 7, 1533, she became the mother of Elizabeth She was speedily, however, in turn supplanted by her own lady of honor, Jane Seymour. Suspicions of infidelity were alleged against her, and in 1536 the queen was brought before a jury of peers on a charge of treason and adultery. Smeaton, a musician, who was arrested with others, confessed that he had enjoyed her favors, and on May 17 she was condemned to death. The clemency of Henry went no further than the substitution of the scaffold for the stake, and she was beheaded on May 19, 1536. Whether she was guilty or not has never been decided; that she was exceedingly indiscreet is certain.

BO'LINGBROKE, Henry St. John, Viscount, English statesman and political writer, born in 1678 at Battersea, London; educated at Eton and at Oxford, where he had a reputation both for ability and libertinism. In 1700 he married a considerable heiress, the daughter of Sir Henry Winchcomb, but they speedily separated. In 1701 he obtained a seat in the House of Commons, attaching himself to Harley and the Tories. He at once gained influence and became secretary of war in 1706, though he retired with the ministry in 1708. He continued, however, to maintain a constant intercourse with the queen, who preferred him to her other counselors, and on the overthrow of the Whig ministry in 1710, after the Sacheverell episode, he became one of the secretaries of state. In 1712 he was called to the House of Lords by the title of Viscount Bolingbroke, and in 1713, against much popular opposition, concluded the Peace of Utrecht. Queen Anne, provoked by Oxford, dismissed him, and made Bolingbroke prime-minister, but died herself four days later. Bolingbroke, dismissed by King George while yet in Germany, fled to France in March, 1715, to escape the inevitable impeachment by which, in the autumn of that year, he was deprived of his peerage and banished. In 1723 he was permitted to return to England. In 1735 a return to France became prudent, if not necessary. In 1742, on the fall of Walpole, he came back in the expectation that his allies would admit him to some share of power; but, being disappointed in this respect, he withdrew entirely from politics and spent the last nine years of his life in quietude at Battersea, dying in 1751 He was clever and versatile, but unscrupulous and insincere

BOLIVAR (bo-lē'vär), Simon, the liberator of Spanish South America, was born at Caracas, July 24, 1783. He finished his education in Europe, and having then joined the patriotic party among his countrymen he shared in the first unsuccessful efforts to throw off the Spanish yoke. In 1812 he joined the patriots of New Granada in their struggle, and having defeated the Spaniards in several actions he led a small force into his own country (Venezuela), and entered the capital, Caracas, as victor and liberator, Aug. 4, 1813. But the success of the revolutionary party was not of long duration. Bolivar was beaten by General Boves, and before the end of the year the royalists were again masters of Venezuela. Bolivar next received from the Congress of New Granada the command of an expedition against Bogota, and after the successful transfer of the seat of government to that city retired to Jamaica. Having again returned to Venezuela he was able to rout the royalists under Morillo, and, after a brilliant campaign, effected in 1819 a junction with the forces of the New Granada republic. The battle of Bojaca which followed gave him possession of Santa Fé and all New Granada, of which he was appointed president and captain-general. A law was now passed by which the Republics of Venezuela and New Granada were to be united in a single state, as the Republic of Colombia; and Bolivar was elected the first president. In 1822 he went to the aid of Peru, and was made dictator, an office held by him till 1825, by which time the country had been completely freed from Spanish rule. In 1825 he visited Upper Peru, which formed itself into an independent republic named Bolivia, in honor of Bolivar. In Colombia a civil war arose between his adherents and the faction opposed to him, but Bolivar was confirmed in the presidency in 1826, and again in 1828, and continued to exercise the chief authority until May, 1830, when he resigned. He died at Carthagena on the 17th December, 1830.—One of the departments of Colombia is named after him, as are also a state of the republic Venezuela, and the town Ciudad Bolivar.

BOLIV'IA, formerly called Upper Peru, a republic of South America, bounded n. and e by Brazil, s. by the Argentine Republic and Paraguay, and w. by Peru and Chile. Estimates of its area vary from 471,788 to 800,000 sq. miles. The total pop. is about 2,300,000. An unascertained proportion of the inhabitants belong to aboriginal races (the Aymaras and the Quichuas); the larger portion of the remainder being Mestizos or descendants of the original settlers by native women. The largest town is La Paz, but the executive government has its seat at Sucre or Chuquisaca; other towns are Potosi, Oruro, and Cochabamba. The broadest part of the Andes, where these mountains, encompassing Lakes Titicaca (partly in Bolivia) and Aullagas, divide into two chains, known as the Eastern and Western Cordilleras, lies in the western portion of the state. Here are some of the highest summits of the Andes, as Sorata, Illimani, and Sajama. The two chains inclose an extensive tableland, the general elevation of which is about 12,500 feet, much of it being saline and barren, especially in the south.

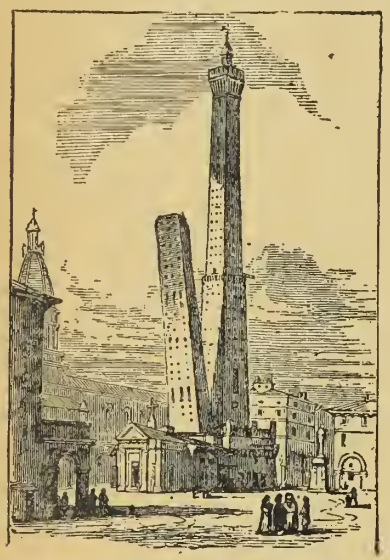
The climate, though ranging between extremes of heat and cold, is very healthful, and cholera and yellow fever are unknown. The elevated regions are cold and dry, the middle temperate and delightful, the lower valleys and plains quite tropical. Among animals are the llama, alpaca, vicuña, chinchilla, etc.; the largest bird is the condor. Bolivia has long been famed for its mineral wealth, especially silver and gold. The celebrated Potosi was once the richest silver district in the world. The country is capable of producing every product known to South America, but cultivation is in a very backward state. Coffee, coca, cacao, tobacco, maize, and sugar-cane are grown, and there is an inexhaustible supply of india-rubber. The chief exports are silver (two-thirds of the whole) cinchona or Peruvian bark, cocoa, coffee, caoutchouc, alpaca wool, copper, tin, and other ores.

By its constitution Bolivia is a democratic republic. The executive power is in the hands of a president elected for four years, and the legislative belongs to a congress of two chambers, both elected by universal suffrage. The religion is the Roman Catholic, and public worship according to the rites of any other church is prohibited. Education is at an exceedingly low ebb.

Bolivia under the Spaniards long formed part of the viceroyalty of Peru, latterly it was joined to that of La Plata or Buenos Ayres. Its independent history commences with the year 1825, when the republic was founded. The constitution was drawn up by Bolivar, in whose honor the state was named Bolivia; and was adopted by congress in 1826. It has since undergone important modifications. But the country has been almost continually distracted by internal and external troubles, and can scarcely be said to have had any definite constitution.

BOLOGNA (bo-lōn'yâ), one of the oldest, largest, and richest cities of Italy, capital of the province of same name, in a fertile plain at the foot of the Apennines, between the rivers Reno and Savena, surrounded by an unfortified brick wall. It is the see of an archbishop, and has extensive manufactures of silk goods, velvet, artificial flowers, etc. The leaning towers Degli Asinelli and Garisenda, dating from the 12th century, are among the most remarkable objects in the city; and the market is adorned with the colossal

bronze Neptune of Giovanni da Bologna. An arcade of 640 arches leads to the church of Madonna di S. Lucca, situated at the foot of the Apennines, near Bologna, and the resort of pilgrims from all parts of Italy. Bologna has long been renowned for its university, claiming to have been founded in 1088, and having a library, at one time in the care of Cardinal Mezzofanti, which



The Asinelli and Garisenda towers, Bologna.

numbers over 200,000 volumes and 9000 MSS. The Instituto delle Scienze has a library which numbers about 160,000 volumes, with 6000 manuscripts. The Church of San Domenico has a library of 120,000 volumes. The Academy of Fine Arts has a rich collection of paintings by native artists, such as Francia, and the later Bolognese school, of which the Caraccis, Guido Reni, Domenichino, and Albano were the founders.—Bologna was founded by the Etruscans under the name of Felsina; became in 189 B.C. the Roman colony Bononia; was taken by the Longobards about 728 A.D.; passed into the hands of the Franks, and was made a free city by Charlemagne. In the 12th and 13th centuries it was one of the most flourishing of the Italian republics; but the feuds between the different parties of the nobles led to its submission to the papal see in 1513. Several attempts were made to throw off the papal yoke, one of which, in 1831, was for a time successful. In 1849 the Austrians obtained possession of it. In 1860 it was annexed to the dominions of King Victor Emmanuel. Pop. 130,000.—The province of Bologna, formerly included in the papal territories, forms a rich and beautiful tract; area, 1390 sq. miles; pop. 527,000.

BOLOM'ETER, a most sensitive electrical instrument that is employed for the measurement of radiant heat.

BOLSTER, a nautical term applied to a piece of wood covered with canvas upon which rests the topmost rigging to prevent injury to the rigging.

BOLT, a piece of metal used to bind machinery together, or to fasten, temporarily or permanently, any kind of structure. The manufacture of bolts requires very complicated machinery, especially bolts to which are attached nuts to hold the bolt in place. Various kinds of bolts are called eye-bolts, through-bolts, blunt-bolts, Lewis bolts, track-bolts (for railroad track), etc.

BOLTING-CLOTH, a fabric of silk used in the manufacture of flour to separate the fine parts of the product from the coarse.

BOLTON, a large manufacturing town and municipal, parl., and county borough of Lancashire, England, lying 10 miles n.w. from Manchester, and consisting mainly of two divisions, Great Bolton and Little Bolton, separated from each other by the river Croal. In manufacturing industries it is now surpassed by few places in Britain, and it contains some of the largest and finest cotton-mills in the world. There are large engineering works, besides collieries, paper-mills, foundries, chemical works, etc. Pop. 168,205.

BOMB (bom), a large, hollow iron ball or shell, filled with explosive material and fired from a mortar. The charge in the bomb is exploded by means of a fuse filled with powder and other inflammable materials, which are ignited by the discharge of the mortar. Conical shells shot from rifled cannon have largely supplanted the older bomb. The use of bombs and mortars is said to have been invented in the middle of the 15th century.

BOM'BARD, a kind of cannon or mortar formerly in use, generally loaded with stone instead of iron balls. Hence the term bombardier.

BOMBARDIER (-dēr'), an artillery soldier whose special duties are connected with the loading and firing of shells, grenades, etc., from mortars or howitzers

BOMBARDIER BEETLE, a name given to beetles of the family Carabidæ, because of the remarkable power they possess of being able to defend themselves by expelling from the anus a pungent acrid fluid, which explodes with a pretty loud report on coming in contact with the air.

BOMBARD'MENT, an attack with bombs or shells upon a fortress, town, or any position held by an enemy, generally carried out from the sea.

BOMBAR'DON, a large musical instrument of the trumpet kind, in tone not unlike an ophicleide. Its compass is from F on the fourth ledger-line below the bass-staff to the lower D of the treble-staff. It is not capable of rapid execution.

BOMBASIN. See Bombazine.

BOMBAY', chief seaport on the west coast of India, and capital of the presidency of the same name, stands at the southern extremity of the island of Bombay. Bombay has many handsome buildings, both public and private, as the cathedral, the university, the secretariat, the new high court, the post and telegraph offices, etc. Various industries, such as dyeing, tanning, and metal working, are carried on, and there are large cotton factories. The commerce is very extensive. The harbor is one of the largest and safest in India, and there are commodious docks. There is a large traffic with steam-vessels between Bombay and Great Britain, regular steam communication with China, Australia, Singapore, Mauritius, etc The island of Bombay is about 11 miles long and 3 miles broad. After Madras, Bombay is the oldest of the British possessions in the East, having been ceded by the Portuguese in 1661. Pop. 776,006.

Bombardon.

BOMBAY', one of the three presidencies of British India, between lat. 14° and 29° n., and lon. 66° and 77° e. It stretches along the west of the Indian peninsula, and is irregular in its outline and surface, presenting mountainous tracts, low barren hills, valleys, and high tablelands. It is divided into a northern, a central, and a southern division, the Sind division, and the town and island of Bombay. The

northern division contains the districts of Ahmedabad, Kaira, Panch Mahals, Broach, Surat, Thana, Kolaba; the central, Khandesh, Nasik, Ahmednagar, Poona, Sholapur, Satara; the southern, Belgaum, Dharwar, Kaladgi, Kanara, Ratnagiri. Total area, 123,064 sq. miles; pop. 18,559,561, including the city and territory of Aden in Arabia, 80 sq. miles (pop. 43,974). The native or

feudatory states connected with the presidency (the chief being Kathiawar) have an area of 65,761 sq. miles and a pop. of 6,908,648. The Portuguese possessions Goa, Daman, and Diu geographically belong to it. Many parts, the valleys in particular, are fertile and highly cultivated; other districts are being gradually developed by the construction of roads and railroads. The southern portions are well supplied with moisture, but a great part of Sind is the most arid portion of India. The climate varies, being unhealthful in the capital Bombay and its vicinity, but at other places, such as Poonah, very favorable to Europeans. The chief productions of the soil are cotton, rice, millet, wheat, barley, dates, and the cocoa-palm. The manufactures are cotton, silk, leather, etc. The great export is cotton. The administration is in the hands of a governor and council.

BOMBAZINE (-zēn′) is a mixed tissue of silk and worsted, the first forming the warp and the second the weft. It is fine and light in the make, and may be of any color, though black is now most in use.

BOMB-PROOF, a quality of fortification which enables the fortification to resist injury from bombs or shells cast upon it. Gibraltar, cut from the solid rock, and certain forts of exceedingly massive walls are bomb-proof.

BONA FIDES, BONA FIDE (fī′dēz, fī′dē), a term derived from the Roman jurists, implying the absence of all fraud or unfair dealing.

BONAN′ZA, a term applied in the U. States to an abundance of precious metal or rich ore in a mine.

BONAPARTE (bon′a-pärt), the French form which the great Napoleon was the first to give to the original Italian name Buonaparte, borne by his family in Corsica.

BONAPARTE, Jerome, youngest brother of Napoleon I., was born at Ajaccio in 1784. In 1801 he was sent out on an expedition to the West Indies, but the vessel being chased by English cruisers, was obliged to put into New York. During his sojourn in America Jerome Bonaparte became acquainted with Miss Elizabeth Patterson, of Baltimore, and though still a minor, married her in spite of the protests of the French consul on 24th December, 1803. The emperor, his brother, after an ineffectual application to Pope Pius VII. to have it dissolved, issued a decree declaring it to be null and void. After considerable services both in the army and navy, in 1807 he was created King of Westphalia, and married Catherine Sophia, princess of Würtemberg. After the election of his nephew, Louis Napoleon, to the presidentship of the French Republic, in 1848, he became successively governor-general of Les Invalides, a marshal of France, and president of the senate. He died in 1860. Of the three children that were born to Jerome Bonaparte from his second marriage one was Prince Napoleon Joseph, who assumed the name of Jerome, and was well known by the nickname "Plon-Plon." He died in 1891, having married Clotilde, daughter of King Victor Emmanuel of Italy. He had three children: Victor (born 18th July, 1862), Louis, and Marie Letitia. The first of these, since the death of Napoleon III.'s son, the Prince Imperial, is generally recognized by the Bonapartist party as the heir to the traditions of the dynasty. He had to leave France in 1886, a law being passed expelling pretenders to the French throne and their eldest sons.

BONAPARTE, Joseph, the eldest brother of Napoleon I., was born in Corsica in 1768. In 1796, with the rise of his brother to fame after the brilliant campaign of Italy, Joseph began a varied diplomatic and military career. At length, in 1806, Napoleon, having himself assumed the imperial title in 1804, made Joseph king of Naples, and two years afterward transferred him to Madrid as King of Spain. His position here, entirely dependent on the support of French armies, became almost intolerable. He was twice driven from his capital by the approach of hostile armies, and the third time, in 1813, he fled, not to return. After Waterloo he went to the U. States, and lived for a time near Philadelphia, assuming the title of Count de Survilliers. He subsequently came to England, finally repaired to Italy, and died at Florence in 1844.

BONAPARTE, Letizia Ramolino, the mother of Napoleon I., and, after Napoleon's assumption of the imperial crown, dignified with the title of Madame Mère, was born at Ajaccio in 1750, and was married in 1767 to Charles Buonaparte. She was a woman of much beauty, intellect, and force of character. Left a widow in 1785, she resided in Corsica till her son became first consul, when an establishment was assigned to her at Paris. On the fall of Napoleon she returned to Rome, where she died in 1836.

BONAPARTE, Louis, second younger brother of the Emperor Napoleon I., and father of Napoleon III., was born in Corsica in 1778. He accompanied Napoleon to Italy and Egypt, and subsequently rose to the rank of a brigadier-general. In 1802 he married Hortense Beauharnais, Josephine's daughter, and in 1806 was compelled by his brother to accept, very reluctantly, the Dutch crown. He exerted himself in promoting the welfare of his new subjects, and resisted as far as in him lay the tyrannical interference and arbitrary procedure of France; but disagreeing with his brother in regard to some measures of the latter, he abdicated in 1810 and retired to Grätz under the title of the Count of St. Leu. He died at Leghorn in 1846. He was the author of several works which show considerable literary ability.

BONAPARTE, Louis. See Napoleon III.

BONAPARTE, Lucien, Prince of Canino, next younger brother of Napoleon I., was born at Ajaccio in 1775. Shortly after Napoleon's return from Egypt in 1799 he was elected President of the Council, in which position he contributed greatly to the fall of the Directory and the establishment of his brother's power, on the famous 18th Brumaire (9th Nov.). Next year, as Napoleon began to develop his system of military despotism, Lucien, who still held to his republican principles and candidly expressed his disapproval of his brother's conduct, fell into disfavor and was sent out of the way as ambassador to Spain. Eventually, when Napoleon had the consulate declared hereditary, Lucien withdrew to Italy, settling finally at Rome, where he devoted himself to the arts and sciences, and lived in apparent indifference to the growth of his brother's power. In vain Napoleon offered him the crown, first of Italy and then of Spain; but he came to France and exerted himself on his brother's behalf, both before and after Waterloo. Returning to Italy, he spent the rest of his life in literary and scientific researches, dying in 1840. Pope Pius VII. made him Prince of Canino.

BONAPARTE, Napoleon. See Napoleon I.

BONAVENTURE, St., otherwise John of Fidanza, one of the most renowned scholastic philosophers, was born in 1221 in the Papal States; became in 1243 a Franciscan monk; in 1253 teacher of theology at Paris, where he had studied, in 1256 general of his order, which he ruled with a prudent mixture of gentleness and firmness. In 1273 Gregory X. made him a cardinal, and he died in 1274 while papal legate at the Council of Lyons. He was canonized in 1482 by Sixtus IV.

BOND, an obligation in writing to pay a sum of money, or to do or not to do some particular thing specified in the bond. The person who gives the bond is called the obligor, the person receiving the bond is called the obligee. A bond stipulating either to do something wrong in itself or forbidden by law, or to omit the doing of something which is a duty, is void. No person who cannot legally enter into a contract, such as an infant or a lunatic, can become an obligor, though such a person may become an obligee. No particular form of words is essential to the validity of a bond. A common form of bond is that on which money is lent to some company or corporation, and by which the borrowers are bound to pay the lender a certain rate of interest for the money. Goods liable to customs or excise duties are said to be in bond when they are temporarily placed in vaults or warehouses under a bond by the importer or owner that they will not be removed till the duty is paid on them. Such warehouses are called bonded warehouses.

BONE, a hard material constituting the framework of Mammalia, birds, fishes, and reptiles, and thus protecting vital organs such as the heart and lungs from external pressure and injury. In the fœtus the bones are formed of cartilaginous (gristly) substance, in different points of which earthy matter—phosphates and carbonates of lime—is gradually deposited till at the time of birth the bone is partially formed. After birth the formation of bone continues, and, in the temperate zones, they reach their perfection in men between the ages of twenty and twenty-five. From this age till fifty they change but slightly; after that period they grow

thinner, lighter, and more brittle. Bones are densest at the surface, which is covered by a firm membrane called the periosteum; the internal parts are more cellular, the spaces being filled with marrow, a fatty tissue, supporting fine blood-vessels. Bone consists of nearly 34 per cent organic material and of 66 per cent inorganic substances, chiefly phosphate, carbonate, and fluoride of lime, and phosphate of magnesium. The organic material is converted into gelatine by boiling. It is this which makes bones useful for yielding stock for soup. The inorganic substances may be dissolved out by steeping the bone in dilute hydrochloric acid. Bones, from the quantity of phosphates they contain, make excellent manure.

BONE-ASH, BONE-EARTH, the earthy or mineral residue of bones that have been calcined so as to destroy the animal matter and carbon. It is composed chiefly of phosphate of lime, and is used for making cupels in assaying, etc.

BONE BLACK, IVORY BLACK, or **ANIMAL CHARCOAL,** is obtained by heating bones in close retorts till they are reduced to small coarse grains of a black carbonaceous substance. This possesses the valuable property of arresting and absorbing into itself the coloring matter of liquids which are passed through it. Hence it is extensively used in the process of sugar-refining, when cylinders of large dimensions filled with this substance are used as filters. After a certain amount of absorption the charcoal becomes saturated and ceases to act. It has then to be restored by reheating or other methods. Bone black has also the property of absorbing odors, and may thus serve as a disinfectant of clothing, apartments, etc.

BONE-DUST, bones ground to dust to be used as manure.

BONE MANURE, one of the most important fertilizers in agriculture. The value of bones as manure arises chiefly from the phosphates and nitrogenous organic matters they contain; and where the soil is already rich in phosphates bone is of little use as manure. It is of most service therefore where the soil is deficient in this respect, or in the case of crops whose rapid growth or small roots do not enable them to extract a sufficient supply of phosphate from the earth, turnips, for instance, or late-sown oats and barley. There are several methods for increasing the value of bones as manure, by boiling out the fat and gelatine, for instance, the removal of which makes the bones more readily acted on by the weather and hastens the decay and distribution of their parts, or by grinding them to dust, or dissolving them in sulphuric acid, by which latter course the phosphates are rendered soluble in water.

BONFIRE, a large fire lighted out of doors in celebration of some event; originally a fire in which bones were burned.

BONHEUR (bo-n*eur*), Rosa, a distinguished French artist and painter of animals, born at Bordeaux 22d March, 1822. She died in 1899.

BON'IFACE, the name of nine popes. Boniface I., elected 418. He was the first to assume the title of the First Bishop of Christendom. He died 422.—Boniface II., elected 530, died in 532. He acknowledged the supremacy of the secular sovereign in a council held at Rome.—Boniface III. chosen 607, died nine months after his election.—Boniface IV., elected 608. He converted the Pantheon at Rome into a Christian church.—Boniface V., 619 to 625. He endeavored to diffuse Christianity among the English.—Boniface VI., elected 896, died a fortnight after.—Boniface VII., elected 947, during the lifetime of Benedict VI., and therefore styled antipope. Expelled from Rome in 984, he returned and deposed and put to death Pope John XIV. He died 985.—Boniface VIII. (1294–1303), Benedict Cajetan, one of the ablest and most ambitious of the popes. His idea was, like that of Gregory VII., to raise the papal chair to a sort of universal monarchy in temporal as well as spiritual things.—Boniface IX. (1389–1404), elected during the schism in the church while Clement VII. resided at Avignon. He died in 1404.

BONN, an important German town in the Rhenish province of Prussia, on the left bank of the Rhine. It is chiefly important for its famous university founded in 1777 by Elector Maximilian Frederick of Cologne. Enlarged and amply endowed by the King of Prussia in 1818, it is now one of the chief seats of learning in Europe, with a library of more than 200,000 volumes, an anatomical hall, mineralogical and zoological collections, museum of antiquities, a botanical garden, etc. Bonn was long the residence of the Electors of Cologne, and finally passed into the hands of Prussia by the arrangements of the Congress of Vienna in 1815. Pop. 50,737.

BONNER, Robert, an American editor and publisher, born in Ireland in 1824, died in New York in 1899. He published the Ledger, in the columns of which appeared stories, articles, and poems by numerous literary men of England and America.

BON'NET, a covering for the head, now especially applied to one worn by females. In England the bonnet was superseded by the hat as a head-dress two or three centuries ago, but continued to be distinctive of Scotland to a later period.

BONNET-ROUGE (bo-nā-rōzh), the emblem of liberty during the French Revolution, and then worn as a head-dress by all who wished to mark themselves as sufficiently advanced in democratic principles: also called cap of liberty.

BONNEVILLE, Benjamin L. E., an American engineer, born in France in 1795, died in 1878. He graduated at West Point, explored the Rocky Mountains, and built a military road in Mississippi. He served in the Florida, Mexican, and civil wars, and became a brigadier-general in 1865.

BO'NUS, something given over and above what is required to be given, especially an extra dividend to the shareholders of a joint-stock company, holders of insurance policies, etc., out of accrued profits.

BONY PIKE, or **GARFISH,** a remarkable genus of fishes inhabiting N. American lakes and rivers, and one of the few living forms that now represent the order of ganoid fishes so largely developed in previous geological epochs. The body is covered with smooth enameled scales, so hard that it is impossible to pierce them with a spear. The common garfish attains the length of 5 feet, and is easily distinguished by the great length of its jaws.

BONZES, the name given by Europeans to the priests of the religion of Fo or Buddha in eastern Asia, particularly in China, Burmah, Tonquin, Cochin-China, and Japan. They do not marry, but live together in monasteries. There are also female bonzes, whose position is analogous to that of nuns in the Roman Catholic Church.

BOOBY, a swimming bird nearly allied to the gannet, and so named from the extraordinary stupidity with which, as the older voyagers tell, it would allow itself to be knocked on the head without attempting to fly. The booby lives on fish, which it takes, like the gannet, by darting down upon them when swimming near the surface of the water.

BOODHA. See Buddha.

BOOK, the general name applied to a printed volume. In early times books were made of the bark of trees; hence the Latin liber means bark and book, as in English the words book and beech may be connected. The materials of ancient books were largely derived from the papyrus, a plant which gave its name to paper. The use of parchment, prepared from skins, next followed, until it was supplanted in Europe by paper in the 12th century, though paper was made in Asia long before this.

BOOK'BINDING, the art of making up the sheets of a book into a volume with a substantial case or covering. In the middle ages the work of binding the manuscripts then used was done by the monks, in a heavy and excessively solid style. With the invention of printing, and the consequent multiplication of books, binding became a great mechanical art, in which the Italians of the 15th and 16th centuries took the lead. Later on the French binders enjoyed a well-deserved supremacy for delicate and elegant work, and it was not till almost the opening of the 19th century that English bookbinding began to take the foremost place.

BOOK'KEEPING is the art or method of recording mercantile or pecuniary transactions, so that at any time a person may be able to ascertain the details and the extent of his business. It is divided, according to the general method pursued, into bookkeeping by single or by double entry. Bookkeeping by single entry is comparatively little used, except in retail businesses of small extent, where only the simplest record is required.

Bookkeeping by double entry, a system first adopted in the great trading cities of Italy, gives a fuller and more accurate record of the movement of a business, and is necessary in all extensive

mercantile concerns. The chief feature of double entry is its system of checks, by which each transaction is twice entered, to the Dr. side of one account and then to the Cr. side of another. An important feature of the system consists in adopting, in addition to the personal accounts of debtors and creditors contained in the ledger, a series of what are called book accounts, which are systematic records in the form of debtor and creditor of particular classes of transactions. For every debt incurred some consideration is received. This consideration is represented under a particular class or name in the ledger, as the debtor in the transaction in which the party from whom the consideration is received is the creditor. Thus A buys goods to the value of $500 from B. He enters these in his journal—Stock Acct. Dr. $500 (for goods purchased) ordinary To B, $500. The first $500 appears in the Dr. column of the journal, and is posted in the ledger to the debit of Stock Account; the second appears in the Cr. column, and is posted in the ledger to the Cr. of B. In like manner, when the goods are paid, Cash, for which an account is opened in the ledger, is credited with $500, and B is debited with the same. When the goods are sold (for cash) Stock is credited and Cash is debited. If the amount for which they sell is greater than that for which they were bought, there will be a balance at the debit of Cash, and a balance at the credit of Stock. The one balance represents the cash actually on hand (from this transaction), the other the cause of its being on hand. If there is a loss on the transaction, the balance will be on the other side of these accounts. Ultimately the balance thus arising at Dr. or Cr. of Stock is transferred to an account called Profit and Loss, which makes the stock account represent the present value of goods on hand, and the profit and loss account, when complete, the result of the business. In this system the risk of omitting any entry, which is a very common occurrence in single bookkeeping, is reduced to its smallest, as, unless a particular transaction is omitted in every step of its history, the system will inexorably require that its whole history should be given to bring the different accounts into harmony with each other.

BOOK OF MORMON, the bible of the Mormons, first published in 1830 by Joseph Smith, who claimed it was written on gold plates, buried in a sacred hill, and disclosed to Smith by an angel. The plates disappeared, but a translation (the original characters were Egyptian) was made by the finder, who, upon it, founded the Mormon faith.

BOOK-PLATE, a label pasted on the inside of the first cover of a book, giving the name of the owner. Book-plates are a very ancient usage and some of them, especially rare ones, or those from the books of famous persons, are very valuable. Sir Wollasten Franks made a collection of 200,000 book-plates, which is now in the British Museum. Many noted artists, such as Hogarth, for example, drew book-plates for distinguished patrons.

BOOKS, Censorship of, the supervision of books by some authority so as to settle what may be published. After the invention of printing the rapid diffusion of opinions by means of books induced the governments in all countries to assume certain powers of supervision and regulation with regard to printed matter. The popes were the first to institute a regular censorship. By a bull of Leo X. in 1515 the bishops and inquisitors were required to examine all works before they were printed, with a view to prevent the publication of heretical opinions. As this decree could not be carried out in countries which had accepted the reformed religion, they prepared a list of prohibited books (Index Librorum Prohibitorum), books, that is, which nobody was allowed to read under penalty of the censure of the church. This index continues to be reprinted and revised down to date, as well as another index commonly called the Index Expurgatorius, containing the works which may be read if certain expurgations have been made. In England the censorship was established by act of parliament in 1662, but before that both the well-known Star-chamber and the parliament itself had virtually performed the functions. In 1694 the censorship in England ceased entirely. In France the censorship, like so many other institutions, was annihilated by the revolution. During the republic there was no formal censorship, but the supervision of the directory virtually took its place, and at length in 1810 Napoleon openly restored it under another name (Direction de l'Imprimerie). After the restoration it underwent various changes, and was re-established by Napoleon III. with new penalties. In the old German empire the diet of 1530 instituted a severe superintendence of the press, but in the particular German states the censure was very differently applied, and in Protestant states especially it has never been difficult for individual authors to obtain exemption. In 1849 the censorial laws were repealed, but were again gradually introduced, and still exist in a modified form in most of the German states. The censorship was abolished in Denmark in 1770, in Sweden in 1809, in the Netherlands in 1815. In Russia and Austria there is a despotic censorship. See Press, Liberty of the.

BOOM, a long pole or spar run out from various parts of a ship or other vessel for the purpose of extending the bottom of particular sails. Also a strong beam, or an iron chain or cable, fastened to spars extended across a river or the mouth of a harbor, to prevent an enemy's ships from passing.

BOO'MERANG, a missile instrument used by the Australian aborigines, and by some peoples of India, made of hard wood, about the size of a common reaping-hook, and of a peculiar curved shape, sometimes resembling a rude and very open V. The boomerang, when thrown as if to hit some object in advance, instead of going directly forward, slowly ascends in the air, whirling round and round to a considerable height, and returns to the position of the thrower. If it hits an object of course it falls. The Australians are very dexterous with this weapon, and can make it go in almost any direction, sometimes making it rebound before striking.

Boomerangs.

BOONDEE', or **BUNDI,** a principality, Hindustan, in Rajputana, under British protection; area, 2300 sq. miles. Pop. 295,675. Boondee is the capital. Pop. 22,544.

BOONE, Daniel, an American pioneer of civilization, born 1735, died 1820. In 1769 with five companions he went to explore the little known region of Kentucky, and was taken prisoner by the Indians. In 1775 he built a fort on the Kentucky river, where Boonesborough now is, and settled there. In

Daniel Boone

1778 he was taken prisoner by the Indians, and was retained and adopted into the family of a Shawanese chief, but at length he effected his escape. In the end of the century he removed from Kentucky into Missouri. From him a number of places in the U. States take the name of Boone, Booneville, etc., all of small importance.

BOOT, an article of dress, generally of leather, covering the foot and extending to a greater or less distance up the leg. Hence the name was given to an instrument of torture made of iron, or a combination of iron and wood, fastened on to the leg, between which and the boot wedges were introduced and driven in by repeated blows of a mallet, with such violence as to crush both muscles and bones. The special object of this form of torture was to extort a confession of guilt from an accused person.

BOOTH, Agnes, an American actress, born in Sydney, Australia, in 1843. She was born Marion Agnes Land Rookes, and made her début in San Francisco when very young, playing Shakespearian parts. In 1867 she

married Junius Brutus Booth and until 1891 was prominent on the American stage. After the death of her husband she married (1885) John B. Schoeffel.

BOOTH, Ballington, an American religious leader, son of William Booth, founder of the Salvation Army. In 1896 he disagreed with his father and founded the American Volunteers, an organization of a kind with the Salvation Army.

BOOTH, Edwin Thomas, an American actor, son of Junius Brutus Booth, regarded as the most finished actor produced by the American stage. He was born at Belair, Md., in 1833, and died at New York in 1893. Booth made his début in Boston in 1849. In 1851 he appeared in Richard III. at New York, married Mary Devlin in 1860, who died three years later. Among the rôles played with excellent success by Booth were Shylock, Hamlet, Richard III., Richelieu, and Cassius. He built Booth's Theater, New York, in 1869, played in Europe in 1880 and 1882, toured the U. States with Lawrence Barrett in 1891, and retired soon afterward. Booth's Hamlet was regarded as unapproachable by many critics.

BOOTH, James Curtis, an American chemist, born at Philadelphia in 1810, died 1888. He was a specialist in the chemistry of mining and was superintendent of the United States Mint at Philadelphia from 1849 till his death.

BOOTH, John Wilkes, brother of Edwin Booth, and the assassin of Abraham Lincoln, born 1839, killed in 1865 by his pursuers. Booth was a highly sensitive man, and an intense secessionist. For a time he had been an actor, but the civil war, it is believed, turned his brain. He organized a conspiracy to assassinate the president, vice-president, and cabinet, and succeeded in the first part of his plan when he shot Lincoln on the night of April 14, 1865, at Ford's Theater in Washington. He was overtaken April 26 at Bowling Green, Va., and, refusing to surrender, was shot. Four of his accomplices, including Mrs. Surratt, were hanged.

BOOTH, Junius Brutus, a British actor of great ability, born in 1796, died in 1852. He appeared first in London in 1813 and subsequently became noted on the British stage. Coming to America in 1821 he settled in this country. His principal rôles were Sir Giles, Hamlet, Richard, and Iago. He threw so much passion into his work that his mimic antagonists in stage duels were often in serious danger of being injured.

BOOTH, Maude Ballington, a leader of the American Volunteers, wife of Ballington Booth. She was born in London in 1865 and entered the Salvation Army at the age of seventeen. In 1896 she seceded with her husband from the Salvation Army.

BOOTH, William, founder of the Salvation Army, born in England in 1829. He was formerly a Methodist Episcopal minister, but in 1865 began an independent mission movement in London, which gradually developed into the Salvation Army, which name it was given in 1878. He is the author of numerous books, among them In Darkest England and The Way Out (1890).

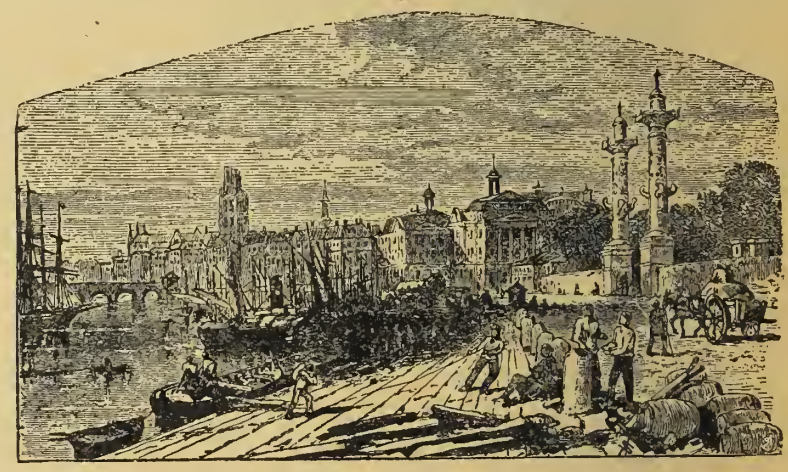
BOOTH-TUCKER, Emma Moss, a leader of the Salvation Army, daughter of William Booth and wife of Commander Booth-Tucker. She was born in England in 1860 and for many years has been head of the Salvation Army in the U. States jointly with her husband.

BOOTH-TUCKER, Frederick St. George de Latour, chief of the Salvation Army organization in the U. States. He was born in India in 1853, and occupied an official position in the Indian civil service, which he resigned in 1881 to join the Salvation Army. In 1896 he was appointed commander of the army in America, with headquarters in New York.

BORACIC ACID, BORIC ACID, a compound of the element boron, with hydrogen and oxygen. Boracic acid is found as a saline incrustation in some volcanic regions, is an ingredient in many minerals, and is contained in the steam which, along with sulphureous exhalations, issues from fissures in the soil in Tuscany. The steam from the fumaroles here is now an important source of the acid, a system of condensation and evaporation being employed. The acid forms white, shining, scaly crystals, which on heating melt into a transparent mass, when cooled resembling glass. It dissolves in water, and has a slight acid taste; it colors blue litmus purple, and the yellow coloring matter turmeric brown. The chief use of the acid is as a source of borax, the biborate of sodium. See Borax.

BORAX, biborate of sodium. Native borax has long been obtained under the name of tincal, from India, the main source being not India but a series of lakes in Thibet. As imported it is in small pieces of a dirty yellowish color, and is covered with a fatty or soapy matter. Tincal, which contains various impurities, was formerly the only source of borax; but besides Tuscany other sources of boracic acid, more particularly in North and South America, and the salt mines at Stassfurt, etc., in Germany, have been rendered available. The U. States yields large quantities, there being rich deposits of borax and boracic minerals on the Pacific slope. Pure borax forms large transparent six-sided prisms, which dissolve readily in water, effloresce in dry air, and when heated melt in their water of crystallization, swell up, and finally fuse to a transparent glass. Borax has a variety of uses. In medicine it is employed in ulcerations and skin diseases. It has valuable antiseptic and disinfecting properties, and is now much used for the preservation of meat, fish, and milk. It is also employed in soldering metals, and in making fine glaze for porcelain as it renders the materials more fusible. It is used in enameling, and in making beads, glass, and cement.

BORDEAUX (bor-dō'), one of the most important cities and ports of France, capital of the dep. of Gironde, on the Garonne, about 70 miles from the sea. In the old town are the Cathedral of Saint-André, St. Michael's Church, with its superb front of florid Gothic, the Hotel de Ville, and the Palais de Justice. There are extensive and finely-planted promenades. Its position gives it admirable facilities for trade, and enables it to rank next after Marseilles and Havre in respect of the tonnage employed. Large vessels sail up to the town and there is ready communication by railway or river with the Mediterranean, Spain, and the manufacturing centers of France. The chief exports are wine and brandy; sugar and other colonial produce and wood are the chief imports. Ship-building is the chief industry, and there are sugar-refineries, woolen and cotton mills, potteries, soap-works, distilleries, etc.



Bordeaux—Quay of Louis XVIII.

BORDELAIS WINES, the wines of Bordeaux and district, the name of vin de Bordeaux being generally given to the wines made in the eleven departments of the southwest of France, Gironde, Landes, Lot, Tarn et Garonne, etc., though it is in the Gironde alone that the famous growths are found. The soil of Médoc (a sandy and calcareous loam) produces such famous wines as Château-Margaux, Château-Lafitte, and Château-Latour. The wines of this country are the best which France produces. Their characteristics are fine bouquet, velvety softness on the palate, and the faculty of acting beneficially

on the stomach without mounting too readily to the head. Besides the red wines of the Bordelais, known under the general name of claret, there are also white wines, of which the finest growths are Sauterne, Preignac, Barsac, etc.

BORDER RUFFIANS, a term applied to certain pro-slavery men who went to Kansas from Missouri in 1853 to turn the elections.

BORDER STATES, a term applied to certain states which were on the border of the free states. Under this head are classified usually. Maryland, Delaware, Virginia, Kentucky, Tennessee, Missouri, and Arkansas.

BORDER WAR, the war waged between the pro- and anti-slavery men in Kansas some years previous to the civil war.

BO'REAS, the name of the north wind as personified by the Greeks and Romans.

BORER, a name given to the larvæ of certain insects which bore holes in trees and thus injure them.

BORGIA, Cesare (che'zâ-re bor'jâ), the natural son of Pope Alexander VI., and of a Roman lady named Vanozza, born in 1478. He was made Duc de Valentinois by Louis XII. In 1499 he married a daughter of King John of Navarre. He carried on a series of petty wars, made himself master of the Romagna, attempted Bologna and Florence, and had seized Urbino when Alexander VI. died, 1503. Enemies now rose against him on all sides, one of the most bitter of whom was the new pope, Julius II. Borgia was arrested and carried to Spain. He at length made his escape to his brother-in-law the King of Navarre, and was killed before the castle of Viana, March 12, 1507. He was charged with the murder of his elder brother, of the husband of his sister Lucretia, and the stiletto or secret poisoning was freely used against those who stood in his way. With all his crimes he was a patron of art and literature.

BORGIA, Lucretia, daughter of Pope Alexander VI., and sister of Cesare Borgia. She was accused by contemporaries of incest, poisoning, and almost every species of enormous crime; but several modern writers defend her, maintaining that the charges which have been made against her are false or much exaggerated. She was a patroness of art and literature. Born 1480, died 1523.

BORING, the process of perforating wood, iron, rocks, or other hard substances by means of instruments adapted for the purpose. For boring wood the tools used are awls, gimlets, augers, and bits of various kinds, the latter being applied by means of a crank-shaped instrument called a brace, or else by a lathe, transverse-handle, or drilling-machine. Boring in metal is done by drills or boring-bars revolved by boring-machines. Boring in the earth or rock for mining, geologic, or engineering purposes is effected by means of augers, drills, or jumpers, sometimes wrought by hand, but now usually by machinery driven by steam or frequently by compressed air. In ordinary mining practice a bore-hole is usually commenced by digging a small pit about 6 feet deep, over which is set up a shear-legs with pulley, etc. The boring-rods are from 10 to 20 feet in length, capable of being jointed together by box and screw, and having a chisel inserted at the lower end. A lever is employed to raise the bore-rods, to which a slight twisting motion is given at each stroke, when the rock at the bottom of the hole is broken by the repeated percussion of the cutting-tool. Various methods are employed to clear out the triturated rock. The work is much quickened by the substitution of steam-power, water-power, or even horse-power for manual labor. Of the many forms of boring-machines now in use may be mentioned the diamond boring-machine, invented by Leschot, a Swiss engineer. In this the cutting-tool is of a tubular form, and receives a uniform rotatory motion, the result being the production of a cylindrical core from the rock of the same size as the inner periphery of the tube. The boring-bit is a steel thimble, about 4 inches in length, having two rows of Brazilian black diamonds firmly embedded therein, the edges projectign slightly. The diamond teeth are the only parts which come in contact with the rock, and their hardness is such that an enormous length can be bored with but little appreciable wear.

BORN, Bertrand de, French troubadour and warrior, born about the middle of the 12th century in the castle of Born, Périgord; died about 1209. He dispossessed his brother of his estate, whose part was taken by Richard Cœur de Lion in revenge for De Born's satirical lays. Dante places him in the Inferno on account of his verses intensifying the quarrel between Henry II. and his sons.

BOR'NEO, one of the islands of the Malay Archipelago, and the third largest in the world. Greatest length 780, greatest breadth, 690 miles; area 283,-358 sq. miles. There are several chains of mountains ramifying through the interior, the culminating summit (13,-698 feet) being Kini-Balu, near the northern extremity. The rivers are very numerous, and several of them are navigable for a considerable distance by large vessels. There are a few small lakes. Borneo contains immense forests of teak and other trees, besides producing various dye-woods, camphor, rattans and other canes, gutta-percha and india-rubber, honey and wax, etc. Its fauna comprises the elephant, rhinoceros, tapir, leopard, buffalo, deer, monkeys (including the orang-outang), and a great variety of birds. The mineral productions consist of gold, antimony, iron, tin, quicksilver, zinc, and coal, besides diamonds. It is only portions of the land on the coast which are well cultivated. Among cultivated products are sago, gambier, pepper, rice, tobacco, etc. Edible birds'-nests and trepang are important articles of trade. The climate is not considered unhealthful. The pop. is estimated at about 1,700,-000, comprising Dyaks (the majority of the inhabitants), Malays, Chinese, and Bugis. The southwestern, southern, and eastern portions of the island are possessed by the Dutch, under whom are a number of semi-independent princes. On the n.w. coast is the Malay kingdom of Borneo or Bruni. Its chief town is Bruni, on the river of the same name, a place of considerable trade, and the residence of the sultan. British North Borneo has an area of about 31,-000 sq. miles (slightly greater than Scotland), several splendid harbors, a fertile soil, and a good climate. At present the population is sparse, and a large part of the territory consists of virgin forests. The soil is believed to be well adapted

Dyaks of Borneo.

for coffee, sago, tapioca, sugar, tobacco, cotton, etc. Probably there are valuable mineral deposits also, gold having been already found. The chief settlement is Sandakan, the capital, on Sandakan Bay. The revenue is from customs and excise dues, licenses, etc. Birds'-nests, rattans, gutta-percha, timber, etc., are exported, the trade being chiefly with Singapore and Hong-Kong. Pop. estimated at 150,000. North Borneo, Bruni, and Sarawak are all under British protection.

BOR'NU, a negro kingdom of the central Sudan, on the w. side of Lake Chad, with an area of about 79,000 sq. miles, and a pop. estimated at 5,000,-000. Kuka, the capital (pop. 60,000), near the western shore of Lake Chad, is one of the greatest markets in central Africa, a large trade being done in horses, the breed of which is famed throughout the Sudan. Another large town, on the shore of the lake, is Ngornu. Bornu is now under British and German protection.

BOROGLYCERIDE, a compound of boracic acid with glycerine, represented by the formula. It is a powerful antiseptic, and being perfectly harmless is as useful in the preservation of food as in surgery, etc.

BORON, the element from which all boracic compounds are derived, is a dark brown or green amorphous powder, which stains the skin, has no taste or odor, and is only slightly soluble in water. It also crystallizes into darkish brilliant crystals nearly as hard as dia-

mond, which, in the form of dust, are used for polishing. It is one of the few elements which combine direct with nitrogen.

BORROME'O Carlo, Count, a celebrated Roman Catholic saint and cardinal, born 1538, at Arona, on Lago Maggiore, died at Milan 1584. Immediately after his death miracles were said to be wrought at his tomb, and his canonization took place in 1610.—His nephew, Count Federigo Borromeo, also cardinal and Archbishop of Milan, equally distinguished for the sanctity of his life and the benevolence of his character, was born at Milan in 1564, and died in 1631. He is celebrated as the founder of the Ambrosian Library.

BOR'ROW, George, English writer, born 1803, died 1881. He had a passion for foreign tongues, stirring scenes, and feats of bodily prowess. He associated much with the gypsies, and acquired an exact knowledge of their language, manners, and customs. As agent of the British and Foreign Bible Society he traveled France, Germany, Russia, and the East; spent five years in Spain, and published The Gypsies in Spain (1841), and The Bible in Spain (1842), the best known of his works. Other works are Lavengro, largely autobiographical (1850), The Romany Rye (1857), Wild Wales (1862), and Dictionary of the Gypsy Language (1874).

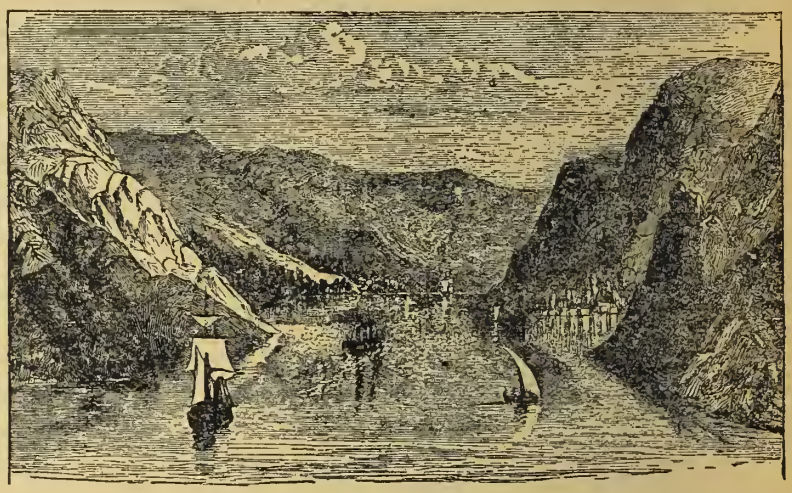
BORROWING, the act of taking something with agreement to return the identical thing or its equivalent, or its equivalent plus compensation to the lender. The first kind of contract is called in law commodatum, the second locatio. Unless a time for return is set the borrowed thing is returnable at the demand of the lender.

BOS'NIA, a Turkish province in the northwest of the Balkan Peninsula, west of Servia, by the Treaty of Berlin (1878) to be administered for an undefined future period by the Austrian government; area (including Herzegovina and Novi-bazar), 23,570 sq. miles (of which Bosnia Proper occupies 16,200), with 1,568,092 inhabitants, mostly of Slavonian origin. In 1708 Bosnia was annexed by Austria.

BOS'PORUS, or **BOSPHORUS,** the strait, 19 miles long, joining the Black Sea with the Sea of Marmora, called also the Strait of Constantinople. It is defended by a series of strong forts; and by agreement of the European powers no ship of war belonging to any nation shall pass the Bosporus without the permission of Turkey.

BOSS, a word used to designate a master of some kind, generally of a lower order. It is derived from the Dutch baas, which means the same thing. In the U. States the word is used colloquially to designate a man of influence and importance in almost any occupation, such as labor boss, railroad boss, political boss. The last mentioned term is applied to politicians who have acquired the power to influence the action of conventions, etc. In very recent years it has lost much of its opprobrious signification, and is now applied to any politician who controls a large number of followers.

BOSS, Lewis, an American astronomer, born at Providence, R. I., in 1846. He is chief of the Dudley Observatory at Albany, N. Y., and in 1878 published a list of declinations of fixed stars, and 1890 a catalogue of 8241 stars. He observed the transit of Venus in 1882 for the U. States government.



View in the Bosporus.

BOSSUET (bos-û-ā), Jacques Bénigne, illustrious French preacher and theologian, was born in 1627, died in 1704. He was unrivaled as a pulpit orator, and greatly distinguished for his strength and acumen as a controversialist. The great occupation of his life was controversy with the Protestants.

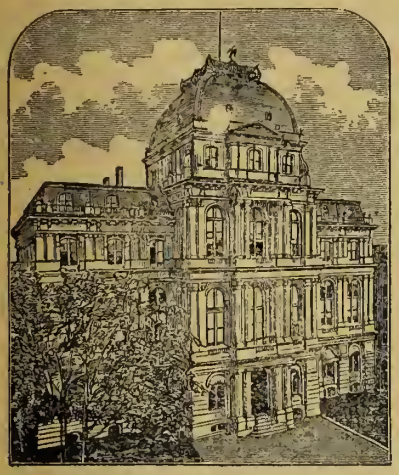
BOSTON, the capital of Massachusetts, metropolis of New England, situated on Massachusetts Bay, 232 miles from New York, and 450 miles from Washington. It is the center of a vast suburban population, and is unique among American cities for its external resemblance to the cities of Europe. Pop. 622,000

Boston was founded in 1630, and derives its name from the English city Boston. It figured prominently in the American revolution, was evacuated by the British March 17, 1776, was

almost wiped out by fire in 1872, and was rebuilt with vast improvement within two years. Washington street, extending from Haymarket Square to and through the Roxbury district, has always been the main thoroughfare. Tremont street, from Scollay Square also to Roxbury, is another important artery. State street is the financial center. Atlantic avenue, 100 feet wide, extends along a portion of the waterfront at the head of the principal wharves. Many of the old streets have been straightened, widened, and extended at enormous expense; and in place of the waters of the Back Bay has grown up the "Back Bay quarter," a region of broad streets and stately avenues, costly and often elegant dwellings, noble churches, fine public and private buildings, famous institutions, great hotels and apartment-houses: remarkable especially for the taste displayed in its embellishment and the richness and variety of its architecture. Beacon street, sweeping over Beacon Hill, for years the finest residential quarter, is now continued across the Back Bay into the Brighton district as a broad boulevard. Commonwealth avenue, 250 feet wide, with a mall in the center, also extending through the Back Bay section to and through the Brighton district, is one of the finest boulevards in the world. Near the heart of Boston proper is the Common, set apart for public use by the first settlers, a rare old park, with broad malls and pleasant by-paths shaded by elms, lindens, and other graceful trees; and beyond, separated from it by a single street, is the Public Garden, the gateway to the Back Bay quarter. In these parks and other public places are numerous statues and monuments. The greater public-park system consists of a chain of parks beginning with the Back Bay Fens, and extending through parkways to the Arboretum and Franklin Park in the West Roxbury district, and along the shores of Dorchester Bay to the Marine Park at South Boston.

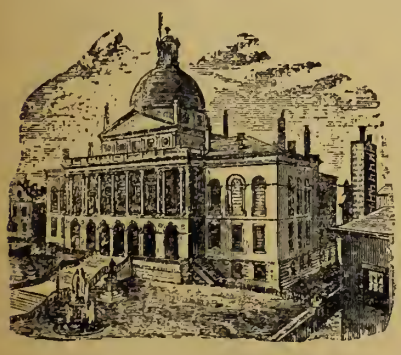
The Subway, an underground roadway, carries the street-car traffic through portions of the heart of the city, It was built by the municipality, under the direction of a Transit Commission, in 1897–99, at a cost of $4,400,000, and leased to the local street railway company for a period of twenty years at a rental of 4⅞ per cent of its cost. An elevated system between the Roxbury

and Charlestown districts, completed in 1901, is connected with the Subway. The steam railways radiating from the city, formerly 5, subsequently consolidated into 3 great systems, connect Boston with all parts of New England,



The city hall Boston.

and the far West, South, and East. They enter two great stations, the Union Station at the north, and the South, or Terminal Station, at the south. The system of public schools comprises kindergarten, primary, grammar, high, Latin, normal, and special schools, in which 86,719 pupils are taught by 1970 teachers. There are 226 schoolhouses. The Boston Public Library, opened in 1854, is wholly free, and is supported by the city at an annual expense of about $255,000. It is the largest library in the world for free circulation. With its 10 branches it contains 746,383 volumes, and the annual circulation is over 1,250,000 volumes. Its executive force consists of 140 persons. A new public library building on Copley Square, Back Bay, costing upward of $2,225,000, was built in 1888–95. It is a monumental structure, of elegant proportions, the interior especially enriched by some of the best of modern decorative work. Among other notable libraries are those of the Boston



State capitol, Boston.

Athenæum, the Massachusetts Historical Society, the N. E. Historic-Genealogical Society, and the State Library. Conspicuous among the higher institutions for instruction are the Massachusetts Institute of Technology, the Boston University, the Boston College (Roman Catholic), the medical and dental schools connected with Harvard University, the Massachusetts Normal Art School, and the New England Conservatory of Music.

The first bank in America was established in Boston in 1686, and the first savings institution in 1816. There are 43 national banks with a total capital of $38,500,000; 13 trust companies, $8,500,000; and 17 savings-banks. The valuation of taxable property in Boston is $1,129,175,832; the tax levy, $16,928,136; the tax rate, $14.70.

BOSTON MASSACRE, THE, the killing of several citizens of Boston by British troops in a riot on March 5, 1770, which was the culmination of much quarreling between the soldiery and the people. Seven soldiers were tried for murder, but were acquitted. The occurrence helped to produce the American revolution, and, in fact, has been called "the first drama of the revolution."

BOSTON PORT BILL, a law passed in March, 1774, by the British parliament closing the harbor of Boston for having destroyed the famous tea cargo on December 16th previously. It reacted by hurrying on the revolution. See Boston Tea Party.

BOSTON TEA PARTY, a name given the throwing of 350 chests of tea into Boston harbor by a mob of citizens disguised as Indians on Dec. 16, 1773. It was as a protest to the importation of tea following the policy of taxation without representation. See Boston Port Bill, The.

BOSTON UNIVERSITY, founded in 1869, at Boston, supporting schools of medicine, law, and theology. It has an endowment of $1,500,000, a college of liberal arts, and a college of agriculture. It offers sixty-four free scholarships, 200 general scholarships, and two fellowships. It has a registration of 1324 students, 134 instructors, and a library of 30,000 volumes.

BOS'WELL, James, the friend and biographer of Dr. Johnson. He was born at Edinburgh in 1740, and died in London in 1795. In 1763 he became acquainted with Johnson — a circumstance which he himself calls the most important event of his life. He afterward visited Voltaire at Ferney, Rousseau at Neufchâtel, and Paoli in Corsica, with whom he became intimate. In 1785 he settled at London, and was called to the English bar. Being on terms of the closest intimacy with Johnson, he at all times diligently noted and recorded his sayings, opinions, and actions, for future use in his contemplated biography. In 1773 he accompanied him on a tour to the Scottish Highlands and the Hebrides, and he published an account of the excursion after their return. His Life of Samuel Johnson, one of the best pieces of biography in the language, was published in 1791.

BOTANY is the science which treats of the vegetable kingdom.

Plants may be studied from several different points of view. The consideration of their general form and structure, and the comparison of these in the various groups from the lowest to the highest, constitutes morphology. Anatomy and histology treat respectively of the bulkier and the more minute internal structure of the parts, and physiology of their functions. Systematic botany considers the arrangement of plants in groups and subgroups according to the greater or less degree of resemblance between them. Geographical botany tells of their distribution on the earth's surface, and strives to account for the facts observed, while palæobotany bears the same relation to distribution in the successive geological strata which make up the earth's crust. Economic botany comprises the study of the products of the vegetable kingdom as regards their use to man.

The simplest plants are very minute, and can only be studied by use of the compound microscope. A little rain-water which has been standing some time when thus examined is found to contain a number of roundish green objects, each of which is an individual plant, consisting of one cell only. Increased complexity of structure is exemplified in many of the ordinary seaweeds, the stalk and more or less flattened expansions of which are several to many cells thick, the external cell-layers differing somewhat in structure from the internal.

Going a step higher we reach the Mosses, where, for the first time, we distinguish a clear differentiation of the part of the plant above ground into a stem and leaves borne upon it. The stem is attached to the soil by delicate colorless hairs — root-hairs. Its structure is, however, very simple, and the leaves are merely thin plates of cells. Microscopical examination of sections of stem, leaf, or root, shows great differences in structure between various groups of cells; there is, in fact, marked differentiation of tissues. A tissue is a layer, row, or group of cells which have all undergone a similar development; by differentiation of tissues we mean that various layers, rows, or groups have developed in different ways, so that we can make out and mark by distinctive names the elements of which a stem or leaf is built up.

Phanerogams, or Flowering-plants, represent the highest group of plants: Seed-plants would be a better name, as their main distinction from those already described is the production of a seed. The much greater variety in form and structure seen in them as compared with the ferns justifies us in regarding them as the highest group in the vegetable kingdom They are divided into two classes: (1) those in which the seed is developed on an open leaf, termed a carpel, and called therefore Gymnosperms; and (2) those in which the seed is developed in a closed chamber, formed by the folding together of one or more carpels, and called accordingly Angiosperms. To the former belong the Conifers—pines and firs—and Cycads; to the latter the rest of our trees and the enormous number of field and garden plants which are not ferns or mosses.

The embryo, or rudimentary plant contained in the seed, consists of a very short axis or stem, bearing one (in Monocotyledons), two (in Dicotyledons), or several (in many Gymnosperms) primary leaves, the cotyledons, above which it terminates in a little bud or plumule, while below them the axis passes into the primary root or radicle. When the seed germinates the radicle is the first to protrude between the separating seed-coats, and growing downward fixes itself in the soil. Then the plumule grows out accompanied or not, as the case may be, by the cotyledons, which have hitherto concealed and protected it, and by rapid growth soon develops into a stem bearing leaves. The stem continues growing in length at its apex throughout the life of the plant; at a short distance below the apex growth in length ceases; but while in Gymnosperms and Dicotyledons it also continually increases in thickness through its whole length, Monocotyledons are distinguished by the fact that when once the stem has been formed its diameter remains unchanged. The same rule applies to the branches.

Branches proceed from buds which are formed in the autumn in the axils of the leaves, that is, at the point where the leaf or leaf-stalk is joined on to the stem; they remain dormant through the winter, and grow out into new shoots in the spring.

The leaf is borne on the stem; its tissues, epidermal, cortical, and vascular, are continuous with those of the stem; but it is distinguished by the fact that its growth is limited, it soon reaches the normal size and stops growing.

In Dicotyledons and Gymnosperms the primary root or radicle after emerging from the seed continues to grow vigorously, often with copious lateral branching, forming an extensive root-system; but in Monocotyledons it soon perishes, and its place is taken by roots developed from the base of the stem, such roots are called adventitious. Adventitious roots occur also in Dicotyledons, as in creeping stems like the strawberry, which bears buds at intervals from which new shoots are formed and roots given off. The clinging roots of the ivy are also adventitious. There are many forms of roots: some are large and woody, as those of trees; others fibrous, as in grasses; or they may be greatly swollen, forming the fleshy globose root of the turnip, or the conical one of the carrot. Such fleshy developments are due to the plant storing up a quantity of reserve food-material in the first year on which to draw in the second, when it will want to expand all its energy in flowering and fruiting. The potato, which is a swollen stem, answers the same purpose. The mistletoe and other parasites give off sucker-like roots which penetrate into the tissues of their host.

As to their reproduction, plants may be asexual, that is, not requiring the cooperation of two distinct (male and female) elements to produce a new individual; or sexual, when two such elements are necessary, and a process of fertilization takes place in which the female cell is impregnated by one or more male cells, and the cell resulting from the fusion of the two gives rise by very extensive growth and division to a new individual. In the very lowest plants, like Protococcus, only asexual reproduction is known, but in most Thallophytes both forms occur. In the asexual method numbers of small cells called spores are produced which on germination give rise to a plant similar to that which bore them. In the sexual process the contents of a male organ. escape and impregnate the oösphere, or female cell contained in the female organ. The fertilized oösphere is termed an oöspore, and by growth and division gives rise to a plant like that on which it was produced.

The flower of a seed-plant is a shoot modified for purposes of reproduction. A buttercup, for instance, consists of a number of modified leaves borne in several whorls on the somewhat expanded top of the stalk, the receptacle or thalamus. Dissection of the flower shows (1) An outer whorl of five green leaves, very like ordinary foliage leaves; these are the sepals, and together make up the calyx. (2) An inner whorl of five yellow leaves, composing the corolla, each leaf being a petal. (3) More or less protected by the petals are a great number of stamens, each consisting of a slender stalk or filament capped by an anther, a little case containing the dry powdery pollen. The stamens are really much modified leaves; collectively they form the androecium. (4) The rest of the receptacle right up to the apex is also covered by very much modified leaves, the carpels, forming the pistil or gynœcium. Each carpel consists of a basal portion, the ovary, in which is contained an ovule, and of a terminal beak-like portion, the style. The androecium and gynœcium, being the parts directly concerned in reproduction, are distinguished, as the essential organs of the flower, from the calyx and corolla, which are only indirectly so concerned, though of great importance in the process.

An important characteristie is the fruit, which is the result of fertilization on the ovary.

Many flowers contain both stamens and pistil, these are termed bisexual or hermaphrodite (☿); while others contain stamens or pistil only, such are said to be unisexual. When both male (♂) and female (♀) flowers occur on the same plant the species is monœcious, like the hazel; while it is dioecious if the separate sexes are borne on different individuals, as is the case in the hop.

Plants which, like the sunflower, pass through all the stages from germination to production of fruit and seed in one season, and then perish, are called annuals; if two years are required, as with the turnip and onion, they are biennials; while perennials last several to many years, during which they may flower and seed many times.

A plant is built up chiefly of four elements: carbon, hydrogen, oxygen, and nitrogen, with small quantities of sulphur and phosphorus and some mineral matter. Substances containing these must therefore form the food. A green plant can take up its carbonaceous food in a very simple form by means of the green chlorophyll contained especially in its leaves. This absorbs some of the sun's rays, and by virtue of the energy represented by the light so absorbed it can obtain the carbon from the carbonie acid gas present in the atmosphere. An animal, having no chlorophyll, has to use more complex carbon-containing compounds, in fact those which have already been worked up in the vegetable kingdom. The other items of the food are obtained from the water and mineral salts in the soil, the salts being brought into solution and absorbed with large quantities of water by the roots. The leaves are the laboratory where the food is worked up into the complex compounds which form the plant substance, and to raise the crude material from the absorbing roots to the leaves there is an upward current of liquid through the stem. This is known as the transpiration current; it travels in the wood-cells. A much larger quantity of water is absorbed than is required as food; this is got rid of by transpiration, that is, by the giving off of water-vapor from the leaves. This is evident if a plant be placed under a glass shade in the sunlight, the vapor given off becoming condensed on the glass. The complex compounds elaborated in the leaves are returned to all parts of the plant where growth, or storage of reserve-material, is taking place, by means of the other constituent of the vascular bundle, the bast tissue.

BOTANY BAY, a bay in New South Wales, so called by Captain Cook on account of the great number of new plants collected in its vicinity. The English penal settlement, founded in 1788, and popularly known as Botany Bay, was established on Port Jackson, some miles to the northward, near where Sydney now stands.

BOT-FLY, a fly the maggots of which are developed from the egg in the intestines of horses or under the skins of oxen; a gadfly.

BOTH'NIA, GULF OF, the northern part of the Baltic Sea, which separates Sweden from Finland. Length about 450 miles, breadth 90 to 130, depth from 20 to 50 fathoms. Its water is but slightly salt, and it freezes in the winter, so as to be passed by sledges and carriages.

BOTH'WELL, James Hepburn, Earl of, known in Scottish history by his marriage to Queen Mary, was born about 1526. It is believed that he was deeply concerned in the murder of Darnley, Mary's husband, and that he was even supported by the queen. He was charged with the crime and tried, but, appearing along with 4000 followers, was readily acquitted. He was now in high favor with the queen, and with or without her consent he seized her at Edinburgh, and carrying her a prisoner to Dunbar Castle prevailed upon her to marry him after he had divorced his own wife. But by this time the mind of the nation was roused on the subject of Bothwell's character and actions. A confederacy was formed against him, and in a short time Mary was a prisoner in Edinburgh, and Bothwell had been forced to flee to Denmark, where he died in 1576.

BOTTICELLI (bot-tē-chel'lē), Sandro (for Alessandro), an Italian painter of the Florentine school, born in 1447, died 1515. Working at first in the shop of the goldsmith Botticello, from whom he takes his name, he showed such talent that he was removed to the studio of the distinguished painter Fra Lippo Lippi. From this master he took the fire and passion of his style, and added a fine fantasy and delicacy of his own. He painted flowers, especially roses, with incomparable skill. In his later years Botticelli became an ardent disciple of Savonarola, and is said by Vasari to have neglected his painting for the study of mystical theology.

BOTTLE, a vessel of moderate or small size, and with a neck, for holding liquor. By the ancients they were made of skins or leather; they are now chiefly made of glass or earthenware. The common black bottles of the cheapest kind are formed of the most ordinary materials, sand with lime, and sometimes clay and alkaline ashes of any kind, such as kelp, barilla, or even wood ashes. This glass is strong, hard, and less subject to corrosion by acids than flint-glass.

BOTTLE-CHART, a chart which shows the course traveled by a sealed bottle thrown into the sea. It had its origin in the custom of throwing into the sea sealed bottles containing intelligence from travelers on long or disastrous voyages. The chart represents the travels of various bottles. It is used chiefly by hydrographers. Charts of this kind are made at the U. States hydrographic office.

BOTTLE-FLOWER. See Blue-bottle.

BOTTLE-GOURD, a kind of gourd, the dried fruits of which, when the pulp is removed, are used in warm countries for holding liquids.

BOTTLE-NOSE, a kind of whale, of the dolphin family, 20 to 28 feet long, with a beaked snout and a dorsal fin, a native of northern seas. The caaing whale is also called bottle-nose.

BOTTLE-TREE, a tree of north-eastern Australia, with a stem that

Bottle-tree.

bulges out into a huge rounded mass. It abounds in a nutritious mucilaginous substance.

BOTTLING, the art of placing liquid in bottles, corking, and otherwise sealing them. Special apparatus has been designed for this work by which the bottles are cleaned, filled, corked, and sealed. One machine will clean 75 dozen bottles a day. Self-feeding corking machines will each cork 2000 bottles an hour. A wiring machine will wire 1000 bottles an hour, and these can be labeled by machinery at the rate of 12,000 a day. The liquids bottled on the largest scale are all kinds of beverages, alcoholic and otherwise.

BOTTOMRY is a contract by which a ship is pledged by the owner or master for the money necessary for repairs to enable her to complete her voyage. The freight and even the cargo may be pledged as well as the ship. The conditions of such a contract usually are that the debt is repayable only if the ship arrives at her destination. As the lender thus runs the risk of her loss, he is entitled to a high premium or interest on the money lent. The latest bottomry bond takes precedence of all previous ones.

BOUCHES-DU-RHONE (bösh-dü-rōn), a dep. in the s. of France, in ancient Provence. Chief town, Marseilles. Area, 1,267,088 acres, of which about one-half is under cultivation. The Rhone is the principal river. The manufactures are principally soap, brandy, olive-oil, chemicals, vinegar, scent, leather, glass, etc. The fisheries are numerous and productive. Pop. 737,112.

BOUCICAULT (bō'si-kō), Dion, dramatic author and actor, born at Dublin Dec. 20, 1822. He was intended for an architect, but the success of a comedy, the well-known London Assurance, which he wrote when only nineteen years old, determined him for a career in connection with the stage. Boucicault being a remarkably facile writer, in a few years had produced quite a lengthy list of pieces, both in comedy and melodrama, and all more or less successful. He produced a new style of drama, dealing largely in sensation, but with more heart in it than his earlier work. The Colleen Bawn and Arrahna-Pogue are the best examples. Indeed the best Mr. Boucicault could do was such pictures of Irish life and manners. He died in 1890.

BOUDOIR (bö'dwär), a small room, elegantly fitted up, destined for retirement. The boudoir is the peculiar property of the lady, where only her most intimate friends are admitted.

BOUGUER (bö-gā), Pierre, a French mathematician and astronomer, born in 1698. He was associated with Godin and La Condamine in an expedition to the South American equatorial regions to measure the length of a degree of the meridian The main burden of the task fell upon Bouguer, who performed it with great ability, and published the results in his Théorie de la Figure de la Terre. He also invented the heliometer, and his researches about light laid the foundation of photometry. He died in 1758.

BOUILLON, Godfrey. See Godfrey of Bouillon.

BOULDER (bōl'dėr), a rounded water-worn stone of some size; in geol. applied to ice worn and partially smoothed blocks of large size lying on the surface of the soil, or embedded in clays and gravels, generally differing in composition from the rocks in their vicinity, a fact which proves that they must have been transported from a distance, probably by ice. When lying on the surface they are known as erratic blocks. The boulder-clay in which these blocks are found belongs to the post-tertiary or quaternary period. It occurs in many localities, consists of a compact clay often with thin beds of gravel and sand interspersed, and is believed to have been deposited from icebergs and glaciers in the last glacial period.

BOULEVARD (böl-vär), a French word formerly applied to the ramparts of a fortified town, but when these were leveled, and the whole planted with trees and laid out as promenades, the name boulevard was still retained. Modern usage applies it also to many streets which are broad and planted with trees, although they were not originally ramparts. The most famous boulevards are those of Paris.

BOULOGNE (bö-lon-yė or bö-lōn), or **BOULOGNE-SUR-MER,** a fortified seaport of France, dep. Pas de Calais, at the mouth of the Liane. In the castle, which dates from 1231, Louis Napoleon was imprisoned in 1840. Boulogne has manufactories of soap, earthenware, linen and woolen cloths; wines, coal, corn, butter, fish, linen and woolen stuffs, etc., are the articles of export. Steamboats run daily between this place and England, crossing over in two or three hours. Pop. 49,083, about a tenth being English.

BOULOGNE-SUR-SEINE, a town of France, dep. Seine, southwest of Paris, of which it is a suburb. It is from this place that the celebrated Bois de Boulogne gets its name. Pop. 47,168.

BOUNTY, in political economy, is a reward or premium granted for the encouragement of a particular species of trade or production, the idea being that the development of such trade or production will be of national benefit. The subsidies granted for carrying the oceanic mails are the only bounties now made by the English government. —The same name is given to a premium offered to induce men to enlist in the army and navy.

BOUNTY JUMPER, a term applied to those individuals who, during the civil war, enlisted in the army for a reward and deserted at the earliest opportunity. This was repeated again and again, one man having confessed to "jumping the bounty" thirty times.

BOURBON (bör-bōn), an ancient French family which has given three dynasties to Europe, the Bourbons of France, Spain, and Naples. The first of the line known in history is Adhemar, who, at the beginning of the 10th century, was lord of the Bourbonnais (now the dep. of Allier). The power and possessions of the family increased steadily through a long series of Archambaulds of Bourbon till in 1272 Beatrix, daughter of Agnes of Bourbon and John of Burgundy, married Robert, sixth son of Louis IX. of France, and thus connected the Bourbons with the royal line of the Capets. Their son Louis had the barony converted into a dukedom and became the first Duc de Bourbon. Two branches took their origin from the two sons of this Louis, duke of Bourbon, who died in 1341. The royal branch was divided by the

two sons of Louis XIII., the elder of whom, Louis XIV., continued the chief branch, while Philip, the younger son, founded the house of Orleans as the first duke of that name. The kings of the elder French royal line of the house of Bourbon run in this way: Henry IV., Louis XIII., XIV., XV., XVI., XVII., XVIII., and Charles X. The last sovereigns of this line, Louis XVI., Louis XVIII., and Charles X. (Louis XVII., son of Louis XVI., never obtained the crown), were brothers, all of them being grandsons of Louis XV. Louis XVIII. had no children, but Charles X. had two sons, viz., Louis Antoine de Bourbon, duke of Angoulême, who was dauphin till the revolution of 1830, and died without issue in 1844, and Charles Ferdinand, duke of Berry, who died 14th Feb., 1820, of a wound given him by a political fanatic. The Duke of Berry had two children: (1) Louise Marie Thérèse, called Mademoiselle d'Artois; and (2) Henri Charles Ferdinand Marie Dieudonné, born in 1820, and at first called Duke of Bourdeaux, but afterward Count De Chambord, who was looked upon by his party until his death (in 1883) as the legitimate heir to the crown of France.

The branch of the Bourbons known as the House of Orleans was raised to the throne of France by the revolution of 1830, and deprived of it by that of 1848. It derives its origin from Duke Philip I. of Orleans (died 1701), second son of Louis XIII., and only brother of Louis XIV.

BOURGEOIS (bur-jō′), a size of printing type larger than brevier and smaller than long-primer, used in books and newspapers.

BOURGEOISIE (börzh-wȧ-zē), a name applied to a certain class in France in contradistinction to the nobility and clergy as well as to the working-classes. It thus includes all those who do not belong to the nobility or clergy, and yet occupy an independent position, from financiers and heads of great mercantile establishments at the one end to master tradesmen at the other. It corresponds pretty nearly with the English term "middle classes."

BOUTELLE, Charles Addison, an American writer and legislator, born in Maine in 1839, died in 1901. He was a delegate to several republican national conventions and served three terms in congress.

BOUT'WELL, George Sewall, an American legislator, politician, and cabinet officer, born in Massachusetts in 1818. He was secretary of the treasury from 1869 to 1873, in which latter year he became a U. States senator. He published several books of speeches and political history. He died in

BOW, the name of one of the most ancient and universal weapons of offense. It is made of steel, wood, horn, or other elastic substance. The figure of the bow is nearly the same in all countries. The long bow was the favorite national weapon in England. The battles of Crecy (1346), Poictiers (1356), and Agincourt (1415) were won by this weapon. It was made of yew, ash, etc., of the height of the archer, or about 6 feet long, the arrow being usually half the length of the bow. The arbalist, or cross-bow, was a popular weapon with the Italians, and was introduced into England in the 13th century, but never was so popular as the long-bow. In England the strictest regulations were made to encourage and facilitate the use of the bow.

BOW, in music, is the name of that well-known implement by means of which the tone is produced from violins, and other instruments of that kind.

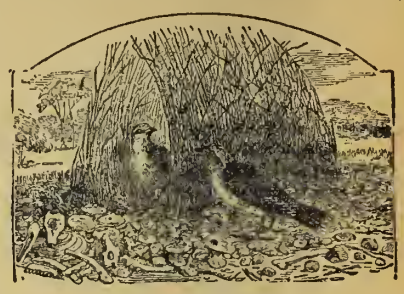
BOWDITCH'S PRACTICAL NAVIGATOR, a compendium of information for navigators. It contains explanations of all the ordinary methods of determining the ship's position at sea, together with all the tables necessary for using them; also descriptions of instruments used in navigation, methods of making hydrographic surveys, charts, etc. The copyright of this work was purchased by the United States government, and it is now published and issued by the hydrographic office, United States navy. It has been several times revised, and a considerable amount of matter has been added.

BOWDOIN (bō′dn), James, born 1727, at Boston, died 1790. In 1785 was appointed governor of Massachusetts, and he was a member of the convention assembled to deliberate on the adoption of the constitution of the United States. He was a friend and correspondent of Franklin.—Bowdoin College, Brunswick, Maine, was named after him. It is a flourishing institution, which has had among its students Longfellow and Hawthorne.

BOWDOIN, James, an American public man and philanthropist, born at Boston in 1752, the son of Governor Bowdoin. He graduated at Harvard, studied also at Oxford, and traveled in Europe, returning to America soon after the battle of Lexington. In 1805 he was United States minister to Spain. He left to Bowdoin College 6000 acres of land and $5500, the reversion of the island of Naushon, where he had his summer home, a large library; and an extensive collection of philosophical apparatus. He died in 1811.

BOWDOIN COLLEGE, chartered in 1794 by Massachusetts, and named after James Bowdoin, governor of Massachusetts, of which state Maine was formerly a district. The college opened at Brunswick, Cumberland Co., in 1802, with Joseph McKeen, D.D., a Dartmouth graduate, as its first president. The present buildings of the college, representing a value of $600,000, include King Chapel, the Walker Art building, the Searles Science building, Memorial Hall, the Hubbard Library, and a gymnasium, observatory, and dormitories. The course of study leading to the degree of A.B. is based on a knowledge of the ancient and modern languages and mathematics, and includes such other courses as are usually given in smaller colleges of the first class. Connected with Bowdoin College is the Medical School of Maine, organized in 1820.

BOWER-BIRD, a name given to certain Australian birds of the starling family from a remarkable habit they have of building bowers to serve as places of resort. The bowers are constructed on the ground, and usually under overhanging branches in the most retired parts of the forest. They are decorated with variegated feathers,



Bower-bird and its run.

shells, small pebbles, bones, etc. At each end there is an entrance left open. These bowers do not serve as nests at all, but seem to be places of amusement and resort, especially during the breeding season.

BOWERY, a famous street of New York City, running from Chatham Square to Cooper Union. It was formerly a street of dangerous and low resorts, but recently has been invaded by retail business stores.

BOWIE-KNIFE, a long kind of knife like a dagger, but with only one edge, named after Colonel James Bowie, and used by hunters and others.

BOW INSTRUMENTS are all the instruments strung with catgut from which the tones are produced by means of the bow. The most usual are the double-bass, the small bass, or violoncello, and the violin proper. In reference to their construction the several parts are alike; the difference is in the size.

BOWLINE (bō′-), in ships, a rope leading forward, which is fastened by bridles to loops in the ropes on the perpendicular edge of the square sails. It is used to keep the weather-edge of the sail tight forward and steady when the ship is close-hauled to the wind.

BOWLS, a game played with a variable number of wooden pins and a wooden ball on a smooth wooden runway called an alley. The alley is 75 feet long, 41 inches wide, and flanked on both sides by a gutter for the return of the balls. The pins are "set up" at one end and the player tries to knock them down (according to rule) by rolling the ball along the floor from the other end. The game in the U. States is played with ten, nine, five, three, or other number of pins, and usually three rolls are permitted for each frame, the purpose being to knock down all the pins. When all the pins are knocked with one stroke (in tenpins) the play is called a "ten strike," or "double spare," meaning that the player has two more rolls on the next frame. A player who makes "ten strikes" to the end scores 300. The game has a very ancient origin.

BOWMAN, Edward Morris, an American musician, born at Barnard, Vt., in 1848. In 1877 he published his Manual of Musical Theory, which was trans-

lated into German, and in 1881 became the first American associate of the Royal College of Organists of England. In 1891 he became professor of music in Vassar College, and has done much toward raising the tone of popular musical taste in the U. States.

BOWSPRIT (bō'-), the large boom or spar which projects over the stem of a vessel, having the foremast and foretopmast stays and staysails attached to it, while extending beyond it is the jib-boom.

BOW-WINDOW, a window constructed so as to project from a wall, properly one that forms a segment of a circle. See Bay-window.

BOX-ELDER, the ash-leaved maple, a small but beautiful tree of the U. States, from which sugar is sometimes made.

BOXING, or **PUGILISM,** a manner of fighting with the fists so common in England as to be regarded abroad as a national accomplishment. The art of boxing consists in showing skill in dealing blows with the fist against one's opponent, especially on the upper part of the body, while at the same time one protects one's self. In England professional boxers, who made a livelihood out of their skill in the art, were at one time common, especially during the reigns of the Georges, when persons of the highest rank were sometimes to be seen at pugilistic combats, and "professors" of the art frequently had members of the nobility among their pupils. Byron relates in his diary that he received instruction in boxing from the celebrated Jackson, who made a fortune as a pugilist. Boxing has, however, fallen in a great measure into disrepute, and prize-fights are illegal, and both the principals and the spectators may be proceeded against. At the gladiatorial shows of the Greeks and Romans boxing was common, but in a more dangerous form, the fist being armed with leather appliances loaded with iron or lead.

BOXING-DAY, the day after Christmas, which has long been held as a holiday in England. It is so called from the practice of giving Christmas boxes as presents on that day.

BOXING THE COMPASS, in seaman's phrase, the repetition of all the points of the compass in their proper order—an accomplishment required to be attained by all sailors.

BOX-TORTOISE, a name given to one or two North American tortoises that can completely shut themselves into their shell.

BOX-TREE, a shrubby evergreen tree, 12 or 15 feet high, a native of England, southern Europe, and parts of Asia, with small oval and opposite leaves, and greenish, inconspicuous flowers, male and female on the same tree. The wood is of a yellowish color, close-grained, very hard and heavy, and admits of a beautiful polish. On these accounts it is much used by turners, wood-carvers, engravers on wood (no wood surpassing it in this respect), and mathematical-instrument makers. Flutes and other wind-instruments are formed of it. The box of commerce comes mostly from the regions adjoining the Black Sea and Caspian, and is said to be diminishing in quantity.

BOYACÁ', in South America, one of the departments or provinces of Colombia. On the west side the country is traversed by a chain of the Andes, from which it slopes toward the east into immense plains or llanos, mostly uncultivated, and watered by the tributaries of the Orinoco. Area, 33,351 sq. miles; pop. 702,000.

BOY'COTTING, a name given to an organized system of social and commercial ostracism employed in Ireland in connection with the Land League and the land agitation of 1880 and 1881 and subsequently. Landlords, tenants, or other persons who are subjected to boycotting find it difficult or impossible to get any one to work for them, to supply them with the necessaries of life, or to associate with them in any way. It took its name from Captain James Boycott, a Mayo landlord, against whom it was first put in force.

BOY'DELL, John, an English engraver, but chiefly distinguished as an encourager of the fine arts. He engaged Reynolds, Opie, West, and other celebrated painters to illustrate Shakespeare's works, and from their pictures was produced a magnificent volume of plates, the Shakespeare Gallery (London, Boydell, 1803). In 1790 Boydell had been made lord-mayor; but the outbreak of war consequent on the French revolution injured his foreign trade and brought him into difficulties. He died in 1804.

BOYLE LECTURES. See Boyle, Robert.

BOYLE'S LAW, otherwise called Mariotte's Law, a law in physics to the effect that the volume of a gas will vary inversely to the pressure to which it is subjected.

BOYS' CLUBS, associations of American boys for various purposes, chiefly maintained by their parents and grown-up friends. Of these, investigation has shown, there are nearly 1000 in the U. States, the membership consisting of boys ranging from ten to seventeen years old. The character of the clubs are social, industrial, literary, benevolent, musical, hunting and fishing, athletic, and game playing.

BOZZARIS (bot-sä'ris), Marko, a hero of the Greek war of independence against the Turks, born in the end of the 18th century. In the summer of 1823, when he held the command-in-chief of the Greek forces at Missolonghi, he made a daring night attack on the camp of the Pasha of Scutări, near Karpenisi. The attack was successful; but the triumph of the Greeks was clouded by the fall of the heroic Bozzaris. His deeds are celebrated in the popular songs of Greece.

BRABANT', the central district of the lowlands of Holland and Belgium, extending from the Waal to the sources of the Dyle, and from the Meuse and Limburg plains to the lower Scheldt. It is divided between the kingdoms of Holland and Belgium, into three provinces: 1st, Dutch or North Brabant, area 1977 sq. miles, pop. 559,287; 2d, the Belgian province of Antwerp, area 1095 sq. miles, pop. 837,976; and 3d, the Belgian province of South Brabant, area 1276 sq. miles, pop. 1,303,064.

BRACELET, a kind of ornament usually worn on the wrist, the use of which extends from the most ancient times down to the present, and belongs to all countries, civilized as well as uncivilized. Bracelets were in use in Egypt and among the Medes and Persians at a very remote period, and in the Bible the bracelet is frequently mentioned as an ornament in use among the Jews, both men and women. Among the ancient Greeks bracelets seem to have been worn only by the women. The spiral form was preferred, and very often made to assume the appearance of snakes, which went round the arm twice or thrice. Among the Romans it was a frequent practice for a general to bestow bracelets on soldiers who had distinguished themselves by their valor. Roman ladies of high rank frequently wore them both on the wrist and on the upper arm. Among the ancient heathen Germanic tribes they formed the chief and almost only ornament, as is shown by their being so often found in old graves. They seem to have been used by the men even more than by the women, and were the gifts by which an ancient German chief attached his followers to himself. So, in old Anglo-Saxon poems, "ring-giver" is a common name for the lord or ruler.

BRACES, in ships, ropes passing through blocks at the ends of the yards, used for swinging the latter round so as to meet the wind in any desired direction.

BRACKET, a short piece or combination of pieces, generally more or less triangular in outline, and projecting from a wall or other surface. They may be either of an ornamental order, as

Bracket,
Harlestone church, Northamptonshire.

when designed to support a statue, a bust, or such like, or plain forms of carpentry, such as support shelves, etc. Brackets may also be used in connection with machinery, being attached to walls, beams, etc., to support a line of shafting.

BRAD'DOCK, Edward, major-general and commander of the British army in the expedition against the French on the river Ohio, in 1755. In the spring of that year he set out from Virginia to invest Fort Duquesne, now Pittsburg, but from want of caution fell into an Indian ambuscade by which he lost nearly one-half of his troops and received himself a mortal wound.

BRAD'DOCK, a borough in Allegheny Co., Pa., 10 miles east of Pittsburg, on the Monongahela river, and on the

Pennsylvania, the Baltimore and Ohio, and the Pittsburg and Lake Erie railroads. Pop. 18,422.

BRAD'FORD, a mun., parl., and county bor. and important manufacturing town in W. Riding of Yorkshire, England. Bradford is the chief seat in England of the spinning and weaving of worsted yarn and woolens, but there are also manufactures of alpaca stuffs, plush and velvet, machine works, foundries, etc. Pop. 279,809.

BRADFORD, a city in McKean Co., Pa., 76 miles south of Buffalo, N. Y., on the Pennsylvania, the Erie, the Buffalo, Rochester and Pittsburg, and several local railroads. It is in a petroleum and natural-gas region. Pop. 18,129.

BRADFORD, William, one of the Pilgrim Fathers, born in England in 1590, died in 1657. He came over in the Mayflower in 1620 and founded Plymouth Colony. He acquired considerable fame by his exhaustive works on the history of Massachusetts.

BRADLAUGH (brad'la), Charles, English secularist, atheist, and advocate of republicanism, born in London in 1833. He is well known by his writings and lectures, and more especially by his efforts to gain admission to parliament. Being elected for Northampton in 1880 he claimed the right to make affirmation simply instead of taking the oath which members of parliament take before they can sit and vote, but being a professed atheist this right was denied him. Though he was repeatedly reelected by the same constituency, the majority of the House of Commons continued to declare him disqualified for taking the oath or affirming; and it was only after the election of a new parliament in 1885 that he was allowed to take his seat without opposition as a representative of Northampton. He was editor of the National Reformer. He died in 1891.

BRADLEY, Joseph P., an American jurist, born in New York in 1813, died in 1892. He was appointed associate justice of the United States Supreme court in 1870, and in 1877 was a member of the commission which decided the election of 1876 in favor of Rutherford B. Hayes.

Braxton Bragg.

BRAGG, Braxton, an American soldier. He was born in North Carolina in 1817 and died in 1876. During the Mexican war he served under Taylor and took part in the engagements of Fort Pickens, Shiloh, Corinth, Perryville, Murfreesboro, Chattanooga, and other battles during the civil war. He fought against Sherman in Georgia and was under the command of General Johnston until the peace. After the war he devoted himself to civil engineering.

BRAGG, Edward Stuyvesant, an American legislator, born in New York in 1827. He served in the civil war as one of the "iron brigade" of Wisconsin, and has been prominent in democratic national politics. In 1902 he became consul general to the Cuban republic.

BRAH'MA, a Sanskrit word signifying (in its neuter form) the Universal Power or ground of all existence, and also (in its masculine form with long final syllable) a particular god, the first

Brahma—Bronze, Indian museum.

person in the Triad (Brahmā, Vishnu, and Siva) of the Hindus. The personal god Brahmā is represented as a red or golden-colored figure with four heads and as many arms, and he is often accompanied by the swan or goose. He is the god of the fates, master of life and death, yet he is himself created, and is merely the agent of Brahmă, the Universal Power. His moral character is no better than that of the Grecian Zeus.

BRAH'MANISM, a religious and social system prevalent among the Hindus, and so called because developed and expounded by the sacerdotal caste known as the Brahmans (from brahman, a potent prayer; from root brih or vrih, to increase). It is founded on the ancient religious writings known as the Vedas and regarded as sacred revelations, of which the Brahmans as a body became custodians and interpreters, being also the officiating priests and the general directors of sacrifices and religious rites. As the priestly caste increased in numbers and power they went on elaborating the ceremonies, and added to the Vedas other writings tending to confirm the excessive pretensions of this now predominant caste, and give them the sanction of a revelation. The earliest supplements to the Vedas are the Brahmanas, more fully explaining the functions of the officiating priests. Both together form the revealed Scriptures of the Hindus. In time the caste of Brahmans came to be accepted as a divine institution, and an elaborate system of rules defining and enforcing by the severest penalties its place as well as that of the inferior castes was promulgated. Other early castes were the Kshattriyas or warriors, and the Vaisyas or cultivators, and it was not without a struggle that the former recognized the superiority of the Brahmans. It was by the Brahmans that the Sanskrit literature was developed; and they were not only the priests, theologians, and philosophers, but also the poets, men of science, lawgivers, administrators, and statesmen of the Aryans of India.

The sanctity and inviolability of a Brahman are maintained by severe penalties. The murder of one of the order, robbing him, etc., are inexpiable sins; even the killing of his cow can only be expiated by a painful penance. A Brahman should pass through four states: First, as Brahmachari, or novice, he begins the study of the sacred Vedas, and is initiated into the privileges and the duties of his caste. He has a right to alms, to exemption from taxes, and from capital and even corporal punishment. Flesh and eggs he is not allowed to eat. Leather, skins of animals, and most animals themselves are impure and not to be touched by him. When manhood comes he ought to marry, and as Grihastha enter the second state, which requires more numerous and minute observances. When he has begotten a son and trained him up for the holy calling he ought to enter the third state, and as Vanaprastha, or inhabitant of the forest, retire from the world for solitary praying and meditation, with severe penances to purify the spirit; but this and the fourth or last state of a Sannyasi, requiring a cruel degree of asceticism, are now seldom reached, and the whole scheme is to be regarded as representing rather the Brahmanical ideal of life than the actual facts.

The worship represented in the oldest Vedic literature is that of natural objects: the sky, personified in the god Indra; the dawn, in Ushas; the various attributes of the sun, in Vishnu, Surya, Agni, etc. These gods were invoked for assistance in the common affairs of life, and were propitiated by offerings which, at first few and simple, afterward became more complicated and included animal sacrifices. In the later Vedic hymns a philosophical conception of religion and the problems of being and creation appears struggling into existence; and this tendency is systematically developed by the supplements and commentaries known as the Brahmanas and the Upanishads. In some of the Upanishads the deities of the old Vedic creed are treated as symbolical. Brahma, the supreme soul, is the only reality, the world is regarded as an emanation from him, and the highest good of the soul is to become united with the divine. The necessity for the purification of the soul in order to its reunion with the divine nature gave rise to the doctrine of metempsychosis or transmigration.

This philosophical development of Brahmanism gave rise to a distinct separation between the educated and the vulgar creeds. While from the fifth to the first century B.C. the higher thinkers among the Brahmans were

developing a philosophy which recognized that there was but one god, the popular creed had concentrated its ideas of worship round three great deities—Brahmā, Vishnu, and Siva—who now took the place of the confused old Vedic Pantheon. Brahmā, the creator, though considered the most exalted of the three, was too abstract an idea to become a popular god, and soon sank almost out of notice. Thus the Brahmans became divided between Vishnu, the preserver, and Siva, the destroyer and reproducer, and the worshipers of these two deities now form the two great religious sects of India. Siva, in his philosophical significance, is the deity mostly worshiped by the conventional Brahman, while in his aspect of the Destroyer, or in one of his female manifestations, he is the god of the low castes, and often worshiped with degrading rites. But the highly cultivated Brahman is still a pure theist, and the educated Hindu in general professes to regard the special deity he chooses for worship as merely a form under which the One First Cause may be approached.

The sharp division of the people of India into civilized Aryans and rude non-Aryans has had a great influence upon Brahmanism, and thus the spiritual conceptions of the old Vedic creed have been mixed in modern Hinduism with degrading superstitions and customs belonging to the so-called aboriginal races. Suttee, for example, or the burning of widows, has no authority in the Veda, but like most of the darker features of Hinduism is the result of a compromise which the Brahmanical teachers had to make with the barbarous conceptions of non-Aryan races in India. The Buddhist religion has also had an important influence on the Brahmanic.

The system of caste originally no doubt represented distinctions of race. The early classification of the people was that of "twice-born" Aryans (priests, warriors, husbandmen) and once-born non-Aryans (serfs); but intermarriages, giving rise to a mixed progeny, and the variety of employments in modern times, have profoundly modified this simple classification. Innumerable minor distinctions have grown up, so that among the Brahmans alone there are several hundred castes who cannot intermarry or eat food cooked by each other.

The Brahmans represent the highest culture of India, and as the result of centuries of education and self-restraint have evolved a type of man distinctly superior to the castes around them. They have still great influence, and occupy the highest places at the courts of princes. Many, however, are driven by need or other motives into trades and employments inconsistent with the original character of their caste.

BRAIN, the center of the nervous system, and the seat of consciousness and volition in man and the higher animals. It is a soft substance, partly gray and partly whitish, situated in the skull, penetrated by numerous blood-vessels, and invested by three membranes or meninges. The outermost, called the dura mater, is dense and elastic. The next, the tunica arachnoidea, is very thin, and is really double. The third, the pia mater, covers the whole surface of the brain, and is full of blood-vessels. The brain consists of two principal parts, connected by bands of fibers. The one, called the cerebrum, occupies, in man, the upper part of the head, and is seven or eight times larger than the other, the cerebellum, lying behind and below it. The surface of the brain exhibits the appearance of a series of ridges and furrows, forming what are called the convolutions. The cerebrum is divided into two portions, the right and left hemispheres, by the longitudinal fissure, the hemispheres being at the same time transversely connected by a band of nervous matter called the corpus callosum. The external or grayish substance of the brain is softer than the internal white substance. The cerebellum lies below the cerebrum, in a peculiar cavity of the skull. It is divided into a right and a left hemisphere, connected by a bridge of nervous matter called the pons Varolii, under which is the medulla oblongata or continuation of the spinal marrow. Like the cerebrum, it is gray on the outside and whitish within. At the base of the brain are several masses of nervous matter or ganglia known as the corpora striata (two), optic thalami (two), and corpora quadrigemina (four); and there are in it certain cavities or ventricles. Every part of the brain is exactly symmetrical with the part opposite. Twelve pairs of nerves proceed from the base of the brain, including the nerves for the organs of smell, of sight, of hearing, and of taste, also those for the muscles of the face, those for the cavity of the mouth and for the larynx. When compared with the brain of other animals, the human brain presents striking differences. Even the brain of the higher classes of the inferior vertebrate animals differs from that of man, especially in the degree of development; while among the lower grades there is sometimes, properly speaking, no brain at all, but only nerve ganglia, which correspond to the brain. In size, also, the brain of the lower animals, although sometimes (as in the elephant) actually greater, is always much less when compared with the size of the whole body, and it is found that the size of the brain proportionally to the size of the body is a direct measure of the intelligence of different animals. In man the brain weights from 2 to 4 lbs., the average weight in male European adults being 49 to 50 oz., or about $\frac{1}{35}$th of the weight of the body; in the dog the average weight is about $\frac{1}{120}$th of the animal; in the horse $\frac{1}{400}$th; and in the sheep $\frac{1}{750}$th. The heaviest brain yet known was that of Cuvier—64½ oz. The brain of females weighs 5 oz. less on the average than that of males. The brain attains its highest degree of development earlier any other part of the body. In old age it loses both in bulk and in weight. Comparatively little is known of the functions of the separate parts of the brain, but, speaking generally, the parts lying in front have functions connected with the intellectual part of man's nature; while the parts lying nearer the back of the head belong more to our merely animal or organic nature. As the central organ of the nervous system the brain is sympathetically affected in nearly all cases of acute disease. Diseases of the brain fall into two classes, according as they exhibit mental characteristics alone, or also anatomical disturbances. To the former class belong hypochondria, mania, etc. Among the latter may be mentioned meningitis, or inflammation of the membranes of the brain, which seldom occurs without affecting also the substance of the brain, and thus giving rise to phrenitis; hydrocephalus, or water in the head, caused by pressure of water in the cavities of the brain; softening of the brain, frequently the result of chronic inflammation; and plethora, or poverty of blood in the brain, which, though opposite diseases, may cause the same symptoms of giddiness and headache.

Brain and spinal cord

BRAINARD, David Legge, an American traveler and explorer, born in New York in 1856. He was sergeant of the Franklin Bay Expedition in 1881, and won latitude 83° 24′ 30″ north in that enterprise, which was the record for thirteen years. In 1900 he was sent to the Philippines as major in the regular army.

BRAKE, a contrivance for retarding or arresting motion by means of friction. In machinery it generally consists of a simple or compound lever, that may be pressed forcibly upon the periphery of

a wheel, fixed upon a shaft or axis. A similar contrivance is attached to road and railway carriages, but continuous brakes applied to every pair of wheels in a railway train, and operated by air either by the compression or vacuum method, are now generally used on railways. By the first method, of which the Westinghouse brake is an example, the air is compressed by a pump on the locomotive and conveyed by pipes and tubes to cylinders which are under each car, and the pistons of which act on the brake-levers. In the vacuum method, exemplified in the Loughridge brake, the air is exhausted from the device beneath the car, and the pressure of the atmosphere operates the brake-levers.

BRAKE, AIR. See Air-brake.

BRAM'BLE, the name commonly applied to the bush with trailing prickly stems which bears the well-known berries usually called in Scotland brambles, and in England blackberries. It is similar to the raspberry, and belongs to the same genus. It is rarely cultivated, but as a wild plant it grows in great abundance. The flowers do not appear till late in the summer, and the fruit, which is deep purple or almost black in color, does not ripen till autumn.

BRAN, the husky part of wheat separated by the bolter from the flour. Its components are: water, 13; gluten, 19·5; fatty matter, 5; husk with starch, 55; and ashes, 7·5; but the results of different analyses vary considerably. It is employed in feeding cattle, and has also been found useful as a manure.

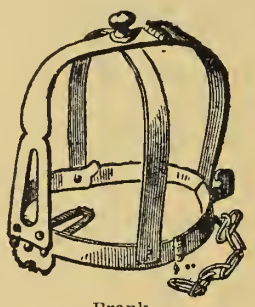
BRAN'DENBURG, a province of Prussia, surrounded mainly by Mecklenburg and the provinces of Pomerania, Posen, Silesia, and Prussian Saxony. The soil consists in many parts of barren sands, heaths, and moors; yet the province produces much grain, as well as fruits, hemp, flax, tobacco, etc., and supports many sheep. The forests are very extensive. The principal streams are the Elbe, the Oder, the Havel, and the Spree. Berlin is locally in Brandenburg. Area, 15,600 sq. miles; pop. 3,108,554. Most of the inhabitants are Lutherans.—The town Brandenburg is on the Havel, 35 miles w.s.w. of Berlin. Pop. 49,263.

BRAND'ING, a form of punishment once in use in England for various crimes, but abolished in 1822. It was performed by means of a red-hot iron, and the part which was branded was the cheek, the hand, or some other part of the body. Even after branding had been abolished in all other cases, a milder form of it was for a long time retained in the army as a punishment for desertion, the letter D being marked with ink or gunpowder on the left side of a deserter 2 inches below the armpit. This also has been abolished.

BRANDY, the liquor obtained by the distillation of wine, or of the refuse of the wine-press. It is colorless at first, but usually derives a brownish color from the casks in which it is kept or from coloring matters added to it. The best brandy is made in France, particularly in the Cognac district in the department of Charente. Much of the so-called brandy sold in Britain and America is made there from more or less coarse whisky, flavored and colored to resemble the real article; and France itself also exports quantities of this stuff. Brandy is often used medicinally as a stimulant, stomachic, and restorative, or in mild diarrhœa. In America various distilled liquors get the name of brandy, as cider brandy, peach brandy.

BRANDYWINE CREEK, a small river which rises in the state of Pennsylvania, passes into the state of Delaware, and joins Christiana Creek near Wilmington. It gives its name to a battle fought near it, Sept. 11, 1777, between the British and Americans, in which the latter were defeated.

BRANK, or **BRANKS,** an instrument formerly in use in Scotland, and to some extent also in England, as a punishment for scolds. It consisted of an iron frame



Brank.

which went over the head of the offender, and had in front an iron plate which was inserted in the mouth, where it was fixed above the tongue, and kept it perfectly quiet.

BRANT, Joseph, a chief of the Mohawk tribe of Indians, born in 1742, died in 1807. His native name was Thayendanega. He became a convert to Christianity and helped the British in several of the Indian wars, and fought against the Americans during the revolution. His alleged exploits are recounted by Campbell in his Gertrude of Wyoming.

BRASS is an alloy of copper and zinc, of a bright-yellow color, and hard, ductile, and malleable. The best brass consists of two parts by weight of copper to one of zinc; but any degree of variation may be obtained by altering the proportions; thus by increasing the quantity of zinc we may form tombac and pinchbeck, and with nearly a seventh more of zinc than copper the compound becomes brittle and of a silver-white color. By increasing the copper, on the other hand, the compound increases in strength and tenacity. Brass which is to be turned or filed is made workable by mixing about 2 per cent of lead in the alloy, which has the effect of hardening the brass and preventing the tool being clogged. For engraving purposes a little tin is usually mixed with the brass. Brass is used for a vast variety of purposes, both useful and ornamental.

BRASSES, SEPULCHRAL or **MONUMENTAL,** large plates of brass inlaid in polished slabs of stone, and usually exhibiting the figure of the person intended to be commemorated, either in a carved outline on the plate or in the form of the plate itself. In place of the figure we sometimes find an ornamented cross. The earliest example of these monumental slabs now existing is that on the tomb of Sir John D'Abernon (died 1277) at Stoke D'Abernon in Surrey, England. These brasses are of great value in giving us an exact picture of the costume of the time to which they belong.

Brass—Westminster abbey.

BRASSEY, Thomas, an English railway contractor, born 1805, died 1870. His operations were on an immense scale, and extended to most of the European countries, as well as to America, India, and Australia, one of his greatest works being the Grand Trunk Railway of Canada, with the great bridge over the St. Lawrence at Montreal. He left a very large fortune. His son, Thomas, born 1836, now Lord Brassey, has been admiralty secretary and civil lord, governor of Victoria, and writes on naval matters, etc. His first wife (died 1888) wrote Voyage of the Sunbeam and other books.

BRAVO (brä'vō), an Italian adjective used as exclamation of praise in theaters, meaning "well done! excellent!" The correct usage is to say bravo to a man, brava to a woman, bravi to several persons.

BRAZIL', United States of, a republic in S. America, occupying nearly one-half of that continent; greatest length, e. to w., 2630 miles, greatest length, n. to s., 2540 miles; area estimated at 3,124,000 square miles, or about one-sixth smaller than Europe. It is bounded s.e., e. and n.e. by the Atlantic Ocean, n. by French, Dutch, and British Guiana, and Venezuela; w. and s.w. by

Ecuador, Peru, Bolivia, Paraguay, the Argentine Republic, and the Republic of Uruguay. Brazil is divided politically into a federal district and twenty states. Pop. 14,333,915.

The coast has few indentations of importance—the chief being the estuaries of the Amazon and Para in the north—and good harbors are comparatively few. As a whole the country may be regarded as having three natural divisions, namely, one belonging to the basin of the Amazon, another belonging to the La Plata basin, and a third consisting of the eastern portion watered by a number of streams directly entering the Atlantic. The Amazon valley is bounded by elevated tablelands which, in the lower course of the river, approach within a comparatively short distance of each other. The characteristic feature of this region is its immense low-lying, forest-covered plains, intersected by innumerable water-courses, and in many parts subject to annual inundation, the vegetation being of the most luxuriant character, from the heat and frequent rains. The greater part of this vast region is unpopulated except by Indians, and as yet of little commercial importance. The climate, notwithstanding the tropical heat and moisture, is comparatively healthful, and the facility for commerce given by thousands of miles of great navigable streams must in time attract numerous settlers. This northern part of Brazil is unequaled in the number and magnitude of the streams which compose its river system and connect it with Venezuela, Colombia, Ecuador, Peru, and Bolivia. On the north side the chief affluents of the Amazon are the Rio Negro and the Japura, the former giving through the Cassiquiare continuous water communication with the Orinoco. Among the southern affluents which are important as water highways into the interior of Brazil are the Xingu, the Tapajos, the Maderia the Purus, and the Jurua; the Madeira being the most important, and forming a navigable waterway into Bolivia, except that it is interrupted by falls about 200 miles below where it enters Brazil. The Tocantins is another large stream from the south, which enters the Para estuary and hardly belongs to the Amazon basin. The forest region of the Amazon occupies about one-fourth of the empire; the rest is made up of undulating tablelands 1000 to 3000 feet above the sea, mountain ranges rising to 10,000 feet, and river valleys.

The great streams belonging to the La Plata basin, in the south, are the Paraguay and Parana. The water-shed between this and the Amazonian basin, near the western boundary of Brazil, is only about 500 feet above sea-level, and here a canoe can be hauled across from a head-stream of the Madeira to be launched on one belonging to the Paraguay. It would thus be easy to connect the one system with the other by means of a canal, and so connect the La Plata with the Orinoco. The water-shed rises gradually from west to east. The southern part of Brazil is characterized by its low plains or pampas, covered with grass or scrub. Its vegetation is of a much less tropical character than in the Amazon basin, and its climate more variable. In many parts of this region there is an admirable field for future colonization, though it is as yet defective in means of transport. Near the coast, in the provinces of S. Paulo, Rio Grande, and Parana, there is already a considerable population, much augmented by German and Italian immigration, and mostly occupied in cattle-raising and agriculture. Railways also have been constructed and have given a great stimulus to trade.

The most important river in eastern Brazil is the San Francisco, which is the great waterway into its interior, and after a course of 1800 miles discharges its waters into the Atlantic at San Antonio. The three greatest cities of Brazil, Rio de Janeiro, Pernambuco, and Bahia, are all endeavoring to develop a traffic in connection with this river. A state line has now been constructed round the falls of Pedro Affonso on its lower course, and thus brought the traffic of the upper river into communication with the lower. Eastern Brazil exhibits a great variety in surface, climate, and productions, and though large tracts consist of arid and sandy tablelands, it contains within itself the greater part of the population, wealth, and industry of the empire.

The chief mountain ranges are near the southeastern coast. The Serra do Mar or Maritime range commences in the far south, and travels close to the coast-line in a northeasterly direction till it reaches Rio de Janeiro and Cape Frio, where it culminates in the Serra dos Orgaos, or Organ Mountains, from 7000 to 8000 feet above the sea, and forming the noblest element in the marvelous scenery of the bay of Rio de Janeiro. West of the Serra do Mar lies the Serra Mantequeira, which farther north is known as the Serra do Espinhaço. Here are the loftiest summits in Brazil, Itatiaia-Assu, the highest of all, being 10,040 feet above the sea. Between the sources of the Tocantins and Parana are the Montes Pyreneos, the second most elevated ridge in Brazil, some of its heights being estimated at nearly 8000 and 10,000 feet above the level of the sea.

As almost the whole of Brazil lies s. of the equator, and in a hemisphere where there is a greater proportion of sea than land, its climate is generally more cool and moist than that of countries in corresponding latitudes in the northern hemisphere. In the s. parts of Brazil, in consequence of the gradual narrowing of the continent, the climate is of an insular character—cool summers and mild winters. The quantity of rain differs widely in different localities. The n. provinces generally are subject to heavy rains. At Rio, where the climate has been much modified by the clearing away of the forests in the neighborhood, the mean temperature of the year is 74°. At Pernambuco the temperature rarely exceeds 82°; in winter it descends to 68°. Generally the climate of Brazil is delightful.

Only an insignificant portion of Brazil is as yet under cultivation. The pastures are of vast extent, and support great herds of horned cattle, one of the principal sources of the wealth of the country. The chief food-supplying plants are sugar, coffee, cocoa, rice, tobacco, maize, wheat, manioc (or cassava), beans, bananas, ginger, yams, lemons, oranges, figs, etc.—the two first, sugar and coffee, being the staple products of the empire. As much coffee, indeed, is produced in Brazil as in all the rest of the world together. In its forests Brazil possesses a great source of wealth. They yield dyewoods and fancy woods of various kinds, including Brazil-wood, rosewood, fustic, cedar, mahogany, and a variety of others, as also Brazil-nuts, coconuts, vegetable ivory, india-rubber, copaiba, arnotto, piassava fiber, etc. Other vegetable products are vanilla, sarsaparilla, ipecacuanha, cinnamon, and cloves.

The principal domestic animals of Brazil are horned cattle and horses. Sheep are kept only in some parts, chiefly in the south. Goats and hogs are abundant. The wild animals comprise the puma, jaguar, sloth, porcupine, etc. Monkeys are numerous. Among the feathered tribes are the smallest, the humming-bird, and one of the largest, the rhea, parrots in great variety, tanagers, toucans, and the harpy eagle. The reptiles consist of the boa-constrictor and other species of serpents, some of them venomous, alligators, and fresh-water turtle, the eggs of which yield a valuable oil. The insects are, many of them, remarkable for the beauty of their colors and their size, especially the butterflies. Among minerals the diamonds and other precious stones of Brazil—emeralds, sapphires, rubies, beryls, etc. Gold also is procured in considerable quantities. Other minerals are quicksilver, copper, manganese, iron, lead, tin, antimony, and bismuth. The shores and rivers abound with fish.

The population of Brazil consists of whites, Indians, negroes, and people of mixed blood. The negroes are over 2,000,000 in number, and till 1888 were partly slaves. Of the Indians some are semi-civilized, but others (estimated at 600,000) roam about in a wild state, and are divided into a great many tribes speaking different languages. The state language is Portuguese. Primary education is gratuitous, but the great majority of the people are illiterate, though education is now compulsory in some provinces.

The principal imports are cottons, linens, woolens, machinery, hardware and cutlery, wheat, flour, wine, coals, etc., the manufactured articles and coals being largely from Britain. The exports consist of coffee, sugar, cotton, hides, cabinet and dye woods, drugs, caoutchouc, and diamonds.

The prevailing religion of Brazil is the Roman Catholic, but all religions are now on an equal footing. Previous to 1889 the government was monarchical, but in that year a revolution took place and a republic was established. By the new constitution of 1891 each of the old provinces forms a state, having its own local government, with representation in a congress appointed by popular vote, and consisting of a senate and a

chamber of deputies. The standing army numbers about 30,000. The navy comprises eleven iron-clads, besides other vessels.

Brazil was discovered in 1499 by Vincente Yanez Pinçon, one of the companions of Columbus in the service of Spain, and next year was taken possession of by Pedro Alvares de Cabral on behalf of Portugal. The first governor-general was Thome de Sousa, who in 1549 arrived in the Bay of Bahia and established the new city of that name, making it the seat of his government. The usurpation of the crown of Portugal by Philip II. left Brazil in a defenseless and neglected condition, and the English, French, and Dutch made successive attempts to obtain a footing. The Dutch were the most persevering, and for a time almost divided the Brazilian territory with the Portuguese. The tyranny of the Dutch governors, however, incited their native and Portuguese subjects to revolt, and after a sanguinary war, in 1654 the Dutch were driven out and the Portuguese remained masters of an undivided Brazil. The value of Brazil to Portugal continued steadily to increase after the discovery of the gold mines in 1698 and the discovery of the diamond mines in 1728. The vigorous policy of the Portuguese government under the administration of the Marquis de Pombal (1760–77) did much to open up the interior of Brazil, though his high-handed modes of procedure left among the Brazilians a discontent with the home government which took shape in the abortive revolt of 1789. On the invasion of Portugal in 1808 by the French the sovereign of that kingdom, John VI., sailed for Brazil, accompanied by his court and a large body of emigrants. He raised Brazil to the rank of a kingdom, and assumed the title of King of Portugal and Brazil. But on his return to Portugal in 1820 he found the Portuguese Cortes unwilling to grant civil and political equality to the Brazilians—a fact which raised such violent convulsions in Rio Janeiro and other parts of Brazil that Dom Pedro, the king's son, was forced to head the party resolved to make Brazil independent, and in 1822 a national assembly declared the separation of Brazil from Portugal, and appointed Dom Pedro the constitutional emperor. In 1864 began a severe struggle between Brazil and Paraguay, caused principally by the arbitrary conduct of Lopez, the dictator of Paraguay. Brazil, though joined by Uruguay and the Argentine Confederation, had to bear the brunt of the war, which terminated only with the death of Lopez in 1870. This struggle was attended with an immense expenditure of men and money to Brazil, but it established her reputation as a great power, and secured the freedom of the navigation of the La Plata river-system. In 1871 an act was passed for the gradual emancipation of slaves, and in 1888 slavery was finally abolished. In 1889 took place the revolution and establishment of the republic. The proceedings of the president, Fonseca, led to a revolutionary movement in 1891, which was not quelled without difficulty.

BRAZIL-NUT, the fruit of a South American tree, native to Guiana, Venezuela, and Brazil. The fruit is nearly round, about 6 inches in diameter, has a hard shell, and contains a number of seeds, from twenty to twenty-four, wrinkled, triangular and which are pleasant to the taste and are used as a dessert. An oil is also extracted from them.

BRAZIL-WOOD, a kind of wood yielding a red dye, obtained from several trees, natives of the West Indies and Central and South America. The wood is hard and heavy, and as it takes on a fine polish it is used by cabinet-makers for various purposes, but its principal use is in dyeing red. The dye is obtained by reducing the wood to powder and boiling it in water, when the water receives the red coloring principle, which is a crystallizable substance called brazilin. The color is not permanent unless fixed by suitable mordants.

BRAZOS (brä'zōs), a large river, in Texas, rising in the n.w. part of the state, and flowing into the Gulf of Mexico, after a course of 900 miles, 40 miles w.s.w. Galveston. During the rainy season, from February to May inclusive, it is navigable by steamboats for about 300 miles.

BREACH, the aperture or passage made in the wall of any fortified place by the ordnance of the besiegers for the purpose of entering the fortress.—Breaching batteries are batteries of heavy guns intended to make a breach.

BREACH, in law, any violation of a law, or the non-performance of a duty imposed by law.—Breach of Peace is an offense against the public safety or tranquillity either personally or by inciting others. Breaches of peace are such as affrays, riots, routs, and unlawful assemblies, forcible entry or detainer by violently taking or keeping possession of lands or tenements with menaces, force, and arms; riding, or going, armed with dangerous or unusual weapons, terrifying people; challenging another to fight, or bearing such a challenge, besides certain other offenses.—Breach of Promise (of marriage), the failure to implement one's promise to marry a particular person, in consequence of which that person may raise an action for damages, though it is only the woman as a rule that gains damages.—Breach of Trust is a violation of duty by a trustee, executor, or any other person in a fiduciary position, as, for instance, when a trustee manages an estate entrusted to him for his own advantage rather than for that of the trust.

BREAD is the flour or meal of grain kneaded with water into a tough and consistent paste and baked. There are numerous kinds of bread, according to materials and methods of preparation; but all may be divided into two classes: fermented, leavened, or raised, and unfermented, unleavened, not raised. The latter is the simplest, and no doubt was the original kind, and is still exemplified by biscuits, the oat cakes of Scotland, the corn-bread of America, the dampers of the Australian colonies, and the still ruder bread of savage races. It was probably by accident that the method of bringing the paste into a state of fermentation was found out, by which its toughness is almost entirely destroyed, and it becomes porous, palatable, and digestible. All the cereals are used in making bread, each zone using those which are native to it. Thus maize, millet, and rice are used for the purpose in the hotter countries, rye, barley, and oats in the colder, and wheat in the intermediate or more temperate regions. In the most advanced countries bread is made from wheat, which makes the lightest and most spongy bread. The fermentation necessary for the ordinary loaf-bread is generally produced by means of leaven or yeast. The chemical changes that take place during the process of making bread may be explained in the following way: An average quality of flour consists of gluten 12, starch 70, sugar 5, gum 3, water 10; total, 100. When water is added to the flour, in the first operation of baking, it unites with the gluten and starch, and dissolves the gum and sugar. The yeast or barm added acts now upon the dissolved sugar, especially at an elevated temperature, and produces the vinous fermentation, forming alcohol and setting free carbonic acid as a consequence of the transformation of the elements of the sugar. The gaseous carbonic acid is prevented from escaping by the gluten of the mass, and if the mixing or kneading has been properly performed it remains very equally diffused through every part of the dough. The alcohol and carbonic acid are carried into the oven with the dough, and the former partially escapes, while the latter gas, being expanded by the heat, produces the lightness and sponginess of the loaf.

It may be produced in bread-making by other means than fermentation, as by some of those well-known preparations called "baking powders," which usually contain bicarbonate of potash or of soda, with tartaric acid. Aërated bread is so called because made with aërated water—that is, water strongly impregnated with carbonic acid under pressure, the dough being also worked up under pressure and caused to expand by the carbonic acid when the pressure is removed.

The several qualities of flour used for bread-making are known by the names of firsts or whites, seconds or households, and thirds, according to the degree of fineness resulting from the process of bolting or dressing. The latter two contain a certain proportion of the bran. Brown or whole-flour bread is considered to be very wholesome. It is made from undressed wheat, and consequently contains the bran as well as the flour.

Various adulterations are found in bread, such as chalk, starch, potatoes, etc.; but the commonest is alum, which enables the baker to give to bread of inferior flavor the whiteness of the best bread, and also to keep in the loaf an undue quantity of water, which, of course, increases its weight. Boiled rice also is used for the same purpose. In the making of bread the flour or meal of wheat, barley, rye, oats, buckwheat, Indian corn, rice, beans, peas, and

potatoes may be used, along with salt, eggs, water, milk, and leaven or yeast of any kind; but any other ingredient is regarded as an adulteration.

BREADFRUIT, a large globular fruit of a pale-green color, about the size of a child's head, marked on the surface with irregular six-sided depressions, and containing a white and somewhat fibrous pulp, which when ripe be-

Breadfruit.

comes juicy and yellow. The tree that produces it grows wild in Otaheite and other islands of the South Seas, whence it was introduced into the West Indies and S. America. It is about 40 feet high, with large and spreading branches, and has large bright-green leaves deeply divided into seven or nine spear-shaped lobes. The fruit is generally eaten immediately after being gathered, but is also often prepared so as to keep for some time either by baking it whole in close underground pits or by beating it into paste and storing it underground, when a slight fermentation takes place. The eatable part lies between the skin and the core, and is somewhat of the consistence of new bread. Mixed with cocoanut milk it makes an excellent pudding. The inner bark of the tree is made into a kind of cloth. The wood is used for the building of boats and for furniture.

BREADNUTS, the seeds of a tree of the same order as the breadfruit. The breadnut tree is a native of Jamaica. Its wood, which resembles mahogany, is useful to cabinet-makers, and its nuts make a pleasant food, in taste not unlike hazelnuts.

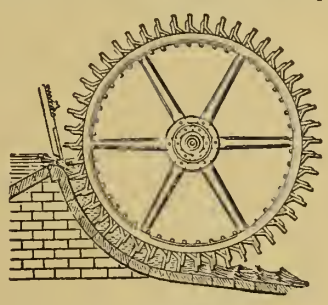
BREAK'WATER, a work constructed in front of a harbor to serve as a protection against the violence of the waves. The name may also be given to any structure which is erected in the sea with the object of breaking the force of the waves without and producing a calm within. Breakwaters are usually constructed by sinking loads of unwrought stone along the line where they are to be laid, and allowing them to find their angle of repose under the action of the waves. When the mass rises to the surface, or near it, it is surmounted with a pile of masonry, sloped outward in such a manner as will best enable it to resist the action of the waves.

BREAMING, a nautical term meaning the operation of clearing a ship's bottom by means of fire of the shells, seaweeds, barnacles, etc., that have become attached to it. It is performed by holding to the hull kindled furze, reeds, or such like light combustibles, so as to soften the pitch and loosen the adherent matters, which may be then easily swept off.

BREAST, The female, is of a glandular structure, containing vesicles for the secretion of milk, and excretory ducts, which open by small orifices in the nipple, and discharge the secreted fluid for the nourishment of the child. At the center of each breast there is a small projection, the nipple, and this is surrounded by a dark ring termed the areola. The breast is liable to many diseases, from irritation during nursing, bruises of the part, undue pressure from tight clothes, and from constitutional causes. Among the most common of these is inflammation arising from a superabundant secretion of milk during nursing.

BREASTPLATE, a piece of defensive armor covering the breast, made of leather, brass, iron, steel, or other metals. Among the ancient Jews the name was given to a folded piece of rich, embroidered stuff worn by the high-priest. It was set with twelve precious stones bearing the names of the tribes.

BREAST-WHEEL, a water-whcel in which the water driving it is delivered to the float-boards between the top and



Breast-wheel.

bottom, generally a little below the level of the axis. In this kind of wheel the water acts partly by impulse, partly by weight.

BREASTWORK, in the military art, a hastily-constructed parapet made for protection against the shot of the enemy, generally of earth.

BREATH, the air which issues from the lungs during respiration through the nose and mouth. A smaller portion of oxygen and a larger portion of carbonic acid are contained in the air which is exhaled than in that which is inhaled. There are also aqueous particles in the breath, which are precipitated by the coldness of the external air in the form of visible vapor; likewise other substances which owe their origin to secretions in the mouth, nose, windpipe, and lungs. These cause the changes in the breath which may be known by the smell. A bad breath is often caused by local affections in the nose, the mouth, or the windpipe; viz., by ulcers in the nose, cancerous polypi, by discharges from the mouth, by sores on the lungs, or peculiar secretions in them. It is also caused by rotten teeth, by impurities in the mouth, and by some kinds of food. The remedies of course vary. Frequent washing, gargles of chlorine-water, charcoal, etc., are prescribed according to the disease.

BREATHING. See Respiration.

BRECKENRIDGE, John Cabell, an American soldier, statesman, and politician, born in Kentucky in 1821, died in 1875. He was elected vice-president of the U. States with Buchanan, and in 1860 was nominated by the southern section of the democracy for president, but, with Douglas, was defeated by Lincoln. Elected to the senate, he resigned, entered the Confederate military service, and fought at many of the principal battles of the civil war, subsequently becoming a member of the cabinet of Jefferson Davis. After the war he practiced law.

BREECH, BREECH-LOADING. The breech is the solid mass of metal behind the bore of a gun, and that by which the shock of the explosion is principally sustained. In breech-loading arms the charge is introduced here, there being a mechanism by which the breech can be opened and closed. In small arms the advantages of breech-loading for rapidity of fire, facility of cleaning, etc., recommended it to general use, and its efficacy for military purposes was effectively demonstrated by the Prussian campaigns against Denmark and Austria in 1864 and 1866. Since that time every government has adopted the new system, both in small-arms and heavy ordnance, while breech-loading sporting-arms are also in general use. The chief difficulty in breech-loading is to close the breech so as to prevent the escape of the highly elastic gas to which the force of the explosion is due, but the appliances of modern science and mechanical art may be said to have effectually met this difficulty. See Cannon, Musket, etc.

BREECHES, an article of clothing for the legs and lower part of the body in use among the Babylonians and other ancient peoples as well as among the moderns. In Europe we find them first used among the Gauls; hence the Romans called a part of Gaul breeched Gaul. Trousers are longer and looser than the breeches that used to be worn.

BREECHING, a rope used to secure a ship's gun and prevent it from recoiling too much in battle.

BREEDING, the art of improving races or breeds of domestic animals, or modifying them in certain directions, by continuous attention to their pairing, in conjunction with a similar attention to their feeding and general treatment. Animals (and plants no less) show great susceptibility of modification under systematic cultivation; and there can be no doubt that by such cultivation the sum of desirable qualities in particular races has been greatly increased, and that in two ways. Individual specimens are produced possessing more good qualities than can be found in any one specimen of the original stock; and from the same stock many varieties are taken characterized by different perfections, the germs of all of which may have been in the original stock but could not have been simultaneously developed in a single specimen. But when an effort is made to develop rapidly, or to

its extreme limit, any particular quality, it is always made at the expense of some other quality, or of other qualities generally, by which the intrinsic value of the result is necessarily affected. High speed in horses, for example, is only attained at the expense of a sacrifice of strength and power of endurance. So the celebrated merino sheep are the result of a system of breeding which reduces the general size and vigor of the animal, and diminishes the value of the carcass. Much care and judgment, therefore, are needed in breeding, not only in order to produce a particular effect, but also to produce it with the least sacrifice of other qualities.

Breeding, as a means of improving domestic animals, has been practiced more or less systematically wherever any attention has been paid to the care of live stock. Quantity of meat, smallness of bone, lightness of offal; in cows, yield and quality of milk; in sheep, weight of fleece and fineness of wool, have all been studied with remarkable effects by modern breeders.

BREEZE, BREEZE-FLY, a name given to various flies, otherwise called gadflies, horseflies, etc.

BREEZES, Sea and Land. See Wind.

BREMEN (brā'men), a free city of Germany, an independent member of the empire, one of the three Hanse towns, on the Weser, about 50 miles from its mouth, in its own small territory of 98 sq. miles, besides which it possesses the port of Bremerhaven at the mouth of the river. The manufacturing establishments consist of tobacco and cigar factories, sugar-refineries, rice-mills, iron-foundries, machine-works, rope and sail works, and ship-building yards. Its situation renders Bremen the emporium for Hanover, Brunswick, Hesse, and other countries, traversed by the Weser, and next to Hamburg it is the principal seat of the export and import and emigration trade of Germany. Vessels drawing 17½ feet can now come up to the town itself; but the bulk of the shipping trade centers in Bremerhaven. Bremerhaven is a place of over 16,000 inhabitants, has docks capable of receiving the largest vessels, and is connected by railway with Bremen, where the chief merchants and brokers have their offices. The chief imports are tobacco, cotton and cotton goods, wood and woolen goods, rice, coffee, grain, petroleum, etc., which are chiefly re-exported to other parts of Germany and the Continent. Pop. of town, 163,418; of total territory (including Bremerhaven), 224,967.

Bremen was made a bishopric by Charlemagne about 788, was afterward made an archbishopric, and by the end of the 14th century had become virtually a free imperial city. The constitution is in most respects republican.

BREN'EMAN, Abram Adam, an American inventor, born in Pennsylvania in 1847. He is noted for the invention of a process for making iron non-corrosive. In 1892 Breneman was elected vice-president of the American Chemical Society.

BRENT GOOSE, a wild goose, smaller than the common barnacle goose and of much darker plumage, remarkable for length of wing and extent of migratory power, being a winter bird of passage in France, Germany, Holland, Great Britain, the United States, Canada, etc. It breeds in high northern latitudes; it feeds on drifting seaweeds and saline plants, and is considered the most delicate for the table of all the goose tribe.

BRESCIA (brā'shi-ȧ), a city of north Italy, capital of the province of the same name, is beautifully situated at the foot of the Alps, and is of a quadrilateral form, about 4 miles in circuit. The city contains a museum of antiquities, picture-gallery, botanic garden, a fine public library, a theater, hospital, etc. An aqueduct supplies water to its numerous fountains. Near the town are large ironworks, and its firearms are esteemed the best that are made in Italy. It has also silk, linen, and paper factories, tan-yards, and oil-mills, and is an important mart for raw silk. Pop. 70,618. The province has an area of 1644 sq. miles; pop. 537,690.

BRESLAU (bres'lou), an important city of the German Empire, the second largest in the Prussian dominions (being excelled in population only by Berlin), is the capital of the province of Silesia, and is situated on both sides of the Oder. The cathedral, built in the 12th century, and the Rathhaus, or town-hall, a Gothic structure of about the 14th century, are among the most remarkable buildings. There is a flourishing university, with a museum, library of 400,000 volumes, observatory, etc. Breslau has manufactures of machinery, railway-carriages, furniture and cabinet ware, cigars, spirits and liquors, cotton and woolen yarn, musical instruments, porcelain, glass, etc., and carries on an extensive trade. Pop. 422,738.

BREST, a seaport in the n.w. of France, department of Finisterre. It has one of the best harbors in France, and is the chief station of the French marine, having safe roads capable of

containing 500 men-of-war in from 8 to 15 fathoms at low water. The entrance is narrow and rocky, and the coast on both sides is well fortified. Brest stands on the summit and sides of a projecting ridge, many of the streets being exceedingly steep. Several of the docks have been cut in the solid rock, and a breakwater extends far into the roadstead. The manufactures of Brest are inconsiderable, but it has an extensive trade in cereals, wine, brandy, sardines, mackerel, and colonial goods. It is connected with America by a cable terminating near Duxbury, Mass. Pop. 81,948.

BRET'ONS, the inhabitants of Brittany.

BREV'ET, in Britain and the U. States applied to a commission to an officer, entitling him to a rank in the army higher than that which he holds in his regiment, without, however, conferring the right to a corresponding advance of pay.

BREV'IARY, the book which contains prayers or offices to be used at the seven canonical hours of matins, prime, tierce, sext, nones, vespers, and compline by all in the orders of the Church of Rome or in the enjoyment of any R. Catholic benefice. It is not known at what time the use of the breviary was first enjoined, but the early offices were exhaustive from their great length, and under Gregory VII. (1073–85) their abridgment was considered necessary, hence the origin of the breviary. In 1568 Pius V. published that which has remained, with few modifications, to the present day. The Roman breviary, however, was never fully accepted by the Gallican Church until after the strenuous efforts made by the Ultramontanes from 1840 to 1864. The Psalms occupy a large place in the breviary; passages from the Old and New Testament and from the fathers have the next place. All the services are in Latin, and their arrangement is very complex. The English Book of Common Prayer is based on the Roman Breviary.

BREVIER (bre-vēr'), a kind of printing type, in size between bourgeois and minion, the same as the type of this book.

BREWER, David Josiah, an American jurist, born in Smyrna, Asia Minor, in 1837. He was for many years a federal judge in Kansas, and in 1889 was appointed an associate justice of the United States Supreme court.

BREWING, the process of extracting a saccharine solution from malted grain and converting the solution into a fermented and sound alcoholic beverage called ale or beer. The preliminary process of malting (often a distinct business to that of brewing) consists in promoting the germination of the grain for the sake of the saccharine matter into which the starch of the seed is thus converted. The barley or other grain is steeped for about two days in a cistern and then piled in a heap, or couch, which is turned and re-turned until the radicle or root, and acrospire or rudimentary stem, have uniformly developed to some little extent in all the heap of grain. This treatment lasts from seven to ten days, by which time the grain has acquired a sweet taste; the life of the grain being then destroyed by spreading the whole upon the floor of a kiln to be thoroughly dried. At this point begins the brewing process proper, which in breweries is generally as follows: The malt is crushed or roughly ground in a malt-mill, whence it is carried to the mashing-machine, and there thoroughly mixed with hot water. The mixture is now received by the mash-tun—a cylindrical vessel with a false perforated bottom held about an inch from the true one. In the mash-tun the useful elements are extracted from the malt in the form of the sweet liquor known as wort, and the tun, therefore, is fitted with an elaborate system of revolving rakes for thoroughly mixing

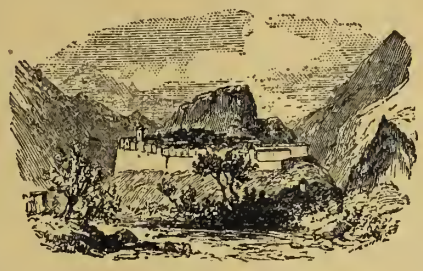
the malt with hot water. The mixing completed, the mash-tun is covered up and allowed to stand for about three hours, when the taps in the true bottom are opened and the wort or malt-extract run off. The wort being drained into a copper the hops are now added, and the whole boiled for about two hours, the boiling, like the addition of hops, tending to prevent acetous and putrefactive fermentation. When sufficiently boiled the contents of the copper are run into the hop-back—a long rectangular vessel with a false bottom 8 or 9 inches from the true bottom. The hot wort leaving the spent hops in the hop-back runs through the perforations in the false bottom and thence into the cooler—a large flat vessel where the worts are cooled to about 100° Fah. From the cooler the liquor is admitted to the refrigerator—a shallow rectangular vessel, which reduces the temperature to almost that of the cold water, or about 58°. The worts are next led by pipes into the large wooden fermenting tuns, where yeast or barm is added as soon as the wort begins to run in from the refrigerator. During the operation of fermentation, by which a portion of the saccharine matter is converted into alcohol, the temperature rises considerably, and requires to be kept in check by means of a coil of copper piping with cold water running through it lowered into the beer. When the fermentation has gone far enough, and the liquor has been allowed to settle, the beer becomes comparatively clear and bright, and may be run off and filled into the trade casks or into vats.

BREWSTER, Benjamin Harris, an American lawyer, born in New Jersey in 1816, died in 1888. From 1881 to 1885 he was attorney-general of the U. States, prosecuting the famous Star Route trials for fraud.

BREW'STER, Sir David, natural philosopher, born in Jedburgh 1781. In 1808 he became editor of the Edinburgh Encyclopædia, and in 1819 was one of the founders of the Edinburgh Philosophical Journal, of which he was sole editor from 1824–32. Brewster was one of the founders of the British Association, and its president in 1850. In 1832 he was knighted and pensioned, and both before and after this time his services to science obtained throughout Europe the most honorable recognition. From 1838 to 1859 he was principal of the united colleges of St. Leonard's and St. Salvador at St. Andrews, and in the latter year was chosen principal of the University of Edinburgh —an office which he held till his death in 1868. Among his inventions were the "polyzonal lens" (introduced into British lighthouses in 1835), the kaleidoscope, and the improved stereoscope.

BRI'AN, a famous chieftain of the early Irish annals, who succeeded to Munster in 978, defeated the Danes of Limerick at Waterford, attacked Malachi, nominal king of the whole island, and became king in his stead (1002). He was slain at the close of the battle of Clontarf, near Dublin, in 1014, after gaining a signal victory over the revolted Maelmora and his Danish allies.

BRIANCON (brē-ȧn-sōn). A town and fortress of France, department of Hautes-Alpes, on the right bank of the Durance. It occupies an eminence 4284 ft. above the sea level and is called the Gibraltar of the Alps. Pop. 3,579.



Briancon.

BRIAR, BRIER, the wild rose. The well-known briar-root tobacco-pipes are made from the root of a large kind of heath, a native of southern Europe, Corsica, Sardinia, Algeria, etc.

BRIBE, a reward given to a public officer or functionary to induce him to violate his official duty so as to suit the person bribing; especially a corrupt payment of money for the votes of electors in the choice of persons to places of trust under government. Bribery is in most countries regarded as a crime deserving severe punishment.

BRICK, a sort of artificial stone, made principally of argillaceous earth formed in molds, dried in the sun, and baked by burning, or, as in many Eastern countries, by exposure to the sun. Sun-dried bricks of great antiquity have been found in Egypt, Assyria, and Babylonia, and in the mud walls of old Indian towns. Under the Romans the art of making and building with bricks was brought to great perfection, and the impressions on Roman bricks, like those on the bricks of Babylonia, have been of considerable historic value. The Roman brick was afterward superseded in England by the smaller Flemish make. Of the various clays used in brickmaking, the simplest, consisting chiefly of silicates of alumina, are almost infusible, and are known as fire-clays. Of such clays fire-bricks are made. Clays containing lime and no iron burn white, the colors of others being due to the presence in varying proportions of ferric oxide, which also adds to the hardness of bricks. The clay should be dug in autumn and exposed to the influence of frost and rain. It should be worked over repeatedly with the spade and tempered to a ductile homogeneous paste, and should not be made into bricks until the ensuing spring. The making of bricks by hand in molds is a simple process. After being made and dried for about nine or ten days they are ready for the burning, for which purpose they are formed into kilns, having flues or cavities at the bottom for the insertion of the fuel, and interstices between them for the fire and hot air to penetrate. Much care is necessary in regulating the fire, since too much heat vitrifies the bricks and too little leaves them soft and friable. Bricks are now largely made by machines of various construction. In one the clay is mixed and comminuted in a cylindrical pug-mill by means of rotatory knives or cutters working spirally and pressing the clay down to the bottom of the cylinder. From this it is conveyed by rollers and forced through an opening of the required size in a solid rectangular stream, which is cut into bricks by wires working transversely. Machine-made bricks are heavier, being less porous than hand-made bricks, and are more liable to crack in drying; but they are smoother, and, when carefully dried, stronger than the hand-made.

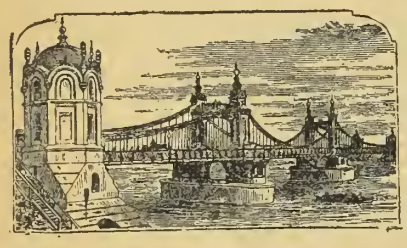
Bricks were made in Virginia as early as 1612, in New England in 1647, and in Philadelphia in 1685. The various kinds of brick made in the U. States at present are as follows: Common brick; stock, or pressed, or front brick, of prime clay and very smooth; enameled or glazed brick; ornamental brick, variously formed; fire brick, from refractory clays; paving and vitrified brick, of specially hard quality.

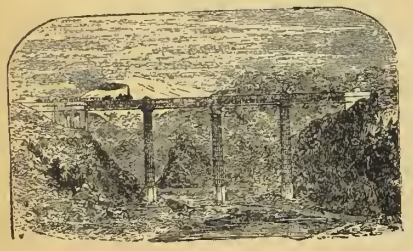
BRIDEWELL, a name given, in the U. States, to penal work-houses, or minor prisons where the prisoners are required to do hard labor. The name originates from a well in London named for St. Bride. The name Bridewell came to be applied to a palace in the vicinity, which was afterward used as a house of correction. The original building was destroyed in 1864.

BRIDGE, a structure of stone, brick, wood, or iron, affording a passage over a stream, valley, or the like. The earliest bridges were no doubt trunks of trees. The arch seems to have been unknown among most of the nations of antiquity. Even the Greeks had not sufficient acquaintance with it to apply it to bridge-building. The Romans were the first to employ the principle of the arch in this direction, and after the construction of such a work as the great arched sewer at Rome, the Cloaca Maxima, a bridge over the Tiber would be of comparatively easy execution. One of the finest examples of the Roman bridge was the bridge built by Augustus over the Nera at Narni, the vestiges of which still remain. It consisted of four arches, the longest of 142 feet span. The most celebrated bridges of ancient Rome were not generally, however, distinguished by the extraordinary size of their arches, nor by the lightness of their piers, but by their excellence and durability. Old London Bridge was commenced in 1176, and finished in 1209. It had houses on each side like a regular street till 1756–58. In 1831 it was altogether removed, the new bridge, which had been begun in 1824, having then been finished

Stone bridges consist of an arch or series of arches, and in building them the properties of the arch, the nature of the materials, and many other matters have to be carefully considered. It has been found that in the construction of an arch the slipping of the stones upon one another is prevented by their mutual pressure and the friction of their surfaces; the use of cement is thus subordinate to the principle of construction in contributing to the strength and maintenance of the fabric.

The first iron bridges were erected from about 1777 to 1790. The same general principles apply to the construction of iron as of stone bridges, but the greater cohesion and adaptability of the material give more liberty to the architect, and much greater width of span is possible. At first iron bridges were erected in the form of arches, and the material employed was cast-iron; but the arch has now been generally superseded by the beam or girder, with its numerous modifications; and wrought-iron or steel is likewise found to be much better adapted for resisting a great tensile strain than cast-metal. Numerous modifications exist of the beam or





1, Suspension-bridge, Chelsea.
2, Lattice bridge on railway from St. Gall to Appenzell.
3, The Britannia tubular bridge.

girder, as the lattice-girder, bow-string-girder, etc.; but of these none is more interesting than the tubular or hollow girder, first rendered famous from its employment by Robert Stephenson in the construction of the railway bridge across the Menai Strait, and connecting Anglesey with the mainland of North Wales. This is known as the Britannia Tubular Bridge. The Victoria Bridge over the St. Lawrence at Montreal, originally tubular, is no longer so, the upper portion having been reconstructed with an open track. It is nearly two miles in length, or about five and a half times as long as the bridge across the Menai Strait. A girder railway bridge across the Firth of Tay at Dundee was opened in 1887, being the second built at the same place, after the first had given way in a great storm. It is 2 miles 73 yds. long, has 85 spans, is 77 feet high, and carries two lines of rails. The bridge over the Firth of Forth, at Queensferry, completed in 1889, has two chief spans of 1710 feet, two others of 680 feet, fifteen of 168 feet, and seven small arches, and the bridge gives a clear headway for navigation purposes of 150 feet above high-water of spring-tides. The great spans consist of a cantilever at either end, 680 feet long, and a central girder of 350 feet. Both the above bridges carry the lines of the N. British Railway. The Crumlin Railway Viaduct, S. Wales, having lattice-girders supported on open-work piers, is more remarkable for height than length, being 200 feet high.

Suspension-bridges, being entirely independent of central supports, do not interfere with the river, and may be erected where it is impracticable to build bridges of any other kind. The entire weight of a suspension-bridge rests upon the piers at either end from which it is suspended, all the weight being below the points of support. Such bridges always swing a little, giving a vibratory movement which imparts a peculiar sensation to the passenger. The modes of constructing these bridges are various. The roadway is suspended either from chains or from wire-ropes, the ends of which require to be anchored, that is, attached to the solid rock or masses of masonry or iron. One of the earlier of the great suspension-bridges is that constructed by Telford over the Menai Strait near the Britannia Tubular Bridge, finished in 1825; the opening between the points of suspension is 580 feet. The Hammersmith Chain-bridge, the Union Suspension-bridge near Berwick, and the suspension-bridge over the Avon at Clifton are other British examples. On the European continent, the Fribourg Suspension-bridge in Switzerland, span 870 feet, erected 1834, is a celebrated work; as is that over the Danube connecting Buda with Pesth. In America the lower suspension-bridge over the Niagara, 7 miles below the falls, supported by wire cables, is 822 feet long; it has two floors or roadways connected together but 15 feet apart, the lower serving for ordinary traffic, the upper carrying three lines of rails, 245 feet above the river. Another bridge, close to the falls, has a span of 1250 feet. The Cincinnati bridge over the Ohio has a span of 1057 feet. A suspension-bridge of great magnitude, connecting the city of New York with Brooklyn, was opened in 1883. The central or main span is 1595½ feet from tower to tower, and the land spans between the towers and the anchorages 930 feet each; the approach on the New York side is 2492 feet long, and that on the Brooklyn side 1901 feet, making the total length 5989 feet. The height of the platform at the center is 135 feet above high-water, and at the ends 119 feet. The roadway is 85 feet broad, and is divided into five sections, the two outside for vehicles, the two inner for tram-cars, and the middle one, 12 feet above the rest, for foot-passengers. Of recent devices the most useful is that of the counterpoise bridge, or jackknife bridge, which is lifted up from one end or from the middle by counter-weights.

BRIDGE, a game of cards played by four players and one pack of 52 cards. The players are known as the leader, the dummy, the pone, and the dealer. One of the varieties of bridge is called bridge-whist.

BRIDGE, Ship's, a raised walk on the forward end of a ship, patrolled by the officer in charge.

BRIDGE'MAN, Laura, a blind deaf-mute, born in Hanover, New Hampshire, in 1829. Till the age of two years she was a bright active child, when a severe illness deprived her of the senses of sight, hearing, and smell, and partly also of that of taste. She was put under the care of Dr. Howe of Boston, and the history of the methods by which she was gradually taught to read, write, and eventually perform most of the ordinary duties and even some of the accomplishments of life, is a very interesting one. She became herself a teacher of persons similarly afflicted, and led an active and useful life, dying in 1889.

BRIDGE'PORT, a seaport of Connecticut, 58 miles n.e. of New York, on an arm of Long Island Sound, with a large coasting trade, but chiefly supported by its manufactories, including the large sewing-machine factories of Wheeler, Wilson & Co., Elias Howe, etc. Pop. 84,216.

BRIDGETON (brij' tun), a city, port of entry, and county-seat of Cumberland Co., N. J., 38 miles south of Philadelphia, at the head of navigation on the Cohansey river, and on the New Jersey Central and the West Jersey and Seashore railroads. Pop. 15,418.

BRIDGETOWN, the capital of the island of Barbados, in the West Indies, extending along the shore of Carlisle Bay, on the s.w. coast of the island, for nearly 2 miles. Bridgetown is the residence of the governor-general of the Windward Islands. Pop. 25,000.

BRIDG'MAN, Elijah Coleman, an American missionary to China, born in Massachusetts in 1801, died in 1861. In 1829 he went to China as a missionary and founded a mission at Shanghai.

BRIDGMAN, Frederick Arthur, an American painter, born at Tuskegee, Ala., in 1847. He exhibited in Paris in 1878 and was made a Chevalier of the Legion of Honor. In 1900 two of his paintings were exhibited at the Paris Exposition.

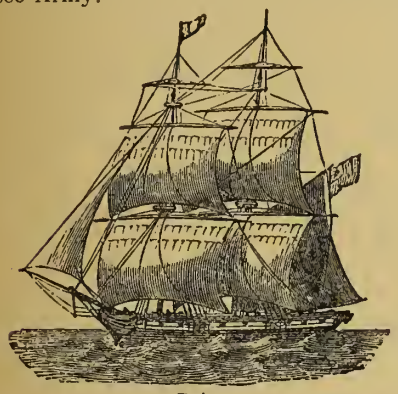
BRIDGMAN, Herbert Lawrence, an American explorer, born in Massachusetts in 1844. He accompanied Peary in his expedition of 1894, and in 1899 he commanded the auxiliary Peary expedition on the ship Diana.

BRIEF, which comes from the Latin brevis, short, denotes a brief or short statement or summary, particularly the summary of a client's case which the solicitor draws up for the instruction of counsel. A brief may also mean, in law, an order emanating from the superior courts. A papal brief is a sort of pastoral letter in which the pope gives his decision on some matter which concerns the party to whom it is addressed. The brief is an official document, but of a less public character than the bull.

BRIG, a sailing vessel with two masts rigged like the foremast and mizzen-

mast of a full-rigged ship. See Brigantine.

BRIGADE', in general an indeterminate number of regiments or squadrons. A number of brigades form a division, and several divisions an army corps. A brigadier or brigadier-general is the officer who commands a brigade. See Army.



Brig.

BRIGADIER-GENERAL, an army officer who commands a brigade of soldiers. See Army, and Brigade.

BRIG'ANTINE, a sailing vessel with two masts, the foremast rigged like a brig's, the main-mast rigged like a schooner's. Called also hermaphrodite brig.

BRIGHT, John, a great English orator and politician, born at Greenbank, near Rochdale, Lancashire, Nov. 16, 1811. He first became known as a leading spirit along with Mr. Cobden in the Anti-Corn-Law League. In 1843 he was chosen M.P. for Durham, and distinguished himself as a strenuous advocate of free-trade and reform. In 1847 he sat for the first time for Manchester,

John Bright.

but in 1857 his opposition to the Crimean war had made him so unpopular in the constituency that he lost his seat by a large majority. He was, however, returned for Birmingham, and soon after made speeches against the policy of great military establishments and wars of annexation. In 1865 he took a leading part in the movement for the extension of the franchise, and strongly advocated the necessity of reform in Ireland. In the Gladstone ministry formed in 1868 he was President of the Board of Trade and afterward Chancellor of the Duchy of Lancaster, and he held the latter office again under Mr. Gladstone in 1880–82. In 1886 he joined the Liberals who opposed Mr. Gladstone's schemes for Ireland, and contributed by his letters and influence to the overthrow of the Gladstone party. He was a member of the Society of Friends. He died March 27, 1889.

BRIGHTON (brī'tun), a county borough and favorite watering-place in England, county of Sussex, 50½ miles from London. In front of the town is a massive sea-wall, with a promenade and drive over 3 miles in length, one of the finest in Europe. Among the remarkable buildings, all of modern date, is the Pavilion, built by George IV., which cost upward of $5,000,000. It is in the oriental style, with numerous cupolas, spires, etc. The building and its gardens, which are open to the public as pleasure-grounds, cover 9 acres. There is a very large and complete aquarium, and a fine iron pier. Brighton has no manufactures, and is resorted to chiefly as a watering-place. It was about the middle of the 18th century that Dr. Russell, an eminent physician, drew attention to Brighton, which subsequently was patronized by George IV., then Prince of Wales; in this way it was converted from a decayed fishing village into a fashionable and populous watering place. It has sent two members to parliament since 1832. Pop. 153,393.

BRIGHT'S DISEASE, a name (derived from a Dr. Bright of London, who first described the disorder) given to various forms of kidney disease, especially to that which is characterized by a granular condition of the cortical part of the kidneys and inflammation of the malpighian bodies. The urine during life contains albumen, and is of less specific gravity than natural. The disease is accompanied with uneasiness or pain in the loins, pale or cachectic countenance, disordered digestion, frequent urination, and dropsy. The blood contains urea, and is deficient in albumen and corpuscles. Progressive blood-poisoning induces other visceral diseases, and in the end gives rise to the cerebral disturbance which is the frequent cause of death.

BRIM'STONE, a name of sulphur. Sulphur, in order to purify it from foreign matters, is generally melted in a close vessel, allowed to settle, then poured into cylindrical molds, in which it becomes hard, and is known in commerce as roll brimstone.

BRINE, water saturated with common salt. It is naturally produced in many places beneath the surface of the earth, and is also made artificially, for preserving meat, a little saltpeter being generally added to the solution.

BRIS'BANE, the capital of Queensland, about 25 miles by water from the mouth of the river Brisbane, which intersects the town. Brisbane was originally settled, in 1825, as a penal station by Sir Thomas Brisbane (whence the name of the town). In 1842 the district was opened to free settlers, and on the erection of Queensland into a separate colony in 1859, Brisbane became the capital. Since then it has made great progress, and now possesses many fine public buildings, such as the Houses of Legislature, the town-hall and the Albert Hall, the viceregal lodge, the post and telegraph offices, etc. There are also botanical gardens, several public parks, etc. The climate is tropical,

the annual rainfall about 55 inches. The town is the terminus of the western and southern railway system, and the port is the principal one in the colony. Pop. (with suburbs), 119,428.

BRIS'BANE, General Sir Thomas MacDougall, a Scotch soldier and astronomer, born in 1773. After serving in Flanders and the West Indies he commanded a brigade under the Duke of Wellington during the Peninsular war, and took part in the battles of Victoria, Orthes, and Toulouse. In 1821 he was appointed governor of New South Wales, where his administration tended greatly to promote the prosperity of the colony. At the same time he devoted himself to astronomy, and from his observatory at Paramatta catalogued 7385 stars, until then scarcely known. On his return to Scotland he continued his astronomical pursuits, and died in 1860.

BRISSOT (brē-sō), Jean Pierre, a French political writer, born in 1754, executed 30th October, 1793. He early turned his attention to public affairs, associating himself with such men as Pétion, Robespierre, Marat, etc. During the revolution he made himself known as a politician and one of the leaders of the Girondist party. The extreme views of the men of the "Mountain" having prevailed over more moderate counsels, Brissot, like most of his party, suffered death by the guillotine.

BRISTLES, the stiff, coarse, glossy hairs of the hog and the wild boar, especially of the hair growing on the back; extensively used by brushmakers, shoemakers, saddlers, etc., and chiefly imported from Russia and Germany. Russia supplies the finest qualities, which are worth about $250 or $300 per cwt.

BRIS'TOL, a cathedral city of England, a municipal, county, and parl. borough, situated partly in Gloucestershire, partly in Somersetshire, but forming a county in itself. It stands at the

confluence of the rivers Avon and Frome, which unite within the city, whence the combined stream (the Avon) pursues a course of nearly 7 miles to the Bristol Channel. The Avon is a navigable river, and the tides rise in it to a great height. The public buildings are numerous and handsome, and the number of places of worship very great. The most notable of these are the cathedral, founded in 1142, exhibiting various styles of architecture, and recently restored and enlarged; St. Mary Redcliff, said to have been founded in 1293, and perhaps the finest parish church in the kingdom. Among the educational institutions are the University College, the Theological Colleges of the Baptists and Independents, Clifton College, and the Philosophical Institute. There is a school of art, and also a public library. Bristol has glass-works, potteries, soap-works, tanneries, sugar-refineries, and chemical works, ship-building and machinery yards. Coal is worked extensively within the limits of the borough. The export and import trade is large and varied. There is a harbor in the city itself, and docks at Avonmouth and Portishead. Bristol is one of the most healthful of the large towns of the kingdom. It has an excellent water supply, chiefly obtained from the Mendip Hills. Pop. 328,842.

BRISTOL-BOARD, a fine kind of pasteboard, smooth, and sometimes glazed, on the surface.

BRISTOL CHANNEL, an arm of the Altantic, extending between the southern shores of Wales and the southwestern peninsula of England, and forming the continuation of the estuary of the Severn. It is remarkable for its high tides.

BRITAIN, or **GREAT BRITAIN,** the island consisting of the three countries, England, Scotland, and Wales, the name being also used as equivalent to the British Islands collectively, or to the British Empire. Great Britain and Ireland, with their connected islands, form the United Kingdom of Great Britain and Ireland.

The British Islands form a kind of archipelago in the northwest of Europe. The principal islands are Great Britain and Ireland, separated from each other by the Irish Sea, which, near the center, attains its greatest width of about 130 miles; but between Holyhead in Wales and Howth Head in Ireland is not wider than 60 miles; while the distance between the Mull of Cantyre in Scotland and Fair Head in Ireland is only about 12 miles. Great Britain is the largest island in Europe, and the seventh largest in the world. Its nearest approach to the continent of Europe is at its s.e. extremity, where the Strait of Dover, separating it from France, is only 21 miles broad. The British Isles rise from a submarine plateau connecting them geologically with the rest of Europe, of which at a remote period they must have actually formed a part. This is evidenced too by the similarity of the British fauna and flora to the continental.

The n. part of Britain is, for the most part, rugged, mountainous, and barren, this being the character of much of Scotland. The chief feature of the southern portion is the mountain mass of the Grampians, the culminating points of which, Bennevis and Benmacdhui, are the highest British summits, being respectively 4406 and 4296 feet. South of the Highlands lies the plain of the Forth and Clyde, a region of coal and iron, in which the chief manufacturing industries of Scotland are carried on.

The mountains which constitute the principal watersheds of Great Britain being generally at no great distance from the w. coast, the rivers which descend from them in that direction have generally a short course, and are comparatively unimportant. The two great exceptions to this rule are the Clyde and the Severn, which owe both their volume and the length of their course to a series of longitudinal valleys, which, instead of opening directly to the coast, take a somewhat parallel direction. The chief rivers entering the sea on the e. coast, proceeding from n. to s., are the Spey, Don, Dee, Tay, Forth, Tweed, Tyne, Ouse, Trent, and Thames, the last named in navigable importance the greatest river of the world. Owing to the great central flat of Ireland its rivers usually flow on in a gently winding course in different directions to the sea. Those of importance are not very numerous; but one of them, the Shannon, is the longest river of the British Isles, its length being about 225 miles; while the Thames is 215.

Their maritime situation has a favorable effect on the climate of the British Isles, making it milder and more equable than that of continental countries in the same latitude.

The principal cereal crops grown in England are wheat, barley, and oats, oats now covering the largest area; the principal green crops are turnips, potatoes, mangolds, vetches, etc. In Ireland and Scotland oats are by far the principal grain crop; by far the chief green crop being in Ireland potatoes, in Scotland turnips. Hops are grown to a large extent in Kent, and less extensively in some other parts of southern England.

Such is the mineral wealth of the British Isles that there is scarcely a metal or mineral product of economical value which is not worked, to a greater or less extent, beneath their surface. Among these the first place is due to coal, which, in regard both to the quantity raised annually and its aggregate value, surpasses any other mineral product. The coal-fields are not confined to one particular district, but extend as a series of basins in an irregular curve from central Scotland through northern and middle England to the Bristol Channel. On the east side of Scotland there are coal-fields both north and south of the Forth; farther west lie the coal-basins of Lanark, Renfrew, and Ayrshire; the first famous throughout the world for the immense manufacturing establishments which it mainly has called into existence and made prosperous. In the north of England is the great coal-field centering near Newcastle, which gives it its name.

Britain, next to the U. States, is the most important commercial country. Its exports exceed $1,800,000,000 and its imports $2,900,000,000 annually. It has about 25,000 miles of railroad, of which upward of 20,000 belong to England and Wales. Its annual tonnage is about 110,000,000, and the number of its vessels about 20,000. Two-thirds of its tonnage is steam.

Every form of religion enjoys the most complete toleration, but there are two churches, one in England having an Episcopal form of government, and one in Scotland with a Presbyterian organization, established by law and partly supported by state endowments. Both of these are Protestant. In Ireland there has been no state church since 1871, when the branch of the Anglican Church there established was disestablished. The great majority of the people are Roman Catholics.

All education in England was long entirely voluntary. The average attendance is about 5,000,000. The elementary schools number 3000, the average attendance being about 650,000. Ireland is still far behind in the matter of education.

For the higher education there are in England the universities of Oxford, Cambridge, London, Durham, Birmingham, and Liverpool; Victoria University, Manchester; the University of Wales; also colleges, some of them called "University colleges," at Newcastle, Nottingham, Bristol, etc., besides institutions giving a university education in one or more departments; the training institutions for teachers; and the colleges belonging to the different religious bodies. London University, which till 1900 only held examinations and conferred degrees, is now a teaching institution, embracing University College, King's College, etc. In Scotland there are the universities of Edinburgh, Glasgow, Aberdeen, and St. Andrews, the last with a college at Dundee, St. Mungo's College, Glasgow —theological colleges, normal schools, etc. Ireland has the University of Dublin, the Queen's Colleges of Belfast, Cork, and Galway, in connection with the Royal University of Ireland, which is merely an examining and degree-conferring body; the Roman Catholic university, and Maynooth and other Roman Catholic colleges.

The earliest inhabitants of the United Kingdom known to history were Celts, who inhabited both Great Britain and Ireland at the time of the Roman occupation. In the 5th and 6th centuries, however, the Celts were displaced through the greater part of South Britain and in the eastern lowlands of North Britain by the Anglo-Saxons, a Teutonic race from which the modern English and Lowland Scotch are mainly descended. The Celts as a distinct people were gradually confined to the mountainous districts of Wales and Cornwall and the Highlands of Scotland, and only in Wales and Scotland has the Celtic language survived in Great Britain, being still also spoken by many in the west of Ireland. There is a considerable Celtic element, however, among the population everywhere. The English language is the direct descendant of that spoken by the Anglo-Saxons, but con-

tains a strong infusion of French elements introduced by the Normans in the 11th and following centuries, as well as other elements, chiefly of Latin and Greek origin, introduced in later times. The population is as follows: England 32,526,075; Wales, 4,471,957; Ireland, 4,456,546; islands, 150,000; total, 41,605,599.

The area of the British empire is about 11,455,283 sq. miles, with a population of about 393,000,000, distributed as follows: British Isles and possessions in Europe (Gibraltar, Malta, and Gozo), area, 121,000 sq. miles; pop. about 41,605,000; British India and feudatory states, Ceylon, Straits Settlements, Hong Kong, etc., in Asia; area, 1,900,000, pop. about 295,000,000; Cape Colony, Natal, Bechuanaland, Sierra Leone, Mauritius, St. Helena, protectorates and other African possessions, 2,500,000 sq. miles; pop. estimated 40,000,000; Canada, Newfoundland, Jamaica, Trinidad, and other West India islands; Honduras, Guiana, and all possessions in America, North or South, 3,648,000 sq. miles; pop. 6,790,000; Australia, Tasmania, New Zealand, Fiji, New Guinea, islands in the Pacific, etc.; area, 3,270,000 sq. miles; pop. about 4,285,000. The increase of some of the British colonies, especially of Canada and Australia, in population, wealth, and trade has been something prodigious within the last few years. Self-government has been conceded to the larger colonies.

Under the name of a constitutional and hereditary monarchy the government of Britain is vested in a sovereign and the two houses of parliament—the House of Lords and the House of Commons. Laws passed by these houses, and assented to by the sovereign, become the laws of the land. But under this general fixity of form the center of real power may change greatly, as it has in Great Britain within the last two centuries. The sovereign's right of veto on acts of parliament has practically passed into desuetude, while of the two legislative houses the House of Commons, from its being the expression of the national will as a whole, has become the real center of power and influence.

The British army has a total (peace footing) of 270,128 men, 42,140 horses, and 984 guns. It has a war footing of 1,315,000 men, 98,040 horses, and 1764 guns. The British navy consists of 40 first-class battle-ships, 20 second-class battle-ships, 7 coast defense ships, 24 armored cruisers, 147 other cruisers, 97 sea-going gunboats, 18 river gunboats, 149 torpedo boat destroyers, 188 torpedo boats, 383 transports and other service boats, 29 training ships, 6740 officers, and 124,930 men.

The island in the remotest times bore the name of Albion. From a very early period it was visited by Phœnicians, Carthaginians, and Greeks, for the purpose of obtaining tin. Cæsar's two expeditions, 55 and 54 B.C., made it known to the Romans, by whom it was generally called Britannia; but it was not till the time of Claudius, nearly a hundred years after, that the Romans made a serious attempt to convert Britain into a Roman province. Some forty years later, under Agricola, the ablest of the Roman generals in Britain, they had extended the limits of the Provincia Romana as far as the line of the Forth and the Clyde. Here the Roman armies came into contact with the Caledonians of the interior, described by Tacitus as large-limbed, red-haired men. After defeating the Caledonians under Galgacus at "Mons Grampius" Agricola marched victoriously northward as far as the Moray Firth, establishing stations and camps, remains of which are still to be seen. But the Romans were unable to retain their conquests in the northern part of the island, and were finally forced to abandon their northern wall and forts between the Clyde and the Forth and retire behind their second wall, built in 120 A.D. by Hadrian, between the Solway and the Tyne. Thus the southern part of the island alone remained Roman, and became specially known as Britannia, while the northern portion was distinctively called Caledonia. The capital of Roman Britain was York (Eboracum). Under the rule of the Romans many flourishing towns arose. Great roads were made, traversing the whole country and helping very much to develop its industries. Christianity was also introduced, and took the place of the Druidism of the native British. Under the tuition of the Romans the useful arts and even many of the refinements of life found their way into the southern part of the island.

British history since the Norman conquest is really a history of the progress of the world since that time in the arts and the sciences. The principal events of its external political history are the war of the grand alliance in which the Duke of Marlborough commanded the British army and which ended in the peace of Utrecht in 1713; the loss of the American colonies, the consolidation of the Canadian colonies, the Napoleonic wars, the acquisition of India, Australia, and parts of Africa, and the gradual territorial growth of the empire, the extent of which is described above.

In 1900 the Unionist government appealed to the country on their South African War policy, and received a majority of over 130. Queen Victoria died on Jan. 22, 1901, and was succeeded by her eldest son Edward VII. In May, 1902, the South African War ended, and Lord Salisbury soon afterward resigned the premiership to Mr. A. J. Balfour. Edward VII. was crowned in Westminster Abbey on Aug. 9, 1902. In 1906 Sir Campbell-Bannerman became premier, and on his retirement in 1908, owing to ill health, the premiership was assumed by Herbert H. Asquith.

BRITANNIA, the ancient name of Britain.

BRITANNIA METAL, also called White Metal, a metallic compound or alloy of tin, with a little copper and antimony, used chiefly for tea-pots, spoons, etc. The general proportions are 85½ tin, 10½ antimony, 3 zinc, and 1 copper.

BRITANNIA TUBULAR BRIDGE, an iron tubular bridge across Menai Strait, which separates Anglesey from Wales, about one mile from the Menai Suspension Bridge. It has two principal spans of 460 feet each over the water, and two smaller ones of 230 feet each over the land; constructed 1846–50. See Bridge.

BRITAN'NICUS, son of the Roman Emperor Claudius, by Messalina, born A.D. 42, poisoned A.D. 56. He was passed over by his father for the son of his new wife Agrippina. This son became the emperor Nero, whose fears that he might be displaced by the natural successor of the late emperor caused him to murder Britannicus.

BRITISH CHANNEL. See English Channel.

BRITISH COLUMBIA, a British colony forming with Vancouver Island a province of the Dominion of Canada. It is situated partly between the Rocky Mountains and the sea, partly between Alaska and the meridian of 120° w., and extends from the U. States boundary north to the 60th parallel n. lat. Area, 341,305 sq. miles (including Vancouver Island). Till 1858 it was part of the Hudson Bay Territory; in that year gold discoveries brought settlers, and it became a colony. Vancouver Island, 16,000 sq. miles, became a colony at the same time, but was afterward joined to British Columbia; the conjoined colony entered the Dominion in 1871. The coast-line is much indented, and is flanked by numerous islands, the Queen Charlotte Islands being the chief after Vancouver. The interior is mountainous, being traversed by the Cascade Mountains near the coast, and by the Rocky Mountains farther west. There are numerous lakes, generally long and narrow, and lying in the deep ravines that form a feature of the surface and are traversed by numerous rivers. Of these the Fraser, with its tributary the Thomson, belongs entirely to the colony, as does also the Skeena; while the upper courses of the Peace river and of the Columbia also belong to it. All except the Peace find their way to the Pacific. Its mountain ranges (highest summits: Mount Hooker, 15,700 feet, and Mount Brown, 16,000 feet) afford magnificent timber (including the Douglas pine and many other trees); and between the ranges are wide grassy prairies. Part of the interior is so dry in summer as to render irrigation necessary, and the arable land is comparatively limited in area, but there is a vast extent of splendid pasture land. The climate is mild in the lower valleys, but severe in the higher levels; it is very healthful. The chief products of the colony are gold, coal, silver, iron, copper, galena, mercury, and other metals; timber, furs, and fish, the last, particularly salmon, being very abundant in the streams and on the coasts. Gold exists almost everywhere, but has been obtained chiefly in the Cariboo district. The total yield since 1858 has been over $75,000,000. The coal is found chiefly in Vancouver Island, and is mined at Nanaimo, where large quantities are now raised. Mining, cattle-rearing, agriculture, fruit-growing, salmon-canning, and lumbering are the chief industries. Victoria, on the s.e. coast of Vancouver Island, is the capital and chief town of the colony. Near Victoria is Esquimalt, a British naval station. New Westminster, on the Fraser river, about 15 miles from

its mouth, is a place of some importance; but the new town Vancouver, the terminus of the Canadian Pacific Railway, at the mouth of the Fraser, is the chief town on the mainland (pop. 17,000). Besides this railway there is one between Nanaimo and Victoria. Steamers now run to China and Japan in connection with the Canadian Pacific Railway, and lines to Australia and India are projected. Like the other provinces of the Dominion, British Columbia has a separate parliament and administration, with a lieutenant-governor of its own. (See Canada.) Schools are supported entirely by government. Pop. in 1881, 65,954, including about 25,000 Indians; in 1891, 98,173; in 1901, 177,272.

BRITISH HONDURAS. See Honduras, British.

BRITISH MUSEUM, the great national museum in London, owes its foundation to Sir Hans Sloane, who, in 1753, bequeathed his various collections, including 50,000 books and MSS., to the nation. Montague House was appropriated for the museum, which was first opened on the 15th January, 1759. The Museum is under the management of 48 trustees. It is open daily, free of charge. Admission to the reading-room as a regular reader is by ticket, procurable on application to the chief librarian, there being certain simple conditions attached. The library, which is now one of the largest and most valuable in the world, has been enriched by numerous bequests and gifts, among others the splendid library collected by George III. during his long reign. A copy of every book, pamphlet, newspaper, piece of music, etc., published anywhere in British territory, must be conveyed free of charge to the British Museum. The museum contains eight principal departments; namely, the department of printed books, maps, charts, plans, etc.; the department of manuscripts; the department of natural history; the department of oriental antiquities; the department of Greek and Roman antiquities; the department of coins and medals; the department of British and medieval antiquities and ethnography; and the department of prints and drawings.

BRITISH NORTH AMERICA, a name under which are included the Dominion of Canada and the colony of Newfoundland, comprising all the mainland north of the U. States (except Alaska) and a great many islands.

BRIT'TANY, or **BRETAGNE,** an ancient duchy and province of France, corresponding nearly to the modern departments of Finisterre, Côtes du Nord, Morbihan, Ille et Vilaine, Loire Inférieure. It is supposed to have received its name from the Britons who were expelled from England and took refuge here in the 5th century. Along the coast and toward its seaward extremity the country is remarkably rugged, but elsewhere there are many beautiful and fertile tracts. Fisheries employ many of the inhabitants. The people still retain their ancient language, which is closely allied to the Welsh, and is exclusively used by the peasantry in the western part of the province.

BRI'ZA, a genus of grasses, commonly called quaking grass, maiden's hair, or lady's tresses. There are about thirty species, chiefly found in South America.

BROAD ARROW, a government mark placed on British stores of every description (as well as on some other things) to distinguish them as public or crown property, and to obliterate or deface which is felony. Persons in possession of goods marked with the broad arrow forfeit the goods and are subject to a penalty. The origin of the mark is not clearly known.

BROAD'CAST, a mode of sowing grain by which the seed is cast or dispersed upon the ground with the hand or with a machine devised for sowing in this manner; opposed to planting in drills or rows.

BROAD CHURCH, a name given originally to a party in the Church of England, assuming to be midway between the Low Church or Evangelical section and the High Church or Ritualistic; now widely applied to the more tolerent and liberal section of any denomination.

BROAD'SIDE, in a naval engagement, the whole discharge of the artillery on one side of a ship of war. The term is also applied to any large page printed on one side of a sheet of paper, and, strictly, not divided into columns.

BROAD'SWORD, a sword with a broad blade, designed chiefly for cutting, formerly used by some regiments of cavalry and Highland infantry in the British service. The claymore or broadsword was the national weapon of the Highlanders.

BROADWAY, the leading thoroughfare of New York City. It begins at Bowling Green, near the southern point of Manhattan Island, and runs diagonally through the city to Central Park, and then by extension to the northern part of Manhattan. It contains many of the largest theaters, hotels, and retail shops, and is one of the busiest thoroughfares in the world.

BROCADE', a stuff of silk, enriched with raised flowers, foliage, or other ornaments. The term is restricted to silks figured in the loom, distinguished from those which are embroidered after being woven. Brocade is in silk what damask is in linen or wool.

BROD'HEAD, John Romeyn, American historian, born in Philadelphia in 1814, died in 1873. His principal work is his History of the State of New York, published 1853–71.

BROGUE (brōg), a coarse and light kind of shoe made of raw or half-tanned leather, of one entire piece, and gathered round the foot by a thong, formerly worn in Ireland and the Highlands of Scotland. The term is also used of the mode of pronunciation peculiar to the Irish.

BROKE, Sir Philip Bowes Vere, a British admiral, born in 1776, died in 1841; distinguished himself, particularly in 1813, as commander of the Shannon, in the memorable action which that vessel, in answer to a regular challenge, fought with the U. States vessel Chesapeake off the American coast, and in which the latter was captured.

BROKEN-WIND, a disease in horses, often accompanied with an enlargement of the lungs and heart, which disables them for bearing fatigue. In this disease the expiration of the air from the lungs occupies double the time that the inspiration of it does; it requires also two efforts rapidly succeeding to each other, attended by a slight spasmodic action, in order fully to accomplish it. It is caused by rupture of the air-cells, and there is no known cure for it.

BROKER, an agent who is employed to conclude bargains or transact business for others in consideration of a charge or compensation, which is usually in proportion to the extent or value of the transaction completed by him, and is called brokerage. In large mercantile communities the business of each broker is usually limited to a particular class of transactions, and thus there are brokers with several distinctive names, as bill-brokers, who buy and sell bills of exchange for others; insurance-brokers, who negotiate between underwriters and the owners of vessels and shippers of goods; ship-brokers, who are the agents of owners of vessels in chartering them to merchants or procuring freights for them from one part to another; stock-brokers, the agents of dealers in shares of joint-stock companies, government securities, and other monetary investments.

BROM'BERG, a town of Prussia, province of Posen, on the Brahe, near its confluence with the Vistula. Among its industries are machinery, iron-founding, tanning, paper, tobacco, chicory, pottery, distilling, and brewing. The Bromberg Canal connects the Brahe with the Netz, and thus establishes communication between the Vistula, the Oder, and the Elbe. Pop. 52,154.

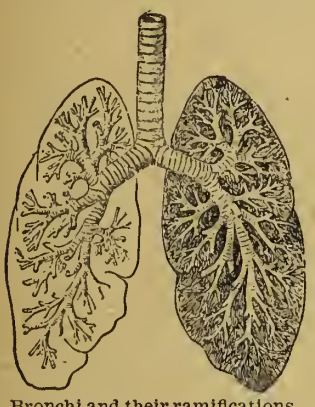
BROMELIA'CEÆ, the pineapple family, a natural order of endogenous plants, taking its name from the genus Bromelia (so called after a Swedish botanist, Olaus Bromel), to which the pineapple was once incorrectly referred, and consisting of herbaceous plants remarkable for the hardness and dryness of their gray foliage. They abound in tropical America, commonly growing epiphytically on the branches of trees. With the exception of the pineapple the Bromeliaceæ are of little value, but some species are cultivated in hot-houses for the beauty of their flowers. They can exist in dry hot air without contact with the earth, and in hot-houses are often kept hung in moist moss.

BROMIDES, certain salts consisting of hydrobromic acid united with another substance such as a metal, or metallic salts. Bromides, especially the bromide of potassium, are used extensively in medicine

BRO'MINE, a non-metallic element discovered in 1826. In its general chemical properties it much resembles chlorine and iodine, and is generally associated with them It exists, but in very minute quantities, in sea-water, in the ashes of marine plants, in animals, and in some salt springs. It is usually extracted from bittern by the agency of chlorine. At common temperatures it is a very dark reddish liquid of a powerful and suffocating odor, and

emitting red vapor. It has bleaching powers like chlorine, and is very poisonous. Its density is about four and a half times that of water. It combines with hydrogen to form hydrobromic acid gas. With oxygen and hydrogen it forms bromic acid.—Bromide of potassium has sedative and other properties, and is used in medicine (scrofula, goiter, rheumatism, etc.); bromide of silver is used in photography.

BRON'CHI (-kī), the two branches into which the trachea or wind-pipe divides in the chest, one going to the



Bronchi and their ramifications.

right lung, the other to the left, and ramifying into innumerable smaller tubes—the bronchial tubes.

BRONCHITIS (bron-kī'tis), an inflammation of the mucous membrane of the bronchial tubes, or the air-passages leading from the trachea to the lungs. (See Bronchi.) It is of common occurrence, and may be either acute or chronic. Its symptons are those of a feverish cold, such as headache, lassitude, and an occasional cough, which are sueceeded by a more frequent cough occurring in paroxysms, a spit of yellowish mucus, and a feeling of great oppression on the chest. Slight attacks of acute bronchitis are frequent and not very dangerous. They may be treated with mustard poultices or fomentations. Acute bronchitis is often a formidable malady, and requires prompt treatment. Confirmed chronic bronchitis is hardly amenable to medical treatment. Its main symptoms are cough, shortness of breath, and spit. It is particularly apt to attack a person in winter; and in the end may cause death through the lungs becoming unable to do their work, and through accompanying complications.

BRON'TE, Charlotte (afterward Mrs. Nicholls), English novelist, born at Thornton, in Yorkshire, 21st April, 1816; died at Haworth, 31st March, 1855. The success of Jane Eyre, which was published in October, 1847, was immediate and decided. Her second novel, Shirley, appeared in 1849. In the autumn of 1852 her third novel, Villette, was published. Shortly after, she married her father's curate, the Rev. Arthur Bell Nicholls, but in nine months died of consumption. Her originally rejected tale of The Professor was published after her death, in 1857, and the same year a biography of her appeared from the pen of Mrs. Gaskell.

BRONTOSAU'RUS, a gigantic reptilian animal, of the order Dinosauria, found fossil in seeondary strata of the Rocky Mountains, having a long neck and tail, a very small head, and strong limbs. It seems to have lived in swampy localities, and to have been herbivorous. Living it must have weighed between 20 and 30 tons.

BRONZE is an alloy of copper and tin, to which other metallic substances are sometimes added, especially zinc. It is a fine-grained metal, taking a smooth and polished surfaee, harder and more fusible than copper, but not so malleable. In various parts of the world weapons and implements were made of this alloy before iron came into use, and hence the bronze age is regarded as one coming between the stone age and the iron age of prehistoric archæology. (See Archæology.) Both in ancient and modiern times it has been much used in making casts of all kinds, metals, bas-reliefs, statues, and other works of art; and varieties of it are also used for bells, gongs, reflectors of telescopes, cannon, etc. Its color is reddish, brownish, or olive-green, and is darkened by exposure to the atmosphere. Ancient bronze generally contains from 4 to 15 per cent of tin. An alloy of about 85 parts copper, 11 zinc, and 4 tin is used for statues. Bell-metal consists of 78 of copper and 22 of tin. An alloy called phosphor bronze, consisting of about 90 per cent of copper, 9 of tin, and from ·5 to ·75 of phosphorus has been found to have peculiar advantages for certain purposes. The addition of phosphorus increases the homogeneousness of the compound, and by varying the proportion of the constituents the hardness, tenacity, and elasticity of the alloy may be modified at pleasure.—Aluminium bronze is an alloy of eopper and aluminium, the metals being combined in different proportions aceording to the kind of bronze wanted. One variety is of a yellow or golden color, and is made into watch-chains and ornamental articles.—Manganese bronze is a bronze containing manganese and iron, and is said to possess remarkable properties in regard to strength, hardness, toughness, etc.—Bronzing is the operation of covering artieles with a wash or coating to give them the appearance of bronze. Two kinds are common, the yellow and the red. The yellow is made of fine copper dust, the red of copper dust with a little pulverized red ocher. The fine green tint which bronze acquires by oxidization, called patina antiqua, is imitated by an applieation of sal-ammoniac and salt of sorrel dissolved in vinegar. Recently bronze has been deposited on small statues and other articles with good effect by means of the electrotype process.

BRONZING. See Bronze.

BROOCH (brōch), a kind of ornament worn on the dress, to which it is attached by a pin stuck through the fabric. They are usually of gold or silver, often worked in highly artistic patterns and set with preeious stones. Brooches are of great antiquity, and were formerly worn by men as well as women, especially among the Celtic races.

BROOK FARM, a community at West Roxbury, Mass., founded by George Ripley to test the socialistic doctrines of Fourier. Among the members were George W. Curtis, Nathaniel Hawthorne, Charles H. Dana, and Margaret Fuller. Hawthorne based his story "The Blithedale Romance" on Brook Farm. The community fell to pieces after a short life.

BROOKLYN, a borough of New York City, formerly a city in Long Island on Long Island Sound. Population, 1906, 1,500,000. It consists of an aggregation of villages which have gradually grown together to form a vast city, and that is why the streets have no uniformity of plan. The park system of Brooklyn consists of 36 parks, with a combined area of 1566½ acres, and 22 parkways, 42½ miles in length. The principal park is Prospect; area, 516½ acres. It is on the highest ground in the city, and includes 110 acres of woodland. Fort Greene Park, 30 acres of beautiful grounds, is less than half a mile from the Borough Hall. Here 11,000 victims of the Revolutionary War prison ships are entombed. The Soldiers and Sailors' Memorial Arch on Prospect Park Plaza, dedicated in 1892, is of white marble; the bas-reliefs are by Maurice J. Power. Six cemeteries lie wholly or partly in Brooklyn, and others are just beyond the borough boundary in Queens. Greenwood, southwest of Prospect Park, has an area of 474 acres, and is widely known for the beauty of its ground and monuments. Other cemeteries within Brooklyn's boundaries are Evergreens, Holy Cross, Kings County Farm (Potter's Field), Maimonides Cemetery, 7½ acres; Mount Hope, 12 acres; Washington Cemetery, on Ocean Parkway. The suspension-bridge over the East river was commenced Jan. 2, 1870. The first wire was run out May 29, 1877, and the bridge was opened to the public May 24, 1883. The bridge railroad was opened Sept. 24, 1883. Total length, with extensions, 6537 feet. The original cost of construction was $15,000,000.

Brooklyn is called "the city of churches." There are 400 Protestant churches, with a total indebtedness of $1,863,700, and property valued at $169,923,681. There are 84 Roman Catholic churches, with property to the value of $10,086,000, indebted to the extent of $1,342,859. There are 75 religious societies and Young Men's Christian Associations, besides church societies, 100 city missionaries, 31 missions, 10 Chinese missions, 41 church sewing and industrial schools, 19 church kindergartens, and 19 free church reading-rooms. There are 6 high-schools, a training-school for teachers, 122 day and 16 evening schools, 10 industrial and asylum schools, and a truant school. There are 23 libraries, having an aggregate of more than 480,000 volumes, of which 208,445 volumes are also in free circulation. Brooklyn has developed an extensive commerce. The wharves and docks of the city nave a water frontage of more than 25 miles, lined with great storehouses and elevators, and represent an investment of hundreds of millions of dollars. Ninety per cent of the coffee and sugar imported into the U. States is received here. Thirty-three regular lines of steamships,

and a great number of "tramp" steamers and sailing vessels, dock in Brooklyn. Along the water-front are also extensive basins, one covering 40 acres and accommodating 500 vessels at one time, ship-yards, dry-docks, and marine railways. Here also is the Brooklyn Navy-yard, the most important station in the U. States, where four-fifths of the stores for the entire navy are handled, and war-ships repaired and fitted for sea. Pop. 1909, 1,492,970. See New York.

BROOKS, Phillips, a noted American Protestant Episcopal bishop and preacher, born in Boston Dec. 13, 1835, died in 1893. He served in charges at Philadelphia and Boston, and was elected bishop of Massachusetts in 1891. His works are: Lectures on Preaching, The Influence of Jesus, and several volumes of sermons. His hymn, O, Little Town of Bethlehem, is one of the most popular Christmas hymns of the church.

BROOKS, Preston Smith, an American lawyer and legislator, born in South Carolina in 1819, died in 1857. He served as congressman from 1852 to 1856. On May 22, 1856, he assaulted Senator Charles Sumner while the latter was at his desk in the senate chamber, the alleged offense being Sumner's arraignment of South Carolina in his famous speech on the "Crime of Kansas," delivered a few days previously.

BROOM, a popular name which includes several allied genera of plants distinguished by a leguminous fruit and papilionaceous flowers. The common broom of Europe is a bushy shrub with straight angular branches, of a dark-green color, deciduous leaves, and flowers of a deep golden yellow. Its twigs are often made into brooms, and are used as thatch for houses and corn-stacks. They have also been used for tanning. The whole plant has a very bitter taste, and a decoction of it is diuretic, in strong doses emetic.—White broom or Portugal broom has beautiful white flowers.—Spanish broom or Spart is an ornamental flowering shrub growing in Africa, Spain, Italy, and the s. of France. It has upright, round branches, that flower at the top, and spear-shaped leaves. Its fiber is made into various textile fabrics, and is also used in paper-making.—Dyer's broom yields a yellow color used in dyeing.—Butcher's broom is an evergreen shrub of the order Liliaceæ, and therefore entirely different from the brooms proper.

BROOM-CORN, BROOM-GRASS, a plant of the order of grasses, with a jointed stem, rising to the height of 8 or 10 feet, extensively cultivated in N. America, where the branched panicles are made into carpet-brooms and clothes-brushes. The seed is used for feeding poultry, cattle, etc.

BROTH, the liquor in which some kind of flesh is boiled and macerated, often with certain vegetables, to give it a better relish. Beef-tea is a kind of broth. Scotch broth is a kind of soup in which pot-barley is an ingredient.

BROTHERHOODS. See Fraternities.

BROTHERS, a term applied to the members of monastic and military orders as being united in one family. Lay brothers were an inferior class of monks employed in monasteries as servants. Though not in holy orders, they were bound by monastic rules.

BROUGH, John, an American governor and politician, born in Ohio in 1811, died in 1865. He is known as "the war governor of Ohio."

BROUGHAM (bröm or brō'ĕm), a close four-wheeled carriage, with a single inside seat for two persons, glazed in front and with a raised driver's seat, named after and apparently invented by Lord Brougham.

BROUGHAM (bröm or brō'ĕm), Henry, Baron Brougham and Vaux, was born at Edinburgh 19th September, 1778; died at Cannes 7th May, 1868. He was educated at Edinburgh, studied law there, and was admitted a member of the Society of Advocates in 1800. Along with Jeffrey, Horner, and Sydney Smith, he bore a chief part in the start-

Lord Brougham.

ing of the Edinburgh Review in 1802, to which he contributed a great number of articles. Finding too circumscribed a field for his abilities in Edinburgh he removed to London, and in 1808 was called to the English bar. In 1810 he entered parliament as member for the borough of Camelford, joined the Whig party, which was in opposition, and soon after obtained the passing of a measure making the slave-trade felony. At the general election of 1830 he was returned for the large and important county of York. In the ministry of Earl Grey he accepted the post of lord-chancellor, and was raised to the peerage (22d Nov. 1830), with the title of Baron Brougham and Vaux. In this post he distinguished himself as a law reformer, and aided greatly in the passing of the Reform Bill of 1832. Lord Brougham accomplished a large amount of literary work, contributing to newspapers, reviews, and encyclopedias, besides writing several independent works; and he had no mean reputation in mathematics and physical science.

BROUGHTON (brą'tun), John Cam Hobhouse, Lord, English writer and statesman; born 1786, died 1869. He entered parliament in 1819 as member for Westminster. In 1832 he entered Lord Melbourne's ministry as secretary at war, and became a privy-councilor. In 1833 he was made chief-secretary for Ireland, and in 1835 he was appointed president of the board of control. He held this office till Sept., 1841, and in Lord Russell's administration, 1846–52. He was raised to the peerage as Baron Broughton in 1851.

BROUSSONET (brō-so-nā), Pierre Marie Auguste, French naturalist, born 1761, died 1807. He was professor of botany at Montpellier, and a member of the Academy of Sciences.

BROWN, a color which may be regarded as a mixture of red and black, or of red, black, and yellow. There are various brown pigments, mostly of mineral origin, as bister, umber, cappagh brown, etc.

BROWN, Charles Brockden, an eminent American novelist, was born in Philadelphia in 1771, died 1810. He was originator of the Monthly Magazine and American Review (1799–1800). He also founded in 1805 the Literary Magazine and American Register, which he edited for five years.

BROWN, John, an American opponent of slavery, born 1800, hanged 1859. He early conceived a hatred for slavery, and having removed to Osawatomie, Kansas, in 1855, he took an active part against the pro-slavery party, the slavery question there giving rise already almost to a civil war. In the summer of 1859 he rented a farmhouse about 6 miles from Harper's Ferry, and organized a plot to liberate the slaves of Virginia. On Oct. 16 he, with the aid of about twenty friends, surprised and captured the arsenal at Harper's Ferry, but was wounded and taken prisoner by the Virginia militia next day, tried, and executed at Charlestown, 2d Dec.

BROWN, Robert, botanist, born at Montrose, December 21, 1773; died in London June 10, 1858. In 1800 he was appointed naturalist to Flinders's surveying expedition to Australia. He returned with nearly 4000 species of plants, and was shortly after appointed librarian to the Linnæan Society. He was the first English writer on botany who adopted the natural system of classification, which has since entirely superseded that of Linnæus. In 1810 he received the charge of the collections and library of Sir Joseph Banks. He transferred them in 1827 to the British Museum, and was appointed keeper of botany in that institution. He became a fellow of the Royal Society in 1811, D.C.L. Oxford in 1832, and a foreign associate of the French Academy of Sciences in 1833. He had the Copley medal in 1839, and was appointed president of the Linnæan Society in 1849 As a naturalist Brown occupied the very highest rank among men of science.

BROWN, Dr. Thomas, Scotch metaphysician, was born at Kirkmabreck, Kirkcudbright, in 1778; died at Brompton, London, 1820 He distinguished himself, at a very early age, by an acute review of the medical and physiological theories of Dr. Darwin, in a work entitled Observations on Darwin's Zoonomia. He published some indifferent poems which were collected in 1820 But he chiefly deserves notice on account of his metaphysical speculations, his chief work being Lectures on the Philosophy of the Human Mind, 1822. His system reduces the intellectual faculties to three great classes—perception, sim-

ple suggestion, and relative suggestion; employing the term suggestion as nearly synonymous with association. He held original views in regard to the part played by touch and the muscular sense in relation to belief in an external world. His development of the theory of cause and effect was first suggested by Hume.

BROWN UNIVERSITY, founded at Providence, R. I., in 1765, and named for Nicholas Brown, one of its supporters. The university confers degrees in art, science, and philosophy. It has an endowment of nearly $2,000,000, 100 instructors and a student body of nearly 1000. The libraries contain 120,000 volumes. The school is open, in all departments, to women.

BROWNE, Charles Farrar, an American humorist, best known as "Artemus Ward," was born at Waterford, Maine, 1836; died at Southampton, England, 1867. Originally a printer, he became editor of papers in Ohio, where his humorous letters became very popular. He subsequently lectured on California and Utah in the States and in England, where he contributed to Punch. His writings consist of letters and papers by "Artemus Ward," a pretended exhibitor of wax figures and wild beasts, and are full of drollery and eccentricity.

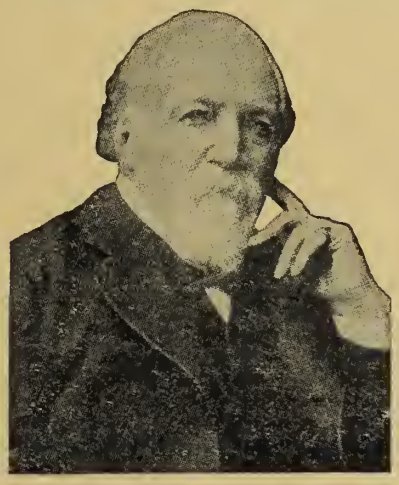
BROWNE, Francis Fisher, an American poet and critic, born in South Halifax, Vt., 1843. He has edited several literary publications, including The Dial, of which he has been the editor since 1880. He has published several collections of poems.

BROWNE, Hablot Knight, an English designer of humorous and satirical subjects, and an etcher of considerable skill, better known by the pseudonym of "Phiz," born at Kennington, Surrey, 1815, died at Brighton 1882. In 1835 he succeeded Seymour as the illustrator of Dickens's Pickwick, and was afterward engaged to illustrate Nicholas Nickleby, Dombey & Son, Martin Chuzzlewit, David Copperfield, and other works of that author. He also illustrated the novels of Lever, Ainsworth, etc., besides sending many comic sketches to the illustrated serials of the time.

BROWNIE, in Scotland, an imaginary spirit formerly believed to haunt houses, particularly farmhouses. Instead of doing any injury he was believed to be very useful to the family, particularly to the servants if they treated him well, for whom he was wont to do many pieces of drudgery while they slept. The brownie bears a close resemblance to the Robin Goodfellow of England, and the Kobold of Germany.

BROWNING, Elizabeth Barrett, English poetess; born at Burn Hall, Durham, in 1809; died at Florence 1861. Her bodily frame was from the first extremely delicate, but her mind was sound and vigorous, and disciplined by a course of severe and exalted study. She early began to commit her thoughts to writing, and in 1826 a volume, entitled An Essay on Mind, with other Poems, appeared of her authorship. Her health was at length partially restored, and in 1846 she was married to Mr. Robert Browning, soon after which they settled in Italy, and continued to reside for the most part in the city of Florence. Her Prometheus Bound (from the Greek of Æschylus) and Miscellaneous Poems appeared in 1833; the Seraphim and other Poems in 1838. In 1856 a collected edition of Mrs. Browning's works appeared, including several new poems, and among others Lady Geraldine's Courtship. Casa Guidi Windows, a poem on the struggles of the Italians for liberty in 1848–49, appeared in 1851. The longest and most finished of all her works, Aurora Leigh, a narrative and didactic poem in nine books, was published in 1857. Poems before Congress appeared in 1860, and two posthumous volumes, Last Poems, 1862, and The Greek Christian Poets and the English Poets (prose essays and translations), 1863 were edited by her husband.

BROWNING, Robert, poet, born at Camberwell May 7, 1812; died Dec. 12, 1889. In 1846 he married Elizabeth Barrett (see above), and thereafter resided chiefly in Italy, making occasional



Robert Browning

visits to England. His first poem, Pauline, was published in 1833; followed by Paracelsus in 1835; Strafford, a Tragedy (1837), produced at Covent Garden. Sordello appeared in 1840, followed by Pippa Passes, A Blot on the Scutcheon, Luria, A Soul's Tragedy, the well-known Pied Piper of Hamelin, and How They Brought the Good News from Ghent to Aix (1841–46). Between 1846 and 1889 appeared The Ring and the Book, his longest poem, Fifine at the Fair; Aristophanes' Apology; Dramatic Idylls; Jocoseria; Ferishtah's Fancies; Asolando. He received the degree of D.C.L. from Oxford in 1882. A Browning Society for the study of his works was formed in 1881, under whose auspices several of his dramas have been performed. His poems are often difficult to understand from the quick transitions of thought, and they are not infrequently rugged and harsh in expression, yet they are among the chief poetic utterances of last century.

BRUCE, a family name distinguished in the history of Scotland. The family of Bruce (or de Brus) was of Norman descent, its founder having obtained from William the Conqueror large grants of land in Northumberland. After being frequently involved in border warfare with the Scots, the house of Bruce received about 1130 from from David I. a grant of the lands of Annandale, thus obtaining a footing in the south of Scotland.

BRUCE, David. See David II.

BRUCE, Edward, a brother of Robert I., who, after distinguishing himself in the war of independence, crossed in 1315 to Ireland to aid the native septs against the English. After many successes he was crowned king of Ireland at Carrickfergus, but fell in battle near Dundalk in 1318.

BRUCE, Robert, the greatest of the kings of Scotland, born 1274. In 1296, as Earl of Carrick, he swore fealty to Edward I., and in 1297 fought on the English side against Wallace. He then joined the Scottish army, but in the same year returned to his allegiance to Edward until 1298, when he again joined the national party, and became in 1299 one of the four regents of the kingdom. In the three final campaigns, however, he resumed fidelity to Edward, and resided for some time at his court; but, learning that the king meditated putting him to death on information given by the traitor Comyn, he fled in Feb., 1306, to Scotland, stabbed Comyn in a quarrel at Dumfries, assembled his vassals at Lochmaben Castle, and claimed the crown, which he received at Scone, March 27th. Being twice defeated, he dismissed his troops, retired to Rathlin Island, and was supposed to be dead, when, in the spring of 1307, he landed on the Carrick coast, defeated the Earl of Pembroke at Loudon Hill, and in two years had wrested nearly the whole country from the English. He then in successive years advanced into England, laying waste the country; and on June 24, 1314, defeated at Bannockburn the English forces advancing under Edward II. to the relief of the garrison at Stirling. In 1316 he went to Ireland to the aid of his brother Edward, and on his return in 1318, in retaliation for inroads made during his absence, he took Berwick and harried Northumberland and Yorkshire. Hostilities continued until the defeat of Edward near Byland Abbey in 1323, and though in that year a truce was concluded for thirteen years, it was speedily broken. Not until March 4, 1328, was the treaty concluded by which the independence of Scotland was fully recognized. Bruce did not long survive the completion of his work, dying at Cardross Castle on June 7, 1329. He was twice married; first to a daughter of the Earl of Mar, Isabella, by whom he had a daughter, Marjory, mother of Robert II.; and then to a daughter of Aymer de Burgh, Earl of Ulster, Elizabeth, by whom he had a son, David, who succeeded him.

BRUCINE, an alkaloid accompanying strychnia in nux vomica. Its taste is exceedingly bitter and acrid, and its action on the animal economy is entirely analogous to that of strychnia, but much less powerful.

BRUGES (brüzh), an old walled city of Belgium, capital of West Flanders, 57 miles n.w. Brussels, on the railway to Ostend. It is an important canal center, and has over fifty bridges, all opening in the middle for the passage of vessels. The principal canals are those to Sluis, Ghent, and Ostend, on all of which pretty large vessels can come up to Bruges. Among its more noteworthy buildings are the Halles (containing cloth and other halls or markets), a fine old building, with a tower 354 feet high, in which is a numerous set of chimes; the Hôtel de Ville, the Bourse, and the Palace of Justice; the Church of Nôtre Dame, with its elevated spire and splendid tombs of Charles the Bold and Mary of Burgundy; etc. The town possesses interesting works of art by Jan Van Eyck, Memling, the Van Oosts, etc. Textile goods, lace, etc., are manufactured. Pop. 51,657.

BRUHL (brül), Heinrich, Count von, minister and favorite of Augustus III., king of Poland, born in 1700, died 1763. In 1747 he became the prime-minister of Augustus, to gratify whose wishes he exhausted the state, plunged the country into debt, and greatly reduced the army. He acquired great wealth and lived in greater state than the king himself. His profusion was often beneficial to the arts and sciences, and his library of 62,000 vols. forms a chief part of the Royal Library at Dresden.

BRUISE, a hurt caused by a blow or other violent pressure on the body. Owing to the rupture of small blood-vessels and the leakage of blood into the tissues the skin becomes discolored in the region affected. The best remedy for bruises is rest. The pain resulting from small bruises may be relieved by letting cold water fall on the part, or by immersing the part in cold water.

BRUMAIRE (brü-mār), the second month in the calendar adopted by the first French republic, beginning on the 23d of October and ending 21st November. The 18th Brumaire of the year VIII. of the French Revolution (Nov. 9, 1799) witnessed the overthrow of the Directory by Bonaparte. The next day he dispersed at the point of the bayonet the Council of Five Hundred, and was elected consul.

BRUMMELL, George Bryan (Beau Brummell), son of a clerk in the Treasury, born in London in 1778, died 1840. He was educated at Eton and at Oxford, and at the age of sixteen made the acquaintance of the Prince of Wales, afterward George IV., who made him a cornet in his own regiment of the 10th Hussars, and secured his rapid promotion. The death of his father in 1794 brought him a fortune of $150,000, which he expended in a course of sumptuous living, extending over twenty-one years, during which his dicta on matters of etiquette and dress were received in the beau monde as indisputable.

BRUNEL', Isambard Kingdom, English engineer, son of Sir Mark Isambard Brunel, born in 1806, died in 1859. He was educated at the Henri IV. College, Paris; and commenced practical engineering under his father, acting at twenty as resident engineer at the Thames Tunnel. Among his best-known works were the Great Western, Great Britain, and Great Eastern steamships; the entire works on the Great Western Railway, to which he was appointed engineer in 1833; the Hungerford Suspension-bridge; docks at Plymouth, Milford Haven, etc.

BRUNEL', Sir Mark Isambard, a distinguished engineer, born near Rouen in 1769. He was educated in Rouen, his mechanical genius early displaying itself. Among his inventions were a machine for making seamless shoes, machines for making nails and wooden boxes, for ruling paper and twisting cotton into hanks, and a machine for producing locomotion by means of carbonic acid gas; but his greatest engineering triumph was the Thames Tunnel, commenced March, 1825, and opened in 1843. In 1841 the honor of knighthood was conferred on him. He died in Dec., 1849.

BRUNN (brūn), an Austrian city, capital of Moravia, on the railway from Vienna to Prague, nearly encircled by the rivers Schwarzawa and Zwittawa. It contains a cathedral and other handsome churches; a landhaus, where the provincial assembly meets, and several palaces; and has extensive manufactures of woolens, which have procured for it the name of the Austrian Leeds. Pop. 108,944.

BRUNO, Giordano (jor-dä'nō), an Italian philosopher of the Renaissance, born at Nola about 1550. He entered the order of Dominicans, but was accused of impiety, and, after enduring much persecution, fled from Rome about 1577 to Geneva. Here he was soon persecuted in turn by the Calvinists, and traveled slowly through southern France to Paris, where he was offered a chair of philosophy, but declined to fulfil its conditions of attendance at mass. In 1583 he went to London, where he published several of his works, and to Oxford, where he taught for a short time. In 1585 he went by way of Paris and Marburg to Wittenberg, and from 1586 to 1588 taught his philosophy there. He next went to Prague and to Helmstedt, where he remained till 1589; thence to Frankfort until 1592; and finally to Padua, where he remained until the inquisition of Venice arrested him and transferred him to Rome. After an imprisonment of seven years, during which he steadfastly refused to retract his doctrines, he was burned, February 16, 1600, for apostasy, heresy, and violation of his monastic vows. His doctrines form a more complete Pantheistical system than had been previously exhibited, and represent the highest level of the thought of the period.

BRUNO, THE GREAT, Archbishop of Cologne and Duke of Lorraine, third son of Henry the Fowler, and brother of the Emperor Otho I. He was employed in various important negotiations, and was a great patron of learning. Commentaries on the Pentateuch, and some biographies of saints, are ascribed to him. He died 965, at Rheims.

BRUNS'WICK, a duchy and sovereign state in the northwest of Germany, area 1425 sq. miles. A good portion of it is hilly or undulating, and it partly belongs to the Harz mountain system. Mining is carried on chiefly in the Harz, and the minerals include iron, lead, copper, brown coal, etc. About half the surface is arable, and the chief cultivated products are grain, flax, hops, tobacco, potatoes, and fruit. Brewing, distilling, the manufacture of linens, woolens, and leather, the preparation of paper, soap, tobacco, beet-sugar, with agriculture and mining, afford the principal employment of the people. Pop. 464,251, mostly Lutherans by religion.—Brunswick, the capital, is situated on the Oker, and on the railway from Hanover to Berlin. The principal buildings of note are the ducal palace, the cathedral of St. Blaise (1173), St. Catherine's Church (dating from 1172), and St. Magnus's (1031), the Gewandhaus, and the fine old Gothic Council House. The educational institutions include the polytechnic school, a gymnasium, etc., and there are a city museum, a ducal museum, and a public library. The principal manufactures are wool, linen, jute, machinery, sewing-machines, gloves, lackered wares, etc., chemicals, and the town is famous for beer. Pop. 128,177.

BRUNSWICK (brunz'wik), a city, port of entry, and county seat of Glynn Co., Ga., 90 miles south by west of Savannah, on Saint Simon's Sound, 8 miles from the ocean, and on the Seaboard Air Line, the Plant System, and the Southern railroads. Pop. 10,840.

BRUNSWICK, a town of Maine, on the Androscoggin, 26 miles n.e. of Portland. At Bowdoin College, in this town, Hawthorne and Longfellow graduated in 1825, and the latter filled the chair of modern languages for several years. Pop. 10,125.

BRUNSWICK, Family of, a distinguished family founded by Albert Azo II., Marquis of Reggio and Modena, a descendant, by the female line, of Charlemagne. In 1047 he married Cunigunda, heiress of the Counts of Altorf, thus uniting the two houses of Este and Guelph. From his son, Guelph, who was created Duke of Bavaria in 1071, and married Judith of Flanders, a descendant of Alfred of England, descended Henry the Proud, who succeeded in 1125, and by marriage acquired Brunswick and Saxony. Otho, the great-grandson of Henry by a younger branch of his family, was the first who bore the title of Duke of Brunswick (1235). By the two sons of Ernest of Zell, who became duke in 1532, the family was divided into the two branches of Brunswick-Wolfenbüttel (II.) and Brunswick-Hanover, from the latter of which comes the present royal family of Britain. The former was the German family in possession of the duchy of Brunswick until the death of the last duke in 1884. George Louis, son of Ernest Augustus and Sophia, granddaughter of James I. of England, succeeded his father as Elector of Hanover in 1698, and was called to the throne of Great Britain in 1714 as George I.

BRUNSWICK, NEW. See New Brunswick.

BRUNSWICK BLACK, a varnish composed chiefly of lamp-black and turpentine, and applied to cast-iron goods. Asphalt and oil of turpentine also are ingredients in some kinds of it.

BRUNSWICK GREEN, commonly a carbonate of copper mixed with chalk or lime.

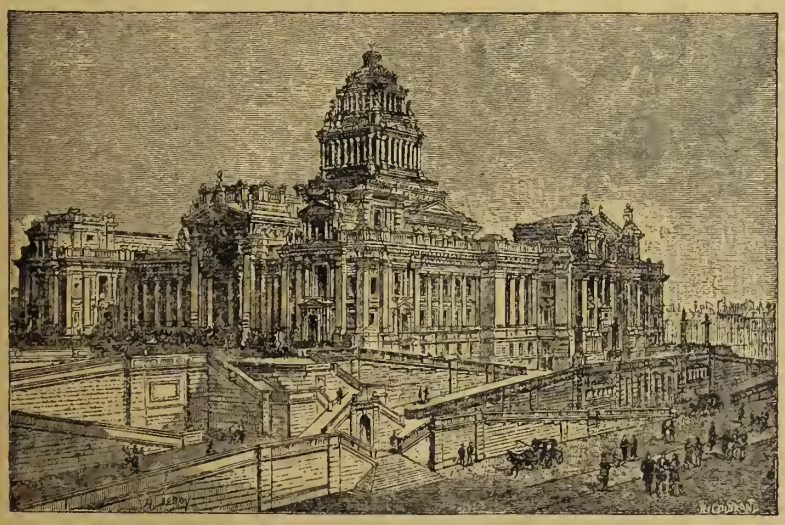
BRUSA, BROUSSA (brō'sà), or **BURSA,** a Turkish city in Asia Minor, south of the Sea of Marmora, about 20 miles distant from its port Mudania, with a pop. of about 75,000 Turks, Greeks, Armenians, and Jews, engaged in commerce, and the manufacture of satins, silk stuffs, carpets, gauze, etc.

BRUSH, Charles Francis, an American inventor, born in Ohio in 1849. His principal inventions are the dynamo which bears his name and a number of other electric devices, being chiefly improvements on his dynamo. He is the founder of the Brush Electric Company.

BRUSH, an implement for removing dirt, for polishing surfaces, or for painting. Brushes are made of broom (which see), bristles, wire, and of various kinds of hair. Among the materials principally used in the manufacture of brushes are bristles, broom straw, feathers, and the hair of the camel, squirrel, goat, badger, and bear. Brushes are simple when they consist of a single tuft, compound when they consist of a series of tufts. The brush industry of the U. States has increased vastly during the past twenty years.

BRUSH-WHEEL, a toothless wheel sometimes used in light machinery to turn a similar wheel by means of bristles, or some brush-like or soft substance, as cloth, buff-leather, india-rubber, or the like.

BRUS'SELS, the capital of Belgium and of the province of Brabant, is situated on the small river Senne, which is not navigable, but serves as a canal-feeder. The city consists of a north-western or lower portion and a south-eastern or upper portion. The older part is surrounded with fine boulevards on the site of its fortifications, and in many places presents a congeries of twisted streets. The upper town, which is partly inside the boulevards and partly outside, is the finest part of the city, and contains the king's palace, the palace of the chambers, the palace of justice, the palace of the fine arts, the public library and museum, etc.; and has also a fine park of 17 acres, around which most of the principal buildings are situated. The lower town retains much of its ancient appearance. The hôtel de ville (1401–55) is an imposing Gothic structure, with a spire 364 feet in height, the square in front of it being perhaps the most pictorial of all the public places of Brussels. The cathedral of Saint Gudule (dating in part from the 13th century) is the finest of many fine churches, richly adorned with sculptures and paintings. The whole town is rich in monuments and works of art. The institutions comprise a university, an academy of science and the fine arts and polytechnic school; one of the finest observatories in Europe; a conservatorium of music; a public library, containing 400,000 volumes and 30,000 MSS.; a picture-gallery with the finest specimens of Flemish art; and many learned societies and educational organizations. The manufactures and trade are greatly promoted by canal communications with Charleroi, Mechlin, Antwerp, and the ocean, and by the network of Belgian railways. The industries are varied and important. Lace was an ancient manufacture, and is still of great importance; the manufacture of cotton and woolen fabrics, paper, carriages, and many minor manufactures are carried on. There are breweries, distilleries, sugar-refineries, foundries, etc. The language spoken by the upper classes is French, and Flemish is that of the lower; but German, Dutch, and English are also a good deal spoken. Pop. 211,429, or, including suburbs, about 590,000.



The law courts or Palais de Justice, Brussels.

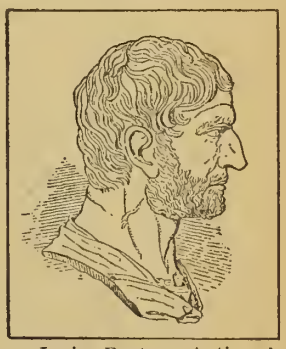
BRUSSELS CARPET. See Carpet.

BRUTUS, or **BRUTE,** the first king of Britain; a purely mythical personage, said to have been the son of Sylvius, and grandson of Ascanius, the son of Æneas. He landed in Devonshire, destroyed the giants then inhabiting Albion, and called the island from his own name. At his death the island was divided among his sons: Locrine, Cumber, and Albanact.

BRUTUS, Decimus Junius, served under Julius Cæsar in Gaul, and was afterward commander of his fleet, but, like his relative, Marcus Junius Brutus, joined in the assassination of Cæsar. He was afterward for a short time successful in opposing Antony, but was deserted by his soldiers in Gaul and betrayed into the hands of his opponent, who put him to death in B.C. 43.

BRUTUS, Lucius Junius, ancient Roman hero, son of Marcus Junius by the daughter of the elder Tarquin. He saved his life from the persecutions of Tarquin the Proud by feigning himself insane, whence his name Brutus (stupid). On the suicide of Lucretia (see Lucretia), however, he threw off the mask, and headed the revolt against the Tarquins. Having secured their banishment, he proposed to abolish the regal dignity and introduce a free government, with the result that he was elected to the consulship, in which capacity he condemned his own sons to death for conspiring to restore the monarchy. He fell in battle B.C. 509.

BRUTUS, Marcus Junius, a distinguished Roman, born B.C. 85; was at first an enemy of Pompey, but joined him on the outbreak of civil war until



Marcus Junius Brutus.—Antique bust.

the battle of Pharsalia. He then surrendered to Cæsar, who made him in the following year governor of Cisalpine Gaul, and afterward of Macedonia. He soon, however, joined the conspiracy against Cæsar, and by his influence insured its success. After the assassination he took refuge in the East, made himself master of Greece and Macedonia, and with a powerful army joined Cassius in the subjugation of the Lycians and Rhodians. In the meantime the triumvirs, Octavianus, Antony, and Lepidus, had been successful at Rome, and were prepared to encounter the army of the conspirators, which, crossing the Hellespont, assembled at Philippi in Macedonia. Cassius appears to have been beaten at once by Antony; and Brutus, though temporarily successful against Octavianus, was totally

defeated twenty days later. He escaped with a few friends; but, seeing that his cause was hopelessly ruined, fell upon the sword held for him by his confidant Strato, and died (B.C. 42).

BRUYERE (brü-yār'), Jean de la, a French writer, born at Paris in 1645. Through the influence of Bossuet he was employed in the education of the Duke of Bourbon, grandson of the great Condé, with a pension of 3000 livres, and was attached to his person during the remainder of his life. In 1695 he was elected a member of the French Academy. He died in 1696.

BRYAN, William Jennings, an American politician, born at Salem, Ill., in 1860. He graduated in law at the Union College of Law in Chicago, and settled in Lincoln, Neb., in 1887. From 1891 to 1895 he was congressman from the Lincoln district; in 1896 he was nominated by the Chicago convention for president on the democratic ticket. Defeated by McKinley, he was again nominated in 1900, but was again defeated by McKinley. He subsequently founded The Commoner, a weekly paper which he still publishes. Bryan is one of the most appealing orators in the United States.

BRYANT, Henry Grier, an American traveler, born in Pennsylvania in 1859. In 1892 he was second in command of the Peary relief expedition to Greenland, and in 1894 was the commander of a similar expedition, also in 1897 commander of the expedition to Mount Elias.

BRYANT, William Cullen, an American poet and journalist, born in Hampshire, Mass., in 1794. At ten years of age he published translations from Latin poets; at thirteen wrote The Embargo;

William Cullen Bryant.

and at eighteen the Thanatopsis. In 1815 he was admitted to the bar, and practiced with success till 1825, when he established the New York Review. In 1826 he became assistant editor of the Evening Post, a leading organ of the New York democrats, of which he was long chief editor. His poems, first collected in 1832, took rank as the best America had up to that time produced. In 1842 he issued The Fountain and other poems; and a new edition of his poems in 1858 was followed by metrical translations of the Iliad in 1869 and of the Odyssey in 1871. His Letters of a Traveller record his visits to Europe in 1834 and subsequently. He died in 1878.

BRYN MAWR (mär) **COLLEGE,** founded by Joseph W. Taylor, was incorporated in 1880, and opened for students in 1885, at Bryn Mawr, near Philadelphia. Bryn Mawr is distinctive among women's colleges in that its course and method of study are based upon the university model. The system of "major and minor electives in fixed combination" has been adopted; students are grouped in accordance with the work they have actually accomplished, instead of by arbitrary "classes"; original research is in all cases encouraged; and, in pursuance of the same policy of placing the scholarship of the college upon a basis of pure merit, candidates for admission as undergraduates are not accepted upon certificate, and honorary degrees are not granted. The college offers the graduate degrees of A.B., A.M., and Ph.D. Eleven resident fellowships, eight graduate scholarships, and three European fellowships are offered to graduate students, and there are also scholarships and a students' loan fund for undergraduates.

Bryn Mawr has grown rapidly since its foundation, and in 1902 had 45 professors and instructors, and a student body of 425.

BUCCANEERS', a name derived from Carib boucan, a place for smoking meat, first given to European settlers in Hayti or Hispaniola, whose business was to hunt wild cattle and swine and smoke their flesh. In an extended sense it was applied to English and French adventurers, mostly seafaring people, who, combining for mutual defense against the arrogant pretensions of the Spaniards to the dominion of the whole of America, frequented the W. Indies in the 17th century, acquired predatory and lawless habits, and became ultimately, in many cases, little better than pirates. The earliest association of these adventurers began about 1625, but they afterward became much more formidable, and continued to be a terror until the opening of the 18th century, inflicting heavy losses upon the shipping trade of Spain, and even attacking large towns. Among their chief leaders were Montbars (Il exterminador), Peter the Great of Dieppe, L'Olonnas, de Busco, Van Horn, and the Welshman Henry Morgan, who, in 1670, marched across the Isthmus, plundered Panama, and, after being knighted by Charles II., became deputy-governor of Jamaica. The last great exploit of the buccaneers was the capture of Carthagena in 1697, after which they are lost sight of in the annals of vulgar piracy.

BUCEPH'ALUS, the horse of Alexander the Great. On its death from a wound Alexander built over its grave, near the Hydaspes, a city called Bucephala.

BUCHANAN, Franklin, an American naval officer, born in Maryland in 1800, died in 1874. He served in the Mexican war, and was an officer on Perry's ship in the expedition to Japan. In 1861 he resigned from the United States navy, joined the confederate navy and commanded the Merrimac in the famous battle with the Monitor in Hampton Roads. After the war he devoted himself to the life of an educator.

BUCHANAN, James, the fifteenth president of the United States, born in Stony Batter, Franklin Co., Pennsylvania in 1791, died in 1868. He was educated at Dickinson College and

James Buchanan.

qualified for the bar. In 1820 Buchanan became a member of congress, continuing in that capacity for ten years. He supported Jackson for president, was made minister to Russia, and in 1833 was elected United States senator. He held that congress had no power over slavery, but favored petition for abolition. In 1845 he became secretary of state in Polk's cabinet, and successfully handled the various territorial expansion questions of his time. In 1856 he was nominated for president by the democrats, defeating Fremont, the candidate of the newly-organized republican party. His administration was marked by much activity in diplomatic affairs, and successfully avoided the brewing trouble between the North and the South. He died at Lancaster, Pa.

BUCHANAN, Robert, an English poet, born in 1841. His earliest volumes of verse—Undertones (1863), Idylls and Legends of Inverburn (1865), and London Poems (1866)—gained him a good reputation for truth, simplicity, humor, and pathos, and he afterward produced various volumes of poetry which have been no less well received; such as Wayside Poesies (1866), North Coast and other Poems (1867); The Drama of Kings (1871); Ballads of Life, Love, and Humour (1882); The City of Dream (1888); The Wandering Jew (1893). He also wrote novels—The Shadow of the Sword, God and the Man, The Child of Nature, etc., and plays. He died in 1901.

BUCHAREST. See Bukarest.

BUCHARIA. See Bokhara.

BUCK, the male of the fallow-deer, of the goat, rabbit, and hare.

BUCKBOARD, a four-wheeled vehicle in which a long elastic board or platform is used in place of the ordinary body, springs, and gear. It is fixed as a connection between the fore and rear axles, and may have one or more seats. It is thus the most simply constructed of any four-wheeled vehicle. Buckboards were first used only in mountain districts where the roads are rugged, and

were for a long time rudely and simply built. When the Adirondack region and Mount Desert became fashionable resorts, the summer vistors to these places had the primitive buckboards reproduced in more elegant form by carriage-builders, so that the buckboard now usually seen differs greatly from the model, being made in handsome woods of a light color, ash or hickory, with springs, silver mountings, and cushions of russet leather.

BUCKEYE, an American name for certain species of horse-chestnuts.

BUCK-HOUND, a kind of hound similar to but smaller than a stag-hound, once commonly used in Britain for hunting bucks. The Master of the Buckhounds is still the title of an officer of the royal household in England.

BUCK'INGHAM, an inland county of England, bounded by Northampton, Bedford, Hertford, Middlesex, Berks, and Oxford; area about 730 sq. miles, or 467,009 acres, of which over 400,000 are under crops or permanent pasture. The rich vale of Aylesbury stretches through the center, and a portion of the Chiltern range across the south of the county, which is watered by the Ouse, the Thame, and the Thames. The breeding and fattening of cattle and pigs are largely carried on, also the breeding of horses, and much butter is made. The manufactures are unimportant, among them being straw-plaiting, thread lace, and the making of wooden articles, such as beechen chairs, turnery, etc. There are also paper-mills, silk-mills, etc. The mineral productions are of no great importance. The county comprises eight hundreds, those of Stoke, Burnham, and Desborough being known as "the Chiltern Hundreds." Buckingham is nominally the county town, but Aylesbury is the assize town. Pop. 195,534.—Buckingham, the county town, a municipal, and, until 1885, a parl. borough, is pleasantly situated on a peninsula formed by the Ouse. Malting and tanning are carried on, and some lace is made. Pop. 3151.

BUCKINGHAM, George Villiers, Duke of, favorite of James I. and Charles I. of England, was born in 1592, his father being George Villiers, Knight. At eighteen he was sent to France, where he resided three years, and on his return made so great an impression on James I. that in two years he was made a knight, a gentleman of the bed-chamber, baron, viscount, Marquis of Buckingham, lord high-admiral, etc., and at last dispenser of all the honors and offices of the three kingdoms. In 1623, when the Earl of Bristol was negotiating a marriage for Prince Charles with the Infanta of Spain, Buckingham went with the prince incognito to Madrid to carry on the suit in person in the hope of securing the Palatinate as dowry. The result, however, was the breaking off of the marriage, and the declaration of war with Spain. During his absence Buckingham was created duke. After the death of James in 1625 he was sent to France as proxy for Charles I. to marry the Princess Henrietta Maria. In 1626, after the failure of the Cadiz expedition, he was impeached, but saved by the favor of the king. Despite the difficulty in obtaining supplies Buckingham took upon himself the conduct of a war with France, but his expedition in aid of the Rochellese proved an entire failure. Aug. 24, 1628, he was stabbed by John Felton, an ex-lieutenant who had been disappointed of promotion.

BUCKINGHAM PALACE, a royal palace in London, facing St. James's Park, built in the reign of George IV., and forming one of the residences of the sovereign.

BUCKLE, Henry Thomas, English historical writer, born 1822. His chief work, a philosophic History of Civilization, of which only two volumes (1858 and 1861) were completed, was characterized by much novel and suggestive thought, and by the bold coordination of a vast store of materials drawn from the most varied sources. He died, while traveling, at Damascus, 1862.

BUCKLER, a kind of small shield formerly worn on the left arm, and varying in form and material, among the latter being wickerwork, wood covered with leather, a combination of wood and metal, etc.

BUCKNER, Simon Bolivar, an American politician and soldier, born in Kentucky in 1823. He graduated from West Point, served in the Mexican war, and was a brigadier-general of the Confederate army. In 1896 he was candidate for vice-president with John M. Palmer on the ticket of the gold wing of the democratic party.

BUCK'RAM, a coarse textile fabric stiffened with glue and used in garments to give them or keep them in the form intended. It is also used in binding books.

BUCK-SHOT, a kind of large leaden shot used for killing deer or other large game.

BUCK'SKIN, a kind of soft leather of a yellowish or grayish color, made originally from deer-skins, but now usually from sheep-skins. The softness which is its chief characteristic is imparted by using oil or brains in dressing it.

BUCK'THORN, the name of an extensive genus of trees and shrubs. Several species belong to N. America. The common buckthorn, a British and N. American shrub, grows to 7 or 8 feet, has strong spines on its branches, elliptical and serrated leaves, male and female flowers on different plants, a greenish-yellow calyx, no corolla, and a round black berry. It flowers in May. The berries are purgative, but harsh in action. The bark yields a yellow dye, the berries sap green.

BUCK'WHEAT, a plant with branched herbaceous stem, somewhat arrow-shaped leaves, and purplish-white flowers, growing to the height of about 30 inches, and bearing a small triangular grain of a brownish-black without and white within. The shape of its seeds gives it its German name Buchweizen, "beech-wheat," whence the English name. The plant was first brought to Europe from Asia by the Crusaders, and hence in France is often called Saracen corn. It grows on the poorest soils. It is cultivated in China and other Eastern countries as a bread-corn. In Europe buckwheat has been principally cultivated as food for oxen, swine, and poultry; but in Germany it serves as an ingredient in pottage, puddings, and other food, and in America buckwheat cakes are common.

BUD, the name of bodies of various form and structure, which develop upon vegetables, and contain the rudiments of future organs, as stems, branches, leaves, and organs of fructification. Upon exogenous plants they are in their commencement cellular prolongations from the medullary rays, which force their way through the bark. In general a single bud is developed each year in the axil of each leaf, and there is one terminating the branch called a terminal bud. The life of the plant during winter is stored up in the bud as in an embryo, and it is by its vital action that on the return of spring the flow of sap from the roots is stimulated to renewed activity. Buds are distinguished into leaf-buds and flower-buds. The latter are produced in the axil of leaves called floral leaves or bracts. The termina, bud of a branch is usually a flower-bud, and as cultivation is capable of producing flower-buds in place of leaf-budsl the one is probably a modification of the other.

BUDAPEST (-pesht'), the official name of the united towns of Pest and Buda or Ofen, the one on the left, the other on the right, of the Danube, forming the capital of Hungary, the seat of the imperial diet of the Hungarian ministry and of the supreme court of justice. Buda, which is the smaller of the two, and lies on the west bank of the river, consists of the fortified Upper Town on a hill, the Lower Town or Wasserstadt at the foot of the hill, and several other districts. The mineral baths of Buda have long been famous, the Bruckbad and Kaiserbad having both been used by the Romans. Pest, or the portion of Budapest on the left or cast bank of the river, is formed by the inner town of Old Pest on the Danube, about which has grown a semicircle of districts—Leopoldstadt, Theresienstadt, Elizabethstadt, etc. There is a well-attended university. In commerce and industry Budapest ranks next to Vienna in the empire. Its chief manufactures are machinery, gold, silver, copper, and iron wares, chemicals, silk, leather, tobacco, etc. A large trade is done in grain, wine, wool, cattle, etc. Budapest is strongly Magyar, and as a factor in the national life may almost be regarded as equivalent to the rest of Hungary. It was not until 1799 that the population of Pest began to outdistance that of Buda; but from that date its growth was very rapid and out of all proportion to the increase of Buda. In 1799 the joint population of the two towns was little more than 50,000; in 1900 it was 713,383.

BUDA'UN, a town of India, United Provinces, consisting of an old and a new town, the former partly surrounded by ancient ramparts; there is a handsome mosque, American mission, etc. Pop. 39,031. The district of Budaur

has an area of 2017 sq. miles, and a pop. of 925,598.

BUDDHA (bud'ha), the sacred name of the founder of Buddhism, an Indian sage who appears to have lived in the 5th century B.C. His personal name was Siddhartha, and his family name Gautama; and he is often called also Sakya-muni. His father was King of Kapilavastu, a few days' journey north of Benares. Siddhartha, filled with a deep compassion for the human race, left his father's court, and lived for years in solitude till he had penetrated the mysteries of life, and become the Buddha. He then began to teach his new faith, in opposition to the prevailing Brahmanism, commencing at Benares. Among his earliest converts were the monarchs of Magadha and Kosala, in whose kingdoms he chiefly passed the latter portion of his life, respected, honored, and protected. See Buddhism.

BUDDHISM, the religious system founded by Buddha, one of the most prominent doctrines of which is that Nirvâna, or an absolute release from existence, is the chief good. According to it pain is inseparable from existence, and consequently pain can cease only through Nirvâna; and in order to attain Nirvâna our desires and passions must be suppressed, the most extreme self-renunciation practiced, and we must, as far as possible, forget our own personality. In order to attain Nirvâna eight conditions must be kept or practiced. The first is in Buddhistic language right view; the second is right judgment; the third is right language; the fourth is right purpose; the fifth is right profession; the sixth is right application; the seventh is right memory; the eight is right meditation. The five fundamental precepts of the Buddhist moral code are: not to kill, not to steal, not to commit adultery, not to lie, and not to give way to drunkenness. To these there are added five others of less importance, and binding more particularly on the religious class, such as to abstain from repasts taken out of season, from theatrical representations, etc. There are six fundamental virtues to be practiced by all men alike, viz., charity, purity,

Buddha—From a Burmese bronze

patience, courage, contemplation, and knowledge. These are the virtues that are said to "conduct a man to the other shore." The devotee who strictly practices them has not yet attained Nirvâna, but is on the road to it. The Buddhist virtue of charity is universal in its application, extending to all creatures, and demanding sometimes the greatest self-denial and sacrifice. There is a legend that the Buddha in one of his stages of existence (for he had passed through

Singhalese Buddhist priests and dagobah at Kandy.

innumerable transmigrations before becoming "the enlightened") gave himself up to be devoured by a famishing lioness which was unable to suckle her young ones. There are other virtues less important, indeed, than the six cardinal ones, but still binding on believers. Thus not only is lying forbidden, but evil-speaking, coarseness of language, and even vain and frivolous talk, must be avoided. Buddhist metaphysics are comprised in three theories—the theory of transmigration (borrowed from Brahmanism), the theory of the mutual connection of causes, and the theory of Nirvâna. The first requires no explanation. According to the second, life is the result of twelve conditions, which are by turns causes and effects. Thus there would be no death were it not for birth; it is therefore the effect of which birth is the cause. Again, there would be no birth were there not a continuation of existence. Existence has for its cause our attachment to things, which again has its origin in desire; and so on through sensation, contact, the organs of sensation and the heart, name and form, ideas, etc., up to ignorance. This ignorance, however, is not ordinary ignorance, but the fundamental error which causes us to attribute permanence and reality to things. This, then, is the primary origin of existence and all its attendant evils. Nirvâna or extinction is eternal salvation from the evils of existence, and the end which every Buddhist is supposed to seek. Sakya-muni did not leave his doctrines in writing; he declared them orally, and they were carefully treasured up by his disciples, and written down after his death. The determination of the canon of the Buddhist scriptures as we now possess them was the work of three successive councils, and was finished two centuries at least before Christ. From Buddhism involving a protest against caste distinctions it was eagerly adopted by the Dasyus or non-Aryan inhabitants of Hindustan. It was pure, moral, and humane in its origin, but it came subsequently to be mixed up with idolatrous worship of its founder and other deities. Although now long banished from Hindustan by the persecutions of the Brahmans, Buddhism prevails in Ceylon, Burmah, Siam, Anam, Tibet, Mongolia, China, Java, and Japan, and its adherents are said to comprise about a third of the human race.

BUDDING, the art of multiplying plants by causing the leaf-bud of one species or variety to grow upon the branch of another. The operation consists in shaving off a leaf-bud, with a portion of the wood beneath it, which portion is afterward removed by a sudden jerk of the operator's finger and thumb, aided by the budding-knife. An incision in the bark of the stock is then made in the form of a T; the two side lips are pushed aside, the bud is thrust between the bark and the wood, the upper end of its bark is cut to a level with the cross arm of the T, and the whole is bound up with worsted or other soft fastening, the point of the bud being left exposed. In performing the operation, a knife with a thin flat handle and a blade with a peculiar edge is required. The bud must be fully formed; the bark of the stock must separate readily from the wood below it; and young branches should always be chosen, as having beneath the bark the largest quantity of cambium or viscid matter out of which tissue is formed. The maturer shoots of the year in which the operation is performed are the best. The autumn is the best time for budding, though it may also be practiced in the spring.

BUELL, Don Carlos, an American soldier, born in Ohio in 1818, died in 1898. He was graduated at West Point, fought in the Mexican war, and was brigadier-general of the Union forces

D. C. Buell.

(volunteer) at the beginning of the civil war, and later brigadier-general. He took part in several of the great battles of the civil war, and was subsequently appointed pension agent.

BUENOS AYRES (bu-en'ōs ī'rās), a city of S. America, capital of the Argentine Republic, on the s.w. side of the La Plata, 150 miles from its mouth. It was founded in 1535 by Don Pedro de Mendoza, and is built with great regularity, the streets uniformly crossing each other at right angles. It contains the palace of the president, the house of

representatives, a town-hall, a number of hospitals and asylums, a cathedral, several monasteries, nunneries, and Catholic and Protestant churches; several theaters, a university, and a custom-house. The university, founded in 1821, is attended by about 800 students. There are also a medical school, normal and other schools, besides literary and scientific societies. Formerly large vessels could only come within 8 or 9 miles of the town, but they can now come up to it and enter the extensive docks that have been constructed, about $25,000,000 having been spent on harbor works and channels. La Plata (capital of the province), 30 miles lower down the estuary, serves as a subport. Buenos Ayres is one of the leading commercial centers of S. America. Chief exports are wool, wheat, maize, meat, hides and skins, tallow, etc. There are six railways running from the city, and 100 miles of tramway in the city and suburbs. About one-fourth of the inhabitants are whites; the rest are of mixed blood or Indians, negroes, etc. Pop. in 1900, 795,323.—The province of Buenos Ayres has an area of 177,777 sq. miles, and consists mostly of level or slightly undulating plains (pampas), which afford pasture to vast numbers of cattle, sheep, and horses. Pop. 1,140,067.

BUF'FALO, an ungulate or hoofed ruminant mammal, family Bovidæ or oxen, the best-known species of which is the common or Indian buffalo, larger than the ox and with stouter limbs, origi-

1, Head of Cape buffalo.
2, Head of Indian buffalo.

nally from India, but now found in most of the warmer countries of the Eastern Continent. A full-grown male is a bold and powerful animal, quite a match for the tiger. The buffalo is less docile than the common ox, and is fond of marshy places and rivers. It is, however, used in tillage, draft, and carriage in India, Italy, etc. The female gives much more milk than the cow, and from the milk the ghee or clarified butter of India is made. The hide is exceedingly tough, and a valuable leather is prepared from it, but the flesh is not very highly esteemed. Another Indian species is the arnee, the largest of the ox family. The Cape buffalo is distinguished by the size of its horns, which are united at their bases, forming a great bony mass on the front of the head. It attains a greater size than an ordinary ox. The name is also applied to wild oxen in general, and particularly to the bison of N. America. See Bison.

BUFFALO, a city of the state of New York, situated on Lake Erie, and by virtue of its position one of the principal ports of the country. It is 400 miles from New York, 500 miles from Chicago, and only 20 miles from Niagara Falls. Its population in 1908 was 400,000. The city has an area of 42 square miles.

Buffalo is one of the most marked of large American cities in its recent development, and owes its prosperity to commerce. Several great steamship lines and innumerable independent vessels ply to the chief ports on the Great Lakes, and there are several ferries to the Canada side, besides the International Bridge, completed at a cost of $1,500,000. The city is connected with the tide-waters of the Hudson by the Erie Canal, and with ports on Lake Ontario and the Saint Lawrence river by the Welland Canal, and is also the terminus or connecting-point of a score of railroads. the commerce of Buffalo by these various means of transportation is very great. With a season of only about 246 days in the year, Buffalo ranks with the leading American and European ports in extent of traffic. The immense quantity of flour and grain moved from the Western States to the seaboard constitutes the most important feature of its commerce; but live stock, lumber, and coal, iron ore, and fish, also, are of importance. Some part of the lumber and iron ore which arrive at this end of Lake Erie is received at Tonawanda, a suburb to the north, on Niagara river, but Buffalo receives large quantities of each. Over 15,000,000 pounds of fish are received annually, mainly from Georgian Bay, and are distributed as far east as Boston and as far west as Denver. The horse market and sheep market of Buffalo are the largest in the U. States, and in the trade in cattle and hogs Buffalo is among the leading American cities. In the production of foundry and machine-shop products, including stoves, nails, etc., and agricultural implements, the city ranks among the foremost. Other industries are slaughtering and meat-packing, refining petroleum, and ship-building; clothing, flouring- and grist-mill products, brick, stone, lime, and stucco, malt and distilled liquors, soap and candles, starch, furniture, and tobacco and cigars, are extensively produced.

BUFFALO-GRASS, a strong-growing N. American grass, so called from forming a large part of the food of the buffalo, and said to have excellent fattening properties.

BUFFER, any apparatus for deadening the concussion between a moving body and the one on which it strikes. In railway-carriages they are placed in pairs at each end, and are fastened by rods to springs under the frame-work to deaden the concussions caused when the velocity of part of the train is checked.

BUFFET, a cupboard, sideboard, or closet to hold china, crystal, plate, and the like. The word is also very commonly applied to the space set apart for refreshments in public places.

BUFF LEATHER, a sort of leather prepared from the skin of the buffalo and other kinds of oxen, dressed with oil, like shammy. It is used for making bandoliers, belts, pouches, gloves, and other articles.

BUFFON (bu-fōn), George Louis Leclerc, Count de, celebrated French naturalist, was born at Montbard, in Burgundy, 1707; died in Paris 1788. In 1739 he was appointed superintendent of the Royal Garden at Paris (now the Jardin des Plantes), and devoted himself to the great work on Natural History, which occupied the most of his life. It is now obsolete and of small scientific value, but it for long had an extraordinary popularity, and was the means of diffusing a taste for the study of nature throughout Europe. After an assiduous labor of ten years the three first volumes were published, and between 1749 and 1767 twelve others, which comprehend the theory of the earth, the nature of animals, and the history of man and the Mammalia. In these Buffon was assised by Daubenton in the purely anatomical portions. Buffon was raised to the rank of count by Louis XV., whose favor, as also that of Louis XVI., he enjoyed. His works were translated into almost every European language.

BUFFOON', a merry-andrew, a clown, a jester.

BUFORD, John, an American soldier, born in Kentucky in 1826, died in 1863. He was graduated at West Point, fought in the Indian wars, and was a brigadier-general in the Union army during the civil war. He was one of the most brilliant of the minor generals in American history.

BUG, a name given to the house-bug or bedbug, or any member of this genus or of the family Cimicidæ. The common bug is about $\frac{3}{16}$ inch long, wingless, of a roundish depressed body, dirty rust color, and emits an offensive smell when touched. The female lays her eggs in summer in the crevices of bedsteads, furniture, and walls of rooms. Its larvæ are small, white, and semi-transparent. They attain full size in eleven weeks. The mouth of the bug has a three-jointed proboscis, which forms a sheath for a sucker. It is fond of human blood, but eats various other substances.

BUGGY, a name given to several species of carriages or gigs: in England, a light one-horse two-wheeled vehicle without a hood; in the U. States, a light one-horse four-wheeled vehicle, with or without a hood or top; in India, a gig with a large hood to screen those who travel in it from the sun's rays.

BU'GLE, a military musical brass wind-instrument of the horn kind, sometimes furnished with keys or valves. It is used in the American and other armies to sound signal-calls. The name is an abbreviation of bugle-horn, that is, buffalo-horn.

BUGLE, a shiny elongated glass bead, usually black, used in decorating female apparel and also in trafficking with savage tribes.

BUILDING ACTS, laws restricting the rights of land owners in the matter of improving their land with buildings.

They generally have to do with the height, stability, material, sanitation, etc., of proposed structures.

BUILDING AND LOAN ASSOCIATIONS, societies the purpose of which is to encourage and assist individuals in buying, building, and paying for a home. They were in existence in England as early as 1781, but were first introduced in the U. States in 1831.

Five states, New York, Massachusetts, New Jersey, Ohio, and Illinois, require these associations to make annual returns, the same as is required of savings banks. In all the other states no control whatsoever is exercised over them.

BUILDING LOANS, loans made to owners of land who desire to build upon the land. They are usually secured by a mortgage on the whole property.

BUILDING STONE, stone used in the construction of buildings of any kind, of bridges, walls, or other structures in which stone can be used. The principal building stones are granite, limestones of various kinds, marbles, sandstones, and slate. Granite is the most enduring of stones, as it is not so easily affected by weather. The granite quarries of the U. States are practically inexhaustible, and the natural resources of the country in respect to the other stones used for building are unsurpassed in the world.

BUKAREST′, the capital of Roumania, situated on the Dimbovitza about 33 miles north of the Danube, in a fertile plain. It is in general poorly built, among the chief buildings being

A street in Bukarest.

the royal palace, the National Theater, the university buildings, the National Bank, the Mint, and the Archiepiscopal Church. There are handsome public gardens. Manufactures are varied but unimportant; the trade is considerable, the chief articles being grain, wool, honey, wax, wine, hides. The mercantile portion of the community is mostly foreign, and the whole population presents a curious blending of nationalities. Bukarest became the capital of Walachia in 1665, in 1862 that of the united principalities of Walachia and Moldavia. A treaty was concluded here in 1812 between Turkey and Russia by which the former ceded Bessarabia and part of Moldavia. Pop. 282,071.

BUKOWINA (bō-ko-vē′nâ), an Austrian duchy, forming the southeastern corner of Galicia. Area, 4035 sq. miles; pop. 571,671. It is traversed by ramifications of the Carpathians, and much of the surface is occupied with swamps and forests. Chief town, Czernowitz.

BULANDSHAHR (bu-land-shär′), a district of India, United Provinces, in the alluvial plain between the Ganges and the Jumna; producing cotton, indigo, sugar, etc. Area, 1911 sq. miles; pop. 949,914.—Bulandshahr, the capital, has a pop. of 16,900.

BULB, a modified leaf-bud, formed on a plant upon or beneath the surface of the ground, emitting roots from its base, and producing a stem from its center. It is formed of imbricated scales or of concentric coats or layers. It incloses the rudiments of the future plant and a store of food to nourish it. Examples of bulbs are the onion, lily, hyacinth, etc.

BULGA′RIA, a principality tributary to Turkey, constituted by the first article of the Treaty of Berlin, July 13, 1878, and placed under the suzerainty of the sultan. It is bounded north by Roumania and the Dobrudsha, east by the Black Sea, south by the Balkan Mountains, which separate it from Eastern Rumelia, and west by Servia. The principal towns are Widdin, Sofia, Plevna, Sistova, Tirnova, Rustchuk, Shumla, Varna, and Silistria. The country almost wholly belongs to the north slope of the Balkans, and is intersected by streams flowing from that range to the Danube. It possesses much good agricultural land and a good climate; but cultivation is backward, though the rearing of cattle and horses is successfully carried on. Agricultural produce is exported, manufactured goods imported. Education is backward, but is improving; four years' school attendance is obligatory in principle. The prevalent religion is that of the Greek Church. The revenue and expenditure are each about $20,000,000. Military service is obligatory; the war strength of the army is about 130,000. In accordance with the Treaty of Berlin a constitution was drawn up by an assembly of Bulgarian notables in 1879 By this constitution, as subsequently amended, the legislative authority is vested in a single chamber, called the Sobranje or National Assembly, elected by manhood suffrage for five years, the members being now one for every 20,000 of the population. The capital is Sofia. On the 29th of April, 1879, Prince Alexander of Battenberg, cousin of the Grand-duke of Hesse, was elected prince by unanimous vote of the constituent assembly. In 1885 a national rising took place in Eastern Rumelia, the Turkish governor was expelled, and union with Bulgaria proclaimed. In consequence Servia demanded an addition to her own territory, and began a war against Bulgaria (Nov., 1885), in which she was severely defeated. By the treaty which followed, the Prince of Bulgaria was appointed governor-general of Eastern Rumelia for a term of five years, to be renominated at the end of that time by sanction of the great powers. These events greatly irritated Russia, whose agents managed to seduce certain regiments of Bulgarians; and in August, 1886, the prince was seized and carried off, while a proclamation was issued to the effect that he had abdicated. When he was set free on Austrian territory he discovered that the people were still with him, and determined to return. Seeing, however, that his presence would cause an immediate interference on the part of Russia he formally abdicated and left the country (7th Sep., 1886). In 1887 Prince Ferdinand of Saxe-Coburg accepted an invitation to occupy the throne and the six great powers sanctioned the step. In 1908 Bulgaria proclaimed its independence. The area of Bulgaria proper is 24,440 sq. miles of Eastern Rumelia or southern Bulgaria, 13,500 sq. miles. The total pop. is 3,733,189.

BULGARIANS, a race of Finnish origin, whose original seat was the banks of the Volga, and who subdued the old Mœsian population and established a kingdom in the present Bulgaria in the 7th century. They soon became blended with the conquered Slavs, whose language they adopted. In the 14th century the country was conquered by the Turks, and has until lately remained part of the Ottoman Empire. (See Bulgaria) The Bulgarian language is divided into two dialects, the old and the new; the former is the richest and best of the Slavonic tongues, and although extinct as a living tongue is still used as the sacred language of the Greek Church. The Bulgarians are now spread over many parts of the Balkan peninsula.

BULK-HEADS, partitions built between the several portions of the interior of a ship, whether to separate it into rooms, or as a safeguard in case of wreck.

BULL, a letter, edict, or rescript of the pope, published or transmitted to the churches over which he is head, containing some decree, order, or decision, and in many cases having a leaden seal attached, impressed on one side with the heads of St. Peter and St. Paul, on the other with the name of the pope. The document is in Latin and on parchment.

BULL, the name given to the male of any bovine quadruped.

BULL, John, the English nation personified, and hence any typical Englishman: first used in Arbuthnot's satire, The History of John Bull, designed to ridicule the Duke of Marlborough; and in which the French are personified as Lewis Baboon, the Dutch as Nicholas Frog, etc.

BULL, Ole Bornemann, famous violinist, born at Bergen, in Norway, 1810; died 1880. He secured great triumphs both throughout Europe and in America by his wonderful playing.

BULL-BAITING, the barbarous sport of setting dogs on a bull, which is tied to a stake and worried by the dogs for the amusement of the spectators. It was a favorite sport in England from a very early period till it was finally put down by act of parliament in 1835.

BULLDOG, a variety of the common dog, remarkable for its short, broad muzzle, and the projection of its lower jaw, which causes the lower front teeth to protrude beyond the upper. The head is massive and broad: the lips are

thick and pendulous; the ears pendent at the extremity; the neck robust and short; the body long and stout; and the legs short and thick. The bulldog is a slow-motioned, ferocious animal, better suited for savage combat than for any purpose requiring activity and intelligence. For this reason he is often employed as a watch-dog. It was formerly used—as its name implies—for the barbarous sport of bull-baiting.—The bull terrier was originally from a cross between the bulldog and the terrier. It is smaller than the bulldog, lively, docile, and very courageous.

BULLEN, Anne. See Boleyn.

BULLER, Sir Henry Redvers, a British soldier, born in 1839, commander of the army in South Africa during the early part of the Anglo-Boer war in 1898. His command was marked by numerous disasters and defeats, and his military reputation totally annihilated. He was soon afterward retired from the service. Died in 1908.

BUL'LET (bụl'et), a projectile intended to be discharged from firearms or other missile weapons; more especially, one for a rifle, musket, fowling-piece, pistol, or similar firearm. Bullets used to be solid spherical masses, but of late many changes have been made in their shape and structure. Bullets used for rifles of recent construction are elongated and generally rounded, conical, or ogival at the apex, somewhat like half an egg drawn out, often with a hollow at the base, into which a plug of wood or clay is inserted. When the rifle is fired the plug is driven forward, forcing the base of the bullet outward till the lead catches the grooves of the barrel.

BULLETIN (bụl'e-tin), an authenticated official report concerning some public event, such as military operations, the health of the sovereign or other distinguished personage, issued for the information of the public. The name is also given to some periodical publications recording the proceedings of learned societies.

BULLET-TREE, or **BULLY-TREE,** a forest tree of Guiana and neighboring regions yielding an excellent gum (the concreted milky juice) known as balata, having properties giving it in some respects an intermediate position between gutta-percha and india-rubber, and making it for certain industrial purposes more useful than either. In the U. States it is used as a chewing material. The timber of the tree is also valuable.

BULL-FIGHTS are among the favorite diversions of the Spaniards. They are usually held in an amphitheater having circular seats rising one above another, and are attended by vast crowds who eagerly pay for admission. The combatants, who make bull-fighting their profession, march into the arena in procession. They are of various kinds—the picadores, combatants on horseback, in the old Spanish knightly garb; the chulos or banderilleros, combatants on foot, in gay dresses, with colored cloaks or banners; and lastly, the matador (the killer). As soon as the signal is given the bull is let into the arena. The picadores, who have stationed themselves near him, commence the attack with their lances, and the bull is thus goaded to fury. Sometimes a horse is wounded or killed (only old worthless animals are thus employed), and the rider is obliged to run for his life. The chulos assist the horsemen by drawing the attention of the bull with their cloaks; and in case of danger they save themselves by leaping over the wooden fence which surrounds the arena. The banderilleros then come into play. They try to fasten on the bull their banderillas—barbed darts ornamented with colored paper, and often having squibs or crackers attached. If they succeed, the squibs are discharged, and the bull races madly about the arena. The matador or espada now comes in gravely with a naked sword, and a red flag to decoy the bull with, and aims a fatal blow at the animal. The slaughtered bull is dragged away, and another is let out from the stall. Several bulls are so disposed of in a single day.

BULLFINCH, an insessorial bird, with short thick rounded bill, beak and crown of the head black, body bluish-gray above and bright tile-red below. It

Bullfinch.

occurs in Britain, in the middle and south of Europe, and in Asia, and when tamed may be taught to sing musical airs.

BULLFROG, a large species of frog found in North America, 8 to 12 inches long, of a dusky-brown color mixed with a yellowish green, and spotted with black. These frogs live in stagnant water, and utter a low croaking sound resembling the lowing of cattle, whence the name.

BULLHEAD, the popular name of certain fishes. One of these, a British fish, is about 4 inches long, with head very large and broader than the body. The armed bull-head is found in the Baltic and northern seas; the six-horned bull-head is a North American species. In America this name is called also Catfish and Horned-pout.

BUL'LION is uncoined gold or silver, in bars, plate, or other masses, but the term is frequently employed to signify the precious metals coined and uncoined.

BULL RUN, a stream in the n.e of Virginia, flowing into the Occoquan river, 14 miles from the Potomac; the scene of two great battles during the American civil war in which the Federals were defeated. The first battle was fought 21st July, 1861; and the second on 30th August, 1862.

BULLS AND BEARS, in stock-exchange slang, manipulators of stocks; the former operating in order to effect a rise in price, the latter doing all they can to bring prices of stock down.

BULL'S-EYE, (1) a round piece of thick glass, convex on one side, inserted into the decks, ports, scuttle-hatches, or skylight-covers of a vessel for the purpose of admitting light. (2) A small lantern with a lens in one side of it to concentrate the light in any desired direction. (3) In rifle shooting, the center of a target, of a differerent color from the rest of it and usually round.

BULOW (bü'lō), Friedrich Wilhelm von, Prussian general, born 1755, died 1816. He was actively engaged against the French at the earliest periods of the revolutionary war; and his services in 1813 and 1814, especially at Grosbeeren and Dennewitz, were rewarded with a Grand Knightship of the Iron Cross and the title Count Bülow von Dennewitz. As commander of the fourth division of the allied army he contributed to the victorious close of the battle of Waterloo.

BULOW (bü'lō), Hans Guido von, pianist and composer, born at Dresden 1830. He studied the piano under Liszt, and made his first public appearance in 1852. In 1855 he became leading professor in the Conservatory at Berlin; in 1858 was appointed court pianist; and in 1867 he became musical director to the King of Bavaria. His compositions include overture and music to Julius Cæsar, The Minstrel's Curse, and Nirwana; songs, choruses, and pianoforte pieces. He was considered one of the first of pianists and orchestral conductors. He died in 1894.

BULOZ (bü-loz), François, born near Geneva, Switzerland, 1803, died at Paris 1877; founder and editor of the Revue des Deux Mondes, the celebrated French fortnightly literary magazine.

BULRUSH (bụl'-), the popular name for large rush-like plants growing in marshes, not very definitely applied. Some authors apply the name to cat's-tail or reed-mace. But it is more generally restricted to a tall rush-like plant from which the bottoms of chairs, mats, etc., are manufactured.

BULWER (bụl'-), Sir Henry Lytton, Lord Dalling and Bulwer, diplomatist and author, elder brother of Lord Lytton, born 1804, died 1872. He was attached to the British embassies at Berlin, Brussels, and the Hague from 1827 to 1830, when he entered parliament. In 1837 he was sent as secretary of legation to Constantinople; subsequently he was minister at Madrid and Washington; and he succeeded Lord Stratford de Redcliffe as ambassador at the Porte (1858–65). He wrote, among others, France, Social, Literary, and Political; Life of Byron, Life of Palmerston, and Historical Characters. He was raised to the peerage in 1871.

BULWER LYTTON. See Lytton, Lord.

BUM-BOAT, a small boat used to sell vegetables, etc., to ships lying at a distance from shore.

BUMPUS, Herman Carey, an American anatomist and zoologist, born in Maine in 1862. He is director of the

biological laboratory at Am. Mus. Natural History, New York.

BUNCE, Francis Marvin, an American admiral, born in Connecticut in 1836. He was graduated at Annapolis in 1857, was wounded at the siege of Charleston in 1863, and was commander of the monitor Monadnock from Philadelphia to San Francisco in 1865. In 1898 he was retired with the rank of rear admiral.

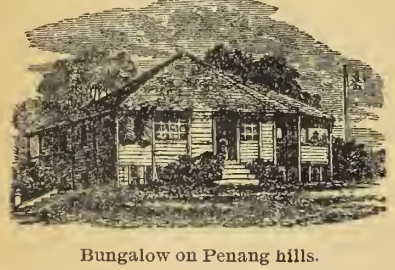
BUNCO, a word used to designate a species of swindling practiced by city sharpers on strangers. The stranger is led to believe that the "bunco man" is acquainted with people of influence in the stranger's locality, and in one way or another is then fleeced of money.

BUNCOMBE, BUNKUM, a county in South Carolina; area, 450 sq. miles; pop. 21,910. The term Bunkum, meaning talking for talking's sake, bombastic speech-making, is said to have originated with a congressional member for this county, who declared that he was only talking for Buncombe, when attempts were made to cut his oratory short.

BUNDELCUND, a tract of country in Upper India lying between the river Jumna on the n., and the Chambal on the n. and w.; area, 20,658 sq. miles; pop. 3,779,627. It comprises the British districts of Hamirpur, Jalaun, Jhansi, Lalitpur, and Banda, and thirty-one native states.

BUNDESRATH (bun'des-rät), the German federal council which represents the individual states of the empire, as the Reichstag represents the German nation. It consists of sixty-two delegates, and its functions are mainly those of a confirming body, although it has the privilege of rejecting measures passed by the Reichstag.

BUN'GALOW, in India, a house or residence, generally of a single floor. Native bungalows are constructed of wood, bamboos, etc.; but those erected



Bungalow on Penang hills.

by Europeans are generally built of sun-dried bricks, and thatched or tiled, and are of all styles and sizes, but invariably surrounded by a veranda.

BUN'ION, an enlargement and inflammation of the joint of the great toe arising from irritation of the small membranous sac called bursa mucosa.

BUNK, a wooden box or case serving as a seat during the day and a bed at night; also one of a series of sleeping berths arranged above each other.

BUNKER HILL, a small eminence in Charlestown, now a part of Boston, Mass.; scene of the first important battle in the revolutionary war, fought June 17, 1775. A considerable body of Americans having been sent to occupy the peninsula on which Charlestown stands, a British force was sent to dislodge them. This was not effected till after three assaults on their intrenched position, with a loss of 1000 men, while the Americans did not lose half that number.

BUNKUM. See Buncombe.

BUNSEN, Robert Wilhelm Eberard, eminent German chemist, born at Göttingen 1811. Among his many discoveries and inventions are the production of magnesium in quantities, magnesium light, spectrum analysis, the Bunsen burner, etc. He died in 1899.

BUNSEN'S BURNER, a form of gas burner especially adapted for heating, consisting of a tube, in which, by means of holes in the side, the gas becomes mixed with air before consumption so that it gives a non-illuminating smokeless flame.

BUNT'ING, a thin woolen stuff, of which the colors and signals of a ship are usually formed; hence, a vessel's flags collectively.

BUN'YAN, John, author of the Pilgrim's Progress, was the son of a tinker, and was born at the village of Elstow, near Bedford, in 1628, died in London 1688. He followed his father's employment, but during the civil war he served as a soldier. Returning to Elstow, after much mental conflict his mind became impressed with a deep sense of the truth and importance of religion. He joined a society of Anabaptists at Bedford, and at length undertook the office of a public teacher among them. Acting in defiance of the severe laws against dissenters, Bunyan was detained in prison for twelve years (1660–72), but was at last liberated, and became pastor of the community with which he had previously been connected. During his imprisonment he wrote Profitable Meditations, The Holy City, etc., and also the curious piece of autobiography entitled Grace Abounding to the Chief of Sinners. In 1675 he was sent to prison for six months under the Conventicle Act. To this confinement he owes his chief literary fame, for in the solitude of his cell he produced the first part of that admired religious allegory, the Pilgrim's Progress. His Holy War, his other religious parables, and his devotional tracts, which are numerous, are also remarkable, and many of them valuable. On obtaining his liberty Bunyan resumed his functions as a minister at Bedford, and became extremely popular. He died when on a visit to London.

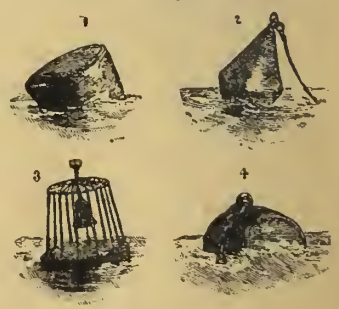
BUONAPARTE. See Bonaparte.

BUONAROTTI (bu-o-nä-rot'tē), Michael Angelo, of the ancient family of the counts of Canossa, born at Caprese, in Tuscany, 1475, died at Rome 1563; a distinguished Italian painter, sculptor, architect, and poet. Having distinguished himself both in sculpture and painting, he was commissioned (together with Leonardo da Vinci) to decorate the senate-hall at Florence with a historical design, but before it was finished, in 1505, he was induced by Pope Julius II. to settle in Rome. Here he sculptured the monument of the pontiff (there are seven statues belonging to it) now in the church of St. Pietro in Vincoli; and painted the dome of the Sistine Chapel, his frescoes representing the creation and the principal events of sacred history. In 1530 he took a leading part in the defense of Florence

Michael Angelo Buonarotti.

against Charles V. Three years later he began his great picture in the Sistine Chapel, the Last Judgment, which occupied him eight years. His last considerable works in painting were two large pictures: the Conversion of St. Paul and the Crucifixion of St. Peter in the Pauline Chapel. In sculpture he executed the Descent of Christ from the Cross, four figures of one piece of marble. His statue of Bacchus was thought by Raphael to possess equal perfection with the masterpieces of Phidias and Praxiteles. As late as 1546 he was obliged to undertake the continuation of the building of St. Peter's, and planned and built the dome, but he did not live long enough to see his plan finished, in which many alterations were made after his death. Besides this, he undertook the building of the Piazza del Campidoglio (Capitol), of the Farnese Palace, and of many other edifices. His style in architecture is distinguished by grandeur and boldness, and in his ornaments the untamed character of the imagination frequently appears, preferring the uncommon to the simple and elegant.

BUOY (boi), any floating body employed to point out the particular situation of a ship's anchor, a shoal, the direction of a navigable channel, etc.



Buoys.
1, Can-buoy. 2, Nun-buoy. 3, Bell-buoy. 4, Mooring-buoy.

They are made of wood, or now more commonly of wrought-iron plates riveted together and forming hollow chambers. They are generally moored by chains to the bed of the channel, etc.

They are of various shapes, and receive corresponding names; thus there are the can-buoy, the nun-buoy, the bell-buoy, the mooring-buoy, as represented in the accompanying cuts. The name is also given to a floating object intended to keep a person afloat till he can be taken from the water: more particularly called a life-bouy.

BURBANK, Luther, an American plant grower, born in Massachusetts in 1849, and since 1875 the proprictor of an experimental farm near Santa Rosa, Cal. By means of artificial selection he has bred numerous useful varieties of food plant, including a thornless cactus and a white blackberry.

BURCHARD, Samuel Dickinson, an American Presbyterian clergyman, born in New York in 1812, died in 1891. He preached to New York City. Burchard is famous chiefly for his speech in 1884 during the Blaine-Cleveland campaign, in which he denounced the democratic party as the party of Rum, Romanism, and Rebellion. The speech, it is believed, defeated Blaine, notwithstanding his favor with many Roman Catholics.

BURDEN, Henry, an American inventor, born in Scotland in 1791, died in 1871. His principal inventions, are improvements in the plow, a railroad spike making machine, and a horseshoe making machine. He was the owner of the Troy Iron and Nail Works.

BURDEN OF PROOF, the obligation resting on the affirmant of a proposition to prove the truth of his affirmation. In criminal cases the burden of proof rcsts with the state.

BUR'DETT, Sir Francis, English politician, born 1770, died 1844. In 1796 he entered parliament as member for Boroughbridge, and advocated parliamentary reform and various liberal measures. He afterward sat for Middlesex, and in 1807–37 for Westminster. In his later years he became a Tory, and represented North Wilts. In 1793 he married the youngest daughter of Thomas Coutts the banker.

BURDETT-COUTTS (kōts), Angela Georgina, daughter of the above, born 1814, has become deservedly popular for the liberal use she has made of the immense wealth she inherited from her grandfather (Thomas Coutts) in public and private charities. In 1871 she received a peerage from government, and in 1881 married a Mr. Ashmead-Bartlett who has assumed the name of Burdett-Coutts. She died in 1906.

BUREAU (bū-rō'), a writing-table, also the chamber of an officer of government and the body of subordinate officers who labor under the direction of a chief.—Bureau system, or bureaucracy, is a term often applied to those governments in which the business of administration is carried on in departments, each under the control of a chief; or, more broadly, the system of centralizing the administration of a country through regularly graded series of government officials.

BURGESS, Edward, an American naval architect, born in 1848, died in 1891. He is noted for his designs of racing yachts, including the Puritan, the Mayflower, and the Volunteer, which were successful defenders of the America's cup in 1885, 1886, and 1887.

BURGESS, Frank Gelett, an American humorist, born in 1866, in Boston. He originated in 1895 a fantastical weekly called The Lark, which was published with poor success at San Francisco. His drawings are quaint and most pleasing.

BURGESS, Neil, an American actor, born in Boston in 1846. His principal rôles have been those of Josiah Allen's Wife, and the Widow Bedott, female characters in which the actor evinced a quaint and fetching humor which has made him exceedingly popular.

BURG'LARY is defined in English law to be a breaking and entering the dwelling-house of another, in the night, with intent to commit some felony within thc same, whether such felonious intent be executed or not. In the U. States the crime of burglary has been defined in many states by statutes in which the meaning of the term has been considerably widened so as to include the breaking into any building at any time with the intention of committing a crime.

BUR'GOMASTER, the chief magistrate of a municipal town in the Netherlands and Germany. The title is equivalent to the English mayor and the Scotch provost.

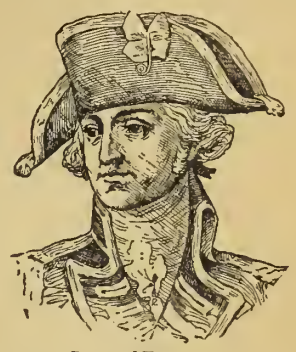
BURGOS (bur'gos), a city of northern Spain, once the capital of the kingdom of Old Castile, and now the chief town of the province of Burgos. The cathedral, commenced in 1221, is one of the

The Cathedral of Burgos.

finest examples of Gothic architecture in Spain. It contains the tombs of the famous Cid, and of Don Fernando, both natives of Burgos, and celebrated throughout Spain for their heroic achievements in the wars with the Moors. Before the removal of the court to Madrid, in the 16th century, Burgos was in a very flourishing condition, and contained thrice its present population. It has some manufactures in woolens and linens. Pop. 29,683.—The province has an area of 5650 sq. miles, largely hilly or mountainous, but with good agricultural and pastoral land. Pop. 348,152.

BURGOYNE (bur-goin'), John, an English general officer and dramatist; born 1722, died 1792. After serving in various parts of the world, he was in 1777 appointed commander of an army against the revolted Americans, and took Ticonderoga, but had at last to surrender with his whole army at Saratoga. He was ill received on his return to England, and deprived of his command of the 76th Light Dragoons and the governorship of Fort William.

BURGUNDY, a region of western Europe, so named from the Burgundians, a Teutonic or Germanic people originally from the country between the Oder and the Vistula. They migrated first to the region of the Upper Rhine, and in the beginning of the 5th century



General Burgoyne.

passed into Gaul and obtained possession of the southeastern part of this country, where they founded a kingdom having its seat of government sometimes at Lyons, and sometimes at Geneva. They were at last wholly subdued by the Franks. In 879 Boson, Count of Autun, succeeded in establishing the royal dignity again in part of this kingdom. He styled himself King of Provence, and had his residence at Arles. His son Louis added the country beyond the Jura, and thus established Cis-Juran Burgundy. A second kingdom arose when Rudolph of Strettlingen formed Upper or Transjuran Burgundy out of part of Switzerland and Savoy. Both these Burgundian kingdoms were united, and finally, on the extinction of Rudolph's line, were incorporated with Germany. But a third state, the historical Duchy of Burgundy, consisting principally of the French province of Bourgogne or Burgundy, had been formed as a great feudal and almost independent province of France in the 9th century. This first ducal line died out with a Duke Philip, and the duchy, reverting to the crown, was, in 1363, granted by King John of France to his son Philip the Bold, who thus became the founder of a new line of dukes of Burgundy. A marriage with Margaret, daughter of Louis III., count of Flanders, brought him Flanders, Mechlin, Antwerp, and Franche-Comté. He was succeeded by his son Duke John the Fearless, whose son and successor, Philip the Good, so greatly extended his dominions, that on his death in 1467 his son Charles, surnamed the Bold, though possessing only the title of duke, was in reality one of the richest and most powerful sovereigns of Europe. (See Charles the Bold.) Charles left a daughter, Mary of Burgundy, the sole heiress of his states, who by her marriage to Maximilian of Austria transferred a large part of her dominions to that prince, while Louis XI. of France acquired Burgundy proper as a male fief of France. Burgundy then formed a province, and is now represented by the four departments of Yonne, Côte-d'Or, Saône-et-Loire, and Ain. It is watered by a number of navigable rivers, and is one of the most productive provinces in France, especially of wines.

BURGUNDY PITCH, a resin got from the Norway spruce and several other pines. It is used in medicine as a stimulating plaster. It takes its name from Burgundy in France, where it was first prepared.

BURGUNDY WINES are produced in the former province of Burgundy, especially in the department of Côte-d'Or, and in richness of flavor and all the more delicate qualities of the juice of the grape they are inferior to none in the world. Among the red wines of Burgundy the finest are the Chambertin, the Clos Vougeot, Romanée-Conty, etc.

BURIAL (be'ri-al), the mode of disposing of the dead, a practice which varies among different peoples. Among savage races, and even among some cultured peoples of the East, exposure to wild animals or birds of prey is not uncommon. The careful embalmment of their dead by the ancient Egyptians may be regarded as a special form of burial. But by far the most common forms of disposing of the dead have been burning and interring. Among the Greeks and Romans both forms were practiced, though among the latter burning became common only in the later times of the republic. In this form of burial the corpse, after being borne in procession through the streets, was placed upon a pyre built of wood, and profusely sprinkled with oils and perfumes. Fire was set to the wood, and after the process of cremation was complete the bones and ashes were carefully gathered together by the relatives and placed in an urn. With the introduction of the Christian religion, consecrated places were appropriated for the purpose of general burial, and the Roman custom of providing the sepulcher with a stone and inscription was continued by the Christians. The practice of cremation now declined and finally disappeared, but has recently to some little extent been revived.

BU'RIATS, a nomadic Tartar people allied to the Kalmucks, inhabiting the southern part of the government of Irkutsk and Transbaikalia. Their number is about 200,000. They live in huts called yurts, which in summer are covered with leather, in winter with felt. They support themselves by their flocks, by hunting, and the mechanical arts, particularly the forging of iron.

BURKE, Edmund, a writer, orator, and statesman of great eminence, was born in Dublin, Jan. 1, 1730. The political career for which he had been arduously preparing himself all along at length opened up to him on his appointment as private secretary to Mr. W. G. Hamilton, Secretary for Ireland, in 1761. On his return he obtained the appointment of private secretary to the Marquis of Rockingham, then First Lord of the Treasury. Through the same interest he entered parliament as member for Wendover (1765). The great question of the right of taxing the American colonies was then occupying parliament, and the Rockingham ministry having taken, mainly through Burke's advice, a middle and undecided course, was soon dissolved (1766). From 1770 to 1782 Lord North was in power, and Burke held no office. In 1774–80 he was member for Bristol. In several magnificent speeches he criticized the ministerial measures with regard to the colonies, and advocated a policy of justice and conciliation. In 1782, when the Rockingham party returned to power, Burke obtained the lucrative post of paymaster-general of the forces, and shortly after introduced his famous

Edmund Burke.

bill for economical reform, which passed after considerable modifications had been made on it. On the fall of the Duke of Portland's coalition ministry, 1783, of which Burke had also been part, Pitt again succeeded to power, and it was during this administration that the impeachment of Hastings, in which Burke was the prime mover, took place. The lucidity, eloquence, and mastery of detail which Burke showed on this occasion have never been surpassed. The chief feature in the latter part of Burke's life was his resolute struggle against the ideas and doctrines of the French revolution. His attitude on this question separated him from his old friend Fox, and the Liberals who followed Fox. His famous Reflections on the Revolution in France, a pamphlet which appeared in 1790, had an unprecedented sale, and gave enormous impetus to the reaction which had commenced in England. From this time most of his writings are powerful pleadings on the same side. In 1794 he withdrew from parliament. Three years after, on July 8, 1797, he died, his end being hastened by grief for the loss of his only son.

BURLEIGH, Lord. See Cecil.

BURLESQUE (bur-lesk') signifies a low form of the comic, arising generally from a ludicrous mixture of things high and low. High thoughts, for instance, are clothed in low expressions, noble subjects described in a familiar manner, or vice versa. The true comic shows us an instructive, if laughable, side of things; the burlesque rravesties and caricatures them in order to excite laughter or ridicule.

BURLET'TA, a light, comic species of musical drama, which derives its name from the Italian burlare, to jest. It originated in Italy, from whence it passed to the Transalpine countries.

BURLINGTON, city, important railroad center, and river-port of Iowa; capital of Des Moines co.; situated on the Mississippi river; 207 miles w.s.w. of Chicago, 250 miles by water above St. Louis, and 296 miles by railroad east of Omaha. The river is here a broad, deep, and beautiful stream. The plan of the city is regular, and the houses are mostly of brick and stone. This place is the seat of Burlington University, and contains about twenty-five churches and numerous manufactories. Pop. 27,400.

BURLINGTON, city, and railroad center, of Burlington co., N. J., on the Delaware river, 20 miles above Philadelphia and 12 miles s.w. of Trenton. The principal industries are the manufacture of shoes, canned goods, iron pipes of all sizes, stoves, heaters, and carriages. Pop. 10,100.

BURLINGTON, city and railroad center and county-seat of Chittenden co., Vt., on Burlington Bay of Lake Champlain; 40 miles w. from Montpelier, the capital of the state.

The heaviest trade in the city is in lumber. There are large quarries of building-stone, of limestone, and of fine marble within or near the city limits; large cotton-mills, steam marble-mills, machine-shops, foundries, sash, chair, furniture, patent medicine, malt cereals, and shoe factories, paper-mills, and many smaller manufacturing trades are thriving.

The University of Vermont and State Agricultural College is situated here. Pop. 20,140.

BURLINGTON LIMESTONE, a formation of the carboniferous period, occuring in Missouri and Illinois, adjacent to the Mississippi river. It affords a valuable building-stone. and is peculiarly interesting to naturalists. The upper bed is of a light-gray color, and is nearly pure carbonate of lime. The lower bed contains more magnesia.

BUR'MAH, a country of southern Asia, bounded on the north by Assam and Tibet, on the east by Chinese territory and Siam, elsewhere mainly by the Bay of Bengal; area about 290,000 sq. miles. It is traversed by great mountain ranges branching off from those of northern India and running parallel to each other southward to the sea. Between these ranges and in the plains or valleys here situated the four great rivers of Burmah—the Irrawaddy, its tributary the Kyen-dwen, the Sittang, and the Salwen—flow in a southerly direction to the sea, watering the rich alluvial tracts of Lower Burmah, and having at their mouths all the great seaports of the country—Rangoon, Bassein, Moulmein, Akyab, etc. The Irrawaddy is of great value as a highway of communication and traffic, being navigable beyond Bhamo, near the Chinese frontier, or over 800 miles. In their lower courses the rivers often overflow their banks in the rainy season. Though its resources are almost entirely undeveloped, the country, as a whole, is productive, especially in the lower portions. Here grow rice, sugar-cane, tobacco, cotton, indigo, etc. Cotton is grown almost everywhere; tea is cultivated in many of the more elevated parts. The forests produce timber of many sorts, including teak, which grows most luxuriantly, and is largely exported. Iron-wood is another valuable timber; and among forest products are also the bamboo, cutch, stick-lac, and

rubber. Burmah has great mineral wealth—gold, silver, precious stones, iron, marble, lead, tin, coal, petroleum, etc.; but these resources have not yet been much developed. The chief precious stone is the ruby, and the mines of this gem belong to the crown. Sapphire, amber, and jade are also obtained. Among wild animals are the elephant, rhinoceros, tiger, leopard, deer of various kinds, and the wild hog. Among domestic animals are the ox, buffalo, horse, and elephant. The rivers abound with fish. The most common fruits are the guava, custard-apple, tamarind, pine, orange, banana, jack, and mango. The yam and sweet-potato are cultivated, and in some parts the common potato. The climate of course varies according to elevation and other circumstances, but as a whole is warm, though not unhealthful, except in low jungly districts. The rainfall among the mountains reaches as high as 190 inches per annum.

The population may be stated at about 9,000,000 or 10,000,000, made up of a great variety of races besides the Burmese proper, as Talaings, Shans, Karens, etc. The Burmese proper are of a brown color, with lank, black hair (seldom any on the face), and have active, vigorous, well-proportioned frames. They are a cheerful, lively people, fond of amusement, averse to continuous exertion, free from prejudice of caste or creed, temperate and hardy. The predominant religion is Buddhism. The Burmese language is monosyllabic, like Chinese, and is written with an alphabet the characters of which (derived from India) are more or less circular. There is a considerable literature.

Burmah is now divided into Lower Burmah and Upper Burmah, the former till 1886 being called British Burmah, while the latter till that date was an independent kingdom or empire. Lower Burmah was acquired from Independent Burmah in 1826 and 1852 as the result of two wars terminating in favor of Britain. It comprises the divisions of Aracan, Pegu, Irrawaddy, and Tenasserim; area, 87,957 sq. miles; population 5,371,328. Under British rule it has prospered greatly, the population and trade having increased immensely. Roads, canals, railways, and other public works have been carried out. The area of Upper Burmah under direct British administration is 83,473 sq. miles; pop. 3,849,833. The chief city and port is Rangoon, which is now connected by railway with Mandalay in Upper Burmah.

Under its native kings the form of government in Upper Burmah was absolute monarchy, the seat of government being latterly at Mandalay. The king was assisted in governing by a council of state known as the Hloot-daw, to which belonged the functions of a house of legislature, a cabinet, and a supreme court. The king had power to punish at his pleasure any one, even the great officers of state. The revenue was derived from taxes levied in a very irregular and capricious manner, and official corruption was rampant. The criminal laws were barbarously severe. Capital punishment was commonly inflicted by decapitation, but crucifixion and disemboweling were also practiced. After the loss of the maritime provinces the influence of Independent Burmah greatly declined, as did also its Asiatic and foreign trade.

The Burmese empire is of little note in ancient or general history. Upper Burmah was annexed to the British empire by proclamation of the Viceroy of India, 1st Jan. 1886. The area thus annexed was about 200,000 sq. miles, of which half belonged to the kingdom proper, half to the semi-independent Shan states. Its government is now organized under a single lieutenant-governor, Upper and Lower Burmah forming each a commissionership, and being divided into four divisions each, which again are subdivided into districts.

BUR'NABY, Frederick Gustavus, English soldier and traveler, born 1842. In 1875 he made his famous ride to Khiva. In 1876 he rode through Asiatic Turkey and Persia. Of both these journeys he published narratives. In 1885 (Jan. 17), while serving as lieutenant-colonel of the Royal Horse Guards in the Egyptian campaign, he was slain at the battle of Abu-Klea.

BURNETT, Frances Eliza Hodgson, an Anglo-American novelist, born in England in 1849 and identified with American literature since 1872. Her most popular works are That Lass o' Lowrie's, A Lady of Quality, Little Lord Fauntleroy, and Through One Administration. In 1873 she married Dr. S. M. Burnett. She lives in Europe and in Washington.

BURNING-GLASS, a lens which, by bringing the sun's rays rapidly to a focus, produces a heat strong enough to kindle combustible matter. The lenses commonly used are convex on both sides, and have a small focal distance. That such a glass may produce its greatest effect it is necessary that the rays of the sun should fall upon it in a perpendicular direction. The effect may be greatly augmented by the use of a second lens, of a smaller focal distance, placed between the first and its focus. Some immense burning-glasses have been made, producing surprising effects. Concave burning-mirrors produce the same kind of results, and have almost four times more power than burning-glasses of equal extent and curvature. The concavity must present a surface of high reflecting power (polished silver or other metal, or silvered glass), and must be either spherical or parabolic. Plane mirrors may also be employed like concave ones, if several of them are combined in a proper manner. The ancients were acquainted with such mirrors, and Archimedes is said to have set the Roman fleet on fire at the siege of Syracuse (B.C. 212) by some such means. In 1747 Buffon by a combination of mirrors burned wood at the distance of 200 feet and melted tin at the distance of 150, etc.

BURNING-MIRRORS. See preceding article.

BURNISHER, a blunt, smooth tool, used for smoothing and polishing a rough surface by rubbing. Agates, tempered steel, and dog's teeth are used for burnishing.

BURN'LEY, a parl., municipal, and county borough of England, in Lancashire, about 22 miles n. of Manchester. Pop. 97,044.

BURNS, Robert, the great lyric poet of Scotland, was born near Ayr, January 25, 1759. He was instructed in the ordinary branches of an English education; to these he afterward added French and a little mathematics. But

Robert Burns.

most of his education was got from the general reading of books, to which he gave himself with passion. In this manner he learned what the best English poets might teach him, and cultivated the instincts for poetry which had been implanted in his nature. He began to produce poetical pieces which attracted the notice of his neighbors and gained him considerable reputation. In 1786 Burns was about to set sail for Jamaica, when he was drawn to Edinburgh by a letter from Dr. Blacklock to an Ayrshire friend of his and the poet, recommending that he should take advantage of the general admiration his poems had excited, and publish a new edition of them. This advice was eagerly adopted, and the result exceeded his most sanguine expectations. After remaining more than a year in the Scottish metropolis, admired, flattered, and caressed by persons of eminence for their rank, fortune, or talents, he retired to the country with the sum of some $2500, which he had realized by the second publication of his poems. A part of this sum he advanced to his brother, and with the remainder took a considerable farm (Ellisland) near Dumfries, to which he subsequently added the office of exciseman. He now married Jean Armour, a Mauchline girl. But the farming at Ellisland was not a success, and in about three years Burns removed to Dumfries and relied on his employment as an exciseman alone. He continued to exercise his pen, particularly in the composition of a number of beautiful songs adapted to old Scottish tunes. In the winter of 1795 his constitution, broken by cares, irregularities, and passions, fell into premature decline; and in July, 1796, a rheumatic fever terminated his life and sufferings at the early age of thirty-seven.

BURNS AND SCALDS are injuries produced by the application of excessive heat to the human body. They are generally dangerous in proportion to the extent of surface they cover, and a wide-spread scald may cause serious consequences on account of the nervous shock. Congestion of the brain, pneu-

monia, inflammation of the bowels, or lock-jaw may result from an extensive burn. Hence the treatment requires to be both local and constitutional. If there is shivering or exhaustion hot brandy and water may be given with good effect, and if there is much pain a sedative solution of opium. The local treatment consists in dredging the burn with fine wheat flour, and then wrapping it up in cotton-wool. An application of equal quantities of olive-oil and lime-water, called carron-oil, is much recommended by some, the part being afterward covered by cotton-wool. The main thing is to keep the air from the injured part, and therefore, when a blister forms, although it may be pricked, the loose skin should not be removed.

BURNSIDE, Ambrose Everett, an American soldier, born in Indiana in 1824, died in 1881. He began his military career as a colonel of Rhode Island volunteers in the civil war and took part

A. E. Burnside.

in the battles of Antietam, Fredericksburg, and other engagements. He tried to suppress several newspapers in the North, but his orders were overruled by popular pressure. He was raised to the rank of major-general of volunteers, and toward the end of the war he served under Grant in the Richmond campaign. Burnside subsequently to the war served in the senate of the U. States.

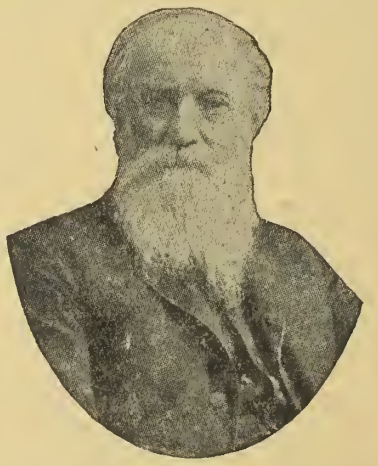
BURNT-OFFERING, something offered and burnt on an altar as an atonement for sin; a sacrifice. The burnt-offerings of the Jews were either some clean animal, as an ox, a sheep, a pigeon; or some species of vegetable substance, as bread, flour, ears of wheat or barley.

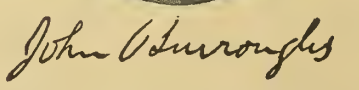
BURR, Aaron, third vice-president of the U. States, born in New Jersey in 1756. After serving with honor in the revolutionary army he became a lawyer, and finally leader of the democratic party and vice-president in 1801. His duel with Alexander Hamilton, which ended fatally for the latter, drove him from New York to settle farther west, where he conceived an audacious and grandiose scheme of founding an empire in the s.w. He was tried for treason, and, though acquitted, sank into obscurity. He died in 1836.

BUR'RITT, Elihu, the "learned blacksmith," as he was called, was born at New Britain, Conn., Dec. 8, 1810. He was apprenticed to a blacksmith, but, conceiving a strong desire for knowledge, he began to read English literature, and with great diligence and perseverance at length acquired proficiency not only in the ancient, but also most of the modern languages of Europe. In 1848 the first International Peace Congress was held under his guidance at Brussels. In 1865 he was consular agent at Birmingham. In 1868 he returned to live on his farm in America, and died March 7, 1879. His best-

known writings are Sparks from the Anvil; Thoughts and Things at Home and Abroad; Chips from Many Blocks; etc.

BURROUGHS, John, an American naturalist and writer, born at Roxbury, N. Y., in 1837. His chief works are concerned with descriptions of animals and plants, but he has also written a considerable number of essays and





criticisms. Among his more popular books are Wake, Robin; Winter Sunshine; Birds and Poets; Locusts and Wild Honey; Fresh Fields; Signs and Seasons; Indoor Studies; and Squirrels and Other Fur-Bearers.

BURROUGHS, Marie, an American actress, born at San Francisco in 1866. She made her début in New York in The Rajah, and subsequently appeared with E. S. Willard in The Middleman, Judah and Ophelia, and other plays. She married Robert Barclay MacPherson in 1901.

BURROWING-OWL, an American owl which dwells in holes in the ground either made by itself or by some other animal, as the prairie-dog or marmot. It feeds on insects and seeks it food by day.

BURTON, John Hill, historian of Scotland, born at Aberdeen 1809, died near Edinburgh 1881. His first book was the Life and Correspondence of David Hume (1846), followed by Lives of Lord Lovat and Duncan Forbes of Culloden, and other works. His chief work was his History of Scotland from the Earliest Times to 1746. He was appointed secretary to the Scottish Prison Board in 1854, and was connected with this department till his death.

BURTON, Sir Richard Francis, K.C. M.G., English traveler and linguist, born in 1821. In 1853 he went to Arabia and visited Mecca and Medina disguised as a Mohammedan pilgrim—a sufficiently dangerous journey. He visited many countries and published many works, and translations of Camöens's Lusiads and of the Arabian Nights, etc. Died 1890.

BUR'TON, Robert, an English writer, born at Lindley in Leicestershire in 1576. His vast out-of-the-way learning is curiously displayed in his book The Anatomy of Melancholy, which he published in 1621. Burton died in 1640.

BURTON-UPON-TRENT, a county borough of England, in Staffordshire. It is chiefly celebrated for its excellent ale, for which there are numerous breweries, employing upward of 5000 men and boys. Pop. 50,386.

BURY (be'ri), a municipal, county, and parl. borough of England, in Lancashire, 8 miles n.n.w. of Manchester. Sir Robert Peel was born near Bury in 1788, and a bronze statue of him adorns the town. Pop. 58,028.

BURYING-BEETLE, the name of a genus of insects. They have a very keen scent, which guides them to the dead bodies of rats, mice, etc., which form their food. Several beetles will unite to cover such animals, burying them sometimes more than 6 inches in the earth. They deposit their eggs on the carrion, and in less than a fortnight the larvæ issue. The species are common everywhere.

BUSBY (buz'bi), a military head-dress worn by hussars, artillerymen, and engineers, consisting of a fur hat with a bag, of the same color as the facings of the regiment, hanging from the top over the right side. The bag appears to be a relic of a Hungarian head-dress from which a long padded bag hung over, and was attached to the right shoulder as a defense against sword-cuts.

BUSHEL, an English dry measure, containing 8 gallons or 4 pecks.

BUSHMEN, a race of people who dwell in the western part of South Africa, in the immense plains bordering on the n. side of the colony of the Cape of Good Hope. They are the most degraded of the races who inhabit this part of the country. Their language is exceedingly poor, consisting only of a certain clicking with the tongue and harsh gurgling tones, for which we have no letters.

BUSH'RANGERS, the name for desperadoes in Australia who, taking to the bush, have supported themselves by levying contributions on the prop-

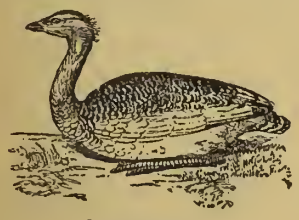
erty of all and sundry within their reach.

BUSINESS COLLEGES, the name in America for the higher-class institutions specially intended to give a practical training in all subjects belonging to commerce.

BUSINESS HOURS, the hours of the day in which business is ordinarily done. In the U. States from 8 a. m. till 6 p. m. is the usual business day. In American banks business hours are from 10 a. m. to 3 p. m. No payment is made nor deposit received except in these hours. Bills cannot be collected nor payment legally tendered except during business hours.

BUST, in sculpture, the representation of that portion of the human figure which comprises the head and the upper part of the body. During the literary period of Greece the portrait busts of the learned formed an important branch of art, and in this way we come to possess faithful likenesscs of Socrates, Plato, Demosthenes, etc., in which the artists showed great power of expressing the character of those represented. The number of busts belonging to the time of the Roman Empire is very considerable, but those of the Roman poets and men of letters have not been preserved in nearly so large numbers as those of the Greeks. The first bust that can be depended upon as giving a correct likeness is that of Scipio Africanus the elder.

BUS'TARD, a bird belonging to the order Cursores, or runners, but approaching the waders. The great bustard is the largest European bird, the male often weighing 30 lbs., with a



Great bustard.

breadth of wing of 6 or 7 feet. The bustard is now rare in Britain, but abounds in the south and east of Europe and the steppes of Tartary, feeding on green corn and other vegetables, and on earth-worms. Its flesh is esteemed. All the species run fast, and take flight with difficulty.

BUTLER, Alban, English Roman Catholic writer, born 1711, died 1773. His Lives of the Saints is a monument of erudition which cost him thirty years' labor.

BUTLER, Benjamin Franklin, an American politician and lawyer, born in New York in 1795, died 1858. He was Martin Van Buren's partner until 1821, revised the New York statutes, was attorney-general in Jackson's cabinet, and secretary of war in Polk's cabinet. He was an ardent democrat.

BUTLER, Benjamin Franklin, an American soldier, politician, and governor, born in Deerfield, N. H., in 1818, died in 1893. He was candidate for governor of Massachusetts in 1860, and at the opening of the civil war was made major-general of volunteers. Butler from the first was an uncompromising enemy of slave-owners, and his occupation of New Orleans from 1862 to 1863 has been critized severely. His chief offense was his general order that women insulting officers should be treated as women of the town. Jefferson Davis issued a proclamation that Butler was an outlaw, and if captured should be at once hanged. Subsequently to the war Butler was very prominent in politics, and in 1880 was elected governor of Massachusetts. In 1884 he was candidate for president on the greenback-labor ticket. He died at Washington.

BUTLER, Joseph, an English prelate and celebrated writer on ethics and theology, born in Berkshire in 1692. The sermons which he delivered as preacher at the Rolls Chapel, an appointment he occupied in 1718–26, still hold a high place in ethical literature. But his great work is the Analogy of Religion, Natural and Revealed, to the Constitution and Course of Nature, which was published in 1736, and acquired for him a great reputation. In 1738 he was made Bishop of Bristol, and in 1750 promoted to the see of Durham. He died in 1752.

BUTLER, Nicholas Murray, an American educator, born in New Jersey in 1862, educated in American and European universities, and in 1887 organized the New York College for the Training of Teachers. He founded the Educational Review in 1891, and since 1901 has been president of Columbia University.

BUTLER, Samuel, English satirical poet. Butler published the first part of Hudibras after the Restoration, in 1663. It became immensely popular, and Charles II. himself was perpetually

Samuel Butler.

quoting the poem, but did nothing for the author, who seems to have passed the latter part of his life dependent on the support of friends, and died in poverty in London in 1680. A second part of Hudibras appeared in 1664, a third in 1678. The poem is a sort of burlesque epic ridiculing Puritanism, and fanaticism and hypocrisy generally. Butler was author also of various other pieces, including a satire on the Royal Society entitled the Elephant in the Moon.

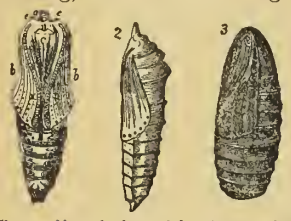
BUTTE, a city and county seat of Silverbow Co., Mont., on the western slope of a range of the Rocky Mountains, and on the Oregon Short Line, the Northern Pacific, the Great Northern, and the Montana Union railroads. The famous Anaconda Copper and Silver Mine is located here, and within a few miles are many other productive gold, silver, and copper deposits, the industries of the city centering almost entirely in the mines. In copper, the production of Butte is placed at about one-half of the entire output of the United States, and the amount of gold and silver mined is also considerable, the value of the annual production of these three minerals being estimated at nearly $50,000,000. Besides the mines, there are immense mills and smelting-works. Pop. 33,125.

BUTTER, a fatty substance produced from milk, especially cows' milk. When the milk is first drawn this fatty matter is disseminated through it in minute clear globules inclosed in membranous sacs or bags which in a short time rise to the surface and form cream. The cream is then skimmed off to undergo the operation of churning, which by rupturing the sacs effects a separation of the cream into a solid called butter and a liquid called buttermilk, the latter consisting of whey and other caseous matter. The quality of the butter depends much upon the treatment of the cream at this stage. Its temperature in warm weather ought to be between 53° and 55°; in colder weather several degrees higher. If too cold the fat is hard and does not coalesce, and if too warm it becomes semi-liquid. The butter, being formed into lumps, is washed well in cold water, and kneaded till all the buttermilk has been expelled. Butter of good quality has a faint sweet odor and a soft delicate flavor. Its composition varies somewhat according to the way in which it is made. It has usually from 80 to 90 per cent of pure fat, the rest consisting of casein, water, and salt. The water should not amount to more than 10 per cent, nor the salt to more than 2 per cent of the whole weight, but butter is frequently adulterated by the excess of these two elements. Butter which is to be thoroughly "cured," so as to keep for some length of time, is usually prepared with from 5 to 8 per cent of common salt.

BUTTERCUP, the popular name of two or three species of plants with brilliant yellow-flowers.

BUTTERFLY, the common name of all diurnal lepidopterous insects. One of the most remarkable and interesting circumstances connected with these beautiful insects is their series of transformations before reaching a perfect state. The female butterfly lays a great quantity of eggs, which produce larvæ commonly called caterpillars. After a short life these assume a new form, and become chrysalids or pupæ. These chrysalids are attached to other bodies in various ways, and are of various forms; they often have brilliant golden or argentine spots. Within its covering the insect develops, to emerge as the active and brilliant butterfly. These insects in their perfect form suck the nectar of plants, but take little food, and are all believed to be short-lived, their work in the perfect state being almost confined to the propagation of

the species. Butterflies vary greatly in size and coloring, but most of them are very beautiful. The largest are found in tropical countries, where some measure nearly a foot across the wings. They may generally be distinguished from moths by having their wings erect when sitting, the moths having theirs



1, 2, Chrysalis of the white butterfly-moth; *a*, Palpi or feelers; *bb*, wing-cases; *c*, sucker; *ee*, eyes; *xx*, antennæ. 3, Chrysalis of the oak efger-moth.

horizontal. Some of them have great powers of flight. Among the most remarkable butterflies are those that present an extraordinary likeness to other objects—leaves, green or withered, flowers, bark, etc.—a feature that serves greatly to protect them from enemies. See Lepidoptera and Mimicry.

BUTTERINE, a mixture of several kinds of fats, worked together, churned in milk, colored, and sold as a substitute for butter. Its manufacture is permitted by U. States law, but it must not be sold as butter, but must be marked plainly "butterine." Some states forbid the coloring of it, and dealers supply coloring matter to the buyer, who may thus evade the law in dealing with his consumers. Butterine now is generally made of deoderized lard mixed with cottonseed stearine and a little genuine butter, and churned with milk. It was formerly made of "oleo oil," that is, the fat expressed from beef tallow, which was mixed and churned as above. Butterine is not an unhealthful article of diet when properly and carefully manufactured.

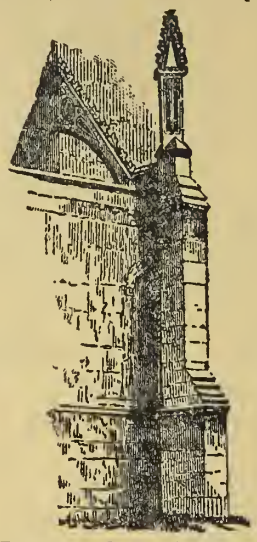
BUTTERMILK, the milk from which butter has been extracted, forming a nutritious and agreeable cooling beverage with an acidulous taste.

BUTTERNUT, the fruit of an American tree, so called from the oil it contains. The tree bears a resemblance in its general appearance to the black walnut, but the wood is not so dark in color.

BUTTONS are of almost all forms and materials—wood, horn, bone, ivory, steel, copper, silver, brass, etc.—which are either left naked or covered with silk or some other material. A substance now very commonly used for buttons is vegetable ivory (seeds of the ivory-nut palm), which may be colored according to taste. Mother-of-pearl buttons are another common kind.

BUT'TRESSES, in architecture, especially Gothic, projections on the outside of the walls of an edifice, extending from the bottom to the top, or nearly, and intended to give additional support to the walls and prevent them from spreading under the weight of the roof. Flying buttresses, of a somewhat arched form, often spring from the top of the ordinary buttresses, leaning inward so as to abut against and support a higher portion of the building, such as the wall of a clear-story, thus receiving part of the pressure from the weight of the roof of the central pile.

BUTYR'IC ACID, an acid obtained from butter; it also occurs in perspira-



Buttress and flying buttress.

tion, cod-liver oil, etc. Butyric acid is a colorless liquid, having a smell like that of rancid butter; its taste is acrid and biting, with a sweetish after-taste.

BUZ'ZARD, the name of raptorial birds which form one of the sub-families of the diurnal birds of prey; characters, a moderate-sized beak, hooked from the base, long wings, long tarsi, and short weak toes. The common buzzard is distributed over the whole of Europe as well as the north of Africa and America. Its food is very miscellaneous, and consists of moles, mice, frogs, toads, worms, insects, etc. It is sluggish in its habits. Its length is from 20 to 22 inches. The rough-legged buzzard, so called from having its legs feathered to the toes, is also a native of Britain. Its habits resemble those of the common buzzard. The red-tailed hawk of the U. States is a buzzard. It is also called hen-hawk, from its raids on the poultry-yard.

BY-LAW, a law made by an incorporated or other body for the regulation of its own affairs, or the affairs intrusted to its care. By-laws must of course be within the meaning of the charter of incorporation and in accordance with the law of the land.

BY'RON, George Gordon Noel, Lord Byron, a great English poet, was born in Holles street, London, Jan. 22, 1788. In 1805 he was entered of Trinity College, Cambridge. Two years after, in 1807, appeared his first poetic volume, Hours of Idleness, which, though indeed containing nothing of much merit, was castigated with overseverity by Brougham in the Edinburgh Review. This caustic critic roused the slumbering energy in Byron, and drew from him his first really notable effort, the celebrated satire English Bards and Scotch Reviewers. In 1809, in company with a friend, he visited the southern provinces of Spain, and voyaged along the shores of the Mediterranean. The fruit of these travels was the fine poem of Childe Harold's Pilgrimage, the first two cantos of which were published on his return in 1812. The poem was an immense success, and Byron "awoke one morning and found himself famous." During the next two years (1813–14) the Giaour, the Bride of Abydos, the Corsair, Lara, and the Siege of Corinth showed the brilliant work of which the new poet was capable. On the 2d of January, 1815, Byron married Anna Isabella, only daughter of Sir Ralph Milkanke, but the marriage turned out unfortunate, and in about a year Lady Byron, having gone on a visit to her parents, refused to return, and a formal separation took place. He visited France, the field of Waterloo and Brussels, the Rhine, Switzerland, and the north of Italy, and for some time took up his abode at Venice, and latterly at Rome, where he completed his third canto of Childe Harold. Not long after appeared the Prisoner of Chillon, The Dream, and other poems; and in 1817 Manfred, a tragedy, and the Lament of Tasso. From Italy he made occasional excursions to the islands of Greece, and at length visited Athens, where he sketched many of the scenes of the fourth and last canto of Childe Harold. In 1819 was published the romantic tale of Mazeppa, and the same year was marked by the commencement of Don Juan. In 1820 appeared Marino Faliero, Doge of Venice, a tragedy; the drama of Sardanapalus; the Two Foscari, a

Lord Byron.

tragedy; and Cain, a mystery. After leaving Venice Byron resided for some time at Ravenna, then at Pisa, and lastly at Genoa. There he continued to occupy himself with literature and poetry, sustained for a time by the companionship of Shelley, one of the few men whom he entirely respected and with whom he was quite confidential. Besides his contributions to the Liberal, a periodical established at this time in conjunction with Leigh Hunt and Shelley, he completed the later cantos of Don Juan, with Werner, a tragedy, and the Deformed Transformed, a fragment. These are the last of Byron's poetical efforts. In 1823 he conceived the idea of throwing himself into the struggle for the independence of Greece. In January, 1824, he arrived at Missolonghi, was received with the greatest enthusiasm, and immediately took into his pay a body of 500 Suliotes. On the 9th of

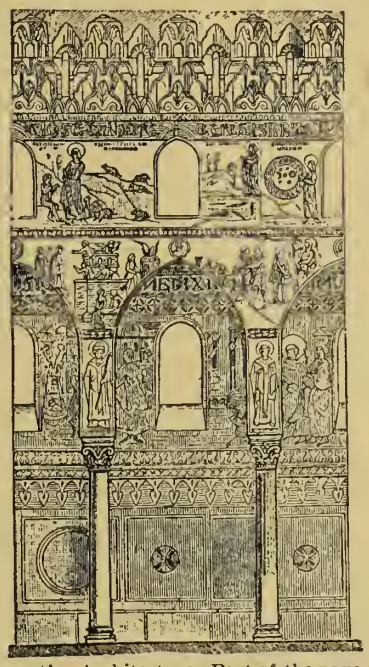
April, 1824, while riding out in the rain, he caught a fever, which ten days later ended fatally. Thus, in his thirty-seventh year, died prematurely a man whose natural force and genius were perhaps superior to those of any Englishman of his time. The body of Byron was brought to England and interred near Newstead Abbey.

BYZAN'TINE ART, a style which arose in southeastern Europe after Constantine the Great had made Byzantium the capital of the Roman Empire (330 A.D.), and ornamented that city, which was called after him, with all the treasures of Grecian art. (See Byzantine Empire.) One of the chief influences in Byzantine art was Christianity, and to a certain extent Byzantine art may be recognized as the endeavor to give expression to the new elements which Christianity had brought into the life of men. The tendency toward Oriental luxuriousness and splendor of ornament now quite supplanted the simplicity of ancient taste. Richness of material and decoration was the aim of the artist rather than purity of conception. Yet the classical ideals of art, and in particular the traditions of technical processes and methods carried to Byzantium by the artists of the Western Empire, held their ground long enough, and produced work pure and powerful enough, to kindle the new artistic life which began in Italy with Cimadue and Giotto.

Byzantine architecture may be said to have assumed its distinctive features in the church of St. Sophia built by Justinian in the 6th century, and still existing as the chief mosque in Constantinople. It is more especially the style associated with the Greek Church as distinguished from the Roman. The leading forms of the Byzantine style are the round arch, the circle, and in particular the dome. The last is the most conspicuous and characteristic object in Byzantine buildings, and the free and full employment of it was arrived at when by the use of pendentives the

Byzantine Architecture—Ancient cathedral, Athens.

architects were enabled to place it on a square apartment instead of a circular or polygonal. In this style of building incrustation, the incrustation of brick with more precious materials, was largely in use. It depended much on color and surface ornament for its effect, and with this intent mosaics wrought on grounds of gold or of positive color are profusely introduced, while colored marbles and stones of various kinds are greatly made use of. The capitals are of peculiar and original designs, the most characteristic being square and



Byzantine Architecture—Part of the nave of the Palatine chapel, Palermo.

tapering downward, and they are very varied in their decorations. Byzantine architecture may be divided into an older and a newer (or Neo-Byzantine) style. The most distinctive feature of the latter is that the dome is raised on a perpendicular circular or polygonal piece of masonary (technically the drum) containing windows for lighting the interior, while in the older style the light was admitted by openings in the dome itself. The Cathedral of Athens (shown in the accompanying cut) is an example of the Neo-Byzantine style. The Byzantine style had a great influence on the architecture of Western Europe, especially in Italy, where St. Mark's in Venice is a magnificent example, as also in Sicily. It had also material influence in Southern France and Western Germany.

BYZAN'TINE EMPIRE, the Eastern Roman Empire, so called from its capital Byzantium or Constantinople. The Byzantine Empire was founded in A.D. 395, when Theodosius at his death divided the Roman Empire between his sons Arcadius and Honorius. In this empire the Greek language and civilization were prevalent; but the rulers claimed still to be Roman emperors, and under their sway the laws and official forms of Rome were maintained. It lasted for about a thousand years after the downfall of the Western Empire. It is also known as the Greek Empire or Lower Empire. Its capital was naturally Constantinople, a city established by Constantine in 330 as the new capital of the whole Roman Empire.

The Eastern Empire, then comprising Asia Minor, Syria, Egypt, Greece, Thrace, Mœsia, Macedonia, and Crete, fell to Theodosius's elder son Arcadius, through whose weakness and that of several of his immediate successors it suffered severely from the encroachments of Huns, Goths, Bulgarians, and Persians. In 527 the celebrated Justinian succeeded, whose reign is famous for the codification of Roman law, and the victories of his generals Belisarius and Narses over the Vandals in Africa, and the Goths in Italy, which was henceforth governed for the Eastern Empire by an exarch residing at Ravenna. But his energy could not revive the decaying strength of the empire, and Justin II. his successor (565–578), a weak and avaricious prince, lost his reason by the reverses encountered in his conflicts with plundering Lombards, Avars, and Persians. Tiberius, a captain of the guard, succeeded in 578, and in 582 Mauricius; both were men of ability. In 602 Phocas, proclaimed emperor by the army, succeeded, and produced by his incapacity the greatest disorder in the empire.

The empire was in sore straits when Leo the Isaurian (Leo III.), general of the army of the East, mounted the throne (716), and a new period of comparative prosperity began. Some writers date the beginning of the Byzantine Empire proper, and the end of the Eastern Roman Empire, from this era. Numerous reforms, civil and military, were now introduced, and the worship of images was prohibited. After an interval of three centuries of indifferent history Isaac Comnenus, the first of the Comnenian dynasty, ascended the throne, but soon after became a monk. The three chief emperors of this dynasty were Alexius, John, and Manuel Comnenus. During the reign of Alexius I. (1081–1118) the Crusades commenced. His son, John II., and grandson, Manuel I., fought with success against the Turks, whose progress also was considerably checked by the Crusaders. The Latins, the name given to the French, Venetian, etc., crusaders, now forced their way to Constantinople (1204), conquered the city, and retained it, together with most of the European territories of the empire. Baldwin, count of Flanders, was made emperor; Boniface, marquis of Montferrat, obtained Thessalonica as a kingdom, and the Venetians acquired a large extent of territory. Theodore Lascaris seized on the Asiatic provinces, in 1206 made Nice (Nicæa) the capital of the empire, and was at first more powerful than Baldwin. Neither Baldwin nor his successors, Henry, Peter, and Robert of Courtenay, were able to secure the tottering throne. John, emperor of Nice, conquered all the remaining Byzantine territory except Constantinople, and at last, in 1261, Michael Palæologus, king of Nice, conquered Constantinople, and thus overthrew the Latin dynasty.

In 1361 Sultan Amurath took Adrianople. Bajazet conquered almost all the European provinces except Constantinople, and was pressing it hard when Timur's invasion of the Turkish provinces saved Constantinople for this

time (1402). Manuel then recovered his throne, and regained some of the lost provinces from the contending sons of Bajazet. To him succeeded his son John, Palæologus II. (1425), whom Amurath II. stripped of all his territories except Constantinople, and laid under tribute (1444). To the Emperor John succeeded his brother Constantine Palæologus. With the assistance of his general Giustiniani, a Genoese, he withstood the superior forces of the enemy with fruitless courage, and fell in the defense of Constantinople, by the conquest of which (May 29, 1453) Mohammed II. put an end to the Greek or Byzantine Empire. The Byzantine Empire, which thus lasted for over a thousand years, was of immense service to the world in stemming the tide of Mohammedan advance, in spreading Christianity and civilization, and in maintaining a regular system of government, law, and policy in the midst of surrounding barbarism.

BYZAN'TIUM, the original name of the city of Constantinople. It was founded by Greek colonists in 658 B.C., and owing to its favorable position for commerce it attained great prosperity, and survived the decay of most of the other Greek cities. In A.D. 330 a new era began for it when Constantine the Great made it the capital of the Roman Empire. See Constantinople.

C

C, the third letter in the English alphabet and the second of the consonants. In English it serves to represent two perfectly distinct sounds, namely, the guttural sound pertaining to k and the hard or thin sound of s, the former being that which historically belongs to it; while it also forms with h the digraph ch. The former sound it has before the vowels a, o, and u, the latter before e, i, and y. The digraph ch has three different sounds, as in church, chaise, and chord. To these the Scotch adds a fourth, heard in the word loch.

C, in music, (a) after the clef, the mark of common time, in which each measure is a semibreve or four minims, corresponding to $\frac{2}{2}$ or $\frac{4}{4}$ and when a bar is perpendicularly drawn through it alla-breve time or a quicker movement is indicated. (b) The name of the first or key-note of the modern normal scale, answering to the do of the Italians and the ut of the French.

CAAING WHALE (kä'ing), the round-headed porpoise, a cetaceous animal of the dolphin family, characterized by a rounded muzzle and a convex head, attaining a size of 16 to 24 feet. It frequents the shores of Orkney, Shetland, the Faroe Islands, and Iceland, appearing in herds of from 200 to 1000, and numbers are often caught. They live on cod, ling, and other large fish, and also on molluscs, especially the cuttle-fishes.

CAB, a kind of hackney-carriage with two or four wheels drawn by one horse. The original cab was for only one passenger besides the driver, and was a kind of hooded chaise.

CABBAGE, the popular name of various species of cruciferous plants, especially applied to the plain-leaved, heart-ing, garden varieties, cultivated for food. The kinds most cultivated are the common cabbage, the savoy, the broccoli, and the cauliflower. The common cabbage forms its leaves into heads or bolls, the inner leaves being blanched. Its varieties are the white, the red or purple, the tree or cow cabbage for cattle (branching and growing when in flower to the height of 10 feet), and the very delicate Portugal cabbage. The garden sorts form valuable culinary vegetables, and are used at table in various ways. In Germany pickled cabbage forms a sort of national dish, known as sauer-kraut.

CABBAGE-PALM, a name given to various species of palm-trees from the circumstance that the terminal bud, which is of great size, is edible and resembles cabbage, one of which is a native of the West Indies, the simple unbranched stem of which grows to a height of 150 or even 200 feet. The unopened bud of young leaves is much prized as a vegetable, but the removal of it completely destroys the tree, as it is unable to produce lateral buds.

CAB'INET, the collective body of ministers who direct the government of a country. In Britain, though the executive government is vested nominally in the crown, it resides practically in a committee of ministers called the cabinet. Every cabinet includes the first lord of the treasury, who is usually (not always) the prime-minister or chief of the ministry, and therefore of the cabinet; the lord-chancellor, the lord-president of the council, the chancellor of the exchequer, the first lord of the admiralty, and the five secretaries of state. A number of other ministerial functionaries, varying from two to eight, have usually seats in the cabinet, and its members belong to both houses of parliament, but usually adhere to that political party which predominates for the time being in the House of Commons. Its meetings are secret, and no minutes of the proceedings are taken. Although the cabinet is regarded as an essential part of the institutions of Great Britain, it has never been recognized by act of parliament. It began to take its present form in the reign of William III.

In the United States the cabinet of the president is appointed by him and assists him in his administration. It consists of the following officials: secretary of state, secretary of the treasury, secretary of war, attorney-general, post-master-general, secretary of the navy, secretary of the interior, secretary of agriculture, and secretary of commerce and labor. By an act of congress which went into effect Jan. 19, 1886, in case of removal by death, resignation, or inability of both the president and the vice-president, the secretary of state, and after him, in the order above given, the other members of the cabinet, shall act as president until the disability of the president is removed or a new president is elected. The departments of agriculture and of labor and commerce were created after the passage of the above law.

CABLE, a large strong rope or chain, such as is used to retain a vessel at anchor. It is made usually of hemp or iron, but may be made of other materials. A hemp cable is composed of three strands, each strand of three ropes, and each rope of three twists. A ship's cable is usually 120 fathoms or 720 feet in length; hence the expression a cable's length. Chain-cables have now almost superseded rope-cables. Although deficient in elasticity, heavier, and more difficult of management, yet their immunity from chafing and rotting, their greater compactness for stowage, and the fact that from their greater weight the strain is exerted on the cable rather than on the ship, more than counterbalance these drawbacks.—A submarine telegraph cable is composed of one or more copper wires embedded in a compound of gutta percha and resinous substances, encircled by layers of gutta percha or india-rubber, hemp or jute padding, and coils of iron wire.

CABLE, a bundle of wires for the conduction of electricity, covered with substances which protect the wires from harm, the wires themselves being separately insulated. Cables are used in several ways: they are strung along posts exposed to the air, or upon houses, or other structures; they are placed underground in conduits, or otherwise; and they are laid in the beds of bodies of water. Various materials are used for their insulation and protection, such as rubber, bitumen, jute, hemp, or oil paper, wax or other resins, rubber tape, and other materials, depending upon the situation of the cable and the nature of the reagents which attack it.

CABLE, George Washington, an American writer and novelist, born in New Orleans in 1844. He was early engaged in journalism, and his first work of fiction was Old Creole Days, a number of short stories of Louisiana and New Orleans. He has published The Grandissimes, Madame Delphine, Dr. Sevier, Bonaventure, and other highly original works of fiction. Since 1885 he has been living in New England.

CABLE-MOLDING, in architecture, a molding with its surface cut in imitation of the twisted strands of a rope.

CABOOSE', the cookroom or kitchen of a ship. In smaller vessels it is an inclosed fireplace, hearth, or stove for cooking on the main deck.

CAB'OT, Sebastian, navigator, was born at Bristol about 1474, died about 1557. He was the son of John Cabot, a Venetian pilot, who resided at Bristol, and was highly esteemed for his skill in navigation. In 1497, in company with his father and two brothers, he dis-

covered the mainland of N. America, having visited Nova Scotia and Newfoundland. In 1517 he made an attempt to discover the northwest passage, visiting Hudson's Bay. In 1526, when in the

Sebastian Cabot.

Spanish service, he visited Brazil and the river Plata. In 1548 he again settled in England, and received a pension from Edward VI. He was the first who noticed the variations of the compass; and he published a large map of the world.

CABRAL', Pedro Alvarez, the discoverer (or second discoverer) of Brazil, a Portuguese, born about 1460, died about 1526. In 1500 he received command of a fleet bound for the East Indies, and sailed from Lisbon, but having taken a course too far to the west he was carried by the South American current to the coast of Brazil, of which he took possession in name of Portugal. Continuing his voyage, he visited Mozambique, and at last reached India, where he made important commercial treaties with native princes, and then returned to Europe.

CABUL (kä-bul'), capital of the kingdom of Afghanistan, 165 miles from the

Cabal—The bazaar during the fruit season.

Indian station and fort of Peshawur, 600 from Herat, and 290 from Candahar. It stands on the Cabul river, at an elevation of 6400 feet above sea-level. The citadel, Bala-Hissar, contains the palace and other public buildings, the fort, etc. Cabul carries on a considerable trade with Hindustan through the Khyber Pass. It was taken by the British in 1839 and in 1842, and on the occasion of a subsequent war with the British in 1879 Cabul was twice taken by their troops. Pop. 75,000.—The Cabul river rises in Afghanistan at the height of about 8400 feet, flows eastward, passes through the Khyber Pass into India, and falls into the Indus at Attock. Length 300 miles.

CACA'O, or CO'COA, the chocolate-tree, and also the powder and beverage made with it obtained from the fruit of this tree. The tree is 16 to 18 feet high, a native of tropical America, and much cultivated in the tropics of both hemispheres, especially in the West India Islands, Central and South America. Its fruit is contained in pointed, oval, ribbed pods 6 to 10 inches long, each inclosing 50 to 100 seeds in a white, sweetish pulp. These are very nutritive, containing 50 per cent of fat, are of an agreeable flavor, and used, both in their fresh state and when dried, as an article of diet. Cocoa and chocolate are made from them, the former being a powder obtained by grinding the seeds, and often mixed with other substances when prepared for sale, the latter being this powder mixed with sugar and various flavoring matters and formed into solid cakes. The seeds when roasted and divested of their husks and crushed are known as cocoa nibs. The seeds yield also an oil called butter of cacao, used in pomatum and for making candles, soap, etc. The term cocoa is a corruption of cacao, but is more commonly used in commerce: cocoanuts, however, are obtained from an entirely different tree.

CACHALOT (kash'a-lot). See Sperm-whale.

CACHE (kåsh), a hole in the ground for hiding and preserving provisions which it is inconvenient to carry: used by settlers in the western states of America and Arctic explorers.

CACHET (kä-shā), Lettre de, a name given especially to letters proceeding from and signed by the kings of France, and countersigned by a secretary of state. They were at first made use of occasionally as a means of delaying the course of justice, but they appear to have been rarely employed before the 17th century as warrants for the detention of private citizens, and for depriving them of their personal liberty. During the reign of Louis XIV. their use became frightfully common, and by means of them persons were imprisoned for life or for a long period on the most frivolous pretexts. They were abolished at the Revolution.

CACHOU (ka-shö'), a sweetmeat in the form of a pill, made from the extract of licorice, cashew-nut, gum, etc., used by smokers to sweeten the breath.

CACIQUE (ka-sēk'), in some parts of America the title of the native chiefs at the time of the conquest by the Spaniards.

CACTUS, a Linnæan genus of plants, now used as a name for any of the Cactaceæ, otherwise called the Indian fig order. The species are succulent shrubs, with minute scale-like leaves

Cacti.

(except in the genus Pereskia, tree-cactus, with large leaves), and with clusters and spines on the stems. They have fleshy stems, with sweetish watery or milky juice, and they assume many peculiar forms. The juice in some species affords a refreshing beverage where water is not to be got. All the plants of this order, except a single species, are natives of America. They are generally found in very dry localities. Some are epiphytes. Several have been introduced into the Old World, and in many places they have become naturalized. The fruits of some species are edible, as the prickly-pear and the Indian fig, cultivated throughout the Mediterranean region. The flowers are usually large and beautifully colored, and many members of the order are cultivated in hot-houses.

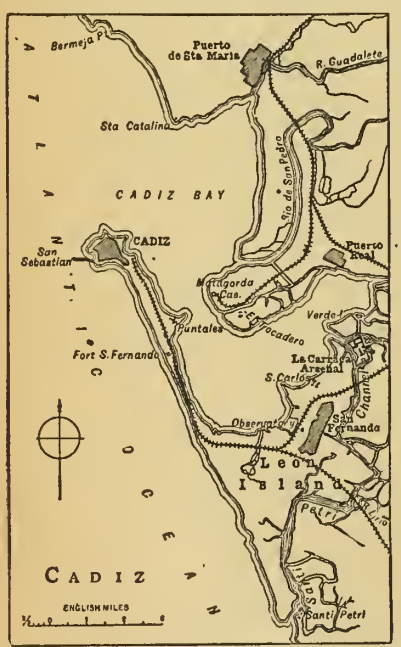
CADE, John (better known as Jack Cade), a popular agitator of the 15th century, leader of an insurrection of the common people of Kent (1450) in the reign of Henry VI. Having defeated a force sent against him he advanced to London, which he ruled for two days. On a promise of pardon being given the rebels soon dispersed, but Cade himself was killed by a gentleman of Kent named Iden.

CA'DENCE, the concluding notes of a musical composition or of any well-defined section of it. A cadence is perfect, full, or authentic when the last chord is the tonic preceded by the dominent; it is imperfect when the chord of the tonic precedes that of the

dominant; it is plagal when the closing tonic chord is preceded by that of the sub-dominant; and it is interrupted, false, or deceptive when the base rises a second, instead of falling a fifth. Cadence, or cadenza, is the name also given to a running passage which a performer may introduce at the close of a movement.

CADET, a student in one of the military schools of the U. States, particularly that of West Point. The appointment of cadets to West Point is generally made after competitive examination, or from recommendation by a congressman, each congressional district being entitled to a cadet, each state to two cadets at large, and the U. States to thirty cadets at large. Cadets spend four years in school and then are commissioned in the army. A naval cadet is the holder of the lowest grade in the navy, being identical with that of midshipman.

CADIZ (kä-dēth′), a seaport of southwestern Spain, situated at the extremity of a long tongue of land projecting from the island of Leon, which is separated by a narrow (bridged) channel from the



coast of Andalusia. It is well built, well paved, and very clean, and is strongly fortified. The chief buildings are the great hospital, the custom-house, the old and new cathedrals, the theaters, the bull-ring, capable of accommodating 12,000 spectators, and the lighthouse of St. Sebastian. The bay of Cadiz is a large basin inclosed by the mainland on one side and the projecting tongue of land on the other, with good anchorage, and protected by the neighboring hills. It has four forts, two of which form the defense of the grand arsenal, La Carraca (4 miles from Cadiz), at which are large basins and docks. Cadiz has long been the principal Spanish naval station. Its trade is large, its exports being especially wine and fruit. Cadiz was founded by the Phœnicians about B.C. 1100, and was one of the chief seats of their commerce in the west of Europe. Pop. 70,177.—The province of Cadiz is the most southerly in Spain; area, 2809 sq. miles; pop. 434,250.

CAD′MIUM, a scarce metal which resembles tin in color and luster, but is a little harder. It is very ductile and malleable; has a specific gravity of 8·6 to 8·69; and fuses a little below a red heat. In its chemical character it resembles zinc. It occurs in the form of carbonate, as an ingredient in various kinds of calamine, or carbonate of zinc. It is also found in the form of a sulphide, as the rare mineral greenockite. It forms at least two oxides, one chloride, and one sulphide.

CADMIUM YELLOW, a pigment prepared from the sulphide of cadmium. It is of an intense yellow color, and possesses much body.

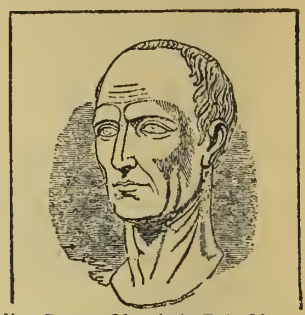
CADMUS, in Greek legend, the son of Agenor and grandson of Poseidon (Neptune). He was said to have come from Phœnicia to Greece about 1550 B.C., and to have built the city of Cadmea or Thebes, in Bœotia. Herodotus and other writers ascribe the introduction of the Phœnician alphabet into Greece to Cadmus. The solar mythists identify him with the sun-god.

CADU′CEUS, Mercury's rod; a winged rod entwisted by two serpents, borne by Mercury as an ensign of quality and office. In modern times it is used as a symbol of commerce, Mercury being the god of commerce. The rod represents power; the serpents, wisdom; and the two wings, diligence and activity.

CÆDMON (kad′mon), the first Anglo-Saxon of note who wrote in his own language, flourished about the end of the 7th century. His chief work (if it can all be attributed to him) consists of paraphrases of portions of the Scriptures, in Anglo-Saxon verse, the first part of which bears striking resemblances to Milton's narrative in Paradise Lost.

CÆ′SAR, a title, originally a surname of the Julian family at Rome, which, after being dignified in the person of the dictator Caius Julius Cæsar, was adopted by the successive Roman emperors, and latterly came to be applied to the heir-presumptive to the throne. The title was perpetuated in the Kaiser of the Holy Roman Empire, and in the Czar of the Russian emperors.

CÆ′SAR, Caius Julius, a great Roman general, statesman, and historian, was born B.C. 100, died B.C. 44. He was the son of the prætor Caius Julius Cæsar, and of Aurelia, a daughter of Aurelius Cotta. At the age of sixteen he lost his father, and shortly after he married Cornelia, the daughter of Lucius Cinna, the friend of Marius. This connection gave great offense to Sulla, the dictator, who proscribed him for refusing to put away his wife. His friends obtained his pardon with difficulty, and Cæsar withdrew from Rome, and went to Asia, serving his first campaign under M. Minucius Thermus, the prætor in Asia. On the death of Sulla Cæsar returned to Rome, where he distinguished himself as an orator. He afterward visited Rhodes, when he was taken by pirates, and compelled to pay fifty talents for his release. To revenge himself, he fitted out some vessels at Miletus, overtook the pirates, made the greater number of them prisoners, and had them crucified before Pergamus. He now returned to Rome, where his eloquence and liberality made him very popular. He was pontifex



Julius Cæsar—Marble in Brit. Museum.

maximus in 63 B.C., prætor in 62 B.C., and governor of Spain in 61 B.C. On his return to Rome, having united with Pompey and Crassus in the memorable coalition called "the first triumvirate," he became consul, and then obtained the government of Gaul with the command of four legions. His military career was rapid and brilliant. He compelled the Helvetii, who had invaded Gaul, to retreat to their native country, subdued Ariovistus, who at the head of a German tribe had attempted to settle in the country of the Ædui, and conquered the Belgæ. In nine years he reduced all Gaul, crossed the Rhine twice (B.C. 55 and 53), and twice passed over to Britain, defeated the gallant natives of this island in several battles, and compelled them to give him hostages. The senate had continued his government in Gaul for another period of five years, while Pompey was to have the command of Spain, and Crassus that of Syria, Egypt, and Macedonia for five years also. But the death of Crassus in his campaign against the Parthians dissolved the triumvirate; and about the same time the friendship between Cæsar and Pompey cooled. The senate, influenced by Pompey, ordered that Cæsar should resign his offices and command within a certain time, or be proclaimed an enemy to the state, and appointed Pompey general of the army of the Republic. Upon this Cæsar urged his soldiers to defend the honor of their leader, passed the Rubicon (49 B.C.), and made himself master of Italy without striking a blow, Pompey retiring into Greece. Cæsar then levied an army with the treasures of the state, and hastened into Spain, which he reduced to submission without coming to a pitched battle with Pompey's generals. He next conquered Massilia (now Marseilles), and returned to Rome, where he was appointed dictator. He then followed Pompey into Greece, and defeated him at Pharsalia, from which Pompey escaped only to be assassinated in Egypt. In Rome the senate and the people strove eagerly to gain the favor of the victor. They appointed him consul for five years, dictator for a year, and tribune of the people for life. When his dictatorship had expired he caused himself to be chosen consul again, and without changing the ancient forms of government, ruled with almost unlimited power. In 46 B.C. he crossed

to Africa, defeated the Pompeians Scipio and Cato at Chapsus, and returning to Rome he was received with the most striking marks of honor. The term of his dictatorship was prolonged to ten years, the office of censor conferred on him alone; his person was declared inviolable, and his statue placed beside that of Jupiter in the capitol. He soon after was honored with four several triumphs, made perpetual dictator, and received the title of imperator with full powers of sovereignty. In February, 44, he declined the diadem which Antony publicly offered him, and next morning his statues were decked with diadems. His glory, however, was short-lived, for a conspiracy was set on foot by his enemy Cassius, and joined by many of his own friends, including M. Brutus; and, notwithstanding dark hints had been given to him of his danger, he attended a meeting of the senate on 15th (ides) March, 44 B.C., and fell beneath the daggers of the conspirators. Of his writings, we still possess the history of his wars with the Gauls and with Pompey. Cæsar was undoubtedly "the foremost man of all this world," being great as a statesman, a general, an orator, a historian, and an architect and engineer, and his assassination was brought about more by jealousy and envy than by real patriotism.

CÆSARE'A, the ancient name of many cities, such as: (1) Cæsarea Philippi in Palestine, north of the Sea of Galilee, rebuilt by Philip, tetrarch of Galilee, son of Herod the Great.—(2) Cæsarea, on the shores of the Mediterranean, about 55 miles n.w. from Jerusalem, enlarged and beautified by Herod the Great, and named in honor of Cæsar Augustus; the place where St. Paul was imprisoned two years (Acts xxiii.–xxv.) —(3) The capital of Cappadocia in Asia Minor.

CÆSA'REAN OPERATION, a surgical operation, which consists in delivering a child by means of an incision made through the walls of the abdomen and womb; necessary when the obstacles to delivery are so great as to leave no other alternative. It is said to be so named because Julius Cæsar was brought into the world in this way.

CÆSIUM, a rare metal, first discovered by Bunsen and Kirchoff by spectrum analysis in 1860; symbol Cs, atomic weight 133. It is soft, and of a silver-white color. It is always found in connection with rubidium. It belongs to the same group of elements with lithium, sodium, potassium, and rubidium, viz. the group of the alkali-metals.

CAFF'EINE, or **THE'INE,** the active principle of tea and coffee, a slightly bitter, highly azotized substance, crystallizing in slender, silk-like needles, found in coffee-beans, tea-leaves, Paraguay tea, guarana, etc. Coffee contains from 0·8 to 3·6, and tea from 2 to 4 per cent. Doses of 2 to 10 grains induce violent nervous and vascular excitement.

CAGE-BIRDS, birds kept in cages as pets or songsters. A large traffic is done in birds of this description, particularly the so-called canary birds which are raised in the Hartz mountains and form a large industry. The tame bird has, under these conditions, altered considerably from its wild ancestor in the Canary Islands. Other song birds kept in cages are mockingbirds, bullfinches, nightingales, goldfinches, cardinal birds, parrots, parakeets, cockatoos, and others are kept for their power of speech or beauty of plumage. In keeping cage birds the cage should be regularly cleaned, should be large, and the bird should be fed generously with proper food.

CAGLIOSTRO (kål-yos'trō), Count Alessandro (real name Giuseppe (Joseph) Balsamo), a celebrated charlatan, born in 1743 at Palermo. He was the son of poor parents, and entered the order of the Brothers of Mercy, where he acquired a knowledge of the elements of chemistry and physic. He left, or had to leave the order, and committed so many crimes in Palermo that he was obliged to abscond. He subsequently formed a connection with Lorenza Feliciani, whose beauty, ability, and want of principle made her a valuable accomplice in his frauds. With her he traveled through many countries, assuming other names besides that of Count Cagliostro, pretending to supernatural powers, and wringing considerable sums from those who became his dupes. In England he established an order of what he called Egyptian Masonry, in which, as grand kophta, he pretended to reveal the secrets of futurity, and made many dupes among the higher classes. In Paris he was implicated in the affair of the diamond necklace which caused so great a scandal in the reign of Louis XVI., and was imprisoned in the Bastile, but escaped by means of his matchless impudence. He afterward visited England, but met with little success. In 1789 he revisited Rome, where he busied himself about freemasonry, but being discovered, and committed to the Castle of St. Angelo, he was condemned by a decree of the pope to imprisonment for life as a freemason, an arch-heretic, and a very dangerous foe to religion. He died in prison in 1795.

CAI'MAN, or **CAY'MAN.** See Alligator.

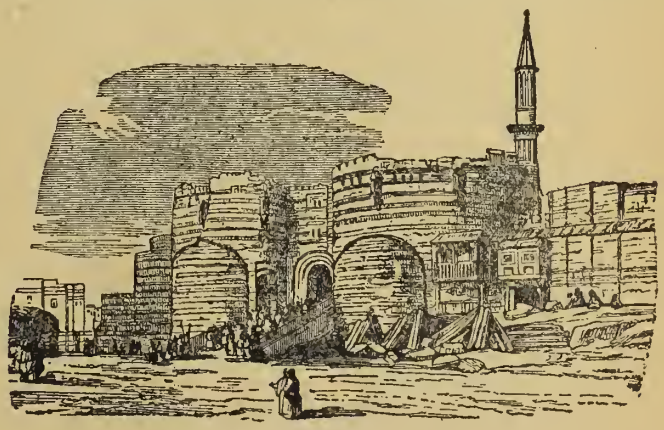
CAIN, the eldest son of Adam and Eve; the first murderer, who slew his brother Abel. For the biblical history of Cain and his descendants see Gen. iv.–vii. A Gnostic sect of the 2d century called Cainites held that Cain was the offspring of a superior power and Eve, and Abel of an inferior power—the Jewish God, and that the killing of Abel symbolized the defeat of the inferior by the superior power.

CAINOZO'IC, a geological term applied to the latest of the three divisions into which strata have been arranged, with reference to the age of the fossils they include. The Cainozoic system embraces the tertiary and postertiary systems of British geologists, exhibiting recent forms of life, in contradistinction to the Mesozoic, exhibiting intermediate, and the Palæozoic, ancient and extinct, forms. It corresponds nearly with what has been called the age of mammals.

CAIQUE (kà-ēk'), a small skiff or rowing boat; especially a light skiff used in the Bosporus, where it almost monopolizes the boat traffic. It may have from one to ten or twelve rowers. The name is also given to a Levantine vessel of a larger size.

CAIRN (kārn), a heap of stones; especially one of those large heaps of stones common in Great Britain, particularly in Scotland and Wales, and generally of a conical form. They are of various sizes, and were probably constructed for different objects. Some are evidently sepulchral, containing urns, stone chests, bones, etc. Some were erected to commemorate some great event, others appear to have been intended for religious rites, while the modern cairn is generally set up as a landmark.

CAIRO (kī'rō), the capital of Modern Egypt, is situated on the right bank of the Nile, 12 miles above the apex of its delta, and 150 miles by rail from Alexandria. The character of the town is still mainly Arabic, though in modern times the European style in architecture and other matters has become more and more prevalent. The city is partly surrounded by a fortified wall, and is intersected by seven or eight great streets, from which run a labyrinth of narrow crooked streets and lanes. There are several large squares or places, the principal being the Ezbekîyeh. To the southeast of the town is the citadel, on the last spur of the Mokattam Hills, overlooking the city. It contains the fine mosque of Mohammed Ali, a well



Gateway of the citadel, Cairo.

270 feet deep called Joseph's Well, cut in the rock, the palace of the viceroy, etc. There are upward of 400 mosques. The finest is that of Sultan Hassan. There are also some forty Christian churches, Jewish synagogues, etc. The tombs in the burying-grounds outside the city also deserve mention, especially those known as the tombs of the Caliphs. The trade of Cairo is large, and the bazaars and markets are numerous. Of these the Khan el Khalili, in the northeast of the town, consists of a series of covered streets and courts in which all kinds of eastern merchandise are displayed in open stalls. Cairo has railway communication with Alexandria, Suez, and Siout. It was occupied by the British, Sept. 1882. Pop. 570,062.

CAIRO (kā'rō), a city, port of entry, and county-seat of Alexander Co., Ill., at the junction of the Mississippi and Ohio rivers, 150 miles southeast of Saint Louis, on the Illinois Central, Cleveland, Cincinnati, Chicago and Saint Louis, and other railroads. Pop. 15,141.

CAIS'SON. In civil engin. (a) a vessel in the form of a boat used as a floodgate in docks. (b) An apparatus on which vessels may be raised and floated; especially a kind of floating-dock, which may be sunk and floated under a vessel's keel, used for docking vessels while at their moorings, without removing stores or masts. (c) A water-tight box or casing used in founding and building structures in water too deep for the cofferdam, such as piers of bridges, quays, etc.

CAITH'NESS, a county occupying the extreme northeast of the mainland of Scotland; area, 438,878 acres, of which about a fourth is under crop. Caithness gives the title of earl to the head of the Sinclair family. It returns one member to Parliament. Pop. 33,859.

CALABAR BEAN, the seed of a leguminous African plant, nearly allied to the kidney-bean. It is a powerful narcotic poison, operating also as a purgative and emetic, and in virtue of these last qualities is the famous "ordeal bean" of Africa, administered to persons suspected of witchcraft. If it causes purging it indicates crime; if vomiting, innocence. It induces fainting fits and asphyxia, and weakens or paralyzes the action of the heart. It is employed in medicine, chiefly (externally) as an agent for producing contraction of the pupil of the eye in certain cases; sometimes also (internally) in neuralgia, tetanus, and rheumatism.

CAL'ABASH, a vessel made of a dried gourd-shell or of a calabash shell, used in some parts of America and Africa. They are so closely grained and hard that when they contain any liquid they may be put on the fire as kettles.

CALA'BRIA, a name anciently given to the peninsula at the southeastern extremity of Italy, but now applied to the s.w. peninsula in which Italy terminates; area 6663 sq. miles; pop. 1,304,980. Scene in 1908 of the greatest earthquake of modern times. (See earthquake.)

CALAIS (kā-lā), a fortified seaport town of France, dep. Pas-de-Calais, on the Strait of, and 25 miles s.e. of Dover, and distant 184 miles by rail from Paris. Pop. 56,857.

CALAMAN'DER WOOD, a beautiful species of wood, the product of Ceylon. It resembles rosewood, but is so hard that it is worked with great difficulty. It takes a very high polish, and is wrought into chairs and tables, and yields veneers of almost unequaled beauty.

CAL'AMARY, the general name for two-gilled decapod cuttle-fishes. The body is oblong, soft, fleshy, tapering, and flanked behind by two triangular fins, and contains a pen-shaped gladius or internal horny flexible shell. They have the power of discharging, when alarmed or pursued, a black fluid from an ink-bag. The species are found in all seas, and furnish food to dolphins, whales, etc. Some species can dash out of the water and propel themselves through the air for 80 or 100 yards. It occasionally grows to the length of 2½ feet. Called also Squid.

CAL'AMUS, a genus of palms, the stems of the different species of which are the rattan-canes of commerce. The genus holds a middle station between the grasses and palms, with the habit of the former and the inflorescence of the latter. The species are principally found in the hotter parts of the East Indies.

CALAS (kā-lā), Jean, a memorable victim of fanaticism, born 1698, executed 1762. He was a Protestant, and was engaged as a merchant in Toulouse, when his eldest son committed suicide; and as he was known to be attached to the Roman Catholic faith, a cry arose that he had on that account been murdered by his father. Jean Calas and his whole family were arrested, and a prosecution instituted against him, in support of which numerous witnesses came forward. The parliament of Toulouse condemned him, by eight voices against five, to be tortured and then broken on the wheel, which sentence was carried out, his property being also confiscated. Voltaire became acquainted with his family, and procured a revision of the trial, when Calas was declared innocent, and his widow pensioned.

CALCA'REOUS, a term applied to substances partaking of the nature of lime, or containing quantities of lime. Thus we speak of calcareous waters, calcareous rocks, calcareous soils.—Calcareous spar, crystallized carbonate of lime. It is found crystallized in more than 700 different forms, all having for their primitive form an obtuse rhomboid.—Calcareous tufa, an alluvial deposit of carbonate of lime, formed generally by springs, which, issuing through limestone strata, hold in solution a portion of calcareous earth; this they deposit on coming in contact with air and light. Calc-sinter is a variety of it.

CALCINATION, the operation of roasting a substance or subjecting it to heat, generally with the purpose of driving off some volatile ingredient, and so rendering the substance suitable for further operations. The term was formerly also applied to the operation of converting a metal into an oxide or metallic calx: now called oxidation.

CAL'CITE, a term applied to various minerals all of which are modifications of the rhombohedral form of carbonate of calcium. It includes limestone, all the white and most of the colored marbles, chalk, Iceland-spar, etc.

CAL'CIUM, the metallic base of lime; in the metallic state, one of the rarest of substances; combined, one of the most abundant and most widely distributed. As phosphate, it forms the main part of the mineral matter of the bones of animals; as carbonate, chalk, limestone, or marble, it forms mountain ranges; as sulphate or gypsum, large deposits in various geological formations; it is a constituent of many minerals, as fluor-spar, Iceland-spar, etc., and is found in all soils, in the ash of plants, dissolved in seawater, and in springs, both common and mineral. It was first obtained in the metallic state by Sir H. Davy in 1808. When quite pure, it is a pale-yellow metal, with a high luster. It is about one and a half times as heavy as water, ductile, malleable, and very oxidizable. Its salts are for the most part insoluble or sparingly soluble in water, but dissolve in dilute acids.

CALC-SINTER, a carbonate of lime, the substance which forms the stalactites and stalagmites that beautify many caves.

CALCULATING MACHINES, contrivances by which the results of arithmetical operations may be obtained mechanically. Modern calculating machines are those invented by Kummer in 1847, and by Lagrous, Djakoff and Webb. The most commonly used machine is called the slide rule machine, by which the multiplication of large numbers can be quickly done. They are based upon the principle of logarithms. The following machines are extensively used: Beher's addition machine (1892), of keyboard type, limited to sums under 500; Illgen's calculator (1888), limited to sums under 1000; Runge's addition machine, Berlin (1896), adding numbers of several figures; Felt's comptometer, Chicago (1887), keyboard type, performing all four operations; Burrough's registering accountant, Saint Louis (1888), an addition machine of 81 keys, with a capacity of 2000 entries per hour, and automatically printing both the addenda and the total sum; Carney's cash register, Dayton (1890), an adding and printing machine of great perfection.

CALCULATORS, LIGHTNING, prodigies having an unusual capacity for combining numbers. Thus, at the age of 6, T. H. Safford computed mentally the number (617,760) of barley corns in 1040 rods, and could extract the cube roots of numbers of 9 and 10 figures. Buxton solved the problem, to find the product of doubling a farthing 139 times, the result, expressed in pounds, being a number of 39 figures. Zerah Colburn, at 9 years of age, gave at sight the factors of 294,967,297, and in 20 seconds found mentally the number of hours in 1811 years. Raising 991 to the fifth power in 13 operations, and giving the product of any pair of tow-figure numbers in 1½ seconds, are feats accomplished by Arthur Griffith, who also

memorized the squares of all numbers up to 130 and the cubes up to 100. Other noted prodigies are Annich, Bidder, Vinckler, Pughiesi, Mondeux, Magimelle, and Inaudi.

CAL'CULUS, The Infinitesimal or Transcendental Analysis, a branch of mathematical science. The lower or common analysis contains the rules necessary to calculate quantities of any definite magnitude whatever. But quantities are sometimes considered as varying in magnitude, or as having arrived at a given state of magnitude by successive variations. This gives rise to the higher analysis, which is of the greatest use in the physico-mathematical sciences. Two objects are here proposed: First, to descend from quantities to their elements. The method of effecting this is called the differential calculus. Second, to ascend from the elements of quantities to the quantities themselves. This method is called the integral calculus. Both of these methods are included under the general name infinitesimal or transcendental analysis. Those quantities which retain the same value are called constant; those whose values are varying are called variable. When variable quantities are so connected that the value of one of them is determined by value ascribed to the others, that variable quantity is said to be a function of the others. A quantity is infinitely great or infinitely small, with regard to another, when it is not possible to assign any quantity sufficiently large or sufficiently small to express the ratio of the two. When we consider a variable quantity as increasing by infinitely small degrees, if we wish to know the value of these increments, the most natural mode is to determine the value of this quantity for any given period, as a second of time, and the value of the same for the period immediately following. This difference is called the differential of the quantity. The integral calculus, as has been already stated, is the reverse of the differential calculus. There is no variable quantity expressed algebraically, of which we cannot find the differential; but there are differential quantities which we cannot integrate: some because they could not have resulted from differentiation; others because means have not yet been discovered of integrating them. Newton was the first discoverer of the principles of the infinitesimal calculus, having pointed them out in a treatise written before 1669, but not published till many years after. Leibnitz, meanwhile, made the same discovery, and published it before Newton, with a much better notation, which is now universally adopted.

CALCULUS, in pathology, a general term for the various inorganic concretions which are sometimes formed in the body. Such are biliary calculi or gallstones, formed in the gall bladder, urinary calculi, formed by a morbid deposition from the urine in the kidney or bladder; and various others known as salivary, arthritic, pancreatic, lachrymal, etc. Urinary and biliary calculi are the most common. The former, when the particles are comparatively small in size, are known as gravel, when larger as stone. Both cause painful and dangerous symptoms.

CALCUTTA, capital of British India and of Bengal; situated about 80 miles from the sea, on the left bank of the Hooghly (Hugli'), a branch of the Ganges, navigable up to the city for large vessels. The river opposite the city varies in breadth from about two furlongs to three-quarters of a mile. Calcutta extends along the river for about five miles from north to south, stretching eastward for nearly two miles in the south and in the north narrowing to half a mile. Adjacent to the city proper are extensive suburbs, which include the large town of Howrah on the opposite side of the Hooghly, connected

Calcutta—Bazaar on the Chitpore road.

with Calcutta by a pontoon bridge. The celebrated Fort William is a magnificent octagonal work, said to have cost altogether $10,000,000. It was built in 1757–73, being begun by Clive after the battle of Plassey. Government-house, or the palace of the governor-general, built by the Marquis Wellesley at an expense of $5,000,000, stands on the Esplanade, a street or road running along the north side of the Maidan. Here also are the high court and the town-hall, other buildings in this quarter being the currency-office, post-office, Bank of Bengal, mint, etc. The churches include the cathedral, St. John's (the old cathedral), St. Andrew's Scotch Church, Roman Catholic cathedral, etc. Calcutta has an extensive system of internal navigation through the Ganges and its connections, as also by the railways (the chief of which start from Howrah), and it almost monopolizes the external commerce of this part of India. The principal exports are opium, cotton, rice, wheat, jute, gunny-bags, tea, indigo, seeds, raw silk, etc. Of the imports the most important in respect of value are cotton goods. The jute manufacture is extensively carried on, as also that of cottons. The religious, educational, and benevolent institutions of Calcutta are numerous. The educational institutions comprise the Presidency College, the Mohammedan College, and the Sanscrit College, all government colleges besides others mainly supported by missionary or native efforts. Other educational institutions are Calcutta Medical College, government school of art, a school of engineering, and Calcutta University, an examining and degree-conferring institution. Pop. 1,026,987.

CALDERON' DE LA BARCA, Don Pedro, the great Spanish dramatist, born at Madrid, 1600. Before his fourteenth year he had written his third play. Leaving Salamanca in 1625, he entered the army and served with distinction for ten years in Milan and the Netherlands. In 1636 he was recalled by Philip IV., who gave him the direction of the court entertainments. The next year he was made knight of the order of Santiago, and he served in 1640 in the campaign in Catalonia. Besides heroic comedies and historical plays, some of which merit the name of tragedies, Calderon wrote hundreds of preludes, farces, etc. He wrote his last play in the eightieth year of his age. His smaller poems are now forgotten; but his plays have maintained their place on the stage even more than those of Lope de Vega. He died May 25, 1681.

CALEDO'NIA, Caledonians, the names by which the northern portion of Scotland and its inhabitants first became known to the Romans, when in the year 80 Agricola occupied the country up to the line of the Firths of Clyde and Forth. He defeated the Caledonians in 83, and again at Mons Grampius in 84, a battle of which a detailed description is given by Tacitus. In the early part of the 3d century they maintained a brave resistance to Severus, but the name then lost its historic importance. Caledonia is now used as a poetical name of Scotland.

CAL'ENDAR, a record or marking out of time as systematically divided into years, months, weeks, and days. The periodical occurrence of certain natural phenomena gave rise to the first division of time, the division into weeks being the only purely arbitrary partition. The year of the ancient Egyptians was based on the changes of the seasons alone, without reference to the lunar month, and contained 365 days divided into twelve months of thirty days each, with five supplementary days at the end of the year. The Jewish year consisted of lunar months of which they reckoned twelve in the year, intercalating a

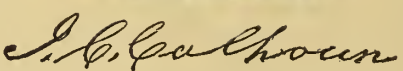
thirteenth when necessary to maintain the correspondence of the particular months with the regular recurrence of the seasons. The Greeks in the earliest period also reckoned by lunar and intercalary months, but after one or two changes adopted the plan of Meton and Euctemon, who took account of the fact that in a period of nineteen years, the new moons return upon the same days of the year as before. This period of nineteen years was found, however, to be about six hours too long, and subsequent calculators still failed to make the beginning of the seasons return on the same fixed day of the year. Each month was divided into three decads. The Romans at first divided the year into ten months, but they early adopted the Greek methods of lunar and intercalary months, making the lunar year consist of 354, and afterward of 355 days, leaving ten or eleven days and a fraction to be supplied by the intercalary division. This arrangement continued till the time of Cæsar. The first day of the month was called the calends. In March, May, July, and October the 15th, in other months the 13th, was called the ides. The ninth day before the ides (reckoning inclusive) was called the nones, being therefore either the 7th or the 5th of the month. From the inaccuracy of the Roman method of reckoning the calendar came to represent the vernal equinox nearly two months after the event, and at the request of Julius Cæsar, the Greek astronomer Sosigenes, with the assistance of Marcus Fabius contrived the so-called Julian calendar. The chief improvement consisted in restoring the equinox to its proper place by inserting two months between November and December, so that the year 707 (B.C. 46), called the year of confusion, contained fourteen months. In the number of days the Greek computation was adopted, which made it 365. To dispose of the quarter of a day it was determined to intercalate a day every fourth year between the 23rd and 24th of February. This calendar continued in use among the Romans until the fall of the empire, and throughout Christendom till 1582.

By this time, owing to the cumulative error of eleven minutes, the vernal equinox really took place ten days earlier than its date in the calendar, and accordingly Pope Gregory XIII. issued a brief abolishing the Julian calendar in all Catholic countries, and introducing in its stead the one now in use, the Gregorian or reformed calendar. In this way began the new style, as opposed to the other or old style. Ten days were to be dropped; every hundredth year, which by the old style was to have been a leap year, was now to be a common year, the fourth excepted; and the length of the solar year was taken to be 365 days, five hours, forty-nine minutes, and twelve seconds, the difference between which and subsequent observations is immaterial. Russia alone retains the old style, which now differs twelve days from the new.

In France, during the revolution, a new calendar was introduced by a decree of the National Convention, Nov. 24, 1793. The time from which the new reckoning was to commence was the autumnal equinox of 1792, which fell upon the 22nd of September, when the first decree of the new republic had been promulgated. The year was made to consist of twelve months of three decades each, and, to complete the full number, five fête days, or sansculotides (in leap years six) were added to the end of the year. The common Christian or Gregorian calendar was re-established in France on the 1st January, 1806, by Napoleon. For the Mohammedan calendar, see Hegira.

CAL'ENDER, a machine consisting of two or more cylinders (calenders) revolving so nearly in contact with each other that cloth or paper passed between them is smoothed and glazed by their pressure, or some other kind of finish is imparted to the surface.

CALHOUN (kal-hön'), John Caldwell, an American statesman, born in 1782, died 1850. He was admitted to the bar of S. Carolina in 1807, and in 1811 was sent to Congress, where he distinguished himself by his eloquence. In 1817 he was made secretary of war under President Monroe; in 1825 he was elected vice-president of the United States; in 1831, a senator; in 1843 secretary of state, and in 1845, again a senator. He continued till his death an advocate of extreme state rights, and of the policy of the slave-holding states.



CAL'IBER, a technical term for the diameter of the bore of a firearm.

CAL'ICO, a general term for any plain white cotton cloth: in America it is usually applied to printed cottons.

CALICO-PRINTING is the art of applying colors to cloth after it has come from the hand of the weaver in such a manner as to form patterns or figures. This art, originally brought from India, is sometimes practised on linen, woolen, and silk, but most frequently upon that species of cotton cloth called calico. The process was first introduced into Britain in 1738, and was originally accomplished by means of hand-blocks made of wood on which patterns or parts of patterns for each different color were cut. The machinery now generally used consists of various modifications of the cylinder printing-machine, in which a number of separate engraved cylinders are mounted, corresponding to the number of colors to be printed. Formerly the cloth had to pass once through the machine for every color; but now, by an arrangement of machinery equally ingenious and effective, any number of cylinders are fitted on one machine, which act on the cloth one after the other, and by this means the pattern is finished with a corresponding number of colors in the same time that was formerly employed to give one. A great variety of methods are employed in calico-printing, but they all fall under the general heads of dye-colors and steam-colors. Under the first head are included all the styles in which the pattern is printed on the cloth by a mordant—a substance which may have little or no color itself, but has an affinity for the fiber on the one hand, and for the coloring matter on the other—the dye or coloring matter being subsequently fixed by dyeing on such parts of the cloth as have been impregnated with the mordant, and thus bringing out the pattern. In steam-color printing the coloring material is applied to the cloth direct from the printing-cylinder, and subsequently fixed by steaming. In steam-colors there is no limit to the number and variety of shades which may be produced, each color-box on the cylinder printing-machine containing the whole ingredients essential to the production and fixation of a separate and distinct shade of color. This process is superseding most of the other styles, the brilliant coal-tar colors so extensively used being almost entirely fixed by steaming. The bodies used for fixing are tin mordants, tannic acid, etc., which are mixed with the dye-colors and printed together. The effects of calico-printing are varied by numerous other operations, such as the discharge-style, in which the cloth is first dyed all over, then printed in a certain pattern with discharge-chemicals, which either produce a pattern of some other color, or one purely white, as in the Turkey-red bandanna handkerchiefs. The resist-style, in some respects, is the reverse of the discharge-style; the process being to print a pattern in certain chemicals, which will enable those parts to resist the action of the dye subsequently applied to all other parts of the cloth. After the prints have undergone the printing process they are submitted to a series of finishing operations, the object of which is to give to the fabrics a pleasing appearance to the eye.

CAL'ICUT, a seaport of India, presidency of Madras, on the Malabar coast, which was ceded to the British in 1792. It was the first port in India visited by Europeans, the Portuguese adventurer, Pedro da Covilham having landed here about 1486, and Vasco da Gama in 1498. It has considerable trade, and manufactures cotton cloth, to which it has given the name calico. Pop. 76,981.

CALIF and **CALIFATE.** See Caliph.

CALIFORNIA, one of the Pacific states, the second in size of the U. States, was ceded by Mexico to the United States in 1847, and in 1850 was admitted to the Union. It is bounded on the north by Oregon, on the south

by Mexico (Lower California), on the east by Nevada and Arizona, and on the west by the Pacific Ocean. Its population in 1906 was 1,750,000. California in many ways is the most interesting state in the Union. It is 750 miles long in a direct line, but has more than 800 miles of coast line. It has an average width of about 200 miles and a measured area of 155,980 sq. miles excluding bodies of water indented into the land, or a total of 158,360 sq. miles, including bays, lakes and inlets. To make the dimensions more clear to persons familiar with the geography of the Atlantic coast, it may be stated as being approximately true that California equals in area all of that country lying east of the Appalachian chain of mountains and extending from Port Royal, South Carolina to Boston, Massachusetts. The surface of California is extremely diversified. The Coast Range of mountains follows the coast line from the northern part of the state down two-thirds the length and then extends eastward to a junction with the Sierra Nevada range which parallels the Coast Range from the northern boundary to this junction, except that it is along the eastern border. Between these two ranges is included the great valley of California, nearly 600 miles in length, the ranges being distant from each other from 100 to 140 miles, a part of this distance being filled with local detached mountain areas and foot hill districts. The valley proper has an ordinary width of from 40 to 60 miles. Between the local detached ranges above mentioned and along the foot hills are many lesser valleys opening out into the big valley and on the western slope of the Coast Range are also many small valleys and some rather large ones opening out upon the sea coast. These valleys are extremely fertile and attractive, as also is the great interior valley. This interior valley is divided at about the middle of the upper two-thirds of the state into the Sacramento Valley, lying to the north and the San Joaquin Valley running to the south, each of these valleys being drained by rivers of the same name. The principal river is the Sacramento, which flows s. for upward of 300 miles, receiving numerous affluents from the Sierra Nevada, and falls into the Bay of Suisun. The San Joaquin rises in the Sierra Nevada, flows n. for about 250 miles, and joins the Sacramento about 15 miles above Suisun Bay. It receives the waters of Lake Tule or Tulares, and has numerous tributaries. The Bay of San Francisco, forming the most capacious harbor on the Pacific coast is about 60 miles in length, 14 broad, and with a coast-line of 275 miles. It is connected with the ocean by a strait about 2 miles wide and from 5 to 7 long, called the Golden Gate. The city of San Francisco stands on the n.w. shore of the southern arm.

The peaks of the Sierra Nevada—Mount Shasta, Lassen's Butte, Spanish Peak, Pyramid Peak, Mounts Dana, Lyell, Brewer, Tyndall, Whitney, and others—reach from 10 000 to nearly 15,000 feet above the sea (Mount Whitney is 14,886). The volcanic character of the state is manifested by the mountain formations; and earthquakes are frequent. California is celebrated for its many wonderful natural objects and remarkable scenery. Noteworthy are the Yosemite Valley (which see) and the "big tree groves" containing groups of giant redwood trees—some of which reach the height of nearly 400 feet.

The climate of California is peculiarly its own. Nothing else on the North American continent is comparable with it. In the valley portions of the state the year is divided into two seasons of approximately equal duration, commonly known as the wet and the dry season. The wet season extends from November to May, and during this part of the year the rains fall about as they do in the eastern states during the spring and summer, although, as a rule, less copiously. In the northern part of the state the rains are abundant; in the central part sufficient, and in the southern part half scanty to such an extent that irrigation must be employed in

Seal of California.

order to make agriculture certainly profitable. During the dry season rains seldom fall, although there may be showers earlier than November and later than May. The summers in the interior are warm. Along the coast the sun is warm, but the ocean breezes are always cool. California offers no climatic hardships. In the higher mountain altitudes there is a wintry season, not as cold as in the Atlantic states, but with a very much heavier snow fall.

Politically speaking, California is divided into fifty-seven counties. The legislature consists of forty senators, elected for four years and eighty assemblymen, elected for two years, and the legislature convenes biennially. The legislators draw pay at the rate of $8.00 per day for 60 days and if the legislature sits longer than 60 days the legislators must serve without further compensation. The governor and other state officers are elected every four years, elections falling in mid-presidential terms so that national and state general elections do not occur simultaneously. In national elections the state in 1892 gave Cleveland eight and Harrison one electoral votes; in 1896 it gave McKinley eight and Bryan one. In the elections of 1900, 1904 and 1908, it went Republican.

For the fiscal year ending June 30, 1906, the property tax levied and collected in California amounted to $7,590 387.87. There were collected from all other sources $5,644,195.99, being a total of $13,234,583.86. The disbursements on account of state government were $12,945,862.73.

Included in this disbursement is one item of state aid to the common schools amounting to $3,952,806.75, state aid to high schools being $238,522.62, making a total of $4,191,329.37.

California regards education as preeminently of concern to the whole commonwealth and therefore collects a large part of the entire educational fund from the state as a whole and disburses it to the several schools in a way that materially aids in supporting schools in sparsely settled districts.

California is liberal in sustaining educational institutions. Its support of the State University, with its 3300 students, is chiefly given in the form of a levy of two cents on each $100 of assessed valuation of all property, although the university has special sources of revenue in addition to this. Besides the common and high schools and the State University, the state supports five normal training schools, two industrial state schools and one polytechnic and elementary agricultural school. Stanford University, with an endowment valued at twenty millions of dollars bears an important part in the educational work of the state and there are also many denominational colleges and preparatory schools which unite in making the school system of California the equal of that of any other state in the union.

The wealth of the state, as ascertained for purposes of taxation for the year 1906, is as follows:

Assessed value of real estate other than city and town lots	$416,238,889
City and town lots	502,934,230
Total real estate	$919,173,119
Assessed value of improvements on other than city and town lots	$ 87,613,284
City and town lots	238,242,091
Total value of improvements	$325,855,375
Total value of all real estate and improvements thereon	$1,245,028,494
Assessed value of personal property, other than money and solvent credits	237,929,012
Money and solvent credits	31,929,084
Assessment of railroads within state	81,010,821
Total assessed valuation of all property	$1,595,897,411

The Forestry interests of California are very important. The entire stand of merchantable forests originally amounted to about 17,000,000 acres, but ⅔ of this has been cut over, at least in part, leaving only about 6,000,000 acres as yet untouched. Most of the cut over areas are capable of being speedily reforested, a work to which the general government, as well as the State of California is now addressing itself. The U. States government has withdrawn from sale about 20,000,000 acres of lands either forested or susceptible of becoming forested, which has been set apart as forest reserves or national parks.

The gold mines of California still yield about $20,000,000 a year in gold, silver and platinum and the tendency

is to increase rather than diminish the yield.

The manufacturing interests of California are steadily developing. Census Bulletin 49, issued by the U. States department of commerce and labor, gives the following figures for manufactures in California:

Between 1900 and 1905, the number of manufacturing establishments increased .369 per cent and now total 6,839 The capital invested increased .611 per cent and now totals $282,647,201.00. The value of the product increased .427 per cent and now totals $367,218,494.00. The number of wage earners increased 30 per cent and totals 100,355. The total wages increased .621 per cent and for the year 1905 amounted to $64,850,686.00. This development is largely the result of the discovery of petroleum, of which California is now a larger producer than any other state in the Union, and the development of electrical power through the utilization of the streams flowing down from the higher altitudes of the Sierra Nevada mountains.

California's fruit and fruit products are annually sufficient to load from 75,000 to 85,000 ten-ton freight cars, and this product is shipped to nearly all of the markets of the world. The canning industry now ranks first among the manufacturing interests of the state. The wool industry adds about 20,000,000 pounds of wool per year to the country's wool supply. The development of the open door in Asia and trade with the Philippine Islands affords a ready market for every pound of agricultural products at remunerative prices.

Ocean steamers run regularly between San Francisco and Australia, Panama, Mexico, China and Japan.

California has 19 railroads, having a total mileage of 5,489 miles, not counting electrical lines, of which there are about a thousand miles of road in the state, including the state railways. The total assessed value of these railroads for purposes of taxation, including Pullman Car Company's rolling stock is $81,010,821.00. There are already 4 trans-continental lines and a fifth line is building and will be completed within two or three years. There are also three other great railroad companies that are heading toward California and it is not improbable that the close of the present decade will witness the completion of at least two of these to a termination at San Francisco Bay.

The principal city and port is San Francisco, the capital is Sacramento. Of the other cities the most important are Oakland and Los Angeles.

California is a very prosperous and growing commonwealth and notwithstanding the great catastrophe of April 18, 1906, which resulted in the destruction of property having an assessed value of $150,000,000.00, the assessed valuation for the entire state for 1906 is only about $39,000,000.00 less than for 1905. The general prosperity has come so near to making good the destruction of property by the great San Francisco fire of 1906. Pop. 1909, about 1,800,000.

CALIFORNIA, Gulf of, a gulf on the w. coast of N. America, in Mexico, lying between the peninsula of Lower California and the mainland. It is about 700 miles long, and, through most of its length, is less than 100 miles wide. It has long had a pearl fishery.

CALIFORNIA, Lower, a territory of Mexico, comprising a peninsula jutting into the Pacific Ocean, and separated from the mainland throughout its entire length by the Gulf of California. It is nearly 800 miles in length, and in different places 30, 60, 90, and 120 miles wide; area 61,562 sq. miles. It is largely mountainous and arid, but is said to possess valuable agricultural and mineral resources. The chief towns are Loretto and La Paz, the capital. Pop. 47,082, of whom perhaps a half are Indians.

CALIG'ULA, Caius Cæsar Augustus Germanicus, Roman emperor, son of Germanicus and Agrippina, was born A.D. 12, in the camp at Antium; assassinated by conspirators A.D. 41. He

Caligula.

received from the soldiers the surname of Caligula, on account of his wearing the caligæ, a kind of boots in use among them. He succeeded Tiberius, A.D. 37, and made himself very popular by his mildness and ostentatious generosity; but at the end of eight months he was seized with a disorder, caused by his irregular mode of living, which appears to have permanently deranged his intellect. After his recovery, he suddenly showed himself the most cruel and unnatural of tyrants—a monster of debauchery and prodigality, a perpetrator of the greatest crimes and follies. The most exquisite tortures inflicted on the innocent served him for enjoyments. In the madness of his arrogance he even considered himself a god, and caused sacrifices to be offered to himself. One of his greatest follies was the building of a bridge between Baiæ and Puteoli (Puzzuoli), in order that he might be able to boast of marching over the sea on dry land. He projected expeditions to Gaul, Germany and Britain, and having reached the sea, he bade his soldiers gather shells for spoils, and then led them back to Rome. At last a band of conspirators put an end to his career in the 29th year of his age.

CAL'IPER COMPASSES, compasses made either with arched legs to measure the diameters of cylinders or globular bodies, or with straight legs and retracted points to measure the interior diameter or bore of anything.

CAL'IPH, CALIF, or **KHALIF** is the name assumed by the successors of Mohammed in the government of the faithful and in the high-priesthood. Caliphate is therefore the name given to the empire of these princes which the Arabs founded in Asia, and enlarged, within a few centuries, to a dominion, exceeding even the Roman empire in extent. The appellation of caliph has long ago been swallowed up in Shah, Sultan, Emir, and other titles peculiar to the East.

CALISTHEN'ICS, a less correct spelling of Callisthenics. (Which see.)

CALIX'TUS, the name of three popes. —Calixtus I. was a Roman bishop from 217 to 224, when he suffered martyrdom. Calixtus II. was elected in 1119, in the monastery of Clugny, successor of the expelled pope, Gelasius II., who had been driven from Italy by the Emperor Henry V., and had died in this monastery. He excommunicated the Emperor Henry V. on account of a dispute respecting the right of investiture; as also the anti-pope Gregory VIII., whom he drove from Rome. He availed himself of the troubles of the emperor to force him, in 1122, to agree to the Concordat of Worms. He died in 1124.—Calixtus III., chosen in 1168 in Rome, as anti-pope to Paschal III., and confirmed by the Emperor Frederick I., in 1178, was obliged to submit to Pope Alexander III. As he was not counted among the legal popes, a subsequent pope, Alfonso Borgia, made pope in 1455, was called Calixtus III. He died in 1458.

CALLAO (kăl-yä'ō), a seaport town of Peru, the port of Lima, from which it is 6 miles distant, and with which it is connected by a railway; pop. 60,000. Callao is the emporium of the whole of the trade of Peru, importing manufactured goods, and exporting guano, copper ore, cubic nitre, wool, bark, etc. In 1746 the old town was destroyed by an earthquake, with much loss of life and damage to shipping.

CAL'LIPERS. See Calliper Compasses.

CALLISTHEN'ICS, the art or practice of exercising the body for the purpose of giving strength to the muscles and grace to the carriage. The term is usually applied to the physical exercises of females, as gymnastics is to those of males.

CALLOS'ITY, any thickened or hardened part of the human skin caused by pressure and friction. Also the natural cutaneous thickenings on the buttocks of monkeys.

CAL'LUS, a callosity; also a new growth of osseous matter between the extremities of fractured bones, serving to unite them.

CALMS, Regions of, tracts in the Atlantic and Pacific Oceans, on the confines of the trade-winds, where calms of long duration prevail. About the winter solstice their average northern limit is in 5° n. lat., and in the months about the summer solstice about 12° n. lat. The southern limit lies nearly always to the north of the equator, varying between 1° and 3° n. lat.

CAL'OMEL, mercurous chloride; a preparation of mercury much used in

medicine, and also found native as horn-quicksilver. It is prepared by grinding in a mortar sulphate of mercury with as much mercury as it already contains, and heating the compound which is formed with common salt in a retort until the mercury sublimes. The calomel is thus produced as a white powder. It is used in a variety of ailments, as a purgative, a vermifuge, etc.

CALORES'CENCE, the transmutation of heat rays into light rays; a peculiar transmutation of the invisible calorific rays, observable beyond the red rays of the spectrum of solar and electric light, into visible luminous rays, by passing them through a solution of iodine in bisulphide of carbon, which intercepts the luminous rays and transmits the calorific. The latter, when brought to a focus, produce a heat strong enough to ignite combustible substances, and to heat up metals to incandescence; the less refrangible calorific rays being converted into rays of higher refrangibility, whereby they become luminous.

CALORIM'ETER, an apparatus for measuring absolute quantities of heat or the specific or latent heat of bodies, as an instrument for measuring the heat given out by a body in cooling from the quantity of ice it melts or from the rise of temperature it produces in water around it.

CALTANISSET'TA, a town, Sicily, capital of the province of the same name, on the right bank of the Salso, 62 miles s. e. of Palermo. In the vicinity are springs of petroleum and of hydrogen gas, a mud-volcano, and important sulphur mines. Pop. 44,600.—The province has an area of 1445 sq. miles, with a pop. of 330,972.

CAL'UMET, a kind of pipe used by the American Indians for smoking tobacco. Its bowl is usually of soft red soapstone, and the tube a long reed, ornamented with feathers. The calumet is (or was) used as a symbol or instrument of peace and war. To accept the calumet is to agree to the terms of peace, and to refuse it is to reject them. The calumet of peace is used to seal or ratify contracts and alliances, to receive strangers kindly, and to travel with safety. The calumet of war, differently made, is used to proclaim war.

CALVADOS (kál-vá-dos), a French dep., part of the old province of Normandy, bounded on the n. by the English Channel, and e. w. and s. by the deps. Eure, La Manche, and Orne. Area, 2145 sq. miles. It is named from a dangerous ridge of rocks which extends along the coast for 10 or 12 miles. The dep. is undulating and picturesque, and possesses rich pastures. Chief town, Caen. Pop. 410,178.

CAL'VARY, applied to the place outside Jerusalem where Christ was crucified, usually identified with a small eminence on the north side of the city. The term is also applied in Roman Catholic countries to a kind of chapel, sometimes erected on a hill near a city and sometimes on the exterior of a church, as a place of devotion, in memory of the place where our Savior suffered; as also to a rocky mound or hill on which three crosses are erected, an adjunct to religious houses.

CALVIN, John, reformer and Protestant theological writer, born at Noyon, in Picardy, 1509, died at Geneva 1564 He went to Paris and entered on a course of regular study. He became dissatisfied with the teaching of the Roman Catholic Church; in consequence he gave up his cure, and took to the study of the law in Orleans. In 1532 he returned to Paris a decided convert to the reformed faith, and was soon compelled to fly, when, after various wanderings, he found a protector in Margaret of Navarre. In 1534 he returned to Paris; but, finding that the persecution against those who were inclined to the doctrines of the reformers was still raging, he retired to Basel in the autumn of the same year. At Basel he completed and published his great work, The Institutes of the Christian Religion. In 1538 he was expelled from Geneva. Here he married a widow, Idelette de Burie, and had one son, who died early. In 1541 his friends in Geneva succeeded in effecting his recall, when he laid before the council the draft of his ordinances respecting church discipline, which were immediately accepted and published. Michael Servetus, passing through Geneva in 1553, was arrested, and through Calvin's instrumentality was burnt alive because he had attacked the mystery of the Trinity in a book which was neither written nor printed at Geneva. This has been regarded as the great blot on Calvin's career, though approved of by many others of the reformers. His energy and industry were enormous: he preached almost daily, delivered theological lectures three times a week, attended all deliberations of the consistory, all sittings of the association of ministers, and was the soul of all the councils. He was consulted, too, upon points of law as well as of theology. Besides this, he found time to attend to political affairs in the name of the Republic, to publish a multitude of writings in defense of his opinions, and to maintain a correspondence through all Europe. Up to 1561 the Lutherans and the Calvinists were as one, but in that year the latter expressly rejected the tenth article of the Confession of Augsburg, besides some others, and hence arose the name of Calvinists Calvin retained his personal influence to the last; but a year or two before his death his health had broken down. As a theologian Calvin was equal to any of his contemporaries in profound knowledge, acuteness of mind, and in the art of making good a point in question. As an author he merits great praise. His Latin works are written with much method, dignity, and correctness. He was also a great jurist and an able politician.

CALVINISM, the theological tenets or doctrines of John Calvin, including a belief in predestination, election, total depravity, original sin, effectual calling, and the final perseverance of the saints. The system also includes several other points of controversy, such as that of free-will, the Sonship of the Second Person of the Trinity, and other differences in doctrine as between Calvinists and Arminians. Calvinism is the theological system expounded in the Westminster Confession of Faith, and is therefore the faith officially held by the Presbyterian churches generally; it is also substantially identical with what is known as "evangelicalism" in any of the churches or religious bodies.

CAL'YDON, an ancient city of northern Greece, in Ætolia, celebrated in Greek mythology on account of the ravages of a terrible boar. All the princes of the age assembled at the famous Hunt of the Calydonian Boar, which was finally despatched by Meleager.

CALYP'SO, in Greek mythology, a nymph who inhabited the island Ogygia, on the shores of which Ulysses was shipwrecked. She promised him immortality if he would consent to marry her but after a seven year's stay she was ordered by the gods to permit his departure.

CALYP'TRA, the hood of the theca or capsule of mosses. The same name is

Calyptra

a, Moss. *b*, Cassule with calyptra. *c*. Do. with calyptra removed.

given to any hood-like body connected with the organs of fructification in flowering plants.

CA'LYX, in botany, the name given to the exterior covering of a flower, that is, the floral envelope consisting of a circle or whorl of leaves external to the corolla, which it incloses and supports. The parts or leaves which belong to it are called sepals; they may be united by their margins, or distinct, and are

Forms of calyx.

usually of a green color and of less delicate texture than the corolla. In many flowers, however, there is little or no difference in character between calyx and corolla, in which case the whole gets the name of perianth. When the calyx leaves are distinct the calyx is called polysepalous (a a a in accompanying

cut); when united, gamosepalous or monosepalous (b b).

CAM, in machinery, a simple contrivance for converting a uniform rotatory motion into a varied rectilinear motion, usually a projecting part of a wheel or other revolving piece so placed as to give an alternating or varying motion to another piece that comes in contact with it and is free to move only in a certain direction.

CAMBACERES (kän-bȧ-sā-rā), Jean Jacques Régis de, Duke of Parma, born in 1753 at Montpellier; died at Paris, 1824. He was trained a lawyer, and by his talents soon attracted the notice of the Convention, and was appointed to various judicial offices. In the discussion relative to the fate of the king he declared Louis guilty, but disputed the right of the Convention to judge him, and voted for his provisory arrest, and in case of a hostile invasion, death. For a time he had the management of foreign affairs; and when Bonaparte was first consul, Cambacérēs was chosen second. After the establishment of the empire, Cambacérēs was created archchancellor, grand officer of the Legion of Honor, and ultimately Duke of Parma. He was banished on the second restoration of Louis XVIII., but was subsequently permitted to return.

CAM'BAY, a feudatory state in India, Bombay Presidency; lying at the head of the gulf of the same name in the western part of Gujarat. Area, 350 sq. miles; pop. 89,722. Also, chief town of above state, situated at the head of the Gulf of Cambay, formerly a flourishing port, but now decayed. Pop. 31,390.—The gulf separates the peninsula of Kathiawar from the northern coast of Bombay, having a length of about 80 miles, and an average breadth of 25 miles.

CAMBO'DIA, or **CAMBO'JA,** a country in the Indo-Chinese peninsula, bounded n. by Siam, e. by Anam, s. by French Cochin-China and Gulf of Siam, and w. by Gulf of Siam Pop. estimated at 1,500,000, partly Cambodians proper, partly Siamese, Annamese, etc.

CAMBRIAN ROCKS, in geology, an extensive series of gritstones, sandstones, conglomerates, slates, and shales, lying under the Lower Silurian beds, and above the Archæan, and divided into the Upper and Lower Cambrian. Many fossils occur in the series, including sponges, star-fishes, trilobites, brachiopods, lamellibranchs, pteropods, gasteropods, cephalopods, etc. They may be regarded as the bottom rocks of the Silurian system, and are well developed in N. Wales (hence the name), but can be recognized in many other regions.

CAM'BRIC, the name of a fine kind of linen which was originally manufactured principally at Cambria, in French Flanders, whence the name. It is also applied to a cotton fabric, which is very extensively manufactured in imitation of the true cambric, and which is in reality a kind of muslin.

CAM'BRIDGE (kām'brij), an inland county of England, bounded by the counties of Lincoln, Northampton, Huntingdon, Bedford, Hertford, Essex, Suffolk, and Norfolk; area, 524,935 acres. The soil is diversified and generally fertile; a large part belongs to the fen country. The principal rivers are the Cam or Granta, and the Ouse. The county abounds in dairy farms, celebrated for the production of excellent butter and cheese. The county town is Cambridge; other towns are Ely, Wisbech, Newmarket, and March. Pop. 190,687. —Cambridge, the county town, is situated on the river Cam, 50 miles n. of London. It occupies a perfect level encompassed by the colleges, and their beautiful grounds and gardens, on both sides of the Cam. The town is supported mainly by the presence of the university; but has some manufactures. Pop. 38,393.

CAMBRIDGE, a city separated from Boston by the Charles River. It is well laid out, with fine broad streets and avenues, and many open spaces adorned with shrubs and trees. The most important institution it contains is Harvard University (which see). Though distinct from Boston it really forms part of it. Pop. 100,000. See Boston.

CAMBRIDGE, University of, one of the two great English universities, as old at least as the thirteenth century, situated in the above town. The following list contains the names of the colleges or distinct corporate bodies comprised in the university, with the time when each was founded:

1.	St. Peter's College, or Peter House	1257
2.	Clare College, formerly Clare Hall	1326
3.	Pembroke College	1347
4.	Gonville and Caius College	1348
5.	Trinity Hall	1350
6.	Corpus Christi College	1352
7.	King's College	1441
8.	Queen's College	1448
9.	St. Catherine's College, or Catherine Hall	1473
10.	Jesus College	1496
11.	Christ's College	1505
12.	St. John's College	1511
13.	Magdalene College	1519
14.	Trinity College	1546
15.	Emmanuel College	1584
16.	Sidney Sussex College	1598
17.	Downing College	1800

There is also Selwyn College (or hostel), founded in 1882, for Church of England students. Each of the colleges is a separate corporation, which is governed by laws and usages of its own although subject to the paramount laws of the university. The university is composed of a chancellor, vice-chancellor, the masters or heads of colleges, fellows of colleges, and students, and is incorporated as a society for the study of all the liberal arts and sciences. The senate, which is composed of all who have taken the degree of Doctor or Master, is the great legislative assembly of the university. The chief executive power is vested in the chancellor, the high-steward, and the vice-chancellor, who is the head of some college. Two proctors superintend the discipline of all pupils. The number of undergraduate students is about 3000. There are over forty professors in the various departments. A botanic garden, an anatomical school, an observatory, and a valuable library containing more than 300,000 printed volumes, besides many manuscripts, are attached to the university. The museums and laboratories for the study of science are among the most complete in the country.

CAMBY'SES, (1) a Persian of noble blood, to whom King Astyages gave his daughter Mandane in marriage. Astyages was dethroned by Cyrus, the offspring of this union. (2) The son of Cyrus the Great, and grandson of the preceding, became, after the death of his father, King of the Persians and Medes, B.C. 529. In the fifth year of his reign he invaded Egypt, conquering the whole kingdom within six months. But his expeditions against the Ammonites and Ethiopians having failed, his violent and vindictive nature broke out in cruel treatment of his subjects, his brother Smerdis and his own wife being among his victims. He died in 521 B.C.

CAMDEN, a town of New Jersey, on the left bank of the Delaware, and connected with Philadelphia, on the opposite side, by a steamboat service. There are manufactories of various kinds, foundries, saw-mills, etc. Pop. 100.000.

CAMEL, a genus of ruminant quadrupeds, characterized by the absence of horns; the possession of incisive, canine, and molar teeth; a fissure in the upper lip; a long and arched neck; one or two humps or protuberances on the back;

Bactrian camel.

a broad elastic foot ending in two small hoofs, which does not sink readily in the sand of the desert. The native country of the camel is said to extend from Morocco to China, within a zone of 900 or 1000 miles in breadth. The common camel, having two humps, is only found in the northern part of this region, and exclusively from the ancient Bactria, now Turkestan, to China. The dromedary, or single-hump camel, or Arabian camel, is found throughout the entire length of this zone, on its southern side, as far as Africa and India. The Bactrian species is the larger, more robust, and more fitted for carrying heavy burdens. The dromedary has been called the race-horse of its species. To people residing in the vicinity of the great deserts the camel is an invaluable mode of conveyance. It will travel three days under a load and five days under a rider without drinking. The stronger varieties carry from 700 to 1000 lbs. burden. The camel's power of enduring thirst is partly due to the peculiar structure of its stomach, to which are attached little pouches or water-cells, capable of straining off and storing up water for future use, when journeying across the desert. It can live on little food, and of the coarsest kind, leaves of trees, nettles, shrubs, twigs, etc. In this it is helped by the fact that its humps are mere accumulations of fat

(the back-bone of the animal being quite straight) and form a store upon which the system can draw when the outside supply is defective. Hence the camel-driver who is about to start on a journey takes care to see that the humps of his animal present a full and healthy appearance. Camels which carry heavy

Figs. 1 and 2, Arabian camels and camel-driver. Fig. 3, Bactrian or two-humped camel.

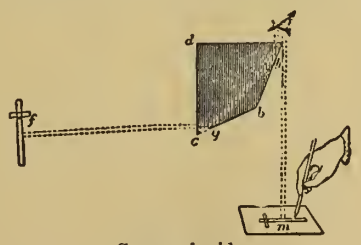
burdens will do about 25 miles a day, those which are used for speed alone, from 60 to 90 miles a day. The camel is rather passive than docile, showing less intelligent co-operation with its master than the horse or elephant; but is is very vindictive when injured. It lives from forty to fifty years. Its flesh is esteemed by the Arab and its milk is his common food. The hair of the camel serves in the East for making cloth for tents, carpets and wearing apparel. It is imported into European countries, for the manufacture of fine pencils for painting and for other purposes. The South American members of the family Camelidæ constitute the genus Auchenia, to which the llama and alpaca belong; they have no humps.

CAMEL, a water-tight box or caisson used to raise a sunken vessel, or to float a vessel over a shoal or bar. It is let down with water in it, and is attached to the vessel, after which the water is pumped out, and the camel rises from its buoyancy.

CAMELLIA (ka-mel'ya), a genus of plants, with showy flowers and elegant dark-green, shining, laurel-like leaves, nearly allied to the plants which yield tea.

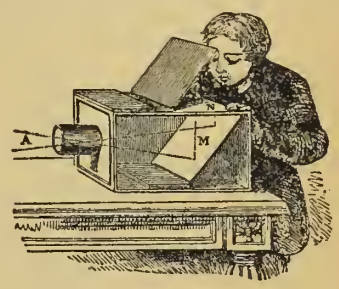
CAM'EO, a general name for all gems cut in relief, in contradistinction to those hollowed out, or intaglios. More particularly, a cameo is a gem composed of several different-colored layers having a subject in relief cut upon one or more of the upper layers, an under layer of a different color forming the ground. For this purpose the ancients used the onyx, sardonyx, agate, etc. The shells of various molluscs are now much used for making cameos; and they are also imitated on glass.

CAM'ERA LU'CIDA, an optical instrument employed to facilitate the sketching of objects from nature by producing a reflected picture of them upon paper. Wollaston's apparatus is one of the commonest. The essential part is a totally-reflecting prism with four angles, one of which is 90°, the opposite one 135°, and the other two each 67° 30′. One of the two faces which contain the right angle is turned toward the object to be sketched. Rays falling in a straight line on this face, as from f, are totally reflected at g from the face c b to the next face at h, whence they are again totally reflected to the fourth face, from which they emerge in a straight line. An eye (e) placed so as to receive the emergent rays, will see an image of the object in the direction m, and by placing the sketching paper below in this place, the image may be traced with a pencil. As the paper, for convenience of drawing, must be at a distance of about a foot, a concave lens, with a focal length of something less than a foot, is placed close in front of the prism in drawing distant objects. By raising or lowering the prism in its stand, the image of the object to be sketched may he made to coincide with the plane of the paper. The prism is mounted in such a way that it can be rotated either about a horizontal or a vertical axis; and its top is usually covered with a movable plate of blackened metal, having a semicircular notch at one edge, for the observer to look through. This form of camera has undergone various modifications. It is very convenient on account of its portability.



Camera lucida.

CAM'ERA OBSCU'RA, an optical instrument employed for exhibiting the images of objects in their forms and colors, so that they may be traced and a picture drawn, or may be represented by photography. A simple camera obscura is presented by a darkened chamber into which no light is permitted to enter excepting by a small hole in the window-shutter. A picture of the objects opposite the hole will then be seen on the wall, or on a white screen placed opposite the opening. A simple camera obscura is shown in the figure; the rays of light passing through a convex lens at A, being reflected from the mirror M (which is at a slope of 45°) to the glass plate N, where they form an image that may be traced. Another arrangement is a kind of tent surrounded by opaque curtains, and having at its top a revolving lantern, containing a lens with its axis horizontal, and a mirror placed behind it at a slope of 45°, to reflect the transmitted light downward on the paper. It is still better to combine lens and mirror in one by using a glass of peculiar shape, in which rays from external objects are first refracted at a convex surface, then totally reflected at the back of the lens, which is plane, and finally emerge through the bottom of the lens, which is concave, but with a larger radius of curvature than the first surface. The camera obscura employed by photographers is commonly a box, one half of which slides into the other, with a tube in front containing an object-glass at its extremity. At the back of the box is a slide of ground glass, on which the image of the object or objects to be depicted is thrown, in setting the instrument. The focussing is performed in the first place by sliding the one half of the box into the other, and by means of a pinion attached to the tube



Camera obscura.

in front which moves the lens. When the image has thus been rendered as sharp as possible, the ground-glass slide is removed, and a sensitized plate substituted, which not only receives, but retains the image.

CAMERON, Simon, an American statesman, born in Pennsylvania in 1799, died in 1889. In 1845 he became a United States senator, and was appointed by Lincoln to be secretary of war, a position which contributed the largest part to his reputation. After serving (1862–66) as minister to Russia he returned to the United States and used his influence for the second nomination of Lincoln. He was a strong opponent of civil service reform.

CAMEROONS, (1) a district on the West Coast of Africa, on the Bight of Biafra, now belonging to Germany, and one of the most suitable districts for colonization in this region. (2) A river in the Cameroons territory. It falls into a broad estuary, on approaching which it has a width of about 400 yards. There are several large and thriving towns (including King Bell's town) on the river, through which an extensive trade is carried on in ivory and palm-oil. (3) A mountain range in the territory, the highest peak of which has been estimated at over 13,000 feet. It is volcanic in character, and is clothed with

a dense growth of forest to the height of 4000 or 5000 ft.

CAMIL'LUS, Marcus Furius, a Roman patrician, famous as the deliverer of the city of Rome from the Gauls. In B.C. 396 he was made dictator during the Veientine war, and captured the town of Veii by mining, after it had defied the Roman power for ten years. In B.C. 394 Camillus besieged the Falerii, and by an act of generosity induced them to surrender. Three years after, Camillus was appointed dictator a second time, and was successful in repelling the invaders. After having been four times appointed dictator, a new invasion of the Gauls called Camillus, now eighty years old, again to the front, and for the fifth and last time, being appointed dictator, he defeated and dispersed the barbarians. He died in B.C. 365.

CAM'OENS, Luis de, the most celebrated poet of the Portuguese, born at Lisbon of a good family, probably in 1524 or 1525. An affray into which he was drawn was the cause of his embarking in 1553 for India. He landed at Goa, but, being unfavorably impressed with the life led by the ruling Portuguese there, wrote a satire which caused his banishment to Macao (1556). Here, however, he was appointed to an honorable position as administrator of the property of absentee and deceased Portuguese, and here, too, in what were the quietest and most prosperous years of his life, he wrote the earlier cantos of his great poem, the Lusiads. The Lusiads was printed at Lisbon (1572), and celebrating, as it did, the glories of the Portuguese conquests in India, acquired at once a wide popularity. The king himself accepted the dedication of the poem. He died on the 18th June, 1579. Fifteen years after his death a magnificent monument was erected to his memory, with an inscription on it which called him the prince of poets. The Lusiads is an epic poem in ten cantos. Its subject is the voyage of Vasco da Gama to the East Indies; but many other events in the history of Portugal are also introduced.

CAMP, the place and aggregate body of tents for soldiers in the field. Among the Greeks, the Lacedæmonians seem to have been the first who devoted attention to the art of forming military camps, adopting a circular form with the general's tent in the center; but the Romans, who had so often to carry on wars in distant and thinly-populated regions, were the first to carry the art of encampment to a high degree of perfection. Their camps as a rule were square, and were strongly intrenched so as to provide against the danger of surprise. Since the invention of gunpowder intrenched camps have become much more elaborate affairs and cover a much greater area. They may consist of intrenched areas permanently connected with and under the protection of fortified places; thus they are sometimes attached to certain large cities on the chief roads, partly in order to defend them against the first attack of the enemy, partly, to give to retreating armies rallying-points able to furnish support to numerous soldiers. Camps which, though intrenched, are to be occupied merely for the period of a campaign, or which serve as a refuge for a few days only to a subordinate army, are termed "lines" or "temporary positions." From the perfection of modern artillery strong detached forts form the chief defensive feature of intrenched camps of the present day.

CAMPAGNA DI ROMA (kâm-pân'yâ), the coast region of Middle Italy, in which Rome is situated, from 30 to 40 miles wide and 100 long, and forming the undulating, mostly uncultivated plain which extends from near Civita Vecchia or Viterbo to Terracina, and includes the Pontine Marshes. The district is volcanic, and its lakes, Regillus, Albano, Nemi, etc., are evidently craters of extinct volcanoes. The soil is very fertile in the lower parts, though its cultivation is much neglected, owing to the malaria which makes residence there during midsummer very dangerous; and during the months of July, August, and September its inhabitants, chiefly herdsmen and peasants, seek refuge in Rome or the neighboring towns.

CAMPAIGN (kam-pān'), generally denotes the series of operations of an army during the time it keeps the field in one season or accomplishes a determinate object. Formerly campaigns lasted only during the warmer months, and were terminated by the troops retiring into winter quarters.

CAMPA'NIA, the ancient name of a province of Italy, in the former kingdom of Naples, which, on account of its beauty and fertility, was a favorite resort of wealthy Romans, who built there magnificent country houses. It comprises the modern provinces of Caserta, Naples, and parts of Salerno and Avellino. Cumæ (the oldest Greek settlement in Italy), Puteoli, Naples, Herculaneum, Pompeii, Baiæ, Stabiæ, Salernum, and Capua (its ancient capital) were the principal cities of Campania. Even now Campania is the most beautiful and fruitful part of Italy.

CAMPBELL, Alexander, an American religious minister, founder of the Disciples of Christ, widely known as Campbellites. Campbell was born in Ireland in 1788, and died in the U. States in 1866. The principle upon which he founded the new method of interpreting the Scriptures was based on the idea that where the Scriptures are silent the interpreter should be silent. The new method spread rapidly and now numbers nearly 2,000,000 adherents.

CAMPBELL, Bartley, an American dramatic writer, born in Pennsylvania in 1843, died 1888. He was early a journalist but left that profession for play-writing. His principal works are Through Fire and My Partner.

CAMPBELL, Thomas, a distinguished modern poet, was born at Glasgow 27th July, 1777, and educated at its university. After leaving the university he resided for a short time in Edinburgh; and all at once attained the zenith of his fame by publishing, in 1799, his Pleasures of Hope. In 1803, after spending some time in Germany, Campbell published an edition of the Pleasures of Hope with the addition of some of the finest lyrics in the English language, including Hohenlinden, Ye Mariners of England, and the Exile of Erin. In 1809 he again made his appearance as a poet, and published Gertrude of Wyoming, Lord Ullin's Daughter, and the Battle of the Baltic. He died at Boulogne, 15th June, 1844, and was interred at Poet's Corner in Westminster Abbey, close to the tomb of Addison.

CAMPBELL-BANNERMAN, Sir Henry, a British statesman, premier of England. Was born in 1836. He has been financial secretary of the war office, admiralty secretary, chief secretary for Ireland, and secretary of state for war. In 1899 he became leader of the liberal party. In 1906 he became premier. He died in 1908.

CAMPEACHY, or **CAMPECHE** (kam'pēchi, kam'pech-e), a seaport of Mexico, in the state and on the bay of the same name, on the w. coast of the peninsula of Yucatan, a mart for logwood and wax. Cigars are manufactured, and ships are built, though the harbor can only admit small vessels. Pop. 15,196. —The state of Campeachy has an area of 25,832 sq. miles; a pop. of 90,413.

CAMP FOLLOWERS, a term applied to servants, small merchants, purveyors, women, and others who follow an army while on the march. In former times these camp followers often exceeded in number the army itself, thus becoming a source of insurmountable difficulty to the commander. Their function, however, was very useful to the daily life of the soldiers.

CAMPHENE (kam'fēn), the generic name for the volatile oils or hydrocarbons, isomeric or polymeric with oil of turpentine, as oil of bergamot, cloves, copaiba, hops, juniper, orange, pepper, etc. They are liquid at ordinary temperatures, and are distinguished from each other by their odors.

CAMPHINE (kam'fēn), the commercial term for purified oil of turpentine, obtained by distilling the oil over quicklime to free it from resin. It is used in lamps, and gives a very brilliant light; but, to prevent smoking, the lamp must have a very strong draft. With oxygen it forms camphor.

CAM'PHOR, a whitish translucent substance, of a granular or foliated fracture, and somewhat unctuous to the

Camphor-tree.

touch, which is mostly extracted from two or three kinds of trees of the laurel tribe. It has a bitterish aromatic taste and a strong characteristic smell. In chemical character it belongs to the vegetable oils. The common camphor of the shops is obtained from the cam-

phor laurel, a native of China and Japan, now naturalized in many other countries. The camphor is chiefly prepared in the island of Formosa, though also exported from Japan, and to a small extent from China. The common camphor is obtained from the wood by distillation and sublimation. Borneo camphor, on the other hand, is not procured by distillation, but is found in masses, secreted naturally in cavities in the trunk and greater branches. Numerous other vegetables, such as thyme, rosemary, sage, etc., are found to yield camphor by distillation. In medicine camphor is used both as an external and internal stimulant. In small doses it acts as an anodyne and antispasmodic; in large doses it acts as a poison. Its effluvia being very noxious to insects, it is much used to protect specimens in natural history. It readily dissolves in alcohol, oils, etc., and in this way is much used as a liniment. It evaporates or volatilizes at ordinary temperatures. A third kind of camphor, blumea camphor, is prepared in China from Blumĕa balsamifĕra, a tall composite plant.

CAMPI, a family of Italian artists who founded what is known in painting as the school of Cremona. Of the four of this name, Giulio, Antonio, Vincenzo, and Bernardino, the first and last are the best known. Giulio (1502–72), the eldest and the teacher of the others, was a pupil of Giulio Romano, and acquired from the study of Titian and Pordenone a skill in coloring which gave the school its high place. Bernardino (1525–90), was the greatest of the school. He took Romano, Titian, Correggio in succession as his models, but without losing his own individuality as an artist.

CAMP-MEETING, religious gatherings held in the open air in which the audiences are addressed by prominent or able exhorters, scholars, entertaining lecturers, etc. They were originated in Kentucky by a Methodist and a Presbyterian preacher, two brothers named McGee. Camp-meetings are now held yearly in the summer by many methodist conferences, and are among the most cherished institutions of that church, although in England the church itself has refused them its countenance.

CAMPOBAS'SO, a town of Italy, province of Campobasso, on a hill-slope, 52 miles n.e. Naples; has manufactures of cutlery, and a good trade. Pop. 14,818.—The prov. (formerly Molise) has an area of 1771 sq. miles; pop. 385,140.

CAMPUS MARTIUS, was a large place in the suburbs of ancient Rome, consisting of the level ground between the Quirinal, Capitoline, and Pincian hills, and the river Tiber, set apart for military exercises and sacred to the god Mars. In the later period of the republic it was a suburban pleasure-ground for the Romans, and was laid out with gardens, shady walks, baths, etc. A large part of the modern city stands on it.

CANAAN (kā'nan). See Palestine.

CANAANITES, the general name for the heathen peoples (Jebusites, Hittites, Amorites, etc.) whom the Israelites found dwelling in Canaan (Palestine) west of the Jordan, and whom latterly they utterly subdued, though the subjugation was not quite complete till Solomon's time. They are believed to have been, in part at least, of kindred race with the Israelites; and some authorities find traces of their descendants among the present inhabitants of Palestine.

CANADA, Dominion of, an extensive series of British territories in North America, the greatest of Britain's colonial possessions, comprising the provinces of Ontario (formerly Upper Canada), Quebec (formerly Lower Canada), Nova Scotia, New Brunswick, British Columbia, Prince Edward Island, and Manitoba, along with the vast regions in the north and northwest known as the Northwest Territories, and another vast region north of Quebec known as the Northeast Territory. The Dominion thus embraces the whole of British North America, with the exception of Newfoundland and part of Labrador (which belongs to Newfoundland), and its area, 3,729,620 sq. miles, is not much less than that of Europe.

The southern boundary is most remarkable for passing through the system of great lakes—Superior, Huron, Erie, and Ontario, between the last two of which are the Falls of Niagara, partly belonging to Canada, partly to the United States. To the Atlantic the drainage of these lakes is carried by the St. Lawrence, with which river, and the great gulf into which it expands, are connected the provinces of Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island, together containing by far the greater portion of the population of the Dominion.

The chief mountain ranges of the east are north and south of the St. Lawrence, and run nearly parallel to that river. On the Pacific slope we have a distinctly mountainous region, including the Rockies, some peaks of which (Mt. Hooker, Mt. Brown) attain a height of about 16,000 feet, as also the Gold and the Cascade Ranges. In the prairie region and the northwest are great lake and river systems, formed by the Saskatchewan, Nelson, Churchill, Athabasca, and Mackenzie rivers, and the great lakes Winnipeg, Athabasca, Great Slave and Great Bear. The Saskatchewan, lying in the heart of the rich wheat-growing district, must in time prove a far more important waterway than at present. The Mackenzie and its connected lakes and rivers form the most remarkable feature of the far northwest. This river, including its tributary the Peace, has a length of perhaps 2500 miles, and drains an area of 550,000 sq. miles, or almost double that of the St. Lawrence basin. Between the Mackenzie system and Hudson Bay is a great region called from its desolate character the Barren Grounds.

Canada has great mineral wealth. Iron of the best quality has been found in great abundance in Quebec, Ontario, and British Columbia. The district round Lake Superior and the upper part of Lake Huron abounds in copper and has much silver as well; and Nova Scotia, Assiniboia, Alberta, and British Columbia are rich in coal. In Nova Scotia there are a number of coal-mines worked; gold is also obtained in some quantity, as well as iron. Coal is worked in the northwest, and more extensively in British Columbia; but the most valuable mineral of the latter is gold. British Columbia is very rich in iron. Gold is also found in the Klondike region, near Alaska.

The chief wild animals (some of them represented by several species) are the deer, buffalo, musk-ox, bear, wolf, fox, otter, beaver, squirrel, raccoon, musk-rat, marten, etc. The buffalo is now scarce, and will probably soon be exterminated. The largest of the deer kind is the moose, or elk, which is found in New Brunswick, Nova Scotia, and the northern parts of Quebec, as well as in the far west and northwest. The reindeer occurs in the north. The grizzly bear is met with in the Rocky Mountains, and the polar bear in the extreme north and northeast. Fur-bearing animals are so numerous as to have been a source of revenue to a large trading company like the Hudson Bay Co., for over two centuries. There are birds in great variety, Canada having more than 700 of these altogether. They include the wild swan, wild turkey, geese and ducks of various kinds, partridges, quail, prairie-fowl, pigeon, woodcock, snipe, plover, etc.; besides eagles, hawks, owls, and many smaller birds, among which are two species of humming-bird. Except at certain seasons game of all kinds may be shot at will. The rattle-snake and other snakes occur, but are less common than in the States. The seas, lakes, and rivers, especially the Gulf of St. Lawrence and the neighboring waters, abound in almost all kinds of fish, and the fisheries are extremely valuable, employing over 250,000 people. The chief sea fish caught are cod, herring, mackerel, halibut, haddock, hake, shad, salmon, etc. The rivers and lakes abound with salmon, white-fish, bass, trout, sturgeon, maskinonge (or maskelonge), pike, pickerel, etc. The seal and whale fisheries are also valuable. Lobsters and oysters are abundant and excellent.

In the forests grow more than sixty kinds of trees.

Generally the climate of the Dominion shows considerable extremes of heat and cold, but, except in some of the coast regions, the exceeding dryness of the Canadian atmosphere makes both extremes of temperature pleasant and healthy.

The chief crops are wheat, barley, oats, rye, pease, maize, buckwheat, potatoes, turnips, mangel-wurzel, etc. The breeds of cattle are now being much improved, partly by the introduction of high-class cattle; and cattle, horses, and sheep are exported.

The trade of the Dominion is chiefly with Great Britain and the United States. About four-fifths of the whole exports are sent to these two countries, while nearly nine-tenths of the imports come from them. Besides timber, animals and their produce, and agricultural products, the chief articles of export are fish, coal and other minerals,

feather, and wooden goods. The imports chiefly consist of manufactured goods, coal, iron, tea, coffee, sugar, cotton, etc. Canada grain and flour, timber, cattle, bacon and hams, cheese, butter, furs, and fish are exported to Great Britain and U. States.

Of the railways the greatest is the Canadian Pacific Railway, running from Montreal across the whole continent to Vancouver on the Pacific coast in British Columbia; length, about 2900 miles, exclusive of branches. The Grand Trunk Railway connects the maritime provinces and the North-eastern U. States with the western railways, running from Portland, Maine, to Sarnia on the Detroit River.

Some of the canals are stupendous achievements. The most important, from a commercial point of view, are the St. Lawrence Canals and the Welland Canal. The last Canadian canal necessary to complete the navigation of the St. Lawrence to Lake Superior is St. Mary's Canal, opened in 1895, avoiding the St, Mary rapids (Sault Ste. Marie), a tumultuous descent by which Lake Superior pours its waters into Lake Huron. Next after those mentioned, the most important of the Canadian canals is the series of locks and short artificial connections known as the Rideau Canal. It connects Lake Ontario at Kingston with the Ottawa near the city of that name. By means of these works large vessels can now sail by the St. Lawrence route from the Atlantic to the head of Lake Superior.

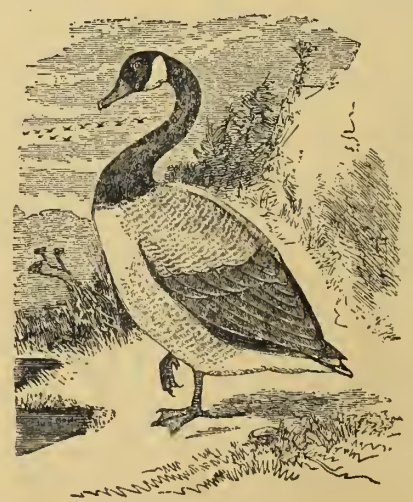
By the Act of Confederation of 1867 the constitution of the Dominion was required to be similar in principle to that of the United Kingdom. There is a central federal government and separate provincial governments and legislatures. The central executive government is vested in the sovereign of Great Britain and Ireland, and is carried on in his name by a governor general appointed by the crown, and a privy-council. The governor-general has a salary of $50,000 per annum. He is assisted by a privy-council consisting of the prime-minister and twelve other ministers or heads of departments. The legislative authority rests with a Parliament consisting of two houses, the Senate and the House of Commons. The Senate consists of eighty-one members, nominated by the governor-general. The House of Commons is elected by the people for five years, there being one member for about every 22,000 of the population. Each of the provinces has a separate parliament and administration, independent in its own sphere, at the head being a lieutenant-governor appointed by the central government. The provinces of Quebec and Nova Scotia have each two chambers; the other provinces have only one There is also a very perfect system of municipal government throughout the Dominion, the counties and townships having local governments or councils which regulate their local taxation. The administration of justice is based on the English model, except in Quebec province, where the old French law prevails. The only court that has jurisdiction throughout the Dominion (except the Exchequer and the Maritime Court), is the Supreme Court, the ultimate court of appeal in civil and criminal cases. In certain cases an appeal may be had to his Majesty's Privy Council. The capital of the Dominion is Ottawa, but the largest cities are Montreal, Toronto, and Quebec. Canada has both a large volunteer force and a militia. The former comprises many well-equipped organizations in infantry, cavalry, and artillery. A military college for the training of officers is maintained by the Dominion government at Kingston.

There is no state church in the Dominion. The prevailing religion in Quebec is that of the Roman Catholic Church. In Ontario Methodists predominate, then Presbyterians, the English Church, and the Roman Catholics. Of the total population in 1901, 2,229,600 were Roman Catholics, 916,886 Methodists, 842,442 Presbyterians, 680,620 Anglicans. Education is well attended to, being everywhere more or less under the supervision of government, and excellent free schools being provided.

The population is increasing rapidly both naturally and by means of immigration. Ontario is settled principally by emigrants from Great Britain and their descendants, with considerable numbers of Germans and Americans. In the province of Quebec the people are mostly French in origin, speech, and customs, being mainly descendants of the French colonists who inhabited the region before it became British. There are, besides, the Indian tribes and the Eskimos, the latter in the extreme north. The Indians number about 130,000. Population about 6,000,000.

CANADA BALSAM, a fluid oleo-resin obtained from the balsam-fir common in Canada and the U. States, and also from Fraser's balsam-fir and the hemlock spruce. It is used in medicine and in making varnishes, etc.

CANADA GOOSE, an American wild goose 30 to 35 inches long, brownish above, lighter below, head, neck, bill,



Canada goose, or wild goose.

and feet black, a white patch on the cheek; breeds in the north of the continent, and migrates southward when the frost becomes severe.

CANADA HEMP, a perennial herb, of the dogbane family, native of N. America. It has a strong fiber used for twine, nets, woven fabrics, etc.

CANADA RICE, a floating grass growing in lakes and sluggish streams in Canada and the northern U. States, yielding a grain that forms part of the food of the Indians, and is eaten by whites also.

CANAL, an artificial water-course for the transportation of goods or passengers by boats or ships, or for purposes of drainage or irrigation. The canals most familiar to ordinary readers are for navigation. These consist usually of a number of different sections, each on one level throughout its course, but differing in relative height from the others. From one section to another boats are transferred by means of locks, or it may be by inclines or lifts. The lock is a water-tight inclosure with gates at either end, constructed between two successive sections of a canal. When a vessel is descending, water is let into the lock till it is on a level with the higher water, and thus permits the vessel to enter; the upper gates are then closed, and by the lower gates being gradually opened, the water in the lock falls to the level of the lower water, and the vessel passes out. In ascending the operation is reversed. The incline conveys the vessel from one reach to another, generally on a specially-constructed carriage running on rails, by means of drums and cables. The lift consists of two counterbalancing troughs, one going up as the other descends, carrying the vessel from the higher to the lower level, or vice versa. Works of great magnitude in the way of cuttings, embankments, aqueducts, bridges, tunnels, reservoirs for water-supply, etc., are often necessary in constructing canals. Canals have been known from remote times, Egypt being intersected at an early period by canals branching off from the Nile to distant parts of the country, for purposes of irrigation and navigation.

The chief canal in Germany is the great North Sea and Baltic Canal for sea-going vessels, constructed at a cost of $40,000,000, starting near the mouth of the Elbe and reaching the Baltic near Kiel. The greatest British canal is the Manchester Canal, a waterway for ocean-going vesesls from the estuary of the Mersey, near Runcorn, to Manchester, through a few locks and partly in the beds of the Mersey and the Irwell, begun in 1887, opened in 1894; total cost, about $75,000,000. In the U. States the most extensive undertakings of this kind are the canal connecting the Hudson with Lake Erie and the Chicago drainage canal. In Canada, besides the Welland Canal, uniting Lakes Erie and Ontario, and avoiding the Niagara river and its falls, there are several other important canals. As yet the greatest achievement in canal-making has been the Suez Canal. It is an example of a ship-canal without locks, open at both ends to the sea. A similar but much smaller canal is that of Corinth. Two great American canals, the Panama Canal and the Nicaragua Canal—the one of very different character from the

other—remain as yet uncompleted. See separate articles.

CANAL, Chicago drainage, for the removal of Chicago's sewage was begun Sept. 3,1892, and opened Jan. 2, 1900. Some sections are excavated in solid rock, are 160 ft. wide, with perpendicular walls, and 30 to 35 ft. deep. Where it is full earth-cut the bottom of the channel is 202 ft. wide. The full length of the channel is 28½ mi. Its capacity per minute is 600,000 cubic ft; maximum velocity of current per hour, 3 mi.; length of spillway, 397 ft. The total cost of construction was about $33,000,000.

CAN'ARA, a maritime region of Hindustan, now partly in the Madras presidency (south Canara), and partly in the Bombay presidency (north Canara), extending along the Indian Ocean for 180 miles, with a mean breadth of 40 miles. The Bombay portion has an area of 3910 sq. miles and a pop. of 446,351; the Madras portion 3902 sq. miles and 1,056,081 inhabitants.

CANA'RY, a wine not unlike Madeira, made in the Canary Islands, chiefly at Teneriffe.

CANARY-BIRD, an insessorial singing bird, a kind of finch from the Canary Islands. Many of the cage canaries are really mules, produced by the interbreeding of canaries with allied species, such as the goldfinch, siskin, linnet, etc.

CANARY, GRAND, or **GRAN CANARIA,** an island in the Atlantic Ocean, about 180 miles from the coast of Africa. It is the most fertile and important of the Canary Islands, to which it gives name. Area, 650 sq. miles; pop. 93,653. Canary, or Cividad de Palmas, is the capital.

CANA'RY ISLANDS, or **CANARIES,** a cluster of islands in the Atlantic, 60 or 70 miles from the n.w. coast of Africa, and belonging to Spain. They are thirteen in number, seven of which are considerable, viz.: Palma, Ferro, Gomera, Teneriffe, Grand Canary, Fuerteventura, and Lancerota. The other six are very small: Graciosa, Roca or Rocca, Allegranza, Sta. Clara, Inferno, and Lobos. All are volcanic, rugged and mountainous, frequently presenting precipitous cliffs to the sea. The principal peak is that of Teneriffe, 12,182 feet; El Cumbre in Gran Canaria is 6650 feet. The area of the whole has been estimated at 2808 sq. miles. Their fine climate and their fertility, which owes little to cultivation, justified their ancient name of Fortunate Islands. The Canaries form a Spanish province; pop. 358,564.

CANARY-SEED, the seed of the canary-grass, order Graminaceæ, is used as food in the Canaries, Barbary, and Italy, and is largely collected for canary-birds.

CANA'RY-WOOD, the light orange-colored wood of trees of the laurel family belonging to the Canaries and Madeira.

CANBY, Edward Richard Sprigg, an American soldier, born in Kentucky in 1819, died in 1873. He graduated at West Point, served in the Indian and Mexican wars, and during the civil war repelled the attacks of Sibley on New Mexico. In 1873 he was killed by the treachery of the Modoc Indians in Oregon.

CANCER, in astronomy, the fourth sign in the zodiac, entered by the sun on or about the 21st of June, and quitted about the 22d of July. The constellation Cancer is no longer in the sign of Cancer, but at present occupies the place of the sign Leo.

CANCER, or **CARCINO'MA,** a malignant growth or structure in some part of the human body, which can extend itself and spread to neighboring parts, and even form again after removal, and usually causes death. Cancer is often a very painful disease, but in many cases is not attended with pain. No cure for it can be said to exist, though excision, if performed in time, may not be followed by a recurrence.

CANCER, Tropic of. See Tropics.

CANDAHAR. See Kandahar.

CANDELA'BRUM, an ornamental candlestick or lamp-holder, often of a branched form. Ancient candelabra frequently display much ingenious treatment in the design, presenting columns, figures, etc., and the branches from the central shaft were often numerous. In ancient times Tarentum and Ægina were famous for their elegant candelabra. Marble, earthenware, and other materials, as well as metal, were employed in their structure, which was sometimes on a large scale.

CAN'DIA, one of the most important islands of the Turkish Empire, situated in the Mediterranean, 81 miles from the southern extremity of the Morea and 230 miles from the African coast, 160 miles long, 14 to 50 broad; area, 4026 sq. miles. The inhabitants (estimated at 1,200,000 in ancient times) now number about 309,349, of whom 269,246 are Greek Christians (rapidly increasing), and 38,281 Mahometans. The capital, Canea, the seat of the governor and chief place of trade, has 24,537 inhabitants; Candia, 22,774.

CAN'DIDATE, a term taken from the Latin candidātus, a candidate, literally a person dressed in white, because, among the Romans, a man who solicited an office, such as the prætorship or consulship, appeared in a bright white garment—toga candida.

CANDLE, a solid cylindrical rod of some fatty substance, with a small bundle of loosely-twisted threads placed longitudinally in its center, used for a portable light. The chief material used for making candles is tallow, either in a pure state or in mixture with other fatty substances, as palm-oil, spermaceti, wax, etc. Paraffin candles are now made in considerable quantities also. Ordinarily tallow candles are either dipped or moulded. The former, generally composed of the coarser tallow, are made by attaching a number of separate wicks to a frame and dipping the whole into a cistern of melted tallow as often as may be necessary to give the candle the required thickness. Moulded candles, as their name implies, are formed in moulds. These, made generally of pewter, are hollow cylinders of the length of the candle, and open at both ends, but provided at the upper end with a conical cap, in which there is a hole for the wick. A number of these moulds are inserted in a wooden frame or trough with their heads downward; the wick is then drawn in through the top hole by means of a wire, and kept stretched while the moulds are filled by running melted tallow from a boiler into the trough. Considerable modern improvements have been made in the manufacture of candles. One of the most important of these consists in not employing the whole of the fatty or oily substances, but in decomposing them, and then using only the stearine of the former and the palmitine of the latter class of substances. Wax cannot be formed into candles by melting it and then running it into moulds. Instead, the wicks, properly cut and twisted, are suspended by a ring over a basin of liquid wax, which is poured on the tops of the wicks until a sufficient thickness is obtained, when the candles, still hot, are placed on a smooth walnut table, kept constantly wet, and rolled upon it by means of a flat piece of boxwood. The large wax candles used in Roman Catholic churches are merely plates of wax bent round a wick and then rolled.

CANDLEBERRY, Candleberry Myrtle, Wax Myrtle, etc., a shrub growing from 4 to 18 feet high, and common in N. America, where candles are made from its drupes or berries, which are about the

Candleberry or wax myrtle.

size of peppercorns, and covered with a greenish-white wax popularly known as Blayberry tallow. The wax is collected by boiling the drupes in water and skimming off the surface. A bushel of berries yields from 4 to 5 lbs. of wax.

CANDLE-FISH, a sea-fish of the salmon family, frequenting the north-western shores of America, of about the size of the smelt. It is converted by the Indians into a candle simply by passing the pith of a rush or a strip of the bark of the cypress-tree through it as a wick, when its extreme oiliness keeps the wick blazing.

CAN'DLEMAS, a church feast, instituted in 492 in commemoration of the presentation of Christ in the temple and of the purification of Mary. It falls on February 2, and on this day among Roman Catholics lighted candles are carried about in procession, and all candles and tapers which are to be used in the churches during the entire year are consecrated.

CANE. See Bamboo, Rattan, Sugar-cane.

CANEBRAKE, a reed or grass, indigenous to the warmer parts of the U. States. It grows in marshy situations,

where it attains a height of 10 to 30 feet. It is of a genus allied to the bamboo. The flowers are in panicles. The young growth of this cane is used as fodder, but the quality is rather poor. The stems supply fishing-rods, pipe-stems, splints for baskets, chair-bottoms, mats, etc.

CANE'PHORUS, one of the bearers of the baskets containing the implements of sacrifice in the processions of the Dionysia, Panathenea, and other ancient Grecian festivals an office of honor

Canephorus, from terra cotta in British Museum.

much coveted by the virgins of antiquity. The term is applied to architectural figures bearing baskets on their head, sometimes improperly confounded with Caryatides.

CAN'IDÆ, the dog family of animals.

CANIS MAJOR, a constellation of the southern hemisphere, remarkable as containing Sirius, the brightest star.—Canis Minor, is a constellation in the northern hemisphere, immediately above Canis Major, the chief star in which is Procyon

CANISTER SHOT. Same as Case-shot.

CANKER, (1) in medicine, a collection of small sloughing ulcers in the mouth, especially of children; called also water eanker. (2) In horticulture, a kind of grangrenous disease to which fruit-trees especially are liable, beginning in the younger shoots and gradually extending to the trunk. (3) In farriery, a disease in horses' feet causing a discharge of fetid matter from the cleft in the middle of the frog, generally originating in a diseased thrush.

CANKER-WORM, a worm or larva destructive to trees or plants; in America specifically applied to moths.

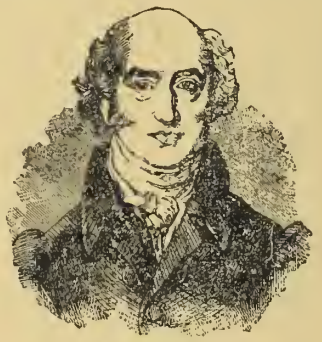
CANNA, a genus of plants, order Marantaceæ, some species of which have fine flowers, and some from their black, hard, heavy seeds are called Indian shot.

CANNEL COAL. See Coal.

CANNES (kân), a seaport of France, on the shore of the Mediterranean, dep. Alpes-Maritimes; famous as a winter residence, and as the place where Napoleon landed when he returned from Elba, March 1, 1815. Pop. 34,151.

CANNIBALISM, or **ANTHROPOPHAGY,** the eating of human flesh as food, a practice that has been known from the earliest times, and in the most widely spread localities. See Anthropophagi.

CANNING, Charles John, Earl, son of George Canning, born in 1812; educated at Eton and Oxford, and in 1856 went out to India as governor-general. Throughout the mutiny he showed a fine coolness and clear-headedness, and though his carefully-pondered decisions were sometimes lacking in promptness, yet his admirable moderation did much to re-establish the British Empire in India. He was raised to the rank of earl and made viceroy, but returned to England with shattered health in 1862, dying in the same year. — **CANNING,** George, a distinguished orator and statesman, born in London in 1770; educated at Eton and at Oxford. He



George Canning.

was first brought into parliament by Pitt in 1793, and in 1796 became under-secretary of state. In 1814 he was appointed minister to Portugal, and remained abroad about two years. He refused to take any part in the proceedings against the queen, and in 1822, having been nominated governor-general of India, he was on the point of embarking when the death of Castlereagh called him to the cabinet as foreign secretary. — **CANNING,** Stratford, Viscount Stratford de Redcliffe, an English diplomatist, son of a London merchant and cousin of George Canning, born in 1788. He retired from diplomatic work in 1858, but exercised no small influence in the House of Lords, and as late as 1880 drew up a paper on the Greek claims. He died in the August of that year, having done more than any one man to establish British prestige in the East.

CANNON, a big gun or piece of ordnance. The precise period at which engines for projecting missiles by mechanical force (catapults, etc.) were supplanted by those utilizing explosive materials is a matter of controversy, the invention of cannon being even attributed to the Chinese, from whom the Saracens may have acquired the knowledge. A doubtful authority asserts their use at the siege of Belgrade in 1073; but they were certainly brought into use in France as early as 1338.

Great improvements and changes in the manufacture of cannon have been introduced in recent times. Those that are now made of bronze have often their bore widened by strong cylinders of steel successively forced into them, a process which condenses and hardens the surrounding bronze, giving it a tenacity approaching that of cast-steel. The heavy guns of the British service, made on the "Woolwich" system, have a steel tube to form the bore, over which are shrunk coils of wrought iron, increasing in thickness about the breech. This method of manufacture was first introduced by Sir W. (later Lord) Armstrong about 1858. This construction presents the hard steel to meet the wear and tear on the bore of the gun, while great support is given by shrinking on the wrought-iron hoops, which contract with a tight grip upon the steel. In the U. States enormous cast-iron smooth-bore guns have been made on the Rodman system, throwing very heavy spherical projectiles at a low velocity, intended by their great weight to bend and open armor at the joints, thus destroying the vessel by what is termed "racking." But the common system is to punch holes in the armor by means of rather smaller projectiles, made of chilled iron, which strike at a high velocity, and the range and penetration of modern ordnance are something enormous. Thus some of the larger guns are sighted for 5 miles, and they can penetrate 30 inches of armor at the distance of 1000 yards. Eighty-ton, 100-ton, and 110-ton guns have been constructed for the navy and land defenses.

Rifled eannon load either at the muzzle or breech. The former system is simpler and stronger. The latter facilitates loading and exposes the gunners less to the fire of the enemy's riflemen, especially when the gun is firing through a ship's port or the embrasure of a fort. The projectiles for rifled guns are not spherical, but elongated, their length being perhaps 2½ or 3 times their diameter; and they require to be so constructed that they may take hold of the grooves of the bore and thus get the required rotation to send them at a high speed point first through the air. For this purpose they used to have rows of studs projecting and fitting into the grooves, or a coating of lead, which served the same purpose; but the projectile now usually has a flanged copper disc fitted on to the base, and the pressure of the gas when the charge is exploded forces out the flanges into the grooves. Among recent improvements may be mentioned the use of a "powder chamber" of greater diameter than the rest of the bore, and the adoption of an increased twist in the rifling instead of a uniform one. Guns for firing charges of dynamite or other powerful explosive have recently been experimented with. See also Gun-carriage, Artillery, Mortar, Howitzer, Machine Gun, Shell, etc.

CANNON, Joseph G., an American politician and congressman, born at Guilford, N. C., in 1836. He removed to Illinois and from 1873 to 1906 has been successively elected to the congresses between those years. He was elected speaker of the house of representatives in 1903.

CANOE (ka-nö'), a light boat narrow in the beam, and adapted to be propelled by paddles, often in conjunction with sails. The name was originally given to the boats of uncivilized races, but its application has been consider-

ably extended, and canoes of home make may be seen on the waters of the most civilized countries. They are of the most diverse materials and construction. Often they are hollowed out of a single log. The Indian canoes are of bark on a wooden frame. The Eskimo kaiaks consist of a light wooden frame, covered with seal-skins sewed together with sinews, and having only one opening to admit the boatman to his seat. In the islands of the Pacific the natives have double canoes, united by a strong platform, serving in this way as one vessel.

CAN'ON, a term given collectively to the books of the Holy Scriptures universally received as genuine by Christian churches. See Bible, Apocrypha.

CAN'ON, a church dignitary who possesses a prebend, or revenue allotted for the performance of divine service in a cathedral or collegiate church.

CANON (kan-yon'), the Spanish word for tube, funnel, cannon; applied by the Spanish Americans, and hence in N. America generally (often with the spelling Canyon), to long and narrow river gorges or deep ravines with precipitous and almost perpendicular sides occurring frequently in the Rocky Mountains, the Sierra Nevada, and great western plateaux of N. America.

CANONICAL BOOKS, the books of Scripture belonging to the canon. See Canon.

CANONICAL HOURS, certain stated times of the day appropriated by ecclesiastical law to the offices of prayer and devotion in the Roman Catholic Church, viz.: matins with lauds, prime, tierce, sext, nones, evensong or vespers, and compline.

CANONICALS, the dress or vestments of the clergy.

CANONIZATION, a ceremony in the Roman Church, by which deceased persons are declared saints. The pope institutes a formal investigation of the miraculous and other qualifications of the deceased person recommended for canonization; and an advocate of the devil, as he is called, is appointed to oppose the canonization and submit evidence. If the examination is satisfactory, the pope pronounces the beatification of the candidate, the actual canonization generally taking place some years afterward, when a day is dedicated to his honor, his name inserted in the calendar of the Saints, a solemn mass is celebrated by the pope, and his remains preserved as holy relics.

CANON LAW, a collection of ecclesiastical constitutions for the regulation of the Church of Rome, consisting for the most part of ordinances of general and provincial councils, decrees promulgated by the popes with the sanction of the cardinals, and decretal epistles and bulls of the popes. There is also a canon law for the regulation of the Church of England, which under certain restrictions is used in ecclesiastical courts and in the courts of the two universities.

CAN'OPY, a raised and ornamental covering above a throne, a bed, or the like; in architecture, a decorative structure serving as a hood or cover above an altar, pulpit, niche, etc.

CANO'VA, Antonio, an Italian sculptor, born in 1757 at Possagno, in Venetian territory. He was first an apprentice to a statuary in Bassano, from whom he went to the Academy of Venice, where he had a brilliant career. In 1779 he was sent by the senate of Venice to Rome with a salary of 300 ducats, and there produced his Theseus and the Slain Minotaur. In 1783 Canova undertook the execution of the tomb of Pope Clement XIV. in the Church of the Apostles, a work in the Bernini manner, and inferior to his second public monument the tomb of Pope Clement XIII. (1792) in St. Peter's. From 1783 his fame rapidly increased. He established a school for the benefit of young Venetians, and among other works produced his group of Venus and Adonis, the Psyche and Butterfly, a Repentant Magdalene, the well-known Hebe, the colossal Hercules hurling Lichas into the Sea, the Pugilists, and the group of Cupid and Psyche. In 1796 and 1797 Canova finished the model of the celebrated tomb of the Archduchess Christina of Austria, and in 1797 made the colossal model of a statue of the King of Naples executed in marble in 1803. He afterwards executed in Rome his Perseus with the Head of Medusa, which, when the Belvidere Apollo was carried to France, was thought not unworthy of its place and pedestal. In 1802 he was invited by Bonaparte to Paris to make the model of his colossal statue. Among the later works of the artist are a colossal Washington, the tombs of the Cardinal of York and of Pius VII.; a Venus Rising from the Bath; the colossal group of Theseus Killing the Minotaur; the tomb of Alfieri; the Graces Rising from the Bath; a Dancing Girl; a colossal Hector; a Paris, etc. After the second fall of Napoleon, in 1815, Canova was commissioned by the pope to demand the restoration of the works of art carried from Rome. He went from Paris to London, and returned to Rome in 1816, where he was made Marquis of Ischia, with a pension of 3000 scudi. He died at Venice, Oct. 13, 1822.

CANROBERT (kaṇ-ro-bār), François Certain, French marshal, born 1809. He commanded in the Crimean war under St. Arnaud, and after his death received the chief command, but could not work in harmony with the British and made way for Pélissier. In the Italian war (1859) he commanded the 3d division, and distinguished himself at Magenta. In the Franco-German war he belonged to the force that was shut up in Metz and had to capitulate. He was latterly a French senator. He died in 1895.

CANTAL', a central department in France, area 2217 sq. miles; capital, Aurillac. This department, formerly part of Upper Auvergne, is named from its highest mountain, the Plomb du Cantal, 6094 feet in height. The principal crops are rye, buckwheat, potatoes, and chestnuts, hemp and flax. Cattle, sheep, pigs, horses, and mules are reared in large numbers. Large quantities of cheese ("Auvergne cheese") are made. Hot mineral springs are abundant. Pop. 241,742.

CAN'TALIVER, Cantilever, a wooden or iron block framed into the wall of a house and projecting from it to carry mouldings, eaves, balconies, etc. Also a large projecting framework forming part of an iron bridge directly carrying part of the roadway, and also supporting beams or girders bridging over a space between it and another similar structure.

CAN'TALOUPE (-lōp), a small round variety of musk-melon, globular, ribbed, of pale green or yellow color, and of delicate flavor; first grown in Europe at the castle of Cantaloupe.

CANTATA (kan-tā'ta), a vocal composition, consisting of an intermixture of air, recitative, duet, trio, quartette, and chorus, often taking the form of a short oratorio or unacted opera.

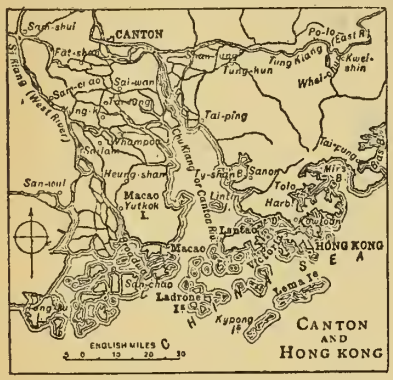
CANTEEN', in military language, a regimental establishment managed by a committee of officers, for the sale of liquors, tobacco, groceries, etc., to the soldiers at reasonable prices. The profits are employed for the benefit of the soldiers themselves.

CAN'TERBURY, a city, and parl., mun., and county borough of England, in Kent, 55 miles s.e. of London, giving name to an archiepiscopal see, the occupant of which is primate of all England. The foundation of the archiepiscopal see took place soon after the arrival of St. Augustine in 596. In the 8th, 9th, 10th, and 11th centuries the city was dreadfully ravaged by the Danes, but at the Conquest its buildings exceeded in extent those of London. The ecclesiastical importance of the place was consummated by the murder of Thomas a Becket in the cathedral, the priory and see benefiting by the offerings of devotees and pilgrims at his shrine. Henry VIII. dissolved the priory in 1539, and ordered the bones of Becket to be burned; and the troopers of Oliver Cromwell made a stable of the cathedral.—The cathedral, one of the finest ecclesiastical structures in England, 530 feet in length and 154 in breadth, has been built in different ages, the oldest part dating from about 1174. The great tower, 235 feet in height, is a splendid specimen of the Pointed style. Other ecclesiastical buildings are St. Augustine's monastery, now a Church missionary college, St. Margaret's Church, and the church dedicated to St. Martin, believed to be one of the oldest existing Christian churches. Canterbury has a royal grammar-school, founded by Henry VIII., numerous other schools, art gallery, etc. There are breweries and malting establishments; and the principal articles of trade are corn and hops. There are extensive barracks for cavalry and infantry. It returns one member to parliament. Pop. 24,868.

CANTERBURY, a district occupying most of the center of South Island, New Zealand, with a coast-line of 200 miles, and a greatest breadth of about 150 miles. The western part is traversed by mountains, from which a fertile plain of 2,500,000 acres slopes gradually down to the sea. The chief places in the province are Christchurch, the capital; and Lyttelton, the port town, 8 miles from Christchurch. Pop. 143,040.

CANTILEVER. See Cantaliver.

CAN'TON, a large and important city of Southern China, 80 miles from the sea, on the Pearl River, in the province of Quangtung (of which name Canton is a corruption). The city proper is enclosed by walls 25 feet high and 20 feet thick,



forming a circuit of six miles, with 12 gates; and it is divided into two parts by a wall running east and west; the larger portion north of this wall being called the old, that on the south of it the new city. The streets are long, straight, and in general paved, but very narrow, and gaudy with painted signs. The houses of the poorer classes are mere mud hovels; those of the shop-keeping class are commonly of two stories, the lower serving as the shop. The foreign mercantile houses, and the British, French, and American consulates, have as their special quarter an area in the suburbs in the southwest of the city, with water on two sides of it. In the European quarter are churches, schools, and other buildings in the European style. The river opposite the city for the space of four or five miles is crowded with boats, a large number of which—as many it is said as 40,000—are fixed residences, containing a population of 200,000. The industries of Canton are varied and important, embracing silk, cotton, porcelain, glass, paper, sugar, lacquered ware, ivory carving, metal goods, etc. It was the chief foreign emporium in China until 1850, when Shanghai began to surpass and other ports to compete with it but it exports and imports together often still amount to about $40,000,000. Since the establishment of the colony of Hong-Kong a flotilla of river steamers ply daily between Canton, Hong-Kong, and Macao. In 1856 the foreign factories were pillaged and destroyed by the Chinese, and about a year after this Canton was taken by an English force, and occupied by an English and French garrison until 1861. Pop. estimated at over 1,600,000.

CANTON, a city and county-seat of Stark Co., Ohio, 60 miles south-southeast of Cleveland, on the Nimishillen Creek, and on the Cleveland, Canton & Southern, the Baltimore & Ohio, and the Pennsylvania railroads. Pop. 36,140.

CANUCK, in the U. States, a term used to designate a Canadian. In Canada it is applied to French Canadians. It is thought by some to have an Indian origin, by others to be a corruption of Connaught.

CANUTE, or **CNUT** (ka-nūt', knut), King of England and Denmark, succeeded his father Swegen or Sweyn on his death in England in 1014 A.D., and confirmed the Danish power in England. He began by devastating the eastern coast, and extended his ravages in the south, where, however, he failed to establish himself until after the assassination of Edmund Ironside, when he was accepted king of the whole of England (1017). Canute, who began his reign with barbarity and crime, afterward became a humane and wise monarch. He restored the English customs at a general assembly, and ensured to the Danes and English equal rights and equal protection of person and property, and even preferred English subjects to the most important posts. His power was confirmed by his marriage with Emma, Ethelred's widow. At Harold's death in 1018 he gained Denmark; in 1028 he conquered Norway; and in 1031 he made Malcolm of Scotland admit his superiority. Sweden also was vassal to him. He died in 1036 at Shaftesbury, leaving Norway to his eldest son, Sweyn; to the second, Harold, England; to the third, Hardicanute, Denmark.

CAN'VAS, a coarse and strong cloth, made of flax or hemp, and used for sails, tents, etc.

CANVAS-BACK DUCK, a bird peculiar to N. America, and considered the finest of the water-fowl for the table. They arrive in the U. States from the north about the middle of October, sometimes assembling in immense numbers. The plumage is black, white, chestnut-brown, and slate color; length about 20 inches.

CAOUTCHOUC (kö'chök or kou'-chök), an elastic gummy substance chemically a hydrocarbon, contained in the milky juice of a number of tropical trees of various orders, growing in S. America. The name is also used as an equivalent of india-rubber, but strictly caoutchouc is only the chief ingredient of india-rubber. The crude india-rubber is most commonly obtained by making incisions in the trunks of the trees, whence the sap exudes in the form of a milky fluid which gradually thickens and solidifies. Caoutchouc is a non-conductor of electricity and a bad conductor of heat. It is not dissolved by water, hot or cold, but chloroform, oil of turpentine bi-sulphide of carbon, etc., dissolve it. India-rubber was at first only used to rub out pencil-marks, but before the end of last century it was

Caoutchouc tree.

used to render leather and other substances water-tight, and in 1823 Macintosh took out a patent for the waterproof materials prepared with caoutchouc which bear his name. Latterly its uses have become innumerable. Gutta percha is a similar substance to caoutchouc, and is often popularly confounded with it. See India-rubber.

CAP, in ships, a strong piece of timber placed over the head or upper end of a mast, having in it a round hole to receive the top or top-gallant masts, which are thus kept steady and firm.

CAP, a covering for the head, usually of softer materials and less definite form than a hat. Cap of maintenance, a cap formerly worn by dukes and com-

Cap of maintenance, from great seal of Henry VII.

manders in token of excellency, now an ornament of state carried before the sovereigns of England at their coronation, and also before the mayors of some cities.

CAPE BRETON, an island of the Dominion of Canada, separated from Nova Scotia, to which province it belongs, by the narrow Gut or Strait of Canso; area 3120 sq. miles. Chief town, Sydney. Pop. of Cape Breton, 97,605.

CAPE COD, a noted peninsula of the United States on the s. side of Massachusetts Bay; 65 miles long and from 1 to 20 broad. It is mostly sandy and barren, but populous.

CAPE COLONY, a British colony occupying the southern extremity of Africa. Area (including southern Bechuanaland), 276,700 sq. miles; pop. about 1,738,000. The coast is not much indented; the principal bays are St. Helena, Saldanha, Table, False, Walker, Mossel, and Algoa. In the interior almost every variety of soil and surface is found, but a great part of the colony is arid and uninviting in appearance. Several ranges of mountains, running nearly parallel to the southern coast, divide the country into successive terraces, rising as they recede inland, between which lie belts of fertile land, or vast barren-looking plains, one of them the Great Karroo, being 300 miles long and 100 broad. The principal and furthest inland mountain terrace, averaging 6000 or 7000 ft. in height, commences in Namaqualand and runs to the northeast frontier. The culminating point is the Compass Berg, over 8000 ft. The Table Mountain at Cape Town rises almost perpendicularly about 3585 feet in height. The climate is very healthy and generally pleasant. Except along the coast, especially the southeast coast district, where there are extensive forests, timber is scarce, but with irrigation trees can be grown anywhere. The quadrupeds of the colony comprise the African elephant, still found in the forests of the southeast coast region; buffalo, wild-boar, zebra, quagga, leopard, hyena, numerous antelopes, baboon, armadillo, etc. The birds include vultures, eagles, the serpent-eater, pelicans, flamingoes, and, most important of all, the ostrich, now bred in farms for the sake of its feathers. The cobra and other reptiles are found.

The principal minerals are copper ore, coal, iron ore, manganese, and diamonds, amethysts, agates, etc. Coal and copper are worked, and the diamonds have brought a great amount of money into the colony since 1869, and have given rise to the town of Kimberley, the center of the diamond-fields. Wheat, maize, and other cereals can be grown almost everywhere, if there is sufficient moisture, in some years yielding a surplus for exportation. Sheep-rearing, especially that of pure merinos, is the most important industry, and wool the chief export. Ostrich feathers, hides, and skins are also exported. Both native and Angora goats are bred, and the export of mohair is important. Cattle breeding is also carried on to some extent. The colony is intersected by 2252 miles of railway, far-inland Kimberley, and still farther Johannesburg and Pretoria, being now thus connected with Cape Town and Port Elizabeth. The total value of diamonds produced is over $400,000,000. The European inhabitants consist in part of English and Scottish settlers and their descendants, but, notwithstanding the recent influx of settlers from Britain, the majority are still probably of Dutch origin. The colored people are chiefly Hottentots, Kaffirs, Basutos, Griquas, Malays, and a mixed race. The laborers are chiefly Hottentots and Kaffirs. For the higher education there are four colleges, besides a university (at Cape Town) incorporated in 1873. Responsible government has been possessed by the colony since 1872. The executive is vested in the governor (who is appointed by the crown and is also commander-in-chief) and an executive council of office-holders appointed by the crown. The legislative is in the hands of a council of twenty-three members (the Upper House); and a representative house of assembly of ninety-five members (the Lower House), elected for five years. After Cape Town the chief towns are Kimberley, Port Elizabeth, Grahamstown, Beaconsfield, Paarl, and King William's Town. The Dutch first colonized the Cape in 1652, and till the end of the 18th century the colony was under the Dutch East India Company. It was held by the British from 1795–1801, and it came finally into British possession in 1806. The progress of the colony was long retarded by a series of Kaffir wars, the last of which was in 1851–53. Its involvements in the Boer war of 1899–1902 are still fresh in the memory of everyone.

CAPE HORN, or **THE HORN,** the southern extremity of an island of the same name, forming the most southerly point of South America. It is a dark, precipitous headland, 500 to 600 feet high, running far into the sea. Navigation round it is dangerous on account of frequent tempests. The cape was first doubled in 1616 by Schouten, a native of Hoorn, in Holland, whence its name.

CAPE OF GOOD HOPE, a celebrated promontory near the southern extremity of Africa, at the termination of a small peninsula extending south from Table Mountain which overlooks Cape Town. This peninsula forms the west side of False Bay, and on its inner coast is Simon's Bay and Simon's Town, where there is a safe anchorage and a British naval station. Bartholomew

Diaz, who discovered the Cape in 1487, called it Cape of Storms; but John II. of Portugal changed this to its present designation. It was first doubled by Vasco de Gama in 1497.

CA'PER, the unopened flower-bud of a low trailing shrub, which grows from the crevices of rocks and walls, and among rubbish, in the countries bordering the Mediterranean. Picked and pickled in vinegar and salt they are much used as a condiment (caper-sauce being especially the accompaniment of boiled mutton). The plant was introduced into Britain as early as 1596, but has never been grown on a large scale. The flower-buds of the marsh-marigold and nasturtium are frequently pickled and eaten as a substitute for capers.

CAPERNAUM (ka-per'nā-um), a town in ancient Palestine, on the w. side of the Sea of Tiberias. Nothing of it now remains, but the site is identified with Tel Hum.

CA'PET, the name of the French race of kings which has given 118 sovereigns to Europe, viz. 36 kings of France, 22 kings of Portugal, 11 of Naples and Sicily, 5 of Spain, 3 of Hungary, 3 emperors of Constantinople, 3 kings of Navarre, 17 dukes of Burgundy, 12 dukes of Brittany, 2 dukes of Lorraine, and 4 dukes of Parma. The first of the Capets known in history was Robert the Strong, a Saxon, made Count of Anjou by Charles the Bold, and afterward duke of the Ile de France. His descendant, Hugh, son of Hugh the Great, was in 987 elected king of France in place of the Carlovingians. On the failure of the direct line at the death of Charles IV. the French throne was kept in the family by the accession of the indirect line of Valois, and in 1589 by that of Bourbon. Capet being thus regarded as the family name of the kings of France, Louis XVI. was arraigned before the National Convention under the name of Louis Capet.

CAPE TOWN, capital of the Cape Colony, S. Africa, at the head of Table Bay, and at the base of Table Mountain, 30 miles from the Cape of Good Hope. The port has a break-water 3554 feet long, two docks 16 acres in area, a large graving-dock, etc. Pop. 83,718.

CAPE VERD, the extreme w. point of Africa, between the Senegal and the Gambia, discovered by Fernandez, 1445.

CAPE VERD ISLANDS, a group of ten or fifteen volcanic islands and rocks in the Atlantic, 320 miles west of Cape Verd (see above), belonging to Portugal. They produce rice, maize, coffee, tobacco, the sugar-cane, physic-nuts, and various fruits. Coffee, hides, archil, physic-nuts, etc., are exported. Most of the inhabitants are negroes or mixed race. Porto Grande, on Sao Vicente, is a coaling station for steamers. Pop. about 147,000.

CA'PIAS, in English law, a writ of two sorts: one before judgment, called a capias ad respondendum, to take the defendant and make him answer to the plaintiff; the other, which issues after judgment, of divers kinds; as, a capias ad satisfaciendum, or writ of execution.

CAP'ILLARIES, in anatomy, the fine blood-vessels which form the links of connection between the extremities of the arteries and the beginnings of the veins.

CAPILLAR'ITY, the general name for certain phenomena exhibited by fluid surfaces when the vessels containing the liquid are very narrow, and also exhibited by that portion of the fluid surface which is in close proximity to the sides of a larger vessel, or to any inserted object. Thus if an open tube of small bore be inserted in water, it will be noted that the liquid rises within it above its former level to a height varying inversely as the diameter of the bore, and that the surface of this column is more or less concave in form (as in Fig. 1). The same phenomenon occurs in any fluid which will wet the tube; but in the case of a fluid like mercury, which does not wet the glass, the converse phenomenon appears, the liquid being depressed in the tube below its former level, and the portion within the tube exhibiting a convex surface (see Fig. 2). Similarly round the sides of the respective vessels, and round the outsides of

Fig. 1. Fig. 2.
Capillarity.

the inserted tubes, we find in the first case an ascension, and in the second a depression of the liquid, with a corresponding concavity or convexity at its extreme edge. Two parallel plates immersed in the liquids give kindred results. As these phenomena occur equally in air and in vacuo they cannot be attributed to the action of the atmosphere, but depend upon molecular actions taking place between the particles of the liquid itself, and between the

liquid and the solid, these actions being confined to a very thin layer forming the superficial boundary of the fluid. Every liquid, in fact, behaves as if a thin film in a state of tension formed its external layer; and although the theory that such tension really exists in the superficial layer must be regarded as a scientific fiction, yet it adequately represents the effects of the real cause, whatever that may be. Scientific calculations with respect to capillary depressions and elevations proceed, therefore, on the working theory that the superficial film at the free surface is to be regarded as pressing the liquid inward, or pulling it outward according as the surface is convex or concave—the convex or concave film being known as the meniscus (crescent). The part which capillarity plays among natural phenomena is a very varied one. By it the fluids circulate in the porous tissues of animal bodies; the sap rises in plants, and moisture is absorbed from air and soil by the foliage and roots. For the same reason a sponge or lump of sugar, or a piece of blotting-paper soaks in moisture, the oil rises in the wick of a lamp, etc.

CAP'ITAL, in trade, the term applied, as the equivalent of "stock," to the money, or property convertible into money, used by a producer or trader for carrying on his business; in political economy, that portion of the produce of former labor which is reserved from consumption for employment in the further production of wealth—the apparatus of production. It is commonly divided under two main heads—circulating capital and fixed capital. Circulating capital comprises those forms of capital which require renewal after every use in production, being consumed (absorbed or transformed) in the single use, e.g. raw materials and wages. Fixed capital, on the other hand, comprises every form of capital which is capable of use in a series of similar productive acts, e.g. machinery, tools, etc. From the ordinary economic point of view capital is conveniently limited to material objects directly employed in the reproduction of material wealth, but from the higher social point of view many things less immediately concerned in productive work may be regarded as capital. Thus Adam Smith includes in the fixed capital of a country, "the acquired and useful abilities of all the inhabitants;" and the wealth sunk in prisons, educational institutions, etc., plays ultimately a scarcely less important part in production than that invested in directly productive machinery.

CAPITAL, an architectural term, usually restricted to the upper portion of a column, the part resting immediately on the shaft. In classic architecture each order has its distinctive capital, but in Egyptian, Indian, Saracenic, Norman, and Gothic they are much diversified. See Column.

CAPITAL PUNISHMENT, in criminal law, the punishment by death. Formerly it was the ordinary form of punishment for felonies of all kinds; but a more accurate knowledge of the nature and remedies of crime, a more discriminating sense of degrees in criminality, and an increased regard for human life have latterly tended to restrict, if not to abolish, the employment of the penalty of death. In several European countries—Sweden, Denmark, North Germany, Bavaria, Austria—there is great unwillingness to enforce capital punishment, though the penalty remains upon the statute books. In Belgium there has been no execution since 1863. In Switzerland capital punishment was abolished in 1874, and though the right of restoring it was allowed to each canton in consequence of an increase of murders, only 7 out of a total of 22 have availed themselves of it. In Roumania it was abolished in 1864; in Holland in 1870; and it has also been discontinued in Portugal and Italy. In several of the U. States—Michigan, Wisconsin, Rhode Island, and Maine, imprisonment for life has been substituted for murder in the first degree; in the remainder capital punishment is retained, though the experiment of its abolition was made for a short time in New York and Iowa.

The manner of inflicting the punishment of death has varied greatly. Barbarous nations are generally inclined to severe and vindictive punishments; and even in civilized countries, in cases of a political nature, or of very great atrocity, the punishment has been sometimes inflicted with many horrible accompaniments, such as tearing the criminal to pieces, starving him to death, breaking his limbs upon the wheel, pressing him to death in a slow and lingering manner, burning him at the stake, crucifixion, etc. In modern times among civilized nations, public opinion is strongly disposed to discountenance the punishment of death by any but simple means; and even in governments where torture is still countenanced by the laws it is rarely or never resorted to. In the U. States, except New York, where it is done by electric shock, the method of execution is by hanging. In Germany and France the sword and the guillotine are the usual means; in Spain, strangulation by means of the garrote, a sort of iron collar tightened by a screw. Capital punishment cannot be inflicted, by the general humanity of the laws of modern nations, upon persons who are insane or who are pregnant, until the latter are delivered and the former become sane. In military law, sentence of death may be passed for various offenses, such as sedition, violence and gross neglect of duty, desertion, assault upon superior officers, disobedience to lawful commands, etc.

CAPITALS, the large letters used in writing and printing, most commonly as the initial letters of certain words. As among the ancient Greeks and Romans, so also in the early part of the middle ages, all books were written without any distinction in the kind of letters, large letters (capitals) being the only ones used; but gradually the practice became common of beginning a book, subsequently, also, the chief divisions and sections of a book, with a large capital letter, usually illuminated and otherwise richly ornamented.

CAP'ITOL, now Campidoglio, the citadel of ancient Rome, standing on the Capitoline Hill, the smallest of the seven hills of Rome. It is used as a hotel de ville, museum, etc., contains some fine statues and paintings, and commands a superb view of the Campagna. — The name of capitol is also given to the edifice in Washington where Congress assembles. The various states also call their state-houses capitols.

CAPITULA'TION, in military language, the act of surrendering to an enemy upon stipulated terms, in opposition to surrender at discretion.

CAPO D'ISTRIA, John Antony, Count, Greek statesman, born at Corfu in 1776. In 1809 he entered the service of Russia and obtained an appointment in the department of foreign affairs. As imperial Russian plenipotentiary he subscribed the Treaty of Paris, Nov. 20 1815. In 1828 he became president of the Greek Republic, in which office he was very unpopular, and in 1831 he was assassinated.

CAP'RICORNUS, Capricorn, a constellation of the southern hemisphere, and one of the twelve signs of the zodiac, the one to which belongs the winter solstice, represented by the figure of a goat or a figure having the fore-part like a goat and the hind-part like a fish.

CAPRIVI, Georg Leo, Count von, a German statesman, successor to Bismarck in the chancellorship of the German empire. He was born at Charlottenburg, in 1831, died in Brandenburg, 1899. Caprivi distinguished himself in the Franco-Prussian war, and after serving in high commands in the army was made chief of the admiralty in 1883. After Bismarck's decline in health, Caprivi took the reins of government, but his administration was not satisfactory. He retired in 1894.

CAP'SICUM, a genus of annual, subshrubby plants, with a wheel-shaped corolla, projecting and converging stamens, and a many-seeded berry. They are chiefly natives of the East and

Capsicum.

West Indies, China, Brazil, and Egypt, but have spread to various other tropical or sub-tropical countries, being cultivated for their fruit, which in some reaches the size of an orange, is fleshy and variously colored, and contains a pungent principle which is present also and more largely in the seed. The fruit or pod is used for pickles, sauces, etc., and also medicinally. Several of them

yield Cayenne pepper, and are originally a native of S. America.

CAP'STAN, a strong upright column of timber, movable round a strong iron spindle, and having its upper extremity pierced to receive bars or levers, for winding a rope round it to raise weights, such as the anchors of a vessel, or to perform other work that requires great power. It is distinguished from a windlass by the axis, and consequently the barrel, being vertical.

CAPTAIN, one who is at the head or has authority over others, especially: (1) The military officer who commands a company, whether of infantry, cavalry, or artillery. (2) An officer in the navy commanding a ship of war. Captains of ships were formerly designated post-captains.—Captain of the fleet (in Britain), a flag-officer temporarily appointed by the admiralty, who acts as adjutant-general of the force, sees to the carrying out of the orders of the commander-in-chief, and to proper discipline being maintained in the fleet. (3) The master of a merchant vessel.

CAPTION, in law, a certificate stating the time and place of executing a commission in chancery, or of taking a deposition, or of the finding of an indictment, and the court or authority before which such act was performed, and such other particulars as are necessary to render it legal and valid.

CAPUCHIN MONKEY (kap-u-shēn'), a name given to various species of S. American monkeys. The hair of their heads is so arranged that it has the appearance of a capuchin's cowl, hence the name.

CAPUCHINS (kap-u-shēnz'), monks of the order of St. Francis, so called from the capuchon or capuce, a stuff cap or cowl, the distinguishing badge of the order. They are clothed in brown or gray, go barefooted, and never shave their beard.

CAPYBA'RA, a species of rodent, sometimes known by the name of the water-hog, and of the family Cavidæ (guinea-pig). It attains the length of

Capybara.

about 3 feet, and has a very large and thick head, a thick body covered with long, coarse, brown hair, and short legs, with long feet, which, being in a manner webbed, fit it for an aquatic life. It has no tail. It is common in several parts of S. America, and particularly in Brazil. It feeds on vegetables and fish, which it catches somewhat in the manner of the otter.

CARABO'BO. a state of Venezuela, washed on the n by the Caribbean Sea. Area about 2984 sq. miles; pop. 167,499. The capital is Valencia, the chief port Puerto Cabello.

CARACAL'LA, Marcus Aurelius Antonins, eldest son of the Emperor Severus, was born at Lyons A.D. 188, died 217. On the death of his father he succeeded to the throne with his brother Antoninus Geta, whom he speedily murdered. To effect his own security upward of 20,000 other victims were butchered. He was himself assassinated by Macrinus, the pretorian perfect, who succeeded him.

CARAC'AS, a city of S. America, capital of Venezuela, situated in a fine valley about 3000 feet above the Caribbean Sea, connected by railway with the port La Guayra, about 10 miles distant. In 1812 it was in great part destroyed by an earth-quake, and nearly 12,000 persons buried in the ruins. Pop. 72,429.

CARAFE (ka-raf'), the French name for an ordinary glass bottle or decanter for holding drinking water.

CAR'AMEL, the brown mass which cane-sugar becomes at 220° C., used in cookery as a coloring and flavoring ingredient, in giving a brown color to spirits, etc. The name is also given to a kind of candy.

CAR'AT, a weight of 3 17 troy grains, used by jewelers in weighing precious stones and pearls. The term is also used to express the proportionate fineness of gold. The whole mass of gold is divided into twenty-four equal parts, and it is called gold of so many carats as it contains twenty-fourth parts of pure metal. Thus if a mass contain twenty-two parts of pure gold out of every twenty-four it is gold of twenty-two carats.

CARAVAGGIO, Michel Angelo Amerighi, or Merighi da, a celebrated painter, born at Caravaggio 1569, died 1609. He attained distinction as a colorist of the Neapolitan school, being considered the head of the so-called Naturalists' school. He was coarse and violent in his character and habits, and was in continual trouble through his quarrelsome disposition. Among his chief pictures are the Card Player (at Dresden), the Burial of Christ, St. Sebastian, Supper at Emmaus, and a Holy Family.

CAR'AVAN, a Persian word used to denote large companies which travel together in Asia and Africa for the sake of security from robbers, having in view, principally, trade or pilgrimages. In Mohammedan countries caravans of pilgrims are annually formed to make the journey to Mecca. The most important are those which annually set out from Damascus and Cairo. Camels are used as a means of conveyance on account of their remarkable powers of endurance.

CAR'AVEL, the name of different kinds of vessels, particularly a small ship used by the Spaniards and Portuguese in the 15th and 16th centuries for long voyages. It was narrow at the poop, wide at the bow, and carried a double tower at its stern and a single one at its bows. It had four masts and a bowsprit, and the principal sails were lateen sails. It was in command of three such caravels that Columbus crossed the Atlantic and discovered America.

CAR'AWAY, an umbelliferous biennial plant, with a tapering fleshy root, a striated furrowed stem, and white or pinkish flowers. It produces a well-known seed used in confectionery, and from which both a carminative oil is extracted and the liquor called kümmel prepared.

Caravel of the fifteenth century.

CARBAZOT'IC ACID, a crystallizable acid and bitter substance obtained by the action of nitric acid on indigo and some other animal and vegetable substances. It is of great importance in dyeing. When silk which has been treated with a mordant of alum or cream of tartar, is immersed in a solution of this acid, it is dyed of a beautiful permanent yellow color. It is also called Picric Acid, and is used as an explosive.

CAR'BIDE, a compound of carbon with a metal, the usual effect of which is to render it hard and brittle. From calcium carbide acetylene gas is prepared.

CARBOL'IC ACID, an acid obtained from coal-tar. It is, when pure, a colorless crystalline substance, but it is usually found as an oily liquid, colorless, with a burning taste and the odor of creosote. Carbolic acid is now much employed as a therapeutic and disinfectant. It may be taken internally in cases in which creosote is indicated; but its principal use in medicine is as an external application to unhealthy sores, compound fractures, and to abscesses after they have been opened, over which it coagulates, forming a crust impermeable to air and to the organic germs floating in the atmosphere, which produce decomposition in the wound. The action of the acid is not only to exclude these germs but also to destroy such as may have been admitted, for which reason it is introduced into the interior of the wound. Called also Phenic Acid and Phenol.

CARBON, one of the elements, existing uncombined in three forms, charcoal, graphite or plumbago, and the diamond. The diamond is the purest form of carbon; in the different varieties of charcoal, in coal, anthracite, etc., it is more or less mixed with other substances. Pure charcoal is a black, brittle, light, and inodorous substance. It is usually the remains of some vegetable body from which all the volatile matter has been expelled by heat; but it may be obtained from most organic matters, animal as well as vegetable, by ignition in close vessels. Carbon being one of those elements which exist in various distinct forms is an example of what is called allotropy. The com-

pounds of this element are more numerous than those of all the other elements taken together. With hydrogen especially it forms a very large number of compounds, called hydrocarbons, which are possessed of the most diverse properties, chemicals and physical. With oxygen, again, carbon forms only two compounds, but union between the two elements is easily effected. It is one of the regular and most characteristic constituents of both animals and plants. See Diamond, Charcoal, Graphite, Bone Black, Carbonic Acid, Coke, etc.

CAR'BONATES, compounds formed by the union of carbonic acid with a base, as the carbonate of lime, the carbonate of copper, etc. Carbonates are an important class of salts, many of them being extensively used in the arts and in medicine.

CAR'BONDALE, a city in Pennsylvania, about 110 miles n.n.w. of Philadelphia. It is the center of a rich coal-field. Pop. 17,000.

CARBON'IC ACID, a gaseous compound of 12 parts by weight of carbon and 32 of oxygen, colorless, without smell, twenty-two times as heavy as hydrogen, turning blue litmus slightly red, and existing in the atmosphere to the extent of 1 volume in 2500. It is incapable of supporting combustion or animal life, acting as a narcotic poison when present in the air to the extent of only 4 or 5 per cent. It is disengaged from fermenting liquors and from decomposing vegetable and animal substances, and is largely evolved from fissures in the earth, constituting the choke-damp of mines. From its weight it has a tendency to subside into low places, vaults and wells, rendering some low-lying places, as the upas valley of Java, and many caves, uninhabitable. It has a pleasant, acidulous, pungent taste, and aerated beverages of all kinds kinds—beer, champagne, and carbonated mineral water—owe their refreshing qualities to its presence, for though poisonous when taken into the lungs, it is agreeable when taken into the stomach. This acid is formed and given out during the respiration of animals, and in all ordinary combustions, from the oxidation of carbon in the fuel. It exists in large quantity in all limestones and marbles. It is evolved from the colored parts of the flowers of plants both by night and day, and from the green parts of plants during the night. During the day plants absorb it from the atmosphere through their leaves, and it forms an important part of their nourishment.

CARBONIC OXIDE, a substance obtained by transmitting carbonic acid over red-hot fragments of charcoal, contained in a tube of iron or porcelain, and also by several other processes. It is a colorless inodorous gas, has neither acid nor alkaline propertics, is very poisonous, and burns with a pale lavender flame.

CARBONIF'EROUS SYSTEM, in geology, the great group of strata which lie between the Old Red Sandstone below and the Permian or Dyas formation above, named from the quantities of coal, shale, and other carbonaceous matter contained in them. They include the coal measures, millstone grit, and mountain limestone, the first being uppermost and containing the chief coal-fields that are worked. Iron-ore, limestone, clay, and building-stone are also yielded abundantly by the carboniferous strata which are found in many parts of the world often covering large areas. As coal consists essentially of metamorphosed vegetable matter, fossil plants are very numerous in the carboniferous rocks, more than 1500 species of them having been named, a large proportion of which are ferns, tree lycopods, and large horse-tail-like plants. The animals include insects, scorpions, amphibians, numerous corals, crinoids, molluscs, cephalopods, sharks, and other fishes.

CARBON POINTS, in electric lighting, two pieces of very hard, compact carbon, between which the electric current is broken, so that the resistance which they offer to the passage of the current produces a light of extraordinary brilliancy.

CARBUN'CLE, a beautiful gem of a deep red color with a mixture of scarlet, found in the East Indies. When held up to the sun it loses its deep tinge, and becomes exactly of the color of a burning coal. The carbuncle of the ancients is supposed to have been a garnet.

CARBUN'CLE, in surgery, an inflammation of the true skin and tissue beneath it akin to that occurring in boils. It is more extensive than the latter, and instead of one has several cores. It is associated with a bad state of general health, from which condition its danger arises, for it may threaten life by exhaustion or blood poisoning. With regard to the local treatment, the principal thing to be done is to make a free incision into the tumor; as much of the contents as possible should then be pressed out, and a poultice applied. The patient's strength should be supported by nourishing and easily-digested food, and tonics and cordials should be administered.

CAR'BURETTED HYDROGEN, the name given to two compounds of carbon and hydrogen, one known as light carburetted hydrogen, and the other as olefiant gas. The former is the compound which occurs in coal-mines (fire-damp) and about the neighborhood of stagnant pools. Mixed with atmospheric air from 7 to 14 times that of the gas it explodes The latter is obtained from distilling coal or fat substances in close vessels. It explodes when mixed with ten or twelve volumes of atmospheric air.

CARD, an instrument for combing, opening, and breaking wool, flax, etc., freeing it from the coarser parts and from extraneous matter. It is made by inserting bent teeth of wire in a thick piece of leather, and nailing this to a piece of oblong board to which a handle is attached. But wool and cotton are now generally carded in mills by teeth fixed on a wheel moved by machinery.

CARD, an oblong piece of thick paper or pasteboard prepared for various purposes. (1) A piece of card-board with one's name written or printed on it, used in visiting, and generally for indicating the name of the person presenting it. (2) A piece of card-board on which are printed certain colored devices or figures forming one of a pack, and used in playing games. A modern pack of playing-cards numbers fifty-two, and consists of four suits, two red (hearts and diamonds), and two black (spades and clubs), each suit comprising thirteen cards—three picture-cards (court-cards), the king, queen, and knave; and ten other cards numbered from one, the ace, to ten, according to the pips or marks belonging to the respective suits printed on them.

CAR'DAMOMS, the aromatic capsules of different species of plants employed in medicine as well as an ingredient in sauces and curries.

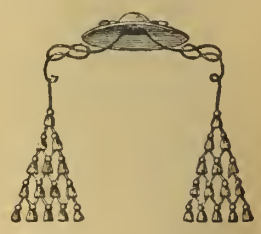
CARD'BOARD, a kind of stiff paper or paste-board for cards, etc., usually made by sticking together several sheets of paper.

CARDIAC MEDICINES, medicines which act upon the heart.

CAR'DIFF, a municipal, county, and parl. borough and seaport, the county town of Glamorganshire, Wales, situated at the mouth of the Taff on the estuary of the Severn. Iron ship-building is carried on, and there are iron and other works on a large scale Among the chief buildings are the county buildings, town-hall, infirmary, university college (for S. Wales and Monmouthshire), law courts, free library and museum, etc. The docks are extensive and well constructed. There is here a castle which dates from 1080. It is the property of the Marquis of Bute, and has been modernized and part of it converted into a residence. Pop. 164,420.

CAR'DIGAN, the county town of Cardiganshire, S. Wales, on the river Teifi, about 3 miles from its mouth in Cardigan Bay. The salmon fishery is extensively carried on. Pop. 3511.—The county of Cardigan has an area of 443,287 acres, of which two-thirds is under crops or pasture. Pop. 60,237.

CAR'DINAL, an ecclesiastical prince in the Roman Catholic Church, who has a voice in the conclave at the election of a pope, the popes being taken from the cardinals. The cardinals are appointed by the pope, and are divided into three



Cardinal's hat.

classes or orders, comprising six bishops, fifty priests, and fourteen deacons, making seventy at most. These constitute the Sacred College and compose the pope's council. Originally they were subordinate in rank to bishops; but they now have the precedence. The chief symbol of the dignity of cardinal is a low-crowned, broad-brimmed red hat, with two cords depending from it, one from either side, each having fifteen tassels at its extremity. Other insignia

are a red biretta, a purple cassock, a sapphire ring, etc.

CARDINAL BIRD, a North American bird of the finch family, with a fine red plumage, and a crest on the head. Its song resembles that of the nightingale, hence one of its common names, Virginian Nightingale. In size it is about equal to the starling. Called also Scarlet Grosbeak or Cardinal Grosbeak and Redbird.

CARDINAL-FLOWER, the name commonly given, because of its large, very showy, and intensely red flowers; it is a native of North America.

CARDINAL POINTS, the n., s., e., and w. points of the horizon; the four intersections of the horizon with the meridian and the prime vertical circle.

CARDINAL VIRTUES, or **PRINCIPAL VIRTUES,** in morals, a name applied to justice, prudence, temperance, and fortitude.

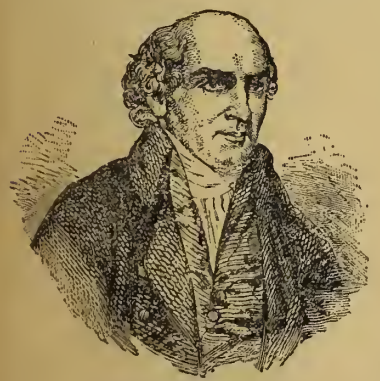
CARDING, the process wool, cotton, flax, etc., undergo previous to spinning, to lay the fibers all in one direction, and remove all foreign substances. See Card.

CARDI'TIS, inflammation of the heart substance. Inflammation of the lining membrane is endocarditis, of the external membrane pericarditis. See Heart.

CARDS, PLAYING. See Card.

CA'REY, Henry, a composer, dramatist, and poet, born at London in 1696. He composed the words and music of many popular songs, including Sally in Our Alley, God Save the King, etc. He also wrote farces and other works. He is said to have committed suicide, 1743.

CAREY, Henry Charles, American economist, born in Philadelphia 1793, died 1879. In that year he published an essay on the Rate of Wages, which he afterward expanded into Principles of



William Carey.

Political Economy. His other important works are The Credit System, The Past, the Present, and the Future, The Principles of Social Science, etc. Originally a free-trader he became an advocate for protection; held that the growth of population was self-regulating; and was opposed to the theories of Ricardo and others on the law of diminished returns from the soil and on rent. He was also opposed to any arrangement on the subject of international copyright.

CAREY, William, D.D., an English oriental scholar and Christian missionary, born in 1761, died at Serampore 1834. In 1793 he sailed for the East Indies as a Baptist missionary, and in 1800, in conjunction with Marshman, Ward, and others, he founded the missionary college at Serampore. Here he had a printing-press, and issued various translations of the Scriptures. His first work was a Bengali Grammar. Under his direction the whole Bible was translated into six, and the New Testament into twenty-one Hindustani dialects. He was long professor of Sanskrit, Mahratta, and Bengali, in Calcutta.

CARGO, the goods or merchandise carried by a trading vessel from one place to another. When part of the cargo is on deck it is called the deck cargo, as distinguished from the inboard cargo.

CAR'IACOU, the Virginian deer, found in all parts of North America up to 43° n. lat. It is smaller than the common stag, and its color varies with the season. In spring it is reddish-brown, in autumn slaty-blue, and in winter dull-brown. Written also Carjacou.

CARIBBE'AN SEA, that portion of the North Atlantic Ocean lying between the coasts of Central and South America, and the West India Islands. It communicates with the Gulf of Mexico by the Yucatan Channel.

CAR'IBBEES, or **LESSER ANTILLES,** usually divided into the Windward and Leeward Islands, a section of the West India Islands.

CAR'IBOU, the name of two American species of reindeer, sometimes regarded as specifically identical with the Old World reindeer. They have never been brought under the sway of man, but are a great object of chase for the sake of their flesh. The woodland caribou most nearly resembles the common reindeer. It is found over considerable tracts of Canada, as also in Newfoundland and Labrador, and is migratory in its habits. The Barren Ground caribou is much smaller, but has larger horns. It inhabits the Barren Grounds northwest of Hudson Bay, and also extends into Greenland. It executes considerable migrations, going north to the Arctic Ocean in summer, and returning in autumn.

CAR'IBS, the original inhabitants of the W. Indian Islands, and, when Europeans became acquainted with America, also found in certain portions of Central America and the north of South America. At present only a few remain on Trinidad, Dominica, and St. Vincent.

CAR'ICA. See Papaw.

CAR'ICATURE, a representation of the qualities and peculiarities of an object, but in such a way that beauties are concealed and peculiarities or defects exaggerated, so as to make the person or thing ridiculous, while a general likeness is retained. Though a degenerate, it is one of the oldest forms of art. Egyptian art has numerous specimens of caricature, and it has an important place in Greek and Roman art. It flourished in every European nation during the middle ages, and in the present day it is a chief feature in the comic and also in the leading daily journals.

CA'RIES (kā'ri-ēz), a disease of bone analogous to ulceration in soft tissues. The bone breaks down, or may be said to melt down into unhealthy matter, which works its way to the surface and bursts. Excision of the carious portion of the bone is often effected with good results, but the disease often results in death. Caries of the teeth is decay of the dentine or body of the tooth.

CARINTH'IA, a western duchy or province of Austria, on the borders of Italy; area, 4006 sq. miles. Pop. 367,344.

CARLETON, Will, an American poet, born in Michigan in 1845. His first volume of poems appeared in 1871. Farm Ballads appeared in 1873, Farm Legends in 1875, Young Folks Centennial Rhymes in 1876, Farm Festivals in 1881, City Ballads in 1885, City Festivals in 1892, and Rhymes of Our Planet in 1895. Carlton's best vein is domestic verses.

CARLISLE (kär-līl'), a parliamentary and municipal borough of England, county town of Cumberland. Sacked by the Danes, it was rebuilt by William Rufus. It was held by the Scots during their tenure of Cumberland, and the Church of St. Mary's was founded by David I., who died here. During the border wars Carlisle underwent many sieges. It surrendered to Charles Edward in 1745. It is a bishop's see. The cathedral, begun in the reign of William Rufus, was partly destroyed by Cromwell in 1648. Carlisle is the seat of various manufactures, of which cotton is the principal. Pop. 45,478.

CARLISLE, a town, in Pennsylvania, 114 miles w. Philadelphia. It is the seat of Dickinson Methodist College, founded in 1783. Pop. 11,526.

CARLISLE, John Griffin, an American statesman and lawyer, born in Kentucky in 1835, and speaker of the national house of representatives from 1883 to 1889. In 1890 he became United States Senator and was Secretary of the Treasury in the second cabinet of Cleveland.

CAR'LISTS, the name given to the followers of Don Carlos of Bourbon and his descendants. See Carlos de Bourbon.

CARLOS', Don, Infant of Spain, son of Philip II., born 1545, died 1568. He was deformed in person, of a violent and vindictive disposition. He was presumably murdered, but of this there is no proof. The story of Don Carlos has furnished the subject of several tragedies, viz., by Otway (English), Schiller (German), and Alfieri (Italian).

CARLOS DE BOURBON, Don Maria Isidor, the second son of Charles IV. of Spain and brother of Ferdinand VII., born 1788, died 1855. He was heir presumptive to the throne until the birth of Maria Isabella in 1830. On the death of his brother he claimed the throne as legitimate king of Spain, and was recognized as such by a considerable party, who excited a civil war in his favor, and thenceforward were designated by the title of Carlists. After a course of hostilities he found himself obliged in 1839 to take shelter in France. In the meantime he and his descendants had been formally excluded from the suc-

cession by a vote of the Cortes in 1836. In 1845 he resigned his claims in favor of his eldest son, and in 1847 was permitted to take up his abode in Trieste, where he died. His eldest son, Don Carlos (1818–61), married Maria Carolina Ferdinanda, a sister of Ferdinand II., king of Naples. His nephew, Don Carlos, duke of Madrid, born 1848, is the present representative of the Carlists. He married the sister of the late Count of Chambord. In 1873 he instigated a rising in the north of Spain, and continued the struggle till after Alfonso XII. came to the throne, when he was defeated and withdrew. See Spain.

CARLOTTA, Empress, the daughter of King Leopold I. of Belgium and wife of the Archduke Maximilian, emperor of Mexico. She was born in 1840, accompanied her husband to Mexico in 1864, but the disasters which overtook her husband affected her mind, and she has lived in retirement in Belgium.

CARLOVIN'GIANS, the second dynasty of the French or Frankish kings, which supplanted the Merovingians, deriving the name from Charles Martel or his grandson Charlemagne (that is, Karl or Charles the Great). Charles Martel (715–741) and his son Pepin (741–768) were succeeded by Charlemagne and his brother Carloman (768–771). Charlemagne became sole king in 771, and was succeeded in the Empire of the West by his son Louis le Debonnaire 814. He divided his empire among his sons, and at his death (840) his son Charles the Bald became king of France. He died in 877, and was succeeded by a number of feeble princes. The dynasty came to an end with Louis V., who died in 987.

CARLSBAD (kärls'bät), a town of Bohemia, famous for its hot mineral springs, and much frequented by visitors from all parts of the world, being useful in diabetes, gout, biliary diseases, etc. Permanent pop. about 15,000.

CARLSRUHE (kärls'rö), the capital of the Grand-duchy of Baden, 3 miles from the Rhine, laid out in 1715, one of the most regularly-built towns in Europe. The castle of the grand-duke stands as a center, and from this point a number of streets radiate at regular distances, thus forming a kind of fan. There are many handsome edifices. The court library contains 100,000 volumes; there are also a large public library, several valuable museums and art collections, a botanic garden, polytechnic school, etc. The industries are active and varied. Pop. 97,164.

CARLYLE, Thomas, one of the greatest English writers of the 19th century, born 4th December, 1795, at Ecclefechan, Dumfriesshire; died at Chelsea, Feb. 5th, 1881. He was the eldest son of James Carlyle, a mason, afterward a farmer, and was intended for the church, with which object he was carefully educated at the parish school and afterward at the burgh school of Annan. In his fifteenth year (in 1810) he was sent to the University of Edinburgh, where he developed a strong taste for mathematics. Having renounced the idea of becoming a minister after finishing his curriculum (in 1814), he became a teacher for about four years, first at Annan, afterwards at Kirkcaldy. In 1818 he removed to Edinburgh, where he supported himself by literary work, devoted much time to the study of German, and went through a varied and extensive course of reading in history, poetry, romance, and other fields. His first literary productions were short biographies and other articles for the Edinburgh Encyclopædia. His career as an author may be said to have begun with the issue in monthly portions of his Life of Schiller in 1823, this work being enlarged and published

Thomas Carlyle.

separately in 1825. In 1824 he published a translation of Legendre's Geometry, with an essay on proportion by himself prefixed. The same year appeared his translation of Goethe's Wilhelm Meister's Apprenticeship. He was next engaged in translating specimens of the German romance writers; published in 4 vols. in 1827. In 1826 he married Miss Jane Bailie Welsh, daughter of a doctor at Haddington, and a lineal descendant of John Knox. After his marriage he resided for a time in Edinburgh, and then withdrew to Craigenputtock, a farm in Dumfriesshire belonging to his wife, about 15 miles from the town of Dumfries. Here he wrote a number of critical and biographical articles for various periodicals; and here was written Sartor Resartus, the most original of his works. The publication of Sartor soon made Carlyle famous, and on his removal to London early in 1834 he became a prominent member of a brilliant literary circle embracing John Stuart Mill, Leigh Hunt, John Sterling, Julius Charles and Augustus William Hare, F. D. Maurice, etc. He fixed his abode at Cheyne Row, Chelsea, where his life henceforth was mainly spent. His next work of importance was on the French Revolution, published in 1837. About this time, and on one or two subsequent years, he delivered several series of lectures, the most important of these, On Heroes and Hero-worship, being published in 1840. Chartism, published in 1839, and Past and Present, in 1843, were small works bearing more or less on the affairs of the time. In 1845 appeared his Oliver Cromwell's Letters and Speeches, with Elucidations, a work of great research, and brilliantly successful in vindicating the character of the great Protector. In 1850 came out his Latter-day Pamphlets. This work was very repulsive to many from the exaggeration of its language and its advocacy of harsh and coercive measures. He next wrote a life of his friend John Sterling, published in 1851, and regarded as a finished and artistic performance. The largest and most laborious work of his life, The History of Friedrich II. of Prussia, called Frederick the Great, next appeared, the first two volumes in 1858, the second two in 1862, and the last two in 1865, and after this time little came from his pen. In 1866, having been elected Lord Rector of Edinburgh University, he delivered an installation address to the students On the Choice of Books. He had appointed James Anthony Froude his literary executor, who, in conformity with his trust, published Reminiscences of Thomas Carlyle, 1881; Thomas Carlyle: the First Forty Years of his Life, 1882; Letters of Jane Welsh Carlyle, 1883; and Thomas Carlyle: Life in London, 1884. The character of Carlyle presented in these volumes gave an unexpected shock to the public, and a bitter controversy has raged regarding Froude's conduct in the matter.

CARMAR'THEN, or **CAERMAR'THEN,** a maritime county, S. Wales, the largest of the Welsh counties; area, 594,405 acres, of which about 440,000 are under tillage or permanent pasture. Pop. 135,325.—Carmarthen, the county town, is situated 9 miles from the sea, on the Towy, which is navigable to its outlet in Carmarthen Bay. Pop. 9935.

CAR'MELITES, mendicant friars of the order of Our Lady of Mount Carmel. From probably the 4th century holy

Carmelite.

men took up their abode as hermits on Mount Carmel, in Syria, but it was not till about the year 1150 that pilgrims established an association for the pur-

pose of leading a secluded life on this mountain, and so laid the foundation of the order. Being driven by the Saracens to Europe in 1247 they adopted all the forms of monastic life and a somewhat milder rule. In time they became divided into several branches, one of them distinguished by walking barefooted. They are still to be seen in Roman Catholic countries. The habit of the order is of a dark-brown color, and over it when out of doors they wear a white cloak, with a hood to cover the head.

CAR'MINATIVES, medicines obtained chiefly from the vegetable kingdom, and used as remedies for flatulence and spasmodic pains.

CAR'MINE, the fine red coloring matter or principle of cochineal, from which it is prepared in several ways. It is used to some extent in dyeing, in water-color painting, to color artificial flowers, confectionery, etc.

CARNA'RIA. Same as Carnivora.

CARNAR'VON or **CÆRNARVON,** a maritime county of N. Wales, forming the n.w. extremity of the mainland; area, 369,477 acres. Although the most mountainous county in Wales there are many tracts of low and fertile land, but the arable area is small. Pop. 126,835. —Carnarvon, the county town, is a seaport and parliamentary borough on the s.e. side of the Menai Strait. The magnlficent castle or palace of Edward I., and in which Edward II. was born, stands at the w. end of the town, and is still externally entire. Pop. 9760.

CARNATION, the popular name of varieties of the clove-pink. The carnations of the florists are much prized for the beautiful colors of their sweet-

Carnation.

scented double flowers. They are arranged into three classes according to color, viz.: bizarres, flakes, and picotees.

CARNEGIE, Andrew, an American philanthropist and steel manufacturer, born in Dumferline, Scotland, in 1837. He removed to the U. States as a boy and early became associated with the iron industry at Pittsburg. In 1868 he introduced the Bessemer process into this country and retired from active business life in 1901 with the organization of the United States Steel Corporation. He has given upward of $40,000,000 in donations to education.

CARNEGIE HERO FUND, a fund of $5,000,000 for the benefit of "the dependents of those losing their lives in heroic effort to save their fellow men, or for the heroes themselves if injured only," created by Andrew Carnegie in 1904. Provision was also made for medals to be given in commemoration of heroic acts. The endowment known as "The Hero Fund" was placed in the hands of a commission composed of twenty persons, residents of Pittsburg, Pa. The first awards were made by the commission in May, 1905. Nine persons were awarded medals for brave acts, six of them receiving bronze medals, and three silver medals. To three widows who lost their husbands while the latter were performing acts of bravery money was given.

CARNEGIE INSTITUTION, a foundation of Andrew Carnegie for scientific research, with the co-operation of universities and other institutions. The institute was incorporated on Jan. 4, 1902, with a fund of $10,000,000. It is administered by 27 trustees, one of them being the president of the U. States (ex officio). The purpose of the foundation is to encourage research in all departments of science and to pay the expenses of workers while devoting themselves to the work. The office of the institute is in Washington, D. C.

CARNIO'LA, a duchy or province of Austria, bounded by Carinthia, Styria, Croatia, and Italy; area, 3856 sq. miles. There are iron, lead, and quicksilver mines, and abundance of coal, marble, and valuable stone. Pop. 508,348. The capital is Laibach.

CAR'NIVAL, the feast or season of rejoicing before Lent, observed in Catholic countries with much revelry and merriment.

CARNIV'ORA, a term applicable to any creatures that feed on flesh or animal substances, but now applied specially to an order of mammals which prey upon other animals. The head is small, the jaws powerful, and the skin is well covered with hair. Two sets of teeth, deciduous or milk and permanent, are always developed in succession, and in both sets incisors, canines, and molars are ditinguishable. The stomach is simple and the alimentary canal short, thus making the body as light and slender as possible for the purpose of hunting and springing on its prey. The muscular activity of the Carnivora is very great, their respiration and circulation very active, and their demand for food is consequently constant. Carnivora comprise the bears, badgers, raccoons, lions, tigers, cats, dogs, seals and walruses.

CARNOT (kär-nō), Lazare Nicolas Marguerite, a French statesman, general, and strategist, was born in 1753, and died in 1823. When the revolution broke out he was captain in the corps of engineers. In 1791 he was appointed deputy to the constituent assembly. In the following March he was sent to the Army of the North, where he took command, and successfully repulsed the enemy. On his return he was made member of the Committee of Public Safety, and directed and organized the French armies with great ability and success. In 1797 Carnot, having unsuccessfully opposed Barras, had to escape to Germany, but returned, and was appointed minister of war by Napoleon (1800). In 1814 Napoleon gave him the chief command at Antwerp, and in 1815 the post of minister of the interior. After the emperor's second fall he retired from France. A grandson of his, Marie François Sadi, born in 1837, was elected president of the French republic in 1887, and assassinated in 1894.

CAR'OL, a song, especially one expressive of joy. It often signifies, specifically, a religious song or ballad in celebration of Christmas.

CAROLI'NA, North. (See North Carolina.)

CAROLI'NA, South. (See South Carolina.)

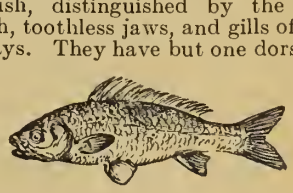
CAROLINA-PINK, a name given to a N. American plant bearing scarlet flowers, and having a root used as a vermifuge.

CAROLINE, British queen, was a daughter of the Duke of Brunswick-Wolfenbüttel, born May 17, 1768. In 1795 she was married to the Prince of Wales, afterward George IV. The marriage was not to his liking, and after the birth of the Princess Charlotte he separated from her. She died 7th Aug. 1821.

CAROLINE ISLANDS, or **NEW PHILIPPINES,** a large archipelago, North Pacific Ocean, between lat. 3° and 12° n. and lon. 132° and 163° 6′ e., and between the Philippines and the Marshall Isles, first discovered by the Spaniards in 1543, if not by the Portuguese in 1525. Many of the islands are mere coral reefs little elevated above the ocean. The islands were long in the possession of Spain, but in 1899, after the conclusion of the war between that power and the U. States, they were sold to Germany.

CARO'TID ARTERIES, the two great arteries which convey the blood from the aorta to the head and the brain. The common carotids, one on either side of the neck, divide each into an external and an internal branch. The external carotid passes up to the level of the angle of the lower jaw, where it ends in branches to the neck, face, and outer parts of the head. The internal carotid passes deeply into the neck, and through an opening in the skull behind the ear enters the brain, supplying it and the eye with blood. Wounds of the carotid trunks cause almost immediate death.

CARP, a genus of soft-finned abdominal fish, distinguished by the small mouth, toothless jaws, and gills of three flat rays. They have but one dorsal fin,



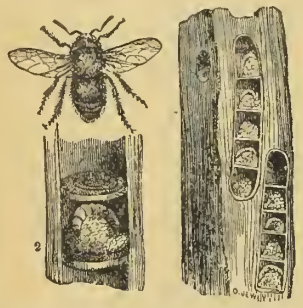
Carp.

and the scales are generally of large size. They frequent fresh and quiet waters, feeding chiefly on vegetable matters, also on worms and molluscs. The common carp is olive-green above and yellowish below, and in many parts is bred in ponds for the use of the table. It sometimes weighs many pounds, is of

quick growth, and spawns thrice a year. It is said to live to the great age of 100 or even 200 years.

CARPA'THIAN MOUNTAINS, a range of mountains in southern Europe, chiefly in Austria, forming a great semicircular belt of nearly 800 miles in length. The Carpathian range is rich in minerals, including gold, silver, quicksilver, copper, and iron. Salt occurs in beds, which have sometimes a thickness of 600 or 700 feet. On the plateaux corn and fruit are grown to the height of 1500 feet. Higher up the mountain steeps are covered with forests of pine. There is much remarkable scenery.

CARPENTER-BEE, the common name of the different species of insects numerous in Asia, Africa, and America, and one species inhabits the south of



Carpenter-bee, half the natural size.
1, A piece of wood bored by the bee, and grubs and food deposited in the cells. 2, Two of the cells drawn larger to show the partitions.

Europe. They are generally of a dark violet-blue, and of considerable size. They usually form their nests in pieces of half-rotten wood, cutting out various apartments for depositing their eggs.

CAR'PENTRY is the art of combining pieces of timber to support a weight or sustain pressure. The work of the carpenter is intended to give stability to a structure, that of the joiner is applied to finishing and decoration. An explanation of some of the terms employed in carpentry may be useful. The term frame is applied to any assemblage of pieces of timber firmly connected together. The points of meeting of the pieces of timber in a frame are called joints. Lengthening a beam is uniting pieces of timber into one length by joining their extremities. When neatness is not required this is done by fishing, that is, placing a piece of timber on each side of where the beams meet and securing it by bolts passed through the whole. When the width of the beam must be kept the same throughout scarfing is employed. This is cutting from each beam a part of the thickness of the timber, and on opposite sides, so that the pieces may be jointed together and bolted or hooped. When greater strength is required than can be produced by a single beam building and trussing beams are resorted to. Building beams is combining two or more beams in depth so as to have the effect of one. In trussing the beam is cut in two in the direction of its length, and supported with cross-beams, as in roofing. Mortise and tenon is a mode of jointing timber. An excavation called the mortise is made in one piece, and a projecting tongue to fit it called the tenon in the other. The timber framework of floors is called naked flooring, and is single if there be but a single series of joists, double if there are cross-binding joists, and framed if there are girders or beams in addition to the joists. The roof is the framework by which the covering of a building is supported. It may consist of a series of sloping pieces of timber, with one end resting on one wall and the other end meeting in a point with a corresponding piece resting on the opposite wall: these are called rafters. There is usually a third piece which connects the lower extremities of the rafters and prevents them from spreading. This is called a tie, and the whole frame a couple. The principal instruments used in carpentry are saws, as the circular-, band-, and tenon-saws; planes, as the jack-plane, smoothing-plane, moulding-plane, etc.; chisels, gouges, brad-awls, gimlets, etc.

CARPET, a thick fabric, generally composed wholly or principally of wool, for covering the floors of apartments, staircases, and passages in the interior of a house. The Persian, Turkish, and Indian carpets are all woven by hand, and the design is formed by knotting into the warp tufts of woolen threads of the proper color one after the other. The Brussels carpet is a common and highly-esteemed variety. It is composed of linen thread and worsted, the latter forming the pattern. The linen basis does not appear on the surface, being concealed by the worsted, which is drawn through the reticulations and looped over wires that are afterward withdrawn, giving the surface a ribbed appearance. Wilton carpets are similar to Brussels in process of manufacture, but in them the loops are cut open by using wires with a knife-edge, and the surface thus gets a pile. Tapestry carpets also have a pile surface, the great specialty of which is that the threads are particolored by printing in the proper manner for each design before being woven up. The Kidderminster or Scotch carpet consists of two distinct webs woven at the same time and knitted together by the woof. The pattern is the same on both sides of the cloth, but the colors are reversed. An improvement upon this is the three-ply carpeting, made originally at Kilmarnock. The original Axminster carpets were made on the principle of the Persian or Turkey carpets. Patent Axminster carpets have a fine pile, which is produced by using chenille as the weft, the projecting threads of which form the pile, which is dyed before being used. Carpets of felted wool, with designs printed on them, are also used, and are very cheap. Cheap jute carpets are also made.

CARPET-BAGGER, a needy political adventurer who goes about the country pandering to the prejudices of the ignorant with the view of getting into place or power, so called because regarded as having no more property than might fill a carpet-bag. Originally applied to needy adventurers of the northern states of America who tried in this way to gain the votes of the negroes of the southern states.

CARPET-SWEEPER, a device consisting of a closed box from which the ends of a brush protrude, used for sweeping carpets. The box is on rollers, is pushed by a long handle, and the dust is swept into the cavity of the box which can be opened and emptied at will.

CARPUS, in anatomy, the bones between the forearm and hand, the wrist in man, or corresponding part in other animals.

CARRACCI (kär-räch'ē), Ludovico, Agostino, and Annibale, the three founders of the Bologna, or, as it has been called, the eclectic school of painting. —Ludovico was born in 1555 at Bologna. He set up a studio in Bologna, and established a school of painting characterized particularly by its attention to composition and its principle of eclecticism, or endeavor to imitate and unite the chief excellencies of different great masters, the drawing of Raphael, the coloring of Titian, etc. To assist him Ludovico had his two younger cousins, Agostino and Annibale, educated as artists; and after the completion of their studies all three by their able work soon made a high reputation for the academy of the Carracci at Bologna. He died in 1619.—Agostino was born in 1558 at Bologna; he died at Parma in 1601. He engraved more pieces than he painted, though some of his pictures were admired by contemporaries even more than those of his brother Annibale.—Annibale was born in 1560 at Bologna. In 1600 he was invited by Cardinal Farnese to Rome, where the influence of Raphael and Michael Angelo's work tempered the characteristics he had acquired from the Lombard and Venetian schools. His chief work is the series of frescoes for the Farnese Palace at Rome, which kept him eight years. He is generally considered the greatest of the Carracci. He died at Rome in 1609.

CARRA'RA, a city of northern Italy, 59 miles s.w. of Modena, a few miles from the coast. It is surrounded by hills which contain fine white statuary marble, in the preparation of which and commoner sorts most of the inhabitants are occupied. Pop. 16,000.—The Carrara marble is the variety generally employed by statuaries. It was formerly supposed to be a primitive limestone, but is now considered an altered limestone of the Oolitic period. Although the Carrara quarries have been worked for 2000 years, having furnished the material for the Pantheon at Rome, the supply is still practically inexhaustible. They employ 6000 or 7000 men.

CARRIAGE, a general name for a vehicle, but more especially for one of the lighter and more ornamental kind.

CAR'RIER, is a person who undertakes to transport the goods of other persons from place to place for him. Persons who undertake this as a systematic business are called common carriers, and come under special legal regulations, such as that they shall be responsible for the goods intrusted to them so long as in their custody.

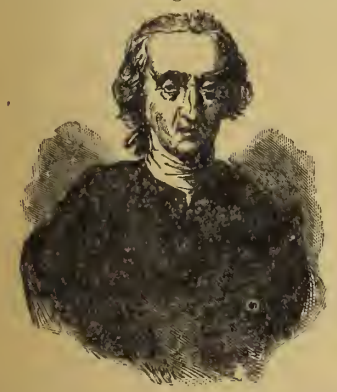
CARRIER PIGEON is a large bird with long wings, large tuberculated mass of naked skin at the base of the beak, and with a circle of naked skin round

the eyes. The practice of sending letters by pigeons belongs originally to eastern countries. An actual post-system in which pigeons were the messengers was established at Bagdad by the Sultan Nureddin Mahmud, who died in 1174, and lasted till 1258. These birds can be utilized in this way only in virtue of what is called their "homing" faculty or instinct, which enables them to find their way back home from surprising distances. But if they are taken to the place from which the message is to be sent and kept there too long, say over a fortnight, they will forget their home and not return to it. By the use of microphotography a long message may be conveyed in this way, and such were received by the besieged residents in Paris during the Franco-Prussian war of 1870–71, the birds being conveyed out of the city in balloons. Seventy-two miles in two and a half hours, a hundred and eighty in four and a half, have been accomplished by carrier pigeons.

CARRINGTON, Henry Beebee, an American historian and soldier, born in Connecticut in 1824. In the civil war he was a brigadier-general of volunteers, and was subsequently an educator. He has published Battles of the Revolution, Russia as a Nation and other military historical works of note.

CARRION-CROW, in Britain the common crow, so called because it often feeds on carrion. In America the name is given to a small species of vulture called the Black Vulture.

CARROLL, Charles, of Carrollton, an American gentleman and patriot, born at Annapolis, Md., in 1737, died 1832. He was one of the signers of the Declara-



Charles Carroll of Carrollton

tion of Independence. He helped to draft the Maryland constitution and in 1789 was elected U. States senator. He was the last of the signers of the Declaration to die.

CARROLL, John, an American Roman Catholic bishop, the first in the U. States. He was born in Maryland in 1735, and was a cousin of Charles Carroll of Carrollton. He was the first archbishop of Baltimore and the founder of Georgetown College. He died in 1815.

CARRONADE, an iron gun introduced in 1779 by the director of the Carron Foundry, from which it took its name. They were of large caliber, but short and much lighter than common cannon. They were of great service in close naval engagements, but they had a very short range, and have been superseded by more modern inventions.

CARROT, a biennial umbelliferous plant, a native of Britain and other parts of Europe. The leaves are tripinnate, of a handsome feathery appearance. The plant rises to the height of 2 feet, and produces white flowers. The root, in its wild state, is small, tapering, of a white color, and strong-flavored; but that of the cultivated variety is large, succulent, and of a red, yellow, or pale straw-color, and shows remarkably the improvement which may be effected by cultivation. It is cultivated for the table and as a food for cattle. Carrots contain a large proportion of saccharine matter, and attempts have been made to extract sugar from them.

CARROUSEL (kâr'ö-zel), a name given in the middle ages to a tilting match or other occasion when knightly exercises, such as riding at the ring, throwing the lance, were publicly engaged in. They were superseded by tournaments, but were again revived when the latter had fallen out of use, and were frequent at the court of Louis XIV. In the U. States the name is applied to a merry-go-round or movable platform filled with wooden horses on which children ride.

CARRYING-TRADE, that department of trade or commerce which consists in the carriage of commodities from one place or country to another; generally applied to the carrying of merchandise from one country to another by sea, especially when the vessels conveying the goods belong to a different country from either of the other two.

CARSON, Christopher ("Kit"), an American scout and trapper, born in Kentucky in 1809, died in 1868. He lived for a time in Missouri, crossed the continent to California in 1829, and served with distinction in the west during the civil war. Carson knew the American Indian perhaps better than any other scout and his adventures read like romances rather than sober facts. Several biographies of him have been published.

CARSTAIRS, or **CARSTARES,** William, a Scottish divine of political eminence, born in 1649 near Glasgow, died 1715. He studied at the University of Edinburgh, and afterward at Utrecht. He was introduced to the Prince of Orange, on whom he made a favorable impression. When William was settled on the throne Carstairs was constantly consulted by him on Scotch affairs. He was the chief agent between the Church of Scotland and the court, and was very instrumental in the establishment of Presbyterianism, to which William was averse. On the death of William he was no longer employed on public business, but Anne retained him as her chaplain royal, and made him principal of the University of Edinburgh. When the union of the two kingdoms was agitated he took a decided part in its favor. He was repeatedly moderator of the General Assembly of the church. His countrymen have mostly looked upon him as an enlightened patriot.

CART, a carriage with two wheels, with or without springs, fitted to be drawn by one horse, and used for carrying goods, or as a vehicle for conveying persons.

CARTAGENA (kâr-tâ-*hā'n*), or **CARTHAGENA** (kâr-thă-jē'na), a fortified town and seaport of Spain, in the province of and 31 miles s.s.c. Murcia; with a harbor which is one of the largest and safest in the Mediterranean, sheltered by lofty hills. It is a naval and military station, with an arsenal, dockyards, etc. Lead smelting is largely carried on; and there are in the neighborhood rich mines of excellent iron. Cartagena was founded by the Carthaginians under Hasdrubal about 243 B.C., and was called New Carthage. It was taken by Scipio Africanus B.C. 210, and was long an important Roman town. It was ruined by the Goths, and revived in the time of Philip II. Pop. 99,871.

CARTE-BLANCHE (kârt-blânsh), a blank paper, duly signed, intrusted to a person to fill up as he pleases, and thus giving unlimited power to decide.

CARTE-DE-VISITE (kârt-dē-vi-zēt'), literally a visiting card, a name applied to a size of photographs somewhat larger than a visiting card, and usually inserted in a photographic album.

CAR'TEL, an agreement for the delivery of prisoners or deserters; also, a written challenge to a duel.—Cartel-ship, a ship commissioned in time of war to exchange prisoners.

CARTER, James Coolidge, an American lawyer, born in Massachusetts in 1850. He served on the New York constitutional commission in 1888 and in 1892 represented the U. States before the Bering Sea tribunal.

CAR'THAGE, the most famous city of Africa in antiquity, capital of a rich and powerful commercial republic, situated in the territory now belonging to Tunis. Carthage was the latest of the

Phœnician colonies in this district, and is supposed to have been founded by settlers from Tyre and from the neighboring Utica about the middle of the 9th century before Christ. The story of Dido and the foundation of Carthage is mere legend or invention. The history of Carthage falls naturally into three epochs. The first, from the foundation to 410 B.C., comprises the rise and culmination of Carthaginian power; the second from 410 to 265 B.C., is the period of the wars with the Sicilian Greeks; the third, from 265 to 146 B.C.,

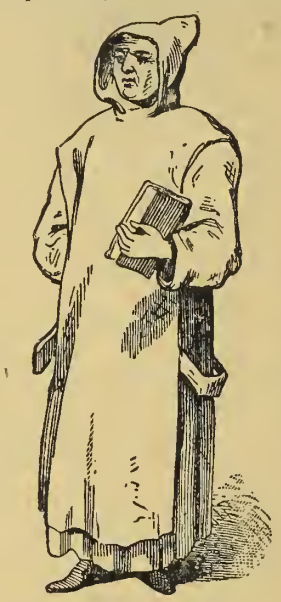
the period of the wars with Rome, ending with the fall of Carthage.

The rise of Carthage may be attributed to the superiority of her site for commercial purposes, and the enterprise of her inhabitants, which soon acquired for her an ascendency over the earlier Tyrian colonies in the district, Utica, Tunis, Hippo, Septis and Hadrumetum.

In extending her commerce Carthage was naturally led to the conquest of the various islands which from their position might serve as entrepôts for traffic with the northern shores of the Mediterranean. Sardinia was the first conquest of the Carthaginians, and its capital, Caralis, now Cagliari, was founded by them. Soon after they occupied Corsica, the Balearic, and many smaller islands in the Mediterranean. When the Persians under Xerxes invaded Greece the Carthaginians, who had already several settlements in the west of Sicily, cooperated by organizing a great expedition of 300,000 men against the Greek cities in Sicily. But the defeat of the Carthaginians at Himera by the Greeks under Gelon of Syracuse effectually checked their further progress (480 B.C.). The war with the Greeks in Sicily was not renewed till 410. Hannibal, the son of Gisco, invaded Sicily, reduced first Selinus and Himera, and then Agrigentum. Syracuse itself was only saved a little later by a pestilence which enfeebled the army of Himilco (396). The struggle between the Greeks and the Carthaginians continued at intervals with varying success, its most remarkable events being the military successes of the Corinthian Timoleon (345–340) at Syracuse, and the invasion of the Carthaginian territory in Africa by Agathocles B.C. 310. After the death of Agathocles the Greeks called in Pyrrhus, king of Epirus, to their aid, but notwithstanding numerous defeats (B.C. 277–5), the Carthaginians seemed, after the departure of Pyrrhus, to have the conquest of all Sicily at length within their power. The intervention of the Romans was now invoked, and with their invasion, B.C. 264, the third period of Carthaginian history begins. The first Punic war (L. Punicus, Phœnician), in which Rome and Carthage contended for the dominion of Sicily, was prolonged for twenty-three years, B.C. 264 to 241, and ended, through the exhaustion of the resources of Carthage, in her expulsion from the island. The loss of Sicily led to the acquisition of Spain for Carthage, which was almost solely the work of Hamilcar and Hasdrubal. The second Punic war, arising out of incidents connected with the Carthaginian conquests in Spain, and conducted on the side of the Carthaginians by the the genius of Hannibal, and distinguished by his great march on Rome and the victories of Lake Trasimene, Trebia, and Cannæ, lasted seventeen years, B.C. 218 to 201, and after just missing the overthrow of Rome, ended in the complete humiliation of Carthage. The policy of Rome in encouraging the African enemies of Carthage occasioned the third Punic war, in which Rome was the aggressor. This war, begun B.C. 150, ended B.C. 146, in the total destruction of Carthage.

CARTHAGE, a city and county-seat of Jasper Co., Mo., 150 miles southeast of Kansas City, on Spring River, and on the Missouri Pacific, the Saint Louis and San Francisco, and other railroads. It has lead and zinc mines, stone and lime works, foundries, flour-mills, etc. Pop 11,220.

CARTHU'SIANS, a religious order instituted by St. Bruno, who about 1084, built several hermitages 4 leagues from Grenoble in s.e. France, and, with six companions, united the ascetic with



Carthusian monk.

the monastic life. They practiced the greatest abstinence, wore coarse garments, and ate only vegetables and the coarsest bread. From their original seat (La Chartreuse) they were called Carthusians. Their habit is a hair-cloth shirt, a white tunic, a black cloak, and a cowl.

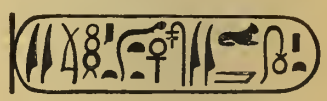
CARTIER, Sir George Etienne, Canadian statesman, born at St. Antoine, Quebec, in 1814; died in England in 1873. He was admitted to the bar in 1835, took part in the rebellion of 1837, and had for a time to leave Canada. In 1848 he entered the Canadian Parliament, and in 1855 became provincial secretary. Next year he became attorney-general for Lower Canada, in which post he was active in behalf of legal reforms. In 1857 he was a member of the Macdonald ministry, and in 1858 he himself became premier, remaining in this position till 1862. He was active in bringing about the establishment of the Dominion of Canada in 1867, and held a post in the first Dominion cabinet. The following year he received a baronetcy.

CARTIER (kär-tyā), Jacques, a French navigator, born at St. Malo 1479, time of death not known. He commanded an expedition to N. America in 1534, entered the Straits of Belle Isle, and took possession of the mainland of Canada in name of Francis I. Next year he sailed up the St. Lawrence as far as the present Montreal. He subsequently went to found a settlement in Canada, and built a fort near the site of Quebec. He was living in France in 1552.

CAR'TILAGE, or **GRISTLE,** a firm and very elastic substance occurring in vertebrate animals. When cut, the surface is uniform, and contains no visible cells, cavities, nor pores, but resembles the section of a piece of glue. It enters into the composition of parts whose functions require the combination of firmness with pliancy and flexibility, the preservation of a certain external form with the power of yielding to external force or pressure. The ends of bones entering into the formation of a joint are always coated with cartilage. Temporary cartilages are those from which bones are formed by ossification. The permanent cartilages are of various kinds. They are found in the external ear and aid in forming the nose, the larynx, etc.

CARTOON', in painting, a drawing on stout paper or other material, intended to be used as a model for a large picture in fresco, a process in which it is necessary to complete the picture portion by portion and in which a fault cannot afterward be easily corrected. The cartoon is made exactly the size of the picture intended, and the design is transferred to the surface to be ornamented by tracing or other processes. Cartoons executed in color, like paintings, are used for designs in tapestries, mosaics, etc. The most famous are those painted by Raphael for the Vatican tapestries, seven of which are still preserved in the South Kensington Museum, London. In modern times the term is also applied to a pictorial sketch relating to some notable character or events of the day.

CARTOUCHE (kär'tōsh), (1) in architecture, a sculptured ornament in the form of a scroll unrolled, often appearing on the cornices of columns, used as a field for inscriptions, etc.—(2) In



Cartouche.

heraldry, a sort of oval shield, much used by the popes and secular princes in Italy, and others, both clergy and laity, for painting or engraving their arms on.—(3) The name given to that oval ring or border which includes, in the Egyptian hieroglyphics, the names of persons of high distinction. The annexed cut shows a cartouche of one of the Ptolemies, kings of Egypt, with the inscription "Ptolemy eternal beloved of Phtah."

CAR'TRIDGE, a case of paper, parchment, or flannel suited to the bore of fire-arms, and holding the exact charge, including, in the case of small arms, both powder and bullet (or shot). In loading with the old style of cartridge for muzzle-loading rifles, the paper over the powder was bitten or twisted off and the powder poured in, the bullet being then inserted and rammed home. The car-

tridges used for breech-loading rifles contain the powder in a case of solid brass, and have the percussion-cap by which they are ignited fixed in the base. Such cases can be refilled and used a number of times in succession. Cartridges for shot-guns are similar to those for rifles, but are usually of less solid construction, being commonly of strong paper with a base of metal. Those for large guns are usually made of flannel and contain only the powder. Blank-cartridge is a cartridge without ball or shot. Cartridges for blasting are filled with dynamite or other explosive.

CARTWRIGHT, Edmund, the inventor of the power-loom, was born in 1742 in Nottinghamshire, Eng. He was educated at Oxford, and took orders in the church. In 1785, he brought his first power-loom into action. Although much opposed both by manufacturers and workmen, it made its way, and in a developed and improved form is now in universal use. He died in 1823.

CARTWRIGHT, Peter, an American clergyman, born in Virginia in 1785, died 1872. He was noted for the revivals he preached in Illinois and for the large number of converts he made.

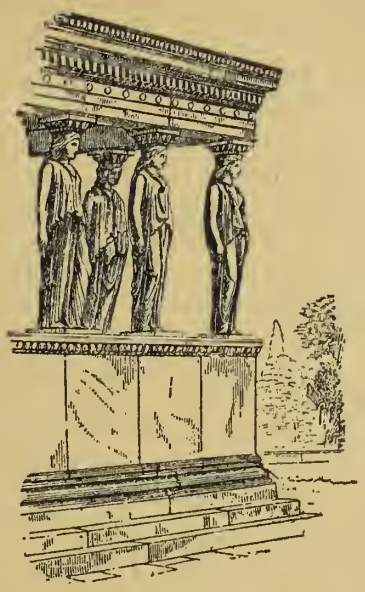
CARVING, as a branch of art, is the process of cutting a hard body by means of a sharp instrument into some particular shape, and is a term generally employed in speaking of figures cut out in ivory or wood, in contradistinction to sculpture, or figures produced in stone or metal. The art of carving is of the highest antiquity. Even among the most uncivilized tribes, rudely-carved representations in wood are common. In the early and middle ages wood-carving became general for the decoration of Christian churches and altars. One of the latest developments of the art of carving is the modern invention of carving by machinery. A machine patented in 1845 is capable of copying any carved design that can be produced, so far as that is possible, by revolving tools; the finish is afterward given by hand-labor.

CARY, Alice and Phœbe, two American poets, sisters. Alice was born in Ohio, in 1820, and died in 1871, Phœbe was born in Ohio in 1824, and died in 1871. Their first book of poems appeared in 1850 under the title Poems of Alice and Phœbe Cary. From 1850 to 1869 the sisters issued numerous volumes of verses which won them international fame. They died within three months of each other.

CARY, Alice Louise, an American operatic singer, born in Maine in 1842. Her rich contralto voice early attracted attention and after studying in Italy, made her debut in Copenhagen in 1868. In 1870 she appeared in New York and for many years was the favorite American singer. She married Charles M. Raymond in 1882.

CARYAT'IDES (-dēz), or **CAR'YATIDS,** in architecture, figures of women dressed in long robes, serving to support entablatures.

CARYOPHYLLA'CEÆ, an order of plants, of which the pink, may be considered as the type. The plants have opposite undivided leaves, without stipules, tumid articulations of the stems, and seeds disposed upon a free central placenta, surrounded by several carpellary leaves. The great proportion of the species are inconspicuous weeds, like chick-weed, sandwort, etc., but



Caryatides.

many are found as favorite plants in our gardens, as the carnation, sweet-william, etc.

CASCADE RANGE, a range of mountains in North America, near the Pacific coast, to which they are parallel, extending from the Sierra Nevada in California northward to Alaska. It contains several active volcanoes. Highest peak, Mount St. Elias, 18,017 feet. The highest peaks in the U. States portion of it are in Washington territory, where Tacoma reaches 14,444 feet.

CASE, in grammar, a term indicating certain relationships in which nouns and pronouns may stand as regards other words, and which are often marked by special forms or inflections. A word that is the subject of a verb is generally said to be in the nominative case, one that is an object in the objective or accusative case. In English these two cases are alike except in pronouns, the only inflected noun-case in English being the possessive. English pronouns have three cases—nominative, possessive, and objective, as he, his, him. In Sanskrit there are eight cases. In French, Italian, Spanish and Portuguese there are no case-forms. In German there are four cases, nominative, genitive, dative, accusative.

CASE, in law, a cause or action, or a statement on which a decision is to be given.

CASE-HARDENING is a process by which iron is superficially converted into steel, in such articles as require the toughness of the former conjointly with the hardness of the latter substance. The articles intended for case-hardening are first manufactured in iron, and are then placed in an iron box, with charcoal in powder, and heated to redness. Immersion into water then converts the surface into a coating of steel.

CASEIN (kā'sē-in), that ingredient in milk which is neither coagulated spontaneously, like fibrin, nor by heat, like albumen, but by the action of acids alone, and constituting the chief part of the nitrogenized matter contained in it. Cheese made from skimmed milk and well pressed is fully half casein. Casein is one of the most important elements of animal food as found in milk and leguminous plants. It consists of carbon 53·7 per cent, hydrogen 7·15, nitrogen 15·65, oxygen 22·65, and sulphur 0·85.

CASE'MATES (from the Spanish casa, a house, and matare, to kill), in fortification, vaults which are proof against bombs, and which may serve as a place for keeping ordnance, ammunition, etc., and in case of necessity as habitations for the garrison.

CASEMENT, a frame inclosing part of the glazing of a window and opening on hinges.

CASER'TA, or **CASERTA NUOVA,** the capital of the province of Caserta, south Italy, in a plain, 7 miles e.s.e. of Capua and 18 from Naples. The principal edifice is the royal palace, a large and richly-decorated structure, commenced in 1752 by Charles III. of Spain. Pop. 20,000.—The province has an area of 2307 sq. miles and a pop. of 805,305.

CASE-SHOT, in artillery, is formed by putting a quantity of small iron balls into a cylindrical tin box called a canister, that just fits the bore of the gun. This kind of shot is very injurious to an enemy within a short distance. The shrapnel-shell is a modern variety of case-shot.

CASH CREDIT. A cash credit is an account which the trader may overdraw to a certain amount as he may require, paying cash in and taking it out according to his needs within that limit. Heritable property, two sureties, or some other form of security is usually demanded by the bank.

CASH'MERE, an extensive principality in the n.w. of Hindustan, subject to a ruler (the Maharajah) belonging to the Sikh race. The principality embraces not only Cashmere proper, but also Jamoo or Jummoo, Baltistan or Little Tibet, Ladakh, Gilghit, etc. The area is estimated at 80,000 sq. miles. It extends from about 32° to 37° n. lat., and from about 73° to 80° e. lon., and is largely a region of mountains, containing magnificent glaciers. The elevated situation of the valley, and the mountains of snow which surround it, render the climate rather cold; but the region is well watered by streams and very fertile. Among its minerals are iron and plumbago. Sulphur springs are common. Earthquakes frequently occur, and in 1885 one caused the loss of thousands of lives. Bears, leopards, wolves, the ibex, and chamois are among the animals. The flora has a strong affinity to that of Europe; the deodar cedar forms extensive and valuable forests. The chief crops are wheat, barley, rice, and Indian corn, and two harvests are reaped in the year. The chief manufacture is that of the celebrated Cashmere shawls. The genuine Cashmere shawls owe their superiority to the material of which they are made, which is, properly

speaking, not wool, but a fine kind of down with which the animals of this region are clad during the winter season, and which in length and fineness far surpasses the merino wool. This down is obtained in great quantities from the Cashmere goat, the yak of Tibet, and the wild sheep. The average time taken to manufacture a good Cashmere shawl is from sixteen to twenty weeks. The inhabitants of Cashmere are a fine race physically, tall, strong, and well-built, with regular features. There are thirteen separate dialects in use. The Maharajah is independent, but his relations with other states are subject to the authority of the government of India. The capital of the whole principality is Srinagar (or Cashmere), which is the Maharajah's usual residence and the largest town. Population 2,906,173, about 1,800,000 being Mohammedans and 700,000 Hindus.

CASHMERE GOAT, a variety of the common goat remarkable for its fine downy fleece, said to be found in perfection only in Tibet in the neighborhood of Lhassa, but also found in other parts of this region, including Ladakh, now a province of Cashmere. The colder the region where the goat pastures, the heavier is its fleece. A full-grown goat yields not more than 8 ounces, the fine curled wool being close to the skin. A large shawl of the finest quality requires 5 lbs. of the wool; one of the inferior quality from 3 to 4 lbs.

CASHMERE SHAWL. See Cashmere and Cashmere Goat.

CASINO, a word used, in the U. States to designate some place of amusement or recreation. It is derived from the Italian in which tongue it means a little house, and formerly Italian noblemen built casinos adjacent to their castles.

CASPIAN SEA, a large lake or inland sea between Europe and Asia, 730 miles in length from n. to s., and from 130 to 270 in breadth; area, 170,000 sq. miles, the largest isolated sheet of water on the globe. Its surface is 85 feet below that of the Sea of Azof; greatest depth about 3250 feet. Russian territory surrounds it on three sides, Persia on the fourth.

CASS, George Washington, an American engineer and railroad man, born in Ohio in 1810, died in 1888. He assisted in the development of the Adams Express Company, of the Pittsburg, Fort Wayne & Chicago, and of the Northern Pacific railroads.

CASS, Lewis, an American politician, born in Exeter, New Hampshire, in 1782. In 1813, having entered the army, he rose to the rank of general; in 1814–30 was governor of Michigan, was minister of war in 1831, was a candidate for the presidency several times, was long a senator, and in 1857–60 was secretary of state. He wrote the History Traditions, Languages, etc., of Indians in the U. States. He died in June, 1866.

CASSAN'DER, a king of Macedonia, born about 354 B.C. He displaced his brother Polysperchon in the regency, removed in succession the mother, the wife, and the son of Alexander the Great to make way for himself to the throne. He married Thessalonica, Alexander's half-sister, and founded the city of that name in her honor. In company with Seleucus, Ptolmy, and Lysimachus he defeated and slew Antigonus, king of Asia, whose dominions were divided among the conquerors. He died in 297 B.C.

CASSAN'DRA, in Greek legend, a daughter of Priam and Hecuba. She is fabled to have been endowed by Apollo with the gift of prophecy, coupled with this disadvantage, that her prophecies should never be believed. She frequently foretold the fall of Troy, and warned her countrymen in vain against the stratagem of the horse.

CASSA'TION, a term used in the courts on the continent of Europe, signifying the annulling of any act or decision, if the forms prescribed by law have been neglected, or if anything is contained in it contrary to law.—Court of Cassation, one of the most important institutions of modern France, established by the first national assembly in 1790. In 1814 the number of its members was fixed at forty-nine, at which it still remains. The members are appointed for life. The sphere of this court is to decide on the competency of the other courts, and on the petitions to have their decisions reviewed or annulled. Its decisions are uot only recorded in the journals of the courts the decisions of which are reversed, but published likewise in an official bulletin. It has enjoyed from its commencement the respect and confidence of France.

Lewis Cass.

CASSA'VA, a South American shrub, about 8 feet in height, with broad, shining, and somewhat hand-shaped leaves, and beautiful white and rose-colored flowers. A nutritious starch is obtained from the white soft root of the plant, and is called by the same name. It is prepared in the West Indies, tropical America, and in Africa in the following manner:—The roots are washed, stripped of their rind, and grated down to a pulp, which is put into coarse, strong canvas bags, and submitted to powerful pressure to express the juice, which is highly poisonous in its natural state. The flour that remains after pressing is formed into cakes, and baked on a hot iron plate. In this state it forms a valuable article of food, upon which many of the inhabitants of southern America live almost entirely. From cassava the tapioca of commerce is prepared. Another species, the sweet cassava, has roots the juice of which is not poisonous, and which are an agreeable and nutritive food.

Cassava plant.

CAS'SEL, or KASSEL, formerly the residence of the Elector of Hesse-Cassel, is now the chief town in the province of Hessen-Nassau, Prussia, on the Fulda, 91 miles n.n.e. of Frankfort-on-the-Main. There are many fine walks and public gardens in the vicinity; among the latter are the gardens of Wilhelmshöhe, in which is situated the ex-elector's summer palace, the residence of the late Emperor Napoleon III., after his being taken prisoner at Sedan, from Sept. 5, 1870, to March 19, 1871. Pop. 106,001.

CASSIMIR-PERIER, Jean Paul Pierre, a French statesman, born in 1857 at Paris, and president of the French Republic in 1894 and 1895. He won distinction in the Franco-Prussian war, was elected to the chamber of deputies in 1874, vice-president of the chamber in 1890 and president of the chamber in 1893. In December of that year Cassimir-Perier was called to be prime minister under Carnot and in 1894, on the assassination of Carnot he was elected to the presidency of the republic. Although believed to be a royalist, he has always acted as a moderate republican.

CASSIN, John, an American ornithologist, born in 1813 at Chester, Pa., died 1869. He wrote several authoratitive works on North American birds.

CASSI'NI, a name famous in astronomy and physics for three generations:—(1) Giovanni Domenico, born in 1625 near Nice. He discovered four new satellites of Saturn and the zodiacal light, proved that the axis of the moon is not perpendicular to the plane of the ecliptic, and showed the causes of her libration. He died in 1712.—(2) Jacques, his son, born at Paris in 1677. After several essays on subjects in natural philosophy, etc., he completed his great work on Saturn's satellites and ring. He died in 1756.—(3) Cassini de Thury, César François, son of the preceding, born in 1714, member of the Academy from his twenty-second year, undertook a geometrical survey of the whole of France, which was completed by his son. He died in 1784.—(4) Cassini, Jean Dominique, Count de Thury, son of the preceding, born at Paris 1748. In 1787 he completed the topographical work

which was begun by his father, and which in its complete state consists of 180 sheets. He died in 1845.

CASSI'NO, a game at cards somewhat resembling whist.

CAS'SIUS, full name Caius Cassius Longinus, a distinguished Roman, one of the assassins of Julius Cæsar. In the civil war that broke out between Pompey and Cæsar he espoused the cause of the former, and, as commander of his naval forces, rendered him important services. After the battle of Pharsalia he was apparently reconciled with Cæsar, but later was among the more active of the conspirators who assassinated him B.C. 44. He then, together, with Brutus, raised an army, but they were met by Octavianus and Antony at Philippi. The wing which Cassius commanded being defeated, he imagined that all was lost, and killed himself, B.C. 42.

CAS'SOCK, a tight-fitting coat worn under the gown or surplice by the clergy. The cassock is generally black; but in the Church of Rome only the ordinary priests wear black cassocks, those of bishops being purple, of cardinals scarlet, and that of the pope white.

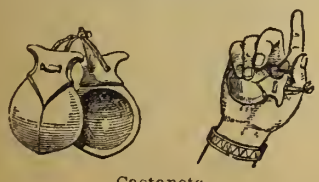
CAS'SOWARY, a family of birds akin to the ostrich, emeu, etc., among living, the moa and others among extinct, birds. The shortness of their wings

Helmeted cassowary.

totally unfits them for flying, and, like others of their order, the pectoral or wing muscles are comparatively slight and weak, while those of their posterior limbs are very robust and powerful.

CAST, in the fine arts, is an impression taken by means of wax or plaster of Paris from a statue, bust, bas-relief, or any other model, animate or inanimate. When plaster casts are to be exposed to the weather their durability is greatly increased by saturating them with linseed-oil, with which wax or rosin may be combined.

CAS'TANETS, an instrument composed of two small concave shells of ivory or hardwood, shaped like spoons, placed together, fastened to the thumb,



Castanets.

and beat with the middle finger. This instrument is used by the Spaniards and Moors as an accompaniment to their dances and guitars.

CASTE, a term applied to a distinct class or section of a people marked off from others by certain restrictions, and whose burdens or privileges are hereditary. The word is derived from the Portuguese casta, a breed or race, and was originally applied to the classes in India whose occupations, customs, privileges, and duties are hereditary. It is probable that wherever caste exists it was originally grounded on a difference of descent and mode of living, and that the separate castes were originally separate races. It now prevails principally in India, but it is known to exist or have existed in many other regions. "The effect of the caste system is," as the Cyclopedia of India says, "that no man may lawfully eat with any individual of any other caste, or partake of food cooked by him, or marry into another caste family; but he may be his friend, his master, his servant, his partner." Those that are outside of any caste are known as pariahs.

CASTELAR', Emilio, a Spanish politician and author, born in 1833. In 1856 he was made professor of history in the University of Madrid, but becoming involved in the republican disturbances of 1866, he had to take refuge in Switzerland. Having gone back to Spain in 1868 he was returned to the Cortes in the following year. In 1873 he was elected president of the republican Cortes, but resigned in Jan. 1874, in consequence of the vote of confidence being defeated. After the pronunciamiento in favor of Alphonso XII., Dec. 13, 1874, Castelar retired from Spain, but in a year or two returned, and again sat in the Cortes. He died in 1899. He published many novels, poems, and popular works.

CASTELLON-DE-LA-PLANA (kȧs-tel-yon'), a town, Spain, capital of the province of Castellon, 40 miles n.n.e. of Valencia, in a large and fertile plain, with manufactures of sail-cloth, woolen and hempen fabrics, ropes, paper, soap, etc., and some trade in hemp, grain, and fruit. Pop. of town, 31,272; of province, 304,477; area of latter, 2445 sq. miles.

CASTILE (kas-tēl'), an ancient kingdom of Spain, the nucleus of the Spanish monarchy, extends over a large part of the peninsula from the Bay of Biscay southward. It is divided into New Castile and Old Castile. The former occupies nearly the center of the peninsula; area, 28,010 sq. miles. It is traversed from e. to w. by three lofty mountain chains, nearly parallel to each other—the Sierra Guadarrama, the mountains of Toledo and Sierra Molina, and the Sierra Morena. Between these chains, which form the great watersheds of the province, lie two extensive plains or plateaux, almost without wood, and arid and barren in appearance. Dryness, indeed, is the curse of the whole country, and there is a great deficiency of method alike in agriculture and industries. The inhabitants are of a grave, manly character, with much of the old Spanish pride and probity, but devoid of enterprise, and content to live on from day to day as their fathers did before them. This ancient province now forms the five provinces of Madrid, Ciudad-Real, Cuenca, Guadalajara, and Toledo. Pop. 1,853,314.—Old Castile stretches from the Bay of Biscay to New Castile; area, 25,405 sq. miles. It is traversed by three mountain chains—the Sierra de Guadarrama, the Sierra de Deza, and the Cantabrian Mountains. It is less dry than New Castile, and grain, particularly wheat, is raised in great abundance. The pastures both of the mountains and the plains are excellent, and much merino wool is produced. Old Castile now forms the provinces of Burgos, Logroño, Santander, Soria, Segovia, Avila, Palencia, and Valladolid. Pop. 1,761,440.

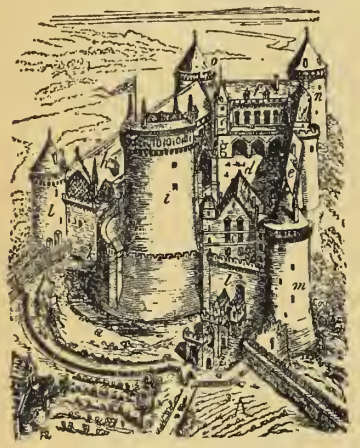
CASTING, the running of melted metal into a mold prepared for the purpose, so as to produce an article of a certain shape. Iron-casting (or iron-founding) is the most important branch. In ordinary operations the pattern is laid on a board known as the turn-over board, and the flask placed over it, the sand being carefully rammed into the flask till it is full. Another board, known as the bottom-board, is then laid upon it. The flask is then turned over, the first or turn-over board taken off, the one side of the pattern uncovered, a fine facing of sand spread upon the surface to prevent adhesion, after which a second flask, called the cope, sometimes made with crossbars to strengthen it and help to hold the sand, is placed upon it and sand carefully rammed in. The cope or second flask is them lifted off, the sand which it contains carrying the impression of the upper side of the pattern; the pattern in the lower part of the flask, or drag, is then carefully drawn out, and any injuries which the mold receives during the operation is repaired. Holes or passages are then cut into the sand for pouring in the metal, all loose sand carefully removed, the cope replaced and secured to the drag by clamps. The mold is now ready for the molten metal. In pouring, the metal is generally run through two or three different passages at the same time to prevent it losing fluidity by cooling. It is only in lighter castings that sand, of the proper degree of dryness, porosity, and adhesiveness, is used. In heavy castings the mold is usually made of loam, which is more adhesive, and in complicated articles the making of the mold is often a difficult process.

CASTING-VOTE, the vote of a presiding officer in an assembly or council which decides a question when the votes of the assembly or house are equally divided between the affirmative and negative.

CAST-IRON, the name given to the iron obtained from the blast-furnace by running the fused metal into molds prepared for the purpose. The molds are in the form of long narrow channels, from which the iron, when it has cooled and solidified, is taken in bars called pigs, between 3 and 4 feet long and 3 or 4 inches broad. See Iron.

CASTLE, an edifice serving at once as a residence and as a place of defense, especially such an edifice belonging to feudal times. Castles differed somewhat at different times and in different places, but they had all several features of similarity. The first defense of a castle was usually the moat or ditch,

that sometimes comprised several acres; and behind it was the outer wall, generally of great height and thickness, strengthened with towers at regular distances, and pierced with loopholes through which missiles could be discharged at the assailants. The main entrance through the outer wall was protected by the barbican, with its narrow archway, and strong gates and portcullis, and inside there were usually an outer and an inner court, and the strong more or less detached building known as the keep, which formed the residence of the owner and his family. This was the most strongly constructed of all the buildings, to which the defenders retreated only in the last extremity. The cut shows the castle of the Sires de Coucy, France, built in the 13th century. In the foreground is the outer bailey or esplanade, fortified, and containing a chapel, stables, and other buildings. The outer entrance to this was formed by the barbican. a, is the fosse, 20 yards broad; b, the gateway, approached by two swing-bridges, defended by two guard-rooms, and having a double portcullis within, giving entrance to vaulted guard-rooms with sleeping apartments, etc.,



Castle—Château de Coucy.

above, c; d, inner bailey or courtyard; e, covered buildings for the men defending the walls or curtains; f, apartments for the family, entered by the grand staircase, g; h, great hall, with store-rooms and vaults below; i, donjon or keep (the chapel is seen behind it), the strongest part of the castle, with walls of immense thickness. At k was a postern leading from the donjon and communicating with an outer postern, drawbridge, etc.; l, m, n, o, towers or bastions flanking the walls.

CASTLE GARDEN, a building in Battery Park, New York City, and long used as a landing place for immigrants. It is now used as a public swimming place and has a collection of salt-water and fresh-water fishes.

CAS'TOR, Casto'reum, a reddish-brown substance, of a strong penetrating smell, secreted by two glandular sacs connected with the organs of reproduction of the beaver, and used by perfumers.

CASTOR AND POLLUX, in Greek mythology, twin divinities, sons of Zeus (Jupiter) and Leda, also called Dioscūri (sons of Zeus). Castor was mortal, but Pollux was immortal. The former was particularly skilled in breaking horses, the latter in boxing and wrestling. They were the patron deities of mariners. In the heavens they appear as one of the twelve constellations of the zodiac, with the name of Gemini (the Twins).

CASTOR AND POLLUX are two minerals which are found together in granite in the island of Elba. Castor is a silicate of aluminium and lithium, pollux is a silicate of aluminium and the rare element cæsium.

CASTOR-OIL, the oil obtained from the seeds of a plant, a native of India, but now distributed over all the warmer regions of the globe. The oil is obtained from the seeds by bruising and pressing.

Castor-oil plant.

The oil that first comes away, called cold-drawn castor-oil, is reckoned the best; an inferior quality being obtained by heating or steaming the pressed seeds, and again subjecting them to pressure. The oil is afterward heated to the boiling point, which coagulates and separates the albumen and impurities. Castor-oil is used medicinally as a mild but efficient purgative. It is chiefly imported from India. The plant is often cultivated as an ornamental plant.

CASTRATION, the act of depriving a male animal of the testicles. It is practiced on domestic animals (as oxen and horses) with the object of rendering them more submissive and docile, etc. Men who are castrated are known as eunuchs.

CAST-STEEL, steel made by fusing the materials and running the product into molds.

CAS'UISTRY, that part of the old theology and morals which relates to the principles by which difficult cases of conscience (especially where there is a collision of different duties) are to be settled. Hence a casuist is a moralist who endeavors to solve such doubtful question.

CASUS BELLI, the material grounds which justify a declaration of war.

CAT, a well-known domesticated quadruped, order Carnivora, the same name being given also to allied forms of the same order. It is believed that the cat was originally domesticated in Egypt, and the gloved cat of Egypt and Nubia has by some been considered the original stock of the domestic cat, though more probably it was the Egyptian cat. It was seldom, if at all, kept by the Greeks and Romans, and till long after the Christian era was rare in many parts of Europe. Some have thought that the domestic breed owed its origin to the wild cat; but there are considerable differences between them, the latter being larger, and having a shorter and thicker tail, which also does not taper. The domestic cat belongs to a genus—that which contains the lion and tiger—better armed for the destruction of animal life than any other quadrupeds. The short and powerful jaws, trenchant teeth, cunning disposition, combined with nocturnal habits (for which their eyesight is naturally adapted) and much patience in pursuit, give these animals great advantages over their prey. The cat in a degree partakes of all the attributes of her race. Its food in a state of domestication is necessarily very various, but always of flesh or fish if it can be obtained. Instances of its catching the latter are known, though usually the cat is extremely averse to wetting itself. It is a very cleanly animal, avoiding to step in any sort of filth, and preserving its fur in a very neat condition. Its fur is very easily injured by water on account of the want of oil in it, and it can be rendered highly electric by friction. The cat goes with young for sixty-three days, and brings forth usually from three to six at a litter, which remain blind for nine days. It is usually regarded as less intelligent than the dog, but this is by no means certain. It has a singular power of finding its way home when taken to a distance and covered up by the way.

CAT'ACLYSM, in geol. a physical catastrophe of great extent, supposed to have occurred at different periods, and to have been the efficient cause of various phenomena observed in the surface configuration of localities.

CAT'ACOMBS, (a hollow or recess), caves or subterranean places for the burial of the dead, the bodies being placed in graves or recesses hollowed out in the sides of the cave. Caves of

Catacomb of St. Agnes, Rome.

this kind were common among the Phœnicians, Greeks, Persians, and many oriental nations. In Sicily and Asia Minor numerous excavations have been discovered containing sepulchers, and the catacombs near Naples are remarkably extensive. Those of Rome, how-

ever, are the most important. The term catacumbæ is said to have been originally applied to the district near Rome which contains the chapel of St. Sebastian, in the vaults of which, according to tradition, the body of St. Peter was first deposited; but (besides its general application) it is now applied in a special way to all the extensive subterranean burial-places in the neighborhood of Rome, which extend underneath the town itself as well as the neighboring country, and are said to contain not less than 6,000,000 tombs. They consist of long narrow galleries usually about 8 feet high and 5 feet wide, which branch off in all directions, forming a perfect maze of corridors. Different stories of galleries lie one below the other. Vertical shafts run up to the outer air, thus introducing light and air, though in small quantity. The graves lie longwise in the galleries. They are closed laterally by a slab, on which there is occasionally a brief inscription or a symbol, such as a dove, an anchor, or a palm-branch, and sometimes both. The earliest that can be dated with any certainty belongs to the year 111 A.D. It is now regarded as certain that in times of persecution the early Christians frequently took refuge in the catacombs, in order to celebrate there in secret the ceremonies of their religion; but it is not less certain that the catacombs served also as ordinary places of burial to the early Christians, and were for the most part excavated by the Christians themselves.

CAT'ACOUSTICS, the science of reflected sounds, or that part of acoustics which considers the properties of echoes.

CATAFAL'CO, Catafalque, a temporary and ornamental structure, representing a tomb placed over the coffin of a distinguished person or over a grave.

CATALEP'SY, a spasmodic disease, generally connected with hysteria, in which there is a sudden suspension of the senses and volition, with statue-like fixedness of the body and limbs in the attitude immediately preceding the attack, while the action of the heart and lungs continues, and the pulse and temperature remain natural. It is generally the consequences of some other disease, or of a constitution enfeebled by the gradual operation of unobserved causes.

CATALOGUING, the art of making classified lists of books, or other things. Book catalogues, especially those of large libraries have been superseded by card indexes, although catalogues are still used by libraries for the purpose of distribution to other libraries. Catalogues are made in a systematic manner by name of author and subject each "crossed" with the other.

CATALO'NIA, an old province of Spain, bounded n. by France, e. and s.e. by the Mediterranean, s. by Valencia, and w. by Arragon. The country in general is mountainous, but intersected with fertile valleys, while the mountains themselves are covered with valuable woods and fruit-trees, the slopes being cut in terraces and plentifully supplied with water by an artificial system of irrigation. Wheat, wine, oil, flax, hemp, vegetables, and almost every kind of fruit are abundant. There are mines of lead, iron, alum, etc. On the coast is a coral-fishery. Catalonia, though less fertile than most of Spain, stands pre-eminent for the industry of its inhabitants, who speak the Catalan dialect (see Catalan). Pop. 1,942,245; area, 12,480 sq. miles. It comprises the modern provinces of Tarragona, Gerona, Lerida, and Barcelona.

CATAL'PA, a genus of plants. The species are trees with simple leaves and large, gay, trumpet-shaped flowers. A North American species, is well adapted for large shrubberies, and has been introduced into England and other parts of Europe.

CATAL'YSIS, or CONTACT ACTION, the chemical change which occurs when one body decomposes another without being itself changed; thus oxide of cobalt decomposes a solution of bleaching-powder into chloride of calcium and oxygen, itself remaining without change.

The square of the elephant, Catania.

CATAMARAN', a sort of raft used in the East Indies, Brazil, and elsewhere. Those of the island of Ceylon, like those of Madras and other parts of that coast, are formed of three logs lashed together. Their length is from 20 to 25 feet, and breadth 2½ to 3½ feet. The center log is much the largest, and is pointed at the fore-end. These floats are navigated with great skill by one or two men in a kneeling posture. They think nothing of passing through the surf which lashes the beach at Madras when boats of the best construction would be swamped.

CATAMAR'CA, a province of the Argentine Republic, S. America; area, about 31,500 sq. miles; mountainous in all directions except the s. Pop. 102,000. The capital is Catamarca, or more fully San Fernando de Catamarca. Pop. about 6000.

CAT'AMOUNT, or CATAMOUNTAIN, the wild cat. In America the name is also given to the tiger or the puma.

CATA'NIA, a city on the east coast of Sicily, in the province of Catania, at the foot of Mount Etna. It has been repeatedly visited by tremendous earthquakes, one of the worst of which was in 1693, when 18,000 people were destroyed and has been partially laid in ruins by lava from eruptions of Mount Etna. Most of the edifices have an air of magnificence unknown in other parts of the island, and the town has a title to rank among the elegant cities of Europe. The ruins of the amphitheater, which was more extensive than the Colosseum at Rome, are still to be seen, as also the remains of the theater, baths, aqueducts, sepulchral chambers, hippodrome, and several temples. The harbor was choked up by the eruption of 1669, but latterly has been greatly improved. The trade is of some importance, the chief exports being sulphur, oranges, and lemons, grain, wine, oil, etc. Pop. 113,391.

CATANZA'RO, a cathedral city, South Italy, capital of province of the same name, on a height, 5 miles from the Gulf of Squillace, with manufactures of silk and velvet and some trade in wheat, wine, oil, etc. Pop. 20,931. Area of prov. 2307 sq. miles; pop. 433,975.

CAT'APULT, a machine of the ancients for projecting missiles, chiefly arrows. They may be described as a kind of gigantic cross-bows. Balistæ were engines somewhat similarly constructed, but were chiefly confined to the shooting of stones.

CAT'ARACT, a disease of the eye, consisting in an opacity of the crystalline lens, or its capsule, or both. It is quite different from amaurosis, which is a disease of the retina. In cataract the lens becomes opaque, and is no longer capable of transmitting the light. Its earliest approach is marked by a loss of the natural color of the pupil, and when developed it causes the pupil to have a milk-white or pearly color. It is most common in old or elderly people, and is quite painless. Cataract is treated by different surgical operations, all of them consisting in removing the diseased lens from its situation opposite the transparent cornea. In couching, the lens is depressed, removed downward, and kept from rising by the vitreous humor; but this method is now almost entirely given up in favor of removal of the lens by extraction. Extraction consists in making an incision in the cornea, and in the capsule of the lens, by which the lens may be brought forward, and through the cut in the cornea, so as to be altogether removed. The third operation is by absorption. This consists in wounding the capsule.

breaking down the crystalline, and bringing the fragments into the anterior chamber of the eye, where they are exposed to the action of the aqueous humor, and are at length absorbed and disappear. Extraction is now the regular method, and after it is effected a special kind of spectacles are required.

CAT'ARACT, or **WATERFALL,** the leap of a stream over a ledge or precipice occurring in its course. Many cataracts are remarkable for their sublimity, the grandest being the Falls of Niagara, on the Niagara River between Lakes Erie and Ontario, in N. America, the river having here a fall of about 160 feet. Among other notable falls are those of the river Montmorency, a tributary of the St. Lawrence, which are 242 feet in height; that of the river Potaro, in British Guiana, about 822 feet high and 369 broad; that of the Yosemite River, California, which makes a perpendicular leap of 2100 feet; the Victoria Falls, on the river Zambesi, in south Africa, about 370 feet high and 1860 yards broad. The cataract of the Riukanfoss, on the river Maan, in Norway, is about 900 feet high. The cascade of Gavarnie, in the Pyrenees, is reputed the loftiest in Europe, being about 13,000 feet, but its volume is so small that it is converted into spray before reaching the bottom. The fall of the Staubbach at Lauterbrunnen, in Switzerland, is between 800 and 900 feet, but has also a very small volume of water; the falls of the Rhine at Schaffhausen, renowned over Europe, are 300 feet broad and nearly 100 feet in height. In Italy the falls of Terni, on the Velino, and those of the Anio, at Tivoli, are artificial but very beautiful. Among British waterfalls, the falls of the Clyde, three in number, viz., Bonniton Linn, 30 feet, Corra Linn, 84 feet, and Stonebyres Linn, 80 feet, are remarkable for their beauty and grandeur.

CATARRH (ka-tar'), an increased secretion of mucus from the membranes of the nose, fauces, and bronchi, accompanied with fever and attended with sneezing, cough, thirst, lassitude, and want of appetite. There are two species of catarrh, one which is very common, and is called a cold in the head; and another, the influenza, or epidemic catarrh. It is seldom fatal except in scrofulous habits by laying the foundation of consumption.

CAT-BIRD, a well-known species of American thrush, which during the summer is found throughout the Middle and New England States, frequenting thickets and shrubberies. Its note is strikingly similar to the plaint of a kitten in distress. The plumage is a deep slate-color above and lighter below, and it is about 9 inches in length. In habit it is lively, familiar, and unsuspicious; the song is largely imitative of those of other birds. During the winter it inhabits the extreme south of the U. States, and is found also in Mexico and Central America. The catbird frequently attacks the common black snake, which, in the absence of the bird, rifles its nest.

CAT-BOAT, a sailboat with one large fore-and-aft sail, and generally not longer than 25 or 30 feet. Cat-boats are fast sailers and easily managed.

CATECHISM (kat'e-kizm), an elementary book containing a summary of principles in any science or art, but particularly in religion, reduced to the form of questions and answers.

CAT'ECHU (-shö), a name common to several astringent extracts prepared from the wood, bark, and fruits of various plants. Catechu is one of the best astringents in the materia medica. It consists chiefly of tannin, and is used in tanning, in calico-printing, etc. It is chiefly obtained from Burmah.

CATERPILLAR. See Butterfly.

CAT-FISH, a remarkably voracious fish, belonging to the family of gobies, known also as the wolf-fish; also the name common to several N. American fish. The common cat-fish is known also as the horned pout and bull-head. It is excellent eating.

CAT'GUT, a cord made from the intestines of sheep, and sometimes from those of the horse, ass, and mule, but not from those of cats. The manufacture is chiefly carried on in Italy and France by a tedious process. Catgut for stringed instruments, as violins and harps, is made principally in Milan and Naples, the latter having a high reputation for treble strings.

CATHARINE I., Empress of Russia and wife of Peter the Great, was a woman of humble origin, who, having become mistress to Prince Menschikoff, was relinquished by him to the czar. In 1708 and 1709 she bore the emperor the Princesses Anna and Elizabeth, the first of whom became the Duchess of Holstein by marriage, and mother of Peter III. The second became Empress of Russia. In 1711 the emperor publicly acknowledged Catharine as his wife, and she was subsequently proclaimed empress, and crowned in Moscow in 1724. When Peter with his army seemed irreparably lost on the Pruth in 1711 Catharine secured the relief of her husband by bribing the Turkish general. At Peter's death in 1725 Catharine was proclaimed empress and autocrat of all the Russias, and the oath of allegiance to her was taken anew. Catharine died suddenly in 1727, her death having been hastened by dissipation.

CATHARINE II., Empress of Russia, was born in 1729, her father being Christian Augustus, prince of Anhalt-Zerbst. In 1745 she was married to Peter, nephew and successor of the Russian Empress Elizabeth, on whose death in 1762 her husband succeeded as Peter III. In danger of being supplanted by his mistress, the Countess Woronzoff, Catharine, with the assistance of her lover, Gregory Orloff, and others, won over the guards and was proclaimed monarch (July, 1762). Peter attempted no resistance, abdicated almost immediately, and was strangled in prison a few days later, apparently without Catharine's knowledge. On the death of Augustus III. of Poland she caused her old lover, Poniatowski, to be placed on the throne with a view to the extension of her influence in Poland, by which she profited in the partition of that country in the successive dismemberments of 1772, 1793, and 1795. By the war with the Turks, which occupied a considerable part of her reign, she conquered the Crimea and opened the Black Sea to the Russian navy. Her dream, however, of driving the Turks from Europe and restoring the Byzantine Empire was not to be fulfilled. Her relations with Poland and with other European powers induced her to make peace with Turkey in 1792, and accept the Dniester as the boundary line between the two countries. She appears to have been successful in improving the administration of justice, ameliorated the condition of the serfs, constructed canals, founded the Russian Academy, and in a variety of ways contributed to the enlightenment and prosperity of the country. Her enthusiasm for reform, however, was summarily checked by the events of the French revolution; and the dissipation and extravagance of her court were such that there was even a danger of its exhausting the empire. She died in 1796.

Catharine II of Russia.

CATHARINE, St., in the Roman hagiology there are six saints of this name, of whom only two are of importance:—(1) St. Catharine, a virgin of Alexandria who suffered martyrdom in the 4th century. She is represented with a wheel; and the legend of her marriage with Christ has been painted by several of the first masters. (2) St. Catharine of Siena, born in 1347, who was preternaturally pious from her birth, and at six years of age was given to self-castigation and other penances. Urban VI. and Gregory XI. sought her advice, and in 1460—80 years after her death—she was canonized. Her poems and letters have been published.

CATHARINE DE' MEDICI (dā-med'i-chē), wife of Henry II., king of France, born at Florence in 1519, the only daughter of Lorenzo de' Medici, duke of Urbino, and the niece of Pope Clement VII. She was married to the Duke of Orleans, afterward Henry II., in 1533, but had little or no influence at the French court either during the reign of her husband, who was under the influence of his mistress Diana de Poitiers, or during the reign of her eldest son, Francis II., who, in consequence of his marriage with Mary Stuart, was devoted to the party of the Guises. The death of Francis placed the reins of government during the minority of her son Charles IX., in her hands. Waver-

ing between the Guises on one side, who had put themselves at the head of the Catholics, and Condé and Coligny on the other, who had become very powerful by the aid of the Protestants, she played off one faction against the other in the hope of increasing her own power; and the thirty years of civil war which followed were mainly due to her. Her influence with Charles IX. was throughout of the worst kind, and the massacre of St. Bartholomew's Day was largely her work. After the death of Charles IX., in 1574, her third son succeeded as Henry III., and her mischievous influence continued. She died in 1589, shortly before the assassination of Henry III. Of her two daughters, Elizabeth married Philip II. of Spain, and Margaret of Valois married Henry of Navarre, afterward Henry IV.

CATHARINE HOWARD, Queen of England, fifth wife of Henry VIII., daughter of Lord Edmund Howard, son of the Duke of Norfolk; born 1522. Her beauty and vivacity induced the king to marry her in 1540, but her conquest appears to have been of a dubious kind both before and after marriage, and she was charged in 1541 with adultery. Her paramours Derham and Culpepper were beheaded, and two months later (Feb., 1542), she shared the same fate.

CATHARINE OF ARAGON, Queen of England, the youngest daughter of Ferdinand of Aragon and Isabella of Castile, was born in 1485. In 1501 she was married to Arthur, prince of Wales, son of Henry VII. Her husband dying about five months after, the king, unwilling to return her dowry, caused her to be contracted to his remaining son, Henry, and a dispensation was procured from the pope for that purpose. On his accession to the throne as Henry VIII. in 1509 she was crowned with him, and despite the inequality of their ages retained her ascendency with the king for nearly twenty years. Her children, however, all died in infancy, excepting Mary, and on the advent of Anne Boleyn Henry affected to doubt the legality of his union with Catharine. He applied therefore to Rome for a divorce, but the attitude of the papal court ultimately provoked him to throw off his submission to it, and declare himself head of the English church. In 1532 he married Anne Boleyn; upon which Catharine, no longer considered queen of England, retired to Ampthill in Bedfordshire. She died in January, 1536.

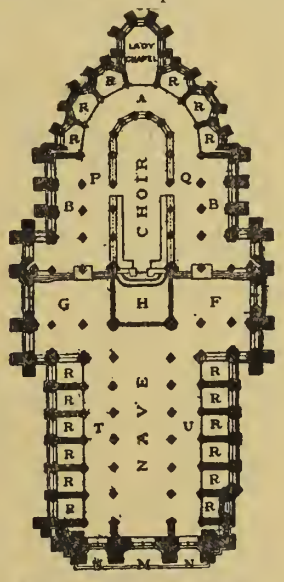
CATHARINE OF BRAGANZA, wife of Charles II., king of England, and daughter of John IV., king of Portugal, was born in 1638. In 1693 she returned to Portugal, where, in 1704, she was made regent, and in the conduct of affairs during the war with Spain showed marked ability. She died in 1705.

CATHARINE PARR, sixth and last wife of Henry VIII. of England was born in 1512, and had had two husbands before she became Henry's queen in 1543. After the death of the king she espoused the Lord-admiral Lord Thomas Seymour, uncle to Edward VI.; but the union was an unhappy one. She died in 1548.

CATHAR'TICS, a general name for purgative medicines.

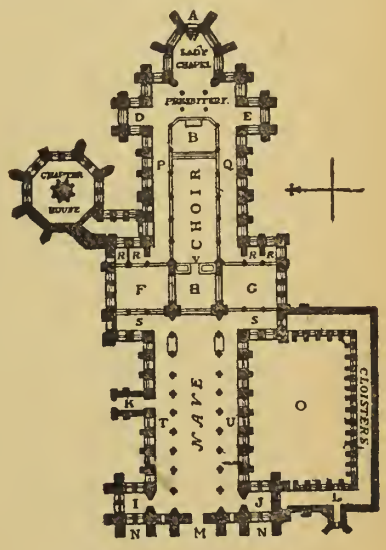
CATHAY', an old name of China.

CATHE'DRAL, the principal church of a diocese, so called from its possessing the episcopal chair or cathedra. This is really what distinguishes a cathedral from other churches, though most cathedrals are also larger and more elaborate structures than ordinary churches, and have various dignitaries and functionaries connected with them. The cathedral establishments in England regularly consist of a dean and chapter, presided over by the bishop, the chapter being composed of a certain number of canons. The dean and chapter meet in the chapter-house of the cathedral; in them the property of the cathedral is vested, and they nominally elect the bishop on a congé d'élire from the crown. There are often a certain number of honorary canons, also "minor canons" who assist in the performance of the choral services, choristers, etc. As regards architecture cathedrals naturally vary much. Those in England are almost all in the Gothic style, cruciform or cross-shaped in arrangement, and having connected with them a chapter-house, side chapels (varying in number and position), cloisters, crypt, etc. This style and arrangement are also common on the continent of Europe and in most modern cathedrals; but the Romanesque, Renaissance, and Byzantine styles of architecture are also employed. Many cathedrals furnish the most magnificent examples of the architecture of the middle ages; and as they were intended to accommodate great numbers of people, and to exhibit imposing religious services, they are often of great size (St. Peter's, Rome, is 613 feet long and 450 across the transepts). Among the most notable cathedrals are St. Peter's, the largest of all, founded 1450; the cathedral at Milan, founded in 1386, built of white marble; the cathedral at Florence, begun about 1294, one of the finest specimens of the Italian-Gothic style; Cologne Cathedral, commenced in 1248 (and only finished recently); Notre Dame at Paris begun 1163; and those of Amiens, Chartres, and Rheims. The most noteworthy English cathedrals are St. Paul's, London (1675–1711), in the Renaissance style, and those of Canterbury, Ely, Exeter, Lichfield, Lincoln, Norwich, Salisbury, Wells, Westminster, and York. The cathedrals of Glasgow and Kirkwall are the only entire cathedrals in Scotland, exclusive of modern edifices.



Plan of Amiens Cathedral.

A, Apsidal aisle. BB, Outer aisles of choir.
FG, Transepts. H, Central tower.
IJ, Western turrets.
M, Principal or western doorway.
NN, Western side doors.
PQ, North and south aisles of choir.
RRR, Chapels.
TU, North and south aisles of naive.



Plan of Wells Cathedral.

A, Apse or apsis. B, Altar, altar-platform, and altar-steps. DE, Eastern or lesser transept. FG, Western or greater transept. H, Central tower. IJ, Western towers. K, North porch. L, Library or register. M, Principal or western doorway. NN, Western side doors. O, Cloister yard or garth. PQ, North and south aisles of choir. RS, East and west aisles of transept. TU, North and south aisles of nave. RR, Chapels. V, Rood screen or organ loft. W, Altar of Lady chapel.

CATHERINE. See Catharine.

CATHERWOOD, Mary Hartwell, an American novelist born in Ohio in 1847, died 1902. Her stories are chiefly concerned with the early days of the Middle West.

CATHETOM'ETER, an instrument for measuring small differences of level between two points; in its simplest form, a vertical graduated rod, upon which slides a horizontal telescope. With the telescope the observer sights the two objects under examination, and the distance on the graduated rod moved over by the telescope is the measure of the distance of height between the two objects.

CATH'OLIC APOSTOLIC CHURCH. See Irvingites.

CATHOLIC CHURCH, the universal church, the whole body of true believers in Christ; but the term is often used as

equivalent to the Roman or Western Church. See Roman Catholic Church.

CATHOLIC EMANCIPATION, i.e., the abolition of those civil and ecclesiastical restraints to which the Roman Catholics of Great Britain, and particularly of Ireland, were once subjected. By the statutes of William III. Roman Catholics were forbidden to hold property in land, and their spiritual instructors were open to the penalties of felony; and although latterly these restrictions had not been enforced, they remained unrepealed in England until 1778. The proposal to repeal similar enactments on the Scotch statute-books was delayed by the strenuous opposition of the Protestant associations, in connection with which the Lord Gordon riots occurred. In 1791, however, a bill was passed allowing Roman Catholics who took the oath of allegiance to hold landed property, enter the legal profession, and enjoy freedom of education. In Ireland the Roman Catholics had been even more unjustly treated. Their public worship was proscribed, all offices and the learned professions were closed against them, they were deprived of the guardianship of their children, and if they had landed estates they were forbidden to marry Protestants. Burke and a strong body of followers took up their cause, and in 1792 and 1793 the worst of the disabilities were removed by the Irish parliament. Restraints on worship, education, and disposition of property were removed; they were admitted to the franchise, and to some of the higher civil and military offices, and to the honors and endowments of the Dublin University.

CATHOLIC KNIGHTS OF AMERICA, a Roman Catholic fraternal order founded in 1877. It is the pioneer of the Roman Catholic assessment insurance organizations, and the only one which admits women to membership on the same footing as men. There are now 600 branches in the order, with a total membership of about 25,000; it also has a uniform rank, with a membership of 2000. It has paid about $15,500,000 to the beneficiaries of its deceased members.

CATHOLIC MAJESTY, a title which Pope Alexander VI. gave to the kings of Spain, in memory of the complete expulsion of the Moors from Spain in 1491 by Ferdinand of Aragon. But even before that time, and especially after the council at Toledo in 589, several Spanish kings are said to have borne this title.

CATHOLIC UNIVERSITY OF AMERICA, founded at Washington, D. C., in 1887, and was opened in 1889. The faculties at present organized are those of theology, philosophy, law, and technology. Its library contains approximately 32,000 volumes, exclusive of pamphlets.

CATHOLIC YOUNG MEN'S NATIONAL UNION, a society of young men among Roman Catholics, organized at Newark, N. J., in 1875. It has over 50,000 members, distributed in more than 300 societies.

CATILINE (Lucius Sergius Catilina), a Roman conspirator, of patrician rank, born about 108 B.C. In his youth he attached himself to the party of Sulla, but his physical strength, passionate nature, and unscrupulous daring soon gained him an independent reputation. Despite the charges of having killed his brother-in-law and murdered his wife and son, he was elected prætor in B.C. 68, and governor of Africa in 67. In B.C. 66 he returned to Rome to contest the consulship, but was disqualified by an impeachment for maladministration in his province. Urged on by his necessities as well as his ambition, he entered into a conspiracy with other disaffected nobles. The plot, however, was revealed to Cicero, and measures were at once taken to defeat it. Thwarted by Cicero at every turn, and driven from the senate by the orator's bold denunciations, Catiline fled, and put himself at the head of a large but ill-armed following. The news of the suppression of the conspiracy and execution of the ringleaders at Rome diminished his forces, and he led the rest toward Gaul. Metellus Celer threw himself between the rebels and their goal, while Antonius pressed upon their rear, and, driven to bay, Catiline turned upon the pursuing army and perished fighting (62 B.C.).

CATLIN, George, a writer on the American Indians, born in Pennsylvania 1796, died 1872. After practising as a lawyer for two years he set up at New York as a portrait-painter, and in 1832 commenced special studies of Indian types, residing many years among them both in N. and S. America. In 1840 he went to Europe, and subsequently introduced three parties of American Indians to European courts. His finely illustrated works are: Manners, Customs, and Condition of the N. American Indians (1841); North American Portfolio (1844); Eight Years' Travel in Europe (1848); Last Rambles Among the Indians, etc. (1868).

CATMINT, or **CATNIP,** a plant of the natural order Labiatæ, not uncommon in England, scarce in Scotland and Ireland, and widely diffused throughout Europe, N. America, etc. It grows erect to a height of 2 or 3 feet, has whorls of rose-tinged, whitish flowers, and stalked, downy, heart-shaped leaves. It has much the same fascination for cats as valerian root.

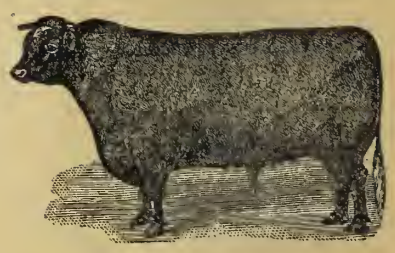
CATO, Marcus Porcius, the Censor, a celebrated Roman, born 234 B.C. at Tusculum. He served his first campaign, at the age of seventeen, under Fabius Maximus, was present at the siege of Capua in 214 B.C.; and five years after fought under the same commander at the siege of Tarentum. He rose rapidly, accompanied Scipio to Sicily as quæstor in B.C. 204, became an ædile in 199, and in 198 was chosen prætor, and appointed to the province of Sardinia. Three years later he gained the consulship, and in 194 for his brilliant campaign in Spain obtained the honor of a triumph. His election to the censorship in 184 set an official seal to his efforts, the unsparing severity of which has made his name proverbial. From that year until his death, in 149, he held no public office, though zealously continuing his unofficial labors for the state. His hostility to Carthage, the destruction of which he advocated in every speech made by him in the forum, was the most striking feature of his closing years. His incessant "Delenda est Carthago" (Carthage must be destroyed) did much to further the third Punic war.

CATO, Marcus Porcius (called Cato of Utica, the place of his death, to distinguish him from the Censor, his great-grandfather), a distinguished Roman, born 95 B.C. He formed an intimacy with the Stoic Antipater of Tyre, and ever remained true to the principles of the Stoic philosophy. He distinguished himself as a volunteer in the war against Spartacus, served as military tribune in Macedonia in B.C. 67, was made quæstor in B.C. 65. His rigorous reforms won him general respect, and in B.C. 63 he was chosen tribune of the people. On the breach between Pompey and Cæsar he threw in his lot with Pompey, and guarded the stores at Dyrrhachium, while Pompey pushed on to Pharsalia. After receiving news of Pompey's defeat he sailed to Cyrene and effected a junction with Metellus Scipio at Utica, in B.C. 47. He took command of that city, but its defense appearing hopeless after the defeat of Scipio at Thapsus, he determined on suicide, and after spending some time in the perusal of the Phædo of Plato, stabbed himself with his sword. His wounds were bound up by his attendants, but he tore off the bandages and died. B.C. 46.

CAT'S-EYE, a mineral, a variety of quartz, very hard and semi-transparent, and from certain points exhibiting a yellow opalescent radiation or chatoyant appearance, somewhat resembling a cat's eye.

CATSKILL MOUNTAINS, a fine range of mountains in New York state. They lie on the w. side of and nearly parallel to the Hudson, from which their base is, at the nearest point, 8 miles distant. The two most elevated peaks are Round Top and High Peak; the former 3804 feet, the latter 3718 feet high.

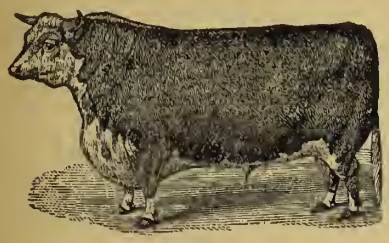
CATTLE, a term applied in the U. States to horned animals, horses, and sheep, and to almost all domestic mammals. Specifically, however, the



Shorthorn.

term applies to bovine animals used for purposes of food. The principal breeds of beef cattle in Great Britain and the U. States are the Shorthorn, Hereford, Galloway, Devon, and Aberdeen-Angus. These breeds all originated in Great Britain, and for the most part took their names from the county or district whence the came. Alvord says: "The cattle which have been most famous as a breed in England and America, which have received the longest and closest

attention of breeders and improvers, which have commanded prices, singly and in herds, far above all others, and which have made the greatest impression upon the live stock of both countries during the 19th century, are the Shorthorns or Durhams." The name



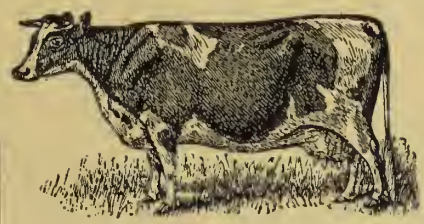
Hereford.

Shorthorns was probably given to distinguish them from the rival race of Blackwell's Longhorns, which they soon surpassed. They are red and white cattle, the colors being variously blended and often roan, rectangular in outline and having horns of moderate length. They are notable for early maturity, beauty of form, quick fattening qualities and minimum amount of waste in slaughtering. Although unsurpassed as beef cattle, many of the cows are good milkers, the best of any of the strictly beef breeds. The Herefords, originated in the county of Hereford, may be described as red with white on face, chest, belly, feet, and over the tops of the shoulders. They are close rivals or the equals of Shorthorns as beef cattle. The breeds of dairy cattle most common in the U. States and England at the present time are Ayrshire, Holstein, Guernsey, Jersey, Red Poll, and Shorthorns. The Jersey and Guernsey breeds were both originated in the Channel Islands.

Guernseys are rather larger than the Jerseys, stronger boned, and are claimed to be hardier. They are light in color, with darker shades approaching brown,

Jersey.

and have a yellow skin. The milk of both breeds is unusually rich in fat, the fat-globules being large and separating readily in creaming. The Guernseys are liberal milkers. The average cow is expected to produce 5000 pounds of milk and 300 pounds of butter a year without high feeding. There are records of several herds which have averaged over 6000 pounds of milk and 350 pounds of butter a year. Individual cows have produced 10,000, and nearly 13,000 pounds, of milk, and 500 to 700 pounds of butter a year. The Jerseys are the smallest of the better dairy breeds, though in the U. States they have been considerably increased in size. Good herds produce from 3500 to 4500 pounds of milk a year, and several herd records show averages of 6000 and 7000 pounds per cow. Single cows produce 1000, 1200 pounds of butter, and even more. There are numerous records of 25 to 30 pounds of butter a week, and individual records run all the way from 600 to 800, and even 1000 pounds of butter in a year. The Holsteins, or Holstein-Friesians, of north Holland and Friesland, are black and white, irregularly marked, but not mixed, large in frame, strong, and usually in good flesh. It is not unusual for a cow to give more than her own weight in milk every month for ten or twelve



Holstein.

consecutive months, and there are numerous instances of yields of 100 pounds or more a day, and 20,000 to 30,000 pounds a year, although 40 to 60 pounds a day, or 7500 to 8000 pounds a year, is considered an average.

CATTLE PLAGUE, or **MURRAIN,** a fever which attacks cattle and sheep and which is almost always fatal. It does not occur in the U. States, Texas fever, with which it is sometimes confused, being a totally different disease. The disease lasts from 5 to 7 days. Murrain is very ancient and has been described by Roman writers.

CATUL'LUS, Caius (or Quintus) Valerius, a famous Roman lyric poet, born probably B.C. 94, at Verona, died probably about B.C. 54. Almost all the known details of his life are derived by inference from his works, and relate to such matters as his passion for Lesbia, his journey to Bithynia, and voyage home in his yacht, his pleasant villa on Lake Benacus, etc. He was the first of the Romans who successfully caught the Greek lyric spirit, and gave to the Roman literature its most genuine songs.

CAUCA (kou'kȧ), a S. American river in Colombia, an important tributary of the Magdalena; length 600–700 miles. It gives its name to a department or state of Colombia; area, 52,000 sq. miles; pop. 450,000.

CAUCASIAN RACE, a term introduced into ethnology by Blumenbach, in whose classification of mankind it was applied to one of the five great races into which all the different nations of the world were divided. Blumenbach believed this to be the original race from which the others were derived, and he gave it the epithet of Caucasian because he believed that its most typical form—which was also that of man in his highest physical perfection—was to be met with among the mountaineers of the Caucasus. In later classifications this "race" is usually divided into Aryan or Indo-European, and Semitic. Most of the tribes inhabiting the Caucasus belong to the Turanian class.

CAU'CASUS, a chain of mountains which gives name to a lieutenancy under Russian government lying to the southeast of Russia Proper, between the Black Sea and the Caspian. The total area of the lieutenancy (including the district of Armenia, acquired in 1878) is 179,527 sq. miles, and the pop. about 5,900,000. The Causasus chain of mountains traverses the lieutenancy from northwest to southeast through a length of 700 miles. It does not form a single chain, but is divided, at least for part of its length, into two, three, or even four chains, which sometimes run parallel to one another, and sometimes meet and form mountain ganglions. The heights of the chief summits are Elbruz, 18,572 feet; Koshtan-tau, 17,123; Dych-tau, 16,928; Kasbek, 16,546.

CAU'CUS, a term, for a private meeting of citizens to agree upon candidates to be proposed for election to offices or to concert measures for supporting a party.

CAUL, a popular name for a membrane investing the viscera, such as the peritoneum or part of it, or the pericardium; also a portion of the amnion or membrane enveloping the fetus, sometimes encompassing the head of a child when born. This caul was supposed to predict great prosperity to the person born with it, and to be an infallible preservative against drowning, as well as to convey the gift of eloquence.

CAU'LIFLOWER, a garden variety of cabbage, in which cultivation has caused the inflorescence to assume when young the form of a compact fleshy head, which is highly esteemed as a table vegetable.

CAULKING (kąk'ing), of a ship, driving a quantity of oakum into the seams of the planks in the ship's decks or sides in order to prevent the entrance of water. After the oakum is driven very hard into these seams it is covered with hot melted pitch to keep the water from rotting it.

CAUSALITY, a term of metaphysics which designates in general the idea of cause. See Cause.

CAUSE, that which produces an effect; that from which anything proceeds and without which it would not exist. In the system of Aristotle the word rendered by cause and its equivalents in modern language has a more extensive signification. He divides causes into four kinds: efficient, formal, material, and final. The efficient or first cause is the force or agency by which a result is produced; the formal, the means or instrument by which it is produced; the material, the substance from which it is produced; the final, the purpose or end for which it is produced. In a general sense the term is used for the reason or motive that urges, moves, or impels the mind to act or decide.

CAUSTIC, a name given to substances which have the property of burning, corroding, or disintegrating animal matter; or of combining with the principles of organized substances and

destroying their texture.—Lunar Caustic, a name given to nitrate of silver when cast into sticks for the use of surgeons, etc.—Caustic potash, the hydrate of potassium.—Caustic soda, protoxide of sodium.

CAUSTIC, in optics, the name given to the curve to which the rays of light, reflected or refracted by another curve, are tangents.

CAU'TERY, in surgery, the searing or burning of living flesh by a hot iron (actual cautery) or a caustic substance (potential cautery).

CAUTION, a legal term signifying much the same as guarantee or security, now mostly used in Scots law.

CAVAIGNAC (ká-van-yák), Louis Eugène, French general, born 1802, died 1857. Cavaignac in 1824 joined the 2d Regiment of Engineers, and being at Arras on the outbreak of the revolution of 1830 he was the first officer in his regiment to declare for the new order of things. In 1832 he was sent to Africa, where he remained for several years, and greatly distinguished himself. When the revolution of 1848 broke out Cavaignac was appointed governor-general of Algeria; but on being elected a member of the Constituent Assembly he returned to Paris and was appointed minister of war. At the outbreak of the June insurrection Cavaignac was appointed dictator with unlimited powers. For three days Paris presented a dreadful scene of tumult and bloodshed. About 15,000 persons perished, and property was destroyed to the value of upward of $1,000,000. By the energy of Cavaignac, aided by the loyalty of the army and the National Guard, the insurrection was suppressed, and France saved from a threatened dissolution of all the bonds of society. Toward the close of the year he became a candidate for the presidency of the republic, but was defeated, and Louis Napoleon was preferred to the office. On 20th December he resigned his dictatorship. After the coup d'etat of 2d December, 1851, he was arrested and conveyed to the fortress of Ham, but was liberated after about a month's detention. In 1852 and in 1857 he was elected member for Paris of the legislative body, but on both occasions was incapacitated from taking his seat by refusing to take the oath of allegiance to the emperor.

CAVALIER (ka-va-lēr'), a horseman, especially an armed horseman; applied in history to the partisans of Charles I., as opposed to Roundheads, the adherents to the parliament.

CAV'ALRY, a body of troops which serve on horseback, one of the three great classes of troops, and a formidable power in the hands of a leader who knows how to employ it with effect. Its adaptation to speedy movements is a great advantage, which enables a commander to avail himself immediately of a decisive moment, when the enemy exposes a weak point, or when disorder appears in his ranks. It is a very important instrument in completing the defeat of an enemy, in disconcerting him by a sudden attack, or overthrowing him by a powerful shock. It is very serviceable in protecting the wings and center of an army, for escorts, for blockading, for intercepting the supplies, of the enemy, for procuring intelligence, for covering a retreat, for foraging, etc.

CAVALRY AND LIGHT ARTILLERY SCHOOL, a school for officers of the cavalry and light artillery arms of the United States Army. The curriculum of the school includes all that pertains to the art and science of war, so far as regards the cavalry and artillery. Improvements in equipment and tactics, or the application of new principles affecting either branch of the service, are here tested, reported upon, and formulated to the army at large. The school is located at Fort Riley, Kan., and is governed by special regulations of the War Department.

CAV'AN, an inland Irish county in Ulster; area, 477,399 acres, of which three-fourths are arable. Pop. 97,368.

CAVE, or **CAVERN,** an opening of some size in the solid crust of the earth beneath the surface. Caves are principally met with in limestone rocks, sometimes in sandstone and in volcanic rocks. Some of them have a very grand or picturesque appearance, such as Fingal's Cave in Staffa; others, such as the Mammoth Cave of Kentucky, which incloses an extent of about 40 miles of subterranean windings, are celebrated for their great size and subterranean waters. Caves in which the bones of extinct animals are found owe their origin, for the most part, to the action of rain-water on limestone rocks. The deposit contained in them usually consists of clay, sand, and gravel combined. In this are embedded the animal remains, and stones either angular or rounded. Some of the remains found in European caverns belong to animals now found only in the tropical or subtropical regions, and others are the remains of animals now living in more northerly areas; others, again, are the relics of extinct animals. Among the latter class of animals are the cave bear and lion, the mammoth and mastodon, species of rhinoceros, etc. Of others that have only migrated may be mentioned the reindeer, which is no longer found in Southern Europe; and the hyena, found in the Gibraltar caves, which now lives in south Africa. The ibex, the chamois, and a species of ground squirrel, are shown to have once lived in the Dordogne, but are now found only on the heights of the Alps and Pyrenees. Thus it is evident that the geographical conditions of the country must have been very different from what they are now. Man's relation to these extinct animals, and his existence at the time these changes took place, are demonstrated by such discoveries as those of human bones and worked flints beneath layers of hyena droppings.

CA'VEAT, in law, a process in a court to stop proceedings, as to prevent the enrolment of a decree in chancery in order to gain time to present a petition of appeal to the lord-chancellor. In the U. States this name is given to a notice lodged in the patent-office by a person who wishes to patent an invention, but desires to be protected till he has perfected it. It stands good for a year.

CAVE-MEN, prehistoric races who lived in caves. That they were at a low state of civilization, though possessed of some artistic faculty, is evidenced by the fact that they were ignorant of the metals, of pottery, and of agriculture, and had no domestic animals. Their chief food seems to have been the reindeer, and their manner of life was probably somewhat similar to that of the Eskimos.

CAVENDISH, or **CANDISH,** Thomas, an English circumnavigator in the reign of Elizabeth; born about 1555, died 1592. Having collected three small vessels for the purpose of making a pred-

Thomas Cavendish.

atory voyage to the Spanish colonies, he sailed from Plymouth in 1586, took and destroyed many vessels, ravaged the coasts of Chili, Peru, and New Spain, and returned by the Cape of Good Hope, having circumnavigated the globe in two years and forty-nine days, the shortest period in which it had then been effected. In 1591 he set sail on a similar expedition, during which he died.

CAVIARE (kav'i-ār), the roes of certain large fish prepared and salted. The best is made from the roes of the sterlet and sturgeon, caught in the lakes or rivers of Russia.

CAV'IDÆ, the guinea-pig tribe. See Cavy.

CAVITE (ká-vē'tá), a town in the island of Luzon, one of the Philippines; situated on the Bay of Manilla, about 11 miles s. w. of Manilla. It gives name to a province with a pop. of 57,000. Pop. of town about 7000.

CAVOUR (ká-vör'), Count Camillo Benso di, a distinguished Italian statesman, was born at Turin in 1809 or 1810, died 1861. He became a member of the Sardinian Chamber of Deputies in 1849, and the following year minister of commerce and agricullture. In 1852 he became premier, and not long afterward took an active part in cementing an alliance with Great Britain and France, and making common cause with these powers against Russia, during the Crimean War. The attitude, however, thus taken by Sardinia could not fail to prove offensive to Austria. A collision, therefore, was inevitable, resulting in the campaign of 1859. The intimate connection formed at that time with France, who lent her powerful assistance in the prosecution of the war, was

mainly due to the agency of Cavour, who was accused by some on this occasion of having purchased the assistance of Napoleon III. by unduly countenancing his ambitious projects. In 1860 Garibaldi's expedition to Sicily

Count Cavour.

took place; but toward this and the subsequent movements of the Italian liberator Count Cavour was forced to maintain an apparent coldness. He lived to see the meeting of the first Italian parliament, which decreed Victor Emmanuel king of Italy.

CA'VY, the popular name for a genus of rodent animals, family Cavidæ, characterized by molars without roots, fore-feet with five toes, hinder with three, and the absence of a tail and clavicles. They are natives of tropical America, the most familiar example of this genus being the guinea-pig.

CAWNPORE', a town, India, United Provinces, on the right bank of the Ganges, which is here about a mile wide, 130 miles n.w. from Allahabad, 628 miles n.w. of Calcutta, and 266 miles s.e. of Delhi. Pop. 197,170.

In 1857 the native regiments stationed here mutinied and marched off, placing

Cawnpore.

themselves under the command of the Rajah of Bithoor, the notorious Nana Sahib. General Wheeler, the commander of the European forces, defended his position for some days, was at length induced to surrender to the rebels on condition of his party being allowed to quit the place uninjured. This was agreed to; but after the European troops had embarked in boats on the Ganges, they were treacherously fired on by the rebels; many were killed, and the remainder conveyed back to the city, where the men were massacred and the women and children placed in confinement. The approach of General Havelock to Cawnpore roused the brutal instincts of the Nana, and he ordered his hapless prisoners to be slaughtered, and their bodies to be thrown into a well. The following day he was obliged, by the victorious progress of Havelock, to retreat to Bithoor.

CAXAMARCA, or **CAJAMARCA** (kä-*hä*-mär'kä), a department and town, Peru; area of the department about 14,200 sq. miles; pop. 442,412. The town is situated about 70 miles from the Pacific Ocean, 280 n. Lima. Pop. 18,400.

CAXTON, William, the introducer of the art of printing into Britain, was born in the Weald of Kent about 1422, died at Westminster 1491. He had translated the popular mediæval romance Le Recueil des Histoires de Troye (Collection of the Histories of Troy), and in order to multiply copies he learned the newly-discovered art of printing. It was printed either at Cologne or Bruges about 1474, and is the earliest specimen of typography in the English language. The Game and Playe of the Chesse, Bruges, 1475, is the second English book printed. In 1476 he returned to England, and in 1477 printed at Westminster The Dictes and Sayings of the Philosophers, the first book printed in England. In fourteen years he printed nearly 80 separate books, nearly all of folio size, some of which passed through two editions, and a few through three. He was buried in the church of St. Margaret's, Westminster.

CAYENNE PEPPER, or **CAPSICUM,** the name given to the powder formed of the dried and ground fruits, and more especially the seeds, of various species of Capsicum. It is used as a condiment to improve the flavor of food, aid digestion, and prevent flatulence. In medicine it is used as a stimulent, and is a valuable gargle for a relaxed throat. See Capsicum.

CAYMAN. See Caiman.

CAYVAN, Georgia, an American actress born at Bath, Me., in 1858. She made her debut as Hebe in Pinafore at Boston in 1879. In 1880 her first success as an actress was made in Hazel Kirke, and until her retirement in 1897 she played in various society plays and melodramas.

CEARA (sä-ä-rä'), a state on the northern coast of Brazil; area, 50,247 sq. miles. Pop. of state, 805,687; of town Ceara, 40,902.

CEBU (thä-bö'), one of the Philippine Islands, lying between Luzon and Mindanao, 135 miles long, with an extreme width of 30 miles. Sugar cultivation and the manufacture of abaca are the chief industries. Pop. 320,000. The town of Cebu, on the eastern coast of the island, the oldest Spanish settlement on the Philippines, is a place of considerable trade, and has a cathedral and several churches.

CECIL (ses'il), Robert, Earl of Salisbury, English statesman, second son of William Cecil, Lord Burleigh, born

William Cecil, Lord Burleigh.

about 1563. On the death of Sir Francis Walsingham he succeeded him as principal secretary, and continued to be a confidential minister of Queen Elizabeth to the end of her reign. In 1608 Lord Salisbury was made lord high-treasurer, an office which he held till his death in 1612.—William, Lord Burleigh, eminent English statesman, was the son of Richard Cecil, master of the robes to Henry VIII., and was born at Bourne, in Lincolnshire, in 1520, died 1598. He held no public office during the reign of Mary, and by extraordinary caution managed to escape persecution. On the accession of Elizabeth he was appointed privy-councillor and secretary of state, and during all the rest of his life he was at the helm of affairs. On the suppression of the northern rebellion in 1571 Elizabeth raised him to the peerage by the title of Baron Burleigh. Much of the glory of the reign of Elizabeth is due to the counsels and measures of Cecil. His character in private life was very attractive.

CECIL'IA, Saint, the patron saint of music, who has been falsely regarded as the inventress of the organ, and who is said to have suffered martyrdom A.D. 230, although other dates are given. In the Roman Catholic Church her festival (Nov. 22) is made the occasion of splendid music. Her story forms one of Chaucer's Canterbury Tales, and

Dryden in his Alexander's Feast, and Pope in his Ode on St. Cecilia's Day, have sung her praises. Raphael, Domenichino, Dolce, and Mignard, have represented her in celebrated paintings.

CE'DAR, a tree which forms fine woods on the mountains of Syria and Asia Minor. It is an evergreen, grows to a great size, and is remarkable for its durability. Of the famous cedars of

Cedar of Lebanon.

Lebanon comparatively few now remain, and the tree does not grow in any other part of Palestine. The most celebrated group is situated not far from the village of Tripoli, at an elevation of about 6000 feet above the sea. The circumference of the twelve largest trees here varies from about 18 to 47 feet. Cedar timber was formerly much prized, but in modern times is not regarded as of much value, perhaps from the trees not being of sufficient age. The name is given also to the deodar which is indeed regarded by many botanists as a mere variety of the cedar of Lebanon, and which produces excellent timber. It is a native of India, and is a large and handsome tree, growing in the Himalayas to the height of 150 feet, with a circumference of 30. It has wide-spreading branches, which droop a little at the extremities. The leaves are tufted or solitary, larger than those of the cedar of Lebanon and very numerous, of a dark-bluish green, and covered with a glaucous bloom. The cones are rather larger than those of the Lebanon cedar, and very resinous. The wood is well adapted for building purposes, being compact and very enduring.

CEDAR RAPIDS, a flourishing town in Iowa, on Red Cedar River, with large railway machine-shops and numerous industrial establishments. Pop. 30,000.

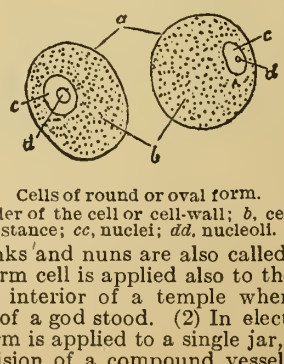
CEILING, the inner covering of a room, apartment, hall, or other enclosure. Ceilings may be decorated in various ways, by paintings, sculpture in bas relief, stucco, or by those curved lines called in the Pompeiian style. Ceilings, especially of domes, or dome-like structures may be made in glass. Famous ceilings are those of numerous churches in Europe, as St. Mark's in Venice, and the Byzantine churches of Constantinople.

CELEBES (sel'e-bēz), one of the larger islands of the Indian Archipelago, between Borneo on the w. and the Moluccas on the e. Gold is found in all the valleys of the north peninsula, which abounds in sulphur. Copper occurs at various points, and in Macassar tin also. Diamonds and other precious stones are found. The maritime districts are inhabited by Malays; the Peninsula of Macassar is occupied by Bugis and Macassars. Mandhars dwell in the w. of the island, and the mountainous regions in the interior, especially in the n., are inhabited by Alfoories. The inhabitants may be classed into two groups: the Mohammedan semi-civilized tribes, and the pagans, who are more or less savages. The capital is Macassar, in the s.w. of the island. Pop. estimated at 1,000,000.

CEL'ERY, an umbelliferous plant. There are two varieties in cultivation, viz. red and white stalked, and of these many sub-varieties. Celery is commonly blanched by heaping up the soil about the plants.

CEL'IBACY, the state of being celibate or unmarried; specially applied to the voluntary life of abstinence from marriage followed by many religious devotees and by some orders of clergy, as those of the Roman Catholic Church. The ancient Egyptian priests preserved a rigid chastity; the priestesses of ancient Greece and Rome were pledged to perpetual virginity; and celibacy is the rule with the Buddhist priests of the East. Among Christians the earliest aspirants to the spiritual perfection supposed to be attainable through celibacy were not ecclesiastics as such, but hermits and anchorites who aimed at superior sanctity. During the first three centuries the marriage of the clergy was freely permitted, but by the Council of Elvira (305) continence was enjoined on all who served at the altar. For centuries this subject led to many struggles in the church, but was finally settled by Gregory VII. positively forbidding the marriage of the clergy. The Council of Trent (1593) confirmed this rule. In the Greek Church celibacy is not compulsory on the ordinary clergy. Protestants hold that there is no moral superiority in celibacy over marriage, and that the church has no right to impose such an obligation on any class of her ministers.

CELL, a term of various applications. (1) Ecclesiastically it was sometimes applied to a lesser or subordinate religious house, dependent upon a greater. The apartments or private dormitories



Cells of round or oval form.
a, Border of the cell or cell-wall; *b*, cell substance; *cc*, nuclei; *dd*, nucleoli.

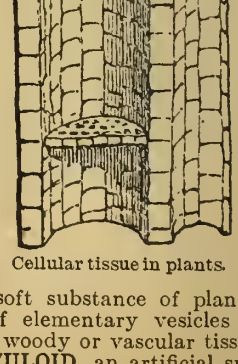
of monks and nuns are also called cells. The term cell is applied also to the part of the interior of a temple where the image of a god stood. (2) In electricity the term is applied to a single jar, bath, or division of a compound vessel, containing a couple of plates, generally copper and zinc, united to their opposites or to each other, usually by a wire. (3) In biol. a cell is a microscopically small semi-fluid portion of matter, consisting of a soft mass of living, contractile, jelly-like matter, and a central structure, consisting of a small, roundish body, called the nucleus, generally more solid than the rest of the cell, and which may have within it a still more minute body, the nucleolus. The cell substance or protoplasm (see Protoplasm) which surrounds the nucleus is an albuminous substance possessing fundamental vital properties, and believed to be the starting point of all animal and vegetable organisms. The cell-wall when present consists of an alteration of the external portion of the cell body, and is not a separate structure. All cells have but a very limited duration, so the tissues are being constantly renewed.

CELLA, part of a temple. See Cell.

CELLINI (chel-lē'nē), Benvenu'to, a sculptor, engraver, and goldsmith, was born at Florence in 1500, and died there in 1571 or 1572. Of a bold, honest, and open character, but vain and quarrelsome, he was often entangled in disputes which frequently cost his antagonists their lives. At the siege of Rome (if we believe his own account, given in his autobiography) he killed the Constable of Bourbon and the Prince of Orange. He was afterward imprisoned on the charge (probably false) of having stolen the jewels of the Papal crown, and with difficulty escaped execution. He then visited the court of Francis I. of France. He afterward returned to Florence, and under the patronage of Cosmo de' Medici made a Perseus with the head of Medusa in bronze, which is still an ornament of one of the public squares; also a statue of Christ, in the chapel of the Pitti Palace, besides many excellent dies for coins and medals.

CELLULAR THEORY, in physiology, that theory which derives all vegetable and animal tissues from the union and metamorphosis of primitive cells.

CELLULAR TISSUE, in physiology, a name for what is also called the areolar tissue. In botany, the term is applied



Cellular tissue in plants.

to the soft substance of plants, composed of elementary vesicles or cells without woody or vascular tissues.

CELL'ULOID, an artificial substance extensively used as a substitute for

ivory, bone, hard rubber, coral, etc., having a close resemblance to these substances in hardness, elasticity, and texture. It is composed of cellulose or vegetable fibrine reduced by acids to pyroxyline (or gun-cotton), camphor is then added, and the compound moulded by heat and pressure to the desired shape. It is used chiefly for such articles as buttons, handles for knives, forks, and umbrellas, billiard-balls, backs to brushes, piano keys, napkin-rings, opera-glass frames, etc. It can be variously colored.

CELL'ULOSE, the substance of which the permanent cell-membranes of plants are always composed. It is closely allied to sugar, dextrin, or gum and starch, and is changed into the latter by heat, sulphuric acid, or caustic potash.

CELTS, the earliest Aryan settlers in Europe according to the common theory. They appear to have been driven westward by succeeding waves of Teutons, Slavonians, and others, but there are no means of fixing the periods at which any of these movements took place. Herodotus mentions them as mixing with the Iberians who dwelt round the river Ebro in Spain. At the beginning of the historic period they were the predominant race in Britain, Ireland, France, Belgium, Switzerland, N. Italy, Spain, and elsewhere. The Romans called them generally Galli, that is Gauls or Gael. They appear to have reached the zenith of their power in the 2d and 3d centuries B.C. Some tribes of them overrunning Greece, settled in a part of Asia Minor, to which the name of Galatia was given. They finally went down before the resistless power of Rome, and either became absorbed with the conquering races or were cooped up in the extreme n.w. of Europe. At at early date the Celts divided into two great branches, speaking dialects widely differing from each other, but doubtless belonging to the same stock. One of these branches is the Gadhelic or Gaelic, represented by the Highlanders of Scotland, the Celtic Irish, and the Manx; the other is the Cymric, represented by the Welsh, the inhabitants of Cornwall, and those of Brittany. The Cornish dialect is now extinct. The sun seems to have been the principal object of worship among the Celts, and groves of oak and the remarkable circles of stone commonly called "Druidical Circles," their temples of worship. All the old Celts seem to have possessed a kind of literary order called Bards. The ancient Irish wrote in a rude alphabet called the Ogham, later they employed the Roman alphabet, or the Anglo-Saxon form of it. The chief literature existing consists of the hymns, martyrologies, annals, and laws of Ireland, written from the 9th to the 16th centuries. The Scottish Gaelic literature extant includes a collection of MSS. in the Advocates' Library, Edinburgh, some of which date from the 12th century; the Book of the Dean of Lismore, 16th century; a number of songs from the 17th century to the present day; and the co-called poems of Ossian. The Welsh literary remains date from the 9th century, and consist of glossaries, grammars, annals, genealogies, histories, poems, prose tales, etc.

CEMENTS', the general name for glutinous or other substances capable of uniting bodies in close cohesion. In building the name is given to a stronger kind of mortar than that which is ordinarily used, consisting of those hydraulic limes which contain silica and therefore set quickly. Cements are variously composed, according to the nature of the surfaces to which they are applied and their exposure to heat or moisture. Hydraulic or water cements harden under water and consolidate almost immediately on being mixed. Of this kind are the Roman and Portland cements.

CEM'ETERY. See Burying-places.

CENCI (chen'chē), Beatrice, called the beautiful parricide, the daughter of Francesco Cenci, a noble and wealthy Roman (1527–98), who, according to the common story, after his second marriage, behaved toward the children of his first marriage in the most shocking manner, procured the assassination of two of his sons, on their return from Spain, and debauched his youngest daughter Beatrice. She failed in an appeal for protection to the pope, and planned and executed the murder of her father. She was beheaded 1599 and the Cenci estates confiscated.

CENIS (sė-nē'), Mount, a mountain belonging to the Graian Alps, between Savoy and Piedmont, 11,755 feet high. It is famous for the winding road constructed by Napoleon I. which leads over it from France to Italy, and for an immense railway tunnel, which, after nearly fourteen years' labor, was finished in 1871. The tunnel does not actually pass through the mountain, but through the Col de Fréjus, about 15 miles to the s.w., where it was found possible to construct it at a lower level. The Mount Cenis Pass is 6765 feet above the level of the sea, whereas the elevation of the entrance to the tunnel on the side of Savoy is only 3801 feet, and that on the side of Piedmont 4246 feet. The total length of the tunnel is 12,849 meters (42,145 feet, or nearly 8 miles). The total cost amounted to $13,000,000, which was borne partly by the French and Italian governments and partly by the Northern Railway Company of Italy. The tunnel superseded a grip railway which was constructed over the mountain by Mr. Fell, an English engineer, 1864–68.

CEN'SER, a vase or pan in which incense is burned; a vessel for burning and wafting incense. Among the ancient Jews the censer was used to offer perfumes in sacrifices. Censers, called also thuribles, are still used in the Roman Catholic Church at mass, vespers, and other offices, as well as in some Anglican and other churches. They are of various forms. In Shakespeare's time the term was applied to a bottle perforated and ornamented at the top, used for sprinkling perfume, or to a pan for burning any odoriferous substance.

CENSUS, an enumeration of the people of a country, together with an ascertainment of all the various social and industrial facts concerning them. The first census of the United States was taken in 1790 for the purpose of apportioning representatives. Each succeeding decade a new census is taken and the facts thus gathered are carefully correlated and published by the government. The director of the census is appointed by the president. Census taking originated with King Servius of Rome in 577 B.C.

CENT, Centime (sän-tēm), etc., the name of a small coin in various countries, so-called as being equal to a hundredth part of some other coin. In the U. States and in Canada the cent is the hundredth part of a dollar. In France the centime is the hundredth part of a franc. Similar coins are the centavo of Chili; and the centesimo of Italy, Peru, etc. Cents or centimes, and their equivalents, are written simply as decimals of the unit of value.

CEN'TAURS, in Greek myth. fabulous beings represented as half man, half horse.

Centaur.

CEN'TENARY, the commemoration of any event, as the birth of a great man, which occurred 100 years before.

CENTENNIAL EXHIBITION, an international exposition held at Philadelphia in 1876 to commemorate the Declaration of Independence. There were upward of 50,000 exhibits from all parts of the world, 13,104 exhibitors, and a total of 9,910,966 admissions. The largest number of persons attending in any one day was 274,919 on Pennsylvania Day (Sept. 28). It was the first of the great international expositions held in the U. States and marked a new era in the industrial development of the nation.

CENTER-BOARD, a sort of movable keel used especially in American yachts, and capable of being raised and lowered in a well extending longitudinally amidships. It tends to prevent leeway and gives the vessel greater stability when under a press of canvas.

CENTER OF GRAVITY, that point of a body through which the line of the resultant of the weights of all the particles composing the body always passes, whatever be the position of the body.

CENTER OF GYRATION, the point at which, if the whole mass of a revolving body were collected, the rotatory effect would remain unaltered.

CENTER OF OSCILLATION, that point of a body suspended by an axis, at which, if all the matter were concen-

trated, the oscillations would be performed in the same time.

CENTER OF PRESSURE, that point of a body at which the whole amount of pressure may be applied with the same effect as it would produce if distributed; specifically, in hydro-statics, that point in the side of a vessel containing a liquid, to which, if a force were applied equal to the total pressure and in the opposite direction, it would exactly balance the effort of the total pressure.

CENTIGRADE. See Thermometer.

CENTIME. See Cent.

CEN'TIPEDE, a term applied to various insect-like creatures having many feet, and a body consisting of numerous similar rings or segments. Those of tropical countries inflict severe and often dangerous bites. They sometimes grow to a foot in length.

CENTRAL AMERICA, a geographical division, including the stretch of territory from the Isthmus of Panama to the Isthmus of Tehuantepec, but by political arrangements the limits most generally assigned to it include the five republican states of Guatemala, Honduras, San Salvador, Nicaragua, and Costa Rica, with British Honduras, and the Mosquito Coast. It thus has Mexico on the n.w., Colombia on the s.e., and the Pacific Ocean and Caribbean Sea on either side. Its entire length may be about 800 miles, with a breadth varying from between 20 and 30 to 350 miles. It is generally mountainous, contains a number of active volcanoes, and on the whole is a rich and fertile, but almost totally undeveloped region. The area is about 181,500 sq. miles; the pop. 5,000,000.

CENTRAL FALLS, a city in Providence Co., R. I., 4 miles north of Providence on the Blackstone River, and on the New York, New Haven and Hartford Railroad. Pop. 21,717.

CENTRAL INDIA AGENCY, a collection of states in Hindustan, consisting of four divisions or agencies, viz.: Gwalior, Bundelkhand, Baghelkhand, and Nimar, and Malwa, under the ultimate charge of the governor-general's agent at Indore; chief states, Gwalior, Indore, Bhopal, and Rewah. These states cover an area of 78,772 sq. miles, and have a pop. of 8,628,781.

CENTRALIZATION, a term in a specific sense applied to a system of government where the tendency is to administer by the central government matters which had been previously, or might very well be, under the management of local authorities.

CENTRAL PROVINCES, an extensive British territory in India. They became a separate administration in 1861, and are under the authority of a chief commissioner. Their total area is 115,936 sq. miles, of which 86,501 sq. miles are British territory, and 29,435 the territory of native protected states, fifteen in number. In 1891 the population, including the native states, was 12,944,805 persons; in 1901 it was 11,873,029. For administrative purposes the province is divided into four commissionerships, Jabalpur, (Jubbulpore), Nagpur, Narbada (Nerbudda), and Chhattisgarh.

CENTRIF'UGAL and CENTRIP'ETAL, in bot., terms applied to two kinds of inflorescence, the former being that in which the terminal or central flower is the first to expand, as in a true cyme (examples, elder and valerian), the latter being that kind in which the lower or outer flower is the first to expand, as in spikes, racemes, umbels, and corymbs. The laburnum, hemlock, and daisy are examples.

CENTRIFUGAL AND CENTRIPETAL FORCE. See Central Forces.

CENTU'RION, in the ancient Roman army, the commander of a century, or body of 100 men, but afterward an indefinite number, the sixtieth part of a legion. The rank of a centurion corresponded pretty much to that of a captain in modern armies.

CENTURY-PLANT, a popular name of the American aloe.

CERAM', an island in the Moluccas, lying w. of New Guinea; area about 7000 sq. miles; pop. estimated at 200,000.

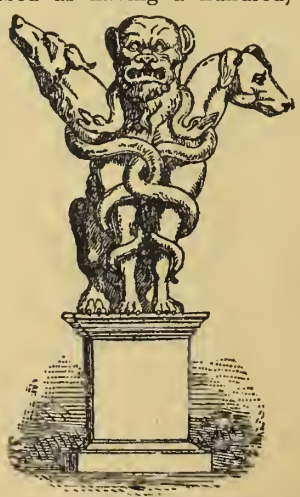
CERAM'IC ART, that department of plastic art which comprises all objects made of baked clay, as vases, cups, urns, bassi-rilievi, statuettes, etc., and including all the varieties of earthenware and porcelain which can be regarded as works of art.

CERAS'TES, a genus of African vipers, remarkable for their fatal venom, and for two little horns formed by the

Cerastes vulgaris.

scales above the eyes. Hence they have received the name of horned vipers. The tail is very distinct from the body.

CER'BERUS, in classical mythology, the dog-monster of Hades, variously described as having a hundred, fifty,



Cerberus—Antique bronze.

and three heads, with a serpent's tail, and a mane consisting of the heads of various snakes. He was subdued by Hercules.

CE'REALS, a term derived from Ceres, the goddess of corn, though sometimes extended to leguminous plants, as beans, lentils, etc., is more usually and properly confined to wheat, barley, rye, oats, and other grasses, cultivated for the sake of their seed as food.

CEREBRA'TION, exertion or action of the brain, conscious or unconscious.

CEREBRO-SPINAL, pertaining to the brain and spinal cord together, looked on as forming one nerve mass.

CEREBRUM and CEREBELLUM. See Brain.

CEREMONY, an act done with a certain amount of solemnity, whether of a joyous, sad, indifferent nature. Ceremonial institutions are traced back to remote antiquity and have an undoubted primitive origin. That origin is doubtless of a religious nature and all living ceremonies have some association, whether obvious or not, with ancient religious fear, veneration, or piety.

CERES (sē'rēz), a Roman goddess, corresponding to the Greek Dēmētēr; she was the daughter of Kronos and Rhea, and the mother of Proserpine and Bacchus. She was the goddess of the earth in its capacity of bringing forth fruits, especially watching over the growth of grain and other plants. The Romans celebrated in her honor the festival of the Cerealia. Ceres was always represented in full attire, her attributes being ears of corn and poppies, and her sacrifices consisted of pigs and cows.—Also a planet discovered by M. Piazzi at Palermo, in Sicily, in 1801. It was the first discovered of the asteroids. Its size is less than that of the moon.

CERTIFICATE, a written attestation of the truth of a fact. Certificates are used to attest graduation from high schools (diplomas), and the law often requires certificates for the practice of trade or professions. The United States army issues certificates of merit which entitle the holder to extra pay of $2 per month

CERTIORA'RI, in law, a writ issuing out of a superior court to call up the records of an inferior court or remove a cause there depending, that it may be tried in the superior court. This writ is obtained upon the complaint of a party that he has not received justice, or that he cannot have an impartial trial in the inferior court.

CERU'LEUM, a blue pigment, consisting of stannate of protoxide of cobalt mixed with stannic acid and sulphate of lime.

CERU'MINOUS GLANDS, the glands of the ear which secrete the cerumen or wax which lubricates the passage to the tympanum and prevents the entrance of foreign matter.

CERUSE (sē'rus), white-lead, carbonate of lead produced by exposing the metal in thin plates to the vapor of acetic acid or vinegar. It is much used in painting, and a cosmetic is made from it.

CE'RUSITE, a native carbonate of lead, next to galena the must abundant ore of lead. When heated it decrepitates and is converted into oxide of lead.

CERVANTES SAAVEDRA (ther-vän'-tes sä-ä-vä'*dhrä*), Miguel de, author of Don Quixote, born at Alcala de Henares in 1547, and removed thence to Madrid at the age of seven. He commenced writing verses at an early age, and his pastoral Filena attracted the notice of Cardinal Acquaviva, whom he accompanied to Italy as page. In 1570 he served under Colonna in the war against the Turks and African corsairs, and in the battle of Lepanto (1571) he lost the use of his left hand. After this he joined the troops at Naples, in the service of the Spanish king, winning the highest reputation as a soldier. In 1575, while returning to his country, he was taken by the corsair Arnaut Mami, and sold in Algiers as a slave—a condition in which he remained for seven years, displaying great fortitude. In 1580 his friends and relations at length ransomed him, and, rejoining his old regiment, he fought in the naval battle and subsequent storming of Terceira. In 1583, however, he retired from service and recommenced his literary work, publishing in 1584 his pastoral Galatea. In the same year he married, and lived for a long time by writing for the stage, to which he contributed between twenty and thirty plays, of which two only have survived. From 1588 to 1599 he lived retired at Seville, where he held a small office. He did not appear again as an author till 1605, when he produced the first part of Don Quixote, a work having, as its immediate aim, the satirical treatment of the novels of chivalry then popular, but embodying at the same time human types of cosmopolitan interest, and having a profounder bearing upon life than its express object covered. In 1613 his twelve Exemplary Novels (his best work after Don Quixote), in 1614 his Journey to Parnassus, and in 1615 eight new dramas, with intermezzos, were published. In 1614 an unknown writer published, under the name of Alonzo Fernandez de Avellaneda, a continuation of Don Quixote, full of abuse of Cervantes, who thereupon published the real continuation which was the last work of his issued during his lifetime. His novel Persiles and Sigismunda was published after his death, which took place at Madrid on the same day as that of Shakespeare, April 23, 1616.

CESTUS, a leathern thong or bandage, often covered with knots and loaded

Various forms of cestus.

with lead and iron, anciently worn by Roman pugilists to increase the force of the blow.

CETA'CEA, an order of marine animals, surpassing in size all others in existence. They are true mammals, since they suckle their young, have warm blood, and respire by means of lungs, for which purpose they come to the surface of the water to take in fresh supplies of air. The body is fish-like in form, but ends in a bilobate tail, which is placed horizontally, not, as in the fishes, vertically. The posterior limbs are wanting, and the anterior are converted into broad paddles or flippers, consisting of a continuous sheath of the thick integument, within which are present representatives of all the bones usually found in the fore-limb of mammals. The fish-like aspect is further increased by the presence of a dorsal fin, but this is a simple fold of integument, and does not contain bony spines. The right whale and its allies have no teeth in the adult state, their place being taken by the triangular plates of baleen or whalebone which are developed on transverse ridges of the palate, but the fœtal whales possess minute teeth, which are very soon lost. The nostrils open directly upward on the top of the head, and are closed by valvular folds of integument which are under the control of the animal. When it comes to the surface to breathe it expels the air violently (popularly known as "blowing" or "spouting"), and the vapor it contains becomes condensed into a cloud, which resembles a column of water and spray. The blood-vessels in these animals break up into extensive plexuses or net-works, in which a large amount of oxygenated blood is delayed, and they are thus enabled to remain a considerable time under water. Injury to these dilated vessels leads to profuse hemorrhage, and hence the whale is killed by the comparatively trifling wound of the harpoon. The Cetacea (which are grouped broadly as Mysticeti or toothless whales; and Odontoceti, Denticeti, or toothed whales) are commonly divided into five families: (1) whalebone whales, divided into two sections: smooth whales, with smooth skin and no dorsal fin, and furrowed whales, with furrowed skin and a dorsal fin; (2) sperm-whales or cachalots, the palates of which have no baleen-plates, and which are furnished with teeth, developed in the lower jaw only; (3) a family possessing teeth in both jaws, and including the dolphins, porpoises, and narwhal; (4) a family allied to the sperm-whales, but having only a pair or two pairs of teeth in the lower jaw, a pointed snout or beak, a single blow-hole, etc.; (5) an extinct family, distinguished from all the tooth-bearing whales by the possession of molar teeth implanted by two distinct fangs, etc. The last family is exclusively confined to the Eocene, Miocene, and Pliocene periods. The manatees and dugongs, have sometimes been classified among the Cetacea, but they must be regarded as forming a separate order.

CETEWAYO (kech-wā'ō), a Kaffir chief or king, son of Panda, king of the Zulus. A dispute regarding lands on the frontier was settled by arbitration in favor of the Zulus; but on the refusal of Cetewayo to comply with the conditions imposed war was declared against him by the British, and the king made prisoner soon after the battle of Ulundi (July, 1879). In 1882 he was conditionally restored to part of his dominions. In the following year he was driven from power by the chief Usibepu, and remained under the protection of the British until his death in 1884.

CETTE (set), a fortified seaport of France, dep. Hérault. After Marseilles, Cette is the principal trading port in the south of France, and it is much resorted to as a watering-place. Pop. 35,517.

CEVENNES (sė-venz'), a chain of mountains in the southeast of France, The length of the chain, exclusive of the Côte d'Or, is about 330 miles, the average height not more than 3000 feet. It is divided into two sections, the northern and southern Cevennes; the dividing point is Mount Lozère, in the department of the same name, 5582 feet high. The highest peak is Mezenc, 5753 feet. The Cevennes form the watershed between the Bay of Biscay and the Mediterranean, separating the basins of the Garonne and Loire from those of the Rhone and Saône. They are rich in minerals, containing mines of copper, iron, lead, and coal, and quarries of granite, porphyry, marble and plaster.

CEYLON (si-lon'), an island belonging to Great Britain in the Indian Ocean, 50 to 60 miles southeast of the southern extremity of Hindustan, from which it is separated by the Gulf of Manaar and Palk's Strait, and by a chain of sand-banks, called Adam's Bridge, impassable by any but very small vessels. Length, about 270 miles north to south; average breadth, 100 miles; area, 25,364 sq. miles. The north and northwest coasts are flat and monotonous, those on the south and east bold, rocky, and picturesque, with exuberant vegetation. The mountainous regions are confined to the center of the south and broader part of the island. Their average height is about 2000 feet, but several summits are upward of 7000 and one over 8000 feet high, the culminating point being Pidurutallagalla, 8296 feet. Adam's Peak, reaching 7420 feet, is the most remarkable from its conical form, the distance from which it is visible from the sea, and from the legend that thence Buddha ascended to heaven, leaving in evidence a gigantic footprint.

In respect of climate, where the jungle has been cleared away, and the land drained and cultivated, the country is perfectly healthy; but where low wooded tracts and flat marshy lands abound it is malarial and insalubrious The east part of the island being exposed to the northeast monsoon has a hot and dry climate; while the west division, being open to the southwest monsoon has a temperate and humid climate

In the luxuriance of its vegetable productions Ceylon rivals the islands of the Indian Archipelago, and in some respects bears a strong resemblance to them. Its most valuable products are tea, coffee, rice, cinnamon (which is found almost exclusively in the southwest), and the cocoa-nut palm Coffee used to be very extensively cultivated, but disease has within recent years reduced the produce to a fraction of its former amount, and tea cultivation ha taken its place, and is rapidly increasing The island abounds with timber o

various descriptions, including ebony, satin, rose, sapan, iron, jack, and other beautiful woods adapted for cabinet work. Attention has been directed latterly to the cultivation of cinchona, cacao, and silk. The chief mineral products are iron, plumbago or graphite, and a variety of gems, including sapphires, rubies, etc. The pearl-fisheries of Ceylon are famous.

The commerce of Ceylon is now important. The exports comprise tea, coffee, plumbago, areca-nuts, cocoa-nut oil fibre and kernals (copra), cinnamon, cinchona, cacao, etc. The principal articles of import are manufactured goods, iron and steel manufactures, machinery, dried fish, rice, wheat, sugar, tea, cowries, etc. Ceylon is one of the British crown colonies, the government being conducted by a governor and two councils, executive and legislative, of both of which the governor is president. The present population of Ceylon is composed of Singhalese or Cingalese, who are the Ceylonese proper, Tamils (from India), Moormen or Moors, Malays, Veddahs, a small proportion of Europeans and their descendants, and negroes. The Singhalese are in stature rather below the middle size; their limbs slender, but well shaped, eyes dark, finely-cut features, hair long, smooth, and black, turned up and fixed with a tortoise-shell comb on the top of the head; color varying from brown to black, or rather from the lightest to the darkest tints of bronze. The general population of the island was decreasing for several centuries. It is now, however, on the increase, and latterly this increase has been rapid. In 1901 the population was 3,576,990, of whom 9583 were Europeans, and 4913 Boer prisoners of war. The Singhalese numbered 2,334,817, the Tamils 952,237. The population in 1891 was 3,008,466.

Buddhism prevails in the interior, and generally among the Singhalese of the sea-coasts. The Singhalese have a colloquial language peculiar to themselves, but their classic and sacred writings are either in Pali or Sanskrit. The Hindu religion (Brahmanism) prevails among the Tamils or population of Indian extraction, which forms a large proportion of the inhabitants of the north and northeast districts. The Tamils speak their own Tamil tongue.

The Singahalese possess a native chronicle, the Mahawanso, which records history of the island from 543 B.C. onward, under a long series of kings reigning most frequently at the ancient capital Anuradhapura, the earliest of these being leader of an invading host from India. Buddhism was introduced 307 B.C. The island was not known to Europeans till the time of Alexander the Great, and their knowledge of it was long vague and meager. Little, however, was known in Europe regarding the island until 1505, when the Portuguese established a regular intercourse with it, and latterly made themselves masters of it. When they arrived the Malabars were in possession of the north, the Moors or Arabs held all the seaports, the rest was under petty kings and chiefs. The Portuguese, who were cruel and oppressive rulers, were subsequently expelled by the Dutch in 1658, after a twenty years' struggle. The Dutch in turn were driven from the island by the British in 1796, though a part of the island remained independent under native princes. The King of Kandy, nominally the sovereign of the island, was deposed in 1815 on account of his cruelties, and the island was then finally annexed by Britain, though a rebellion had to be put down in 1817. The principal towns are Colombo (the capital and chief port), Kandy, Galle, Jaffna, and Trincomalee.

CHAFF'INCH, a lively and handsome bird of the finch family. The male is 6 or 7 inches in length, and is very agreeably colored, having a chestnut back, reddish-pink breast and throat, and a yellowish-white bar on the wings. The food consists of seeds and of insects and their larvæ. The nest, which is generally placed in the fork of a tree, is an elegant structure usually covered with moss and lichens.

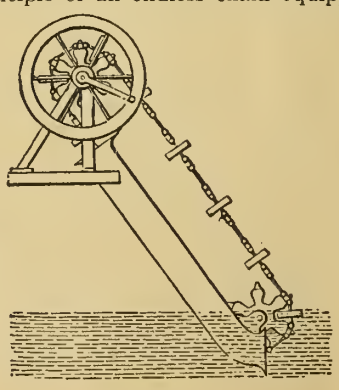
CHAFIN, Eugene Wilder, born at East Troy, Wis., Nov. 1, 1852; educated in public school; graduated from law department of University of Wisconsin, 1875; practiced law in Waukesha, Wis., 1876-1900; grand chief templar of Good Templars of Wisconsin and Illinois; Prohibition candidate for various offices; nominated for president of the United States by Prohibitionist national convention at Columbus, O., in 1908.

CHAILLE-LONG, Charles, an American traveler, born in Maryland in 1840. He served on the Union side during the civil war and in 1875 was chief of staff to Gordon in the latter's expedition up the Nile. Returning to America he studied international law, and in 1887 was made consul general in Korea. He has published several works on the Orient.

CHAIN, in surveying, is a measure consisting of 100 links, each 7·92 inches in length, and having a total length of 4 rods, or 66 feet. It is sometimes called Gunter's chain, from its inventor.

CHAIN-ARMOR, coats and other pieces of mail, formed of hammered iron links, constituting a flexible garment which fitted to the person.

CHAIN-PUMP, a pump consisting in principle of an endless chain equipped



Chain-pump.

with a number of valves or buckets moving round two wheels, one above and one below. The chain in its ascent passes through a tube closely fitting the valves or buckets, the water being discharged either from the top of the tube or from an orifice in it.

CHAINS, strong links or plates of iron, the lower ends of which are bolted to a ship's side, used to contain the blocks called dead-eyes, by which the shrouds of the masts are fastened.

CHAIN-SHOT, two cannon-balls connected by a chain, which, when discharged, revolve upon their shorter axis, and mow down masts, rigging, etc.

CHALCED'ONY (kal-sed'o-ni), a mineral, a variety of quartz, called also white agate, resembling milk diluted with water, semi-transparent or translucent, and more or less clouded with circles and spots. It is found usually in cavities of rocks uncrystallized, in veins, botryoidal masses, etc., and is used in jewelry. There are several varieties, such as the common chalcedony, chrysoprase, sard, and sardonyx.

CHALDÆA, in ancient geography, the southerly part of Babylonia, or in a wider sense corresponding to Babylonia itself. The name Chaldæans was especially applied latterly to a portion of the Babylonian Magi, who were devoted to the pursuit of astronomy and magical science. See Babylonia.

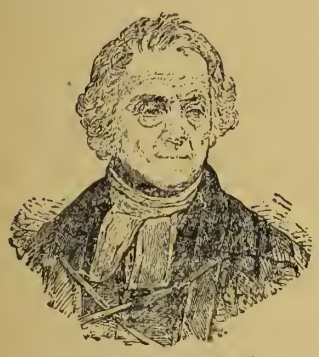
CHAL'ICE, a term generally applied to a communion cup for the wine in the Eucharist, often of artistic and highly ornamental character.

CHALK (chak), a well-known earthy limestone, of an opaque white color, soft and admitting no polish. It is an impure carbonate of lime, and is used as an absorbent and ant-acid, and for making marks for various purposes, as on the black-board in schools, and by artisans and others.—Black chalk is a soft variety of argillaceous slate. (See Black Chalk.)—Brown chalk, a familiar name for umber.—Red chalk, another name for ruddle.—French chalk, steatite or soap-stone, a soft magnesian mineral. Drawing chalks were originally restricted in colors to white, black, and red, but now chalks of every color are used, and are known by the name of crayons.—In geology chalk is the rock which forms the higher part of a series or group of strata, comprising rocks of different kinds, termed the cretaceous system.

CHAL'LENGE, to jurors, is an objection either to the whole panel or array, that is, the whole body of jurors returned, or to the polls, that is, to the jurors individually; and it is either peremptory, that is, without assigning any reason, or for cause assigned. See Jury.

CHALMERS, Thomas, D.D., an eminent Scottish divine, born in 1780, at Anstruther Easter, Fife. In 1803 he was presented to the parish of Kilmany, in Fife, where he made a high reputation as a preacher. In 1808 he published an Inquiry into the Extent and Stability of National Resources. In 1813 his article on Christianity appeared in the Edinburgh Encyclopædia, and shortly afterward his review of Cuvier's Theory of the Earth, in the Christian Instructor. His fame as a preacher had by this time extended itself throughout Scotland, and in 1815 he was inducted to the Tron

Church of Glasgow. His astronomical discourses delivered there in the following winter produced a sensation not only in the city but throughout the country. In 1832 he published his Political Economy, and shortly afterward his Bridgewater Treatise On the Adaptation of External Nature to the Moral and Intellectual Constitution of Man. During this period he was occupied with the subject of church



Thomas Chalmers, D.D.

extension on the voluntary principle, but it was in the great non-intrusion movement in the Scottish church that his name became most prominent. Throughout the whole contest to the Disruption in 1843, he acted as the leader of the party that then separated from the Establishment, and may be regarded as the founder of the Free Church of Scotland, of the first assembly of which he was moderator. His death took place suddenly, and apparently during sleep, in the night preceding May 31, 1847. He was a D.D. of Glasgow University and a D.C.L. of Oxford.

CHAMBER, a word used in many countries to designate a branch of government whose members assemble in a common apartment, as the chamber of deputies in France, or applied to bodies of various kinds meeting for various purposes. The imperial chamber (in German Reichskammergericht) of the old German Empire was a court established at Wetzlar, near the Rhine, by Maximilian I. in 1495, to adjust the disputes between the different independent members of the German Empire, and also such as arose between them and the emperor.—Chambers of commerce are associations of the mercantile men of towns for the purpose of protecting and furthering the interests of the commercial community.

CHAMBERLAIN, Joseph, English statesman, born in London in 1836, and educated at London University school. In 1876 he entered parliament as a representative of Birmingham, and at the general election of 1880 he was chosen for the same city along with Mr. Bright and Mr. Muntz. Under Mr. Gladstone's premiership he became president of the Board of Trade, and a cabinet-minister, and was able to pass the Bankruptcy Act now in force, though he failed with his merchant shipping bill. In the Gladstone government of 1886 he was president of the Local Government Board. As colonial secretary in the Unionist government in 1895–1903 he has been prominent in other affairs besides the Boer War of 1899–1902.

CHAMBER OF COMMERCE, an organization of traders or merchants for the purpose of facilitating transactions of business, making a central market, etc. The term has been superseded in many American cities by the term Board of Trade. Chambers of Commerce use their influence for legislation favorable to trade, collect and publish trade statistics, and take part in public enterprises for the commercial good of the community. The New York Chamber of Commerce was organized in 1768, and many Chambers of Commerce in Europe antedate it by many years.

CHAMBERS, Robert, historical and miscellaneous writer, the younger of two brothers originally composing the publishing firm of W. & R. Chambers, was born at Peebles in 1802. Besides editing or compiling many instructive works of a high class, including the Cyclopædia of English Literature; the Domestic Annals of Scotland; Ancient Sea-Margins; and the Book of Days. He also edited a valuable edition of Burns. He died at St. Andrews in 1871. His name was long associated with the authorship of the famous "Vestiges of Creation," and it was not known to be really his till years after his death.—William Chambers wrote Things as They Are in America, History of Peebles-shire; France, its History and Revolutions; Memoir of Robert Chambers, with Autobiographical Reminiscences, etc. He was twice lord-provost of Edinburgh. He died in 1883, just as a baronetcy was to be conferred on him.

CHAMBERS, Robert William, an American writer and artist, born in New York in 1865. He has pubished several volumes of fiction and exhibited in the Paris salon of 1889.

CHAMBERSBURG, a town in Pennsylvania, in a fertile and populous district. Pop. 10,000.

CHAMBERTIN (shän-ber-tan), a superior kind of red Burgundy wine, named after the place where it is produced.

CHAMBORD (shäṅ-bōr), Henri Charles Ferdinand Marie Dieudonné, Comte de, Duke of Bordeaux, the last representative of the elder branch of the French Bourbon dynasty, called by his partisans Henry V. of France. He was born in 1820, seven months after the assassination of his father, Prince Charles Ferdinand d'Artois, duke de Berry. Charles X., after the revolutionary outbreak of 1830, abdicated in his favor; but the young count was compelled to leave the country with the royal title unrecognized by the nation. In 1846 he married the Princess Maria-Theresa, eldest daughter of the Duke of Modena; and in 1851 inherited the domain of Frohsdorf, near Vienna, where for the most part he subsequently resided. He died in 1883, leaving no heir.

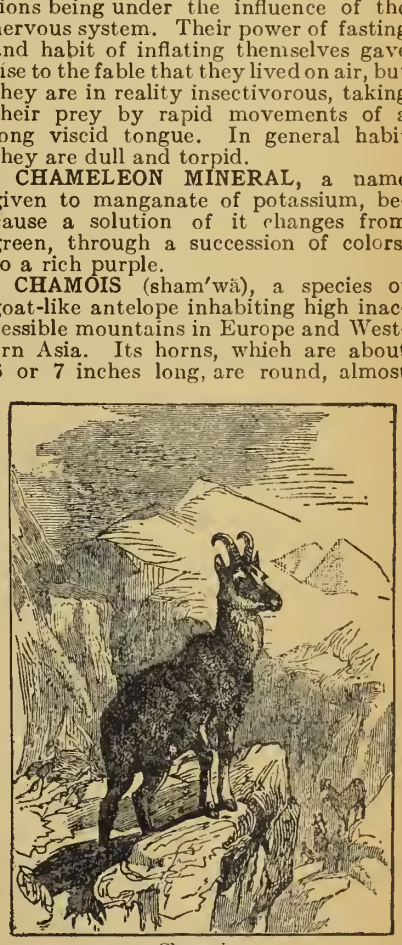
CHAME'LEON (ka-mē'li-on), a genus of reptiles belonging to the Saurian or lizard order, a native of parts of Asia, Africa, and the south of Europe. The best-known species, has a naked body 6 or 7 inches long, with a prehensile tail of about 5 inches, and feet suitable for grasping branches. The skin is cold to the touch, and contains small grains or eminences of a bluish-gray color in the shade, but in the light of the sun all parts of the body become of a grayish-brown or tawny color. It possesses the curious faculty, however, of changing its color, either in accordance with its environment, or with its temper when disturbed, the change being due to the presence of clear or pigment-bearing

Chameleon.

contractile cells placed at various depths in the skin, their contractions and dilations being under the influence of the nervous system. Their power of fasting and habit of inflating themselves gave rise to the fable that they lived on air, but they are in reality insectivorous, taking their prey by rapid movements of a long viscid tongue. In general habit they are dull and torpid.

CHAMELEON MINERAL, a name given to manganate of potassium, because a solution of it changes from green, through a succession of colors, to a rich purple.

CHAMOIS (sham'wä), a species of goat-like antelope inhabiting high inaccessible mountains in Europe and Western Asia. Its horns, which are about 6 or 7 inches long, are round, almost



Chamois.

smooth, perpendicular and straight until near the tip, where they suddenly terminate in a hook directed backward and downward. Its hair is brown in winter, brown fawn color in summer, and grayish in spring. The head is of a pale yellow color with a black band

from the nose to the ears and surrounding the eyes. The tail is black. Its agility, the nature of its haunts, and its powers of smell, render its pursuit an exceedingly difficult and hazardous occupation.

CHAMOMILE or **CAMOMILE** (kam'o-mīl), a well-known European plant. It is perennial, and has slender, trailing, hairy, and branched stems. The flower is white, with a yellow center. Both leaves and flowers are bitter and aromatic. The fragrance is due to the presence of an essential oil, called oil of chamomile, of a light blue color when first extracted, and used in the preparation of certain medicines. Both the leaves and the flowers are employed in fomentations and poultices, and also in the form of an infusion as a stimulant or anti-spasmodic.

CHAMPAGNE (sham-pān'), a French wine, white or red, which is made chiefly in the department of Marne, in the former province Champagne, and is generally characterized by the property of creaming, frothing, or effervescing when poured from the bottle, though there are also still Champagne wines. The creaming or slightly sparkling Champagne wines are more highly valued by connoisseurs, and fetch greater prices than the full-frothing wines, in which the small quantity of alcohol they contain escapes from the froth as it rises to the surface, carrying with it the aroma and leaving the liquor nearly vapid. The property of creaming or frothing possessed by these wines is due to the fact that they are partly fermented in the bottle, carbonic acid being thereby produced. Wine of a similar kind can of course be made elsewhere, and some of the German champagnes are hardly to be distinguished from the French. Much artificial or imitation champagne is sold.

CHAMPAIGN, (shăm-pān'), a city in Champaign County, Ill., 128 miles south by west of Chicago, on the Illinois Central, the Cleveland, Cincinnati, Chicago and Saint Louis, and a branch of the Wabash railroads. Pop., 13,160.

CHAMP-DE-MARS (shăṇ-dē-märs), that is Field of Mars, an extensive piece of ground in Paris, used as a place of military exercise. It was here that Louis XVI. swore to defend the new constitution in 1790, and it was the site of the exhibitions of 1867 and 1878.

CHAMPLAIN (sham-plān') Lake, a lake, chiefly in the United States, between the states of New York and Vermont, but having the north end of it in Canada; extreme length, north to south, about 120 miles; breadth, from half a mile to 15 miles; area, about 600 square miles. It is connected by canal with the Hudson River, and has for outlet the river Richelieu, or Sorel, flowing north to the St. Lawrence. Its scenery is beautiful, and attracts many vistors.

CHAMPLAIN (shăṇ-plaṇ), Samuel, a French naval officer and maritime explorer, born about 1570. His exploits in the maritime war against Spain in 1595 attracted the attention of Henry IV., who commissioned him in 1603 to found establishments in North America. After three voyages for that purpose, in the last of which he founded Quebec, he was in 1620 appointed governor of Canada. He wrote an account of his voyages, and died in 1635.

Champlain.

CHAMPOLLION (shăṇ-pol-yōṇ), Jean François, French scholar, celebrated for his discoveries in the department of Egyptian hieroglyphics, born at Figeac, department of Lot, in 1790. At an early age he devoted himself to the study of Hebrew, Arabic, Coptic, etc., and in 1809 became professor of history at Grenoble. He soon, however, retired to Paris, where, with the aid of the trilingual inscription of the Rosetta Stone and the suggestions thrown out by Dr. Thomas Young, he at length discovered the key to the graphic system of the Egyptians, the three elements of which —figurative, ideographic, and alphabetic—he expounded before the Institute in a series of memoirs in 1823. These were published in 1824 at the expense of the state. In 1826 Charles X. appointed him to superintend the department of Egyptian antiquities in the Louvre; in 1828 he went as director of a scientific expedition to Egypt; and in 1831 the chair of Egyptian archæology was created for him in the Collège de France. He died at Paris in 1832.

CHANCE, in the ordinary acceptation of the term, an unexpected occurrence. Chance exists only in so far as the intention, desires, or knowledge of men are concerned. See Cause.

CHAN'CELLOR, a high official in many of the kingdoms of Europe, the office including in its duties the supervision of charters and other official writings of the crown requiring solemn authentication. The title and office are also ecclesiastical, and hence each bishop still has his chancellor, the principal judge of his consistory. In the new German empire, the chancellor (Reichskanzler) is president of the Federal Council, and has the general conduct of the imperial administration. In the United States, a chancellor is the judge of a court of chancery or equity established by statute.

CHAN'CELLORSVILLE, the site of one of the greatest battles of the American civil war, in which, on the 2d, 3d, and 4th of May, 1863, a nominal victory was gained by the Confederates under Generals Lee and Jackson over the Federal troops, commanded by General Hooker. The Federal troops, though compelled to retreat across the Rappahannock, carried with them some thousands of prisoners and one more gun than they had lost, while the Confederates lost from 15,000 to 18,000 men and their brilliant leader Jackson.

CHAN'CERY, in England, the highest court, next to parliament, and presided over by the Lord High Chancellor. In the U. States, a court established in many states under this name and, in effect, a court of equity. In most states there are no separate courts of chancery or equity, the same judge presiding over the court of common law and the equity court also. The court of equity originated the injunction, and, in many ways, has larger power than a law court.

CHANDA (chân-dä'), a town of India, Central Provinces, surrounded by a wall 5½ miles long, with manufactures and a considerable trade. Pop. 16,137.—The District, has an area of 10,785 sq. miles, a pop. of 697,610.

CHAN'DLER, William Eaton, an American legislator, born in 1835 in New Hampshire. He occupied several positions in the departments of the national government from 1865 to 1881, and from the latter year to 1901 was U. States senator from New Hampshire.

CHANDLER, Zachariah, an American legislator born in New Hampshire in 1813, removed to Detroit in 1833, and one of the organizers of the republican party. In 1857 he was elected United States senator from Michigan and was twice re-elected. In 1875–7 he was secretary of the interior under Grant, and in 1879 was again elected to the senate. As chairman of the national republican committee he aroused much enmity by his forceful methods. He died suddenly in 1879.

CHANG-CHOW-FOO, a city, China, province of Fokien, 36 miles s.w. of Amoy, which is its port. It stands in a valley surrounded by hills and intersected by a river, and is the center of the silk manufacture of the province. Pop. estimated at from 800,000 to 1,000,000.

CHANNEL, English. See English Channel.

CHANNEL ISLANDS, a group of islands in the English Channel, off the w. coast of department La Manche, in France. They belong to Britain, and consist of Jersey, Guernsey, Alderney, and Sark, with some dependent islets. They form the only remains of the Norman provinces once subject to England. Area 112 sq. miles, pop. 95,841.

CHANNEL TUNNEL. See English Channel.

CHANNING (chan'ing), William Ellery, American preacher and writer, born at Newport, Rhode Island, in 1780. He studied at Harvard College, became a decided Unitarian, and propagated Unitarian tenets with great zeal and success. His first appointment as a pastor was in 1803, when he obtained the charge of a congregation in Boston, and ere long be became known as one of the most popular preachers of America. His reputation was still further increased by the publication of writings, chiefly sermons, reviews, etc., on popular subjects. He died at Burlington, Vermont, in 1842.—His nephew, William Henry Channing, born 1810, also a Unitarian preacher (for some time at Liverpool)

and supporter of the socialistic movement, wrote a memoir of his uncle and other works. He died in 1884.

CHANT, a short musical composition consisting generally of a long reciting note, on which an indefinite number of words may be intoned, and a melodic phrase or cadence. A single chant consists of two strains, the first of three and the second of four bars in length. A double chant has the length of two single ones.

CHAOS (kā'os), in old theories of the earth, the void out of which sprang all things or in which they existed in a confused, unformed shape before they were separated into kinds.

CHAP-BOOKS, a species of cheap literature which preceded the popular periodicals of the present day. They usually consisted of coarsely printed (and often coarsely written) publications sold for a copper or two, and were so called because they were prepared by the popular publishers expressly for sale by the chapmen or pedlars, who hawked them from district to district. They included lives of heroes and wonderful personages, tales of roguery and broad humor, witch and ghost stories etc.

CHAP'EL, a term applied to buildings of various kinds erected for some sort of religious service.

CHAPELLE, Placide Louis, an American Roman Catholic churchman, born in France in 1842, and studied in Maryland. In 1891 he was made coadjutor of Santa Fé, in 1897 archbishop of New Orleans, and in 1899 apostolic delegate to the Philippine Islands.

CHAPLAIN (chap'lin), literally a person who is appointed to a chapel, as a clergyman not having a parish or similar charge, but connected with a court, the household of a nobleman, an army, a prison, a ship, or the like.

CHAPTER, one of the chief divisions of a book. As the rules and statutes of ecclesiastical establishments were arranged in chapters, so also the assembly of the members of a religious order, and of canons, was called a chapter. The orders of knights used this expression for the meetings of their members, and some societies and corporations call their assemblies chapters.

CHARADE (sha-rād' or sha-rād'), a kind of riddle, the subject of which is a word that is proposed for discovery from an enigmatical description of its several syllables, taken separately as so many individual and significant words. When dramatic representation is used to indicate the meaning of the syllables and the whole word it is called an acting charade.

CHAR'COAL, a term applied to an impure variety of carbon, especially such as is produced by charring wood. One kind of it is also obtained from bones (see Bone Black); lampblack and coke are also varieties. Wood charcoal is prepared by piling billets of wood in a pyramidal form, with vacuities between them for the admission of air, and causing them to burn slowly under a covering of earth. In consequence of the heat, part of the combustible substance is consumed, part is volatilized, together with a portion of water, and there remains behind the carbon of the wood, retaining the form of the ligneous tissue. Another process consists in heating the wood in close vessels, by which the volatile parts are driven off, and a charcoal remains in the retorts, not so dense as that obtained by the other process. Wood charcoal, well prepared, is of a deep-black color, brittle, and porous, tasteless and inodorous. It is infusible in any heat a furnace can raise; but by the intense heat of a powerful galvanic apparatus it is hardened, and at length is volatilized, presenting a surface with a distinct appearance of having undergone fusion. Charcoal is insoluble in water, and is not affected by it at low temperatures; hence, wooden stakes which are to be immersed in water are often charred to preserve them, and the ends of posts stuck in the ground are also thus treated. Owing to its peculiarly porous texture, charcoal possesses the property of absorbing a large quantity of air or other gases at common temperatures, and of yielding the greater part of them when heated. Charcoal likewise absorbs the odoriferous and coloring principles of most animals and vegetable substances, and hence is a valuable deodorizer and disinfectant. Water which, from having been long kept in wooden vessels, as during long voyages, has acquired an offensive smell, is deprived of it by filtration through charcoal powder. Charcoal can even remove or prevent the putrescence of animal matter. It is used as fuel in various arts, where a strong heat is required, without smoke, and in various metallurgic operations. By cementation with charcoal, iron is converted into steel. It is used in the manufacture of gunpowder. In its finer state of aggregation, under the form of ivoryblack, lampblack, etc., it is the basis of black paint; and mixed with fat oils and resinous matter, to give a due consistence, it forms the composition of printing-ink.

CHARENTE (shà-rānt), a river in Western France, rising in the department of Haute-Vienne, and falling into the sea about 8 miles below Rochefort, opposite to the isle of Oleron, after a course of about 200 miles. It gives its name to two departments.—Charente, an inland department; area, 2294 sq. miles; capital Angoulême. Soil generally thin, dry and arid; one-third devoted to tillage, a third to vineyards, and the remainder meadows, woods, and waste lands. The wines are of inferior quality, but they yield the best brandy in Europe, the celebrated cognac brandy being made in Cognac and other districts. Pop. 350,305.

CHARENTE-INFÉRIEURE (aṇ-fā-rieur), a maritime department; area, 2635 sq. miles. Surface in general flat; soil chalky and sandy, fertile, and well cultivated; a considerable portion planted with vines; salt marshes along the coast. The pastures are good, and well stocked with cattle, horses and sheep. Oysters and sardines abound on the coast. Salt and brandy are the only articles manufactured to any great extent. Capital La Rochelle. Pop. 452,149.

CHARGE, in heraldry, signifies the various figures depicted on the escutcheon.—In gunnery charge signifies the quantity of powder used at one discharge of a gun.—Charge, in military tactics, is the rapid advance of infantry or cavalry against the enemy, with the object of breaking his lines by the momentum of the attack. Infantry generally advance to about 100 yards and fire, then gradually quicken their pace into the charge-step, and dash at the enemy's lines. Cavalry charge in echelon or column against infantry, which is usually formed in squares to receive them.

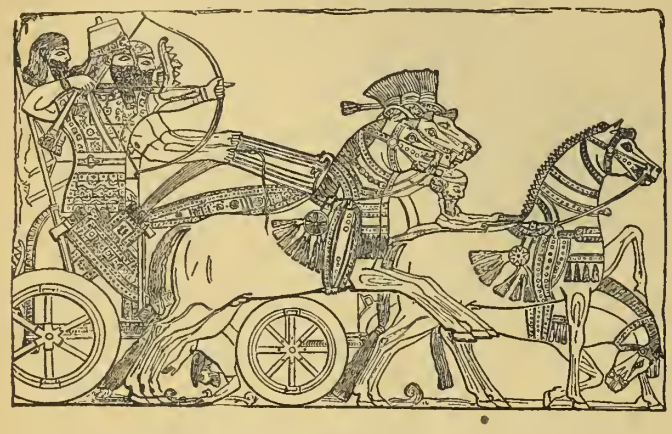
CHARGE-D'AFFAIRES (shàr-zhā-dàf-ār), the title of an inferior rank of diplomatic agents. See Minister, Foreign.

CHARIOT, a term applied to vehicles used both for pleasure and in war. Ancient chariots, such as those used among the Egyptians, Assyrians, Greeks and Romans, were of various forms.

Egyptian war-chariot.

A common form was open behind and closed in front, and had only two wheels. In ancient warfare chariots were of great importance; thus we read of the 900 iron chariots of Sisera, as giving him a great advantage against the Israelites. The Philistines in their war against Saul had 30,000 chariots. The sculptures of ancient Egypt show that the chariots formed the strength of the Egyptian army, these vehicles being two-horsed and carrying the driver and the warrior, sometimes a third man, the shield-bearer. There is no representation of Egyptian soldiers on horse-back, and consequently when Moses in his song of triumph over Pharaoh speaks of the "horse and his rider," "rider" must be understood to mean chariot-rider. In the Egyptian chariots the framework, wheels, pole, and yoke were of wood, and the fittings of the inside, the bindings of the framework, as well as the harness were chiefly of raw hide or of tanned leather. We have also numbers of sculptures which give a clear idea of the Assyrian chariots. These resembled the Egyptian in all essential features, containing almost invariably three men —the warrior, the shield-bearer, and the charioteer. A peculiarity of both is the quiver or quivers full of arrows attached to the side. The Assyrian war-chariot shown in the figure is drawn by three horses abreast, and all the appointments are rich and elaborate. It has, as will be noticed, two quivers crossing each other on the side, filled with arrows, and each also containing a small axe. A socket for holding the spear is also

attached. From the front of the chariot a singular ornamental appendage stretches forward. War-chariots had sometimes scythe-like weapons attached to each extremity of the axle, as among the ancient Persians and Britons.



Assyrian war-chariot.

Among the Greeks and Romans chariot-races were common. In Britain the name chariot was formerly given to a kind of light travelling carriage.

CHARITIES, institutions for the relief of the poor, sick, or otherwise disabled or incompetent members of society. Within the past 25 or 30 years organized charity has grown with tremendous strides until at present they represent vast sums of wealth and innumerable workers, paid and unpaid. These charities care for destitute adults, incurables of various kinds, criminals, the sick, children, homeless aged, indigent families, and many other types of pitiable persons. The majority of these institutions are independent of the state and are supported by private donations and bequests.

CHARITIES, United, societies for charitable purposes in various cities, consisting of a union of many or most of the charity organizations in the city. These united charity organizations have been established in 140 cities of the U. States and in 10 Canadian cities. The purpose is to secure co-ordination of work and to prevent imposition, or systematic deception or double dealing on the part of applicants.

CHARITIES AND CORRECTION, the national conference of, an organization with 1500 members scattered throughout the U. States, Canada, and Mexico. The first meeting was held in New York in 1874. In 1879 the conference met in Chicago, and yearly meetings are held in varions cities. A fee of $2.50 is charged for membership which entitles the member to the annual publications. The general secretary is J. P. Byers, Columbus, Ohio.

CHARITY, Sisters of. See Sisters of Charity.

CHARLEMAGNE (shär-lē-mān′), King of the Franks, and subsequently Emperor of the West, was born in 742, probably at Aix-la-Chapelle. His father was Pepin the Short, king of the Franks, son of Charles Martel. On the decease of his father, in 768, he was crowned king, and divided the kingdom of the Franks with his younger brother Carloman, at whose death in 771, Charlemagne made himself master of the whole empire, which embraced, besides France, a large part of Germany. His first great enterprise was the conquest of the Saxons, a heathen nation living between the Weser and the Elbe, which he undertook in 772; but it was not till 803 that they were finally subdued, and brought to embrace Christianity. While he was combating the Saxons, Pope Adrian implored his assistance against Desiderius, king of the Lombards. Charlemagne immediately marched with his army to Italy, took Pavia, overthrew Desiderius, and was crowned King of Lombardy with the iron crown. In 778 he repaired to Spain to assist a Moorish prince, and while returning his troops were surprised in the valley of Roncesvalles by the Biscayans, and the rear-guard defeated; Roland, one of the most famous warriors of those times, fell in the battle. As his power increased, he meditated more seriously the accomplishemnt of the plan of his ancestor, Charles Martel, to restore the Western Empire. Having gone to Italy to assist the pope, on Christmas-day 800 he was crowned and proclaimed Cæsar and Augustus by Leo III. His son Pepin, who had been made king of Italy, died in 810, and his death was followed the next year by that of Charles his eldest son. Thus of his legitimate sons one only remained, Louis, king of Aquitania, whom Charlemagne adopted as his colleague in 813. He died Jan. 28, 814, in the forty-seventh year of his reign, and was buried at Aix-la-Chapelle, his favorite and usual place of residence. Charlemagne was a friend of learning, and deserves the name of restorer of the sciences and teacher of his people. He attracted by his liberality the most distinguished scholars to his court (among others, Alcuin, from England), and established an academy in his palace at Aix-la-Chapelle, the sittings of which he attended with all the scientific and literary men of his court. He invited teachers of language and mathematics from Italy to the principal cities of the empire, and founded schools of theology and the liberal sciences in the monasteries. He strove to cultivate his mind by intercourse with scholars; and, to the time of his death, this intercourse remained his favorite recreation. His mother-tongue was a form of German, but he spoke several languages readily, especially the Latin, and was naturally eloquent. He sought to improve the liturgy and church music, and attempted unsuccessfully to introduce uniformity of measures and weights. He built a lighthouse at Boulogne, constructed several ports, encouraged agriculture, and enacted wise laws. He convened councils and parliaments, published capitularies, wrote many letters (some of which are still extant), a grammar, and several Latin poems. His empire comprehended France, most of Catalonia, Navarre, and Aragon; the Netherlands, Germany as far as the Elbe, Saale, and Eider, Upper and Middle Italy, Istria, and a part of Sclavonia.

CHARLES I., surnamed le Chauve, or the Bald, King of France, was son of Louis le Débonnaire, and was born 823. He died in 877. **CHARLES II.,** surnamed le Gros, or the Fat, King of France, is also known as Charles III., emperor of Germany, and was born about 832. He was the son of Louis the German, and ascended the French throne in 885 to the prejudice of his cousin, Charles the Simple, but was deposed in 887 and died the following year. **CHARLES III.,** King of France, surnamed the Simple, was the son of Louis the Stammerer, and born in 879, died in 929. **CHARLES IV.,** King of France, surnamed le Bel, or the Handsome, third son of Philippe le Bel was born in 1294, and ascended the throne in 1322. He died in 1328. **CHARLES V.,** surnamed the Wise, King of France, was the son of King John, and was born in 1337. He died in 1380. He erected the Bastille for the purpose of overawing the Parisians. **CHARLES VI.,** surnamed the Silly, King of France, and son of the foregoing, was born at Paris in 1368, and in 1388 took the reins of government into his own hands. Four years later he lost his reason, and one of the most disastrous periods of French history began. Charles died in 1422. **CHARLES VII.,** King of France, was born at Paris in 1403. He succeeded only to the southern provinces of the kingdom, Henry VI. of England being proclaimed king of France at Paris. The English dominion in France was under the government of the Duke of Bedford, and so skilfully did the English general conduct his operations that Charles had almost abandoned the struggle as hopeless, when the appearance of Jeanne d'Arc, the Maid of Orleans, gave, as if by a miracle, a favorable turn to his affairs, and the struggle ended in the expulsion of the English from all their possessions in France, except Calais. Charles died in 1461. **CHARLES VIII.,** King of France, son of Louis XI., was born in 1470, died in 1498. **CHARLES IX.,** King of France, son of Henry II., and Catharine de' Medici, born in 1550, ascended the throne at the age of ten years. His haughty and ambitious mother seized the control of the state. Along with the Guises she headed the Catholic League against the Calvinists, and her

tortuous and unscrupulous policy helped to embitter the religious strife of the factions. After a series of Huguenot persecutions and civil wars a peace was made in 1570, which, two years later, on 24th August, 1572, was treacherously broken by the Massacre of St. Bartholomew's. The king, who had been little more than the tool of his scheming mother, died two years afterward, in 1574. **CHARLES X.**, King of France, Comte d'Artois, born at Versailles in 1757, grandson of Louis XV., was the youngest son of the dauphin, and brother of Louis XVI. He died in 1836. His grandson, the Comte de Chambord (which see), claimed the French throne as his heir.

CHARLES IV., Emperor of Germany, of the house of Luxemburg, was born 1316, and was the son of King John of Bohemia. In 1346 he was elected emperor by five of the electoral princes,

Charles V, of Germany.

while the actual emperor Louis the Bavarian was still alive. On the death of the latter a part of the electors elected Count Gunther of Schwarzburg, who soon after died; and Charles at length won over his enemies, and was elected and consecrated emperor at Aix-la-Chapelle. He died at Prague in 1378. **CHARLES V.**, Emperor of Germany and King of Spain (in the latter capacity he is called Charles I.), the eldest son of Philip, archduke of Austria, and of Joanna, the daughter of Ferdinand and Isabella of Spain, was born at Ghent, Feb. 24, 1500. Charles was thus the grandson of the Emperor Maximilian and Mary, daughter of Charles the Bold, last duke of Burgundy, and inherited from his grandparents on both sides the fairest countries in Europe, Aragon, Naples, Sicily, Sardinia, Castile, and the colonies in the New World, Austria, Burgundy, and the Netherlands. On the death of Ferdinand, his grandfather, Charles assumed the title of King of Spain. Foiled in his schemes and dejected with repeated failures, Charles resolved to resign the imperial dignity, and transfer his hereditary estates to his son Philip. In 1555 he conferred on him the sovereignty of the Netherlands, and on January 15, 1556, that of Spain, retiring himself to a residence beside the monastery of Yuste, in Estremadura, where he amused himself by mechanical labors and the cultivation of a garden. He still took a strong interest in public affairs, though latterly he was very much of an invalid, his ill health being partly caused by his high living. He died on Sept. 21, 1558. **CHARLES VI.**, German emperor, the second son of the Emperor Leopold I., was born Oct. 1, 1685. He was destined according to the ordinary rules of inheritance to succeed his relative Charles II. on the throne of Spain. But Charles II. by his will made a French prince, Philip, duke of Anjou, grandson of Louis XIV., heir to the Spanish monarchy. This occasioned the war of the Spanish Succession, in which England and Holland took the part of the Austrian claimant. In 1733 a war with France and Spain regarding the succession in Poland terminated unfavorably for him, he having to surrender Sicily, Naples, and part of Milan, to Spain, and Lorraine to France. In 1737 he renewed the war with the Turks, this time unsuccessfully. Charles died Oct. 20, 1740. **CHARLES VII.**, Emperor of Germany, born in 1697, was the son of Maximilian Emanuel, elector of Bavaria. In 1726 he succeeded his father as Elector of Bavaria. In support of his claims he invaded Austria with an army, took Prague, was crowned king of Bohemia, and in 1742 was elected emperor. But fortune soon deserted him. The armies of Maria Theresa reconquered all Upper Austria, and overwhelmed Bavaria. Charles fled to Frankfort, and returning to Munich in 1744, died there the following year.

CHARLES I., King of England, Scotland, and Ireland, was born at Dunfermline, Scotland, in the year 1600, and was the third son of James VI. and Anne of Denmark. He married Henrietta Maria, daughter of Henry IV. of France, and in 1625 succeeded to the throne, receiving the kingdom embroiled in a Spanish war. The first parliament which he summoned, being

Charles I, of England.

more disposed to state grievances than grant supplies, was dissolved. Next year (1626) a new parliament was summoned; but the House proved no more tractable than before, and was soon dissolved. In 1628 the king was obliged to call a new parliament, which showed itself as much opposed to arbitrary measures as its predecessor, and after voting the supplies prepared the Petition of Right, which Charles was constrained to pass into a law. In was in Scotland, however, that formal warlike opposition was destined to commence. The king had on his side the great bulk of the gentry, while nearly all the Puritans and the inhabitants of the great trading towns sided with the parliament. The first action, the battle of Edgehill (23d Oct., 1642), gave the king a slight advantage; but nothing very decisive happened till the battle of Marston Moor, in 1644, where Cromwell routed the royalists. Charles at length gave himself up to the Scottish army at Newark (5th May, 1646) All interposition being vain, he was beheaded before the Banqueting House, Whitehall, on 30th Jan., 1649, meeting his fate with great dignity and composure.

CHARLES II., King of England, Ireland, and Scotland, son of Charles I. and Henrietta Maria of France, was born in 1630. He was a refugee at the Hague on the death of his father, on which he immediately assumed the royal title. Cromwell was then all-powerful in England; but Charles accepted an invitation from the Scots, who had proclaimed him their king July, 1650, and, passing over

Charles II.

to Scotland, was crowned at Scone (1651). Cromwell's approach made him take refuge among the English royalists, who, having gathered an army, encountered Cromwell at Worcester, and were totally defeated. With great difficulty Charles escaped to France. On the death of Cromwell the Restoration, effected without a struggle by General Monk, set Charles on the throne after the declaration of Breda, his entry into the capital (29th May, 1660) being made amidst universal acclamations. In 1662 he married the Infanta of Portugal, Catharine of Braganza, a prudent and virtuous princess, but in no way calculated to acquire the affection of a man like Charles. For a time his measures, mainly counselled by the chancellor Lord Clarendon, were prudent and conciliatory. But the indolence, extravagance, and licentious habits of the king soon involved the nation as well as himself in difficulties. He died from the consequences of an apoplectic fit in February, 1685, after having received the sacrament according to the rites of the Roman Church.

CHARLES XII., King of Sweden, was born at Stockholm, June 27, 1682. On the death of his father, in 1697, when he was but fifteen years old, he was declared of age by the estates. Unfortunate in his campaigns against the Russians he returned to his own country and set about the measures necessary to defend the kingdom, and the fortunes of Sweden were beginning to assume a favorable aspect when he was

slain by a cannon-ball as he was besieging Frederikshall, Nov. 30, 1718. Firmness, valor, and love of justice were the great features in the character of Charles, but were disfigured by an obstinate rashness. After his death Sweden sank from the rank of a leading power.

CHARLES XIII., King of Sweden, was born in 1748, being the second son of King Adolphus Frederick. In the war with Russia, in 1788, he received the command of the fleet, and defeated the Russians in the Gulf of Finland. He adopted as his successor Marshal Bernadotte, who became king on the death of Charles, Feb. 5, 1818.

CHARLES XIV. See Bernadotte.

CHARLES I., King of Spain. See Charles V., Emperor of Germany.

CHARLES IV., King of Spain, born at Naples 12th Nov. 1748, succeeded his brother Ferdinand VI. in 1788, was all his life completely under the influence of his wife and her paramour Godoy. In 1808 Charles abdicated in favor of Napoleon. He died in 1819.

CHARLES, Archduke of Austria, third son of the Emperor Leopold II., was born in Florence 5th Sept. 1771. After distinguishing himself in various campaigns, in 1796 he was appointed commander-in-chief of the Austrian army on the Rhine, and won several victories against the French. In 1805 he commanded in Italy against Masséna, and won Caldiero (31st Oct.); but in the campaign of 1809 in Germany against Napoleon he was unsuccessful, the battle of Wagram (5th and 6th July) laying Austria at the feet of the French emperor. With that event the military career of Charles closed. He died in 1847. He published several military works of value.

CHARLES ALBERT, King of Sardinia, born 1798, was the son of Charles Emmanuel, prince of Savoy-Carignan. He abdicated in favor of his son, Victor Emmanuel, and, retiring to Portugal, died 28th July, 1849.

CHARLES EDWARD STUART, called the Pretender, grandson of James II. king of England, son of James Edward and Clementina, daughter of Prince Sobieski, was born in 1720 at Rome.

Prince Charles Edward Stuart.

In 1742 he went to Paris and persuaded Louis XV. to assist him in an attempt to recover the throne of his ancestors. Fifteen thousand men were on the point of sailing from Dunkirk, when the English admiral Norris dispersed the whole fleet. Charles now determined to trust to his own exertions. Accompanied by seven officers he landed on the west coast of Scotland, from a small ship called the Doutelle. Many Lowland nobles and Highland chiefs went over to his party. With a small army thus formed he marched forward, captured Perth, then Edinburgh (Sept. 17, 1745), defeated an army of 4000 British under Sir John Cope at Prestonpans (Sept. 22), and advancing obtained possession of Carlisle. He now caused his father to be proclaimed king, and himself regent of England; removed his head-quarters to Manchester, and soon found himself within 100 miles of London, where many of his friends awaited his arrival. The rapid successes of the adventurer now caused a part of the British forces in Germany to be recalled. Want of support, disunion, and jealousy among the adherents of the house of Stuart, some errors, and the superior force opposed to him, compelled Prince Charles to retire in the beginning of 1746. He latterly fell into habits of intoxication, and he died Jan. 31, 1788.

CHARLES MARTEL', ruler of the Franks, was a son of Pepin Héristal. His father had governed as mayor of the palace under the weak Frankish kings with so much justice that he was enabled to make his office hereditary in his family. Chilperic II., king of the Franks, refusing to acknowledge Charles Martel as mayor of the palace, the latter deposed him, and set Clothaire IV. in his place. After the death of Clothaire he restored Chilperic, and subsequently placed Thierri on the throne. Charles Martel rendered his rule famous by the great victory which he gained in October, 732, over the Saracens, near Tours, from which he acquired the name of Martel, signifying hammer. He died 741. Charlemagne was his grandson. See Charlemagne.

CHARLES THE BOLD, Duke of Burgundy, son of Philip the Good and Isabella of Portugal, born at Dijon Nov. 10, 1433. While his father yet lived Charles left Burgundy, and forming an alliance with some of the great French nobles for the purpose of preserving the power of the feudal nobility, he marched on Paris with 20,000 men, defeated Louis XI. at Montlhéri, and won the counties of Boulogne, Guines, and Ponthieu. Succeeding his father in 1467 he commenced his reign by severe repression of the citizens of Liège and Ghent. Charles now turned his arms against the Swiss, took the city of Granson, putting 800 men to the sword. But this cruelty was speedily avenged by the descent of a Swiss army, which at the first shock routed the duke's forces at Granson, March 3, 1476. Mad with rage and shame Charles gathered another army, invaded Switzerland, and was again defeated with great loss at Morat. The Swiss, led by the Duke of Lorraine, now undertook the reconquest of Lorraine, and obtained possession of Nancy. Charles marched to recover it, but was utterly routed and himself slain.

CHARLESTON, a city and seaport of South Carolina, on a tongue of land formed by the confluence of the rivers Cooper and Ashley, which unite just below the city, and form a spacious and convenient harbor extending about 7 miles to the Atlantic, and defended by several forts. The city is regularly laid out, most of the principal thoroughfares being 60 to 70 feet wide and bordered with fine shade-trees. It is much the

largest town in the state, and is one of the leading commercial cities in the south. The staple exports are cotton (to the value of, say, $20,000,000 annually), cotton-seed, rice, rosin and turpentine, lumber, and phosphate. The civil war greatly damaged the trade, but there has since been marked commercial and industrial progress. Yellow fever has made frequent ravages in Charleston, but on the whole it is considered more healthy than most other Atlantic towns in the southern states. It was the scene of the outbreak of the civil war on April 12, 1861, and was evacuated by the Confederates on February 17, 1865. On 31st August, 1886, the coast region of the U. States from Alabama to New York experienced a series of earthquake shocks, from which Charleston in particular suffered severely, many lives and about five million dollars worth of property being destroyed. Pop. 64,000.

CHARLESTON, the county seat of Kanawha county, and capital of West Virginia, is situated on the Kanawha river at the confluence of Elk river 65 miles from its mouth and 150 miles s.s.w. of Wheeling. Pop. 13,109.

CHARLOTTE, a city and county-seat of Mecklenburg County, N. C., 125 miles west by south of Raleigh, on Sugar Creek, and on the Southern and the Seaboard Air-line railroads. It is in the gold region of the State, and a branch mint was established here in 1838. Pop. 21,040.

CHARLOTTENBURG (shâr-lot'enburh), a town of Prussia, on the Spree, about 3 miles from Berlin, with a royal palace and park, great technical school or college, also a number of industrial and manufacturing establishments. Pop. 189,290.

CHARLOTTE-RUSSE (shâr'lot-rus), a dish made of whipped-cream surrounded with a border of sponge-cake.

CHARM, anything believed to possess some occult or supernatural power, such as an amulet, spell, etc., but properly

applied (as the name, derived from Lat. carmen, a song, indicates) to spells couched in formulas of words or verses.

CHARNEL-HOUSE, a chamber or building under or near churches where the bones of the dead are deposited.

CHARON (kā'ron), in Greek mythology, the son of Erebus and Night. It was his office to ferry the dead in his crazy boat over the rivers of the infernal regions, for which office he received an obolus, or farthing, which accordingly was usually put into the mouth of the deceased. He was represented as an old man, with a gloomy aspect, matted beard, and tattered garments.

CHART, a hydrographical or marine map, that is a draft or projection of some part of the earth's surface, with the coasts, islands, rocks, banks, channels, or entrances into harbors, rivers, and bays, the points of compass, soundings, or depth of water, etc., to regulate the courses of ships in their voyages. The term chart is applied to a marine map; map is applied to a draft of some portion of land (often including sea also). A plane chart is one in which the meridians are supposed parallel to each other, the parallels of latitude at equal distances, and of course the degrees of latitude and longitude everywhere equal to each other. A great number of excellent charts are produced by the hydrographic department of the British admiralty. The United States Coast Survey Department produces similar charts.

CHARTER, a franchise or power, given to a corporation by a state enabling the corporation to perform the functions described in the charter. Charters were granted by the English kings to all sorts of associations in the American colonies. In the United States today corporations of all kinds are chartered by legislatures, inclusive of the cities incorporated within the state. Thus all public or civic corporations, of whatever kind, being creatures of the state, can be nullified or destroyed by the state at the will of the legislature. But the state cannot nullify the charter of a private corporation as this is forbidden by the federal constitution which provides that no state can pass a law impairing the obligation of contracts—unless this power is reserved by the state when it grants the charter.

CHARTER-HOUSE, a celebrated school and charitable foundation in the city of London. In 1371 Sir Walter Manny built and endowed it as a priory for Carthusian monks (hence the name, a corruption of Chartreuse, the celebrated Carthusian convent). After the dissolution of the monasteries it passed through several hands till it came into the possession of Thomas Sutton, who converted it into a hospital and school, richly endowed, consisting of a master, preacher, head schoolmaster, forty-four boys and eighty decayed gentlemen, with a physician and other officers and servants. Among famous men who have received their education at the Charter-house are Isaac Barrow, Addison, Steele, John Wesley, Blackstone, Grote, Thirlwall, Havelock, John Leech, and Thackeray.

CHARTER OAK, a great oak tree in Hartford, Conn., which was blown down in 1856, and which was believed to have been standing for 1000 years previously. It received its name from the tradition that the charter of Connecticut had been concealed in its hollow.

CHARTREUSE (shär-treuz) or **GREAT CHARTREUSE,** a famous Carthusian monastery in Southeastern France. a little northeast of Grenoble, situated at the foot of high mountains, 3280 feet above sea-level, the head-quarters of the order of the Carthusians. It was founded in 1084, but the present building, a huge, plain-looking pile, dates from 1676. The monks of this monastery manufacture the well-known liquor called Chartreuse, which owes its special properties to the aromatic plants growing on the Alps.

CHARYBDIS (ka-rib'dis), an eddy or whirlpool in the Straits of Messina, celebrated in ancient times, and regarded as the more dangerous to navigators because in endeavoring to escape it they ran the risk of being wrecked upon Scylla, a rock opposite to it. There are several whirlpools in this region which may have been dangerous enough to the undecked boats of the Greeks, but none, which the modern navigator with due caution may not easily pass.

CHASE: (1) in printing, an iron frame used to confine types when set in columns or pages. (2) The part of a gun between the trunnions and the swell of the muzzle, or in modern guns, in which the muzzle has no swell, the whole of that part of a gun which is in front of the trunnions.

CHASE, Salmon Portland, American statesman and jurist, born in New Hampshire, 1808. Having adopted the law as his profession he settled at Cincinnati and acquired a practice there. He early showed himself an opponent of slavery, and was the means of founding the Free-soil party, which in time gave rise to the great Republican party—the power that brought the downfall of slavery. In 1849–55 he was a member of the United States Senate, in which he vigorously opposed the extension of slavery into the new territories. In 1855 he was elected governor of Ohio, being re-elected in 1857. In 1860 he was an unsuccessful candidate for the presidency. In 1861 he was nominated secretary of the treasury, and in this post was signally successful in providing funds for carrying on the civil war. In 1864 he resigned office, and was appointed chief-justice of the supreme courts. He died in 1783.

CHASING is the art of working decorative forms in low-relief in gold, silver, or other metals. It is generally practised in connection with repoussé work, in which the figures are punched out from behind and are then sculptured on the front or chased with the graver.

CHASSEPOT RIFLE (shàs-pō), a breech-loading rifle, named after its inventor, and adopted as the firearm of the French infantry in 1866, but since given up. It was about 4 lbs. lighter than the needle-gun and about 1 lb. lighter than the Martini-Henry rifle.

CHASSEURS (shàs-*eur*), a name given to various sections of light infantry and cavalry in the French service.

CHAS'UBLE, the upper garment worn by a priest during the celebration of mass. It was originally circular, had a hole in the middle for the head, but no holes for the arms. In later times the sides were cut away to give a freer

A, Ancient form of chasuble: 1, Apparel of the neck. 2222, Chasuble. 33, Orphreys of the chasuble. 4, The stole. 5 5, The alb. 6, Apparel of the alb. 7. The maniple.
B, Modern form of chasuble.

motion to the arms, and it has now become an oblong garment hanging down before and behind, made of rich materials, as silk, velvet, cloth of gold, and has a cross embroidered on the back.

CHAT, the popular name of birds of the family Sylviadæ or warblers. They are small, lively birds, moving incessantly and rapidly about in pursuit of the insects on which they chiefly live. There are three species found in Britain, the stone-chat, whin-chat, and wheatear. The yellow-breasted chat of the United States is a larger bird, belonging to the family Turdidæ or thrushes.

CHATEAU (shä-tō), the French term for a castle or mansion in the country; a country-seat.—Château en Espagne, literaly, a castle in Spain; a castle in the air: a phrase of doubtful origin.

CHATEAUBRIAND (shä-tō-bri-äṇ), François Auguste, Vicomte de, a celebrated French author and politician, was born at St. Malo in Brittany, of a noble family, September 14, 1768. After serving in the navy and the army he travelled in North America; but the news of the flight of Louis XVI. and his arrest at Varennes brought him back to France. Shortly after he quitted France and joined with other emigrants the Prussian army on the Rhine. In 1800 he returned to France, and in the following year published his romance of Atala, the scene of which is laid in America, and the year after his celebrated work, Le Génie du Christianisme, which is a kind of brilliant picture of Christianity in an æsthetic and romantic aspect. Style, power of description, and eloquence are the merits of the book rather than any depth of thought; but it carried the author's reputation far and wide, and contributed much to the religious reaction of the time. In his later years he wrote several works, but none of the value of his earlier productions. He died 4th July, 1848.

CHATHAM, William Pitt, Earl of, one of the most illustrious statesmen of

Britain, the son of Robert Pitt of Boconnoc, in Cornwall, born Nov. 15, 1708, and educated at Eton and Oxford. He entered parliament and soon attracted notice as a powerful opponent of Walpole. In spite of the king's dislike Pitt was powerful enough to win a

William Pitt, Earl of Chatham.

place in the administration (1746), first as vice-treasurer of Ireland, and afterward as paymaster-general. In 1756 he became secretary of state and real head of the government. Dismissed in 1757 on account of his opposition to the king's Hanoverian policy, no stable administration could be formed without him, and he returned to power the same year in conjunction with the Duke of Newcastle. In was under this administration and entirely under the inspiration of Pitt that Britain rose to a place among the nations she had not before occupied. Wolfe and Clive, both stimulated and supported in their great designs by Pitt, won Canada and India from the French, and the support the Great Commoner gave Frederick of Prussia contributed not a little to the destruction of French predominance in Europe. The accession of George III. brought Lord Bute into power, and Pitt, disagreeing with Bute, resigned in 1761. In 1766 he strongly advocated conciliatory measures toward the American colonies, and undertook the same year to form an administration, he going to the House of Lords as Earl of Chatham. But the ministry was not a success, and in 1768 he resigned. After this his principal work was his appeals for a conciliatory policy toward the colonies. But his advice was disregarded, and the colonies declared themselves independent in 1776. Chatham died May 11, 1778. He received a public funeral and a magnificent monument in Westminster Abbey. The character of Chatham was marked by integrity, disinterestedness, and patriotism. With great oratorical gifts and the insight of a great statesman he had liberal and elevated sentiments; but he was haughty and showed too marked a consciousness of his own superiority.

CHAT'TANOO'GA, a city and county-seat of Hamilton Co., Tenn., 150 miles southeast of Nashville, on the Tennessee River. The river is navigable eight months of the year as far as this place, and several lines of railroad pass through the city, making it an important railroad center. The Chickamauga National Military Park, laid out by the Federal Government on the site of the battle of Chickamauga, is south by east of the city, and was dedicated in 1895. Another feature of interest is the National Cemetery, one of the largest in the country, containing 13,322 graves. Pop. 84,000.

CHAT'TELS, property movable and immovable, not being freehold. The word chattel is originally the same word with cattle, formed from late Latin capitalia, meaning heads of cattle, from L. caput, head. Chattels are divided into real and personal. Chattels real are such as belong not to the person immediately, but dependently upon something, as an interest in a land or tenement, or a lease, or an interest in advowsons. Any interest in land or tenements, for example, is a real chattel; so also is a lease, an interest in advowsons, etc. Chattels personal are goods which belong immediately to the person of the owner, and include all movable property.

CHATTERERS, the populâr name of certain insessorial birds of the family Ampelidæ, as the Bohemian chatterer or waxwing and the chatterer of Carolina.

CHAT'TERTON, Thomas, a youth whose genius and melancholy fate have gained him much celebrity, was born at Bristol in 1752, of poor parents, and educated at a charity school. The most remarkable of his poems are those published under the name of Rowley, spurious antiques, such as The Tragedy of Ælla, The Battle of Hastings, The Bristow Tragedy, etc. He committed suicide in 1776.

CHAU'CER, Geoffrey, "the father of English poetry," born in London probably about 1340; died there on the 25th of October, 1400. Nothing is known of his education, but in 1356–59 he was a

Geoffrey Chaucer.

page to Princess Lionel. In 1367 we find his name as a valet of the king's chamber. Between 1370 and 1380 he was employed abroad in seven diplomatic missions. In one of these, in 1372, he was sent to Genoa as a commissioner to negotiate a commercial treaty. In 1374 he was appointed comptroller of the customs on wool at London. In 1377 he was sent to Flanders and France on diplomatic business and next year to Lombardy. In 1382 he was appointed comptroller of the petty customs. In 1386 he was returned to parliament as knight of the shire for Kent, but in the same year he shared the disgrace of his patron, John of Gaunt, was dismissed from his comptrollerships, and reduced to a state of comparative poverty. His most celebrated work, The Canterbury Tales, was written at different periods between 1373 and 1400. It consists of a series of tales in verse (two in prose), supposed to be told by a company of pilgrims to the shrine of St. Thomas (Becket) at Canterbury in 1386. In its pages we get such pictures of English life and English ways of thought in the 14th century as are found nowhere else. Besides his great work Chaucer wrote many poems, some of which are founded on French or Italian works. He was buried in Westminster Abbey.

CHAUFFEUR (shâ'fêr) a French word, meaning stoker, applied generally to the operator of an automobile. It also is used to designate certain ruffians who during the French Revolution terrorized the country districts by garroting helpless persons.

CHAUTAU'QUA, a beautiful lake in New York, 18 miles long and 1 to 3 broad, 726 feet above Lake Erie, from which it is 8 miles distant. On its banks is the village of Chautauqua, the center of a religious and educational movement of some interest. This originated in 1874, when the village was selected as a summer place of meeting for all interested in Sunday-schools and missions. Since then the Chautauqua Literary and Scientific Circle has taken origin here, the most prominent feature of which is to engage the members—wherever they may reside—in a regular and systematic course of reading, extending, when completed, over four years and entitling the student to a diploma. There are many local branches or societies, and it is attempted to start the movement in Britain.

CHAUVINISM (shō'vin-izm), an unreflecting and fanatical devotion to any cause, especially an exaggerated patriotism, so called from Nicholas Chauvin, a soldier so enthusiastically devoted to Napoleon I. and so demonstrative in his adoration that his comrades turned him into ridicule.

CHECK. See Cheque.

CHECKERS, the common name for the game of draughts.

CHED'DAR, a parish and thriving village, England, county Somerset, 18 miles s.w. Bristol. The dairies in the neighborhood have long been famous for the excellence of their cheese, which is made from the whole milk, on a highly approved method now widely practised.

CHEESE, one of the most important products of the dairy, is composed principally of casein, which exists in cows' milk to the extent of about 3 or 4 per cent, fat, and water. It is made from milk, skimmed wholly, partially, or not at all, the milk being curdled or coagulated, and the watery portion or whey separated from the insoluble curd, which being then worked into a uniform mass, salted (as a rule), and pressed in a vat or mold forms cheese, but requires to be cured or ripened for a time before being used. The coagulation of the milk may be effected either by adding an acid as in Holland, or sour milk as in Switzerland, or rennet as usual in Britain and this country. There are a great many

varieties of cheese, of which the most notable are Stilton, Cheshire, Cheddar, Dunlop, among British; and Parmesan, Gruyère, Gorgonzola, Gouda, among foreign ones. In the United States immense quantities of cheese are made, almost all the different European kinds being imitated. Large factories are devoted to the manufacture. Other kinds are known as sour-milk, skimmed-milk, cream, sweet-milk, etc., cheese. Sheep's and goat's milk cheese are also made. The output of cheese in the United States is upward of 300,000,000 pounds annually. New York and Wisconsin are the two most productive states, and production has been materially assisted by the experiments of the United States agricultural department with various ferments which hasten the process.

CHEIROMANCY (kī'ro-), or **PALMISTRY,** the art of divining by inspection of the lines of the hand; it was practised in India in the remotest ages; in Europe, during the middle ages, it was in great repute, but latterly it took refuge among the gypsies, who to this day find profit in the exercise of their favorite art.

CHEIROPTERA (kī-rop'te-ra), or **BATS,** an order of mammals, the essential character of which is the possession of a patagium, or expansion of the integument of the body which connects the tail throughout its whole length to the hinder limbs as far as the ankle, and thence passes along the side of the body to the fore-limbs, which are greatly elongated, and give support and varied movement to the expansion (which is popularly called the wing) by means of the very long and slender digits. Other mammals, as some of the squirrels and the flying lemur, have the power of gliding through the air for some distance, but none of them have the power of sustained flight, nor are the anterior extremities modified in the same way as are those of the bats. The Cheiroptera are divided into two sub-orders, Fruit-eaters, and Insect-eaters. (See Bat.)

CHE-KIANG, a maritime province, China, between lat. 27° and 31° n., and including the Chusan Archipelago; area, 39,150 sq. miles; pop. 11,588,692. It is traversed by the Grand Canal, and has as its principal ports Ningpo and Hangchow, the capital. Staple exports, silk and tea.

CHELONIANS (ke-lō'-), or **CHELONIA,** an order of reptiles including the tortoises and turtles, and distinguished by the body being inclosed in a double shell, out of which the head, tail, and four legs protrude. See Tortoise, Turtle.

CHELSEA (chel'sē), a suburb of London, and a mun. and parl. borough, on the Thames, opposite Battersea, and chiefly distinguished for containing a royal military hospital, originally commenced by James I. as a theological college, but converted by Charles II. for the reception of sick, maimed, and superannuated soldiers. The building was finished in 1692 by Sir Christopher Wren. Connected with the hospital is a royal military asylum, founded in 1801, for the education and maintenance of soldiers' children. The parliamentary borough returns one member. Pop. parl. bor. 93,841.

CHELSEA, a city in Suffolk Co., Mass., and a suburb of Boston, from which it is distant 2 miles, on the Boston and Maine Railroad. It is connected with Charlestown by a bridge across the Mystic River, and with Boston by ferry and steam and electric railroads. Pop. 40,000.

CHELTENHAM (chel'tn-am), a municipal and parliamentary borough and fashionable watering-place in England, in the county of Gloucester, beautifully situated on the small river Chelt, within the shelter of the Cotswold Hills. It grew rapidly into a place of fashionable resort after the discovery of its saline, sulphuric, and chalybeate springs in 1716, to which, in 1788, George III. paid a visit. Pop. 49,439.

CHEMICAL RAYS, a not very appropriate name given to the blue and violet rays of the spectrum, and also the non-luminous rays at the violet end of the spectrum, which have a peculiarly powerful chemical effect on silver compounds.

CHEMISTRY, the science which treats of the nature, laws of combination, and mutual actions of the minute particles of the different sorts of matter composing our universe, and the properties of the compounds they form. As a science it is entirely of modern origin, in its earliest phases being identical with alchemy (which see), the great object of which was the discovery of the philosopher's stone. In this pursuit most minerals, especially such as presented the characters of metallic ores, were subjected to numerous experiments, and many important isolated discoveries were made by Basil Valentine, Raymond Lully, Paracelsus, Van Helmont, and others. But during the latter part of the 17th century the belief in alchemy was greatly on the wane, and just at its close the German chemist Becher threw out certain speculations regarding the cause of combustion, which were afterward taken up and extended by Stahl in the "phlogistic theory," and constitute the first generalization of the phenomena of chemistry, though the theory itself was diametrically opposed to the truth. About the middle of the 18th century Dr. Black made his great discovery of a gas differing from atmospheric air, rapidly followed by that of a number of other gases by Cavendish, Rutherford, Priestley, Scheele, etc.; and the discovery of oxygen by the two last-named chemists afforded to Lavoisier the means of revolutionizing and systematizing the science. By a series of experiments he showed that all substances, when burned, absorb oxygen, and that the weight of the products of combustion is exactly equal to that of the combustible consumed and of the oxygen which has disappeared. The application of this theory to the great majority of the most important chemical phenomena was obvious, and the Stahlian hypothesis disappeared from the science. A yet more important step was the discovery by Dalton of the laws of chemical combination. His theory was immediately taken up by Berzelius, to whose influence and careful determination of the chemical equivalents of almost all the elements then known, its rapid adoption was mainly due. To Berzelius we owe almost all the modern improvements in the methods of analysis, and to Sir H. Davy the foundation of electro-chemistry. Of late years every branch of the science has advanced, but the most extraordinary progress has been made in organic chemistry. The investigations of chemists have shown that the great majority of the different substances found at the surface of the earth can be broken up into several substances of less complicated nature, which resist all further attempts to decompose them, and appear to consist of only one kind of matter. These substances, by union of which all the different sorts of known matter are built up, are about seventy in number, and are called the chemical elements. When any two or more of these elements are brought in contact, under the proper conditions, they may unite and form chemical compounds of greater or less complexity, in which the constituents are held in union by a form of energy which has received the name of chemical affinity. This affinity is characterized by its acting between dissimilar particles, and producing a new kind of matter, readily distinguishable from either of the substances combining to form it, and which cannot be again separated into its elements by merely mechanical processes.

The properties of chemical compounds may be classified not merely under the head of the particular elements they contain, but also according to their special chemical functions. The advantages of the latter method were early recognized, and the distinction between acids and alkalies dates back to a period long previous to the ascertainment of their true nature. These, and the class of salts which are produced by the mutual action of an acid and a base, are the most important classes of chemical compounds. An acid is now described as a compound containing a certain quantity of hydrogen, easily replaceable by a metal when it comes in contact with it either in the free state or as an oxide.

Bases are compounds which, by reacting on acids, yield salts. The most important bases are oxides of metals, and they are divided into several sections, of which the most important are the alkalies. These substances are the hydrates of the so-called alkaline metals, and may be compared to water in which an atom of hydrogen is replaced by an atom of metal. Most of the bases, excepting the alkalies, are insoluble in water, and without any effect on vegetable colors. Another class of bases of great importance is typified by ammonia.

Sulphides are compounds of the metals with sulphur, and form a very important class of compounds. They are obtained either by heating the metals with sulphur in proper proportions, or by passing a current of hydrosulphuric acid gas through a solution of a salt. They exist abundantly in the mineral kingdom, and form some of the most important ores. Some of the sul-

phides are capable of acting as bases and others as acids, and by combination a class of salts, usually distinguished as sulphur salts, can be obtained. The greater part of the sulphides are insoluble in water, and some of them possess extremely fine colors, and are used as paints.

Organic chemistry is that branch of the science which treats of the compounds existing in plants and animals, or which may be produced from substances found ready formed in their tissues. It was at first believed that these compounds were peculiar in their constitution, quite distinct in their chemical relations, and produced by what was called vital affinity. The discovery by Wöhler, however, that urea could be produced artificially from purely mineral substances entirely altered this view; and since then the artificial production of many organic compounds has practically annulled the distinction between organic and inorganic chemistry except as a matter of convenience. Organic chemistry is now most commonly defined as the chemistry of the carbon compounds, for that element is found in every substance which can be extracted from plants and animals, in combination with hydrogen, oxygen, nitrogen, and less frequently with sulphur and phosphorus. These elements are so combined as in many cases to form compounds of extreme complexity, the constitution of some of which is still a matter of much difference of opinion among chemists; but the constitution of the simpler organic compounds is now thoroughly understood.

CHEMISTS and **DRUGGISTS,** in the United States, retail venders of drugs and various chemical reagents. They are regulated by law and prohibited from indiscriminately selling certain poisons and other drugs that are deemed dangerous or may be used for criminal purposes.

CHEMNITZ (*kem'nits*), the principal manufacturing town in the kingdom of Saxony, on the Chemnitz, 39 miles southwest of Dresden. The principal manufactures are white and printed calicoes, ginghams, handkerchiefs, woolen and half-woolen goods, etc. There are also extensive cotton-spinning mills, and mills for the spinning of combed wool and floss-silk; dye-works, print-works, bleach-works, chemical works; large manufactures of cotton hose, etc. Pop. 206,584.

CHEMULPO (chē-mul'po), one of the new treaty-ports of Korea, exporting beans, ginseng, etc., and importing European and American manufactures.

CHENEY, Charles Edward, an American bishop of the Reformed Episcopal Church, born in New York in 1836. He was ordained in the Protestant Episcopal church and in 1873 he joined the reformed church in Chicago.

CHENG, a Chinese musical instrument, consisting of a series of tubes having free reeds. Its introduction into Europe led to the invention of the accordion, harmonium, and other free-reed instruments.

CHENILLE (she-nil'), a sort of ornamental fabric of cord-like form, made by weaving or twisting together warp-threads, with a transverse filling or weft, the loose ends of which project all round in the form of a pile. Chenille carpets have a weft of chenille, the loose threads of which produce a fine velvety pile.

CHEOPS (kē'ops), the name given by Herodotus to the Egyptian despot whom the Egyptians themselves called Khufu. He belonged to the rulers who had for their capital Memphis; lived about 2800–2700 B.C., and built the largest of the pyramids. According to Herodotus he employed 100,000 men on this work constantly for 20 years.

CHEPHREN (kef'ren), or **CEPHREN,** was the successor of Cheops as king of Egypt, and the builder of the second pyramid. His name is properly Khafra.

CHEQUE, or **CHECK,** a draft or bill on a bank payable on presentation. A check may be drawn payable to the bearer, or to the order of some one named: the first form is transferable without endorsation, and payable to any one who presents it; the second must be endorsed, that is the person in whose favor it is drawn must write his name on the back of it. Checks are a very important species of mercantile currency wherever there is a well-organized system of banking. The regular use of them for all payments, except of small amount, makes the transfer of funds a mere matter of cross-entries and transferring of balances among bankers, and tends greatly to economize the use of the precious metals as a currency.

CHER (shār), a department of Central France, named from the river Cher, and formed from part of the old provinces of Berry and Bourbonnais; area, 2779 square miles; capital, Bourges. Pop. 355,349.

CHERBOURG (shār-bör), a fortified seaport and naval arsenal of France, in the department of La Manche, 196 miles W.N.W. Paris. The fortifications are very extensive, and have been greatly strengthened in recent years, so that Cherbourg, if not impregnable from the sea, is at least very difficult of attack. There is a great digue or breakwater, stretching across the roadstead, which, though protected on three sides by the land, was formerly open to the heavy seas from the north. The digue was commenced under Louis XVI., is 4120 yards long, and is 2¼ miles from the harbor, in water varying from 42 to 62 feet deep. A fort and lighthouse occupy the center of the digue, and there are circular forts at the extremities. The principal industry of the town is centered in the works of the dockyard, the commercial trade and manufactures being comparatively insignificant. William the Conqueror founded a hospital, and built the castle church. The castle, in which Henry II. frequently resided, was one of the strongholds of Normandy. The town was taken by the British in 1758. Pop. 42,952.

CHEROKEES', a tribe of North American Indians occupying an allotted region in the Indian Territory. Their old seats were in Georgia, Alabama, Mississippi, and Tennessee. The Cherokees are the most enlightened of the Indian tribes, have invented an alphabet, printed books and newspapers in their own language, live in well-built villages, and have an excellent school system. Their numbers are about 20,000.

CHEROOT (she-röt'). See Cigar.

CHERRY, a fruit-tree of the prune or plum tribe. It is a native of most temperate countries of the northern hemisphere. The cultivated varieties probably belong to two species. The fruit of the wild cherry, or gean, is often as well flavored, if not quite so large, as that of the cultivated varieties. It is said that this fruit was brought from Cerasus, in Pontus, to Italy, by Lucullus about B.C. 70, and introduced into England by the Romans about A.D. 46. The cherry is used in making the liquors Kirschwasser and Maraschino. The American wild cherry is a fine large tree, the timber of which is much used by cabinet-makers and others, though the fruit is rather astringent.

CHERUB (cher'ub), one of an order of angels variously represented at different times, but generally as winged spirits with a human countenance, and distinguished by their knowledge from the seraphs, whose distinctive quality is love. The first mention of cherubs is in Gen. iii. 24. The cherubs in Ezekiel's vision had each four heads or faces, the hands of a man, and wings. The four

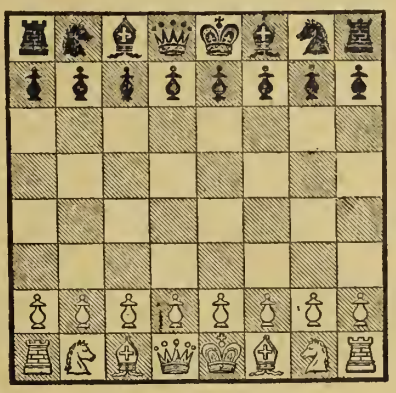
faces were the face of a bull, that of a man, that of a lion, and that of an eagle. (Ezek. iv. and x.) In the celestial hierarchy cherubs are represented as spirits next in order to seraphs.

CHERUBINI (ke-ru-bē'nē), Maria Luigi Carlo Zenobio Salvatore, an eminent Italian composer, born at Florence in 1760. His first opera, Quinto Fabio, was produced in Alcssandria in 1780, and in Rome (in an altered form) in 1783, with such success as to spread his fame over Italy. After visiting London he finally settled in Paris, where he became director of the Ecole Royale in 1822, and died in 1842. Among his compositions are Iphigenia in Aulide, Lodoiska, Faniska, Les Deux Journées, etc. In his later years he confined himself almost exclusively to the composition of sacred music, and gained a lasting fame by his Coronation Mass, and more especially his gorgeous Requiem.

CHES'APEAKE BAY, a spacious bay of North Amcrica, in the states of Virginia and Maryland. Its entrance is between Cape Charles and Cape Henry, 16 miles wide, and it extends 180 miles to the northward. It is from 10 to 30 miles broad, and at most places as much as 9 fathoms deep, affording many commodious harbors and a safe and easy navigation. It receives the Susquehanna, Potomac, and James River.

CHESHIRE (chesh'ir), or **CHESTER,** a maritime county and county palatine of England, bounded by the counties of Lancaster, York, Derby, Stafford, Salop, Denbigh, Flint, the estuaries of the Dee and Mersey, and the Irish Sea. The area is 657,123 acres, of which only a sixteenth is uncultivated. The surface is generally level, the soil mostly a rich reddish loam variously clayey or sandy. There is some of the finest pasture land in England; and cheese, the main produce of the Cheshire farmer, is made in great quantities. Extensive tracts of land are cultivated as market-gardens, the produce being sent to Liverpool, Manchester, and other towns. Minerals abound, especially rock-salt and coal, which are extensively worked. Cotton manufacture is carried on at Stockport, Stalybridge, and the northeastern district, ship-building at Birkenhead and other places. Pop. 814,555.

CHESS, a well-known game of great antiquity and of eastern origin, having probably arisen in India, and thence spread through Persia and Arabia to Europe. The name itself as well as many of the terms used in the game are clearly of eastern origin, the word chess being formed from the old French eschecs, from Persian shâh, a king; rook is from the Sanskrit roka, meaning a ship or chariot; checkmate from Persian shâh mât, the king is dead. The game is played by two persons on a board which consists of sixty-four squares arranged in eight rows of eight squares each, alternately black and white. Each player has sixteen men, eight of which, known as pawns, are of the lowest grade; the other eight, called pieces, are of various grades. They are, on each side, king and queen; two bishops, two knights, and two rooks or castles. The board must be placed so that each player shall have a white square to his right hand. The men are then set upon the two rows of squares next the players; the pieces on the first, the pawns on the second row, leaving between each side four unoccupied rows. The king and queen occupy the central squares facing the corresponding pieces on the opposite side. The queen always occupies her own color, white queen on white square, black on black. The two bishops occupy the squares next the king and queen; the two knights the square next the bishops; the rooks the last or corner squares. The pawns fill indiscriminate-



Chess-board.

ly the squares of the second or front row. The men standing on the king's or queen's side of the board are named respectively king's and queen's men. Thus king's bishop or knight is the bishop or knight on the side of the king. The pawns are named from the pieces in front of which they stand; king's pawn, king's knight's pawn, queen's rook's pawn, etc. The names of the men are contracted as follows:—King, K.; King's Bishop, K.B.; King's Knight, K.Kt.; King's Rook, K.R.; Queen, Q.; Queen's Bishop, Q.B.; Queen's Knight, Q. Kt.; Queen's Rook, Q.R. The pawns are contracted: K.P., Q.P., K.B.P., Q.Kt.P., etc. The board is divided, inversely from the position of each player, into eight rows and eight files. Counting from White's right hand to his left, or from Black's left to his right, each file is named from the picce which occupies its first square, and counting inversely from the position of each player to that of the other, the rows are numbered from 1 to 8. At White's right-hand corner we have thus K.R. square; immediately above this K.R. 2; and so on to K.R. 8, which completes the file; the second file begins with K.Kt. square on the first row, and ends with K.Kt. 8 on the eighth. White's K.R. 8 and K.Kt. 8 are thus Black's K.R. square and K.Kt. square, and the moves of each player are described throughout from his own position, in inverse order to the moves of his opponent.

The definite aim in chess is the reduction to surrender of the opposing king. The K. in chess is supposed to be inviolable, that is, he cannot be taken, he can only be in such a position that if it were any other piece it would be taken. Notice of every direct attack upon him must be given by the adversary saying check, and when the K. is attacked all other plans must be abandoned, and all other men sacrificed, if necessary, to remove him from danger, cover the attack, or capture the assailant. It is also a fundamental rule of the game that the K. cannot be moved into check. When the K. can no longer be defended on being checked by the adversary, either by moving him out of danger, or by interposing, or by capture, the game is lost, and the adversary announces this by saying checkmate. When, by inadvertence or want of skill, the player having the superior force blocks up his opponent's K. so that he cannot move without going into check, and no other man can be moved without exposing him, the player, reduced to this extremity, cannot, without violating the fundamental rule referred to, play at all. In such a case, the one player being unable to play and the other out of turn, the game is considered drawn, that is, concluded without advantage to either player. The laws of the game must be sought in some special manual. Perhaps the best code is that given in Staunton's Chess Praxis.

CHEST, in man and the higher vertebrates, the cavity formed by the breastbone in front and the ribs and backbone at the sides and behind, shut off from the abdomen below by the diaphragm or midriff. It contains the heart, lungs, etc., and the gullet passes through it. See Thorax.

CHESTER, a city in Delaware County, Pa., 14 miles southwest of Philadelphia, on the Delaware River, and on the Baltimore and Ohio, the Pennsylvania, the Philadelphia and Reading railroads. Pop. 39,100.

CHESTER, an English parl., county, and municipal borough, county town of Cheshire, situated on the Dee about 16 miles from Liverpool. It is a bishop's see, and contains an old and interesting cathedral recently restored. Pop. 46,204.

CHESTNUT, a genus of plants, allied to the beech. The common or Spanish chestnut is a stately tree, with large, handsome, serrated, dark-green leaves. The fruit consists of two or more seeds enveloped in a prickly

Chestnut.

husk. Probably a native of Asia Minor. The tree grows freely and may reach the age of many centuries. Its fruit ripens only in some cases, however, and the chestnuts eaten in Britain are mostly imported. Chestnuts form a staple article of food among the peasants of Spain and Italy. The timber of the tree was formerly more in

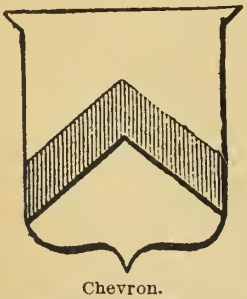
use than it is now; it is inferior to that of the oak, though very similar to it in appearance, especially when old. Two American species of chestnuts, have edible fruits. The former is often regarded as identical with the European tree.—The horse-chestnut is quite a different tree from the common chestnut.

CHETAH (chē'ta), or hunting leopard of India, a native of Arabia and Asia Minor. It has its specific name from a short mane-like crest at the back of the head. When used for hunting it is hooded and placed in a car. When a herd of deer is seen, its keeper places its head in the proper direction and removes its hood. It slips from the car, and, approaching its prey in a stealthy manner, springs on it with several bounds. It is about the size of a large greyhound, has a cat-like head, but a body more like a dog's. A slightly different species inhabits Africa.

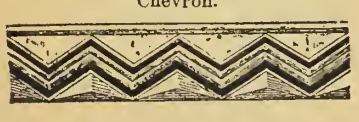
CHEVALIER (shē-vâ-lyā), Michel, a celebrated economist, born at Limoges in France, Jan. 13, 1806. He was educated as an engineer in the School of Mines. M. Chevalier was sent to the United States and to England on special missions. He became a councilor of state (1838), professor of political economy in the Collège de France (1840), member of the chamber of deputies (1846), and member of the Institute (1851). He was known as a strong advocate of free-trade, and as a specialist on questions of currency. Along with Cobden and Bright he had a great part in the commercial treaty of 1860 between France and Britain. He died in 1879.

CHEVIOT SHEEP, a variety of sheep, noted for their large carcass and valuable wool, which qualities, combined with a hardiness second only to that of the black-faced breed, constitute them the most valuable race of mountain sheep. The fleece weighs from 3 to 4 lbs., and the carcass of ewes varies from 12 to 16 lbs. per quarter, that of wethers from 16 to 20 lbs.

CHEV'RON, a heraldic and ornamental form, variously used. In heraldry, the chevron is an ordinary



Chevron.



Chevron molding.

supposed to represent two rafters meeting at top. It is one of charges called honorable ordinaries, and is usually placed as shown in the accompanying cut. A similar form is used for the distinguishing badge worn on the arm of a non-commissioned officer in the British army. In architecture, the chevron molding consists of a variety of fret ornament of a zigzag form, common in Norman architecture.

CHEWING-GUM, a substance, insoluble in saliva, used for continuous exercise of the jaws. It is usually manufactured of paraffin, tolu balsam, and certain resins, sweetened and flavored. The habit is general throughout the United States, men and women indulging freely in it. The chewing of gum is believed to have a beneficial effect upon the digestion.

CHEYENNE (shī-yen'), the capital of the state of Wyoming, on the Union Pacific Railway, where it is joined by the Denver Pacific; a rising place. Pop. 17,640.—The river Cheyenne, or Big Cheyenne, a tributary of the Missouri, is formed by two branches, the N. Fork and the S. Fork, which rise in this state, and have the Black Hills between them, each about 300 miles long, the Big Cheyenne being 150 more.

CHIAPAS (chi-ä'pàs), a state of Mexico on the Pacific coast, area 16,048 square miles. It is in many parts mountainous, is intersected by the river Chiapas, and covered with immense forests. Capital, Tuxtla-Gutierrez. Pop. 363,607.

CHICA (chē'kâ), a red coloring matter which the Indians on the upper parts of the Orinoco and the Rio Negro prepare from the leaves of a plant native to that region called Bignonia Chica, and with which they paint their skin, in order to be better able to resist the rays of the sun. See Bignonia.

CHICA (chē'kâ), a kind of beer made from maize, in general use in Chile, Peru, and elsewhere in the mountainous regions of South America. The usual method of preparing it is to steep the maize till it begins to grow, when it is exposed to dry in the sun. The malt thus prepared is then ground, mixed with warm water, and left to ferment. The beer, when ready, has a dark-yellow color. and a pleasant and somewhat bitter and sour taste, and is very intoxicating. Sometimes the Indians instead of grinding the malt chew it, and this variety of the liquor is considered the best. It is the national drink of the Indians, and consumed by them in great quantities. Pito and poso are other names for it.

CHICAGO, the second city of the United States in population and commercial and manufacturing importance. It is the metropolis of the west, the largest railroad center in the country, and the head of navigation of the great lakes. Situated on the southwest shore of Lake Michigan, it lies 910 miles from New York, 810 miles from Washington, 910 miles from New Orleans, and 2400 from San Francisco, and has an area of 191 square miles. The city is naturally cut into three divisions, or "sides," the north, the south, and the west sides, by the Chicago River, and its north and south forks. The entire site of Chicago is very flat, its highest point being but a few feet above the level of Lake Michigan. The population is estimated at 2,500,000.

The plan upon which Chicago is laid out was a wise provision of the makers of the city, who had an eye to its future growth. Its park and boulevard system is unsurpassed by any city in the world. Of parks there are over 2600 acres, the chief being Lincoln Park, with many monuments, Jackson Park, and the newly prospected Grant Park, on the lake front before the main part of the town. Of boulevards, which connect the parks into a system, there are 65 miles of magnificent driveways. The business center is comparatively small, occupying an area less than a mile square, bounded on the e. by the lake and n. and w. by Chicago river. Here are situated most of the great railway dépôts, the post-office, the court-house, the board of trade building and custom-house, the Art Institute, the principal stores, banks, theaters, and hotels, the lofty structures that are the chief architectural features of the city. The shipping business is transacted along the river and the canal, the former having a frontage, including docks, of 41 miles. The livestock and meat industry is carried on at the Union stock-yards, extending from Thirty-ninth Street to Forty-seventh Street, in the geographical center of the city. The value of the products in 1908 was about $300,000,000.

After several years' agitation and discussion a plan for the construction of a new waterway, 160 feet wide and at least 16 feet deep, from the Chicago river to the Desplaines, and so on to Joliet, was adopted, and the work was begun in 1891. On Jan. 2, 1900, this great canal was opened, the cost to that date having been $33,525,700. The city is supplied with water from Lake Michigan. Pure water is obtained at "cribs" located from 2 to 4 miles from the shore, and is conveyed thence to the city through five tunnels under the lake. It is distributed by ten pumping works capable of supplying the city with 532,000,000 gals. daily. The cost of the system was $30,000,000.

The Chicago river is spanned by fifty-four swinging bridges, of from 200 to 250 feet in length, operated by steam. By the elevation of 260 miles of railway tracks and the construction of 254 subways, dangerous grade crossings have been eliminated. Among the public buildings the new post-office and custom house, by Henry Ives Cobb, recently finished, is by far the most picturesque. A new county building has recently been erected and a new city hall is in prospect.

Chicago is the center of twenty-five railroads, has 1500 miles of track, seven depots, and handles 275 through and 800 local trains per day. It has a lake tonnage of 12,600,000, and 450 miles of street railroad of which 50 are elevated.

The Public Library is the largest in the Northwest, containing over 260,000 volumes. It was established in 1873, and is supported by city taxation. It is housed in a magnificent fireproof building on Michigan avenue. It is a free circulating library, with reading and reference rooms. The Newberry Library is named after its founder, Walter L. Newberry, who left in his will for its esablishment property from which has been realized over $2,500,000. It occupies a handsome building facing

Washington Place, on the north side. The library is for reference only, and over 200,000 volumes, many of them rare and costly, have been collected. The Chicago Law Institute has a fine law library in the county building. The Crerar Library, with an endowment of over $2,000,000 from John Crerar, is to be located on the south side, and, in accordance with the founder's will, must be kept free from sensational and skeptical works.

The city is governed by a mayor, who receives a salary of $7,000; and a common council, composed of 70 aldermen, whose terms are two years, each of the thirty-five wards into which the city is divided electing one each year.

The manufacturing industries of Chicago are second in magnitude only to those of New York city and are growing rapidly. The total value of manufactures for 1908 was 1,000,000,000. The receipts of grain, and flour in its grain equivalent, aggregate about 350,000,000 bushels yearly.

The principal hotels in the heart of the city are the Auditorium and its Annex, the Great Northern, the Palmer House, the Grand Pacific, the Wellington, the Victoria, Sherman, and the Tremont House; the Virginia, the Metropole, the Lexington, and in course of erection the Blackstone and LaSalle. The "downtown" theaters, with the Auditorium, are Orchestra Hall, McVicker's, the Illinois, Chicago, Garrick, the Grand, Whitney, Powers, the Great Northern, Studebaker, Olympic, Majestic, Colonial, Coliseum, the LaSalle, Princess, and American Music Hall.

Chicago was founded in 1803 with the establishment of Fort Dearborn on the site of the present city. The first village was laid out in 1830, the town was incorporated in 1833, and the city in 1837. On Oct. 8, 1871, the great fire began which in two days virtually wiped out the city. The losses were about $190,000,000 in property but only a few lives were lost.

CHICAGO, UNIVERSITY OF, founded by John D. Rockefeller, in 1889 and situated on the Midway Plaisance in Chicago. It has a productive fund of about $15,000,000, and an annual outlay of over $1,000,000. The libraries contain nearly 400,000 volumes, and the registration is about 3000 students. The university offers all degrees except for mechanical and civil engineering, its doctorate of philosophy covering the sciences. It has law, medical, and theological departments and a quadrangle devoted to the biological sciences which cost $1,000,000 to found. It has ten periodical publications, a faculty of 400 instructors, a school of education, and an academic department. Much of the revenue of the university is derived from its real estate, of which it owns nearly a solid mile fronting the Midway Plaisance.

CHICK'ADEE, the popular name in America of the black-cap titmouse and other allied species, being given from their note.

CHICKAHOM'INY, a river in Virginia, rising about 20 miles n.w. of Richmond, flowing s.e. till it joins the James river. Near this river many important battles during the civil war took place—the battle of Williamsburg, of the Seven Pines, of Gaines's Mill, etc.

CHICKAMAU'GA, a small tributary of the Tennessee river, state of Tennessee, U. States, where a battle took place Sept. 19–20, 1863, between the Federal troops under Rosecrans and the Confederates under Bragg and Longstreet, the latter gaining the victory.

CHICKAMAUGA NATIONAL PARK, a military park on the site of the Battle of Chickamauga, near Chattanooga on the Georgia-Tennessee line. It has an area of 15 sq. miles and is laid out as nearly as possible to conform to the state of affairs at the time of the battle itself. The park was dedicated Sept., 1895, since which time a number of fine monuments have been erected in it by the different states. The cost of the improvements was upward of $1,000,000, three-fourths of which was appropriated by Congress, the remainder by the separate states.

CHICK'ASAW INDIANS, a tribe of American Indians of the Appalachian nation. In 1833 they gave up to the United States the last of their lands south of the Tennessee river, receiving as compensation a money indemnity and new lands on the left bank of the Red river, in the Indian Territory. The Chickasaws number about 8000. They have made considerable advances toward civilization, have a senate, house of representatives, and more than a million dollars in deposit with the Union government.

CHICKEN-BREASTED, having that form of breast, resulting from malformation or from carious disease or spinal weakness, in which the vertebral column is curved forward, giving rise to projection of the sternum or breast-bone.

CHICKEN-POX, an infectious disease mainly confined to children. It commences with feverishness, and an eruption of pimples, which speedily become blebs filled with clear fluid and as large as split-peas. Within a week these dry up into dark-colored scabs, which within another week have fallen off. The disease is never fatal, and has no evil results. A little opening medicine and a mild diet is all the treatment requires.

CHICK'ERING, Jonas, born 1737, a self-taught piano maker of Boston, who eventually established the largest piano manufactory in the U. States. He was greatly esteemed for his public spirit and benevolence. He died 1853.

CHICK'WEED, the popular name of one of the most common weeds. It has a procumbent more or less hairy stem, with ovate pointed leaves, and many small white flowers. It is much used for feeding cage-birds, which are very fond both of its leaves and reeds.

CHIC'OPEE, a city in Hampden Co., Mass., three miles north of Springfield, on the east side of the Connecticut river, at the mouth of the Chicopee, and on the Boston and Maine Railroad. Pop. 19,167.

CHIC'ORY, a genus of composite plants. The leaves are sometimes blanched, to be used as salad. But the most important part of the plant is its long, fleshy, and milky root, which when roasted and ground is now extensively used for mixing with coffee. Its presence among coffee may easily be detected by putting a spoonful of the mixture into a glass of clear cold water,

Chicory.

when the coffee will float on the surface, and the chicory separate and discolor the water as it subsides.

CHIEF-JUSTICE, the presiding judge of a judicial body. In England the chief justice is the superior judge of the king's bench and of the court of common pleas. In the U. States he is the presiding judge of the United States Supreme Court—of a state supreme court. The chief justice of the Federal Supreme Court administers the oath of office to the president.

CHIGNON (shēn-yōn), a French word, properly signifying the nape of the neck, now used in English and other languages to denote ladies' back hair when raised and folded up, usually round a pad, in a sort of roll on the back part of the head.

CHIH-LE (chi-lē'), or **PE-CHI-LE,** one of the northern provinces of China, watered by the Pei-ho, containing Peking, the imperial capital. Area about 59,000 sq. miles; pop. 18,000,000.

CHIHUAHUA (chē-wā'wā), a city, Mexican Confederation, capital of the state of the same name, generally well built, and supplied with water by a notable aqueduct. It is surrounded by silver mines, and is an important entrepôt of trade. Pop. about 18,279.—The state is bounded on the n. by the U. States, and on the n.e. by the Rio Grande del Norte; has a healthy climate, and is rich in silver mines. Pop. 327,004.

CHIL'BLAINS are painful inflammatory swellings, of a deep purple or leaden color, to which the fingers, toes, heels, and other extreme parts of the body are subject on being exposed to a severe degree of cold. The pain is not constant, but rather pungent and shooting at particular times, and an insupportable itching attends it. It some instances the skin remains entire, but in others it breaks and discharges a thin fluid. Compound camphor liniment is a useful application, and the parts should be kept warm.

CHILDBIRTH. See Birth.

CHILD LABOR, the employment of children under the age provided by law at which children are allowed to work. Child labor is one of the most distressing problems of social life. Although the

law forbids it, yet poverty compels it, and both employers and employed thus conspire to defeat the laws which, in most states, in virtually all, are really a dead letter. Very young children are employed in mines, offices, stores, factories of many kinds, and, in a word, in all trades or occupations in which they can be used. Disease, stunted growth, defectiveness, moral ruin and general vitiation are some of the results. Before this great wrong society stands avowedly helpless.

CHILDREN, SOCIETIES FOR THE BENEFIT OF, associations to care for homeless children, to prevent cruelty to (see Bergh, Henry), to encourage the industry of children, and to relieve diseased or crippled children. In the U. States vast sums of wealth are devoted to these various designs.

CHILDS, George William, an American philanthropist and journalist, born in Baltimore in 1829, died in 1894. In 1864 he purchased the Philadelphia Public Ledger and soon became quite rich. His gifts to charity and education were exceedingly large.

CHILI, or **CHILE** (chē'lē, chē'lā), a country of S. America, extending along the Pacific coast from lat. 18° s. nearly to Cape Horn, and including Chiloé and many other islands and part of Tierra del Fuego. It is bounded on the n. by Peru (the river Sama being the boundary), on the n.e. and e. by Bolivia and the Argentine Republic, from which it is separated by the chief range of the Cordilleras. Its length from n. to s. is about 2400 miles; its breadth, on an average 120 miles; area, 293,310 sq. miles, divided into a number of provinces and territories; pop. 3,110,085. By the war with Peru and Bolivia which terminated in 1882 Chili gained all the sea-board of Bolivia, and annexed also the Peruvian provinces of Tarapaca and Tacna. The chief towns are Santiago or St. Jago (the capital) and Valparaiso. The rivers are numerous, but small, and have generally rapid currents. The surface is greatly diversified, but rises in elevation as it recedes from the coast and approaches the Andes, along the watershed of which great part of the boundary runs. Some of the summits here rise to 20,000 feet or more, but the elevation decreases toward the south. Chiloé and numerous other islands fringe the coast in the south. Earthquakes are common, those of 1822, 1835, and 1868 being particularly violent. In the Chilian Andes there are twenty volcanoes at least, three of which (Antuco, Villarcia, and Osorno) are still active. The climate is remarkably salubrious. In the northern provinces it rarely rains—in some parts perhaps never; in the central parts rain is sufficiently abundant, while in the extreme south there is even an excess of moisture. Among the minerals of Chili are gold, silver, copper, lead, iron, zinc, antimony, manganese, arsenic, tin, sulphur, alum, salt, and cubic nitre. Silver and copper are the two most important metals. The copper mines are most numerous in the northern districts. The cubic niter, or Chili saltpeter, is a great source of wealth. Coal is mined at several places. From the 29th degree of latitude southward green valleys and fertile tracts appear, the character of the vegetation getting always richer, till in the southern provinces we find the sides of the Andes clothed with forests and with herbaceous plants and flowers of the richest and most beautiful hues. In some of the northern districts maize is cultivated; in the southern districts wheat and barley are the chief agricultural products. Fruits are abundant — apples, pears, apricots, peaches, figs, grapes, oranges, water-melons, etc. The wild animals include the guanaco, puma, or

Costumes of the environs of Santiago.

American lion, the chinchilla, coypu, deer, etc. Cattle are raised in great numbers, from 4000 to 20,000 being sometimes reared on one farm. The manufactures are of little importance. Mineral products form five-sixths of the total exports, the principal article being cubic niter (or Chili saltpeter) next come copper, iodine, wheat, silver, etc.

Chili is a republic, and is considered the best regulated in S. America. It is under a president elected for five years and a council of state. The legislature is composed of a senate elected for six years, and a house of deputies elected for three years. The army numbers about 6000 men; the chief vessels of the navy are three iron-clads and five protected cruisers. The Chilians are mostly of Spanish or Indian descent.

Chili originally belonged to the Incas of Peru, from whom it was wrested by the Spaniards under Pizarro and Almagro in 1535. From this period Chili continued a colony of Spain till 1810, when a revolution commenced, which terminated in 1817 in the independence of Chili. Several internal commotions have since occurred; but the country has been free from these compared with other S. American states. A war begun with Spain in 1865 led to the blockade of the coast by the Spanish fleet, and the bombardment of Valparaiso in 1866. In 1879–81 a war was successfully waged with Bolivia and Peru, in reference to the rights of Chili in the mineral district of Atacama. In 1891 an insurrection arose against President Balmaceda's administration, a movement which resulted in his overthrow and suicide. Since which time the country has been prosperous and peaceful.

The earthquakes in Chili are very severe. The last one of importance occurred on Aug. 5, 1906, and continued for several days. More than 500 people were killed and a property loss of $8,000,000 was sustained, none of which was insured.

CHILLED IRON, iron cast in metal molds called chills, where, on account of the rapid conducting of the heat, the iron cools more quickly on the surface than it would do if cast in sand. Chilled iron is whiter and has a harder surface than iron cast in any other way.

CHILLICOTHE (-koth'e), a town in Ohio, on the west bank of the Scioto, with manufacturing and other industries. Pop. 15,488.

CHILTERN HILLS, a range of flint and chalk hills, England, extending through Oxford, Hertford, and Buckingham shires, loftiest summit 905 feet. These hills were anciently covered with forests, and were infested by numerous bands of robbers. To protect the inhabitants of the neighboring districts an officer was appointed by the crown, called the Steward of the Chiltern Hundreds, and although the duties and emoluments have long ceased the office still exists, and is made use of to afford members of the House of Commons (who cannot give up their seats directly) an opportunity of resigning their seats when they desire to do so. Being regarded as an appointment of honor and profit under government, the acceptance of it disqualifies a member from retaining his seat

CHIMÆRA (ki-mē'ra), in class. myth. a fire-breathing monster, the foreparts of whose body were those of a lion, the middle of a goat, and the hinder of a dragon. Thus the name came to be used for an unnatural production of the fancy.

CHIMES, a species of music, mechanically produced by the strokes of hammers against a series of bells, tuned agreeably to a given musical scale. The hammers are lifted by levers acted upon by metallic pins, or wooden pegs, stuck into a large barrel, which is made to revolve by clock-work, and is so connected with the striking part of the clock mechanism that it is set in motion by it at certain intervals of time, usually every hour, or every quarter of an hour. The chime mechanism is sometimes so constructed that it may be played like a piano.

CHIM'NEY, an erection generally of stone or brick containing a passage by which the smoke of a fire or furnace escapes to the open air. In this sense the first chimneys we hear of are no earlier than the middle ages. The longer a chimney is the more perfect is its draught, provided the fire is great enough to heat the column of air in it, because the tendency of the smoke to draw upward is in proportion to the difference of weight between the heated air in a chimney and an equal column of external air.

CHIMNEY-SWALLOW. See Swallow.

CHIMPAN'ZEE, the native Guinea name of a large West and Central African ape belonging to the anthropoid or man-like monkeys, and to the same genus as the gorilla. When full grown it is sometimes about 5 feet high, with black hair, and is not so large and powerful as the gorilla. Like the orang it has

the hair on its forearm turned backward, but differs from it in having an additional dorsal vertebra and a thirteenth pair of ribs. It walks erect better than most of the apes. It feeds on

Chimpanzee.

fruits, often robs the gardens of the natives, and constructs a sort of nest among the branches. It is common in menageries, where it shows much intelligence and docility.

CHINA, an immense empire stretching from the center of Asia, about 75° e. lon., for 3000 miles to the east coast of Corea, in 128° e. lon.; and from the Siberian frontier at the river Amoor, about 50° 30′ n. lat., for 2400 miles southward to the island of Hainan. This vast empire, second in magnitude only to that of Russia and Great Britain, has an area of about 4,500,000 sq. miles, and a population variously estimated at 300,000,000 and 400,000,000, or more, and is usually divided into China Proper, and the dependencies: Manchuria, Mongolia, Eastern Turkestan, Dzoungaria, and Tibet, of which Tibet is practically autonomous. The dependencies, though they cover more than 3,000,000 sq. miles, contain but a small and relatively unimportant part of the

Chinese mandarin, lady, boy, female attendant, soldier, and bird's-nest seller.

population (about 30,000,000), China Proper being the center of power and population.

Great part of the country is not well known. The coast-line forms an irregular curve of about 2500 miles. The inland boundaries are formed mainly by Tonquin, Burmah, Tibet, and, on the north, partly by the Great Wall separating China from Mongolia, one of the most remarkable of human structures, being an artificial barrier 1500 miles long. Two thirds of the interior are estimated to be mountainous. The general slope is from west to east, and the mountains are a continuation of those of Tibet and Central Asia. The great Kuen-lun range throws off branches, the Tsing-Ling, Fu-niu-shan and Mu-ling, which, running eastward between the great valleys of the Hoang-Ho and Yang-tse-kiang, traverse almost the whole breadth of China. Further north the Nan-shan branch of the Kuen-lun range runs under various names (Kuliang, Alashan, Inshan, etc.) along the northeast of China till it reaches the frontier of Manchuria, north of Peking. The third great mountain system of China is in the southeast, where extensive chains such as the Nanshan, the Ta-yu-ling, and Pu-ling stretch on the south side of the Yang-tse-kiang all the way form the highlands of Yunnan to the eastern sea-board. The two great rivers of China are the Hoang-ho and the Yang-tse-kiang. Here lie the central and richest provinces of China. On both sides of the lower Hoang-ho is an immense delta plain, consisting generally of a deep alluvial soil of unparalleled fertility. As they approach the sea-coast the two rivers are connected by the Grand Canal, 700 miles in length, thus completing a magnificent system of inland navigation.

The greater part of China belongs to the temperate zone, but it has what is called an excessive climate. At Peking in summer the heat ranges from 90° to 100° in the shade, while the winter is so cold that the rivers are usually frozen from December to March. At Shanghai, lat. 31° 20′, the maximum temperature reaches 100°, and the minimum falls at least to 20° below freezing point (12° Fahr.). In the south the climate is of a tropical character, the summer heat rising to 120°. Here the southwest and northeast monsoons blow with great regularity, and divide the year between them.

China is well supplied with minerals, including gold, silver, copper, iron, and other metals, and there are very extensive coal-fields, though the quantity raised from them is comparatively small. Salt is abundant, and there are inexhaustible beds of kaolin, or porcelain earth. Among animals it is difficult to mention any that are characteristic of the country; many of them are identical with or differ but little from those of Europe. Among birds the most beautiful are the gold and silver pheasants. Fish swarm in all inland waters as well as on the coast, the natural supply being immensely increased by artificial means. As regards the flora of China, it is tropical in the south (coco and sago palms, banana, pandanus, etc.), sub-tropical farther north, and still farther north prevails a number of plants and trees identical with or closely akin to those of middle Europe. Flowering plants, shrubs, and trees are so exceedingly abundant as to form a feature. The bamboo, from the immense number of uses to which it is put, is one of the most valuable trees. Oaks, the chestnut, hazel, pines, yew, walnut, etc., are among forest trees. Wax and camphor trees abound. Azaleas are exceedingly numerous; other flowering plants are the camellia rose, passion-flower, cactus, lagerstrœmia, etc. Fruits are abundant and varied. Rice, as the principal food of the people, is the staple crop. Three plants of the greatest economical importance to China are the mulberry, cultivated to provide food for silkworms, cotton, and tea, the last for long regarded as exclusively a Chinese product. Another important crop is the opium poppy, which is extensively grown, though the product is inferior to that of India.

Among the chief industries is the silk manufacture, which produces some varieties of stuffs unsurpassed anywhere. The porcelain of China has been famous from the earliest periods, and the manufacture of the finest forms of it was long known to the Chinese alone, though their productions are now surpassed by those of Europe. Paper is made of a great variety of substances, and the art of making it—like various others—was practiced in China long before Europe acquired it.

The inland trade of China, aided by its vast system of water communication, is of incalculable magnitude, the rivers and canals literally swarming with junks, barges, and boats of all sizes. The chief of ports are: Shanghai (by far the first), Canton, Hankow, Swatow, Tientsin, Ningpo, and Foo-chow. The main articles of export are tea and raw and manufactured silk; the main imports, cotton goods, opium, metals and metal goods. The total exports and imports have increased considerably in recent years. The chief article of export is tea. The quantity of opium imported, almost wholly from India, reaches the value of $30,000,000 annually. Silver bullion, called sycee, and gold bullion, usually stamped with the name of the banker and the year and district in which it is cast, are used in larger transactions.

The Chinese belong to the Mongolian race, but in them its harsher features, as represented in the genuine Tartars, are considerably softened. They are generally of low stature, have small hands and feet (the last artificially made so small in the females as to become a

deformity), a dark complexion, a wide forehead, black hair, eyes and eyebrows obliquely turned upward at the outer extremities. They are strongly attached to their homes, hold age in respect, toil hard for the support of their families, and in the interior, where the worst kind of foreign intercourse has not debased them, exhibit an unsophisticated simplicity of manners which recalls the age of the patriarchs. The Chinese use great politeness in their intercourse with each other. They scrupulously avoid all contradiction and offensive expressions in conversation. Drunkenness has hitherto been rare among them, but the habit of opium-smoking has much extended of late. Hard work, done in the most uncomplaining way, has become second nature with them. Filial piety is also a striking feature of their character, and is, in fact, the principle upon which Chinese society is constituted. They have chambers set apart for the worship of their ancestors, where religious ceremonies are regularly performed.

The Chinese is the most important and most widely spread of the so-called monosyllabic languages of eastern Asia, in which each word is uttered by a single movement of the organs of speech. There is no alphabet, each word being represented by a single symbol or character. The chief religions in China are Confucianism, Taouism, and Buddhism, the last introduced subsequently to the others. In the western parts Mohammedanism has many followers.

Government, Administration, etc.—The government is an absolute despotism. The reigning dynasty is of Manchu-Tartar blood. The monarch unites in his person the attributes of supreme magistrate and sovereign pontiff, and as the "Son of Heaven" is in theory accountable only to heaven. Four principal ministers, two of whom are Manchus and two Chinese, form, along with two assistants, the inner council of state. The Chinese army is said to number 300,000 men on a peace footing, and 1,000,000 on a war footing, but only a small proportion of these are of any value for actual service, the great bulk of the men having received no proper military training or discipline and being equipped only with obsolete weapons. The navy consists of two fleets—one for rivers and another for sea; but though it numbers many vessels it is not very efficient, and is scarcely able to clear the Chinese coast from the pirates who infest the creeks and islets.

The early history of the Chinese is shrouded in fable, but it is certain that civilization had advanced much among them when it was only beginning to dawn on the nations of Europe. The Chow dynasty, which was founded by Woo-wang, and lasted from about 1100 B.C. to 258 B.C., is perhaps the earliest that can be regarded as historic, and even of it not much more is historic than the name. The present reigning house is of Manchu origin. European relations with the Chinese began in 1596 and European interference has gone on uninterruptedly ever since. The Chinese are refractive to European civilization and have resisted intercourse persistently. In spite of this, however, every European nation of importance has secured a foothold in China. In 1850 began the great Tai Ping rebellion against the government. In 1894–5 was fought the Japanese-Chinese war resulting in the defeat of China, the payment of an indemnity and the relinquishment of Formosa to Japan. In 1900 an anti-foreign movement broke out in north China, mainly instigated, it would seem, by a secret nationalist society, whose members are known to Europeans as the Boxers. Native Christians and European and other missionaries were murdered; and for a time the members of the legations in Peking were isolated and in danger of being massacred. An international relief force, however, succeeded in effecting their rescue.. Tsi-Au, the empress dowager, died in November, 1908, the emperor was poisoned and another infant, Pu-Yi ascended the throne.

CHINA ASTER, the common name of a composite plant, hardy and free flowering. See Asters.

CHINA GRASS, a plant of the nettle family, a native of southern and eastern Asia and the Asiatic islands, and now more or less cultivated in many other countries, such as southern France, Algeria, Natal, Mauritius, Australia, the U. States, Mexico, Jamaica, etc. It yields a fiber which possesses most valuable properties, and has long been made in China into a beautiful cloth, and is probably destined to play a much more important part as a textile material. It is very strong, presents unusual resistance to the effects of moisture, and is fine and silky in appearance. With wool, hemp, cotton, and flax it is believed that it may successfully compete, but its full capabilities are hardly as yet known, though it is long since trials have been made with it as a subject of manufacture.

CHINA, GREAT WALL OF, the largest artificial structure on the face of the earth, a barrier extending for about 1500 miles in the north of China proper, of which it partly forms the boundary. Its western end is in the deserts of central Asia, its eastern reaches the sea to the north-eastward of Peking. It was erected as a barrier against the inroads of the barbarous tribes, and dates from about 214 B.C. It is carried over height and hollow, and avoids no inequality of the ground, reaching in one place the height of over 5000 ft. above the sea. Earth, gravel, brick, and stone were used in its construction, and in some places it is much more substantial than in others. Its greatest height, including the parapet on its top, is about 50 feet, and it is strengthened by towers at regular distances.

CHINA INK, a black solid, which, when rubbed down with water, forms a very pure black indclible ink. It has been used in China from time immemorial. There are different accounts of the process, but it appears to be made by boiling the juices of certain plants with water to a syrup, adding to this a quantity of gelatine, and then thoroughly incorporating the carbonaceous matter. There is generally added some perfume —a little musk or camphor. The mass is then made into square columns of different sizes, which are often decorated with figures and Chinese characters. Many attempts have been made to imitate Chinese ink, some of which have been tolerably successful. Good Chinese ink should have a velvety-black appearance, with a gloss which becomes very conspicuous on rubbing. The color it gives on paper should be pure black and homogeneous, and if water be passed over it it should not run or become streaky. It is indelible by ordinary solvents, but may be removed sometimes mechanically.

CHINA ROSE, the name given to a number of varieties of garden rose.

CHINA SEA, that part of the North Pacific Ocean bounded n. by Formosa, n.w. by China, w. by Anam and the Malay Peninsula, s.e. by Borneo, and e. by the Philippines. It contains numerous islands, receives several considerable rivers, and forms the important Gulfs of Siam and Tonquin.

CHINA-WARE, porcelain, the finest and most beautiful of all the kinds of earthenware, so called from China being the country which first supplied it to Europeans. The Chinese are said to have manufactured porcelain previous to the Christian era, but it was not till five or six centuries later that they attained any great perfection in the art. Japan also appears to have been early acquainted with the manufacture. In the beginning of the 16th century the ware was first introduced into Europe, and won immediate popularity by its beauty and novelty. For long it was thought impossible to fabricate anything similar in Europe, but at length John Frederick Böttcher or Böttiger, a native of Saxony who had long devoted himself to alchemy, discovered a means of producing a porcelain equal in whiteness to that of China. This led to the establishment by the government of the far-famed porcelain manufactory at Meissen, near Dresden. The Saxon porcelain soon became celebrated over Europe, and rivalled that of China in the excellence of its quality, and the beauty of its decorations. Subsequently porcelain works were established at Vienna, Munich and elsewhere in Germany. In France also about the middle of the 18th century the celebrated factory at Sèvres was set up and soon acquired a great renown. The first successful attempt in England to manufacture porcelain was made by some Germans, who established a factory at Chelsea, from which, in 1748, it was transferred to Derby. About twenty years afterward the valuable discovery in Cornwall of an excellent species of clay contributed greatly to improve the quality of English porcelain, which now began to be largely manufactured in Staffordshire under the auspices of the celebrated Josiah Wedgwood. China-ware, when broken, presents a granular surface, with a texture compact, dense, firm, hard, vitreous, and durable. It is semi-transparent, with a covering of, white glass, clear, smooth, unaffected by all acids excepting the hydrofluoric, and resisting uninjured sudden changes of temperature. For the process of manufacture see Pottery.

CHINA WAX, a sort of wax deposited by insects on a deciduous tree with light-green ovate, serrated leaves, cultivated in the province of Si-chuen (Ssu-chuan) in south-western China. The insects, a species of Coccus, are bred in galls which are formed on a different tree, an evergreen (a species of Ligustrum or privet), and these galls are transported in great quantities to the districts where the wax trees are grown, to the branches of which they are suspended. Having emerged from the galls the insects spread themselves over the branches, which gradually become coated with a white waxy substance, reaching in 90 or 100 days the thicknes of a quarter of an inch. The branches are then lopped off and the wax removed. It is white in color and is chiefly made into candles; it melts at 160° whereas tallow melts at about 95°.

CHINCH, the popular name of certain fetid American insects, resembling the bed-bug, very destructive to wheat, maize, etc., in the southern and western states. Also applied to the common bed-bug.

CHINCHIL'LA, a genus of S. American herbivorous rodents very closely allied to the rabbit, which they resemble in the general shape of the body, in the limbs being longer behind than before, in the conformation of the rootless molars, and by the nature of the fur, which is more wooly than silky; but differing from the rabbit in the number of their incisors and molars, in a greater length of tail, and also in having broader and more rounded ears. One species about 15 inches long, is covered with a beautiful pearly-gray fur, which is highly esteemed as stuff for muffs, pelisses, linings, etc. The chinchilla

Chinchilla.

lives gregariously in the mountains of most parts of S. America, and makes numerous and very deep burrows. It is of a gentle nature, very sportive, losing none of its gaiety in captivity, and very cleanly.

CHINCHONA (chin-chō'nȧ). See Cinchona.

CHINESE EDIBLE DOG, a small dog, in form somewhat like a greyhound, reared by the Chinese to be used as an article of food.

CHINESE IMMIGRATION, a political question in the U. States, arising from a fear that American labor would be injured by imported labor from China. In 1882 the Chinese exclusion act was passed by congress and has been continued in force ever since. By its provision all Chinese are excluded except those who are certified not to be laborers. In 1900 there were 89,863 Chinese in the U. States.

CHINESE LANTERN, a lantern made of thin paper, usually variously colored and much used in illuminations.

CHINESE WHITE, oxide of zinc used in the arts instead of white lead. It is valuable principally as a color.

CHING'LEPUT (ching'gl-put), or **CHENGALPAT,** a coast district, and its capital, Hindustan, presidency Madras. The district, which lies s. of Arcot and Madras—area, about 2842 sq. miles. Pop. 1,136,928.

CHINIQUY, Charles Pascal Telesphore, a Canadian clergyman, born in Quebec in 1809, died in 1899. He took part in the temperance crusade of 1846 and in 1851 established a Roman Catholic colony at Kankakee, Ill. He published Fifty Years in the Church of Rome.

CHIN-KIANG, or **TCHANG-KIANG,** a city, China, province of Kiangsu. Pop. 135,000.

CHINOOK, a dialect consisting of English, Chinook and other Indian tongues, used largely as a trade language on the Pacific coast.

CHINTZ, cotton cloth or calico printed with flowers or other devices in various colors and now generally glazed. Originally a manufacture of the East Indies it is now largely manufactured in Europe.

CHIP'MUNK, CHIP'MUCK, the popular name in America of the ground-squirrel.

Chipmunk.

CHIPPEWAYS (chip'e-wāz), or **OJIBBEWAYS,** a tribe of N. American Indians, U. States and Canada. They are distributed in bands round both sides of the basin of Lake Superior, where they once owned vast tracts. They are of the Algonquin stock, tall, active, and well formed, subsist chiefly by hunting and fishing, and number about 18,000.

CHIPPING SPARROW, a common N. American bird, some five or six inches long.

CHIRAGRA (kī-rag'ra), that species of gout which attacks the joints of the hand (the wrist and knuckles) and hinders their motions. It gradually bends, distorts, and finally stiffens the fingers.

CHIROMANCY (kī-'ro-man-si). See Cheiromancy.

CHISHOLM VS. GEORGIA, a celebrated case decided by the Supreme Court of the U. States in 1793, in which the court decided that the federal judiciary could not exercise power in an action brought by a citizen of one state against the government of another state.

CHISHOLM, William Wallace, an American politician, born in Georgia in 1830, died 1877. He was a fierce partisan republican in Georgia and in 1877 was arrested charged with having murdered John W. Gully, a democratic leader. Chisholm was attacked in jail by a mob and shot to death.

CHITTAGONG (chit'-), a district, Hindustan, in the s.e. of Bengal, having the Bay of Bengal on the w.; area, 2563 sq. miles; pop. 1,290,167. Chittagong is also the name of a commissionership or division of Bengal. Area, 12,118 sq. miles; pop. 4,190,081.

CHIVALRY (chiv'al-ri), a term which indicates strictly the organization of knighthood as it existed in the middle ages, and in a general sense the spirit and aims which distinguished the knights of those times. The chief characteritics of the chivalric ages were a warlike spirit, a lofty devotion to the female sex, a love of adventure, and an undefinable thirst for glory. The Crusades gave for a time a religious turn to the spirit of chivalry, and various religious orders of knighthood arose, such as the Knights of St. John, the Templars, the Teutonic Knights, etc.

CHLO'RAL, a liquid first prepared by Liebig by passing dry chlorine gas through absolute alcohol to saturation, afterward by Städeler by the action of hydrochloric acid and manganese on starch. The hydrate of chloral, as now prepared, is a white crystalline substance, which, in contact with alkalies, separates into chloroform and formic acid. Chloral kills by paralyzing the action of the heart. It is a hypnotic as well as an anæsthetic, and is frequently substituted for morphia. It has been successfully used in delirium tremens, St. Vitus's dance, poisoning by strychnia, in tetanus, and in some cases of asthma and whooping-cough. It should be taken with great caution and under medical advice, as an extra dose may produce serious symptoms and even death. The treatment of poisoning by chloral is to keep the person warm by means of blankets, warm bottles, etc. Warm stimulating drinks should also be administered, such as hot coffee, hot tea, negus, etc. It has been shown that an animal kept warm by wrapping in cotton wool recovered from a dose of chloral that otherwise would have killed it.

CHLO'RATE, a salt of chloric acid. The chlorates are very analogous to the nitrates. They are decomposed by a red heat, nearly all of them being converted into metallic chlorides, with evolution of pure oxygen. They deflagrate with inflammable substances with such facility that an explosion is produced by slight causes. The chlorates of sodium and potassium are used in medicine. The latter, in doses of from five to twenty grains, is largely used in scarlet fever, inflamed throat, etc. It is also used in the manufacture of lucifer-matches, fireworks, and percussion-caps.

CHLORIC ETHER, a volatile liquid obtained by passing hydrochloric acid gas into alcohol to saturation and distilling the products.

CHLORIDE OF LIME. See Bleaching-powder.

CHLORIM'ETRY, the process of testing the bleaching power of any combination of chlorine, but especially of the commercial articles, the chlorides of lime, potash and soda.

CHLO'RINE is a very heavy gas, being about two and a half times as heavy as ordinary air; it has a peculiar smell, and irritates the nostrils most violently when inhaled, as also the windpipe and lungs. It exercises a corrosive action upon organic tissues. It is not combustible, though it supports the combustion of many bodies, and, indeed, spontaneously burns several. In combination with other elements it forms chlorides, which act most important parts in many manufacturing processes. This gas may be liquefied by cold and pressure, when it becomes a transparent, greenish-yellow, limpid liquid. Chlorine is one of the most powerful bleaching agents, this property belonging to it through its strong affinity for hydrogen. It is a valuabe disinfectant where it can be conveniently applied, as in the form of chloride of lime.

CHLO'RODYNE, a popular patent medicine used in allaying pain and inducing sleep, and containing morphia, chloroform, prussic acid, extract of Indian hemp, etc. There are several makes of it, but all have to be used with caution.

CHLO'ROFORM, a volatile colorless liquid of an agreeable, fragrant, sweetish apple taste and smell, discovered by Soubeiran and Liebig in 1832. It is prepared by cautiously distilling together a mixture of alcohol, water, and chloride of lime or bleaching-powder. Its use as an anæsthetic was introduced in 1847 by Prof. Simpson of Edinburgh. For this purpose its vapor is inhaled. The inhalation of chloroform first produces slight intoxication; then, frequently, slight muscular contractions, unruliness, and dreaming; then loss of voluntary motion and consciousness, the patient appearing as if sound asleep; and at last, if too much be given, death by coma and syncope. When skilfully administered in proper cases it is considered one of the safest of anæsthetics; but it requires to be used under certain precautions, as its application has frequently proved fatal. Chloroform is a powerful solvent, dissolving resins, wax, iodine, etc., as well as strychnine and other alkaloids.

CHLORO'SIS or **GREEN SICKNESS,** a disease specially affecting young girls, is characterized by a greenish or yellowish hue of the skin, languor, indigestion and general debility, and derangement of the system. The pathological condition of chlorosis is a diminution in quantity of the red globules of the blood, an important constituent of which is iron, and accordingly the administration of iron forms a leading part of the treatment of this disease. —The term is also applied to a disease of plants in which a deficiency of chlorophyll causes a blanched and yellow appearance instead of a healthy green in the plant. It is artificially produced in some esculent vegetables to destroy their bitter flavor.

CHOATE, Joseph Hodges, an American diplomat and lawyer, born in Massachusetts in 1832. He became noted for his part as counsel for the defense in the Tweed Ring case, the Tilden will contest and the Chinese exclusion case. He represented the U. States in the Bering Sea dispute, and in 1899 was appointed ambassador to England.

CHOATE, Rufus, a noted American lawyer, born in Massachusetts in 1799, died in 1859. He was a member of the

Rufus Choate.

U. States senate for some years and was an ardent advocate of protection. Choate was particularly noted for his fine oratory.

CHO'COLATE, a paste composed of the kernels of the Theobrōma Cacão or cacao-tree, ground and combined with sugar and vanilla, cinnamon, or other flavoring substance; also a beverage made by dissolving chocolate in boiling water or milk. It was used in Mexico long before the arrival of the Spaniards, and is now largely used.

CHOC'TAWS, a N. American Indian tribe now settled on a portion (10,450 sq. miles) of the Indian Territory on the Red river. They formerly inhabited what is now the w. part of Alabama and s. part of Mississippi. They cultivate the soil, are partially civilized, having a regular constitution prefaced with a bill of rights, courts of justice, books and newspapers.

CHOIR (quīr), that part of a cruciform church extending eastward from the nave to the altar, frequently inclosed by a screen, and set apart for the performance of the ordinary service. The name is also given to the organized body of singers in church services.

CHOKE-CHERRY, a popular name for one or more species of cherry distinguished by their astringency.

CHOKE-DAMP, or **AFTER-DAMP,** the name given to the irrespirable gas (carbonic acid) found in coal-mines after an explosion of fire-damp or light carburetted hydrogen.

CHOLAGOGUE (kō'la-gōg), a medicine which has the property of carrying off bile.

CHOLERA (kol'ē-ra), an acute contagious and very fatal disease. In its more ordinary form it commences with sickness, vomiting, or perhaps two or three loose evacuations of the bowels; after which follow a sense of burning at the præcordia, an increased purging and vomiting of a white or colorless fluid, great prostration of strength, spasms at the extremities, which increase in violence with the vomiting and purging. Such cases may last from twelve to thirty-six hours; after this the patient generally sinks into a state of extreme collapse, and this stage in most cases passes by a gradual transition into a febrile one, which in a majority of instances proves fatal. Sometimes the patient is suddenly stricken down and dies, collapsed within a few hours without diarrhœa or vomiting. This disease is endemic in certain parts of Asia (hence it is sometimes called Asiatic cholera), and is liable to spread to other parts of the world, usually by the ordinary channels of commerical intercourse. It first appeared in Europe in 1829, and reached Britain in 1831, spreading thence to America. Western Europe was again visited by it in 1847, 1853, 1865, 1873, 1875, and in 1885. In 1892 Russia and western Europe suffered severely.

The primary and essential element in the production of cholera has been ascertained to be a constituent of the excreta of cholera patients. Whether this particular substance is the germ of a fungus or other form of minute life is not quite certain, but that it is an organism capable of propagating itself when it is taken into the alimentary canal in food, impure water, or the like, is beyond a doubt. Dr. Koch asserts that the essential cause is a bacillus, having the form of a curved rod, hence called the comma bacillus, and that the disease is caused by the multiplication of this organism in the small intestines. The fact that great numbers are present in persons suffering from cholera is generally admitted, but it is doubted by other experts if they do actually produce the disease. A method of protective inoculation against cholera has been lately tried in Spain, but with small success. The contagion of cholera is not so likely to be conveyed by personal intercourse as by residence in an infected district. Sanitary measures have proved to be the only efficacious means of arresting an epidemic; insanitary conditions decidedly favor it.

Chopines.

CHOPIN (sho-pan), Frédéric François, pianist and musical composer, of French extraction, was born at Warsaw in 1810, went to Paris in 1831 on account of the political troubles of Poland, and died

there in 1849. He wrote numerous pieces for the pianoforte, chiefly in the form of nocturnes, polonaises, waltzes, and mazurkas; all of which display much poetic fancy, abounding in subtle ideas with graceful harmonic effects.

CHOPINE (chop-ēn′), a very high shoe or elevated clog, introduced into England from Venice, in the reign of Queen Elizabeth, and which became the fashionable wear of court ladies during that reign. They were made of wood covered with leather of sundry colors, white, red, yellow, and sometimes gilt. Some of them were of great height, as much as 18 inches, the height of the chopine being seemingly regarded as a mark of the rank of the wearer.

CHOP-STICKS, the Chinese substitute for our knife, fork, and spoon at meals, consisting of two smooth sticks of bamboo, wood, or ivory, which are used for conveying meat to the mouth with wonderful dexterity.

CHORAL SERVICE, in the Church of England, service with intoned responses, and the use of music throughout wherever it is authorized. The service is said to be partly choral when only canticles, hymns, etc., are sung; wholly choral, when, in addition to these, the versicles, responses, etc., are sung.

CHORD (kord), in music, the simultaneous combination of different sounds, consonant or dissonant. The common chord consists of a fundamental or bass note with its third and fifth. When the interval between the bass note and its third is two full tones the combination is a major chord; when the interval is a tone and a half the combination is termed a minor chord; when the intervals between the bass note and its third and the third and the fifth are each a tone and a half, the chord is called diminished. The tonic chord is made up of the key-note and its third and fifth; the dominant chord, consists of the dominant or fifth of the scale accompanied by its third and fifth; the subdominant chord has for its root or bass the subdominant or fourth of the scale, accompanied with its third and fifth.—In geom. a chord is a straight line drawn, or supposed to extend, from one end of an arc of a circle to the other.

CHOROID (kō′-), a term applied in anat. to various textures; as the choroid membrane, one of the membranes of the eye, of a very dark color, situated between the sclerotic and the retina, and terminating anteriorly at the great circumference of the iris.

CHORUS (kō′rus), originally an ancient Greek term for a troop of singers and dancers, intended to heighten the pomp and solemnity of festivals. During the most flourishing period of ancient tragedy (B.C. 500–400) the Greek chorus was a troop of males and females, who, during the whole representation, were spectators of the action, never quitting the stage. In the intervals of the action the chorus chanted songs, which related to the subject of the performance. Sometimes it even took part in the performance, by observations on the conduct of the personages, by advice, consolation, exhortation, or disuasion. In the beginning it consisted of a great number of persons, sometimes as many as fifty; but the number was afterward limited to fifteen. In music, the chorus is that part of a composite vocal performance which is executed by the whole body of the singers, in contradistinction to the solo airs, and concerted pieces for selected voices. The singers who join in the chorus are also called the chorus. The term is also applied to the verses of a song in which the company join the singer, or the union of a company with a singer in repeating certain couplets or verses at certain periods in a song.

CHOTA NAGPORE, a division of British India, presidency Bengal. Total area, 43,020 sq. miles. Pop. 4,645,590.

CHOW-CHOW, a kind of mixed pickles put up in mustard. It originated in India.

CHOW CHOW, a Chinese dog, marked by the possession of a black tongue. It was introduced into the U. States in 1901.

CHOWDER, a dish consisting of a mixture of fish or clams, potatoes, biscuit, vegetables and other ingredients. The word and dish are of French origin.

CHRIST, a title of our Savior, now used almost as a name or part of his name. See Christianity and Jesus Christ.

CHRISTENING, the ceremony at which a person or thing is given a name. In former times it was generally accompanied by baptism at which time the person baptized was believed to become a Christian, as previous to baptism the individual was still a pagan. The ceremony of christening a ship was first practiced in 1418. Nowadays ships are always christened by a woman, preferably young, who breaks a bottle of champagne on the prow as the vessel is launched from the ways.

CHRISTIAN, the name of nine Danish kings. Christian II., King of Denmark, Norway, and Sweden, was born 1480, died 1559. He attained the throne in 1513, and in 1518 usurped the throne of Sweden, from which he was expelled by Gustavus Vasa in 1522. He was deposed by his Danish subjects in 1523, and retired to the Netherlands, whence he returned in 1531 with an army, but was defeated, and kept in confinement till his death.—Christian IV., King of Denmark, son of Frederick II. and the Princess Sophia of Mecklenburg, born in Zealand in 1577, succeeded to the throne as a minor in 1588, and died 1648. In the Thirty Years' war he was beaten by Tilly at Lutter in 1626, but afterward, in conjunction with Gustavus Adolphus, obtained the Treaty of Lübeck, 1629. He has the merit of having laid the foundation of the Danish navy, extended the trade of his subjects to the East Indies, and fitted out several expeditions for the discovery of a northwest passage. Christian IX. died 1906.

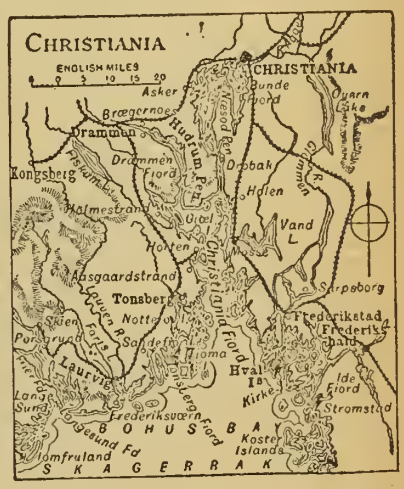
CHRISTIAN BROTHERS COLLEGE, a school at St. Louis founded by the Brothers of the Christian Schools (Roman Catholic) in 1855, and having a regular college curriculum of arts and sciences. It has about 450 students, and income of $30,000.

CHRISTIAN CATHOLIC CHURCH, the name given by John Alexander Dowie to a denomination founded by him in 1890 at Chicago. The faith was based on the belief that miraculous healing is possible. Dowie removed his organization to Zion City, near Chicago, a town built by the Zionites and governed by them, since 1902. In late years Dowie claimed to be Elijah, reincarnated. His followers revolted in 1905 and his place was taken by Voliva, a subordinate. The management of the business of Zion is now in the hands of a receiver.

CHRISTIAN ENDEAVOR, YOUNG PEOPLE'S SOCIETY OF, a society founded in 1881 by Francis E. Clark of the Methodist Episcopal church. It grew with great rapidity and recently had a membership of upward of 3,000,000. The object of the society is to cultivate religious activity in simple things of daily life.

CHRISTIAN ERA, the great era now almost universally employed in Christian countries for the computation of time. It is generally supposed to begin with the year of the birth of Christ; but that event seems to have taken place four years before the present established beginning of the era. Time before Christ is marked B.C., after Christ A.D. The era is computed from the 1st Jan. in the fourth year of the 194th olympiad, and the 753d year from the building of Rome. It was first used by Dionysius, a Syrian monk, in the 6th century, but did not become general until about the middle of the 15th century.

CHRISTIANIA, a city and port, the capital of Norway, province Aggershuus



or Christiania, at the head of the long narrow inlet called Christiania Fjord, about 60 miles from the open sea or Skagerrack. Important public buildings are the royal palace, the house of representatives or Storthing, the governor's palace, and the cathedral. Attached to the university—the only one in Norway, opened in 1813—is a museum, containing a fine collection of antiquities. The manufactures of the city consist of woolen cloth, ironware, tobacco, paper, leather, soap, spirits, glass, etc., and there are extensive breweries. The exports are principally timber and iron. The environs are exceedingly beautiful. Pop. 225,686.

CHRISTIANITY, the religion instituted by Jesus Christ. Though the

great moral principles which it reveals and teaches, and the main doctrines of the gospel, have been preserved without interruption, the genius of the different nations and ages have materially colored its character. The first community of the followers of Jesus was formed at Jerusalem soon after the death of their Master. Another at Antioch in Syria first assumed (about 65) the name of Christians; and the travels of the apostles spread Christianity through the provinces of the Roman Empire. Palestine, Syria, Asia Minor, Greece, the islands of the Mediterranean, Italy, and the northern coast of Africa, as early as the 1st century, contained societies of Christians. At the end of the 3d century almost one-half of the inhabitants of the Roman Empire, and of several neighboring countries, professed this belief. While Christianity as a system was thus spreading, many heretical branches had sprung from the main trunk. From the Gnostics, who date from the days of the apostles, to the Nestorians of the 5th century the number of sects was large, and some of them exist to the present day. The most important events in the subsequent history of Christianity are the separation of the Eastern and Western Churches early in the 8th century; and the Western reformation, which may be said to have commenced with the sectaries of the 13th century and ended with the establishment of Protestantism in the 16th. The number of Christians now in the world is computed at 450,000,000. Of these about 212,000,000 are Roman Catholics, 83,000,000 belong to the Greek Church, and 155,000,000 are Protestants. Of the various sects of Protestants the most numerous are the Lutheran, the Calvinistic, and the Anglican Church.

CHRISTIAN KNOWLEDGE, Society for Promoting, a society founded in London in 1698, in connection with the Church of England, having for its main objects the establishment of churches, schools, and libraries, and the publication and circulation of religious and moral literature. It is still in active operation, publishes a great number of religious and instructive works, and recently established a training college for schoolmistresses.

CHRISTIANS, the general name of the followers of Christ. See Christianity.

CHRISTIANS, or Christian Connection, the name of a denomination in the United States and Canada, adopted to express their renunciation of all sectarianism. They are to be met with in all parts of the country, the number of their churches being estimated at over 1000. Each church is an independent body; the Scriptures are their only rule of faith, and admission to the church is obtained by a simple profession of belief in Christianity. As a rule they are anti-Trinitarians and Baptists.

CHRISTIAN SCIENCE, a religio-scientific discovery claimed by Mrs. Mary Baker Eddy of Concord, N. H., to have been made by her in 1866. Christian Science purports to reveal the science of God, also the science of life and of man. It claims to be the science of the divine Mind or Omniscience. It affirms the divine individuality of God, and denies all man-made conceptions of Him as a finite personality. It declares that God can only be spiritually discerned, and that the material senses cannot cognize or comprehend God. Mrs. Eddy adds to the accepted synonyms for Deity such as Life, Truth, Love and Spirit, that God is the Divine Principle of all true being; the creative principle, the cause, origin, source, basis, foundation, government and law of all that has actual and permanent existence. She repudiates all assumption that God has created or consented to any form of evil, sin, sickness or death. She declares that all of God's laws mean and provide for life, and life only.

It denies the personality of evil as devil, and avers that evil has no real entity or immortality. Sin or evil is a negation—a wrong sense of the truth of being—a wrong sense of that which is eternally right. It asserts that the primary cause of sickness is to be found in the mental realm. It declares that fear, sin, superstition and ignorance have involved the human race in mortality, and that when the world fully learns this fact, it will begin to scientifically cope with, and permanently master disease.

Christian Scientists believe in God, in the inspiration of the Scriptures, in the divinity of Christ, in the supremacy of God as Spirit, in prayer without ceasing, and in all the essentials of Christianity, and claim that the prime office of Christian Science is to destroy evil and reform mankind. They believe that all evil will eventually be destroyed and become extinct.

CHRISTI'NA, Queen of Sweden, daughter of Gustavus Adolphus, born 1626, died 1689. After the death of Gustavus, at Lützen, in 1632, the states-general appointed guardians to the Queen Christina, then but six years old. In 1644 she took upon herself the government. A great talent for business, and great firmness of purpose, distinguished her first steps. She terminated the war with Denmark begun in 1644, and obtained several provinces by the treaty concluded at Bromsebro in 1645. In 1654 she abdicated in favor of her cousin Charles Gustavus, reserving to herself a certain income, entire independence, and full power over her suite and household. She left an immense art collection and a large number of valuable MSS. Her writings were collected and published in 1752.

CHRISTMAS (kris'mas), the festival of the Christian church observed annually on 25th December in memory of the birth of Christ, and celebrated by a particular church service. The time when the festival was first observed is not known with certainty; but it is spoken of in the beginning of the 3d century by Clement of Alexandria, and in the latter part of the 4th century Chrysostom speaks of it as of great antiquity. As to the day on which it was celebrated, there was long considerable diversity, but by the time of Chrysostom the Western Church had fixed on the 25th of December, though no certain knowledge of the day of Christ's birth existed. The Eastern Church, which previously had generally favored the 6th of January, gradually adopted the same date. Many believe that the existence of heathen festivals celebrated on or about this day had great influence on its being selected; and the Brumalia, a Roman festival held at the winter solstice, when the sun is as it were born anew, has often been instanced as having a strong bearing on the question.

CHRISTMAS-BOXES, boxes in which presents were deposited at Christmas; hence a Christmas gift. The custom of bestowing Christmas boxes arose in the early days of the church, when boxes were placed in the churches for the reception of offerings; these boxes were opened on Christmas day, and their contents distributed by the priests on the morrow (boxing-day).

CHRISTMAS CARDS, ornamental cards containing words of Christmas greeting to friends to whom they are sent. The first of them appeared about 1862, and consisted of pictures of robins, holly, etc.; since then highly artistic designs have been introduced, and their manufacture has become a considerable industry in Germany, France and England. Immense quanties of them pass through the post-office every Christmas.

CHRISTMAS CAROL, a carol or song descriptive of the birth of Christ, or of incidents connected with it, sung especially at Christmas.

CHRISTMAS ROSE, the black hellebore, so called from its flower, which resembles a large white single rose; its foliage is dark and evergreen, and the plant blossoms during the winter months.

CHRISTMAS TREE, a small fir-tree lighted up by means of tiny small candles of colored wax or small Chinese lanterns, ornamented with flags, tinsel ornaments, etc., and hung all over with gifts for children.

CHRISTOLOGY, that branch of the study of divinity which deals directly with the doctrine of the person of Christ.

CHRISTOPHE (kris-tof), Henri, King of Hayti, was born in the West Indies in 1767, and was employed as a slave in St. Domingo on the outbreak of the blacks against the French in 1793. From the commencement of the troubles he signalized himself by his energy, boldness, and activity in many bloody engagements. In 1811 he had himself proclaimed King of Hayti by the name of Henri I. His cruelty provoked a revolt, which being unable to quell he shot himself, 1820.

CHRISTOPHER'S, St. (commonly called St. Kitt's), a British island in the West Indies, one of the Leeward Islands, 23 miles in length, and in general about 5 in breadth; area 68 sq. miles, or 44,000 acres, of which about 17,000 acres are appropriated to the growth of sugar, and 4000 to pasturage. It was discovered by Columbus in 1493 and colonized by the English in 1623. Pop. 29,782.

CHRISTY, Howard Chandler, an American illustrator, born in Ohio in

1873. In 1893 be began his career as a magazine illustrator and in 1901 drew the pictures with which Winston Churchill's Crisis is illustrated.

CHROMATE. See Chrome Iron Ore, Chrome Yellow.

CHROMATIC PRINTING. See Color Printing.

CHROMAT'ICS, the science of colors; that part of optics which treats of the properties of the colors of light and of natural bodies.

CHRO'MIUM, a metal which forms very hard steel-gray masses; it never occurs native, but may be obtained by reducing the oxide. In its highest degree of oxidation it forms a compound of a ruby-red color. By itself it has received no practical applications. It takes its name from the various and beautiful colors which its oxide and acid communicate to minerals into whose composition they enter. It is the coloring matter of the emerald and beryl. Chromium is employed to give a fine deep green to the enamel of porcelain, glass, etc. The oxide of chromium is of a bright grass-green or pale-yellow color. This element was originally discovered in 1797 by Vauquelin, in the native chromate of lead of Siberia. See preceding articles.

CHROMO-LITHOGRAPHY, a method of producing a colored or tinted lithographic picture, by using various stones having different portions of the picture drawn upon them with inks of various colors and so arranged as to blend into a complete picture. Sometimes as many as twenty different colors are employed. In printing, the lighter shades are printed off first and the darkest last.

CHRO'MOSPHERE, the name given to the gaseous envelope which exists round the body of the sun, through which the light of the photosphere, an inner envelope of incandescent matter, passes. During total eclipses it had been observed that a red-colored envelope surrounded the sun, shooting up to great distances from the surface. It seems to have been first recognized by Secchi; and the projecting portions of it are commonly described as "red-colored protuberances" and "red flames." To this red envelope the name chromosphere was given by Mr. Lockyer. The light from it is much fainter than that from the photosphere; and till 1868, when M. Janssen and Mr. Lockyer almost simultaneously pointed out a method of viewing it, it was never seen except during eclipses. The chromosphere and its prominences, when examined with the telespectroscope, exhibit a spectrum of bright lines due to incandescent gases. The most elevated portions consist entirely or almost entirely of hydrogen, the lightest of the gases. Lower down are found the gases or vapors of the heavier metals—of sodium, magnesium, barium, iron, and others. The lower the layer of the chromosphere examined the more densely is the spectrum filled with lines of metals, and in the prominences the red hydrogen flames tower high above all.

CHRONIC, a term applied to diseases which are inveterate or of long continuance, in distinction to acute diseases, which speedily terminate.

CHRONICLES, Books of, two books of the Old Testament which formed only one book in the Hebrew canon, in which it is placed last. The name Chronicles was given to it by Jerome. The book is one of the latest compositions of the Old Testament, and is supposed to have been written by the same hand as Ezra and Nehemiah. According to its contents the book forms three great parts:—1, genealogical tables; 2, the history of the reigns of David and Solomon; 3, the history of the kingdom of Judah from the separation under Rehoboam to the Babylonian captivity, with a notice in the last two verses of the permission granted by Cyrus to the exiles to return home and rebuild their temple. The Chronicles present many points of contact with the earlier scriptures, historical and prophetical, more especially, however, with the books of Samuel and of Kings.

CHRON'OGRAPH, the name given to various devices for measuring and registering very minute portions of time with extreme precision. Benson's chronograph is, in principle, a lever watch with a double seconds hand, the one superimposed on the other. The outer end of the lowermost hand has a small cup filled with a black viscid fluid, with a minute hole at the bottom, while the corresponding end of the uppermost is bent down so as just to reach the hole. At the starting (say) of a horse-race, the observer pulls a string, whereupon the bent end of the upper hand passes through the hold and makes a black mark on the dial, instantly rebounding. Again, as each horse passes the winning-post the string is redrawn and a dot made, and thus the time occupied by each horse is noted. This chronograph registers to one-tenth of a second. Strange's chronograph is connected with the pendulum of an astronomical clock, which makes a mark on a sheet of paper at the beginning and end of each swing. By touching a spring on the appearance (say) of a particular star in the field of a telescope, an additional dot is made intermediate between the two extreme ones, and by measuring the distance of this from either of these extremes the exact time can be ascertained to one-hundredth of a second. Schultze's chronograph, in which electricity is applied, is yet far more precise, registering time to the five-hundred-thousandth part of a second.

CHRONOL'OGY, the science which treats of time, and has for its object the arrangement and exhibition of historical events in order of time and the ascertaining of the intervals between them. Its basis is necessarily the method of measuring or computing time by regular divisions or periods, according to the revolutions of the earth or moon. The motions of these bodies produce the natural division of time into years, months, and days. As there can be no exact computation of time or placing of events without a fixed point from which to start, dates are fixed from an arbitrary point or epoch, which forms the beginning of an era. The more important of these are the creation of the world among the Jews; the birth of Christ among Christians; the Olympiads among the Greeks; the building of Rome among the Romans; the Hejira or flight of Mohammed among the Mohammedans, etc. See Epoch, Calendar.

CHRONOM'ETER, any instrument that measures time, as a clock, watch, or dial; but, specifically, this term is applied to those time-keepers which are used for determining the longitude at sea, or for any other purpose where an accurate measure of time is required, with great portability in the instrument. The chronometer differs from the ordinary watch in the principle of its escapement, which is so constructed that the balance is free from the wheels during the greater part of its vibration, and also in being fitted with a "compensation adjustment," calculated to prevent the expansion and contraction of the metal by the action of heat and cold from affecting its movements. Marine chronometers generally beat half-seconds, and are hung in gimbals in boxes 6 or 8 inches square. The pocket chronometer does not differ in appearance from a watch except that it is somewhat larger.

CHRON'OSCOPE, an instrument for measuring the duration of extremely short-lived phenomena, such as the electric spark; more especially the name given to instruments of various forms for measuring the velocity of projectiles.

CHRYS'ALIS, a form which butterflies, moths, and most other insects assume when they change from the state of larva or caterpillar and before they arrive at their winged or perfect state. In the chrysalis form the animal is in a state of rest or insensibility, and exists without nutriment, the length of time varying with the species and season. During this period an elaboration is going on in the interior of the chrysalis, giving to the organs of the future animal their proper development.

CHRYSAN'THEMUM, a large genus of composite plants, consisting of herbs or shrubs with single, large-stalked yellow flowers or with many small flowers; the rays are sometimes white.

CHRYS'OSTOM, John, St., a celebrated Greek father of the church, born in Antioch about A.D. 344, died at Comana in Pontus 407.

CHUB, a fish of the genus carps. The body is oblong, nearly round; the head and back green, the sides silvery, and the belly white. It frequents deep

Chub.

holes in rivers shaded by trees, but in warm weather floats near the surface, and furnishes sport for anglers. It is indifferent food, and rarely attains the weight of 5 lbs.

CHUQUISACA (chō-kē-sä'kä), or **SUCRE,** a city of S. America, the capital of Bolivia; well situated on a plateau between the Amazon and La Plata

rivers, 9343 feet above sea-level. It has a cathedral and a university. It was founded by one of Pizarro's officers in 1539. Pop. estimated at about 25,000.—The province of Chuquisaca has an area of 72,000 sq. miles; pop. 200,000.

CHURCH, a word which in its widest sense denotes the whole community of Christians, and was thus used by the New Testament writers. In more restricted significations it denotes a particular section of the Christian community differing in doctrinal matters from the remainder, as the Roman Catholic Church, the Protestant Church, etc.; or to designate the recognized leading church of a nation, as the English, Scotch, or French Church. Generally speaking any building set apart for religious ordinances is called a church, though when of a minor kind it is usually designated a chapel.

CHURCH CALENDAR, a table of the holy days, feasts, and fasts of a church. It originated in 448 A.D. and has been retained by the Roman Catholic, the Lutheran, and the Protestant Episcopal churches.

CHURCH, FATHERS OF THE, teachers and writers of the ancient church who flourished after the time of the apostles and apostolic fathers (the immediate disciples of the apostles), from the 2nd to the 6th century. The most celebrated among the Greek fathers are Clement of Alexandria, Origen, Eusebius, Athanasius, and Chrysostom. The most distinguished among the Latin fathers are Tertullian, Augustine, Ambrose and Jerome.

CHURCH, Frederick Edwin, an American painter, born in 1826 at Hartford, Conn., died 1900. He painted N. and S. American mountains and American landscapes in general. His best known picture is his Horseshoe Falls, Niagara.

CHURCH, States of the. See Papal States.

CHURCHILL, Randolph Henry Spencer, Lord, second son of the sixth Duke of Marlborough, born 1849. Having entered parliament in 1874, by 1884 he had risen to the position of a recognized leader of the Conservative party, and in 1885 became Indian secretary in Lord Salisbury's government. On the defeat of Gladstone's Irish Bill in 1886 Churchill became leader of the House of Commons and Chancellor of the Exchequer, posts which he unexpectedly resigned in December, 1886. He died in 1895.

CHURCH OF GOD, a religious denomination of the U. States, the doctrines of which are substantially those of the Baptist church. It originated with the revival work of John Winebrener, in 1830, at Harrisburg, Pa. There are about 500 ministers, 580 churches, and 40,000 communicants. The denomination has a college at Findlay, Ohio, and does considerable missionary work.

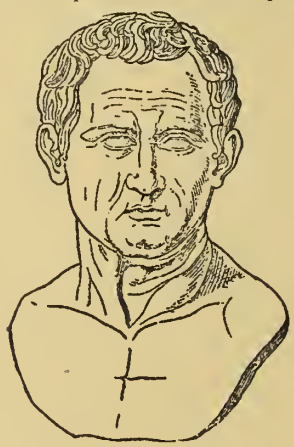
CHURCH TRIUMPHANT, an organization founded by George Schweinfurth in 1883, and centered at Rockford, Ill. Schweinfurth claimed that he was another incarnation of Christ. The church has about 400 members.

CHURCH WARDENS, officials of the Protestant Episcopal Church elected for the purpose of caring for the church property. In the U. States they are generally two and are elected annually.

CHURN, a vessel for preparing butter from cream or milk, in which cream is agitated to separate its buttery globules in a solid mass from the fluid portions.

CIBBER, Colley, a dramatic writer and actor, born in London 1671, died 1757. He took to the stage in 1689. His first dramatic effort, Love's Last Shift, appeared in 1695; and it was followed by Woman's Wit, the Careless Husband, and the Non-juror, of which the Hypocrite of the modern stage is a new version. A court pension and the appointment of poet-laureate drew upon him the rancor of the wits and poets of the day, including Pope. He is author of about twenty-five dramas, the amusing Apology for the Life of Colley Cibber, etc.

CICERO, Marcus Tullius, the greatest Roman orator, was born 106 B.C. at Arpinum. He received the best education available, studied philosophy and law, became familiar with Greek literature, and acquired some military knowledge from serving a campaign in the Marsic war. At the age of twenty-five he came forward as a pleader, and having undertaken the defense of Sextus Roscius, who was accused of parricide, procured his acquittal. In B.C. 76 he was appointed quæstor of Sicily, and behaved with such justice that the Sicilians gratefully remembered him and requested that he would conduct their suit against their governor Verres. After this suit Cicero was elected to the office of ædile, B.C. 70, became prætor in 67, and consul in 63. It was now that he succeeded in defeating the conspiracy of Catiline, after whose fall he received greater honors than had ever before been bestowed upon a Roman citizen. But Cicero's fortune had now reached the culminating point, and soon was to decline. The Catilinarian conspirators who had been executed had not been sentenced according to law, and Cicero, as chief magistrate, was responsible for the irregularity. Publius Clodius, the tribune of the people, raised such a storm against him that he was obliged to go into exile (B.C. 58). On the fall of the Clodian faction he was recalled to Rome, but he never succeeded in regaining the influence he had once possessed. In B.C. 52 he became proconsul of Cilicia, a province which he administered with eminent success. As soon as his term of office had expired he returned to Rome (Jan. B.C. 49), which was threatened with serious disturbances owing to the rupture between Cæsar and Pompey. He espoused the cause of Pompey, but after the battle of Pharsalia he made his peace with Cæsar, with whom he continued to all appearance friendly, and by whom he was kindly treated, until the assassination of the latter (44 B.C.). Antony having taken Cæsar's place, Cicero composed those admirable orations against him, delivered in B.C. 43, which are known to us by the name of Philippics (after the speeches of Demosthenes against Philip of Macedon). He died in his sixty-fourth year, B.C. 43. Cicero's eloquence has always remained a model. After the revival of learning he was the most admired of the ancient writers; and the purity and elegance of his style will always place him in the first rank of Roman classics. His works, which are very numerous, consist of orations; philosophical, rhetorical, and moral treatises; and letters to Atticus and other friends.



Cicero—Antique bust.

CID, an epithet applied to Ruy or Roderigo Diaz, Count of Bivar (born 1026, died 1099), the national hero of Spain. He signalized himself by his exploits in the reigns of Ferdinand, Sancho, and Alphonso VI. of Leon and Castile; but the facts of his career have been so mixed with glorifying myths that it is scarcely possible to separate them. His life, however, appears to have been entirely spent in fierce warfare with the Moors, then masters of a great part of Spain. His exploits are set forth in a special chronicle, and in a Castilian poem, probably composed about the end of the 12th century. The story of his love for Ximena is the subject of Le Cid of Corneille. Whatever chronicles and songs have conveyed to us of the history of the Cid is collected in Southey's Chronicle of the Cid.

CI'DER, a fermented liquor made from the expressed juice of apples. The apples are ground and crushed until they are reduced to a pulp, the juice is allowed to run into casks, where it is freely exposed to the air until fermentation takes place, when a clear liquor of a pale-brown or amber color is the result.

CIENFUEGOS (thē-en-fō-ā'gōs), a seaport of Cuba, on the south coast of the island, with a safe and capacious harbor on the bay of Jagua, 130 miles s e. of Havana, with which (and other towns) it is connected by railway. It is among the finest towns of the island, and exports sugar, wax, timber, etc. During the Spanish-American war it was blockaded by Admiral Schley. Pop. 30,038.

CIGAR (si-gär'), a small roll of manufactured tobacco leaves carefully made up, and intended to be smoked by lighting at one end and drawing the smoke through it. The choicest cigars are those made in and imported from Havana. Medicated cigars, or cigars made of some substance having remedial properties, are often used for certain

complaints, as stramonium cigars for asthma. Cheroots are peculiarly-shaped cigars much thicker at one end than the other, and are largely imported from Manilla.

CIGARETTE (sig-a-ret'), a sort of small cigar made by rolling fine-cut tobacco in thin paper specially prepared for the purpose.

CI'MON, an ancient Athenian general and statesman, was a son of the great Miltiades. He fought against the Persians in the battle of Salamis (480 B.C.), and shared with Aristides the chief command of the fleet sent to Asia to deliver the Greek colonies from the Persian yoke. The return of Aristides to Athens soon after left Cimon at the head of the whole naval force of Greece. He died shortly after, in 449, while besieging Citium in Cyprus.

CINCHONA (sin-kō'na or sin-chō'na), the trees, shrubs, or herbaccous plants, with simple opposite leaves. They are found almost exclusively in the tropics, and many of the species are of great medicinal importance as tonics, febrifuges, emetics, and purgatives. Among

Cinchona.

their chief products are Peruvian bark, quinine, ipecacuanha, coffee, chay-root, etc. The genus trees seldom exceed 40 or 50 feet in height, with simple, opposite, entire leaves and small flowers, inhabiting chiefly the east side of the Andes of Peru, Bolivia, Ecuador, and Colombia. The valuable Peruvian bark is yielded by various species. From the wasteful method of cutting down the trees to get their bark it was believed that there would soon be a dearth of the valuable medicine, and hence chinchona plants were taken from their native regions and plantations formed in various tropical countries, so that Ceylon, India, Java, etc., are now important sources of Peruvian bark. The bark is taken off in strips longitudinally, and is in time renewed by natural growth.

CINCINNATI, the chief city of Ohio, situated on the Ohio river. It is 300 miles from Chicago, 764 miles from New York, and 610 miles from Washington. The city is built on a number of elevations which rise in plateaux from the river and is bounded by a semicircle of hills upon which the fine residences are situated. It has an area of 36 sq. miles and was laid out on a plan similar to that of Philadelphia.

The city was settled in 1788 and the settlement passed through various vicissitudes until 1819 when it was incorporated. Its limits were several times increased. The principal public buildings are the U. States building for post-office, courts, etc., constructed entirely of brick, iron and granite, at a cost of $5,000,000; the city hall, completed in 1893, a substantial, spacious, and elegant structure costing $1,500,000; the Music Hall, with a seating capacity of 5,000; the Chamber of Commerce building; the County Court-house; the Cincinnati College; the Ohio and Miami Medical Colleges; the Public Library; the Central Union R. R. dépôt; the Masonic Temple; the Odd Fellows' building; the Scottish Rite Cathedral; the City Hospital, and the Art Museum in Eden Park. Among theaters, the Pike, Grand Opera-house and Walnut Strcet are very creditable The Ohio Mechanics' Institute has long been a great educational force in the city. It owns an ample building, with library, lecture-hall, and school-rooms. It maintains courses of lectures specially devoted to the mechanic arts, and a night-school with 700 pupils, where instruction is given in the rudiments of science, mathematics, architecture, and kindred subjects. The principal libraries are the Public Library, with 212,262 books and 33,867 pamphlets; the Young Men's Mercantile, with 50,000 volumes; the Law Library, with 8,000 volumes; the library of the Historical Society, with a large number of rare books, pamphlets, manuscripts, etc.; and the library of the Mechanics' Institute.

The government of the city has much of the so-called "federal" plan. The mayor is elected every three years, and is not eligible for re-election. He appoints a board of review, six members, with authority to examine and supervise city officers and fix rates of taxation; and a board of elections, four members, which appoints all election officers, and conducts the elections and canvasses returns. He also appoints the prosecutor of the police court. He is the chief of police, with powers similar to those belonging to an officer of the army—to discipline and command, but not to appoint or discharge. There is a board of four police commissioners, appointed by the governor of the state. The mayor nominates all officers of the police court, and with the approval of the board appoints them. Police officers hold during "good behavior," and can only be removed or punished upon charges and a hearing by the board. They must pass a medical and a literary examination before appointment. A board of service, chosen by popular vote, consisting of five members, has charge of the streets, waterworks, city infirmary, and parks.

The vigorous growth of railway facilities has apparently reduced the importance of river transportation; figures show an enormous tonnage by river each year. The city is also a railway center, every important railway system having lines passing through it. Its inland situation precludes it from foreign commerce, but its location in the most productive portion of the U. States, with its ample means of communication, must always make it a most important center of domestic trade.

It is, however, chiefly a manufacturing city. Its industries ran in this direction at an early date. The distance from any source of supply and the convenience of all sorts of materials made manufacturing profitable, and there was a steady and increasing demand from the growing regions lying south and west. Pop. 475,000.

CINCINNATI MUSICAL FESTIVAL, a musical feast originated by Theodore Thomas in 1873, held every two years, comprehending seven concerts. The Chicago orchestra furnishes the music and a local chorus of 500 assists.

CINCINNATI, SOCIETY OF THE, a patriotic society to perpetuate the traditions of the American revolutionary war. Its members consist of lineal descendants of officers who fought in that war and membership is restricted to the eldest male descendants of such officers. The society was organized in 1783 at Fishkill, N. Y., and the name was adopted from that of the Roman patriot Cincinnatus (which see). There are at present about 860 members, organized into 13 state societies.

CINCINNATI, UNIVERSITY OF, founded in 1858 by Charles McMicken, and subsequently enlarged by appropriations set apart by the city of Cincinnati. The university has a law and a medical school, an academic apartment, a college of engineering, a college of dentistry, and a pathological school. It has a fund of $3,500,000, 164 instructors, 1100 students, and a library of 68,000 volumes.

CINCINNA'TUS, Lucius Quinctius, a wealthy patrician in the early days of the Roman Republic, born about 519 B.C. After violently opposing the passage of the Terentilian law for the equalization at law of patricians and plebians, he succeeded Publicola in the consulship, and then retired to cultivate his small estate beyond the Tiber. Here, when Minucius was surrounded by the Æquians, the messengers of the senate found him at work when they came to summon him to the dictatorship. He rescued the army from its peril, marched to Rome laden with spoil, and then returned quietly to his farm. At the age of eighty he was again appointed dictator to oppose the ambitious designs of Spurius Mælius.

CINNA, Lucius Cornelius, an eminent Roman, an adherent of Marius, who, obtaining the consulship B.C. 87, along with Cneius Octavius, impeached Sulla and endeavored to secure the recall of Marius. Being driven from the city by Octavius, he raised the Italian cities, and invested Rome while Marius blockaded it from the sea. On its capture the friends of Sulla were massacred, and Cinna and Marius made themselves consuls (B.C. 86); but after the dcath of Marius the army refused to follow Cinna against Sulla, and put him to death in B.C. 84.

CIN'NABAR, red sulphide of mercury, the principal ore from which that metal is obtained, occurring abundantly in Spain, California, China, etc. It is of a cochineal-red color, and is used as a

pigment under the name of vermilion.

CIN'NAMON, the bark of the under branches of a species of laurel, which is chiefly found in Ceylon, but grows also in Malabar and other parts of the East Indies. The tree attains the height of 20 or 30 feet, has oval leaves, pale-yellow

Cinnamon.

flowers, and acorn-shaped fruit. The Ceylonese bark their trees in April and November, the bark curling up into rolls or quills in the process of drying; the smaller quills being introduced into the larger ones. These are then assorted according to quality by tasters, and made up into bundles.

CIPHERS, signs used to represent numbers, whether borrowed signs, or letters, with which the Greeks designated their numbers, or peculiar characters, as the modern or Arabic ones. The ciphers, such as they are at present 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, did not come in common European use until the 11th century. For cipher as applied to methods of secret writing see Cryptography.

CIRCAS'SIA, or **TCHERKESSIA,** a mountainous region in the southeast of European Russia, lying chiefly on the

Circassians—From Hommaire de Hell.

north slope of the Caucasus, partly also on the south, and bounded on the west by the Black Sea, and now forming part of the government of the Caucasus. The mountains, of which the culminating heights are those of Mount Elbruz, are intersected everywhere with steep ravines and clothed with thick forests, and the territory is principally drained by the Kuban and its tributaries. Its climate is temperate, its inhabitants healthy and long-lived. They are divided into several tribes speaking widely-different dialects. While they retained their independence their government was of a patriarchal character, but every free Circassian had the right of expressing his opinion in the assemblies. They possessed none but traditional annals and laws. Polygamy was permissible in theory, but not common. The duties of hospitality and vengeance were alike binding, and a Spartan morality existed in the matter of theft. Their religion, which is nominally Moslem, is in many cases a jumble of Christian, Jewish, and heathen traditions and ceremonies. As a race the Circassians are comely, the men being prized by the Russians as warriors, and the women by the Turks as mistresses, a position generally desired by the women themselves. The early history of Circassia is obscure. Between the 10th and 13th centuries it formed a portion of the empire of Georgia, but in 1424 the Circassians were an independent people, and at war with the Tartars of the Crimea, etc., to whose khans, however, some were occasionally tributary. In 1705 the Tartars were defeated in a decisive battle, but shortly after the territorial encroachments of the Russians on the Caucasian regions began, and in 1829 the country was formally annexed by them. The Circassians, properly so called, have been estimated to number from 500,000 to 600,000.

CIRCE (sêr-sē), a fabled sorceress of Greek mythology, who lived in the Island of Ææa, represented by Homer as having converted the companions of Ulysses into swine after causing them to partake of an enchanted beverage. Ulysses under the guidance of Hermes compelled her to restore his companions, and afterward had two sons by her.

CIRCLE is a plane figure contained by one line, which is called the circumference, and is such that all straight lines drawn from a certain point (the center) within the figure to the circumference are equal to one another. The properties of the circle are investigated in books on geometry and trigonometry. Properly the curve belongs to the class of conic sections, and is a curve of the second order. A great circle of a sphere is one that has its center coinciding with that of the sphere. The celebrated problem of "squaring the circle," is to find a square whose area shall be equal to the area of any given circle. It is not possible to do so. All that can be done is to express approximately the ratio of the length of the circumference of the circle to the diameter, and to deduce the area of the figure from this approximation.

CIRCUIT, a division of a country, or a county, or a state, in which the same judges hold court for the trial of facts. In the United States, the federal judiciary sits in nine circuits comprising the whole territory of the United States, and the federal judges move about in these circuits holding court in different parts thereof. In certain states, also there are a number of circuits. In Britain a certain number of counties form a circuit, and the time of court is called assizes.

CIRCULATION, in an organism, the flowing of sap or blood through the veins or channels, by means of which the perpetual and simultaneous movements of composition and decomposition manifested in organic life are carried on. Although Galen, who had observed the opposite directions of the blood in the arteries and veins, may be said to have been upon the very point of discovering the circulation, the discovery was reserved for William Harvey, who in 1628 pointed out the continuity of the connections between the heart, arteries, and veins, the reverse directions taken by the blood in the different vessels, the arrangements of valves in the heart and veins so that the blood could flow only in one direction, and the necessity of the return of a large proportion of blood to the heart to maintain the supply. In 1661 Malpighi exhibited microscopically the circulation in the web of a frog's foot, and showed that the blood passed from arteries to veins by capillaries or intermediate vessels. This finally established the theory with regard to animals, but the movements of sap in vegetables were only traced with difficulty and after numerous experiments. Many physiologists indeed are still disposed to refuse the term "circulation" to this portion of the economy of plants; but though sap, unlike the blood, does not exhibit movements in determinate vessels to and from a common center, a definite course is observable. In the stem of a dicotyledonous tree, for example, the sap describes a sort of circle, passing upward from the roots through the newer woody tissue to the leaves, where it is elaborated under the action of air and light; and thence descending through the bark toward the root, where what remains of it is either excreted or mixed with the new fluid, entering from the soil for a new period of circulation.

CIRCUMCISION, a rite common among the Semites, though by no means peculiar to them, and possibly derived by them from the Egyptians or from some non-Semitic source. At any rate the antiquity of its institution in Egypt is fully established by the monuments, which make it evident that it was practiced at a period very much earlier than the Exodus. It was, however, a primitive Arab custom, and its practice among the Jews may with equal probability be assigned to an Arab source. Whatever its origin, the rite is confined to no single race. It was practiced by the Aztecs and other peoples of Central America, and is still to be found among tribes on the Amazon, among the Australian tribes, the Papuans, the inhabitants of New Caledonia, and those of the New Hebrides. In Africa it is common among the Kaffirs and other tribes widely removed from Semitic influence. It is practised also by the Abyssinian Christians, and although not enjoined in the Koran has been adopted by the Mahometans on the example of Mahomet himself. It was possibly in its origin a sacrifice to the deity pre-

siding over generation, though in certain nations the rite has acquired a new symbolic significance according to the stage of their spiritual development.

CIRCUMNAV'IGATORS, a term usually applied to the early navigators who sailed round the globe. Magellan, a Portuguese in the service of Spain headed the first expedition which succeeded in circumnavigating the globe, though he did not live to complete the voyage.

CIRCUMSTANTIAL EVIDENCE. See Evidence.

CIRCUMVALLA'TION, or **LINE OF CIRCUMVALLATION,** in military affairs, a line of field-works consisting of a rampart or parapet, with a trench surrounding a besieged place, or the camp of a besieging army.

CIR'CUS, among the Romans, a nearly oblong building without a roof, in which public chariot-races and exhibitions of pugilism and wrestling, etc., took place. The largest of these buildings in Rome was the Circus Maximus, capable, according to Pliny, of containing 260,000, and according to Aurelius Victor, 385,000 spectators. The games celebrated in these structures were known collectively by the name of ludi circenses, circensian games, or games of the circus, which under the emperors attained the greatest magnificence. The passion of the common or poorer class of people for these shows appears from the cry with which they addressed their rulers—panem et circenses (bread and the games!). The festival was opened by a splendid procession, or pompa, in which the magistrates, senate, priests, augurs, vestal virgins, and athletes, took part, carrying with them the images of the great gods, the Sibylline books, and sometimes the spoils of war. On reaching the circus the procession went round once in a circle, the sacrifices were performed, the spectators took their places, and the games commenced. These were: 1. Races with horses and chariots, in which men of the highest rank engaged. 2. The gymnastic contests. 3. The Trojan games, prize contests on horseback, revived by Julius Cæsar. 4. The combats with wild beasts or with men (criminals or volunteers). 5. Representations of naval engagements for which purpose the circus could be laid under water. The expense of these games was often immense. Pompey, in his second consulship, brought forward 500 lions at one combat of wild beasts, which, with eighteen elephants, were slain in five days.

The modern circus is a place where horses are trained to perform antics, and where exhibitions of acrobats and various pageantries, including a large amount of buffoonery, are presented.

CIRRHO'SIS, a disease characterized by growth of fibrous tissue which gradually encroaches on and by compression destroys the true structure of the organ attacked. It is very frequent in the liver as a consequence of spirit-drinking; and hence the term "drunkard's liver".

CISAL'PINE REPUBLIC, a state set up in 1797 by Napoleon I. in North Italy, recognized by Germany as an independent power at the Peace of Campo-Formio. It comprised Austrian Lombardy, together with the Mantuan and the Venetian provinces, Bergamo, Brescia, Crema, Verona, and Rovigo, the duchy of Modena, the principality of Massa and Carrara, Bologna, Ferrara, and Romagna, and latterly its area was 16,337 sq. miles; its pop. 3,500,000. The legislative body held its sessions in Milan. On January 25, 1802, it received the name of the Italian Republic; from 1805 to 1814 it formed part of the kingdom of Italy; and it was given to Austria by the Congress of Vienna in 1615 as the Lombardo-Venetian Kingdom.

CIST, a place of interment of an early or prehistoric period, consisting of a rectangular stone chest or inclosure formed of rows of stones set upright,

Cist, found near Driffield, Yorkshire.

and covered by similar flat stones. Such cists are found in barrows or mounds, inclosing bones. In rocky districts cists were sometimes hewn in the rock itself.

CISTER'CIANS, a religious order named from its original convent, Citeaux not far from Dijon, in Eastern France, where the society was formed in 1098 by Robert, abbot of Molesme, under the strictest observance of the rule of St.

Cistercian.

Benedict. The Cistercians led a severely ascetic and contemplative life, and having freed themselves from episcopal supervision, formed a kind of spiritual republic under a high council of twenty-five members, with the abbot of Citeaux as president.

CIT'ADEL, a strong fortress in or near a city intended to keep the inhabitants in subjection, or to form a final point of defense in case of an attack of enemies.

CITA'TION, a summons or official notice given to a person to appear in a court as a party or witness in a cause.

CITH'ERN, or **CIT'TERN,** an old instrument of the guitar kind, strung with wire instead of gut. Its eight

Cittern, in South Kensington museum.

strings were tuned to 4 notes, G, B, D, and E. It was frequently to be found in barbers' shops for the amusement of the waiting customers.

CITIES OF REFUGE, six out of the forty-eight cities, given to the tribe of Levi in the division of Canaan, set apart by the law of Moses as places of refuge for the man-slayer or accidental homicide. Their names were Kedesh, Shechem, and Hebron on the west side of Jordan; and Bezer, Ramoth-Gilead, and Golan on the east.

CITIES OF THE PLAIN. See Sodom and Gomorrah.

CITIZEN, an individual member of a political community or state. In the United States the term has the very same significance as it had under the Republic in ancient Rome, that is, a free individual, co-sovereign with all other free individuals, sharing the power of governing with those others. Citizenship in the United States is restricted to males, 21 years old, either born in the United States or its jurisdiction, or naturalized. The term citizen, however, is also applied in a more general way, to all persons, not aliens, living in the United States, whether they have the rights of sovereign citizens or not.

CIT'RIC ACID, the acid of lemons, limes, and other fruits. It is generally prepared from lemon-juice, and when pure is white, inodorous and extremely sharp in its taste. In combination with metals it forms cyrstalline salts known as citrates. The acid is used as a discharge in calico-printing and as a substitute for lemon in making beverages.

CIT'RON, a small evergreen shrub introduced into the southern parts of Europe from Asia, and yielding a fruit which is candied with sugar. The rind is considered superior to the pulp. The juice is less acid than that of the lemon. See Citrus.

CIT'RUS, an important genus of trees, characterized by simple ovate acuminate leaves or leaflets united by a distinct joint to the leaf-like stalk; by having the stamens united by their filaments into several irregular bundles, and by yielding a pulpy fruit with a spongy rind.—Citrus mēdica is the citron

Other species are the lemon, the sweet orange, the bitter orange, the shaddock, and the forbidden fruit, sometimes used as an ornamental addition to dessert. The genus furnishes the essential oils of orange and lemon peels, of orange flowers, of citron peel, of bergamot, and oil of orange leaves—all much esteemed in perfumery. See Lemon, Orange, etc.

CITY, in the United States, a municipality chartered by a state and having a magistrate called a mayor. In Britain a city is an incorporated town in which there is a cathedral. In ancient Rome and Greece, a city was synonymous with a state, as Rome and the city states of Greece. In Germany today there are certain "free cities," such as Hamburg. During the 19th century cities, in all parts of the world have grown so vastly at the expense of the country population that fear is expressed of the city ultimately swallowing up the rural population. In 50 years the city population of Britain has increased 20 per cent over the rural. In France the only increase has been in cities, the rural population having actually decreased, and in the United States 33 per cent of the people live in cities. Efforts to remedy this state of affairs have not been successful, as those who are making them persist in living in cities themselves.

CIUDAD-REAL (thi-ö-*dȧd*-rā-ȧl'), a town of Spain, capital of the province of same name. Pop. 14,769.—The province occupies the south extremity of New Castile, between the parallel ranges of the Sierra Toledo and Sierra Morena; area, 7840 sq. miles. Pop. 305,002.

CIV'ET, a genus of carnivorous mammals found in N. Africa, and in Asia from Arabia to Malabar and Java, and distinguished by having a secretory apparatus in which collects the odoriferous fatty substance known as civet. The animal, which in form is intermediate between the weasel and the fox, and from 2 to 3 feet long by 10 inches high, is of a cinereous color, tinged with yellow and marked by dusky spots disposed in rows. They are nocturnal, and prey upon birds and small animals, and may be considered as forming the transition from the musteline or marten kind to the feline race. The genus has been divided into two sub-genera—the true civets, having the pouch large and well marked; and the genets, in which there is a simple depression instead of a pouch. Two species of the first and eight of the second are at present known, the chief scent-yielding species being the common civet of N. Africa and the zibeth of Asia. The pouch is situated between the anus and the genitals, and the odorous matter obtained from it is, when good, of a clear yellowish or brown color, and of about the consistence of butter. In its natural state the smell is powerful and very offensive, but when largely diluted with oil or other materials it becomes an agreeable perfume.

CIVIL ADMINISTRATION, the method of conducting the affairs of a state in all those respects in which the interests of the individual come into conflict with the interests of the community, or which is virtually the same thing, into conflict with the interests of other individuals. Civil administration varies in form from that of an absolute monarchy like Turkey, a feudalism such as that of India, or a federalism like that of the United States with its autonomy of commonwealth, county, town, and village. An aspect of civil administration, quite ancient, is that affecting colonies, which support an independent police and city administration, an elective government, and so on. The particulars of civil administration will be found explained in separate articles.

CIVIL DAMAGE ACTS, laws of certain states in the Union in which persons selling intoxicants are made liable for injuries sustained because of the intoxication by the person intoxicated.

CIVIL DEATH. See Death, Civil.

CIVILIZA'TION, the sum at any given time of the attainments and tendencies by which the human race or any section of it is removed from the savage state. The history of progress in civilization is usually presented from one of two points of view—the first conceiving the race as starting from a high civilization, to which in point of intellectual and moral power it has yet to return; the second viewing the civilization of any period as the result of a constant and increasingly-successful stream of effort upward from an origin comparable with the condition of the lower animals. The latter is the prevailing scientific theory, which finds the secret of progress in the interaction of function and environment. According to it primitive man, at first feeding on wild fruits and berries, and sheltering himself under overhanging rocks or caves, entered upon the stone age, in which, as the contemporary of the mammoth and cave-bear, he made himself sharp-edged tools by chipping the flakes of flint found in the drift under gravel and clay. In the newer stone age he learned the art of polishing these rough implements, with which he cut down trees to make canoes, killed wild animals for food, and broke their bones for marrow, or shaped them into weapons. Fire he turned to account to hollow out trees, to cook his food, to fashion clay ware. Artificial means of shelter were constructed by piling rude huts of stones, by digging holes in the ground, or by driving piles into the beds of lakes and raising dwellings on them. The artistic instincts found expression in drawings of animals scratched upon bone or slate. The discovery of metals constituted a great step in advance. Gold and copper came early into use, and bronze was soon discovered, though a long time passed before iron was smelted and substituted for bronze where hardness was required. Gradually the roving savage became a nomadic shepherd and herdsman, or a tiller of the soil, according to his environment. The practice of barter was in part superseded by the beginnings of some sort of currency. Gesture language gave place in part to an enlarged vocabulary, and picture-writing to the use of phonetic signs. In the meantime man had begun to question himself and the world on profounder issues, entering upon the myth-making age, in which was projected outward on the chief phenomena of nature some shadow of his own personality. The worship of the sun, moon, and stars, a faith in a future life, the worship of dead ancestors, fetishes, animals, etc., the belief in magic and witchcraft, all sprang into being. Prayer came spontaneously to him; the idea of propitiation by sacrifice would arise from his dealings with his fellows and his foes; the sacred books began to shape themselves. Tribal and national relations, arising from ties of family and exigencies of defense, were cemented by unity of faith, and the higher social unit began to perfect itself under the rule of the patriarch, the bravest warrior, etc. With varying needs, arising from diversity of environment, distinctions of nationality became more and more emphatic, and the history of civilization becomes the history of the nations viewed from the philosophic standpoint.

CIVIL LAW, among the Romans the term nearly corresponding to what in modern times is implied by the phrase positive law, that is, the rules of right established by any government. They contradistinguished it from natural law, by which they meant a certain natural order followed by all living beings; also from the general laws of mankind established by the agreement of all nations and governments. The final digest of Roman law was made in the 6th century A.D. under the Emperor Justinian, but at first was only admitted as formally binding in a small part of Italy. After the 11th century, in Upper Italy, particularly in the school of Bologna, the body of the Roman law, put together by Justinian, was formed by degrees into a system applicable to the wants of all nations; and on this model the ecclesiastical and papal decrees were arranged, and to a considerable degree the native laws of the new Teutonic states. From all these the Roman law was distinguished under the name of civil law. In this sense, therefore, civil law means ancient Roman law; and it is contradistinguished from canon law and feudal law, though the feudal codes of the Lombards have been received into the body of civil law. As the Roman code exerted the greatest influence on the private law of modern Europe, the expression civil law is also used to embrace all the rules relating to the private rights of citizens. Under the term civil law, therefore, in both Europe and America, is to be understood not only the Roman law, but also the modern private law of the various countries; for example, in Germany, Das gemeine Deutsche Privatrecht; in France the Code Civil des Français or Code Napoleon. In this sense it is chiefly opposed to criminal law, particularly in reference to the administration of justice, which is to be divided into civil justice and criminal justice.

CIVIL LIST, a list of allowances made to government officials. The term is sometimes applied to the salary lists of officials in the United States, but more generally it is applied to the allowances made by European states to members of reigning families.

CIVIL RIGHTS BILL, a bill passed by congress in 1866, giving equality in

citizenship rights to all persons, except Indians not taxed. Its purpose was to secure civil rights to the newly emancipated negroes, a condition covered by the words of the statute "without regard to race, color, or previous condition of slavery or involuntary servitude except as a punishment for crime, whereof the party shall have been duly convicted."

CIVIL SERVICE, a term applied to all branches of public service in a state, or a government of any kind, exclusive of the army and the navy. In the United States the federal civil service employs 100,000 officials, pertaining to the nine general departments, of state, navy, treasury, post-office, war, agriculture, interior, justice, and labor and commerce, and congress. In state, city and county government civil service consists of virtually the entire machinery of these governmental units, the city having, as a matter of necessity, the largest number of employes.

CIVIL SERVICE REFORM, a movement beginning in the early part of the 19th century to purify the civil service of the federal government, and latterly extending to the purification of state, county, and city governments. The cause of civil service reform was the policy, instituted in 1829 by President Jackson, to the effect that "to the victor belong the spoils," spoils here meaning the "patronage," or positions in the gift of an administration. Each new administration would in turn clear the offices of their incumbents and replace them with men who helped to elect the party ticket. The merit system was introduced in 1875 after ten years of effort to pass it in congress, since which time the largest part of the civil service has been free from interference. Employes cannot now be removed "without cause." The reform has spread to certain states and cities, Chicago being an especial example of civil service reform among the larger cities.

CIVIL WAR VETERAN SOCIETIES. See Grand Army of the Republic, Sons of Veterans, etc., under their names.

CLAFLIN, Horace Brigham, an American business man, born in Massachusetts in 1811, died 1885. His house in New York, as early as 1865, did an annual volume of business of $72,000,000, and since that time the house has probably been the largest in America.

CLAIM, in common law, the assertion of right of title to property of any kind. In the United States the term is used to designate the rights of settlers to government lands, and of prospectors to mining property found by them.

CLAIMS, COURT OF, a tribunal created by congress, or by the legislatures of the several states for the adjudication of claims against the government. A sovereign cannot be sued at the law and hence, the United States, or any of the separate states, being sovereign, cannot so be sued. It can be petitioned, however, and it is to provide for this process that courts of claims have been created.

CLAIRVOYANCE, an alleged faculty by which certain persons in certain states, or under certain conditions, are said to be able to see things by some sort of mental or spiritual vision apart altogether from the sense of sight; thus they are said to be able to tell what an absent person is doing, to describe the contents of a closed box, etc. It is claimed that clairvoyance is the result of a kind of natural state of trance, or may be induced by mesmerism; and in evidence of its existence in ancient times the utterances of prophets, sybils, etc., have been adduced.

CLAM, the popular name of certain bivalvular shell-fish of various genera and species, e.g. the thorny clam, the yellow clam, the giant clam, the common clam of the United States, etc. The giant clam has the largest shell known, and the animal is used as food in the Pacific. The common U. States clam is also much used for food.

CLAN, among the Highlanders of Scotland, consisted of the common descendants of the same progenitor, under the patriarchal control of a chief, who represented the common ancestor. The name of the clan was frequently formed of that of the original progenitor with the affix mac (son): thus the MacDonalds were the sons of Donald, and every individual of this name was considered a descendant of the founder of the clan, and a brother of every one of its members. The chief exercised his authority by right of primogeniture, as the father of his clan: the clansmen revered and served the chief with the blind devotion of children. The clans each occupied a certain portion of the country, and hostilities with neighboring clans were extremely common. Next in rank to the chief were a certain number of persons, commonly near relations of the chief, to whom portions of land were assigned, during pleasure or on short leases. Each of these usually had a subdivision of the clan under him, of which he was chieftain, subject, however, to the general head of the sept. The jurisdiction of the chiefs was not very accurately defined, and it was necessary to consult, in some measure, the opinions of the most influential clansmen and the general wishes of the whole body.

CLAN-NA-GÆL, a secret society founded by patriotic Irishmen in the United States for the purpose of intimidating England into granting Ireland home rule. It is charged that the dynamite outrages in London in 1883 were due to Clan-na-Gæl agents.

CLARE, a maritime county, Ireland, province Munster (capital, Ennis), between Galway Bay and the Shannon estuary; area, 827,994 acres, of which 140,000 are under tillage. Oats, potatoes, wheat, and barley are the principal crops. The chief minerals are limestone, lead, and slate, but the produce of the county is almost wholly agricultural. Lakes are numerous, but generally of small size, and the county is deficient in wood. The salmon-fisheries are valuable, and there are immense oyster-beds in some places. Pop. 112,129.

CLARENDON, George William Frederick Villiers, Earl of. He was educated at Cambridge, entered the civil service at an early age, and in 1820 was attached to the embassy at St. Petersburg. In 1831 he was sent to France to negotiate a commercial treaty, and in 1833, as minister plenipotentiary at Madrid, was instrumental in negotiating the Quadruple Alliance signed in 1834. Having succeeded to his uncle's title in 1838 he returned home in the following year, and in Jan. 1840 was appointed lord privy-seal, and in October chancellor of the duchy of Lancaster. He supported the repeal of the corn-laws and the reduction of duties, and in 1846 was appointed president of the board of trade in Lord J. Russell's ministry, and in the following year Lord-lieutenant of Ireland. He resigned with his party in 1852, when the Earl of Derby took office, but soon after the formation of the Aberdeen ministry he was appointed to the foreign secretaryship, which he held until Jan. 1855. After a few weeks' interval he returned to the post under Lord Palmerston, and retained it until 1858, being one of the signatories of the Treaty of Paris. In 1861 Clarendon was sent as ambassador-extraordinary to the coronation of the King of Prussia, and in 1864 was appointed chancellor of the duchy of Lancaster. In the following administration, under Russell, he resumed the direction of the foreign office. He was sent in 1868 on a special mission to the pope and the King of Italy, and again occupied the post of foreign secretary in the Gladstone ministry till his death, in June, 1870.

CLAR'ENDON PRESS, the press of the University of Oxford. In January, 1586, delegates de impressione librorum were appointed by the Convocation of the university, Joseph Barnes and others after him being styled "Printer to the University." The management of the printing-office is committed to a delegacy consisting of the vice-chancellor and ten other members of Convocation. The north side of the present building, called the "learned" or classical side, is set apart for the printing of university documents and authorized books, the "south" for the printing of Bibles and Prayer-books.

CLAR'ET, the name given in Britain, and the United States, etc., to the red wines of Bordeaux. See Bordelais Wines.

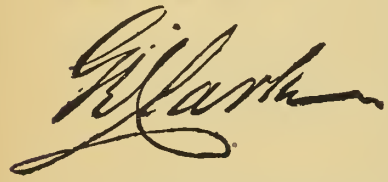
CLARIFICA'TION, or the separation of the insoluble particles that prevent a liquid from being transparent, may be performed by depuration, in which the liquid is allowed to stand until the particles are precipitated, and then decanted; by filtration, or straining through wool, sand, charcoal, etc.; or by coagulation, in which the albumen contained in or added to the liquid is solidified and precipitated by the action either of heat or of acids, the extraneous substances being precipitated with it. See also Fining.

CLAR'INET, or **CLARIONET,** a wind-instrument of the reed kind, played by holes and keys. Its lowest note is E below the F clef, from which it is capable, in the hands of good performers, of ascending more than three octaves. Clarinets in A natural and B flat are those chiefly used in the orchestra, while instruments in B flat and E flat are used in reed bands.

CLARK, Alvan, an American optician and maker of telescope lenses, born in Massachusetts in 1808, died 1887. He founded an establishment at Cambridgeport, Mass., in 1844, at which have been ground the largest telescope lenses in the world.

CLARK, Alvan Graham, an American optician, son of Alvan Clark, born in Massachusetts in 1832, died 1897. He made the objectives of the great Lick and the great Yerkes observatories, and discovered the Companion Star to Sirius.

CLARK, George Rogers, an American soldier, born in Virginia in 1752, died in 1818. In 1778 he began his famous expedition into Illinois capturing



many of the French villages and defeated the English general, Hamilton in 1779. In 1783 the Virginia legislature made him a grant of 8000 acres for his services.

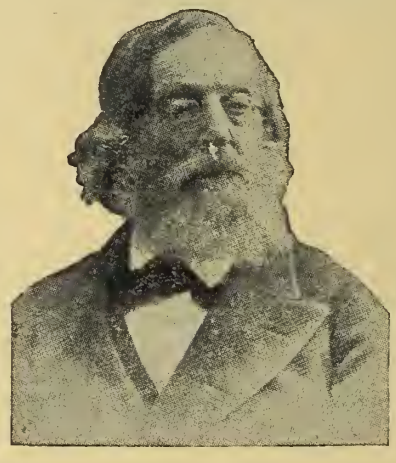
CLARK, John Bates, an American economist, born in Rhode Island in 1847. He is the originator of a new conception of economic science and has published several works of high value to social science and philosophy. Since 1895 he has been professor of economics at Columbia University.

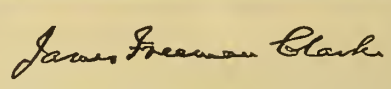
CLARK UNIVERSITY, founded at Worcester, Mass., in 1887 by Jonas Gilman Clark. It is exclusively a graduate school and has an endowment of upward of $3,000,000. The University publishes The American Journal of Psychology, The Pedagogical Seminary, and the Mathematical Review.

CLARK, William, an American traveler and soldier, born in Virginia 1770, died in 1838. He was one of the commanders of the famous Lewis and Clark expedition and was engaged in the early fighting against the Indians. He was superintendent of Indian affairs at St. Louis from 1822 until his death.

CLARK, William Andrews, an American legislator and capitalist, born in Pennsylvania in 1839. He emigrated to Montana in 1863 and acquired immense wealth as a merchant. He was elected in 1899 to the United States senate but was rejected by the committee on elections. He at once resigned from the senate but was forthwith appointed by the governer of Montana to the seat vacated by his resignation. In 1901 he was duly elected senator.

CLARKE, James Freeman, an American clergyman, born in New Hampshire in 1810, died in 1888. He began to





preach to Unitarian charges in 1833, and during his busy life published a mass of literature dealing with the liberal aspect of religion, the more important of which were Christian Doctrine of Prayer, Orthodoxy, Its Truths and Errors, The Ten Great Religions, Common Sense in Religion. Essentials and Non-Essentials in Religion, Manual of Unitarian Belief.

CLARKE, John Sleeper, an American actor, born in Baltimore in 1833, died in 1899. In 1867 he visited England where he succeeded so well that he took up his residence in that country although he afterward paid several visits to the United States.

CLARKE, William Horatio, an American musician and organist, born in Massachusetts in 1840. For ten years, until 1887, he was organist at Tremont Temple, Boston. He is the author of A New Method for Reed Organs, a work which has had a tremendous sale.

CLARKS'VILLE, a city and the county-seat of Montgomery County, Tenn., 45 miles northwest of Nashville; near the junction of the Cumberland and Red rivers, and on the Louisville and Nashville Railroad. It is one of the great tobacco markets of the south, and has manufactures of iron, agricultural implements, etc. Pop. 11,232.

CLASSIC, a term derived from L. classici, the name given to the citizens belonging to the first or highest of the six classes into which the Romans were divided. Hence the Greek and Roman authors have been in modern times called classics, that is, the excellent, the models. The Germans, however, soon gave the word klassisch (classical) a wider sense, making it embrace: 1, the standard works of any nation; and 2, ancient literature and art, in contradistinction to the modern.

CLASSIFICATION is commonly defined as the arrangement of things, or of our notions of them, according to their resemblances or identities; and its general object is to provide that things shall be thought of in such groups, and the groups in such an order, as will best promote the remembrance and ascertainment of their laws. As any collection of objects may be classified in a variety of ways, no fixed method can be laid down; but it will be obvious that in correct classification the definition of any group must hold exactly true of all the members of that group and not of the members of any other group. The best classification again will be that which shall enable the greatest possible number of general assertions to be made; a criterion which distinguishes between a natural and an artificial system of classification. Classification is perhaps of most importance in natural history—for example, botany and zoology. In the former the artificial or Linnæan system long prevailed, in opposition to the modern or natural.

CLAUDIA'NUS, Claudius (commonly called Claudian), a Latin poet, native of Alexandria, lived at the end of the 4th and beginning of the 5th century after Christ, under the Emperor Theodosius and his sons. He did much to recall to dying Rome the splendors of the Augustan literature, ranking considerably above any other of the later poets. Besides several panegyrical poems on Honorius, Stilicho, and others, we possess two of his epic poems, the Rape of Proserpine, and an unfinished War of the Giants, eclogues, epigrams, and occasional poems.

CLAU'DIUS, often also called Clodius, the name of a distinguished Roman family of antiquity. See Appius Claudius.

CLAU'DIUS, or, in full Tiberius Claudius Drusus Nero Germanicus, a Roman emperor, son of Claudius Drusus Nero, stepson of Augustus and Antonia,

Tiberius Claudius.

the daughter of Augustus's sister; born at Lyons (10 B.C.). He lived in privacy, occupying himself with literature, the composition of a Roman history, and

other works, until the murder of Caligula, when he was dragged from his hiding-place and proclaimed emperor (41 A.D.). The early years of his reign were marked by the restoration of the exiles, the embellishment of Rome, the addition of Mauritania to the Roman provinces, and successes in Germany and Britain. But latterly he became debauched, left the government to his wives, and in particular to Messalina, who with his freedmen committed the greatest enormities. He was poisoned by his fourth wife, Agrippina (mother of Nero), A.D. 54.

CLAV'ICLE, the collar-bone, a bone forming one of the elements of the shoulder girdle in vertebrate animals. In man and sundry quadrupeds there are two clavicles each joined at one end to the scapula or shoulder-bone, and at the other end to the sternum or breast-bone. In many quadrupeds the clavicles are absent or rudimentary, while in birds they are united in one piece popularly called the "merry-thought."

CLAY, the name of various earths, which consist of hydrated silicate of aluminium, with small proportions of the silicates of iron, calcium, magnesium, potassium, and sodium. All the varieties are characterized by being firmly coherent, weighty, compact, and hard when dry, but plastic when moist, smooth to touch, not readily diffusible in water, but when mixed not readily subsiding in it. Their tenacity and ductility when moist and their hardness when dry has made them from the earliest times the materials of bricks, tiles, pottery, etc. Of the chief varieties porcelain-clay, kaolin, or china-clay, a white clay with occasional gray and yellow tones, is the purest. Potter's-clay and pipe-clay, which are similar but less pure, are generally of a yellowish or grayish color, from the presence of iron. Fire-clay is a very refractory variety, always found lying immediately below the coal; it is used for making fire-bricks, crucibles, etc. Loam is the same substance mixed with sand, oxide of iron, and various other foreign ingredients. The boles, which are of a red or yellow color from the presence of oxide of iron, are distinguished by their conchoidal fracture. The ochres are similar to the boles, containing only more oxide of iron. Other varieties are fuller's-earth, Tripoli, and boulder-clay, the last a hard clay of a dark-brown color, with rounded masses of rock of all sizes embedded in it, the result of glacial action. The distinctive property of clays as ingredients of the soil is their power of absorbing ammonia and other gases and vapors generated on fertile and manured lands; indeed no soil will long remain fertile unless it has a fair proportion of clay in its composition.

CLAY, Henry, an American statesman, born at Richmond, Virginia, in 1777. After acting as clerk in two or three state offices he commenced business in 1797 as a lawyer at Lexington, Kentucky. He soon became famous as a public speaker, and at the age of twenty-six was a member of the Kentucky legislature. In 1806 he was elected to the United States Senate; and in 1811 to the House of Representatives, where he was at once made speaker. In 1814 he proceeded to Europe and acted as one of the commissioners for adjusting the treaty of peace at Ghent between America and Great Britain. He was an unsuccessful candidate for the presidency in 1824, 1832, and 1844.

H. Clay

He is best known for his endeavors to shut out European influences from America, and in connection with the "Missouri Compromise of 1820," restricting slavery to the states south of lat. 36° 30′ n.; and another similar compromise of 1850 regarding the admission of California, New Mexico, and Utah, etc. He died at Washington in 1852.

CLAYMORE, formerly the large two-handed, double-edged sword of the Scotch Highlanders; now a basket-hilted, double-edged broad-sword.

CLAY-SLATE, in geology, a rock consisting of clay which has been hardened and otherwise changed, for the most part extremely fissile and often affording good roofing-slate. In color it varies from greenish or bluish gray to lead color. The cleavage is independent of the stratification. It rarely lies parallel to the bedding, generally crossing the strata at all angles.

CLAYTON-BULWER TREATY, a treaty between the United States and Britain ratified in 1850, establishing the relations of the two countries as to their powers over the projected inter-oceanic canal across the Isthmus of Panama. According to its provisions neither power was to fortify, nor exclusively control the canal or any part of central America, its neutrality was to be preserved, and other powers were to be invited to participate in these agreements. The treaty was superseded by the Hay-Pauncefote treaty of 1901.

CLEARANCE OF VESSELS, the examination of them by the proper custom-house officers, and the giving of a certificate that the regulations have been duly complied with. Vessels are said to clear inward or outward according as they arrive or set sail.

CLEARING HOUSE, an institution in a city by which the banks of the city can settle all their relations to each other by a single transaction instead of each bank settling separately with the other. In the United States there are nearly 100 clearing houses, the largest being that of New York, the clearings of which are about $80,000,000,000 (eighty billions) annually. The total clearings of all the banks in the country are about $120,000,000,000, or one hundred and twenty thousand million of dollars annually. American clearing houses are united in an association which has proved quite helpful to business.

CLEAVAGE, the manner or direction in which substances regularly cleave or split. The regular structure of most crystallized bodies becomes manifest as soon as they are broken. Each fragment presents the form of a small polyhedron, and the very dust appears under the microscope an assemblage of minute solids, regularly terminated. The directions in which such bodies thus break up are called their planes of cleavage; and the cleavage is called basal, cubic, diagonal, or lateral (or peritomous), according as it is parallel to the base of a crystal, to the faces of a cube, to a diagonal plane, or to the lateral planes. In certain rocks again there is a tendency to split along planes which may coincide with the original plane of stratification, but which more frequently cross it at an angle. This tendency is the consequence of the readjustment by pressure and heat of the components of rocks, which is one of the phases of metamorphism.

CLEAVELAND, Moses, an American soldier and pioneer, the founder of the city of Cleveland, Ohio. The change of the form of the name was due to the fact that the editor of a newspaper spelled the name without the letter a in the first syllable because of lack of space. Cleaveland was born in Connecticut in 1754 and died in 1806.

CLEF (French for key), in music, a sign placed on a line of a staff, and which determines the pitch of the staff and the name of the note on its lines. There are three clefs now in use: the treble or G clef, written on the second line; the mean or C clef, which may be placed on the first, second, third, or fourth lines; and the bass or F clef, seated on the fourth line. The mean clef is very seldom used in writing vocal music in England.

CLEM'ATIS, a genus of woody climbing plants. The most common species, virgin's bower or traveler's joy, is conspicuous by its copious clusters of white blossoms, and afterward by its feather tailed silky tufts attached to the fruits.

CLEM'ENS, Samuel Langhorne, an American humorist, more generally known by his pseudonym "Mark Twain," born in Missouri in 1835. He worked for some time as a compositor in Philadelphia and New York, and then in 1855 learned the business of pilot on the Mississippi. Thence he went to the Nevada mines; became in 1862 local editor of a newspaper in Virginia City; went to San Francisco; was for some time a reporter, and worked in the

Calaveras gold-diggings. In 1866 he went to the Sandwich Islands, and on his return commenced his lecturing career. He edited for a time a paper in Buffalo, and finally married and settled in Hartford, Conn. Mr. Clemens undertook publishing, but failed, and settled dollar for dollar. He removed to England, recovered much of his fortune by writing, and recently came to the United States to spend his remaining years in New York. His chief books are the Jumping Frog, etc., Roughing It, The Innocents Abroad, Tom Sawyer, A Tramp Abroad, Life on the Mississippi, Huckleberry Finn, American Claimant, Tom Sawyer Abroad, The Prince and The Pauper, An American at King Arthur's Court.

CLEM'ENT, the name assumed by many popes, the first being Clement of Rome. Clement XIV., who abolished the order of Jesuits, was one of the most distinguished. He died in 1774.

CLEMEN'TI, Muzio, pianist and composer, born in Rome in 1752. As early as his twelfth year he wrote a successful mass for four voices. He went in 1780 to Paris, and in 1781 to Vienna, where he played with Mozart before the emperor. In 1784 he repeated his visit to Paris, but after that remained in England till 1802, when he went back to the Continent. He returned in 1810 to England, where he settled down as superintendent of one of the principal musical establishments in London. He died in 1832, and was interred in Westminster Abbey. He represented perhaps the highest point of technique of his day, and his influence upon modern execution has led to his being characterized as "the father of pianoforte playing."

CLEOPAT'RA, a Greek queen of Egypt, born B.C. 69, the eldest daughter of Ptolemy Aulētēs. When she was seventeen her father died, leaving her as joint-heir to the throne with his eldest son Ptolemy, whom she was to marry—such marriages being common among the Ptolemies. Being deprived of her part in the government (B.C. 49) she won Cæsar to her cause, and was reinstated by his influence. In a second disturbance Ptolemy lost his life, and Cæsar proclaimed Cleopatra queen of Egypt; though she was compelled to take her brother, the younger Ptolemy, then eleven years old, as husband and colleague. Cæsar continued some time at Cleopatra's court, had a son by her named Cæsarion (afterward put to death by Augustus), and gave her a magnificent reception when she subsequently visited him at Rome. By poisoning her brother she remained sole possessor of the regal power, took the part of the triumvirs in the civil war at Rome, and after the battle of Philippi sailed to join Antony at Tarsus. Their meeting was celebrated by splendid festivals; she accompanied him to Tyre, and was followed by him on her return to Egypt. After his conquest of Armenia he again returned to her and made his three sons by her, and also Cæsarion, kings. On the commencement of the war between Augustus and Antony the latter lost a whole year in festivals and amusements with Cleopatra at Ephesus, Samos, and Athens, and when at last the fleets met at Actium, Cleopatra suddenly took to flight, with all her ships, and Antony, as if under the influence of frenzy, immediately followed her. They fled to Egypt, and declared to Augustus that if Egypt were left to Cleopatra's children they would thenceforth live in retirement. Augustus, however, demanded Antony's death and advanced on Alexandria. Believing Cleopatra, who had taken refuge in her mausoleum, to be treacherous and dead, Anthony threw himself on his sword, and shortly afterward Cleopatra killed herself by applying an asp to her arm to escape the ignominy of being led in a Roman triumph (B.C. 30). With her the dynasty of the Ptolemies ended.

CLEOPATRA'S NEEDLES, the name given to two Egyptian obelisks, formerly at Alexandria, but one of which is now in London, the other in New York. They are made of the rose-red granite of Syene, and were originally erected by the Egyptian king Thothmes III. in front of the great temple of Heliopolis, the On of the Scriptures, where Moses was born and brought up. They were taken to Alexandria shortly before the commencement of the Christian era, and after the death of Cleopatra, but possibly in pursuance of a design originated by her. The London obelisk, which stands on the Thames Embankment, was presented to the British government in 1820, but was long left uncared for. In 1877–78, however, it was brought to London by the private munificence of Sir Erasmus Wilson, and erected in its place at a cost of some $50,000. The New York obelisk was presented to the U. States by the Khedive of Egypt, and was set up in the Central Park in 1881. Each is about 70 feet high and inscribed with numerous hieroglyphics.

CLERGY, the body of ecclesiastical persons, in contradistinction to the laity. At first there was no strongly-marked distinction between clergy and laity, but the former soon drew apart, consisting, after the apostolic age, of bishops, priests, and deacons, and in the 4th century of many additional inferior orders, such as sub-deacons, acolytes, etc. With the increased complexity of the hierarchy there was a steady accretion of privileges until the burden of these became intolerable to the laity. The Episcopalians recognize three classes of clergy—bishops, priests, and deacons; and generally hold the doctrine of the apostolic succession. Large numbers of Protestants however, reject this dogma, and believe in the ministry of only one order. The Catholic clergyman, according to the doctrine of the Roman Catholic Church, is endowed in his spiritual character with a supernatural power, which distinguishes him essentially from the layman.

CLEVELAND, a city of Ohio, capital of Cuyahoga County, on the Cuyahoga river, 255 miles from Cincinnati, 343 miles from Chicago, and 183 miles from Buffalo. Population in 1908, 525,000. It has an area of 33 sq. miles and is built upon a gentle slope from the bank of Lake Erie, the river cutting the city into two parts. The business part of the city extends eastward from the lower reaches of the river, parallel with the lake-front, for about a mile.

Among the principal buildings are the Central Armory, the Cleveland Grays' Armory, the Western Reserve Historical Society Library, Women's College, Lakeside Hospital, several lesser hospitals, U. S. building, Northern Ohio Insane Asylum, House of Correction, Adelbert College, Case School of Applied Science, Cleveland Medical College, city-hall, county court-house, and Union Railway Dépôt. The board of education has under it 73 schools with 58,000 enrolled pupils, of whom 3,460 boys and girls are in the five high schools. The Cleveland Public Library, opened in 1853, has about 150,000 volumes, and is free; the Case Library Association, with property valued at $600,000, maintains for subscribers a circulating and reference collection of over 45,000 volumes; the Law Library, opened in 1870, has 20,000 volumes; the Western Reserve Historical Society has 25,000 books and a valuable collection of antiquities.

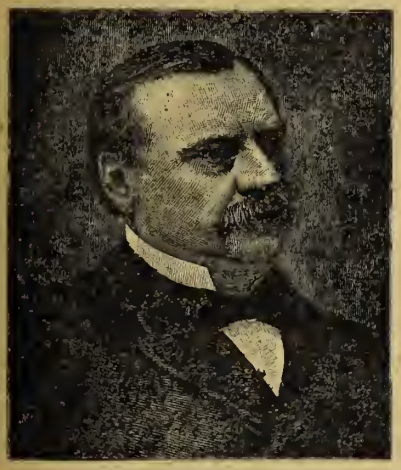
The city is governed by a mayor and a city council, comprising two representatives for each of the 11 districts formed from the 42 wards.

The Lake Shore and Mich. Southern, the Erie, the N. Y., Chicago and St. L. (Nickel Plate), the Cl., Cin., Chic. and St. L., the Cleveland and Pittsburg, as part of the Pennsylvania system, and the Balt. and Ohio, are six great trunk lines carrying the traffic of Cleveland, while several smaller railways enter the city. The lake commerce is large and expanding, and fine passenger steamers run daily to various ports on the Great Lakes. Six suburban street railways radiate from Cleveland.

Cleveland is an important manufacturing center. In the building of iron and steel vessels Cleveland surpasses all lake ports, on the average of the last ten years. Sternposts and shafts for U. States naval vessels built on the Atlantic coast are forged in Cleveland; also heavy castings and forgings for bridges, street-railway machinery, and lifts for unloading vessels. Here is the center of the malleable-iron trade in the U. States. Important optical instruments and their mountings are made in Cleveland. Petroleum refining, hardware, boots and shoes, and chemicals give rise to important industries.

CLEVELAND, Grover, twenty-second president of the U. States, born in New Jersey in 1837. He settled in Buffalo, and having acquired an excellent position as a lawyer was elected mayor in 1881. Next year he was elected by the democrats governor of New York State, and in 1884, having been nominated for the presidency by the democratic national convention at Chicago, was elected on Nov. 4. Civil service reform and tariff reform were advocated by him during his tenure of office, which came to an end in 1889. President Harrison then succeeded, but Cleveland was again elected president in 1892. His second administration was marked by the Venezuela boundary dispute with Britain in which Mr. Cleveland

practically threatened war on England. His administration kept clear of Cuban affairs which confronted Mr. McKinley, his successor. He has lately become



Grover Cleveland.

identified with one of the large life insurance companies. He died in 1908.

CLIFF-DWELLER, a name given to a certain extinct people who presumably built and inhabited the cliff ruins which abound in southwest Colorado. Several expeditions have been made to these ruins but with little effect. It is held by some that the cliff dwellers were the ancestors of the Pueblo Indians.

CLIMAC'TERIC, according to an old theory, a critical period in human life in which some great alteration is supposed to take place in the constitution. The first climacteric is, according to some, the seventh year; the others are multiples of the first, as 14, 21, etc.; 63 is called the grand climacteric.

CLI'MATE, the character of the weather or atmospheric phenomena peculiar to every country as respects heat and cold, humidity and dryness, the direction and force of the prevailing winds, the alteration of the seasons, etc., especially as such conditions affect animal and vegetable life. In general, geographical latitude is the principal circumstance to be taken into view in considering the climate of a country, and thus the torrid, temperate, and frigid zones may each be said roughly to have a climate of its own. The highest degree of heat is found in the equatorial regions, and the lowest, or the greatest degree of cold, at the poles. In the former the temperature continues practically the same all the year round, though there may be alternating rainy seasons and dry seasons. The variations in temperature are very considerable in the temperate zones, and increase as we approach the polar circles. The heat of the higher latitudes, especially about 59° or 60°, is, in July, greater than that of countries 10° nearer the equator, and at Tornea, in Lapland, where the sun's rays are very oblique even in summer, the heat is sometimes equal to that of the torrid zone, because the sun is almost always above the horizon. But even in the equatorial regions, and still more in intermediate regions, the temperature is affected by local configuration and circumstances. In the deserts of Africa, for instance, owing to the exceptional radiating power of sandy plains and the absence of aqueous vapor in the atmosphere, the heat is excessive, while in the corresponding latitudes of south America the mountainous character of the country makes the climate more moderate. Altitude above the sea indeed has everywhere the same effect as removal to a greater distance from the equator, and thus in the Andes we may have a tropical climate at the sea-level and an arctic one on the mountain summits. The winds to which a country is most exposed by its situation have also a great influence on the climate. In the northern hemisphere if north and east winds blow frequently in any region it will be colder, the latitude being the same, than another which is often swept by milder breezes from the south and west. The climate of southern Europe, for instance, is decidedly affected by the warm south winds which blow from the hot deserts of Africa. The greater or lesser extent of coast-line a country possesses in proportion to its area has a decided influence on the climate. The almost unvarying temperature of the ocean equalizes in some degree the periodic distribution of heat among the different seasons of the year, and the proximity of a great mass of water moderates, by its action on the atmosphere, the heat of summer and the cold of winter. Hence the more equable temperature of islands and coasts as compared with that of places far inland, and hence the terms insular climate and continental climate. The British Isles, Tasmania, and New Zealand enjoy a mild or insular climate as compared with, say, Central Russia, or Central Asia. Thus it happens that London has a milder winter and a cooler summer than Paris, though the latter is nearly 3° farther south. Similarly, though Warsaw and Amsterdam are almost in the same latitude, the mean annual temperature of the former is 46·48°, while it reaches at the latter 53·4° Fahr. The proximity of large masses of water involves also the presence of much aqueous vapor in the atmosphere, which may be condensed in abundant rains so as to greatly influence the plant-life of a country. Direction of mountain chains, set of ocean currents, nature of soil, are other modifying elements. In exhibiting graphically the chief climatic facts of a region various methods may be adopted, but in all the use of isothermal lines is one of the most instructive features. These are lines drawn on a map or chart connecting those places which have the same mean annual temperature or same mean summer and mean winter temperature. In this way we may divide the earth into zones of temperature which by no means coincide with the limits of the zones into which the earth is astronomically divided, and when compared with these on a map show interesting and instructive divergences. Geology teaches that vast changes have taken place in the climate of most if not of all countries, the causes of which are not fully understood.

CLI'MAX, a rhetorical figure in which a series of propositions or objects are presented in such a way that the least impressive comes first, and there is a regular gradation from this to the most impressive or final.

CLIMBERS, a name applied to birds of the order Scansores from their climbing habits. They have two toes before and two behind, and are represented by parrots, cockatoos, etc.

CLIMBING PERCH, a singular fish, remarkable for having the pharyngeal bones enlarged and modified into a series of cells and duplications so that they can retain sufficient water to keep

Climbing perch.

the gills moist and enable the fish to live out of water six days. The climbing perch of India proceeds long distances overland in search of water when the pools in which it has been living have dried up.

CLIMBING PLANTS are plants of weak stems which naturally seek support from their surroundings to rise from the ground. Some are twining plants, rising by winding themselves or their tendrils round the trunks of trees, etc. Such are the honey-suckle and scarlet-runner. Others, like the ivy, attach themselves by small roots developed from the stem as they ascend. Some in climbing always twine spirally from right to left, others again always take the opposite direction.

CLIN'ICAL MEDICINE, that department of medicine which teaches how to investigate, at the bedside of the sick, the nature of diseases, to note their course and termination, and to study the effects of the various modes of treatment to which they are subjected. A clinical lecture is the instruction which the teacher gives his pupil at the bedside of the patient.

CLINOMETER, an instrument used for taking the dip and strike of rock strata.

CLINTON, a town in Iowa, on the Mississippi, 42 miles above Davenport, with railway workshops, foundries, etc. Pop. 26,820.

CLINTON, DeWitt, an American statesman, born in New York state in 1769, died in 1828. He became a lawyer and was one of the opponents of the federal constitution. In 1802 he was elected U. States senator from New York, but resigned to become mayor of New York City, a post he filled until 1815. In 1812 he was republican candidate for president but was defeated by Madison. His greatest service was the persistent work he did for the promotion of the Erie canal.

CLINTON, George, an American statesman, born in New York state in 1739, died in 1812. He was a member of the continental congress, was a brigadier-general on the revolutionary army, and the first governor of New

York, a position he held until 1805, when he became vice-president of the U. States, filling that office until the time of his death. He opposed the adoption of the federal constitution.

CLINTON, Sir Henry, a British general who served in the Hanoverian war, and was sent to America in 1775 with the rank of major-general, where he

Sir Henry Clinton.

distinguished himself in the battle of Bunker Hill. He defeated the Americans at Long Island, but had to evacuate Philadelphia to Washington. In 1782 Clinton retired to England. He died in 1795.

CLI'O, in Greek mythology, daughter of Zeus and Mnemosyne; the muse of history. Her attributes are a wreath of laurel upon her head, a trumpet in her right hand, and a roll of papyrus in her left.

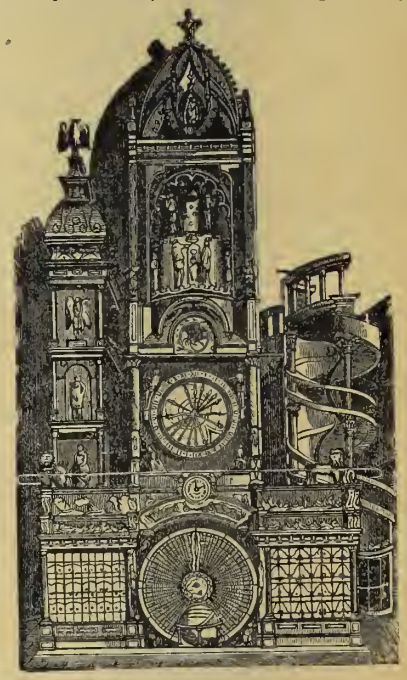
CLIPPER, a modern build of sailing ship, having a long sharp bow, the greatest beam abaft the center, and a great rate of speed.

CLIVE, Robert, Lord Clive and Baron of Plassey, English general and statesman, was born in 1725 in Shropshire. In his nineteenth year he entered the East India Company's service at Madras as a writer, but in 1747 quitted the civil for the military service. In 1751 Clive, who had already a reputation for skill and courage, marched on the large city

Lord Clive.

of Arcot with 200 British troops and 300 Sepoys, and took it, although strongly garrisoned, without a blow, withstood a siege by Chunda Sahib for nearly two months, and at last routed the enemy, took possession of important posts, and returned to Madras completely victorious. In 1753 he sailed to England to recover his health, and was received with much honor. Two years later he was back in India, in his governorship of St. David's, from which he was soon summoned to command the expedition sent to Bengal, where the nabob Suraj-ud-Dowlah had attacked the British, destroyed their factories, taken Calcutta, and suffocated over 120 of his prisoners in the Black Hole. Clive soon took possession of Calcutta and brought Suraj-ud-Dowlah to terms, but having no trust in the loyal intentions of the nabob he resolved to dethrone him. With the help of Meer Jaffier, one of the nabob's officers, he effected his purpose, and in the battle of Plassey completely overthrew Suraj-ud-Dowlah's forces. Meer Jaffier now became the new nabob, and Clive was made governor of Calcutta. Here he was equally successful against the encroachments of the Dutch, defeating their forces both by sea and land. In 1761 he was raised to the Irish peerage with the title of Lord Clive, Baron of Plassey. In 1764 fresh troubles in India brought him back, but now as president of Bengal, with command of the troops there. Before his arrival, however, Major Adams had already defeated the Nabob of Oude, and Lord Clive had only the arranging of the treaty by which the Company obtained the disposal of all the revenues of Bengal, Bahar, and Orissa. In 1767 he finally returned to England. His health was by this time broken, and in one of his habitual fits of melancholy he put an end to his life, November 22, 1774.

CLOCK, an instrument for measuring time and indicating hours, minutes, and usually seconds, by means of hands moving on a dial-plate, and differing from a watch mainly in having the movement of its machinery regulated by a pendulum, and in not being portable. The largest and most typical clocks also differ in having their machinery set in motion by means of a falling weight or weights, the watch wheel-work being moved by the force of an uncoiling spring; but many clocks also have a spring setting their works in motion. The use of a horologium, or hour-teller, was common even among the ancients, but their time-pieces were nothing else than sun-dials, hour-glasses, and clepsydræ. In the earlier half of our era we have accounts of several attempts at clock construction: that of Boethius in the 6th centhry, the clock sent by Harun al Rashid to Charlemagne in 809, that made by Pacificus, archdeacon of Verona, in the 9th century, and that of Pope Sylvester II. in the 10th century. It is doubtful, however, if any of these was a wheel-and-weight clock, and it is probably to the monks that we owe the invention of clocks set in motion by wheels and weights. In the 12th century clocks were made use of in the monasteries, which announced the end of every hour by the sound of a bell put in motion by means of wheels. From this time forward the expression, "the clock has struck," is often met with. The hand for marking the time is also made mention of. In the 14th century there are stronger traces of the present system of clock-work. Dante particularly mentions clocks. Richard, abbot of St. Albans in England, made a clock in 1326, such as had never been heard of till then. It not only indicated the course of the sun and moon, but also the ebb and flood tide. Large clocks on steeples likewise were first made use of in the 14th century. Watches are a much later invention, although they have likewise been said to have been invented as early as the 14th century. A celebrated clock, the construction of which is well known, was set up in Paris for Charles V. in 1379, the maker being Henry de Vick, a German. It probably



Strassburg clock.

formed a model on which clocks were constructed for nearly 300 years, and until Huyghens applied the pendulum to clock-work as the regulating power, about 1657. The great advantage of the pendulum is that the beats or oscillations of a pendulum all occupy substantially the same time (the time depending on its length), hence its utility in imparting regularity to a time-measurer. The mechanism by which comparative regularity was previously attained, though ingenious and simple, was far less perfect; and the first pendulum escapement, that is, the contrivance by which the pendulum was connected with the clock-work, was also less perfect than others subsequently introduced, especially Graham's dead-beat escapement, invented in 1700. In a watch the balance-wheel and spring serves the same purpose as the pendulum, and the honor of being the inventor of the balance-spring was contested between Hugyhens and the English philosopher Dr. Hooke. Various improvements followed, such as the chronometer escapement, and the addition of a compensation adjustment, by which two metals having unequal rates of expansion and contraction under variations of temperature are combined in the pendulum or the balance-wheel, so that, each metal counteracting the other, the vibrations are isochronous

under any change of temperature. This arrangement was perfected by Harrison in 1726, and is especially useful in navigation. See Watch.

CLOIS'TER, an arched way or gallery, often forming part of certain portions of monastic and collegiate buildings, usually having a wall of the building on one side, and an open colonnade, or a series

Part of the cloister—Westminster Abbey.

of windows with piers and columns adjoining an interior yard or court on the other side. Such galleries were originally intended as places of exercise and recreation, the persons using them being under cover. The term is also used as equivalent to convent or monastery.

CLOSE CORPORATION, a corporation which fills up its own vacancies, the election of members not being open to the public.

CLOSE-HAULED, in navigation, said of a ship when the general arrangement or trim of the sails is such as to enable her to sail as nearly against the wind as possible.

CLO'SURE, a rule in British parliamentary procedure adopted in 1887 by which, at any time after a question has been proposed, a motion may be made with the speaker's or chairman's consent "That the question be now put," when the motion is immediately put and decided without debate or amendment. So also if a clause of a bill is under debate a motion that it stand or be added may be put and carried in the same way. The motion must be supported by more than 100 members and opposed by less than 40, or have the support of 200 members. The introduction of the closure was intended to prevent debates from being too much spun out.

CLOTH, a fabric formed by interweaving threads or fibers of animal or vegetable origin, as wool, hair, cotton, flax, hemp, etc. Cloth may also be made by felting as well as by weaving. See Cotton, Woolen, Silk, etc.

CLOTHES-MOTH, the name common to several moths, whose larvæ are destructive to woolen fabrics, feathers, furs, etc., upon which they feed, using at the same time the material for the construction of the cases in which they assume the chrysalis state.

CLOTHING, the clothes or dress, that is the artificial coverings collectively, which people wear. Nothing is more necessary to comfort than that the body should be kept in nearly a uniform temperature, thus preventing the disturbance of the important excretory functions of the skin by the influence of heat or cold. Hence in a changeable climate the question of clothing becomes of special importance. The chief end proposed by clothing ought to be protection from the cold. A degree of cold amounting to shivering cannot be felt without injury to the health, and the strongest constitution cannot resist the benumbing influence of a sensation of cold constantly present, even though it be so moderate as not to occasion immediate complaint, or to induce the sufferer to seek protection from it. This degree of cold often lays the foundation of the whole host of chronic diseases, foremost among which are found scrofula and consumption. The only kind of dress that can afford the protection required by the changes of temperature to which the cooler or temperate climates are liable, is woolen. Those who would receive the advantage which the wearing of woolen is capable of affording, must wear it next the skin; for it is in this situation only that its health-preserving power can be felt. The great advantages of woolen cloth are briefly these:—the readiness with which it allows the escape of sweat through its texture; its power of preserving the sensation of warmth to the skin under all circumstances; the slowness with which it conducts heat; the softness, lightness, and pliancy of its texture. Cotton cloth, though it differs but little from linen, approaches nearer to the nature of woolen, and on that account must be esteemed as the next best substance of which clothing may be made. Silk is the next in point of excellence, but it is very inferior to cotton in every respect. Linen possesses the contrary of most of the properties enumerated as excellencies in woolen. It retains the matter of perspiration in its texture, and speedily becomes imbued with it; it gives an unpleasant sensation of cold to the skin; it is very readily saturated with moisture, and it conducts heat too rapidly. Clothes should be so made as to allow the body the full exercise of all its motions. The neglect of this precaution is productive of more mischief than is generally believed, and the misery and suffering arising from it often begin while we are yet in the cradle.

CLOUD, a collection of visible vapor or watery particles suspended in the atmosphere at some altitude. They differ from fogs only by their height and less degree of transparency. The average height of clouds is calculated to be 2½ miles, thin and light clouds being much higher than the highest mountains, while thick heavy clouds often touch low mountains, steeples, and even trees. Clouds differ much in form and character, but are generally classed (following Luke Howard, in his Essay on Clouds) into three single or primary forms, viz.:—1. The cirrus, so called from its resemblance to a lock of hair, and consisting of fibers which diverge in all directions. Clouds of this description float at a great height, usually from 3 to 5 miles above the earth's surface. 2. The cumulus or heap, a cloud which assumes the form of dense convex or conical heaps, resting on a flattish base, called also summer-cloud. Under ordinary circumstances these clouds accompany fine weather, especially in the heat of summer. They attain their greatest size early in the afternoon and gradually decrease toward sunset. 3. The stratus, so named from its spreading out uniformly in a horizontal layer, which receives all its augmentations of volume from below. It belongs essentially to the night, and is frequently seen on calm summer evenings after sunset ascending from the lower to the higher grounds, and dispersing in the form of a cumulus at sunrise. These three primary forms of clouds are subdivided as follows:—1. The cirro-cumulus, composed of a collection of cirri, and spreading itself frequently over the sky in the form of beds of delicate snow-flakes. 2. The cirro-stratus or wane-cloud, so called from its being generally seen slowly sinking, and in a state of transformation; when seen in the distance, a collection of these clouds suggests the resemblance of a shoal of fish, and the sky, when thickly mottled with them, is called in popular language a

Cloud—Cirrus.

Cloud—Cumulus.

Cloud—Stratus.

Cloud—Nimbus.

mackerel sky. 3. The cumulo-stratus or twain-cloud, one of the grandest and most beautiful of clouds, and consisting of a collection of a large fleecy clouds overhanging a flat stratum or base. 4. The nimbus, cumulo-cirro-stratus, or rain-cloud, recognizable, according to Mr. Howard, by its fibrous border and uniformly gray aspect. It is a dense cloud spreading out into a crown of cirrus and passing beneath into a shower. It presents one of the least attractive appearances among clouds, but it is only when the dark surface of this cloud forms its background that the splendid phenomenon of the rainbow is exhibited in perfection.

CLOUD-BURST, a sudden and very heavy fall of rain. The term was first used in the United States and afterward in India, to describe the same phenomenon. Cloud-bursts occur frequently in the Rocky Mountains, in which 10 to 21 inches of rain fall within an hour.

CLOUD ON TITLE, a defect or fault in a title to realty. It may be removed by a proceeding in a court of equity.

CLOVER, or **TREFOIL,** a name of different species of plants. There are about 150 species. Some are weeds, but many species are valued as food for cattle. Common red clover, is a biennial, and sometimes, especially on chalky soils, a triennial plant. This is the kind most commonly cultivated, as it yields a larger product than any of the other sorts. White clover, is a most valuable plant for pasturage over the whole of Europe, Central Asia, and North America, and has also been introduced into South America. The bee gathers much of its honey from the flowers of this species.

CLOVES, a very pungent aromatic spice, the dried flower-buds of a native of the Molucca Islands, belonging to the myrtle tribe, now cultivated in Sumatra, Zanzibar, Malacca, Jamaica, etc. The

Clove.

tree is a handsome evergreen from 15 to 30 feet high, with large elliptic smooth leaves and numerous purplish flowers on jointed stalks. Every part of the plant abounds in the volatile oil for which the flower-buds are prized. The spice yields a very fragrant odor, and has a bitterish, pungent, and warm taste. It is sometimes employed as a hot and stimulating medicine, but is more frequently used in culinary preparations.

CLOVIS, King of the Franks, born 465, succeeded his father Childeric in the year 481, as chief of the warlike tribe of Salian Franks, who inhabited Nothern Gaul. In 486 he overthrew the Roman governor at Soissons and occupied the country between the Somme and the Loire. He died at Paris, which he had made his capital, on Nov. 27, 511, in the thirtieth year of his reign.

CLOWN, the buffoon or practical jester in pantomime and circus performances. On the old English stage the clown was the privileged laugher-provoker, who, without taking any part in the dramatic development of the piece represented, carried on his improvised jokes and tricks with the actors, often indeed addressing himself directly to the audience instead of confining himself to what was going on on the stage. In Shakespeare's dramas, a distinct part is assigned to the clown, who no longer appears as an extempore jester, although the part he plays is to a certain extent in keeping with his traditional functions. He is now confined to the pantomime and the circus.

CLUB, an association of men, or of men and women, or of women alone, for social purposes, for political purposes, or for purposes other than these. The club originated in England, but there is not in the United States, probably, a single club which, in its usages, is precisely similar to the English clubs. The London clubs originated in the coffee houses and the first of importance was that which met in the Mermaid Tavern. This was attended by Raleigh, Shakespeare, Beaumont and Fletcher and other literary celebrities of that time. The first political club was established in 1659 and from this time forward clubs grew in number and variety representing every art, profession, and business in existence, one may almost say. A bare list of the clubs of London would fill several pages of this book. London has scores of sporting clubs, athletic clubs, travelers' clubs, pistol and gun clubs, in short clubs for every kind of purpose which could possibly bring men together, from the study of oriental tongues to prize-fighting and moral reform.

In the United States the club idea has been expanded so as to include women and their purposes. — The women's clubs—organized chiefly for reform—are associated in a national federation which meets annually. This federation takes in not only the reform clubs of women but also self-improvement clubs, temperance clubs, art and press clubs and all clubs formed exclusively of women.

Of men's clubs in the United States. New York City is the center and its clubs are the most famous in America. Among them may be mentioned The Union Club (1836), The Century Club (1846), The Union League Club (1863), The University Club (1865), The Knickerbocker Club (1871), The Lotus, a literary club (1870), The Manhattan Club (1864), a political club, The Players' Club (1888) and the Lambs' Club. Chicago has a number of strong political clubs the more noted of which are the Marquette Club (republican) and the Iroquois (democratic). The Press Club of Chicago is the best known press club in the world. Every large city in the United States has its quota of clubs, virtually of the same character. In this country the tendency of the larger clubs is to extend the lodging house feature of the establishment which until recently was not a general practice in American clubs.

CLUB-FOOT, a congenital distortion of the foot. There are several varieties. Sometimes the foot is twisted inward; sometimes the heel is raised and the toes only touch the ground; sometimes the foot is twisted outward; or it rests only on the heel. In most cases the deformity is curable by modern surgery.

CLYDE (klīd), a river of Scotland, which has its sources amid the hills that separate Lanarkshire from the counties of Peebles and Dumfries, passes by Lanark, Hamilton, Glasgow, Renfrew, Dumbarton, Greenock, etc., and forms finally an extensive estuary or firth before it enters the Irish Sea, at the southern extremity of the island of Bute. From its source to Glasgow, where navigation begins, its length is 70 or 80 miles. The Clyde, by artificial deepening, has been made navigable for large vessels up to Glasgow, and is the most valuable river in Scotland for commerce.

CLYDE, Lord, Sir Colin Campbell, was born in Glasgow, in 1792. He served in Spain under Sir John Moore and Wellington, being engaged in the battles of Barossa and Vittoria, and

Lord Clyde.

having displayed distinguished gallantry at the siege of San Sebastian, where, as well as at the Bidassoa, he was severely wounded. In 1854 he became major-general, with the command of the Highland Brigade in the Crimean war. His services at the battles of Alma and Balaklava, and during the war generally, were conspicuous, so that on the outbreak of the Indian mutiny he was appointed to the chief command there. Landing at Calcutta on 29th August, 1857, he relieved Havelock and Outram at Lucknow, and crushed the rebellion entirely before the end of the year. For his services here Sir Colin received the thanks of both Houses of Parliament, was created a peer with the title of Baron Clyde. In 1862 he was made field-marshal. He died August 14, 1863, and was buried in Westminster Abbey.

CLYMER, George, one of the signers of the Declaration of Independence, born in Philadelphia in 1739, died 1813. He was one of the treasurers of the continental congress and took part in the revolutionary war both as soldier

and investigating delegate from congress. Clymer was a member of the constitutional convention of 1787 and a member of congress from 1789 to 1791.

COACH, a general name for all covered carriages drawn by horses and intended for the rapid conveyance of passengers. The earliest carriages appear to have been all open, if we may judge from the figures of Assyrian and Babylonian chariots found on the monuments discovered amid the ruins of Nineveh and Babylon. At Rome both covered and uncovered carriages were in use. After the fall of the Roman Empire they went out of use again, and during the feudal ages the custom was to ride on horseback, the use of carriages being considered effeminate. They do not appear to have become common till the 15th century, and even then were regarded exclusively as vehicles for women and invalids. Later on they became, especially in Germany, part of the appendage of royalty. They seem to have been introduced into England about the middle of the 16th century, but were for long confined to the aristocracy and the wealthy classes. Hackney-coaches were first used in London in 1625. They were then only twenty in number, and were kept at the hotels, where they had to be applied for when wanted. In 1634 coaches waiting to be hired at a particular stand were introduced, and had increased to 200 in 1652, to 800 in 1710, and to 1000 in 1771. Stage-coaches were introduced into England about the same time as hackney-coaches.—The first stage-coach in London appears to have run early in the 17th century, and before the end of the century they were started on three of the principal roads in England. Their speed was at first very moderate, about 3 or 4 miles an hour. They could only run in the summer, and even then their progress was often greatly hindered by floods and by the wretched state of the roads generally. In 1700 it took a week to travel from York to London; in 1754 a body of Manchester merchants started a conveyance, the Flying Coach, of an improved kind, which did the journey to London in the unusually short period of four days and a half, and thirty years later a Mr. Palmer of Bath, after a considerable amount of opposition, succeeded in inducing the government to put in practice certain suggestions which he made, by which he showed that great saving both of time and money in the conveyance of passengers and letters would be effected. The result was the establishment of the system of mail-coaches, which continued to be the means of traveling in England until their place was taken by the railways. The first mail-coach started between London and Bristol on the 8th of August, 1784.

The revival of coaching as a sport in recent years has caused, of course a revival of the industry of coach building, and elegant coaches are now turned out in Europe and the United States by numerous factories. The weight of a road coach varies from 2200 to 3000 pounds and it is drawn by four horses. The typical American coach is that made at Concord, N. H. Other vehicles, such as hackney-coaches, landaus, etc., are not coaches at all. For their description see separate articles.

COACH-DOG, a short-haired dog of moderate size, and rather handsome shape, white with numerous black spots, kept as an attendant upon carriages, and of no use otherwise. Called also Dalmatian dog.

COACHING, the art or sport of driving a four-in-hand coach. Coaching as a necessary means of transportation is treated in the article on Coach (which see). Coaching was never brought to a high degree of perfection in America until it recently came into vogue as a pastime. In America it is used for sight seeing in large American and European cities, and in Europe until recently was practiced as a pastime. Today its place is almost entirely filled by the rapid growth of the automobile.

COADJU'TOR, a Latin term, nearly synonymous in its original meaning with assistant. The term is especially applied to an assistant bishop appointed to act for and succeed one who is too old or infirm for duty.

COAGULA'TION, the changing of a fluid into a more or less solid substance, or the separation of a substance from a solution, through the substance becoming more or less solid. Thus albumen of egg can be dissolved in cold water, but if the solution be warmed, the albumen undergoes a change, separates out in white flocky masses, and cannot again be redissolved in the water. Coagulation is well exemplified by the "curdling" of milk and "clotting" of blood.

COAHUILA (kō-ȧ-wē'lȧ), a state of Mexico, on the frontier of the United States, rich in woods and pastures, and having several silver-mines; area, 50,890 square miles; pop. 280,899.

COAL, a solid, opaque, inflammable substance, mainly consisting of carbon, found in the earth, largely employed as fuel, and formed from vast masses of vegetable matter deposited through the luxuriant growth of plants in former epochs of the earth's history. In the varieties of coal in common use the combined effects of pressure, heat, and chemical action upon the substance have left few traces of its vegetable origin; but in the sandstones, clays, and shales accompanying the coal, the plants to which it principally owes its origin are presented in a fossil state in great profusion, and frequently with their structure so distinctly retained, although replaced by mineral substances, as to enable the microscopist to determine their botanical affinities with existing species. The great system of strata in which coal is chiefly found is known as the carboniferous. There are many varieties of coal, varying considerably in their composition, as anthracite, nearly pure carbon, and burning with little flame, much used for furnaces and malt kilns; bituminous (popularly so called) or "household coal;" and cannel or "gas-coal," which burns readily like a candle, and is much used in gas-making. All varieties agree in containing from 60 to over 90 per cent of carbon, the other elements being chiefly oxygen and hydrogen, and frequently a small portion of nitrogen. For manufacturing purposes coals are generally considered to consist of two parts, the volatile or bituminous portion, which yields the gas used for lighting, and the substance comparatively fixed, usually known as coke, which is obtained by heating the coal in ovens or other close arrangements, and thus removing the volatile or smoke-yielding matter, while the full heating power of the coal still remains in the coke.

The principal coal deposits of Europe and America are found in the United States, Great Britain, Germany, France, Belgium, Russia, and Austria-Hungary, Coal is found in immense quantities in China and Japan, in India, and other oriental countries but its production there is limited. In the United States the largest deposits are found in the great coal belt of the Appalachians which extends from Pennsylvania to Alabama, a tract about 800 miles long and nearly 100 wide. In this region all kinds of coal are produced. Bituminous coal is produced in large quantities in Illinois, Indiana, and Kentucky. The western states from Colorado to the Pacific are also rich in coal but its mining is backward.

The coal production of the world at present is about 900,000,000 tons annually of which the United States produces 270,000,000, Great Britain 250,000,000 and Germany 165,000,000 tons. Austria Hungary comes fourth and falls to 40,000,000.

Coal is mined by means of shafts and tunnels which tap the seams in which great chambers are mined, the coal being transported underground on trucks, and brought to the surface through the shafts. Various improvements in machinery have recently facilitated the work, although coal mining still remains one of the most disagreeable and dangerous trades practiced.

COAL BRASS, the iron pyrites found in coal-measures, so named on account of its brassy appearance. Coal containing much pyrites is bad for iron smelting, and it is unpleasant for domestic use on account of the sulphurous acid which it gives off on burning. Coal brass is useful in the manufacture of copperas, and in alkali works.

COAL-CUTTING MACHINE, any machine for cutting out coal in the pit, the chief objects they are intended to serve being the cheapening of the work, the saving of a large quantity of coal, which in the ordinary process of holing by hand-labor with the pick is broken up into slack and dust, and the removal of the danger attending upon the employment of hand-labor. The instruments of excavation in these machines are constructed on various principles, some having an action like that of an ordinary pick, others a horizontal cutting-tool. There are usually arrangements for regulating the depth and force, and to a certain extent the direction of the blow, and the precision obtained is fully equal to that of hand-labor.

COAL GAS, the variety of carburetted hydrogen which produces common gas-light.

COALING-STATIONS, stations established by government at various important points throughout the world, where the ships, both of the navy and the mercantile marine, may obtain supplies of coal. The utility of such stations, when properly fortified, as points of refuge, defense, and repair for ships in the event of war can hardly be over-estimated.

COALITION, a term used in diplomacy and politics to denote a union between different parties not of the same opinions, but who agree to act together for a particular object. Among states it is understood to mean theoretically someting less general in its ends, and less deeply founded than an alliance.

COAL-TAR, or **GAS-TAR,** a substance obtained in the distillation of coal for the manufacture of illuminating gas, a dark-colored more or less viscid mass, consisting principally of oily hydrocarbons. It passes over with the gas into the condenser, along with ammonia liquor, but being heavier than the latter, it is easily separated from it when the whole is allowed to stand. It was formerly of comparatively little use; but in recent years a great number of valuable products have been derived from it by distillation, such as ammonia, naphtha, creosote, carbolic acid, and benzine, while it is also the source of the whole series of aniline colors, and other dyes, of alizarine, salicylic acid, etc.

COAL TAR COLORS, dyes made from the combinations of various hydrocarbons derived from coal tar. The possibility of making these dyes was discovered by the German chemist, Runge, in 1834. This observation was carried farther by Perkins in 1856, but the most interesting discovery in this connection was that of the German chemists Graebe and Liebermann who made a color from anthracene which was really the coloring matter found in madder root. This was in 1868 and the progress of organic chemistry since then has made it possible to prepare from anilinc and other hydrocarbons a variety of dyes varying infinitely in shade.

COAST AND GEODETIC SURVEY, The United States, a bureau pertaining to the department of the treasury, for the purpose of surveying the coasts and boundaries of the country and determining geographical positions in the interior. It was organized on the recommendation of President Jefferson in 1807 and its work since that time has included almost every region in the United States. Some of the important work done by the survey was triangulation, along the Atlantic coast to the Florida Keys, observation of the gulf stream, surveys of the boundary line between Alaska and British Columbia, soundings in all American waters, explorations of rivers and mountains, and magnetic observations in various parts of the country. The bureau issues a line of publications important for commerce, science, and defense.

COAST ARTILLERY, artillery for the defense of coasts. The United States uses 8, 10, and 12-inch breech loading guns, rapid-fire guns, and other forms of ordnance. The 16-inch breech loading rifle of the United States is one of the largest and most effective rifles in existence. It requires a charge of 576 pounds smokeless, and 1176 pounds black powder, and fires a projectile of 2400 pounds, a velocity (muzzle) of 2300 feet per second. The Italian and French rifles are a little larger but not so effective. English coast artillery has not been brought to the same perfection or that of the United States.

COAST DEFENSE, the art of fortifying and defending a coast from an enemy. This is done by the use of large guns (see Coast Artillery), by tactics which obstruct the enemy's advance, by harassing the enemy from different points of attack with isolated instruments or boats, by mining the water with torpedoes, and by the use of search lights to disclose the enemy's location. Since modern coast defense methods have been perfected no good opportunity of testing it has offered. The test made by Dewey at Manila Bay in 1898 was not a fair one, as the Spaniards were not only poor tacticians but their torpedoes were worthless.

COAT OF ARMS. See Arms and Heraldry.

COAT OF MAIL, a piece of armor in the form of a shirt, consisting of a network of iron or steel rings, or of small laminæ or plates, usually of tempered iron, laid over each other like the scales of a fish, and fastened to a strong linen or leather jacket.

CO'BALT, a metal of a grayish-white color, very brittle, of a fine close grain, compact, but easily reducible to powder. It crystallizes in parallel bundles of needles. It is never found in a pure state, but usually as an oxide, or combined with arsenic or its acid, with sulphur, iron, etc. The great use of cobalt is to give a permanent blue color to glass and enamels upon metals, porcelain, and earthenwares.

COBB, Howell, an American legislator, born in Georgia in 1815, died in 1868. He was congressman for four terms until 1851, and in the last term was speaker of the house. His other positions were governor of Georgia (1855) secretary of the treasury in Buchanan's cabinet, and president of the congress which adopted the constitution of the confederacy. He was a bitter anti-reconstructionist.

COB'DEN, Richard, English politician, the "apostle of free trade," born in Sussex 3d June, 1804, died in London 2d April, 1865. His first political writing was a pamphlet on England, Ireland, and America, which was followed by another on Russia. In both of these he gave clear utterance to the political views to which he continued through his life rigidly to adhere, advocating non-intervention in the disputes of other nations, and maintaining it to be the only proper object of the foreign policy of England to increase and strengthen her connections with foreign countries in the way of trade and peaceful intercourse. Having joined the anti-corn-law league, formed in 1838, it was chiefly the extraordinary activity of Cobden, together with Bright and other zealous fellow-workers, which won victory for the movement. In 1841 Cobden entered parliament as member for Stockport, and after several years of unwearied efforts at last induced Sir Robert Peel, then prime minister, to bring in a bill for the repeal of the corn

Richard Cobden.

laws, a measure which became law in 1846. His last great work was the commercial treaty which he was the means of bringing about between Britain and France in 1860. During his later years he lived a good deal in retirement.

COBDEN CLUB, an association formed about a year after the death of Mr. Cobden, mainly by the influence of Mr. Bright and Mr. T. B. Potter, for the purpose of encouraging the growth and diffusion of those economical and political principles with which Mr. Cobden's name is associated. The Cobden Club has distributed a vast number of books and pamphlets.

COBRA DE CAPELLO, the Portuguese name of the hooded or spectacled snake, which is found in Southern Asia, a closely allied species, also called cobra, or asp, being found in Egypt. It is called spectacled snake from a singular marking on the back of the neck, while its other name is given from the remarkable manner in which it spreads out the skin on the sides of the neck and head when disturbed or irritated, raising the anterior part of its body so as to appear to stand erect, and expanding its hood. So exceedingly poisonous is its bite, that in numerous instances death has followed within a few minutes, and under ordinary circumstances a few hours is the longest term where prompt measures have not been taken. But indeed recovery rarely takes place, though injection of potash into the veins is said to be a remedy. In India thousands of natives lose their lives yearly through cobra bites. Its food consists of small reptiles, birds, frogs, fishes (being an excellent swimmer), etc. Its great enemy is the ichneumon. It is one of the snakes that the snake-charmers perform tricks with.

COBWEB, the web or network spun by spiders to catch their prey.

COCA, a South American plant. The leaf is a stimulating narcotic, and is chewed by the inhabitants of countries on the Pacific side of South America, mixed with finely-powdered chalk. It has effects somewhat similar to those of opium. A small quantity of it enables a person to bear up against fatigue ever when receiving less food than usual

and it prevents the difficulty of respiration experienced in climbing high mountains. Used in excess it brings on various disorders, and the desire for it increases so much with indulgence that a confirmed coca-chewer is said never to have been reclaimed. Coca-leaves depend for their influence on a crystallizable alkaloid called cocaine, which, besides having effect similar to the leaf, possesses valuable anæsthetic properties, and in recent times has been especially employed to prevent suffering in operations on the eye, having also similar effects when applied to the tongue, larynx, ear, etc.

COCAINE (kō′ka-in). See Coca.

COCCUS, a genus of insects of the order Hemiptera, family Coccidæ, or scale-insects. The males are elongated in their form, have large wings, and are destitute of any obvious means of suction; the females, on the contrary, are of a rounded or oval form, about an eighth of an inch in length, have no wings, but possess a beak or sucker, by which they suck up the juices of the plants on which they live. At a certain period of their lives the females attach themselves to the plant or tree which they inhabit, and remain thereon immovable during the rest of their existence. In this situation they are impregnated by the male; after which their body increases considerably, in many species losing its original form and assuming that of a gall, and, after depositing the eggs, drying up and forming a habitation for the young. Cochineal consists of the bodies of the females of the Coccus cacti, a native of Mexico, which feeds on various species of cactus, particularly on one called nopal.

COCH′IN, a small native state of India, on the s. w. or Malabar coast connected with the Presidency of Madras. Area, 1361 sq. miles; pop. 815.218.

COCHIN-CHINA, a country forming part of the peninsula of South-eastern Asia, and generally regarded as comprising the whole of Anam and Lower or French Cochin-China. The latter belonged to Anam till, in 1863 a portion of it was finally ceded to France after a war occasioned by the persecution of French missionaries; another portion being declared French territory in 1867. The territory thus acquired covers 21,710 sq. miles, and in 1894 had a pop. of 2,226,935.

COCHIN-CHINA, a term applied to a variety of the domestic fowl, imported from Cochin-China. It is a large ungainly bird, valuable chiefly owing to its fecundity, eggs being laid even during the winter.

COCHINEAL (koch′in-ēl), a dye-stuff consisting of the dried bodies of the females of a species of insect, a native of the warmer parts of America, particularly Mexico, and found living on a species of cactus called the cochineal-fig. The insects are brushed softly off, and killed by being placed in ovens or dried in the sun, having then the appearance of small berries or seeds. A pound of cochineal contains about 70,000 of them. The finest cochineal is prepared in Mexico, where it was first discovered, and Guatemala; but Peru, Brazil, Algiers, the East and West Indies, and the Canary Islands have also entered into this industry with more or less success. Cochineal produces crimson and scarlet colors, and is used in making carmine and lake.

COCHRANE, John, an American legislator and soldier, born in New York State in 1813, died in 1898. He was democratic member of congress from 1856 to 1862 and was a brigadier-general in the Union army during the civil war. In 1864 he was candidate for the vice presidency with Fremont.

COCK. See Fowl.

COCKADE′, a plume of cock's feathers, with which the Croats in the service of the French in the 17th century adorned their caps. A bow of colored ribbons was adopted for the cockade in France, and during the French revolution the tricolored cockade—red, white, and blue—became the national distinction. National cockades are now to be found over all Europe.

COCKATOO′, the name of a number of climbing birds belonging to the family of the parrots. They have a large, hard bill; a crest, capable of being raised and lowered at the will of the bird, commonly white, but sometimes yellow, red, or blue; a tail somewhat longer than that of the parrot, and square or rounded; long wings; and, for the most

Leadbeater's cockatoo.

part, a white plumage, though in some genera the plumage is dark. They are found especially in the Eastern Archipelago and Australia. They live on roots, fruits, grain, insects, etc., and usually congregate in flocks. These birds are easily tamed, and when domesticated become very familiar.

COCK′CHAFER, a species of lamellicorn beetle, remarkable for the length of its life in the worm or larva state, as well as for the injury it does to vegetation after it has attained its perfect condition. The common cockchafer is hatched from an egg which the parent deposits in a hole about 6 inches deep, which she digs for the purpose. At the end of about three months the insect emerges as a small grub or maggot, and feeds on the roots of vegetables in the vicinity with great voracity. When full grown it is over an inch in length; it makes its way underground with ease, and commits great devastation on grass and corn crops. In the fourth year the insect appears as a perfect coleopterous insect—a beetle over an inch long, of a black color, with a whitish down. It usually emerges from the ground about the beginning of May, from which circumstance the English name May bug or beetle has been given it. In its perfect state it is very destructive to the leaves of various trees.

COCKER, a dog of the spaniel kind, allied to the Blenheim dog, used for raising woodcocks and snipes from their haunts in woods and marshes.

COCK-FIGHTING, an amusement practiced in various countries, first perhaps among the Greeks and Romans. At Athens there were annual cock-fights, and among the Romans quails and partridges were also used for this purpose.

COCK′NEY, a nickname for a London citizen, as to the origin of which there has been much dispute. The word is often, but not always, employed slightingly as implying a peculiar limitation of taste or judgment. The epithet is as old at least as the time of Henry II.

COCK OF THE PLAINS, a large North American species of grouse, inhabiting desolate plains in the western states.

COCK OF THE ROCK, a South American bird of a rich orange color with a beautiful crest, belonging to the manakin family.

COCKPIT, in a man-of-war, the place where the wounded are dressed in battle or at other times, and where medicines are kept.

COCK′ROACH, a genus of insects, characterized by an oval, elongated, depressed body, which is smooth on its superior surface. They have parchment-like elytra, and in the female the wings are imperfectly developed. They are nocturnal in their habits, exceedingly agile, and devour provisions of all kinds. Cockroaches, like other orthopterous insects, do not undergo a compiete metamorphosis: the larvæ and nymphs resemble the perfect insect, except that they have merely rudiments of wings. The eggs are carried below the abdomen of the female for seven or eight days till she finally attaches them to some solid body by means of a gummy fluid. The species are numerous.

COCKSWAIN (colloquially cok′sn), the officer who manages and steers a boat and has the command of the boat's crew.

CO′COA, a name given to the ground kernels of the cacao or chocolate tree prepared to be made into a beverage. See Cacao.

CO′COA-NUT, or **COCO-NUT,** a woody fruit of an oval shape, from 3 or 4 to 6 or 8 inches in length, covered with a fibrous husk, and lined internally with a white, firm, and fleshy kernel. The tree which produces the cocoa-nut is a palm, from 40 to 60 feet high. The trunk is straight and naked, and surmounted by a crown of feather-like leaves. The nuts hang from the summit of the tree in clusters of a dozen or more together. The external rind of the nuts has a smooth surface. This incloses an extremely fibrous substance, of considerable thickness, which immediately surrrounds the nut. The latter has a thick and hard shell, with three black scars at one end, through one of which the embryo of the future tree pushes its way. This scar may be pierced with a pin; the others are as

hard as the rest of the shell. The kernel incloses a considerable quantity of sweet and watery liquid, of a whitish color, which has the name of milk. This palm is a native of Africa, the East and West Indies, and South America, and is now grown almost everywhere in tropical countries. Food, clothing, and the means of shelter and protection are all afforded by the cocoa-nut tree The kernels are used as food in various modes of dressing, and yield on pressure an oil which is largely imported into various countries. When dried before the oil is expressed they are known as copra. The fibrous coat of the nut is made into the well-known cocoa-nut matting; the coarse yarn obtained from it is called coir, which is also used for cordage. The hard shell of the nut is polished and made into a cup or other domestic utensil. The fronds are wrought into baskets, brooms, mats, sacks, and many other useful articles; the trunks are made into boats or furnish timber for the construction of houses. By boring the tree a white sweetish liquor called toddy exudes from the wound, and yields by distillation one of the varieties of the spirit called arack. A kind of sugar called jaggery is also obtained from the juice by inspissation.

COCOA-NUT OIL, a solid vegetable fat, largely used in candle-making and in the manufacture of soaps and pomatum. This fat is got by pressure from the albumen of the cocoa-nut kernel, and is as white as lard, and somewhat firmer. Manila and Ceylon send large quantities of the oil to the U. S.

COCOON', the name given to the web or ball spun by caterpillars before passing into the chrysalis state. The valuable product thus obtained from the silkworm is well known.

COD, a genus of well-known soft-finned fishes, distinguished by the following characteristics:—A smooth, oblong, or fusiform body, covered with small soft scales; ventrals attached beneath the throat; gills large, seven-rayed, and opening laterally; a small beard at the tip of the lower jaw; generally two or three dorsal fins, one or two anal, and one distinct caudal fin. The most interesting species is the common or bank cod. Though found plentifully on the coasts of other northern regions, as Britain, Scandinavia, and Iceland, a stretch of sea near the coast of Newfoundland is the favorite annual resort of countless multitudes of cod, which visit the the Grand Banks to feed upon the crustaceous and molluscous animals abundant in such situations, and thus attract fleets of fishermen. Few members of the animal creation are more universally serviceable to man than the codfish. Both in its fresh state and when salted and dried it is a substantial and wholesome article of diet; the tongue is considered a delicacy, and the swimming-bladders or sounds, besides being highly nutritious, supply, if rightly prepared, an isinglass equal to the best Russian. The oil extracted by heat and pressure from the liver is of great medicinal value, and contributes considerably to the high economic value of the cod. The cod is enormously prolific, the ovaries of each female containing more than 9,000,000 of eggs; but the numbers are kept down by a host of enemies. The spawning season, on the banks of Newfoundland, begins about the mouth of March and terminates in June; but the regular period of fishing does not commence before April on account of the storms, ice, and fogs. The season lasts till the end of June, when the cod commence their migrations. The average length of the common cod is about 2½ or 3 feet, and the weight between 30 and 50 lbs., though sometimes cod are caught weighing three times this. The color is a yellowish-gray on the back, spotted with yellowish and brown; the belly white or reddish, with golden spots in young individuals. It is caught by lines and hooks.

COD, Cape. See Cape Cod.

CODE, in jurisprudence, is a name given to a systematic collection or digest of laws. The following are the chief codes which have affected the laws of Europe and the United States: The Theodosian Code, a compilation executed in 429 by a commission on behalf of Theodosius the Younger, and promulgated as law throughout the eastern and western empires. The Justinian Code, a code compiled in 528, in the reign of the Emperor Justinian, incorporating all the codes, rescripts, edicts previously in use (see Civil Laws). The Code Napoléon, or Code Civil, undertaken under the consulship of Napoléon by the most eminent jurists of France, and published in 1804. The Code Napoléon (under which name other four codes of commercial law, criminal law, penal law, and law of procedure, drawn up at the same time, are often included) was a code in the strictest sense, that is, not merely a collection of laws, but a complete and exclusive statement of the law virtually amounting to a recasting of the laws of the country. Under the first empire the adoption of the Code Napoléon was made obligatory on all the countries subject to the French, and although it has been judged defective in some technical respects, its brevity, clearness, and modern spirit have made it popular in all the countries where it has been introduced. At present it is recognized in Belgium (with some modifications), in Baden, in Italy, and elsewhere in Europe.

CODEINE (kō-dē'-in), a crystallizable alkaloid obtained from opium, in which it exists to the amount of 6 or 8 ozs. per 100 lbs. It is used to produce sleep and to soothe irritable coughs; and is the chief remedy in diabetes; dose ¼ grain and upward. It is a poison in excessive doses.

COD'ICIL, in law, a supplement to a will, to be considered as a part of it, either for the purpose of explaining or altering or of adding to or subtracting from the testator's former disposition. A codicil may not only be written on the same paper or affixed to or folded up with the will, but may be written on a different paper and deposited in a different place. In general the law relating to codicils is the same as that relating to wills, and the same proofs of genuineness must be furnished by signature, and attestation by witnesses. A man may make as many codicils as he pleases, and, if not contradictory, all are equally valid.

COD-LIVER OIL, an oil extracted from the livers of different kinds of cod. The finest and palest oil is got from fresh and carefully-cleaned liver, the oil being extracted either in the cold or by a gentle heat. The darker kinds are got at a higher temperature, and often from the livers in a putrefying state. Only the pale oils are used in medicine; the dark oils are too rank and acrid, and they are only used in dressing leather. Cod-liver oil is a somewhat complex substance, but the main ingredients appear to be olein and margarin. Acetic butyric, and other acids are also present, and to these the oil may owe some of its odor. This oil is now a recognized agent in the treatment of rheumatism, gout, scrofula, and especially of consumption, being taken internally and containing a quantity of easily-assimilated nutritive matter.

CODY, William Frederick (Buffalo Bill), an American scout, marksman and showman, born in Iowa in 1845. During the civil war he was a scout for the Union army and was subsequently a contractor for the supply of buffalo meat to the constructors of the Kansas Pacific Railroad, an enterprise which earned him his soubriquet. Of late years he originated his "Wild West Show," which took Europe by storm.

CO-EDUCATION, the education of the two sexes (1) in the same institution, and (2) in the same class room or laboratory. The practice is almost universal in the public schools and state colleges and universities, and in many of the large endowed colleges and universities. In Europe women are not admitted to the large schools except in England, Sweden, Switzerland and Austria. In this country co-education was advocated as early as 1826 by Horace Mann in the high schools of Massachusetts, and in 1833 Oberlin College opened its doors to women. Today virtually all the universities of the U. States and Canada (with the exception of a few religious institutions) admit women either as undergraduate students, graduate students, or both. The merits of the controversy as to the desirability of co-education is a very difficult question to decide.

COFFEE is the seed of an evergreen shrub which is cultivated in hot climates, and is a native of Abyssinia and of Arabia. This shrub is from 15 to 20 feet in height, and belongs to the Rubiaceæ. The leaves are green, glossy on the upper surface, and the flowers are white and sweet-scented. The fruit is of an oval shape, about the size of a cherry, and of a dark-red color when ripe. Each of these contains two cells, and each cell a single seed, which is the coffee as we see it before it undergoes the process of roasting. Great attention is paid to the culture of coffee in Arabia. The trees are raised from seed sown in nurseries and afterward planted out in moist and shady situations, on sloping grounds or at the foot of mountains. Care is taken to conduct little rills of water to their roots, which at certain seasons require to be constantly sur-

rounded with moisture. When the fruit has attained its maturity cloths are placed under the trees, and upon these the laborers shake it down. They afterward spread the berries on mats, and expose them to the sun to dry. The husk is then broken off by large and heavy rollers of wood or iron. When the coffee has been thus cleared of its husk it is again dried in the sun, and, lastly, winnowed with a large fan, for the purpose of clearing it from the pieces of husks with which it is intermingled. A pound of coffee is generally more than the produce of one tree; but a tree in great vigor will produce 3 or 4 lbs. Next in quality to the Mocha coffee may perhaps be ranked that of Southern India and that of Ceylon, which is strong and well flavored; but comparatively little coffee now comes from Ceylon.

Coffee plant.

Java and Central America produce large quantities of excellent coffee. Brazilian coffee, though produced more abundantly than any other, stands at the bottom of the list as regards quality. Liberian coffee may also be mentioned. Of the best Mocha coffee grown in the province of Yemen little or none is said to reach the western markets. Arabia itself, Syria, and Egypt consume fully two-thirds, and the remainder is exclusively absorbed by Turkish or Armenian buyers. The only other coffee which holds a first rank in eastern opinion is that of Abyssinia. Then comes the produce of India, which those accustomed to the Yemenite variety are said to consider hardly drinkable. American coffee holds in the judgment of all Orientals the very last rank.

COFFER-DAM, a temporary wooden inclosure formed in water in order to obtain a firm and dry foundation for bridges, piers, etc. It is usually formed of two or more rows of piles driven close together, with clay packed in between the rows.

COFFIN, the chest or box in which a dead body is inclosed for burial. Coffins were used by the ancients mostly to receive the bodies of persons of distinction. Among the Romans it was latterly the almost universal custom to consume the bodies with fire, and deposit the ashes in urns. In Egypt coffins seem to have been used in ancient times universally. They were of stone, earthenware, glass, wood, etc. A sort of ancient coffin is known as a sarcophagus. Coffins among Christians were introduced with the custom of burying. (See Burial.) Modern coffins are usually made of wood, and are sometimes inclosed in a leaden case. It has been often proposed that they should be made with a hole opposite the place of the mouth of the body, so as to allow breathing in case of revival. Of course it would be necessary, at the same time, to let the coffin stand for some days in a convenient place, as is the custom in some parts of Germany. It has recently been proposed to employ coffins of wicker-work, while some strenuously advocate the burning of all dead bodies. See Cremation.

COFFIN, Charles Carleton, an American journalist and writer, born in New Hampshire in 1823, died in 1896. He was war correspondent during the civil war for the Boston Journal and later made a tour of the world. His published works deal largely with war and travel.

COFFIN, James Henry, an American mathematician and scientist, born in Massachusetts in 1806, died in 1873. He was one of the first scientists appointed to the Smithsonian Institution and his publications deal with meteorology, astronomy nad psychology.

COFFIN, William Anderson, an American painter, born in Pennsylvania in 1855. His paintings are chiefly landscapes. His picture, Rain, was purchased by the Metropolitan Muscum, and he was awarded a bronze medal at the Paris exposition of 1889.

COGHLAN, Rose, an Anglo-American actress, born in England in 1853. Her first appearance was as one of the witches in Macbeth. She made her American debut with E. A. Sothern in 1871 at New York, and since that time has appeared in Shakespearean and other parts in the principal American cities.

COGNAC (kon-yȧk), a town in France, dep. Charente, and near the river Charente, 22 miles w. Angoulême, pleasantly situated on a hill, crowned by the remains of an old castle. It is famous for the brandy which bears its name, and which is exported to all parts uf the world. Pop. 18,932.

COGNATES, relations by the mother's side. See Agnates.

COG'NISANCE, in heraldry, a crest, coat of arms, or similar badge of distinction appertaining to a person or family; in law, judicial or formal notice or acknowledgment of a fact.

COGNO'MEN, the hereditary family name (such ns Cicero, Cato, etc.) among the ancient Romans. The other two names generally borne by every well-born Roman, viz. the prænomen and nomen (as in Marcus Tullius Cicero) served to denote the individual (Marcus), and the gens (Tullius) or clan to which his family belonged.

COGNO'VIT, in law, is a written confession given by the defendant that the action of the plaintiff is just, or that he has no available defense.

COG-WHEEL, a wheel with cogs or teeth.

COHABITATION, the living together of a man and woman as husband and wife. The term does not exclusively mean the very act of sexual intercourse itself, but implies it.

COHE'SION, the force by which the various particles of the same material are kept in contact, forming one continuous mass. Its action is seen in a solid mass of matter, the parts of which cohere with a certain force which resists any mechanical action that would tend to separate them. In different bodies it is exerted with different degrees of strength, and it is measured by the force necessary to pull them asunder. Cohesion acts at insensible distances, or between particles in contact, and is thus distinguished from the attraction of gravitation. It unites particles into a single mass, and that without producing any change of properties, and is thus distinguished from adhesion, which takes place between different masses or substances; and from chemical attraction or affinity, which unites particles of a different kind together and produces a new substance. Hardness, softness, tenacity, elasticity, malleability, and ductility are to be considered as modifications of cohesion. The great antagonist of cohesion is heat.

COHESION FIGURES, a class of figures produced by the attraction of liquids for other liquids or solids with which they are in contact, and divided into surface, submersion, breath, and electric cohesion figures. Thus a drop of an independent liquid, as oil or alcohol, will spread itself out on the surface of water always in a definite figure, but differing with each fluid dropped on the water. Breath figures are produced by putting a drop of the liquid to be examined on a slip of mica, and breathing on it, when each fluid takes a distinct characteristic shape. Electric cohesion figures are produced by electrifying drops of various liquids placed on a plate of glass.

COHOBA'TION, the repeated distillation of the same liquid from the same materials.

COHOES (ko-hoz'), a city of Albany Co., New York, on the west bank of the Hudson River, at the mouth of the Mohawk, with unlimited water-power derived from the Mohawk Falls. There are large cotton and other mills. Pop. 26,140.

COIMBATORE (ko-im-ba-tōr'), a town of Hindustan, Madras Presidency, capital of district to which it gives name, situated on the river Noyil, with wide streets, abundant water, and a healthy climate. Pop. 53,080.—The district has an area of 7860 square miles. It is fertile, producing sugar, cotton, rice, and tobacco; and well watered by several rivers. Pop. 2,202,312.

COINAGE, Coins. See Coining, Money, Numismatics, Currency.

COINAGE, the conversion of a metal into pieces of money, (coins) stamped with impressions which are provided for by law. The right to coin money is a prerogative of the State and one of the foremost marks of sovereignty. The circulation of coins rests, in the first

instance, upon the authority of the State, but that authority must be exercised in good faith. Coinage issued by individuals would lack authority and lack also the guaranty of good faith. There have been occasions of great dearth of money where private persons have issued coins. Such issues are known as tokens, and gain circulation either from their similarity to legal coins or from the promise of redeeming them. Their total lack of uniformity gives a picture of what might be expected were the issue of coins left wholly to private initiative. Almost equally obvious is the necessity for the manufacture by the State of the coins which it issues. To delegate the manufacture of its coins to a private establishment, as was done in France before 1879, required such a minute control of all its operations by State officials that the plan has generally been abandoned. The greater integrity of a national mint over a private enterprise is further illustrated by the fact that the mints of the leading nations are frequently called upon to execute the coinage for smaller States which have no mints of their own. Thus, in 1901, the United States Mint executed a gold coinage for Costa Rica.

In many countries, notably England and the United States, the government makes no charge for coining gold (free coinage) and in others a charge is made, called seignorage, the term being derived from the feudal system of France. Perfectly free coinage has been found to be most advantageous to the general welfare of a nation.

COKE, the carbonaceous residue of coal which has been heated in an oven or retort, or in any way by which little air is admitted, until all volatile matter has been expelled. The simplest method of producing coke is based on the preparation of wood charcoal, the coal being arranged in heaps which are smothered with clay or coal-dust, and then set on fire, sufficient air being admitted to keep the mass at the proper temperature for decomposition without wasting the coke. After the volatile portions are got rid of, the heap is allowed to cool, or is extinguished with water, and the coke is then ready. Methods of heating the coal in close or open ovens until the gaseous and fluid products are driven off are also commonly used. Gas-coke is that which remains in the retorts after the gas has been given off. Good oven-coke has an iron-gray color, sub-metallic luster, is hard, and somewhat vesicular; but gas-coke has rather a slagged and cindery look, and is more porous. Coke contains about 90 per cent of carbon, and is used where a strong heat is wanted without smoke and flame, and it is accordingly largely consumed in drying malt and similar purposes. It used to be burned regularly in locomotive-engines, but raw coal is now commonly substituted. The largest quantities are consumed in smelting operations.

COKE, Sir Edward, an eminent English lawyer, was the son of a Norfolkshire gentleman and was born in 1551. He died, September, 1634. His principal works are Reports, from 1600 to 1615; Institutes of the Laws of England, in four parts; the first of which contains the celebrated commentary on Littleton's Tenures ("Coke Upon Littleton"); A Treatise of Bail and Mainprise, Complete Copyholder.

Sir Edward Coke.

COLBERT (kol-bār), Jean Baptiste, a celebrated French minister of finances, born at Rheims in 1619. After serving in various subordinate departments Colbert was made intendant, and at length comptroller-general of the finances. His task was a difficult one. He found disorder and corruption everywhere. The state was the prey of the farmers-general, and at the same time maintained only by their aid. The people were obliged to pay 90,000,000 livres of taxes, of which the king received scarcely 35,000,000, the revenues were anticipated for two years, and the treasury empty. Colbert at once commenced a system of stringent reforms, abolishing useless offices, retracting burdensome privileges, diminishing salaries, and distributing and collecting the taxes by improved methods till he had reduced them almost to one-half. To his talents, activity, and enlarged views the development and rapid progress of industry and commerce in France was largely due. He constructed the Canal of Languedoc; declared Marseilles and Dunkirk free ports; granted premiums on goods exported and imported; regulated the tolls; established insurance offices; made uniform laws for the regulation of commerce, labored to render the pursuit of it well esteemed, and invited the nobility to engage in it. The French colonies in Canada, Martinique, etc., showed new signs of life; new colonies were established in Cayenne and Madagascar, and to support these Colbert created a considerable naval force. Under the protection and in the house of the minister (1663) the Academy of Inscriptions was founded. Three years afterward he founded the Academy of Sciences, and in 1671 the Academy of Architecture. He enlarged the Royal Library and the Garden of Plants, and built an observatory, in which he employed Huyghens and Cassini. He began the measurement of the meridian in France, and sent men of science to Cayenne. After having conferred the greatest benefits on his country he died in 1683, out of favor with the king and the people.

COLD, the absence of sensible heat, especially such a want of heat as causes some discomfort or uneasiness. The temperature in which man and other animals live is generally below the natural heat of the body, but this is easily kept up in ordinary cases by means of the food taken in and digested. A high degree of cold, however, produces bodily depression, and is a frequent source of disease, or even of death. For the ailment called a cold, see Catarrh.

COLD-BLOODED ANIMALS, a term applied to those animals, such as reptiles, the temperature of whose blood ranges from the freezing-point, or near it, to 90° Fahr., in accordance with that of the surrounding medium.

COLD CREAM, a cooling ointment prepared in various ways. A good variety may be made by heating four parts of olive-oil with one of white wax. This ointment cools the skin, rendering it soft and pliable, and is successfully applied for the cure of chapped hands.

COLD-WATER CURE. See Hydropathy.

COLD WAVE, a term used by the United States weather bureau and applied to sudden changes in temperature. Cold waves are caused by the pressure of the heavy cold air of the north or northwest upon the lighter warm air of the Southern and Eastern parts of the United States. They advance with an even front causing the temperature to drop from a few degrees to 40 or 50 degrees in a few hours.

COLE, Timothy, an American engraver, born in England in 1852 and known as the engraver of numerous fine pictures published by the Century company of New York. Many cities consider Mr. Cole the best of modern engravers.

COLEMAN, William Tell, an American pioneer, one of the 49'ers who went to California with the prospectors on the discovery of gold in that state. He was conspicious as a leader of early vigilance committees. Coleman was born in Kentucky in 1824 and died in 1893.

COLEN'SO, John William, D.D., Bishop of Natal, born in 1814; educated at Cambridge; assistant-master at Harrow till 1842; appointed in 1853 first bishop of Natal, South Africa. He published treatises on Algebra and Arithmetic which have been popular text-books in schools and colleges. His work on the Pentateuch and Book of Joshua, which called in question the historical accuracy of these books, involved the author in a conflict with his ecclesiastical superiors, and he was deposed by the Bishop of Cape Town. But the decisions of the privy-council of chancery were in his favor, and he continued to officiate as bishop. He died in 1883.

COLEOP'TERA, an order of insects, commonly known as beetles. They have four wings, of which the two superior are not suited to flight, but form a covering and protection to the two inferior, and are of a hard and horny or parchment-like nature. The inferior wings, when not in use, are folded transversely under the superior. The coleoptera undergo a perfect metamorphosis. The larva generally resembles a short thick worm with six legs and a scaly head and mouth.

COLERIDGE, Samuel Taylor, a celebrated English poet and philosopher, was born on 21st October, 1772, at Ottery St. Mary, Devonshire. He died July 25th, 1834. The dreamy and transcendental character of Coleridge's poetry eminently exhibits the man. In his best moments he has a fine sublimity of thought and expression not surpassed by Milton; but he is often turgid and verbose. As a critic, especially of Shakespere, Coleridge's work is of the highest rank, combining a comprehensive grasp of large critical principles and a singularly subtle insight into details. Coleridge's poetical works include The Ancient Mariner, Christabel (incomplete), Remorse, a tragedy, Kubla Khan, a translation of Schiller's Wallenstein, etc.; his prose works, Biographia Literaria, The Friend, The Statesman's Manual, Aids to Reflection, On the Constitution of Church and State, etc. Posthumously were published specimens of his Table Talk, Literary Remains, etc.

One of the coleoptera.
a, Head. *b*, Thorax. *c*, Abdomen. *d d*, Elytra. *e e*, Wings. *f f*, Antennæ.

COLFAX, Schuyler, an American statesman, born in New York City in 1823, died in 1885. In 1836 he settled in Indiana and started the South Bend Register. After serving seven terms in congress he was speaker for six years till 1869, he was elected Vice-President of the United States in the last mentioned year.

COLGATE, James Boorman, an American banker, born in New York City in 1818. He was conspicuous during the panic of 1873 for his large loans to the government

COLGATE, Samuel, an American philanthropist and capitalist, born in New York City in 1822, died in 1897. He was famous as a manufacturer of soaps and for his liberal distribution to religion and education of a part of the fortune he made in his business. In honor of him the name of Madison University was changed in 1889 to Colgate University.

COLGATE UNIVERSITY, founded at Hamilton, N. Y., in 1818 by the Baptist Education Society. In 1846 it was incorporated as Madison University, and its name was changed in 1889 to Colgate University in honor of Samuel Colgate, its greatest benefactor. The University has a property of $2,160,000, a library of 35,000 volumes, and a registration of 300 students. A Baptist divinity school forms part of the institution.

CO'LIC, a painful disorder of the bowels, usually of a spasmodic character, unaccompanied by diarrhœa, and presenting itself in various forms. When the pain is accompanied with a vomiting of bile or with obstinate costiveness it is called a bilious colic; if with windy distension, it takes the name of flatulent or windy colic; if with heat and inflammation, it takes the name of inflammatory colic, or enteritis. There are many other varieties of this complaint, some of which are peculiar to certain occupations or districts, as the painters' colic (see Lead Poisoning), the Devonshire colic.

COLIGNY (kol-in-yē), Gaspard de, French admiral, born in 1517, distinguished himself under Francis I. and Henry II., who made him in 1552 Admiral of France. After the death of Henry II., Coligny took the Protestant side in the religious strifes of the time, and became the head of the Huguenot party. He was generally unfortunate in the battles he fought, but speedily repaired his defeats by prudence and good management. When peace was made Coligny was received with apparent favor at court. But this was only a blind; and on the night of St. Bartholomew's (Aug. 24, 1572) Coligny was basely slaughtered, and his corpse given up to the outrages of the mob.

COLLAT'ERAL RELATIONS, descendants of brothers or sisters, or the brothers or sisters of the ascending lines.

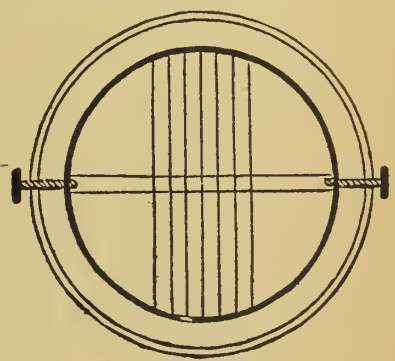
COLLATERAL SECURITY, additional security, such as a deed granted over other property besides that already mortgaged.

COLLATION, a comparison of one copy or thing of a like kind with another, especially manuscripts and editions of books.—In canon law, the presentation of a clergyman to a benefice by a bishop who has the right of patronage. In such a case the combination of the act of presentation and institution constitute collation.

COL'LEGE, in a general sense, a body or society of persons invested with certain powers and rights, performing certian duties, or engaged in some common employment or pursuit. In the U. States and Great Britain some societies of physicians are called colleges. So, also, there are colleges of surgeons, a college of heralds, etc. The most familiar application of the term college, however, is to a society of persons engaged in the pursuits of literature, including the professors, lecturers, or other officers, and the students. As applied to an educational institution the name is somewhat loosely used. The higher class of colleges are those in which the students engage in study for the purpose of taking a degree in arts, medicine, or other subjects, and are connected with, or have more or less the character of universities. The early history of these institutions is somewhat obscure; the probability is that they were originally founded in the various universities of the middle ages, with similar objects and from the same charitable motives. Hostels or boarding-houses were provided (principally by the religious orders, for the benefit of those of their own fraternity), in which the scholars lived under a certain superintendence, and the endowment of these hostels by charitable persons for the support of poor scholars completed the foundation of a college. Out of this has developed the modern English college as seen at Oxford and Cambridge, where each college, though a member or component part of the university, is a separate establishment whose fellows, tutors, and students live together under a particular head, called master. principal, warden, etc., of the college. In Scotland, the U. States, and Germany the college is practically one with the university, the latter body performing all the functions alike, of teaching, examining, degree-conferring, etc. See Universities.

COLLIE, a variety of dog especially common in Scotland, and from its intelligence of much use to shepherds. It is of medium size and varies much in coloring, black and white being common, and black with tan-colored legs, muzzle, etc., being highly esteemed. The head is somewhat fox-shaped, the ears erect, but with drooping points, the tail rather long, bushy, and with a strong curl.

COLLIMATION, Line of, in an astronomical instrument, such as a telescope or transit instrument, the straight line which passes through the center of the object-glass and intersects at right



Collimation.

angles a system of spider-threads placed at the focus of the eye-piece. The proper adjustment of the line of collimation of the instrument is necessary to accurate observation of the time at which movements of the heavenly bodies take place.

COLLIMA'TORS, two small subsidiary telescopes used for collimating astronomical instruments, that is, for adjusting the line of collimation, and for determining the collimation error.

COLLINS, William Wilkie, born in London in 1824. He was educated for the bar, but turned aside to literature, in which he has specially distinguished himself as a novelist of great dramatic and constructive power. Among his best-known works are Antonina, The Woman in White, The New Magdalen, The Evil Genius, etc. He died in 1889.

COLLISION, in maritime affairs, the shock of two ships coming into violent contact, whereby one or both may suffer more or less injury. Collision may happen without blame being imputable to either party, as where the loss is occasioned by a storm, in which case the misfortune must be borne by the party on whom it happens to light. Or a collision may arise where both parties are to blame—where there has been a want

of due diligence or skill on both sides; in which case neither party has an action against the other. Thirdly, it may happen by the misconduct of the suffering party only, and then the rule is that the sufferer must bear his own burden. Lastly, it may have been the fault of the ship which ran the other down; and in that case the injured party would be entitled to an entire compensation from the other. Strict laws and regulations to prevent collisions have been laid down, which contain rules concerning lights, and sailing and steering rules. By the rule of the road at sea, if two sailing ships are approaching each other end on, or nearly so, the helms of both must be put to port, so that each may pass on the port side of the other; in crossing so as to involve risk of collision the sailing ship with the wind on the port side shall keep out of the way of the ship with the wind on the starboard, but if they have both the wind on the same side the ship which is to windward shall keep out of the way of the one that has it to leeward. If a steam ship and a sailing ship are approaching, so as to involve collision the former must keep out of the way of the latter. If one vessel is overtaking another she must keep out of the way of the last-named vessel.

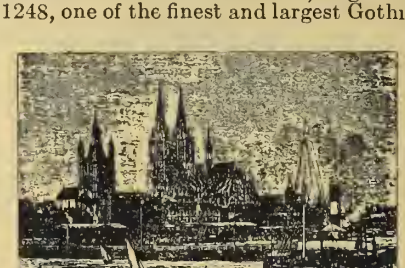
COLLO'DION, a substance prepared by dissolving pyroxiline (gun-cotton) in ether, or in a mixture of ether and alcohol, which forms a useful substitute for adhesive plaster in the case of slight wounds. When the fluid solution is applied to the cut or wound it immediately dries into a semi-transparent, tenacious film, which adheres firmly to the part, and under it the wound or abrasion heals without inflammation. In a slightly modified form collodion is also employed as the basis of a photographic process called the collodion process. See Photography.

COL'LOIDS, non-crystallizable substances, such as gelatine, gum, etc. See Dialysis.

COLLOT D'HERBOIS (kol-ō-dār-bwä), Jean Marie, French revolutionary, born in 1750, On the outbreak of the revolution he soon became prominent as a leader of the Mountain or extreme party. After filling several missions he was sent by Robespierre along with Fouché to Lyons in 1793, with almost unlimited powers, and was guilty of the most flagrant enormities. Returning to Paris he became a determined opponent of Robespierre, and being chosen president of the Convention (19th July, 1794), contributed to his fall. A few weeks after he was banished to Cayenne, where he died in 1796.

COLLU'SION, in law, a secret agreement between opposing litigants to obtain a particular judicial decision on a preconcerted statement of facts, whether true or false, to the injury of a third party. Collusion, when proved to exist, nullifies the judgment obtained through it.

COLOGNE (ko-lōn'), German, Köln (*keuln*), a city of Rhenish Prussia, on the left bank of the Rhine, forming, in connection with Deutz, which serves as a téte-du-pont on the opposite side of the river (across which is a bridge of boats and an iron railway and general traffic bridge), a fortress of the first rank. The old fortifications, dating from the middle ages, are being, or have been recently, swept away, new works being constructed in accordance with the principles of modern fortification. There are many fine old buildings as well as excellent modern ones; the churches in particular are interesting. The most important edifice of all is the cathedral, begun in 1248, one of the finest and largest Gothic



Cologne, showing cathedral and church of St. Martin.

structures in Europe. It was only completed in the 19th century, there being expended on it in 1828–84 over $5,000,000. It is in the form of a cross; its entire length is about 445 feet; breadth, 200 ft.; height to ridge of roof, 202 ft., height of the two western towers, between which is a grand portal, 520 feet, being thus among the highest edifices in the world. The council-house, museum, and the great St. Martin Church with its imposing tower should also be mentioned. The manufactures embrace sugar, tobacco, glue, carpets, leather, machinery, chemicals, pianos, and the celebrated eau de Cologne. The trade by river and railway is very great. —It was annexed to the German Empire in 870, and became one of the most powerful and wealthy cities of the Hanseatic League, but latterly it declined. In 1792 it ceased to be a free city. It was taken by the French in 1794, ceded to them by the Treaty of Lunéville in 1801, and restored to Prussia in 1814. Pop. 372,229.

COLOM'BIA, Republic of, formerly called New Granada, a republic of South America, consisting of the eight departments or states of Antioquia, Bolivar, Boyaca, Cauca, Cundinamarca, Magdalena, Santander, and Tolima. The population is now about 3,593,600. The chief towns are Bogota, the capital, Medellin, Barranquilla, Cartagena, and Bucaramanga. The area is estimated officially at 473,202 sq. miles, but there is much disputed boundary territory in the inland regions toward the south and east. Late in 1903 the department of Panama proclaimed itself an independent republic, and was at once recognized by the U. States, which has concluded with it an agreement for the construction of a canal across the isthmus. The flora is rich and luxuriant. A great part of the country is still covered with virgin forests, which yield excellent building-wood, Peruvian bark, caoutchouc, vanilla, etc. The fauna includes the jaguar, puma, tapir, armadillo, sloth, various species of deer, and the gigantic condor. The mineral wealth is various and abundant, though still imperfectly explored. It comprises coal, gold, silver (both now largely worked by foreign companies), emeralds, and salt. Industry is at a very low stage. Maize, bananas, and plantains are the chief articles of food. Tobacco and coffee are cultivated and exported. Sugar is also grown. Manufactures can scarcely be said to exist, Panama hats, mats, and coarse cotton cloths being almost the only articles that can be mentioned in this class. The chief ports are Sabanilla, the port of Barranquilla and Cartagena. The loss of the Isthmus of Panama has deprived Colombia of much of its commercial importance The foreign trade of the country is chiefly with Britain and the United States. The exports are chiefly precious metals, hides, coffee, tobacco, etc.; the imports, manufactured goods.—By the constitution, as amended in 1886, the executive power is vested in a president elected for six years, the legislative power in a congress of two houses—the Senate and the House of Representatives. The former consists of twenty-four representatives, three from each department, the latter of representatives elected by universal suffrage for four years, one for every 50,000 inhabitants. The revenue is generally under the expenditure and the finances are in an unsatisfactory state. New Granada was discovered by Alonso de Ojeda in 1499; it was visited by Columbus on his fourth voyage, in 1502. The first Spanish settlement was made in 1510 at Santa Maria in the Gulf of Darien, and the whole country was formed into a province under a captain-general in 1547. New Granada declared its independence of Spain in 1811, and after eleven years of warfare succeeded with the help of Venezuela in effecting its liberation. Both states then united with Ecuador, also freed from the Spanish domination, to form the first republic of Colombia; but internal dissensions arising, the three states again separated in 1831, forming three independent republics, which have had a very troubled existence. In 1861 the states forming New Granada by agreement adopted a new constitution, the republic henceforth to be called the United States of Colombia. This title was retained till, by the new constitution adopted in 1886, the state ceased to be a federal republic and became a unitary republic, with the name of Republic of Colombia. The secession of Panama in 1903 was partly brought about by the dilatoriness of the central government in concluding a satisfactory arrangement with the United States in regard to the construction of an interoceanic canal.

COLOM'BO, a seaport town, the capital of Ceylon, on the south west coast, and about 70 miles west by south of Kandy, with which it is connected by railway Pop. 158,093.

CO'LON, the middle portion of the large intestine, or that which lies between the cæcum and the rectum, or terminal portion. In man it is about 4½ feet long, and forms a series of

pouches in which the digested food is for a time detained. It is itself believed to have some digestive power.

CO'LON, a punctuation mark, thus: used to mark a pause in the sense that might also be indicated by a full stop.

COLON', or **ASPINWALL** (the former is the official name), a free port of Panama, on Manzanillo Island, on the north side of the Isthmus of Panama, at the Atlantic extremity of the inter-oceanic railway, and near that of the Panama Canal. Established in connection with the railway, it had an important transit trade before the canal was begun, and since then the place has been entirely transformed, a new town with wide and regular streets having been built on a tract of land reclaimed by the builders of the canal. There is extensive harbor accommodation. Pop. estimated at 8,000 to 10,000.

COLONEL (kër'nel), a military title indicative of a rank under that of brigadier general. In the United States army a colonel commands a regiment. In England and Europe generally the title has more an honorary than an actual value.

COLONIAL DAMES OF AMERICA, national society of, an organization of women patriots, founded in 1890, membership in which is limited to women lineally descended from an ancestor of distinction who resided in the colonies previously to 1776. Its purpose is the collection of interesting documents relative to colonial and revolutionary affairs.

COLONIAL DAMES OF AMERICA, a patriotic society of women organized in 1892 for the purpose of preserving records, manuscripts, etc., pertaining to the colonies. Membership is conditioned on being descended from a worthy ancestor settling in the colonies previously to 1750. It has a membership of 5,000 and is distinct from the other society of the same name.

COLON'NA, an Italian family that had become important as early as the 8th century. Its fame during the middle ages eclipsed that of every other Roman family except the great rival house of the Orsini. The Colonna family is at present represented by several branches, the Colonna-Sciarra, Colonna-Stigliano, etc. It played an important part in the affairs of Europe, became allied to the greatest houses of Italy, Spain, and Germany, and has furnished many celebrated warriors, popes, and cardinals.

COLON'NA, Vittoria, the most renowned poetess of Italy, was born in 1490. At the age of seventeen she was married to Ferdinand, Marquis of Pescara, the companion of her youth, who became one of the distinguished men of his age. All her poems were devoted to the memory of her husband. She died at Rome in 1547. Her most celebrated work is the Rime Spirituali, 1538. They are considered among the happiest imitations of Petrarca.

COLONNADE', in architecture, any series or range of columns placed at certain intervals from each other. When surrounding the building on the exterior the colonnade is called a peristyle; when projecting beyond the line of the building it is called a portico.

COL'ONY, a settlement formed in one country by the inhabitants of another. Colonies may either be formed in dependence on the mother country or in independence. In the latter case the name of colony is retained only in a historical sense. Properly, perhaps, the term should be limited to a settlement which carries on a direct cultivation of the soil, as in the Dominion of Canada or Australia; such settlements as those of the British in Hindustan or Malta being the mere super position on the natives of a ruling race which takes little or no part in the general industry of the country. The motives which lead to the formation of colonies, and the manner of their formation, are various. Sometimes the ambition of extending territory and the desire of increasing wealth have been the chief impulses in colonization; but colonies may now be said to have become a necessity for the redundant population of European states. Among ancient nations the principal promoters of colonization were the Phœnicians, the Greeks, and the Romans; the greatest colonizers in modern times have been the English and the Spaniards, next to whom may be reckoned the Portuguese, the Dutch, and the French.

The Germans have colonized parts of South America and Africa, and since the war with Spain the United States, by the acquisition of Porto Rico and the Philippine Islands have become one of the colonial powers of the world.

COLOR, the sensation in the brain produced by different rates of vibration of light waves which stimulate the retina and give rise to chemical changes therein which when reaching the brain are interpreted in a change of consciousness; also the pigment used in art to produce the sensation. Different lengths in the light waves produce different colors. For example, when the light-wave is $\frac{1}{33\,000}$ of an inch long, red is the color produced, and as the waves decrease in force, we see yellow, green, blue, and so on, through the spectrum. According to the theory of Chevreuil, now generally accepted, white light is the union of all colors, and its decomposition by an object reveals the color separated from the rest. Thus, a rose absorbs all colors but red, which it reflects; while a white substance, rejecting all colors, is therefore colorless. Correctly speaking, there are but six colors—three primary (red, blue, and yellow), and three secondary (orange, violet, and green). Orange is composed of purple and yellow, violet of red and blue, green of yellow and blue. All other colors are compounds of these.

Complementary Colors are those which, combined with another color or colors, make up the three primary colors constituting white light. If the given color be primitive, its complement is composed of the other two primitive colors. For example, the complementary color of blue is orange —that is to say, red and yellow. If the given color be a secondary, its complementary is the remaining primitive color—as, for instance, the complementary color of green (blue and yellow) is red. In painting, brilliancy of coloring may be obtained by placing complementary colors side by side, because each lends to the other a favorable halo, while the juxtaposition of non-complementary colors has the opposite effect of dullness. This method of heightening and softening colors was used with great effect by Delacroix, and is today much practiced by French and Spanish painters.

The fact that color is really a sensation in the brain, rather than a quality of the thing that is colored, is proved by the strange power which many people have of being able to *hear* colors. Statistics go to show that one person in every eight can hear colors; that is to say, one person in every eight, when looking at certain vivid colors, can hear peculiar sounds. On the other hand many persons, on hearing certain musical sounds, can *see* certain colors; sound on the one hand, producing color sensations, color on the other, producing sound sensations. These interesting facts are easily understood when we remember that in the brain there are different receiving centers for the various senses—sight, hearing, taste, smell—and a vast area of the brain used in the coordination of these sensations. Slight derangements of the cerebral machinery might well be imagined to cause a mixing of the functions of these coordinating parts and thus produce the phenomena mentioned. A Swiss boy was discovered recently who could taste, see, and smell sounds, see and hear odors, and so on. The problem is one of the most interesting in the physiology of the brain.

COLORADO, (kol-o-ra'dō) one of the United States of America, situated in the central belt of states in the Rocky Mountains, between lat. 37° and 41° N., and lon. 102° and 109° w., and containing

Colorado seal.

an area of 103,645 sq. miles, being sixth in size among the states. It is bounded on the north by Wyoming and Nebraska; east by Nebraska and Kansas; south by Oklahoma and New Mexico, and west by Utah. Its form is that of a perfect parallelogram, and it is the only state whose lines are so defined. It is traversed from north to south by the main range of the Rocky Mountains. The plains of Kansas, Nebraska and Colorado were, in passed ages, covered

by a great paleozoic ocean, and are now filled with fossil remains of fishes, reptiles and animals. They rise gradually from the Missouri river to the base of the great Rocky chain. This broad and comparatively level expanse is destitute of timber, excepting a fringe of cottonwoods on the borders of the streams, but is covered with short nutritious grasses.

The plains east of the mountains constitute about one-third of the total area. Among the elevated ranges are four large natural parks—the North, South, Middle, and San Luis, which form distinct, picturesque and beautiful features of the mountain system and are watered by numerous streams and covered with verdure. Thousands of square miles are covered by forests, chiefly yellow and white pine and spruce. None of the harder woods, except a few clusters of scrub oaks, worthless for anything but fuel, exist in Colorado. Four-fifths of the state has an elevation of 4,000 to 10,000 feet above the sea. The lowest on the eastern border is 3,703 feet, and on the western, 4,435. The mountain parks are 8,000 to 9,500 feet above tide water. The summit of the main range averages 11,000 feet. Seventy-two peaks from which the snow never disappears, rise to heights between 13,500 and 14,500 feet. The loftiest of these is the Sierra Blanca, a part of the chain enclosing the San Luis park, 14,483 feet high. Among the others being Pikes Peak and Longs Peak.

The geographical center of Colorado is at a point three miles north-northeast of Spinney Station, on the Colorado Midland railway, in Park county.

The climate of Colorado is remarkably healthful. The air is dry, clear, and well adapted to the cure of diseases of the lungs and throat. The annual range of temperature is much less than in other sections of the country. In the various parts it is about 60° F., and the highest temperature does not exceed 80° nor the lowest 20° below. Health resorts are numerous in the mountain regions and there are also mineral and thermal springs. The mean temperature at Denver is 50°.

The soil is fruitful and the climate is well adapted to the growth of cereals. There is a large supply of native grass in Colorado, and this furnishes pasture for the large herds of cattle and sheep. Vegetables of all kinds and many fruits are successfully grown. The soil of the greater part of the state is very fruitful where it can have sufficient moisture. Irrigation is used to a great extent, and in such regions, wheat, corn, barley, oats, hay, and potatoes are staple products. Cattle and sheep raising are important industries.

The chief industry of the state is mining, and in its yield of gold and silver it is the leading state of the Union. Nearly every known mineral is found within the state. There are thousands of mines which produce lodes of silver and gold. There are also large deposits of lead ores, and the state produces about 45 per cent of the entire lead output of the whole country. One of the richest gold fields in the world was opened up in the Cripple Creek district in 1896. In various parts of the state are iron mines. There are large supplies of copper, zinc, cement, silica, gypsum, onyx, and several valuable clays. There are many veins of anthracite and bituminous coal.

The principal manufacturing industries are in connection with the mineral products of the state; they are brass works, lead works, machine shops, foundries, iron works, building materials, tin, copper works, flouring mills, and furniture.

Colorado has a state university, agricultural college, school of mines, state normal school, all of which are sustained by legislative appropriations. Other institutions of learning are Colorado College, University of Denver, Westminster University of Colorado, Presbyterian College of the Southwest.

Colorado was a part of the immense Territory of Louisiana ceded to the United States by Napoleon Bonaparte in 1803. The first explorations were made by Spaniards from Mexico in 1540-42, the first of which, under Francisco Vasquiz di Coronado, found in New Mexico near the southern border of Colorado a peculiar race of people dwelling in towns built of stone and adobe, and far superior in intelligence to the savage tribes of nomads. The southwestern part of the state is strewn with the ruins of these people, who were of Aztec or Toltec origin, probably the former, ancestors or contemporaries of the vast horde which swept down into Anahuac, overthrew the Toltecs and occupied their lands. Several other expeditions came up from the south in later times, and some of them penetrated the plains as far east as the Missouri river. The remnant of Hernando De Soto's army, after the death of the conqueror of Florida, came west to the Rocky mountains, but did not explore them. A Spanish cavalier, Don Juan de Oñato, passed up the Rio Grande river into the San Luis park in 1595, and discovered gold and silver there. Several French expeditions from New Orleans penetrated far out upon the plains toward the mountains, the first in 1712, others from the same source occurred in 1741.

The first regularly organized American exploration of the Rocky mountains occurred in 1806. It was conducted by Lieut. Zebulon M. Pike, whose report contained the first authentic record of the extent and value of the region. The second was by Maj. Stephen S. Long in 1820. In 1842 John C. Fremont began a series of five explorations, which developed practicable routes for the Pacific railways, and led ultimately to the construction of the Union Pacific railway from the Missouri river to San Francisco. The Territory of Colorado was organized by act of congress approved February 28, 1861, and Maj. William Gilpin was appointed governor. It was admitted into the Union as a State, August 1, 1876. From 1876 to 1888 Colorado was republican in national politics, but in the three presidential elections after 1888 the silver interests of the State made it decidedly democratic. In 1896 and 1900 especially, the democrats, populists, and Silver republicans, in fusion, controlled a large proportion of votes in the State. In 1904 and 1908 the state was carried by the republicans.

Colorado is the most populous of the Rocky Mountain States. The following gives the population by decades: 1860, 34,277; 1870, 39,864; 1880, 194,327; 1890, 412,198; 1900, 539,700, of which only 10,654 were colored; 1908, 800,000.

COLORADO, a name of two rivers of the United States.—(1) The Western Colorado, or Rio Colorado, formed by the junction of the Green and Grand Rivers, at about lat. 38° n.; lon. 110° w., in Utah. It flows southwest and south through Arizona, and between Arizona and Nevada and California, and after a total course, including Green River, of about 1200 miles, falls into the Gulf of California. Among the most wonderful natural objects in North America is the Big Cañon of the Colorado, between lon. 112° and 115° w. Here the river flows between walls of rock which are nearly vertical, and are in some places 6000 feet high. This cañon is more than 300 miles long. (2) A river in Texas which rises in the northwest part of the State, flows generally southeast, and after a course of about 900 miles falls into the Gulf of Mexico at the town of Matagordo.

COLORADO BEETLE, an American species of beetle, nearly half an inch in length, almost oval, of a yellowish color marked with black spots and blotches, and on the elytra with ten black longitudinal stripes. The wings, which are folded under the elytra, are of a blood-red color. It is a native of the eastern slopes of the Rocky Mountains, and works great havoc among the potato crops.

COLORADO COLLEGE, an endowed institution at Colorado Springs, founded in 1874. It has a library of 35,000 volumes, has about 700 students and $450,000 productive funds.

COLORADO DESERT, a region in southern California, considerably below the level of the sea, and consisting of arid, sandy wastes.

COLORADO SPRINGS, a thriving town of El Paso County, Colo., noted for the salubrity of its climate and its fine mineral springs. Pop. 25,000.

COLORADO STATE AGRICULTURAL COLLEGE, a school of agriculture at Fort Collins, Colo., founded in 1876. It has an attendance of 400 and a library of 15,000 volumes.

COLORADO, UNIVERSITY OF, the state university of Colorado at Boulder, Colo., founded in 1861 and opened in 1877. It is a complete university with medical and law schools, and offers full courses in the arts and the sciences. It has a library of 25,000 volumes, and a registration of above 500 students.

COLOR-BLINDNESS, total or partial incapability of distinguishing colors. Color-blindness has been divided into three grades: (a) Inability to discern any color, so that light and shade, or black and white, are the only variations perceived. (b) Inability to distinguish the nicer shades of the more composite colors, as browns, grays, and neutral tints. (c) Inability to distinguish be-

tween the primary colors, red, blue, and yellow, or between them and their secondaries, green, purple, orange, and brown. Red is the color which the color-blind are most commonly unable to distinguish, while yellow is the most easily recognized. Color-blindness occurs in eyes whose power of vision, as to form and distance, is quite perfect, and may exist unknown to the person affected by it. This defect is common especially among men. The cause of it in almost every case which has been carefully investigated has been found to be seated in the sensorium, not in the visual apparatus. It will be easily understood that those whose eyesight is thus defective are disqualified for holding various positions.

COLORIM'ETER, an instrument for measuring the depth of color in a liquid by comparison with a standard liquid of the same tint.

COLOR PHOTOGRAPHY, photography which will reproduce the colors of the thing, scene, or person photographed. Experiments have been made for years to succeed in accomplishing this much-to-be desired purpose, but thus far without avail. Experiments have been made upon a suggestion of J. Clark Maxwell concerning the physiology of color but the problem is as yet unsolved.

COLOR PRINTING, the art of producing pictures, designs, cards, etc., in various colors by means of lithography, printing from metal blocks, etc. The ordinary methods are: (1) the chromo-lithographic, in which a tracing of the original picture, or the like, is first made, and a copy transferred to as many stones as there are colors in the original, every color requiring a fresh stone. The drawing on each stone is made to fit in, or register, with the preceding one, and as the paper passes through the machine an additional color is added each time, and thus the picture is built up color upon color (each being allowed to dry before the next is put on) until it is completed. Some chromos or oleographs may have as many as 25 or 30 printings or colors. (2) Block or surface color printing is specially adapted for book illustrations or similar work where nicety of detail or rapidity of production is required. As in chromo-lithography various printings are necessary; but these, while producing similar effects, are reduced in number by a method of printing several tints of the same color at one operation. Each block, which is usually of zinc and prepared in the usual way, is capable of producing three or more gradations of the same color; the darkest shade from the normal surface, lighter shades being got from parts which have been bitten or corroded in an almost inperceptible degree—the deeper corrosions giving, of course, the lightest shade. When all the tints of one color are thus printed from one block and at one operation, a second block with gradations, in the same way, is used, registering as in chromo-lithography, and so on until the picture is finished.

COLORS, a term used to indicate the flag or standard, of a people or a party; hence, in popular speech, anything which shows the true state of affairs.

The colors carried in the United States Army by the various regiments and battalions are two in number, the national flag (see Flag) and the regimental color, both of which are of prescribed size and form for the various arms of the service. The battalions of engineers carry the national flag, with the title of the battalion embroidered in silver on the center stripe; and the battalion color, of scarlet silk having in the center a castle, with the number of the battalion placed above the castle, and the words "U. S. Engineers" below. The artillery corps have similar colors, on which the corps device of two crossed cannon are emblazoned. Infantry regiments have the same national color as artillery and engineers; the regimental color being of blue silk, the coat of arms of the United States embroidered in silk on the center, beneath the eagle, a red scroll with number and name of regiment embroidered in white; cavalry standards in size are somewhat smaller than those carried by the infantry and consist of a national flag made of silk. The regimental standard is of yellow silk, with the coat of arms of the United States embroidered in silk on the center, beneath the eagle a red scroll, with number and name of regiment embroidered in yellow, fringe yellow.

COLOSSE'UM, a name given to the Flavian Amphitheatre in Rome, a large edifice for gladiatorial combats, fights of wild beasts, and similar sports. It was begun by Vespasian, and finished by Titus 80 A.D. The outline of the Colosseum is elliptic, the exterior length of the building being 620 and its breadth 513 feet; it is pierced with eighty openings or vomitoria in the ground story, over which are superimposed three other stories, the whole rising perpendicularly to the height of 160 feet. Although two-thirds of the original building have disappeared it is still a wonderful structure.

COLOS'SIANS, Epistle to the, was written to the Colossians by the Apostle Paul either from Rome or Cæsarea, at the same time that he wrote the Epistles to the Ephesians and to Philemon. The epistle contains a summary of Christian doctrine, especially dwelling on the divine power and majesty of Christ, and a series of practical exhortations to specific duties of Christian morality.

COLOS'SUS, in sculpture, a statue of enormous magnitude. The Asiatics, the Egyptians, and in particular the Greeks, have excelled in these works. Among the colossi of Greece the most celebrated was the Colossus of Rhodes, a brass statue of Apollo 70 cubits high, esteemed one of the wonders of the world, erected at the port of Rhodes by Chares, 290 or 288 B.C. It was thrown down by an earthquake about 224 B.C. There is no authority for the popularly-received statement that it bestrode the harbor mouth, and that the Rhodian vessels could pass under its legs; and Bartholdi's statue of Liberty presented to the U. States by the French nation, and which measures 104 feet, or to the extremity of the torch in the hand of the figure 138 feet. It is erected at New York harbor on a pedestal 114 feet, is constructed for a lighthouse with one of the most powerful fixed lights in the world, and stands 317 feet above mean tide.

COLQUITT, Alfred Holt, an American senator, governor, and soldier, born in Georgia in 1824, died in 1894. He served in the Mexican war, was a member of congress from 1853–5, and rose to the rank of major-general in the Confederate army. He was governor of Georgia from 1876 to 1882 and from that year to his death United States Senator from Georgia.

COLT, Samuel, an American inventor, born in 1814, died in 1862. Colt invented the revolver and his name is a synonym for the weapon. He got the idea while working in his father's factory at Hartford, Conn., and made frequent improvements on his original patent. He laid the first submarine cable in New York harbor and was the first to construct a rational protective armor for water cables of any kind.

COLTON, Walter, an American pioneer and author, born in Vermont in 1797, died in 1851. He was early a teacher and having gone to California in the early forties he founded The Californian, the first newspaper published in the state. His newspaper was the first to announce the discovery of gold on the Pacific coast.

COLT'S REVOLVER. See Revolver.

COLUM'BIA, the capital of South Carolina, situated on an elevated plain on the left bank of the Congaree. It is regularly laid out, and contains some fine public buildings, including the state-house. Among the educational institutions are the South Carolina University, founded in 1804, and a Presbyterian theological college. Pop. 25,100.

COLUMBIA, a city in Pennsylvania, on the Susquehanna, a great mart for lumber. Pop. 14,116.

COLUMBIA, British. See British Columbia.

COLUMBIA, District of, a small tract of country in the U. States, on the Potomac, about 120 miles from its mouth, surrounded on three sides by Maryland, forming a neutral district for the seat of the national government. It has an area of 64 sq. miles; was formed into a territory in 1871; and contains the city of Washington, which has been the national capital since 1800 (and now includes also Georgetown). The affairs of the district and of Washington are administered by three commissioners directly under Congress. Pop. 298,718.

COLUMBIA RIVER, or **OREGON,** a river in N. America, flowing into the Pacific Ocean, and rising at the base of the Rocky Mountains in British Columbia. It has a very winding course partly in British Columbia but mainly in the U. States, where it receives two large tributaries, Clark's River and Snake River. Latterly it turns abruptly to the west and forms the boundary between Washington Territory and Oregon. It drains an area of 298,000 sq. miles, and has a length of about 1400 miles.

COLUMBIA UNIVERSITY, a large institution in New York City, founded

in 1746. It has an endowment of $20,000,000, an income of nearly $1,000,000, a library of 315,000 volumes, and a total attendance of 3632 students. The university is made up of an undergraduate department and graduate schools of science, medicine and law, while its affiliations with various theological schools in New York enable it to offer education in theology also. For many years it has been slowly adding institution after institution to its body until now it is virtually equipped as a complete university. It confers all degrees, including engineering (mechanical and mining) and recently it absorbed Barnard College and Teachers' College, thus providing pedagogy to its curricula. It is governed by a board of 24 trustees.

COLUMBIAN UNIVERSITY, an institution at Washington, D. C., founded in 1821 by members of the Baptist church. It offers courses in the arts and sciences, in medicine, law, dentistry, theology, and in electrical, mining, and mechanical engineering. The university has an endowment of $1,000,000, a library of 20,000 volumes, and a registration of 1420 students.

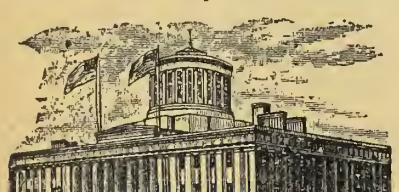
COL'UMBINE, the popular name of plants with five colored sepals and five spurred petals. The common columbine is a favorite flower, and owes its name to the fancied resemblance of the petals to the form of pigeons.

COL'UMBINE, in the older pantomimes, a female mask with whom Harlequin was in love; their marriage formed the dénouement. In modern pantomime the chief female dancer in the harlequinade.

COLUM'BIUM. See Niobium.

COLUMBUS, a town in Georgia, on the Chattahoochee River, well built, with cotton and other manufactures. Pop. 20,000.

COLUM'BUS, Ohio, the capital of the state, in Franklin county, on the east bank of the Scioto. It contains some notable public buildings. The capitol is second in size only to that of Washington, and is built of gray limestone in the simple Doric style Other buildings are the deaf and dumb institution, institution for the blind, lunatic asylum, penitentiary, R. Catholic cathedral, etc. Educational institutions include the state university, Columbus medical college, Starling medical college, etc. There is a very extensive trade, and the manufactures are important and varied. Pop. 179,370.



State capitol, Columbus, O.

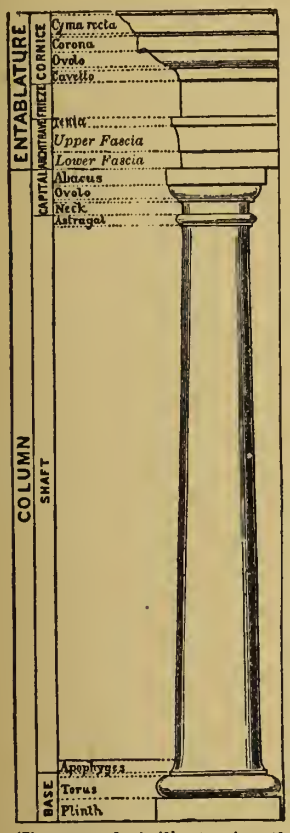
COLUM'BUS, Christopher, was born in Genoese territory in 1435 or 1436, died at Valladolid, Spain, 1506. His father, Domenico Colombo, a poor woolcomber, gave him a careful education. He appears to have gone to sea at an early age and to have navigated all parts of the Mediterranean and some of the coasts beyond the Straits of Gibraltar. In 1470 we find him at Lisbon, where he married the daughter of Bartolommeo de Palestrello, a distinguished navigator. He had gradually come to the conclusion that there were unknown

Columbus.

lands belonging to Eastern Asia separated from Europe by the Atlantic: while the Portuguese were seeking to reach India by a southeast course round Africa he was convinced that there must be a shorter way by the west. He applied in vain to Genoa for assistance, and equally fruitless were his endeavors to interest John II. of Portugal in the enterprise. He then determined to apply to the Spanish court; and after many disappointments he induced Ferdinand and Isabella to equip and man three vessels for a voyage of discovery. It was early in the morning of Friday, on the 3d of August, 1492, that Columbus set sail from the port of Palos, and after sailing for two months the expedition narrowly escaped failure. The variation of the needle so alarmed the crews that they were on the point of breaking out into open mutiny, and he was obliged to promise that he would turn back if three more days brought no discovery. On the third day (12th Oct. 1492) the island of Guanahani or San Salvador was sighted, which Columbus believed to belong to Eastern Asia and to be connected with India—a belief which he carried with him to his grave. Hence the mistaken name of Indians applied to the natives of America, and that of West Indies applied to the group of islands. Columbus, planted the royal standard, and in the name of his sovereigns took possession of the country, which, in memory of his reservation he called San Salvador. He then sailed in search of other lands, and discovered Cuba, St. Domingo, and some other of the West India Islands. Being so far successful, he built a fort at Hispaniola, Hayti, left some of his men there, and set out on his return to Europe, where he was received with almost royal honors. In 1493 he set out on his second great voyage from Cadiz, with three large ships of heavy burden and fourteen caravels, carrying 1500 men. He discovered the island of Dominica, and afterwards Mariegalante, Guadeloupe, and Porto Rico, and at length arrived at Hispaniola. Finding the colony destroyed, he built a fortified town, which he called, in honor of the queen, Isabella. He then left the island in order to make new discoveries, visited Jamaica, and returning after a voyage of five months, worn down with fatigue, found to his great joy that his brother Bartolommeo had arrived at Isabella with provisions and other supplies for the colony. In May, 1498, he sailed with six vessels on his third voyage. Three of his vessels he sent direct to Hispaniola; with the three others he took a more southerly direction, and having discovered Trinidad and the continent of America, returned to Hispaniola. His colony had now been removed from Isabella, according to his orders, to the other side of the island, and a new fortress erected called St. Domingo. Columbus found the colony in a state of confusion, but soon restored tranquility. His enemies, in the meantime, endeavored to convince his sovereigns that his plan was to make himself independent, and Columbus was not only displaced, but Francisco de Bobadilla, a new governor who had come from Spain, even sent him to that country in chains. On his arrival (in 1500) orders were sent directing him to be set at liberty and inviting him to court, but for this injurious treatment he never got redress, though great promises were made. After some time he was able to set out on his fourth and last voyage (1502) in four slender vessels supplied by the court. In this expedition he was accompanied by his brother Bartolommeo and his son Hernando. He encountered every imaginable disaster from storms and shipwreck, and returned to Spain, sick and exhausted, in 1504. The death of the queen soon followed, and he urged in vain on Ferdinand the fulfilment of his promises; but after two years of illness, humiliations, and despondency, Columbus died at Valladolid. His remains were transported, according to his will, to St. Domingo, but on the cession of Hispaniola to France they were removed to Havana in Cuba in 1796. In 1899 they were carried back to Spain.

COL'UMN, in architecture, a round pillar, a cylindrical solid body set upright and primarily intended to support some superincumbent weight. A column has as its most essential portion a long solid body, called a shaft, set vertically on a stylobate, or on a congeries of moldings which forms its base, the shaft being surmounted by a more or less bulky mass which forms its capital. In classical architectecture columns have commonly to support an entablature consisting of three divisions, the architrave, frieze, and cornice, adorned with moldings, etc. The accompanying cut will illustrate these and other terms. Columns are distinguished by the names of the styles of architecture to which they belong; thus there are

Hindu, Egyptian, Grecian, Roman, and Gothic columns. In classic architecture they are further distinguished by the name of the order to which they belong, as Doric, Ionic, Corinthian, Composite or Tuscan columns. They may also be characterized by some peculiarity of position, of construction, of form, or of



Column (Tuscan order), illustrating the terms applied to the several parts.

ornament, as attached, twisted, cabled, etc., columns. Columns are chiefly used in the construction or adornment of buildings. They have also been used, however, singly for various purposes, especially for monuments. See Corinthian, Doric, Ionic, Gothic, etc.

COLUMN, in military tactics, a formation of troops drawn up in deep files, showing a small front; as distinguished from line, which is extended in front and thin in depth. They are said to be close or open according to the intervals between the battalions, regiments, etc., of which they are composed. Sometimes the name column is given to a small army, especially when actively engaged.

COMA, in medicine, a state of complete insensibility, resulting from various diseases, as apoplexy; from narcotics, as opium; from accident or injury to the brain; or from excessive cold.

COMANCHES (kō-man'chez), an American Indian tribe formerly roaming through Texas and part of Mexico. They were excellent horsemen, and extremely warlike, but their numbers are now insignificant. Some of them have been collected on a reservation in the western part of the Indian Territory.

COMB, an instrument with teeth, made of tortoise-shell, ivory, horn, wood, bone, metal, or other material, used for dressing the hair, and by women for keeping the hair in its place when dressed. Combs have been used from the earliest times by rude as well as by civilized races.

COMBINATION, in the United States, a union of persons for the furtherance of their business interests. Combination is lawful when it is not in restraint of trade, nor made with a view of violently or fraudulently, interfering with others in the pursuit of their occupation. When so, it is called conspiracy and is punishable under conspiracy acts.

COMBUSTION, the operation of fire on inflammable substances; or the union of an inflammable substance with oxygen or some other supporter of combustion, attended with heat and in most instances with light. In consequence of the combination of the carbon in fuel with the oxygen of the air being the universal method of getting heat and light, and as when the action takes place the fuel is said to burn or undergo combustion, the latter term has been extended to those cases in which other bodies than carbon—for example, phosphorus, sulphur, metals, etc.—burn in the air or in other substances than air—for example, chlorine. Though the action between the gas and the more solid material, as coal, wood, charcoal, of whose combination combustion is the result, is mutual, the one having as much to do with the process as the other, yet the former, as oxygen, chlorine, iodine, and the compounds which they form with each other and with nitrogen, have received the name of supporters of combustion, while to the latter the term combustibles has been assigned.

Spontaneous Combustion is the ignition of a body by the internal development of heat without the application of fire. It not unfrequently takes place among heaps of rags, wool, and cotton when lubricated with oil; hay and straw when damp or moistened with water; and coal in the bunkers of vessels. In the first case the oil rapidly combines with the oxygen of the air, this being accompanied with great heat; in the second case the heat is produced by a kind of fermentation; in the third by the pyrites of the coal rapidly absorbing and combining with the oxygen of the air. The term is also applied to the extraordinary alleged phenomenon of the human body being reduced to ashes without the direct application of fire. It is said to have occurred in the aged and persons that were fat and hard drinkers; but most chemists reject the theory altogether, maintaining that none of the instances adduced are well authenticated.

COMEDIE FRANCAISE, the national subsidized theater of France, formed in 1680 by the fusion of the two bodies into which Molière's company of actors had split. It is at present managed by regulations, made in 1812, modified by subsequent resolutions.

COMEDIET'TA, a dramatic composition of the comedy class, but not so much elaborated as a regular comedy, and generally consisting of one or at most two acts.

COM'ETS, certain celestial bodies which appear at irregular intervals, moving through the heavens in paths which seem to correspond with parabolic curves, or in a few instances in elliptical orbits of great eccentricity. The former, after being visible from the earth for a shorter or longer time, disappear into space apparently never to return; the latter return to us periodically. Some comets are only visible by the aid of the telescope, while others can be seen by the naked eye. In the latter case they usually appear like stars accompanied with a train of light, sometimes short and sometimes extending over half the sky, mostly single and more or less curved but sometimes forked. In a comet which appeared in 1744 the train was divided into several branches, spreading out from the head like a fan. The train is not stationary relatively to the head, but is subject to remarkable movements. The direction in which it points is always opposite to the sun. and as the comet passes its perihelion the train changes its apparent position with extraordinary velocity The head of the comet is itself of different degrees of luminosity, there being usually a central core, called the nucleus, of greater brilliancy than the surrounding envelope, called the coma.

Comets were long regarded as supernatural objects, and usually as portents of impending calamity. Tycho Brahe was the first who expressed a rational opinion on the subject, coming to the conclusion that the comet of 1577 was a heavenly body at a greater distance from the earth than that of the moon. The general law of the motion of bodies, as well as his own observations on the comet of 1680, led Newton to conclude that the orbits of the comets must, like those of the planets, be ellipses, having

Comet of 1811.

the sun in one focus, but far more eccentric; and having their aphelions, or greater distances from the sun, far remote in the regions of space. This idea was taken up by Halley, who collated the observations which had been made of all the twenty-four comets of which notice had been taken previous to 1680. The results were very interesting. With but few exceptions the comets had passed within less than the earth's shortest distance from the sun, some of them within less than one-third of it, and the average about one-half. Out of the number, too, nearly two-thirds

had had their motions retrograde, or moved in the opposite direction to the planets. While Halley was engaged on these comparisons and deductions the comet of 1682 made its appearance, and he found that there was a wonderful resemblance between it and three other comets that he found recorded—the comets of 1456, of 1531, and of 1607. The times of the appearance of these comets had been at very nearly regular intervals, the average period being between seventy-five and seventy-six years. Their distances from the sun, when in perihelion, or when nearest to that luminary, had been nearly the same, being nearly six-tenths of that of the earth, and not varying more than one-sixtieth from each other. The inclination of their orbits to that of the earth had also been nearly the same, between 17° and 18°; and their motions had all been retrograde. Putting these facts together, Halley concluded that the comets of 1456, 1531, 1607, and 1682 were reappearances of one and the same comet, which revolved in an elliptic orbit round the sun, performing its circuit in a period varying from a little more than seventy-six years to a little less than seventy-five; or having, as far as the observations had been carried, a variation of about fifteen months in the absolute duration of its year, measured according to that of the earth.

It now became possible to predict the reappearance of comets with certainty. Sometimes a comet may split up into thousands of small pieces and reappear as "shooting stars." Among the famous comets are those of Encke (1786 and

Donati's comet, 1858.

1818), Biela's comet (1826, 1839, 1845), which in 1846 split in two and has since been entirely dissipated; and Donati's comet (1858). The tails of comets are sometimes many millions of miles in length.

That the comets are formed of matter of some sort or other we know from the dense and opaque appearance of their nucleus, as well as from the action of the planets upon them; but as their action upon the planets has not been great, or even perceptible, we are led to the conclusion that they are not bodies of the same density or magnitude as even the smallest and rarest of the planets. One modern theory of the nature of comets is that these bodies were ejected millions of years ago from the interior of suns, or planets in a sun-like state. When a comet is viewed through a telescope of considerable power there appears a dense nucleus in the center of the luminous and apparently vaporous matter of which the external parts are composed; and the opacity of this nucleus varies in different comets. On its first appearance, and again when it recedes, the luminous part of the comet is faint and does not extend far from the nucleus; but as it moves on toward the perihelion the brightness increases, and the luminous matter lengthens into a train, which, in some cases, has extended across a fourth of the entire circumference of the heavens. The most remarkable discovery of recent times regarding comets is the identity of the course of some of them with the orbit of certain showers of shooting-stars. This was first demonstrated by the Italian astronomer Schiaparelli, who proved the agreement between the orbit of the great comet of 1862 and that of the star-shower seen annually about August 9, 10. It has since been demonstrated that every meteoric stream follows in the train of some comet large or small, which either exists now or has been dissipated, as Biela's comet was, leaving only its meteoric trail to show where it once traveled; and that every comet is followed or preceded by a train of meteors, extending over a greater or less portion of the comet's orbit according to the length of time during which the comet has existed.

COMITY OF NATIONS, a phrase adopted in international law to denote that kind of courtesy by which the laws and institutions of one state or country are recognized and given effect to by the government of another.

COMMA, in punctuation, the point [,] denoting the shortest pause in reading, and separating a sentence into divisions or members according to the construction.—In music, a comma is the smallest enharmonic interval, being the difference between a major and a minor tone, and expressed by the ratio 80:81.

COMMAN'DER, a chief; the chief officer of an army or any division of it. The office of commander-in-chief is the highest staff appointment in the army. The title is sometimes not commander-in-chief, but field-marshal commanding-in-chief, the difference being that the former is appointed by patent for life, while the latter is appointed by a letter of service, and holds office only during the pleasure of the sovereign. In the navy, a commander holds a definite rank above lieutenant and under captain. In matters of etiquette he ranks with a lieutenant-colonel in the army. In large vessels there is a commander as well as a captain, but in sloops and vessels of that class the commander is the highest officer.

COMMAN'DERY, a term used in several senses in connection with some of the military and religious orders. Among several orders of knights as the Templars, Hospitallers, etc., it was a district under the control of a member of the order (called a commander or preceptor), who received the income of the estates belonging to the knights within that district, and expended part for his own use and accounted for the rest; in England, more especially applied to a manor belonging to the priory of the Knights Hospitallers or Knights of St. John of Jerusalem. In certain religious orders, as those of St. Bernard and St. Anthony, it was the district under the authority of a dignitary called a commander.

COMMENCEMENT, in the universities of the United States, the day when masters of arts and doctors receive their degrees.

COMMEN'SURABLE, an appellation given to such quantities or magnitudes as can be measured by one and the same common measure. Commensurable numbers are such as can be measured or divided by some other number without any remainder; such are 12 and 18, as being measured by 6 or 3.

COMM'ENTARY, a term used (1) in the same sense as memoirs, for a narrative of particular transactions or events as the Commentaries of Cæsar. (2) A series or collection of comments or annotations. These may either be in the form of detached notes, or may be embodied in a series of remarks written and printed in a connected form.

COMM'ERCE, the interchange of goods, merchandise, or property of any kind between countries or communities; trade; traffic.

COMMERCIAL LAW, the law which regulates commercial affairs among the merchants of different countries, or among merchants generally. It is derived from the different maritime codes of mediæval Europe, the imperial code of Rome, international law, and the custom of merchants.

COMMERCIAL TREATIES, treaties entered into between two countries for the purpose of improving and extending their commercial relations; each country engaging to abolish or to reduce to an agreed rate or otherwise modify the duties on articles of production and manufacture imported from the one country into the other. They are usually for a limited period, but may be renewed and modified according to altering conditions. In these treaties the phrase, "most favored nations," implies concessions equal to the most favorable granted under any similar treaty. The first treaty of commerce made by England with any foreign nation was entered into with the Flemings in 1272; the second was with Portugal and Spain, 1308. Among modern treaties the most famous is that negotiated between Richard Cobden, the English free-trader, and the ministers of Napoleon III. in 1860, and which resulted in great benefit to both nations. A second one was signed in 1873, but negotiations for a third in 1882 fell through chiefly owing to French protectionist prejudices. Several treaties of reciprocity have been made between the United States and other countries, notably France and Canada.

COMMISSA'RIAT, the department of an army whose duties consist in supplying transport, provisions, forage, camp equipage, etc., to the troops, but not arms, ammunition, etc.; also the body of officers in that department.

COMMISSION, MILITARY, the authorization of rank or right to command in the army, generally in the form of a certificate. A commission is issued only by the President of the United States. In Britain military commissions were formerly purchasable but this custom was abolished in 1871.

COMMISSIONAIRE, on the continent of Europe hotel runners and general servants of hotels who look after the luggage of guests whom they meet at the railway stations or docks. In Germany commissionaires are analogous to messenger boys in the United States.

COMMITMENT, a warrant of a magistrate holding an accused person to trial. The word is also used to designate an order sending a person to jail for contempt of court, or other offense.

COMMIT'TEE, one or more persons elected or appointed to attend to any matter or business referred to them either by a legislative body, or by a court, or by any corporation, or by any society or collective body of men acting together. In legislative bodies, when a committee consists of the whole members of the body acting in a different capacity from that which usually belongs to them it is called a committee of the whole house, the business of which is conducted under somewhat different regulations from those under which the business of the house when not in committee is carried on.—Standing committees are such as continue during the existence of legislature, and to these are committed all matters that fall within the purposes of their appointment, as the committee of elections or of privileges, etc.—Select committees are appointed to consider and report on particular subjects.

COMMITTEE OF PUBLIC SAFETY, a body elected by the French Convention (6th April, 1793) from among its own members, at first having very limited powers conferred upon it—that of supervising the executive and of accelerating its actions. Subsequently, however, its powers became extended; all the executive authority passed into its hands, and the ministers became merely its scribes. It was at first composed of nine, but was increased to twelve members viz.: Robespierre, Danton, Couthon, St. Just, Prieur, Robert-Lindet, Hérault de Séchelles, Jean-Bon St. André, Barrère, Carnot, Collot d'Herbois, and Billaud Varennes. The severe government of this body is known as the Reign of Terror, which ended with the execution of Robespierre and his associates in July, 1794. During the commune (March to May, 1871) a similar committee was established in Paris.

COM'MODORE, in the navy, an officer, generally a captain, holding a temporary commission with a rank between that of captain and admiral, who commands a ship or detachment of ships in the absence of an admiral. They are of two kinds—one having a captain under him in the same ship, and the other without a captain. They both carry distinguishing pennants. The title is also given to the senior captain of a line of merchant vessels, and also to the president of a yachting club.

COMMON CARRIERS. See Carriers.

COMMON COUNCIL, the council of a city or corporate town, empowered to make by-laws for the government of the citizens. The common councils sometimes consist of two houses, chambers, or courts, and sometimes form only one. Thus the common council of London consists of two houses, the upper house, composed of the lord-mayor and aldermen, and the lower house of the common council men, who are elected annually. In the United States several cities have two houses of municipal legislature, notably St. Louis. The term common council is not used so familiarly in this country as in England, the term city council being preferred.

COM'MONER, IN BRITAIN, a term applied to all citizens except the hereditary nobility.

COMMON LAW, the unwritten law, the law that receives its binding force from immemorial usage and universal reception, in distinction from the written or statute law; sometimes from the civil or canon law; and occasionally from the lex mercatoria, or commercial and maritime jurisprudence. It consists of that body of rules, principles, and customs which have been received from former times, and by which courts have been guided in their judicial decisions. The evidence of this law is to be found in the reports of those decisions and the records of the courts. Some of these rules may have originated in edicts or statutes which are now lost, or in the terms and conditions of particular grants or charters; but it is quite certain that many of them originated in judicial decisions founded on natural justice and equity, or on local customs. It is contrasted with (1) the statute law contained in acts of parliament; (2) equity, which is also an accretion of judicial decisions, but formed by a new tribunal, which first appeared when the common law had reached its full growth; and (3) the civil law inherited by modern Europe from the Roman Empire. Wherever statute law, however, runs counter to common law, the latter is entirely overruled; but common law, on the other hand, asserts its pre-eminence where equity is opposed to it.

COMMON PLEAS, Court of, formerly one of three superior courts of common law in England, presided over by a lord chief-justice and five (at an earlier period four) puisné judges, and having cognizance of all civil causes, real, personal, or mixed, as well by original writ as by removal from the inferior courts; now merged in the High Court of Justice.

COMMON PRAYER, Book of, the liturgy or public form of prayer prescribed by the Church of England to be used in all churches and chapels, and which the clergy are to use under a certain penalty. The Book of Common Prayer is used also by the English-speaking Episcopal churches in Scotland, Ireland, America, and the colonies, as well as by some non-episcopal bodies, with or without certain alterations. It dates from the reign of Edward VI.; was published in 1549, and again with some changes in 1552. Some slight alterations were made upon it when it was adopted in the reign of Elizabeth. In the reign of James I., and finally soon after the Restoration, it underwent new revisions.

COMMONS, House of. See Britain and Parliament.

COMMON SCHOOLS, in the United States, the public schools, including the primary and high schools, and the normal schools. The present system of graded schools is a vast enlargement and improvement of the elementary schools of colonial times. To assist in the support of the public schools the government, and sometimes the several states, particularly in the west, have given grants of land the sale of which has helped to defray the expenses of public education. About 16,000,000 children are enrolled in the common schools of the United States. In the instruction of these nearly 500,000 teachers are engaged, and the total expenditures for the support of these schools aggregate nearly $220,000,000 annually.

COMMON TIME, in music, is that in which every bar contains an even number of subdivisions, such as two minims, four quavers, or their equivalents. It is of two kinds, simple and compound. Simple common time is that which includes four beats in a bar, or any division of that number, or square of the number or its divisions. Compound common time includes two or four beats of three crochets or quavers to each beat.

COM'MONWEALTH, the whole body of people in a state; the body politic. In Eng. hist. the name given to the form of government established after the death of Charles I., and which lasted until the restoration of Charles II. (1649–59).

COM'MUNALISM, the theory of government by communes or corporations of towns and districts, adopted by the advanced republicans of France and elsewhere. The doctrine is that every commune, or at least every important city commune, as Paris, Marseilles Lyons, etc., should be a kind of independent state in itself, and France merely a federation of such states. This system must not be confounded with communism, with which, however, it is naturally and historically allied, though the two are perfectly distinct in principle.

COM'MUNE, a small territorial district in France, being one of the subordinate divisions into which that country is parcelled out; the name is also given to similar divisions in some other countries, as Belgium. In the country a commune sometimes embraces a number of villages, while some large cities are divided into a number of communes. In either case each commune is governed by an officer called a mayor.

COMMUNE OF PARIS.—1. A revolutionary committee which took the place of the municipality of Paris in the French revolution of 1789, and soon usurped the supreme authority in the state. Among its chiefs were some of the most violent of the demagogues, such as Hébert, Danton, and Robespierre. 2. The name adopted by the ultra-radical party in Paris brought once more into prominence by the events of the Franco-German war, more immediately by the siege of Paris (Oct. 1870 to Jan. 1871). They ruled over Paris for a brief period after the evacuation of the German troops, and had to be suppressed by

troops collected by the National Assembly of France. The rising was entirely political and confined to Paris; it was based on no well defined dogmas, only a fractional part of the communal government being communists in the economic sense, and these were soon thrust aside by their more violent and unscrupulous comrades. Much bloodshed and wanton destruction of property took place before the rising was put down by M. Thiers' government.

COMMU'NION, the act of partaking with others of the sacramental symbols in the Lord's Supper. See Lord's Supper.

COM'MUNISM, the economic system or theory which upholds the absorption of all proprietary rights in a common interest, an equitable division of labor, and the formation of a common fund for the supply of all the wants of the community; the doctrine of a community of property, or the negation of individual rights in property. No communistic society has as yet been successful. Robert Owen made several experiments in modified communism, but they failed. St. Simon, Fourier, and Proudhon have been the chief exponents of the system in France; and under the names of socialism, nihilism, etc., it seems to be working as a great unseen force in several countries.

COMO, capital of the province of Como, in the north of Italy (Lombardy), 24 miles n.n.w. of Milan. Pop. 25,560.—The province of Como has an area of 1049 sq. miles, and a pop. of 515,134.

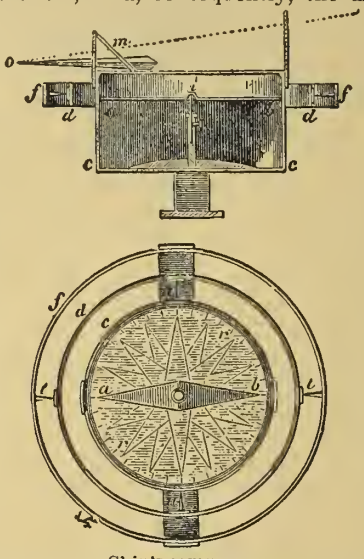
COMPAN'ION, a raised hatch or cover to the cabin stair of a merchant vessel.—Companion Ladder, the steps or ladder by which persons ascend to and descend from the quarter-deck.

COM'PANY, in military language, a subdivision of an infantry regiment or battalion, corresponding to a troop of cavalry or a battery of artillery, consisting of from 60 to 100 men and commanded by a captain.

COMPARATIVE ANATOMY. See Anatomy.

COMPARISON, Degrees of, in grammar, inflections of adjectives or adverbs to express degrees of the original quality, usually divided into positive, comparative, and superlative; as strong, stronger, strongest, glorious, more glorious, most glorious.

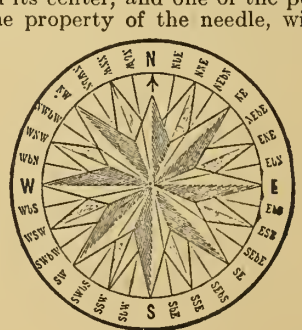
COMPASS, an instrument used to indicate the magnetic meridian or the position of objects with respect to that meridian, and employed especially on ships, and by surveyors and travelers. Its origin is unknown, but it is supposed to have been brought from China to Europe about the middle of the 13th century. As now generally used it consists of three parts: namely, the box, the card or fly, and the needle—the latter being the really essential part, and consisting of a small magnet so suspended that it may be able to move freely in a horizontal direction. The box, which contains the card and needle, is, in the case of the common mariner's compass, a circular brass receptacle hung within a wooden one by two concentric rings called gimbals, so fixed by the cross centers to the box that the inner one, or compass-box, shall retain a horizontal position in all motions of the ship. The circular card is divided into thirty-two equal parts by lines drawn from the center to the circumference, called points or rhumbs; the intervals between the points are also divided into halves and quarters, and the whole circumference into equal parts or degrees, 360 of which complete the circle; and, consequently, the dis-



Ship's compass.

a b, Needle. *c c*, Box. *d d*, Inner gimbal. *f f*, Outer gimbal. *i*, Pivot upon which the card is placed. *m*, Reflector. *r r*, Card. *t t*, *u u*, Supporting pivots.

tance or angle comprehended between any two rhumbs is equal to 11¼°. The four principal are called cardinal points: viz., North, South, East, and West. The names of the rest are compounded of these. The needle is a small bar of magnetized steel. It is fixed on the under side of the card, and in the center is placed a conical socket, which is poised on an upright pointed pin fixed in the bottom of the box; so that the card, hanging on the pin, turns freely round its center, and one of the points, by the property of the needle, will al-



Compass card.

ways be directed toward the north pole. The needle, however, is liable to a certain deviation owing to the magnetism of the ship itself, and this is especially strong in iron ships. (See Deviation.) To obviate this Sir W. Thomson (Lord Kelvin) invented a compass, having a number of needles arranged in a particular manner instead of one. In this compass quadrantal errors are corrected by means of two iron globes fixed on opposite sides of the binnacle; while the various components of the ship's magnetic force are neutralized by a series of bar-magnets so arranged as to act as correctors. In the compass used by land-surveyors and others the needle is not fixed to the card, but plays alone, the card being drawn on the bottom of the box.

COMPASSES, or **PAIR OF COMPASSES,** a mathematical instrument used for the describing of circles, measuring lines, etc. They consist simply of two pointed legs, movable on a joint or pivot, and are used for measuring and transferring distances. For describing circles the lower end of one of the legs is removed and its place supplied by a holder for a pencil or pen.—Hair Compasses are compasses having a spring tending to keep the legs apart, and a finely-threaded screw by which the spring can be compressed or relaxed with the utmost nicety, and the distance of the legs regulated to a hair's-breadth.—Bow Compasses are compasses having the two legs united by a bow passing through one of them, the distance between the legs being adjusted by means of a screw and nut.—Proportional Compasses are compasses used for reducing or enlarging drawings, having the legs crossing so as to present a pair on each side of a common pivot. By means of a slit in the legs, and the movable pivot, the relative distances between the points at the respective ends may be adjusted at pleasure in the required proportion.

COMPLEXION, the color or hue of the skin, particularly of the face. The color depends partly on pigment in the deep cells of the epidermis and partly on the blood supply. The nature and color of the hair seems closely connected with the complexion, and these combined are important distinguishing marks of different races. See Ethnology.

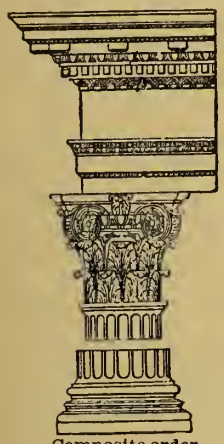
COMPLUTENSIAN POLYGLOT, a celebrated polyglot edition of the Bible published at Complutum, the ancient name of Alcala de Henares, in Spain, 1514–17, by Cardinal Ximenes. See Polyglot.

COMPOSITÆ, the largest known nat. order of plants, containing over 12,000 described species of herbs or shrubs distributed all over the world. The flowers (generally called florets) are numerous (with few exceptions) and sessile, forming a close head on the dilated top of the receptacle, and surrounded by an involucre of whorled bracts. The head of numerous florets was called by the older botanists a compound flower, hence the name. Many are common weeds, like the daisy, dandelion, thistle, etc.; many are cultivated in gardens, such as the asters, marigold, etc.; others have some economic or medicinal value, as chicory, artichoke, chamomile, lettuce, wormwood, arnica, etc.

COMPOSITE ORDER, in arch. the last of the five orders; so called because the capital belonging to it is composed out of those of the other orders, borrowing a quarter-round from the Tuscan and Doric, a row of leaves from the Corinthian, and volutes from the Ionic. Its cornice has simple modil-

lions of dentils. It is called also the Roman or the Italic order.

COMPOSITION OF FORCES AND MOTIONS, in mechanics, the union or assemblage of several forces or motions that are oblique to one another, into an equivalent force or motion in another direction. Thus two forces acting in the directions of the adjacent sides of a parallelogram, compose one force acting in the direction of the diagonal, and if the lengths of the adjacent sides represent also the magnitudes of the forces, the diagonal will represent the magnitude of the compound force or resultant.



Composite order.

COMPOSITION WITH CREDITORS, an arrangement whereby a debtor who has failed, compromises with all or a number of his creditors who agree to discharge him from his indebtedness for a percentage of their claims. If the arrangement be made secretly it is held to be void.

COMPOUND ANIMALS, animals, many of which by no means belong to the lowest types, in which individuals, distinct as regards many of the functions of life, are yet connected by some part of their frame so as to form a united whole. Such are the polyzoa and some of the ascidia.

COMPOUNDING A FELONY, the act of agreeing not to prosecute a person accused of a crime for a consideration of value. In the United States compounding a felony is punishable by imprisonment and a fine.

COMPRESSED AIR, atmospheric air compressed by means of pumps, etc., and used in driving stationary and locomotive engines, and excavating machines; as also in working pneumatic despatch-tubes, railway-brakes, etc.

COMPRESSED-AIR ENGINE, an engine operated by the escape of air from a tank in which atmospheric air has been stored under high pressure.

COMPRESSED-AIR LOCOMOTIVE, a locomotive in which the motive power is compressed air. Many devices for this kind of locomotive have been invented but none of them have stood the practical tests through which they have been put. Compressed air motors have been tried on the street car lines of New York and other cities with small success.

COMPRESSED-AIR TREATMENT, atmospheric pressure brought to bear on the body for the purpose of curing diseases. It is applied by causing the patient to breathe compressed air, or to exhaust the air from a cabinet in which his body is placed, while he breathes the ordinary air through a tube communicating with the outside. It has not been successful.

COMPRESSIBIL'ITY, the property of bodies in virtue of which they may be pressed into smaller bulk. All bodies are probably compressible, though the liquids are but slightly so. The gases are exceedingly compressible, and may be liquefied by pressure and cold combined. Those bodies which occupy their former space when the pressure is removed, are called elastic.

COMSTOCK, Anthony, an American reformer, noted for his detestation of improper literature. He was born in Connecticut in 1844, and served during the civil war on the Union side. Comstock organized the society for the suppression of vice, in 1873, and has done much to suppress immoral literature.

COMSTOCK LODE, a famous vein of gold and silver ore in Nevada (Storey county) in the Sierra mountains. It was discovered in 1859, is about four miles long and 2900 feet at its widest part. In 30 years the vein has produced $350,000,000. Its greatest production in any one year was $38,000,000 in 1877.

COMTE (kont), Isidore Auguste Marie François Xavier, founder of the "positive" system of philosophy, was born at Montpellier on 12th January, 1798, died at Paris 1857. In 1826 Comte commenced a course of lectures on positive philosophy, but only four lectures were given when he became deranged in mind, and did not recover till the end of 1827. In 1830 he commenced the publication of his Cours de Philosophie Positive, which was completed in six volumes in 1842. In 1845 he made the acquaintance of Clotilde de Vaux, who seems to have inspired him with a depth and tenderness of moral and æsthetic feeling before unknown in him. This appears in his second great work, Positive Polity (1851–54); the Positivist Catechism (1852); and his last work, Subjective Synthesis (1855). In his Religion of Humanity he himself assumed the office of high-priest, performing marriage and funeral rites on behalf of the disciples who had been induced to adopt his system. These, however, were never very numerous; and as a practical faith his system is now stationary, though as a philosophy of knowledge it is widely accepted. His works have been made known to American readers mainly by Mr. G. H. Lewes' Comet's Philosophy of the Sciences and Miss Martineau's translation above mentioned.

CONCAN, a maritime subdivision of Hindustan, in the presidency of Bombay. Area about 13,500 sq. miles; pop. about 3,000,000.

CONCAVE, hollow and curved or rounded, as the inner surface of a spherical body. A surface is concave when straight lines drawn from point to point in it fall between the surface and the spectator; and convex when the surface comes between him and such lines.

CONCEALMENT, in law the hiding of facts bearing upon a crime, or the hiding of property in litigation, or of persons.

CONCEPCION', a seaport of Chili, capital of a province of the same name. Conceppcion was founded in 1550, and has suffered much from earthquakes and attacks by the Araucanians. Pop. 55,458.

CONCEP'TION, the act or power of conceiving in the mind; in philosophy, that mental act or combination of acts by which an absent object of perception is brought before the mind by the imagination.

CONCEPTION, Immaculate, in the Roman Catholic Church, the doctrine that the Virgin Mary was born without the stain of original sin. This doctrine came into favor in the 12th century, when, however, it was opposed by St. Bernard, and it afterward became a subject of vehement controversy between the Scotists, who supported, and the Thomists, who opposed it. In 1708 Clement XI. appointed a festival to be celebrated throughout the church in honor of the immaculate conception. Since that time it was received in the Roman Church as an opinion, but not as an article of faith until the year 1854, when the pope issued a bull which makes the immaculate conception a point of faith.

CON'CERT, a public or private musical entertainment, at which a number of vocalists or instrumentalists, or both, perform singly or combined.

CONCERTI'NA, a musical instrument invented by Professor Wheatstone, the principle of which is similar to that of the accordion. It is composed of a bellows, with two faces or ends, generally polygonal in shape, on which are placed the various stops or studs, by the action of which air is admitted to the free metallic reeds which produce the sounds.

CONCERTO (kon-cher'tō), in music, a kind of composition, usually in a symphonic form, written for one principal instrument, with accompaniments for a full orchestra.

CONCERT PITCH. See Pitch.

CONCH (kongk), a marine shell, especially a large spiral shell of a trumpet shape, and which may be blown as a trumpet, as is the practice in Hindustan and some of the Pacific Islands.

CONCHOL'OGY, the science of shells, that department of zoology which treats of the nature, formation, and classification of the shells with which the bodies of many mollusca are protected; or the word may be used also to include a knowledge of the animals themselves, in which case it is equivalent to malacology. In systems of conchology shells are usually divided into three orders, Univalves, Bivalves, and Multivalves, according to the number of pieces of which they are composed.

CON'CORD, in music, the combination of two or more sounds pleasing to the ear. Concords are the octave, the fifth, third, and sixth. The two first are called perfect, because as concords they

are not liable to any alteration by sharps or flats. The two last are called imperfect, as being alterable.

CONCORD, the capital of New Hampshire, on the Merrimac, 60 miles n.n.w. Boston, one of the largest rail-

State capitol, Concord, N. H.

way centers in New England. It has manufactures of carriages, hardware, cutlery, woolen fabrics, paper, etc. Pop. 21,632.

CONCOR'DANCE, a book in which the principal words used in any work or number of works, as the Scriptures, Shakespeare, Milton, Tennyson, Homer, etc., are arranged alphabetically, and the book, chapter, and verse, or act, scene, line, or other subdivision in which each word occurs, are noted; designed to assist an inquirer in finding any passage by means of any leading word which he can recollect, or to show the character of the language and style of any writer.

CON'CRETE, a technical term in logic, applied to an object as it exists in nature, invested with all its attributes, or to the notion of such on object. Concrete is opposite to abstract. The names of individuals are concrete; those of classes, abstract. A concrete name is a name which stands for a thing; an abstract name is a name which stands for the attribute of a thing.

CON'CRETE, a composition used in building, consisting of hydraulic or other mortar mixed with gravel or stone chippings about the size of a nut. It is used extensively in building under water, for example, to form the bottom of a canal or sluice, or the foundation of any structures raised in the sea; and it is also frequently used to make a bed for asphalt pavements, or to form foundations for buildings of any kind. It is sometimes even used as the material with which the walls of houses are built, the concrete being firmly rammed into molds of the requisite shape, and then allowed to set.

CONCU'BINAGE, sexual cohabitation of a man without legal marriage. It was permitted among the ancient Hebrews and the Greeks without limitation; but among the Romans in the case of unmarried men concubinage was limited to a single concubine of mean descent.

CONCURRENT JURISDICTION, the jurisdiction of different courts authorized to take cognizance of the same kind of case. In criminal cases the court which first takes up a case has the right of prevention, that is, of deciding upon that case exclusive of the other courts which but for that right would have been equally entitled to take cognizance of it. In civil cases it lies with the suitor to bring his cause before any court he pleases, which is competent to take it up.

CONCUSSION OF THE BRAIN, a term applied to certain injuries of the brain resulting from blows and falls, though unattended with fracture of the skull. Stupor or insensibility, sickness, impeded respiration, and irregular pulse are the first symptoms, and though these may subside there is always for a time more or less risk of serious inflammation of the brain setting in.

CONDE, Louis de Bourbon, founder of the house of, born 1530; killed after battle of Jarmac, 1569. See Bourbon.

CONDE, Louis de Bourbon, Prince of (the Great Condé), a famous general, born in 1621. In 1641 he married a niece of Cardinal Richelieu. His defeat of the Spanish at Rocroi, in 1643, was followed, in 1645, by his defeat of Mercy at Nordlingen, and by his capture of Dunkirk in 1646, the year in which he inherited his father's title. During the troubles of the Fronde he at first took the side of the court; but believing himself to be ill requited by Mazarin, he put himself at the head of the faction of the Petits Maîtres, and was imprisoned for a year by Mazarin (1650). On his release he at once put himself at the head of a new Fronde, entered upon negotiations with Spain, and, his attack on Paris being indecisive, retired to the Netherlands, where he was appointed generalissimo of the Spanish armies. In this capacity he unsuccessfully besieged Arras in 1654; but he was more fortunate at Valenciennes in 1656, and at Cambrai in 1657. In 1658 he was defeated before Dunkirk by Turenne, but was restored to his rank in France after the peace of 1659. In 1668 he accomplished the reduction of Franche Comté in three weeks; and in 1674 he defeated the Prince of Orange at Senef. His successes over Montecuculi in Alsace in1675 closed his military career. Four years later he retired to Chantilly, near Paris, and died at Fontainebleau in 1687.

CONDENSA'TION, in chemistry and physics, the act of reducing a gas or vapor to a liquid or solid form. Surface condensation, a mode of condensing steam by bringing it in contact with cold metallic surfaces in place of by injecting cold water.

CONDENSED MILK, milk preserved by evaporating part of its moisture, mixing with refined powdered sugar, and packing in air-tight cans hermetically sealed: the sugar may also be omitted.

CONDENSER, an apparatus for reducing the volume of a gas, or for reducing a gas to a liquid, or a liquid to a solid. Condensers are used in steam engines to condense the exhaust, and on shipboard for the purpose of supplying the boilers.

CONDENSER, an electric apparatus used to collect electricity and to store it. The Leyden jar is a classic example of a condenser. The electricity is collected by brushes and passed into the jar. Another form of condenser is the Franklin plate, consisting of a glass plate with strips of tin foil on the sides.

CONDENSING STEAM-ENGINE. See Steam-engine.

CONDILLAC (kōn-dē-yȧk), Etienne Bonnot de, French philosopher, born in 1715. His essay on the Origin of Human Knowledge (1746), in large part a polemic against abstract methods of philosophizing, struck the key-note of his system, and his Treatise on Systems, (1749) continued the condemnation of all systems not evolved from experience, from sensation. In 1754 appeared his Treatise on Sensation, and in 1755 his Treatise on Animals, a criticism on Buffon. The sagacity and clearness of his writings led to his appointment as tutor to the nephew of Louis XV., the infant Duke of Parma, for whom he wrote in 1755 his Cours d'Etudes, including a grammar, The Art of Writing, The Art of Reasoning, The Art of Thinking, and a general history. His work Commerce and Government appeared in the same year as the Wealth of Nations (1776), and was no unworthy companion to it. In 1768 he was elected to the Academy. He died shortly after the publication of his Logic in 1780, his work on Calculus being published posthumously in 1798.

CONDONA'TION, in law, forgiveness of injury. In an action for divorce on the ground of adultery it is a legal plea in defense.

CON'DOR, a South American bird, one of the largest of the Vulturidæ or vulturine birds. In its essential features it resembles the common vultures, differing from them mainly in the large

Condor.

cartilaginous caruncle which surmounts its beak, and in the large size of its oval and longitudinal nostrils placed almost at the extremity of the cere. Despite the many stories of its gigantic proportions, Humboldt met with no specimens whose wings exceeded 9 feet in expanse, though it has occasionally been known to attain an expanse of 14 feet. It is found in greatest numbers in the Andes chain, frequenting regions from 10,000 to 15,000 feet above the level of the sea, where they breed, depositing their two white eggs on the bare rock. They are generally to be seen in groups of three or four, and only descend to the plains under stress of hunger, when they will successfully attack sheep, goats, deer, and bullocks. They prefer carrion, however, and, when they have opportunity gorge themselves until they

become incapable of rising from the ground.

CONDORCET (kon-dor-sā), Marie Jean Antoine Nicolas de Caritat, Marquis de, an eminent French writer, born in 1743. At the age of twenty-one he prescnted to the Academy of Sciences an Essai Sur le Calcul Intégral, and in 1767 his Mémoire on The Problem of Three Points appeared, both being afterward united under the title of Essays on Analysis. The merit of this work gained for him in 1769 a seat in the Academy of Sciences, of which, after the publication of his Eulogies of Academicians, who died previously to 1699, (1773), he was appointed perpetual secretary (1777). In 1777 his Theory of Comets gained the prize offered by the Academy of Berlin; he enriched the transactions of many learned societies; and took an active part in the Encyclopédie. During the troubles of the first French revolution his sympathies were strongly engaged on the side of the people. The fall of the Girondist party, May 31, 1793, prevented the constitution which Condorcet had drawn up from being accepted, and as he freely criticised the constitution which took its place he was denounced as being an accomplice of Brissot. Madame Verney, a woman of noble feelings, secreted him for eight months, during which he wrote his Sketch of an Historic Picture of the Progress of the Human Spirit. Lest he should endanger her safety, however, he left the house secretly in opposition to her wishes, fled from Paris, and wandered about till arrested and thrown into prison, where, March 28, 1794, he was found dead on the floor, having apparently swallowed poison.

CONDUCTION. See Heat.

CONDUC'TOR, or LIGHTNING CONDUCTOR, an instrument by means of which either the electricity of the clouds, the cause of lightning, is conducted without explosion into the earth, or the lightning itself is received and conducted quietly into the earth or water without injuring buildings, ships, etc. It was invented by Benjamin Franklin

Lightning-conductor.
abe, Various forms of rods. *cdf*, Various forms of tips. *ghi*, Various forms of attachments.

about 1752, and met with speedy general adoption, the first conductor in England being erected in 1762. It usually consists of a stout iron rod with one or more points at the top, the lower end being metallically connected with thick strips of copper which are carried into the ground to a considerable depth and terminated, if possible, in water or in wet earth. Various other forms of conductors have been introduced, such as are shown in the accompanying cut, where a is a conductor consisting of metallic strips joined together, b a conductor of copper wires intertwined with iron rods, e a conductor consisting of a metallic strip forming a tube with spiral flanges. Various kinds of tips are also in use, as will be seen in the cut, d being formed of several metals inclosed the one within the other, the most fusible being outside; g, h, i show how in some cases successive sections of rods are connected.

CONDUIT (kun'dit), a line of pipes or an underground channel of some kind for the conveyance of water.

CONE, as used in geometry, generally means a right circular cone, which may be defined as the solid figure traced out when a right-angled triangle is made to revolve round one of the sides that contain the right angle. A more comprehensive definition may be given as follows:—Let a straight line he held fixed at one point, and let any other point of the line be made to describe any closed curve which does not cut itself; the solid figure traced out is a cone. When the curve which the second point describes is a circle, the cone is a right circular cone. The cubical content of a right circular cone is one-third of that of a cylinder on the same base and of the same altitude, and is therefore found by multiplying the area of the base by the altitude, and taking one-third of the product. See also Conic Sections.

CONE, in botany, a dry compound fruit, consisting of many open scales, each with two seeds at the base, as in the conifers; a strobilus.

CONEY ISLAND, a small island 9 miles southeast of New York, at the west end of Long Island, a favorite summer bathing resort, having a fine beach, splendid hotels, and numerous other attractions and accommodations for visitors.

CONFECTIONERY, an edible substance made principally from sugar and including what is generally called candy. Confections were formerly used chiefly as vehicles for medicine and were made by druggists or medicine venders. Since their manufacture on a large scale began in the last century they have been adulterated with various substances injurious to health, such as coal tar colors, clay, etc. The value of confectionery products in the United States amounts to $70,000,000 or more annually.

CONFEDERACY, United Daughters of the, a society of women patriots formed in 1894 at Nashville, Tenn., for the perpetuation of the memory of the part which the women of the South took in the civil war. It is organized into state divisions and has a membership of over 30,000.

CONFEDERATE STATES, the name given to eleven of the Southern States of America, which attempted to secede from the Union on the election of Abraham Lincoln, the abolitionist candidate, to the presidency in November, 1860, thus leading to the great civil war which lasted till 1865. See United States.

CONFEDERATE VETERANS, United, an organization of former soldiers of the Confederate army, founded at New Orleans in 1889, for social, patriotic, and historical purposes. It has a membership of nearly 70,000 and publishes a periodical, The Confederate Veteran, which is the official organ of the society.

CON'FERENCE, (1) a meeting of the representatives of different foreign countries for the discussion of some question. (2) A meeting between delegates of the two houses of parliament called to discuss the provisions of a bill with regard to which they are disagreed, with the object of effecting an agreement between them: (3) The annual meetings of Wesleyan preachers for deliberation on the affairs of the body.

CONFESSION, Auricular, in the strictest sense, the disclosure of sins to the priest at the confessional, with a view to obtain absolution for them. The person confessing is allowed to conceal no sin of consequence which he remembers to have committed, and the father confessor is bound to perpetual secrecy. The practice of a public acknowledgment of great sins was altered by Pope Leo the Great, in 450, into a secret one before the priest, and the Fourth General Lateran council (1215) ordained that every one of the faithful, of both sexes, come to years of discretion, should privately confess all their sins at least once a year to their own pastor, an ordination still binding on members of the R. Catholic Church. Confession is a part of the sacrament of penance.

CONFESSIONAL, in Roman Catholic churches and chapels, a kind of inclosed seat in which the priest sits to hear persons confess their sins. The confessional is often not unlike a sentry-box, the priest sitting within and the

Confessional, cathedral of St. Gudule, Brussels.

penitent kneeling without and speaking through an aperture. Many confessionals are in three divisions or compartments, the center, which is for the reception of the priest, being closed half-way up by a dwarf door, and having a seat within it. The side compartments, which communicate with the center by grated apertures, are for the penitents.

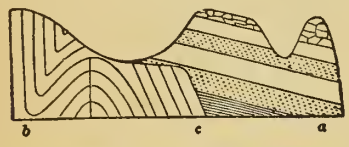
CONFIDENTIAL COMMUNICATION, in law, a communication made by one person to another which the latter cannot be compelled to give in evidence as a witness. Generally all communications made between a client and his agent, between the agent and the counsel in a suit, or between the several parties to a suit, are treated as confidential. The privilege of confidentiality does not extend to disclosures made to a medical adviser, and in England it has been

decided also that confessions made to a priest are not to be treated as confidential.

CONFIRMA'TION, the ceremony of laying on of hands by a bishop in the admission of baptized persons to the enjoyment of Christian privileges, the person confirmed then taking upon himself the baptismal vows made in his name. In the Roman Catholic churches a delay of 7 years is interposed after baptism, in the Lutheran from 13 to 16, and in the English Church from 14 to 18, though in the latter there is no fixed period. The Lord's Supper is not taken by these sects until after confirmation.

CONFISCA'TION, the act of condemning as forfeited, and adjudging to the public treasury, the goods of a criminal in part punishment of a crime.

CONFOR'MABLE, in geol., lying in parallel or nearly parallel planes, and



Conformable strata *a* and *b*, unconformable at *c*

having the same dip and changes of dip; said of strata, the opposite term being unconformable.

CONFU'CIUS, or **KONG-FU-TSE**, that is, "the teacher, Kong," the famous Chinese sage, born about 550 B.C. in the province of Shantung. The deaths of his favorite disciples Yen Hwin and Tze-lu in 481 and 478 did much to further his own, which took place in the latter year. Confucius left no work detailing his moral and social system, but the five canonical books of Confucianism are the Yih-king, the Shu-king, the Shi-king, the Le-king, and the Chun-tsien, with which are grouped the "Four Books," by disciples of Confucius, the Ta-hëo or Great Study, the Chung-Yung or Invariable Mean, the Tun-yu or "Philosophical Dialogues," and the Hi-tse, written by Meng-tse or Mencius. The teaching of Confucius has had, and still has, an immense influence in China, though he can hardly be said to have founded either a religion or a philosophy. All his teaching was devoted to practical morality and to the duties of man in this world in relation to his fellowmen; in it was summed up the wisdom acquired by his own insight and experience, and that derived from the teaching of the sages of antiquity. It is doubtful if he had any real belief in a personal god.

CONGENITAL DISEASE, a disease with which one is afflicted at the time of birth, not necessarily an inherited disease, although most inherited diseases are congenital. Many congenital diseases are due to defects of the mother or to accidental causes during the term of pregnancy.

CONGER-EEL (kong'gẽr), a genus of marine eels characterized by a long dorsal fin beginning near the nape of the neck, immediately above the origin of the pectoral fins, and by having the upper jaw longer than the lower.

CONGES'TION, in medicine, an excessive accumulation of blood in an organ, which thereby becomes disordered. Among the causes of congestion are the different periods of development of the human body, each of which renders some particular organ unusually active; diseased conditions; and the accidental exertions of certain organs. Again, if the current of blood to one organ is checked the blood tends to accumulate in another; and the vessels which bring back the blood to the heart—that is the veins—are sometimes obstructed, as by external pressure, by tumors, etc. Congestion sometimes lasts a short time only; but if not early cured, and its return, which would otherwise be frequent, prevented, it is only the beginning of other diseases. Sometimes it terminates in bleeding, which is a remedy for it; sometimes it increases into inflammation; sometimes it becomes a chronic disease, that is, the blood accumulates for a long time and expands the veins, the expansion becomes permanent, and dropsy may result.

CONGLOM'ERATE, a term applied by geologists to rocks consisting mostly of water-worn pebbles cemented together by a matrix of siliceous, calcareous, or other cement.

CONGO, or **ZAIRE**, one of the great rivers of the world, in Southern Africa, having its embouchure in the South Atlantic. It carries more water to the ocean than the Mississippi, its volume being next to that of the Amazon. Its total length is perhaps 3000 miles. Its chief tributaries are the Aruwimi and the Mobangi from the right, and the Ikelemba and Kwa from the left, which latter represents the collected waters of immense rivers from the south, such as the Kassai, the Kwango, etc. It is navigable for about 110 miles from its mouth, after which the navigation is interrupted by cataracts.

CONGO FREE STATE, a state recently founded on the river Congo, in Central South Africa, stretching by a kind of narrow neck of territory to the river's mouth, but expanding inland so as to cover an immense area, mainly lying south of the river. The central government is at Brussels, consisting of the King of Belgium as sovereign, and three departmental chiefs. In Africa there is a governor-general with many officials, and an armed force. The revenue is partly from funds provided by King Leopold. A number of stations have been formed on the river, the chief of which is Boma, 70 miles from its mouth. The chief exports are palm oil and kernels, caoutchouc, ivory, copal, ground-nuts, wax, etc. From Matadi, opposite Vivi, a railway has been laid to Stanley Pool, and steamers have been placed on the river. Area estimated at 900,000 sq. miles; pop. at 8,000,000 to 40,000,000.

CONGO PEA. See Pigeon Pea.

CONGREGA'TIONALISTS, a Christian sect claiming to continue the primitive form of church government. Each congregation is autonomous and wholly independent of extraneous jurisdiction, the union of Congregational churches having only such indirect authority as attends the cumulative expression of opinion. In doctrine the majority are evangelical, though in individual churches considerable latitude is shown.

CONGRESS, generally speaking a meeting of international representatives for the purpose of considering particular or general questions concerning international politics, art, science, economy, or religion. A series of world's congresses were held at the Chicago World's Fair in 1893. International treaty congresses will be found described under their separate heads.

CONGRESS, the name given to the legislative assembly of the U. States, consisting of two houses—a senate and a house of representatives. The senate consists of two members elected by each state for a period of six years, one-third of whom are elected every two years. The representatives in the lower house are elected by the several states every two years, and their number varies in each state in proportion to the population as determined by the decennial census. The united body of senators and representatives for the two years during which the representatives hold their seats is called one congress. See United States.

CONGRESSMAN AT LARGE, a member of the U. States house of representatives who is elected by the votes of all of the people of a state and not by a single district. They are elected to provide for the excess of population until the state can be regularly redistricted.

CONIC SECTIONS, three curves, the hyperbola, the parabola, and the eclipse, so called because they are formed by the intersection of the surface of a cone with planes that cut the cone in various

Conic sections.

directions. If the cutting-plane be parallel to the axis the curve formed is the hyperbola (1); if parallel to the slope of the cone the curve is a parabola (2); if passing through both sides of the cone obliquely the section is an ellipse (3). A section perpendicular to the axis of the cone forms a circle (4), which may also be considered one of the conic sections. A perpendicular plane through the apex gives a triangle (5).

CONIF'ERÆ, the pines, firs, and their allies, the essential character of which consists in the manner in which the ovules, not inclosed in an ovary, receive directly the action of the pollen without the intervention of a stigma. The ovules in these plants are borne on scales or modified leaves, which are spread out, not folded, and generally grouped in sueh a manner as to form a cone composed of a greater or smaller number of these leaves, of which only a portion may be fertile and bear ovules.

CON'JUGAL RIGHTS, in law, the right which husband and wife have to each other's society, comfort, and affection. A suit for restitution of conjugal rights is competent by either party.

CONJUGATION. See Verb.

CONJUNC'TION, in grammar, a connective indeclinable particle serving to unite words, sentences, or clauses of a sentence, and indicating their relation to one another. They are classifiable into two main groups: (1) Coordinating conjunctions, joining independent propositions, and subdivisible into copulative, disjunctive, adversative, and illative conjunctions; (2) Subordinating conjunctions, linking a dependent or modifying clause to the principal sentence. The only active influence which the conjunction can be said to exercise grammatically in a sentence is in respect of the mood of the verb following it in dependent sentences, the rule being to employ the subjunctive where futurity and contingency are implied, the indicative where they are not; as "I will do it, though he be there" (which he may or may not be); or "I will do it, though he is there" (which he is).

CONJUNC'TION, in astronomy, the position of two of the heavenly bodies, as two planets, or the sun and a planet, when they have the same longitude (are in the same direction from the earth). When it is simply said that a planet is in conjunction, conjunction with the sun is to be understood. Superior conjunction and inferior conjunction are terms used of the planets whose orbits are nearer to the sun than that of the earth, according as the sun is between us and them, or they between us and the sun.

CON'JURING. See Legerdemain.

CONKLING, Roscoe, an American senator and orator, born in Albany, N.Y., in 1829, died in 1888. He was admitted to the bar in 1850 and was early in the political field as a stump-speaker. He was several times elected congressman, up to 1867, and his ability as a debater and orator won him great fame. At 38 he was elected U. States senator and soon became one of the foremost leaders of the republican party. In 1876 he appeared as a presidential candidate, opposed civil service reform, and in 1880 led the movement to nominate Grant for a third time. He quarreled with Garfield for appointing anti-Conkling men to federal offices and soon afterward retired from active politics to the practice of law. Conkling was a very positive man, strong in his friendships and enmities and his work was for the most part ephemeral.

CONNAUGHT (kon'nat), the smallest of the four provinces of Ireland, situated between Leinster and the Atlantic; area, 4,392,086 acres. A large proportion of the province is bog, and, generally it is the least fertile of all of the provinces. It is divided into five counties—Galway, Mayo, Roscommon, Leitrim, and Sligo. Pop. 649,635.

CONNECTICUT (kon-net'i-kut), a river, U. States, the west branch of which forms by treaty the boundary between the U. States and Canada to lat. 45° n. It rises on the north border of New Hampshire; forms the boundary between Vermont and New Hampshire passes through the west part of Massachusetts and the central part of Connecticut, and falls into Long Island Sound. It is navigable for vessels drawing from 8 to 10 feet for about 300 miles from its mouth, subsidiary canals, however, being required above Hartford; total length, 450 miles. It is famed for its shad fisheries.

CONNECTICUT, one of the original thirteen states of the American Union; bounded by New York, Massachusetts, Rhode Island, and Long Island Sound; length, east to west, about 95 miles; greatest breadth, north to south, about 72 miles; area, 4845 sq. miles. It contains several distinct ranges of hills, but none of them have any great elevation. Its principal river is the Connecticut, which divides it into two nearly equal parts. The coast is indented with numerous bays and creeks which furnish many harbors. In former geologic times the area of Connecticut is believed to have formed a part of the southern slope of a great mountain mass, whose summits are perhaps indicated by the present White, Green, and Adirondack mountains. Long-continued erosion of

Connecticut seal.

streams and perhaps of ice reduced this region to a plain, with low relief and shallow stream valleys. A comparatively recent tilting of the land has slightly depressed the coast and elevated the interior. This has revived the cutting power of the streams, which are now actively eroding their valleys, most of them in hard rocks, in which slow progress is made. The Connecticut Valley is, however, largely of relatively softer rocks, which have been eroded away with greater rapidity. In recent geologic times the area of the state was covered by the Laurentian glacier, which did much erusion and deposition, scouring out lake basins, and thus forming the multitude of little lakes and ponds which diversify the surface, and modifying the streams' courses, producing rapids and falls, now utilized for water-power.

Among the highest points in Connecticut are Bear Mountain, 2355 feet; Gridley Mountain, 2200 feet; Riga Mountain, all in Salisbury; Bradford Mountain, in Canaan, 1927; Dutton Mountain, 1620 feet, and Mount Ball, 1760, in Norfolk; Above All Mountain, 1456, in Warren; Ivy Mountain, in Goshen, 1640 feet; and Ellsworth Hill, 1580 feet, in Sharon. Its minerals comprise iron, copper, lead, cobalt, plumbago, marbie, free-stone, porcelain-clay, and coal. Lime is produced in large quantities, and there is abundance of building stone. The soil is in general better suited for grazing than tillage, abounding in fine meadows. But where agriculture is practiced there are ample crops of Indian corn, rye, wheat, oats, barley, buckwheat, potatoes, hay, tobacco, etc.: and fruits, particularly apples, flourish. Connecticut is notably a manufacturing state, 19.5 per cent of the total population being engaged in that industry. Though one of the smallest states of the Union, it ranks eleventh in the importance of its manufactures. Influential among the factors which have developed these interests have been the favorable geographical location and the excellence of the land and water communication of the state, the water power afforded by its streams, and especially the inventive talents and industrious habits of its people.

By the twelfth census the state surpassed any other state in 11 important industries, producing 75 per cent in value of the total ammunition output of the country; 56 per cent of the brass manufactures; 63 per cent of the clocks; 47 per cent of the hardware; 76 per cent of the plated and britannia ware; 64 per cent of the needles and pins. The development of its manufactures has been consistent. The cotton-mills of the state are clustered on the streams that flow into the Thames at Norwich. The principal exports consist of agricultural produce and manufactures. The foreign commerce is nearly all carried on through New York and Boston, but there is a considerable coasting trade, and a large amount of tonnage engaged in the cod-fisheries. Fish-culture has received special attention, many millions of shad ova and young salmon having been introduced into the rivers. The state is intersected in various directions by railways. The chief educational institution is Yale University, one of the most celebrated in the world. Connecticut is divided into eight counties; Hartford is the capital. The state at first consisted of two colonies—Connecticut, with its seat of government at Hartford; and New Haven, at New Haven. Connecticut was settled in 1633 by emigrants from Massachusetts. Hartford was settled by English in 1635, the Dutch having previously built a fort there. The colony of New Haven was settled by English in 1638, and the two colonies were united in 1665 by a charter granted by Charles II. In national elections the state went Democratic in 1888 and 1892; in 1896, 1900, 1904, 1908, Republican. Pop. 1,000,000.

CONNECTIVE TISSUE. See Areolar Tissue.

CONNEMARA ("the Bays of the Ocean"), a boggy and mountainous district occupying the west portion of county Galway, Ireland; about 30 miles in length and 15 to 20 miles in breadth. Its coasts are broken, and there are nu-

merous small lakes. It is subdivided into Connemara Proper in the west, Jar-Connaught in the south, and Joyce Country in the north.

CON'RAD II., king of Germany and emperor of the Romans, reigned from 1024 to 1039, and is regarded as the true founder of the Franconian or Salic line.

CONRAD III., king of Germany, and emperor of the Romans from 1138 to 1152, was the founder of the Suabian dynasty of Hohenstaufen. His marriage with a Greek princess led to his adoption of the double-headed eagle now appearing on the Austrian arms. He was succeeded by his nephew Frederick Barbarossa.

Scene in Connemara—Going to market.

CONSANGUIN'ITY, the relation of persons descended from the same ancestor. It is either lineal or collateral—lineal between father and son, grandfather and grandson, and all persons in the direct line of ancestry and descent, from one another; collateral between brothers, cousins, and other kinsmen descended from a common ancestor, but not from one another.

CONSCIENCE, that power or faculty, or combination of faculties, which decides on the rightness and wrongness of actions; otherwise called the Moral Sense.

CONSCIOUSNESS, a term used in various senses, most commonly perhaps to denote the mind's knowledge or cognizance of its own action.

CONSCRIP'TION, the enlisting of the inhabitants of a country capable of bearing arms, by a compulsory levy, at the pleasure of the government, being thus distinguished from recruiting, or voluntary enlistment. In Great Britain and the U. States a small militia obtained, if necessary, by conscription is usually kept up in time of peace, but the rule is voluntary enlistment.

CONSECRA'TION, the dedication with certain rites or ceremonies of a person or thing to the service of God; especially (1) the ordination of a bishop or archbishop, which requires the co-operation of at least three bishops; (2) the dedication of a church to God's service, which is practiced in the Anglican and Roman Catholic churches and is performed by a bishop; (3) the act of the priest in celebrating the eucharist by which the elements are solemnly dedicated to their sacred purpose.

CONSENT', in law, is understood to be a free and deliberate act of a rational being. It is invalidated by any undue means—intimidation, improper influence, or imposition—used to obtain it. Idiots, pupils, etc., cannot give legal consent; neither can persons in a state of absolute drunkenness, though partial intoxication will not afford legal ground for annulling a contract.

CONSERVATION OF ENERGY. See Energy, Conservation of.

CONSER'VATORY, a name given to a systematic school of musical instruction.

CONSER'VATORY, in gardening, a term generally applied by gardeners to plant-houses, in which the plants are raised in a bed or border without the use of pots, the building being frequently attached to a dwelling-house.

CON'SERVE, a form of medicine in which flowers, herbs, fruits, roots, are preserved as nearly as possible in their natural fresh state.

CONSIGN'MENT, a mercantile term which means either the sending of goods to a factor or agent for sale, or the goods so sent.

CON'SISTORY, the highest council of state in the Papal government. The name is also applied to the court of every diocesan bishop, held in their cathedral churches for the trial of ecclesiastical causes arising within the diocese. In the English Church the consistory is held by the bishop's chancellor or commissary and by archdeacons and their officials either in the cathedral church or other convenient place in the diocese.

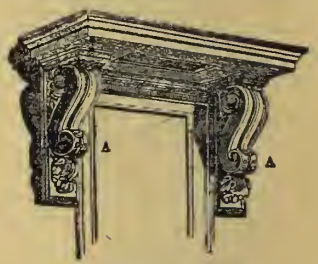
CON'SOLE, in architecture, a projecting ornament or bracket having for its contour generally a curve of contrary flexure. It is employed to support a cornice, bust, vase, or the like, but is frequently used merely as an ornament.

CON'SOLS, or CONSOLIDATED ANNUITIES, a public stock forming the greater portion of the national debt of Great Britain. It was formed in 1751 by an act consolidating several separate stocks bearing interest at 3 per cent into one general stock. At the period when the consolidation took place the principal of the funds united amounted to $45,000,000; but through the addition of other loans it has increased so much that now, after considerable reductions, it still amounts to more than half of the national debt. The interest of about five million pounds is payable in Dublin, that of the remainder in London.

CON'SONANCE, in music, an agreeable accord of sounds, such as the third, fifth, and octave. See Concord.

CON'SONANT, a letter so named as being sounded only in connection with a vowel, though some consonants have hardly any sound even when united with a vowel, serving merely to determine the manner of beginning or ending the vowel sounds; as in ap, pa, at, ta. In uttering a consonant there is greater or less contact of some parts of the organs of speech; in uttering a vowel there is a want of such contact, the vocal passage being open though variously modified. They are classed as liquids, mutes, sibilants, labials, dentals, palatals, gutturals, etc.

CONSPIR'ACY, in law, an offense ranked as a misdemeanor, and punishable by imprisonment and hard labor. It is constituted by a combination between several persons to carry into effect any purpose injurious either to individuals, particular classes, or the community at large. When the conspiracy leads to any overt act of an unlawful kind, the offense becomes felony.



Cornice supported by Consoles. A A.

CONSTABLE, in the common modern acceptation of the term constables are police officers in towns, counties, etc., having as their duties the repression of felonies, the keeping of the peace, the execution of legal warrants, etc. In case of special disturbance a certain number of private citizens may be sworn in as special constables.

CON'STANTINE, Caius Flavius Valerius Aurelius Claudius, Roman emperor, surnamed the Great, son of the Emperor Constantius Chlorus, was born A.D.274. After the death of his father he was chosen emperor by the soldiery, in the year 306, and took possession of the countries which had been subject to his father, namely, Gaul, Spain, and Britain. In the campaign in Italy he saw, it is said, the vision of a flaming cross in the heavens, beneath the sun, bearing the inscription, "In hoc signo vinces." Under the standard of the cross, therefore, he vanquished the army of Maxentius under the walls of Rome, and entered the city in triumph.

In 313, together with his son-in-law, the eastern emperor, Licinius, he published the memorable edict of toleration in favor of the Christians, and subsequently declared Christianity the religion of the state. Licinius, becoming jealous of his fame, twice took up arms against him, but was on each occasion defeated, and finally put to death. Thus

Constantine.

in 325 Constantine became the sole head of the Roman Empire. His internal administration was marked by a wise spirit of reform, and by many humane concessions with regard to slaves, accused persons, widows, etc. In 329 he laid the foundation of a new capital of the empire, at Byzantium, which was called after him Constantinople, and soon rivalled Rome herself. In 337 he was taken ill near Nicomedia, was baptized, and died after a reign of thirty-one years, leaving his empire between his three sons, Constantine, Constantius, and Constans.

CONSTANTINO'PLE, a celebrated city of Turkey in Europe, capital of the Turkish Empire, situated on a promontory jutting into the Sea of Mar-

mora, having the Golden Horn, an inlet of the latter, on the north and the Bosporus on the east. The city proper is thus surrounded by water on all sides excepting the west, where is an ancient and lofty double wall of 4 miles in length, stretching across the promontory. On the opposite side of the Golden Horn are Galata, Pera, and other suburbs, while on the Asiatic side of the Bosporus entrance is Skutari. Occupying the extreme point of the promontory on which the city stands is the seraglio or palace of the sultan, which, with its buildings, pavilions, gardens, and groves, includes a large space At the principal entrance is a large and lofty gate, called Bab Humayum, "the high door" or "sublime porte," from which has been derived the well-known diplomatic phrase. Of the 300 mosques, the most remarkable are the royal mosques, of which there are about fifteen, esteemed the finest in the world. First among these is the mosque of St. Sophia, the most ancient existing Christian church, converted into a mosque in 1453 on the capture of the city by the Turks. Another magnificent mosque is that of Soliman; after which are those of the Sultana Valide, built by the mother of Mohammed IV., and of Sultan Achmet, the most conspicuous object in the city when viewed from the Sea of Marmora. The harbor, the Golden Horn, which more resembles a large river than a harbor, is deep, well-sheltered, and capable of containing 1200 large ships, which may load and unload alongside the quays. It is about 6 miles long, and a little more than half a mile broad at the widest part. Among the imports are corn, timber, cotton stuffs, and other manufactured goods. The exports consist of silk, carpets, hides, wool, goats'-hair, valonia, etc. —Constantinople occupies the site of the ancient Byzantium, and was named after Constantine the Great, who rebuilt it about A.D. 330. It was taken in 1204 by the Crusaders, who retained it till 1261; and by the Turks under Mohammed II., May 29, 1453—an event which completed the extinction of the Byzantine Empire. See Byzantine Empire and Byzantium. Pop. 1,125,000.

CONSTELLA'TIONS are the groups into which astronomers have divided the fixed stars, and which have received names for the convenience of description and reference. It is plain that the union of several stars into a constellation, to which the name of some animal, person or inanimate object is given must be entirely arbitrary, since the several points (the stars) may be united in a hundred different ways, just as imagination directs. The grouping adopted by the Egyptians was accordingly modified by the Greeks, though they retained the Ram, the Bull, the Dog, etc.; and the Greek constellations were again modified by the Romans and again by the Arabians. Ptolemy enumerated forty-eight constellations, which are still called the Ptolemæan. They are the following:—1. The twelve signs of the zodiac (see Zodiac). 2. Twenty-one constellations found in the northern hemisphere—the Great Bear (Ursa Major), the Little Bear (Ursa Minor), Perseus, the Dragon, Cepheus, Cassiopeia, Andromeda, Pegasus, Equulus (Horse's Head), the Triangle, the Wagoner (Aurīga), Boötes, the Northern Crown (Corona Boreālis), Ophiuchus, the Serpent (Serpentarius), Hercules, the Arrow (Sagitta), the Lyre, the Swan (Cygnus), the Dolphin, the Eagle (Aquila). 3. Fifteen constellations in the southern hemisphere—Orion, the Whale (Cetus), Eridanus, the Hare (Lepus), the Great Dog (Canis Major), the Little Dog (Canis Minor), Hydra, the Cup (Crater), the Crow (Corvus), the Centaur, the Wolf (Lupus), the Altar (Ara), the Southern Fish (Piscis Austrālis), the Argo, the Southern Crown (Corona Austrālis). Others were subsequently added, this being especially rendered necessary by the increased navigation of the southern hemisphere, and now the different groups of stars have come to be associated with all sorts of animals and objects, including the Camelopard, the Fly, the Air-pump, the Compasses, etc. The different stars of a constellation are marked by Greek letters, a denoting those of the first magnitude, β those of the second, and so on. Stars of the sixth magnitude are the smallest visible to the naked eye. Several stars have also particular names.

CONSTIPA'TION, the undue retention of feces. Its immediate effects are disordered appetite, a dry coated or clammy tongue, thirst, or a disagreeable taste in the mouth, dullness, giddiness, or pain in the head, torpor, irritability, and despondency. Its less immediate effects are cutaneous affections, dyspepsia, colic, hysteria, hemorrhoids, etc. In most cases it is produced by indigestible food, astringent and stimulating drinks, sedentary habits, excessive indulgence in sleep, etc. The immediate use of purgatives, followed by strict attention to regimen, is in many cases all that is necessary.

CONSTITU'TION, the fundamental law of a state, whether it be a written instrument of a certain date, as that of the United States or an aggregate of laws and usages which have been formed in the course of ages, like the English constitution. The ideal constitution is that established by a free sovereign people for their own regulation, though the expediency of other forms at various stages of national development cannot but be recognized. The chief of these are:—1. Constitutions granted by the plenary power of absolute monarchs, or constitutions octroyées; such as Louis XVIII.'s Charte. 2. Those formed by contract between a ruler and his people, the contract being mutually binding—a class under which, in a great degree, the British constitution must be placed 3 Those formed by a compact between different sovereign powers, such as the constitutions of the German Empire, of the United Provinces of Holland, and of the Swiss Confederation.

In regard to political principles, constitutions are: 1. Democratic, when the fundamental law guarantees to every citizen equal rights, protection, and participation, direct or indirect, in the government, such as the constitutions of the United States and of some cantons of Switzerland. 2. Aristocratic, when the constitution recognizes privileged classes, as the nobility and clergy, and intrusts the government entirely to them, or allows them a very disproportionate share in it. Such a constitution was that of Venice, and such at one time those of some Swiss cantons, for instance, Bern. 3. Of a mixed character.

To this latter division belong some monarchical constitutions, which recognize the existence of a king whose power is modified by other branches of government of a more or less popular cast. The British constitution belongs to this division.

CONSTITUTIONAL LAW, a branch of law which has to do with the organization of government, the soundness of statutory law in relation to the principles of a state's constitution, and with the power of a government over its citizens or subjects. In the United States the interpretation of the constitution is open to all courts but the Supreme Court of the United States has the final jurisdiction in all questions of the federal constitution while the supreme courts of the several states have final jurisdiction over all questions concerned with the constitutions of the separate states themselves.

CONSTITUTION OF THE UNITED STATES, the organic law of the United States. The constitution was drawn up by a constitutional convention which began its work on May 14, 1787, in Independence Hall, Philadelphia. The work was finished on Sept. 17, 1787, and was ratified by all the thirteen states by 1790. Several amendments have been made to the constitution to meet the exigencies of national growth. The following is a complete transcript of the constitution as it exists today:

CONSTITUTION OF THE UNITED STATES.

We, the people of the United States, in order to form a more perfect union, establish justice, insure domestic tranquillity, provide for the common defense, promote the general welfare, and secure the blessings of liberty to ourselves and our posterity, do ordain and establish this Constitution for the United States of America.

Article I., Sec. 1. All legislative powers herein granted shall be vested in a congress of the United States, which shall consist of a senate and house of representatives.

Sec. 2. The house of representatives shall be composed of members chosen every second year by the people of the several states, and the electors in each state shall have the qualifications requisite for electors of the most numerous branch of the state legislature.

No person shall be a representative who shall not have attained to the age of twenty-five years, and been seven years a citizen of the United States, and who shall not, when elected, be an inhabitant of that state in which he shall be chosen.

Representatives and direct taxes shall be apportioned among the several states which may be included within this Union according to their respective numbers, which shall be determined by adding to the whole number of free persons, including those bound to service for a term of years, and excluding Indians not taxed, three-fifths of all other persons. The actual enumeration shall be made within three years after the first meeting of the congress of the United States, and within every subsequent term of ten years, in such manner as they shall by law direct. The number of representatives shall not exceed one for every thirty thousand, but each state shall have at least one representative; and until such enumeration shall be made, the state of New Hampshire shall be entitled to choose 3; Massachusetts, 8; Rhode Island and Providence Plantations, 1; Connecticut, 5; New York, 6; New Jersey, 4; Pennsylvania, 8; Delaware, 1; Maryland, 6; Virginia, 10; North Carolina, 5; South Carolina, 5; and Georgia, 3.

When vacancies happen in the representation from any state, the executive authority thereof shall issue writs of election to fill such vacancies.

The house of representatives shall choose their speaker and other officers; and shall have the sole power of impeachment.

Sec. 3. The senate of the United States shall be composed of two senators from each state, chosen by the legislature thereof, for six years; and each senator shall have one vote.

Immediately after they shall be assembled in consequence of the first election, they shall be divided as equally as may be into three classes. The seats of the senators of the first class shall be vacated at the expiration of the second year, of the second class at the expiration of the fourth year, and of the third class at the expiration of the sixth year, so that one-third may be chosen every second year; and if vacancies happen by resignation, or otherwise, during the recess of the legislature of any state, the executive thereof may make temporary appointments until the next meeting of the legislature, which shall then fill such vacancies.

No person shall be a senator who shall not have attained to the age of thirty years, and been nine years a citizen of the United States, and who shall not, when elected, be an inhabitant of that state for which he shall be chosen.

The vice-president of the United States shall also be president of the senate, but shall have no vote, unless they be equally divided.

The senate shall choose their other officers, and also a president pro tempore, in the absence of the vice-president or when he shall exercise the office of president of the United States.

The senate shall have the sole power to try all impeachments; when sitting for that purpose, they shall be on oath or affirmation. When the president of the United States is tried, the chief justice shall preside; and no person shall be convicted without the concurrence of two-thirds of the members present.

Judgment in cases of impeachment shall not extend further than to removal from office, and disqualification to hold and enjoy any office of honor, trust, or profit under the United States; but the party convicted shall nevertheless be liable and subject to indictment, trial, judgment, and punishment, according to law.

Sec. 4. The times, places, and manner of holding elections for senators and representatives shall be prescribed in each state by the legislature thereof; but the congress may at any time, by law, make or alter such regulations, except as to the places of chosing senators.

The congress shall assemble at least once in every year, and such meeting shall be on the first Monday in December unless they shall, by law, appoint a different day.

Sec. 5. Each house shall be the judge of the elections, returns, and qualifications of its own members, and a majority of each shall constitute a quorum to do business; but a smaller number may adjourn from day to day, and may be authorized to compel the attendance of absent members, in such manner and under such penalties as each house may provide.

Each house may determine the rules of its proceedings, punish its members for disorderly behavior, and, with the concurrence of two-thirds, expel a member.

Each house shall keep a journal of its proceedings and from time to time publish the same, excepting such parts as may in their judgment require secrecy, and the yeas and nays of the members of either house on any question shall, at the desire of one-fifth of those present, be entered on the journal.

Neither house, during the sessions of congress, shall, without the consent of the other, adjourn for more than three days, nor to any other place than that in which the two houses shall be sitting.

Sec. 6. The senators and representatives shall receive a compensation for their services, to be ascertained by law, and paid out of the treasury of the United States. They shall in all cases, except treason, felony, and breach of the peace, be privileged from arrest during their attendance at the sessions of their respective houses, and in going to and returning from the same; and for any speech or debate in either house they shall not be questioned in any other place.

No senator or representative shall, during the time for which he was elected, be appointed to any civil office under the authority of the United States, which shall have been created, or the emoluments whereof shall have been increased during such time; and no person holding any office under the United States shall be a member of either house during his continuance in office.

Sec. 7. All bills for raising revenue shall originate in the house of representatives; but the senate may propose or concur with amendments, as on other bills.

Every bill which shall have passed the house of representatives and the senate shall, before it become a law, be presented to the president of the United States; if he approve, he shall sign it; but if not, he shall return it, with his objections, to that house in which it shall have originated, who shall enter the objections at large on their journal, and proceed to reconsider it. If after such reconsideration two-thirds of that house shall agree to pass the bill, it shall be sent, together with the objections to the other house, by which it shall likewise be reconsidered; and if approved by two-thirds of that house, it shall become a law. But in all such cases the votes of both houses shall be determined by yeas

and nays, and the names of the persons voting for and against the bill shall be entered on the journal of each house respectively. If any bill shall not be returned by the president within ten days (Sunday excepted) after it shall have been presented to him, the same shall be a law in like manner as if he had signed it, unless the congress by their adjournment prevent its return; in which case it shall not be a law.

Every order, resolution, or vote to which the concurrence of the senate and the house of representatives may be necessary (except on a question of adjournment) shall be presented to the president of the United States; and before the same shall take effect, shall be approved by him, or, being disapproved by him, shall be repassed by two-thirds of the senate and house of representatives, according to the rules and limitations prescribed in the case of a bill.

Sec. 8. The congress shall have power to lay and collect taxes, duties, imposts, and excises, to pay the debts and provide for the common defense and general welfare of the United States; but all duties, imposts, and excise shall be uniform throughout the United States;

To borrow money on the credit of the United States;

To regulate commerce with foreign nations, and among the several states, and with the Indian tribes;

To establish an uniform rule of naturalization, and uniform laws on the subject of bankruptcies throughout the United States;

To coin money, regulate the value thereof, and of foreign coin, and fix the standard of weights and measures;

To provide for the punishment of counterfeiting the securities and current coin of the United States;

To establish post-offices and post-roads;

To promote the progress of science and useful arts, by securing for limited times, to authors and inventors, the exclusive right to their respective writings and discoveries;

To constitue tribunals inferior to the supreme court;

To define and punish piracies and felonies committed on the high seas, and offenses against the law of nations;

To declare war, grant letters of marque and reprisal, and make rules concerning captures on land and water;

To raise and support armies, but no appropriation of money to that use shall be for a longer term than two years;

To provide and maintain a navy;

To make rules for the government and regulation of the land and naval forces;

To provide for calling forth the militia to execute the laws of the Union, suppress insurrections, and repel invasions;

To provide for organizing, arming, and disciplining the militia, and for governing such part of them as may be employed in the service of the United States, reserving to the states repectively the appointment of the officers, and the authority of training the militia according to the discipline prescribed by congress;

To exercise exclusive legislation in all cases whatsoever over such district (not exceeding ten miles square) as may, by cession of particular states, and the acceptance of congress, become the seat of the government of the United States, and to exercise like authority over all places purchased by the consent of the legislature of the state in which the same shall be, for the erection of forts, magazines, arsenals, dock-yards, and other needful buildings; and

To make all laws which shall be necessary and proper for carrying into execution the foregoing powers, and all other powers vested by this constitution in the government of the United States, or in any department or officer thereof.

Sec. 9. The migration or importation of such persons as any of the states now existing shall think proper to admit shall not be prohibited by congress prior to the year one thousand eight hundred and eight; but a tax of duty may be imposed on such importation, not exceeding ten dollars for each person.

The privilege of the writ of habeas corpus shall not be suspended, unless when in cases of rebellion or invasion the public safety may require it.

No bill of attainder or ex post facto law shall be passed.

No capitation or other direct tax shall be laid, unless in proportion to the census or enumeration hereinbefore directed to be taken.

No tax or duty shall be laid on articles exported from any state.

No preference shall be given by any regulation of commerce or revenue to the ports of one state over those of another; nor shall vessels bound to or from one state be obliged to enter, clear, or pay duties in another.

No money shall be drawn from the treasury but in consequence of appropriations made by law; and a regular statement and account of the receipts and expenditures of all public money shall be published from time to time.

No title of nobility shall be granted by the United States; and no person holding any office of profit or trust under them shall, without the consent of the congress, accept of any present, emolument, office, or title, of any kind whatever, from any king, prince, or foreign state.

Sec. 10. No state shall enter into any treaty, alliance, or confederation; grant letters of marque and reprisal; coin money; emit bills of credit; make anything but gold and silver coin a tender in payment of debts; pass any bill of attainder, ex post facto law, or law impairing the obligation of contracts, or grant any title of nobility.

No state shall, without the consent of the congress, lay any imposts or duties on imports or exports, except what may be absolutely necessary for executing its inspection laws; and the net produce of all duties and imposts, laid by any state on imports or exports, shall be for the use of the treasury of the United States; and all such laws shall be subject to the revision and control of the congress.

No state shall, without the consent of congress, lay any duty of tonnage, keep troops, or ships of war in time of peace, enter into any agreement or compact with another state, or with a foreign power, or engage in war, unless actually invaded, or in such imminent danger as will not admit of delay.

Article II., Sec. 1. The executive power shall be vested in a president of the United States of America. He shall hold his office during the term of four years, and, together with the vice-president, chosen for the same term, be elected as follows:

Each state shall appoint, in such manner as the legislature thereof may direct, a number of electors, equal to the whole number of senators and representatives to which the state may be entitled in the congress; but no senator or representative, or persons holding an office of trust or profit under the United States, shall be appointed an elector.

The congress may determine the time of choosing the electors, and the day on which they shall give their votes; which day shall be the same throughout the United States.

No person, except a natural-born citizen or a citizen of the United States at the time of the adoption of the constitution, shall be eligible to the office of president; neither shall any person be eligible to that office who shall not have attained at the age of thirty-five years, and been fourteen years resident within the United States.

In case of the removal of the president from office, or of his death, resignation, or inability to discharge the powers and duties of the said office, the same shall devolve on the vice-president, and the congress may by law provide for the case of removal, death, resignation or inability, both of the president and vice-president, declaring what officer shall then act as president, and such officer shall act accordingly, until the disability be removed, or a president shall be elected.

The president shall, at stated times, receive for his services a compensation, which shall neither be increased nor diminished during the period for which he shall have been elected, and he shall not receive within that period any other emolument from the United States, or any of them.

Before he enters on the execution of his office, he shall take the following oath or affirmation: "I do solemnly swear (or affirm) that I will faithfully execute the office of president of the United States, and will, to the best of my ability, preserve, protect, and defend the constitution of the United States."

Sec. 2. The president shall be commander-in-chief of the army and navy of the United States, and of the militia of the several states when called into the actual service of the United States; he may require the opinion, in writing, of the principal officer in each of the executive departments upon any subject relating to the duties of their respective offices, and he shall have power to grant reprieves and pardons for offenses against the United States, except in cases of impeachment.

He shall have power, by and with the advice and consent of the senate, to make treaties, provided two-thirds of the senators present concur; and he shall nominate, and by and with the advice and consent of the senate, shall

appoint ambassadors, other public ministers and consuls, judges of the supreme court, and all other officers of the United States, whose appointments are not herein otherwise provided for, and which shall be established by law; but the congress may by law vest the appointment of such inferior officers as they think proper in the president alone, in the courts of law, or in the heads of departments.

The president shall have power to fill up all vacancies that may happen during the recess of the senate, by granting commissions which shall expire at the end of their next session.

Sec. 3. He shall from time to time give to the congress information of the state of the Union, and recommend to their consideration such measures as he shall judge necessary and expedient; he may on extraordinary occasions convene both houses, or either of them, and in cases of disagreement between them, with respect to the time of adjournment, he may adjourn them to such time as he shall think proper; he shall receive ambassadors and other public ministers; he shall take care that the laws be faithfully executed, and shall commission all the officers of the United States.

Sec. 4. The president, vice-president, and all civil officers of the United States, shall be removed from office on impeachment for, and conviction of, treason, bribery, or other high crimes and misdemeanors.

Article III., Sec. 1. The judicial power of the United States shall be vested in one supreme court, and in such inferior courts as the congress may from time to time ordain and establish. The judges, both of the supreme and inferior courts, shall hold their offices during good behavior, and shall, at stated times, receive for their services a compensation, which shall not be diminished during their continuance in office.

Sec. 2. The judicial power shall extend to all cases, in law and equity, arising under this constitution, the laws of the United States, and treaties made, or which shall be made, under their authority; to all cases affecting ambassadors, other public ministers, and consuls; to all cases of admiralty and maritime jurisdiction; to controversies to which the United States shall be a party; to controversies between two or more states; between a state and citizens of another state; between citizens of different states; between citizens of the same state claiming lands under grants of different states, and between a state, or the citizens thereof, and foreign states, citizens, or subjects.

In all cases affecting ambassadors, other public ministers, and consuls, and those in which a state shall be party, the supreme court shall have original jurisdiction. In all the other cases before mentioned, the supreme court shall have appellate jurisdiction, both as to law and fact, with such exceptions and under such regulations as the congress shall make.

The trial of all crimes, except in cases of impeachment, shall be by jury; and such trial shall be held in the state where the said crimes shall have been committed; but when not committed within any state, the trial shall be at such place or places as the congress may by law have directed.

Sec. 3. Treason against the United States shall consist only in levying war against them, or in adhering to their enemies, giving them aid and comfort.

No person shall be convicted of treason unless on the testimony of two witnesses to the same overt act, or on confession in open court.

The congress shall have power to declare the punishment of treason; but no attainder of treason shall work corruption of blood, or forfeiture except during the life of the person attainted.

Article IV., Sec. 1. Full faith and credit shall be given in each state to the public acts, records, and judicial proceedings of every other state. And the congress may by general laws prescribe the manner in which such acts, records, and proceedings shall be proved, and the effect thereof.

Sec. 2. The citizens of each state shall be entitled to all privileges and immunities of citizens in the several states.

A person charged in any state with treason, felony, or other crime, who shall flee from justice, and be found in another state, shall, on demand of the executive authority of the state from which he fled, be delivered up, to be removed to the state having jurisdiction of the crime.

No person held to service or labor in one state, under the laws thereof, escaping into another, shall in consequence of any law or regulation therein, be discharged from such service or labor, but shall be delivered up on claim of the party to whom such service or labor may be due.

Sec. 3. New states may be admitted by the congress into this Union; but no new state shall be formed or erected within the jurisdiction of any other state, nor any state be formed by the junction of two or more states, or parts of states, without the consent of the legislatures of the states concerned as well as of the congress.

The congress shall have power to dispose of and make all needful rules and regulations respecting the territory or other property belonging to the United States; and nothing in this constitution shall be so construed as to prejudice any claims of the United States, or any particular state.

Sec. 4. The United States shall guarantee to every state in this Union a republican form of government, and shall protect each of them against invasion, and, on application of the legislature, or of the executive (when the legislature cannot be convened), against domestic violence.

Article V. The congress, whenever two-thirds of both houses shall deem it necessary, shall propose amendments to this constitution, or, on the application of the legislatures of two-thirds of the several states, shall call a convention for proposing amendments, which, in either case, shall be valid to all intents and purposes as part of this constitution, when ratified by the legislatures of three-fourths of the several states, or by conventions in three-fourths thereof, as the one or the other mode of ratification may be proposed by the congress; provided, that no amendment which may be made prior to the year one thousand eight hundred and eight shall in any manner affect the first and fourth clauses in the ninth section of the first article; and that no state, without its consent, shall be deprived of its equal suffrage in the senate.

Article VI. All debts contracted and engagements entered into before the adoption of this constitution shall be as valid against the United States under this constitution, as under the confederation.

This constitution and the laws of the United States which shall be made in pursuance thereof, and all treaties made, or which shall be made, under the authority of the United States, shall be the supreme law of the land; and the judges in every state shall be bound thereby, anything in the constitution or laws of any state to the contrary notwithstanding.

The senators and representatives before memtioned, and the members of the several state legislatures, and all executive and judicial officers, both of the United States and of the several states, shall be bound by oath or affirmation to support this constitution; but no religious test shall ever be required as a qualification to any office or public trust under the United States.

Article VII. The ratification of the conventions of nine states shall be sufficient for the establishment of this constitution between the states so ratifying the same.

Done in convention, by the unanimous consent of the states present the 17th day of September, in the year of our Lord one thousand seven hundred and eighty-seven, and of the independence of the United States of America the twelfth.

AMENDMENTS.

Article I. Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech or of the press; or the right of the people peaceably to assemble, and to petition the government for redress of grievances.

Article II. A well-regulated militia being necessary to the security of a free state, the right of the people to keep and bear arms shall not be infringed.

Article III. No soldier shall, in time of peace, be quartered in any house without the consent of the owner, nor in time of war but in a manner to be prescribed by law.

Article IV. The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated; and no warrants shall issue but upon probable cause, supported by oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

Article V. No person shall be held to answer for a capital or otherwise infamous crime, unless on a presentment or indictment of a grand jury except in cases arising in the land or naval forces, or in the militia, when in actual

service, in time of war and public danger; nor shall any person be subject for the same offense to be twice put in jeopardy of life or limb, nor shall be compelled in any criminal case to be a witness against himself; nor to be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use without just compensation.

Article VI. In all criminal prosecutions, the accused shall enjoy the right to a speedy and public trial, by an impartial jury of the state and district wherein the crime shall have been committed, which district shall have been previously ascertained by law, and to be informed of the nature and cause of the accusations; to be confronted with the witnesses against him; to have compulsory process for obtaining witnesses in his favor, and to have the assistance of counsel for his defense.

Article VII. In suits at common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved, and no fact tried by a jury shall be otherwise reexamined in any court of the United States than according to the rules of the common law.

Article VIII. Excessive bail shall not be required, nor excessive fines imposed nor cruel and unusual punishment inflicted.

Article IX. The enumeration in the constitution of certain rights shall not be construed to deny or disparage others retained by the people.

Article X. The powers not delegated to the United States by the constitution, nor prohibited by it to the states, are reserved to the states respectively, or to the people.

Article XI. The judicial power of the United States shall not be construed to extend to any suit in law or equity commenced or prosecuted against one of the United States by citizens of another state, or by citizens or subject of any foreign state.

Article XII. The electors shall meet in their respective states, and vote by ballot for president and vice-president, one of whom at least shall not be an inhabitant of the same state with themselves. They shall name in their ballots the person voted for as president, and in distinct ballots the person voted for as vice-president; and they shall make distinct lists of all persons voted for as president, and of all persons voted for as vice-president, and of the number of votes for each, which lists they shall sign and certify, and transmit, sealed, to the seat of the government of the United States, directed to the president of the senate. The president of the senate shall, in the presence of the senate and house of representatives, open all the certificates, and the votes shall then be counted; the person having the greatest number of votes for president shall be the president, if such number be a majority of the whole number of electors appointed; and if no person have such a majority, then from the persons having the highest numbers, not exceeding three, on the list of those voted for as president, the house of representatives shall choose immediately, by ballot, the president. But in choosing the president, the votes shall be taken by states, the representation from each state having one vote; a quorum for this purpose shall consist of a member or members from two-thirds of the states, and a majority of all the states shall be necessary to a choice. And if the house of representatives shall not choose a president, whenever the right of choice shall devolve upon them, before the fourth day of March next following, then the vice-president shall act as president, as in the case of the death or other constitutional disability of the president. The person having the greatest number of votes as vice-president shall be the vice-president, if such number be a majority of the whole number of electors appointed; and if no person have a majority, then from the two highest numbers on the list the senate shall choose the vice-president; a quorum for the purpose shall consist of two-thirds of the whole number of senators, and a majority of the whole number shall be necessary to a choice. But no person constitutionally ineligible to the office of president shall be eligible to that of vice-president of the United States.

Article XIII., Sec. 1. Neither slavery nor involuntary servitude, except as a punishment for crime whereof the party shall have been duly convicted, shall exist within the United States, or any place subject to their jurisdiction.

Sec. 2. Congress shall have power to enforce this article by appropriate legislation.

Article XIV., Sec. 1. All persons born or naturalized in the United States, and subject to the jurisdiction thereof, are citizens of the United States, and of the state wherein they reside. No state shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States; nor shall any state deprive any person of life, liberty, or property without due process of law, nor deny to any person within its jurisdiction the equal protection of the laws.

Sec. 2. Representatives shall be apportioned among the several states according to their respective numbers, counting the whole number of persons in each state, excluding Indians not taxed. But when the right to vote as any election for the choice of electors for president and vice-president of the United States, representatives in congress, the executive and judicial officers of a state, or the members of the legislature thereof, is denied to any of the male inhabitants of such state being twenty-one years of age, and citizens of the United States, or in any way abridged, except for participation in rebellion or other crime, the basis of representation therein shall be reduced in the proportions which the number of such male citizens shall bear to the whole number of male citizens twenty-one years of age in such state.

Sec. 3. No person shall be a senator or representative in congress, or elector of president and vice-president, or hold any office, civil or military, under the United States, or under any state, who, having previously taken an oath as a member of congress, or as an officer of the United States, or as a member of any state legislature, or as an executive or judicial officer of any state, to support the constitution of the United States, shall have engaged in insurrection or rebellion against the same, or given aid or comfort to the enemies thereof. But congress may, by a vote of two-thirds of each house, remove such disability.

Sec. 4. The validity of the public debt of the United States authorized by law, including debts incurred for payment of pensions and bounties for services in suppressing insurrection or rebellion, shall not be questioned. But neither the United States nor any state shall assume or pay any debt or obligation incurred in aid of insurrection or rebellion against the United States, or any claim for the loss or emancipation of any slave; but all such debts, obligations, and claims shall be held illegal and void.

Sec. 5. The congress shall have power to enforce, by appropriate legislation, the provisions of this article.

Article XV., Sec. 1. The right of the citizens of the United States to vote shall not be denied or abridged by the United States, or by any state, on account of race, color, or previous condition of servitude.

Sec. 2. The congress shall have power to enforce this article by appropriate legislation.

CON'SUL, a name originally given to the two highest magistrates in the republic of Rome. In the beginning of the republic the authority of the consuls was almost as great as that of the preceding kings. They could declare war, conclude peace, make alliances, and even order a citizen to be put to death; but their powers were gradually curtailed, especially by the establishment of the tribunes of the people, early in the 5th century. But they still stood at the head of the whole republic: all officers were under them, the tribunes of the people only excepted: they convoked the senate, proposed what they thought fit, and executed the laws. In times of emergency they received unlimited power, and could even sentence to death without trial, levy troops, and make war without the resolve of the people first obtained. Under the emperors the consular dignity sunk to a shadow, and became merely honorary. The last consul at Rome was Theodorus Paulinus (A.D.536).

In France the name of consul was temporarily adopted for the chief magistrates after the revolution. As early as Aug. 2, 1802, Bonaparte was proclaimed first consul for life, and thus the constitution of France became again practically monarchical. On April 10, 1804, he was proclaimed emperor, and even the nominal consulate ended.

At present consuls are officials appointed by the government of one country to attend to its commercial interests in seaports or other towns of another country. The duties of a consul generally speaking are to promote the trade of the country he represents; to give advice and assistance when called upon to his fellow-subjects; to uphold their lawful interests and privileges if

any attempt be made to injure them; to transmit reports of trade to his own government, to authenticate certain documents, etc. They are generally of three ranks: consuls-general, consuls, and vice-consuls.

CONSUMPTION, or **PHTHISIS,** a disease known by emaciation, debility, cough, hectic fever, and purulent expectoration. The predisposing causes are very variable—hereditary taint, scrofulous diathesis, syphilis, small-pox, etc.; exposure to fumes and dusty air in certain trades; violent passions and excess of various kinds, sudden lowering of the temperature of the body, etc. The more immediate or occasional causes are pneumonic inflammation proceeding to suppuration, catarrh, asthma, and tubercles in the lungs, the last of which is by far the most general. The incipient symptoms usually vary with the cause of the disease; but when it arises from tubercles it is usually marked by a short dry cough that becomes habitual, but from which nothing is spit up for some time except a frothy mucus. The breathing is at the same time somewhat impeded, the body becomes gradually leaner, and great languor, with indolence, dejection, and loss of appetite prevail. At a later stage the cough becomes more troublesome, particularly by night, and is attended with an expectoration, the matter of which assumes a greenish color and purulent appearance, being on many occasions streaked with blood. In some cases a more severe degree of blood-spitting attends, and the patient spits up a considerable quantity of florid, frothy blood. At a more advanced period of the disease a pain is sometimes felt on one side in so high a degree as to prevent the person from lying easily on that side; but it more frequently happens that it is felt only on making a full inspiration, or coughing. At the first commencement of the disease the pulse is often natural, but it afterwards becomes full, hard, and frequent. At the same time the face flushes, particularly after eating, the palms of the hands and soles of the feet are affected with burning heat; the respiration is difficult and laborious; evening exacerbations become obvious, and by degrees the fever assumes the hectic form with remittent exacerbations twice every day, at noon and evening. From the first appearance of the hectic symptoms the urine is high colored, and deposits a copious branny red sediment. At this time the patient is usually costive; but in the more advanced stages a diarrhœa often comes on, colliquative sweats likewise break out, and these alternate with each other, and induce great debility. Some days before death the extremities become cold. In some cases a delirium precedes that event. The morbid appearance most frequently to be met with on the dissection of those who die of phthisis is the existence of tubercles in the cellular substance of the lungs, most usually at the upper and back part; but, in some instances, occupying the outer part, and forming adhesions to the pleura. In some cases life has been protracted till not one-twentieth part of the lungs appeared, on dissection, fit for performing their function. The left lobe is oftener affected than the right. The diet in this disorder should be nutritious, but not heating, or difficult of digestion. Milk, especially that of the ass; farinaceous vegetables; acescent fruits; animal soups; and, above all, cod-liver oil, etc. are usually given. It is also of the utmost importance to see that the digestive organs are in proper working order. As much open air as possible, combined with abundance of nutritious food, is at present the treatment in vogue. With regard to urgent symptoms requiring palliation, the cough may be allayed by demulcents, but especially mild opiates swallowed slowly; colliquative sweats by acids, particularly the mineral; diarrhœa by chalk and other astringents, or by small doses of opium.

CONTA'GION, the communication of disease by contact direct or indirect. A distinction has sometimes been made between contagion, as the communication of disease strictly by contact, and infection, as communication of disease by the miasmata, exhalations or germs which one body gives out and the other receives. There is little doubt that excessively minute disease germs proceed from the breath, the perspiration or other excretions of a diseased person, and are capable of propagating the disease in another person; but the true nature of these is little understood. Antiseptics, or disinfectants, are used to destroy the poisonous particles, such as carbolic acid, sulphur, permanganate of potash, chlorine gas, etc.

CONTEMPT, a term applied to an act of disobedience, impertinence, etc., to a judge or his mandates. It is really a crime and can be punished by the court as the court sees fit. Some American judges have tried to punish persons not connected with a law case who have criticized the conduct of the judge outside the court, but this power has never been legally established.

CON'TINENT, a connected tract of land of great extent, forming a sort of whole by itself, as Europe, Asia, Africa, North and South America; or we may speak of the eastern and western continents, Europe, Asia, and Africa being regarded as one, and North and South America another. Australia, from its size, may also be regarded as a continent.

CONTINEN'TAL SYSTEM, a plan devised by Napoleon to exclude Britain from all intercourse with the continent of Europe. It began with the decree of Berlin of November 21, 1806, by which the British Islands were declared to be in a state of blockade; all commerce, intercourse, and correspondence were prohibited; every Briton found in France, or a country occupied by French troops, was declared a prisoner of war; all property belonging to Britons, fair prize, and all trade in goods from Britain or British colonies entirely prohibited. Britain replied by orders in council prohibiting trade with French ports, and declaring all harbors of France and her allies subjected to the same restrictions as if they were closely blockaded. Further decrees on the part of France, of a still more stringent kind, declared all vessels of whatever flag, which had been searched by a British vessel or paid duty to Britain, denationalized, and directing the burning of all British goods, etc. These decrees caused great annoyance, and gave rise to much smuggling, till annulled at the fall of Napoleon, 1814.

CON'TRABAND, in commerce, all goods and wares exported from or imported into any country, against the laws of said country. There are, also, a number of articles termed contraband of war which neutrals may be prevented, by one belligerent, from carrying to another. These generally include not only arms and munitions of war, but all the articles out of which they may be made. In recent times even provisions in certain cases have been considered contraband of war.

CON'TRACT, in law, an agreement or covenant between two or more persons, in which each party binds himself to do or forbear some act, and each acquires a right to what the other promises. Contracts may be in express terms or implied from the acts of the parties; they may be verbal or written, and at common law both forms are binding; but by statute law a promise must be in writing. To be valid, a contract must be entered into by parties legally competent, that is, of sound mind and of full age The act contracted for must not be contrary to law or public policy. Thus an agreement to do injury to another, or a contract not to marry at all is void. The contract must be founded on a consideration either of money or some act whereby an undoubted advantage accrues to the party sued. Lastly, the contract is voidable, if obtained by fraud, mistake or compulsion.

CONTRAL'TO, in music, the highest voice of a male adult, or the lowest of a woman or a boy, called also the alto, or when possessed by a man counter-tenor. It is next below the treble and above the tenor, its easy range being from tenor G to treble C.

CONVENTION, a coming together of persons delegated to act for others, or not so delegated, the purpose of which is to make agreements, treaties, nominations or elections for office, transact business of various kinds and to do other things that may seem desirable to the convention. Political conventions generally have to do with the machinery of politics not connected with the actual government of a state. The first national convention of a political party was that of the anti-masonic party in 1828. The idea immediately was adopted and today seems to form an inalienable and necessary part of American political procedure.

CONVERSAZIONE (sat-si-ō'ne), a reception, usually on a large scale and in the evening, at which the company move about, converse with their acquaintances, partake of tea, coffee, or other refreshments, and often have objects of art, science, or general, interest set out for their inspection.

CONVERSION, a term in logic. A proposition is converted when the predicate is put in the place of the subject, and the subject in place of the predicate;

as, "no A is B" ("no virtuous man is a rebel"), the converse of which is "no B is A" ("no rebel is a virtuous man"). Simple conversion, however, in this manner is not always logical. In the case of universal affirmatives, for example, "all A are B" (say, "all men are animals"), the simple converse "all B are A" ("all animals are men") would not be true.

CONVEX LENS. See Lens.

CONVEY'ANCING, the practice of drawing deeds, leases, or other writings (conveyances) for transferring the title to property from one person to another, of investigating the title of the vendors and purchasers of property, and of framing those multifarious deeds and contracts which govern and define the rights and liabilities of families and individuals.

CON'VICT, the general term for a person who has been found guilty of a serious offense and sentenced to penal servitude.

CONVIC'TION, the finding a person guilty of an offense by the verdict of a jury. In certain cases of minor offenses, such as are tried before justices of the peace, etc., the law allows of convictions without the intervention of a jury.

CONVICT LABOR, labor performed by felons, or other convicts, and especially a term applied to the labor of convicts the products of which are purchased by contractors at an annual payment. The convict labor plan has been bitterly opposed by labor unions as destructive to the interests of free labor and this view has been confirmed by experience. Convict labor, even when used for public purposes, such as road building, has been found expensive, undesirable and inefficient.

CONVOL'VULUS, a genus of plants, consisting of slender twining herbs with milky juice; bell-shaped flowers and five free stamens.

CONVUL'SION, a diseased action of muscular fibers, known by violent and involuntary contractions of the muscular parts, with alternative relaxations. Convulsions are universal or partial, and have obtained different names according to the parts affected, or the symptoms. The muscles principally affected in all species of convulsions are those immediately under the direction of the will, as those of the eyelids, eye, face, jaws, neck, superior and inferior extremities. Convulsions are produced commonly by irritation of some part of the brain or spinal cord, such as the general convulsions in inflammation of the brain membrances, or of the nerves themselves. Children of a nervous temperament are often the subjects of convulsions during dentition, particularly when accompanied by a disordered state of the bowels or the presence of worms.

CONWAY, Moncure Daniel, an American author, clergyman ,and historian. He was born in Virginia in 1832 and early allied himself with the abolitionist party and the Unitarian Church. In 1863 he went to England and resided there for 20 years. He recently returned to the United States. His principal works are The Rejected Stone, Idols and Ideals, Demonology and Devil Lore, and a number of literary essays.

COOCH-BEHAR', or KUCH-BEHAR', a native state in India, in political relation with the government of Bengal. The greater portion of the soil is fertile and well-cultivated. Area, 1307 sq. miles; pop. 578,868.—The chief town, Cooch-Behar, contains some handsome public buildings and a splendid new palace of the Maharajah. Pop. 11,480.

COOK, Eliza, English poetess, born in London in 1818. She published a collection of poems under the title of Melaia and Other Poems. She afterward wrote a great many poems mostly of a lyric cast, and some of her songs have been highly popular. She died in 1889.

COOK, James, a famous British navigator, born in Yorkshire, 1728. In 1755 he entered the royal navy, and four years later as sailing-master of the Mercury performed valuable services in surveying the St. Lawrence River and

Captain Cook.

the coast of Newfoundland. Some observations on a solar eclipse, communicated to the Royal Society, brought him into notice, and he was appointed commander of a scientific expedition to the Pacific, with the rank of lieutenant in the navy. During this expedition he successively visited Tahiti, New Zealand, discovered New South Wales, and returned by the Cape of Good Hope to Britain in 1771. In 1772 Captain Cook, now raised to the rank of a commander in the navy, commanded a second expedition to the Pacific and Southern Oceans, which resulted like the former in many interesting observations and discoveries. He returned to Britain in 1774. Two years later he again set out on an expedition to ascertain the possibility of a north-west passage. On this voyage he explored the western coast of North America, and discovered the Sandwich Islands, on one of which, Hawaii, he was killed by the natives, February 14, 1779.

COOK, Joseph, an American clergyman and author, born in New York in 1838, died in 1901. For six years until 1880 he delivered his famous "Boston Monday Lectures" and subsequently toured the country as a lecturer.

COOKE, Jay, a noted American financier, born in Ohio in 1821. During the civil war he negotiated loans of over $2,000,000,000 for the government and was one of the most effective advocates of the present national banking system. He died in 1905.

COOKE, John Esten, an American novelist, born in Virginia in 1830, died in 1886. His literary career was interrupted by the civil war in which he took an active part. His principal works of fiction are The Virginia Comedians, and a sequel to that work, The Story of Eagle's Nest, Leather Stocking and Silk, Ellie, or the Human Comedy, and Henry St. John, Gentleman. He also wrote several works of history.

COOKE, Rose Terry, an American story writer and poet, born in Connecticut in 1827, died in 1892. She published Poems in 1860, Steadfast in 1889, Happy Dodd in 1879 and several collections of short stories which in their day were widely read.

COOKERY, the preparation of food so as to render it more palatable and more digestible. The art is of great importance, not only for comfort but also for health. Food is mainly prepared by submitting it to the action of fire, as by roasting, boiling, stewing, etc. These processes give each a different flavor to food, but result alike in rendering the tissues, both of animal and vegetable food, softer and much more easily dealt with by the digestive organs. The art of cookery was carried to considerable perfection among some of the ancient nations, as for instance the Egyptians, Persians, and Athenians. Extravagance and luxury at table were notable features of Roman life under the empire. Among moderns the Italians were the first to reach a high degree of art in this department. Their cooking, like that of the ancient Romans, is distinguished by a free use of oil. Italian cookery seems to have been transplanted by the princesses of the House of Medici to France, and was carried there to perhaps the highest degree of perfection; even yet the skill and resource which the French cook shows in dealing often with very slight materials is a highly creditable feature in the domestic economy of the nation.

COOLEY, Thomas McIntyre, an American jurist and author, born in New York in 1824, died in 1898. For several years he was a professor in the law school of the University of Michigan and from 1864 to 1885 an associate justice of the Supreme Court of Michigan. His various publications are authority on constitutional law.

COOLIDGE, Thomas Jefferson, an American diplomat, born at Boston in 1831. He served as United States minister to France in 1892 and served subsequently on the Canadian American Joint High Commission.

COOLIE, a name in Hindustan for a day laborer, also extended to those of some other eastern countries. Many of these have been introduced into the West Indies, Mauritius, and other places, their passage being paid for them on their agreeing to serve for a term of years. The first coolie emigrants appear to have been those sent to British Guiana from Calcutta in 1839 to supply the want of labor felt after the abolition of slavery. The coolies employed in

Guiana are still chiefly from India, but there is also a considerable number of Chinese. Coolies have also been introduced into Jamaica, Trinidad, Natal, and large numbers into Mauritius, the Indian population of the latter island being nearly 250,000. The Chinese coolies have been principally sent to Cuba and Peru. Chinese coolies were excluded from the United States by act of Congress in 1888. Through the exclusion of Japanese from the schools in San Francisco, a movement is now being made to have Japanese coolies also excluded.

COOL-TANKARD, an old English beverage of various composition, but usually made of ale, with a little wine or wine and water, with an addition of lemon juice, spices, etc.

COOM'ASSIE, a town, West Africa, capital of Ashantee, 130 miles north of Cape Coast Castle. It was taken and burned by Sir Garnet Wolseley in 1874. In 1900 it was invested by Ashanti natives, but was relieved after severe fighting. Pop. 50,000.

COON OYSTER, in the southern states an oyster which grows close enough to shore to be obtained by the raccoon.

COOPER, Henry Ernest, an American lawyer, born in Indiana in 1857. He settled in Honolulu and was one of the leaders of the American revolution in the Hawaiian Islands. He filled several offices of the provisional government pending the annexation of the islands to the United States.

COOPER, James Fenimore, American novelist, born at Burlington, New Jersey, in 1789, studied at Yale College, and entered the American navy as a midshipman at the age of sixteen. In

J. Fenimore Cooper

1821 appeared the novel of Precaution, the first production of his pen. Though successful it gave no scope for his peculiar powers, and it was not till the production of The Spy and The Pioneers that he began to take a high place among contemporary novelists. After that came a steady flow of novels dealing with life on the sea and in the backwoods, most of which, like The Pilot, Red Rover, Waterwitch, Pathfinder, Deer-slayer, and Last of the Mohicans, are familiar names to the novel-reading public. After visiting Europe and serving as consul for the United States at Lyons for three years, Cooper returned to America, where he died at Cooperstown, New York, 1851. Besides his novels he wrote a history of the U. S. navy, and some volumes descriptive of his travels.

COOPER, Peter, American inventor, manufacturer, and philanthropist, born 1791, died 1883. He started life with few advantages, being almost self educated; but by dint of energy, perseverance, sagacity and integrity, accumulated a large fortune. He carried on the manufacture of glue and isinglass for over fifty years, and was also connected with the iron-manufacture, the railways (he designed and built the first American locomotive), and the telegraphs of the U. States.

CO-OPERATIVE SOCIETIES are associations of individuals for mutual assistance in industrial or commercial objects. One form of co-operative societies is that of an association of men belonging to some trade or industry for the purpose of carrying it on entirely by their own efforts, and thus securing all the profits of their labors to themselves; but much more common associations are those the object of which is to provide the members, and sometimes also the general public, with the ordinary household necessaries, at as near as possible the prime cost. Associations of the former kind are thus associations for production, those of the latter for distribution, by means of what are commonly known as Co-operative Stores.

COOPER'S CREEK, or the **BARCOO,** called by the latter name chiefly in its upper course, the largest inland river of Australia, which rises in Queensland by two branches, the Thomson and Victoria (or Barcoo), and flows southwest to Lake Eyre.

COOPER UNION, an institution for the advancement of art and science, founded in New York in 1859 by Peter Cooper. The purpose is to educate the people by means of day and night classes in the different technical trades and sciences. The institution has over $5,000,000 in property and is in reality a technical school which is very well attended. It has about 2,000 students and confers degrees.

COORG, or **KURG,** an ancient principality now a province in Southern Hindustan, lying between Mysore on the east and northeast and the districts of South Canara and Malabar on the west; area, 1583 sq. miles. The country has a healthy climate, and yields coffee, spices, timber, etc. The capital is Merkara. Pop. 180,607.

CO'OS. See Cos.

CO-PARTNERSHIP. See Partnership.

COPE, a sacerdotal vestment, resembling a sleeveless cloak with a hood, reaching from the shoulders to the feet, worn on solemn occasions, and particularly in processions, by the pope and other bishops as well as by priests. It was one of the vestments retained at the reformation in the Anglican Church.

COPE, Edward Drinker, an American zoologist born in Philadelphia in 1840, died in 1897. For many years he was professor in the University of Pennsylvania and from 1878 was the editor of the American Naturalist. Cope's principal contribution to science was his fine collections of fossils and the classification and interpretation of the same. His principal writings are Origin of the Fittest, Origin of Genera, and Primary Factors of Organic Evolution.

Cope.

A, Probably Dr. Robert Langton, Queen's Coll. Oxon. 1, Cope.
B, Figure of Pugin's Glossary. 2 2, Cope.

CO'PECK, a Russian copper coin, so called from the impression of St. George bearing a lance, the hundredth part of a silver ruble, or about the eightieth part of a paper ruble. It is equal to about three quarters of a cent.

COPENHA'GEN, the capital of Denmark, on the Sound, the larger and older portion of it on the east side of the Island of Zealand, a smaller portion on the north point of the island of Amager, with between them a branch of the sea forming the harbor. It has a citadel and several strong forts protecting it on the sea side; and is mostly well built, principally of brick. The chief buildings are the royal palace of Rosenborg, with many antiques and precious articles; the Amalienborg, consisting, properly speaking, of four palaces, one of them the usual residence of the sovereign; the palace of Charlottenburg, now the repository of the Academy of Arts; the Royal Library, containing 550,000 volumes and 25,000 manuscripts; Thorwaldsen's Museum, containing a great many of the sculptor's works; the university buildings; the Vor Frue Kirke; the arsenal; etc. The university, founded by Christian I. in 1478, has about 700 professors and teachers, five faculties, and a library of 200,000 volumes. The harbor is safe and commodious. Copenhagen is the principal station of the Danish fleet and the center of the commerce of Denmark. It carries on an active trade with Norway, Sweden, Russia, and Germany, and in particular with Britain, the principal exports being grain, butter, cheese, beef, pork, cattle, horses, hides, etc. It has foundries and machine-works, woolen and cotton mills, porcelain works, breweries, distilleries, etc., and produces also watches, clocks, pianofortes, etc. Sugar-refining and tanning are carried on. Pop. with suburbs, 476,806.

COPER'NICUS, Nicholas, astronomer, born at Thorn, then in Poland, Feb. 19, 1473, his family being supposed to have come originally from Westphalia. Having studied medicine at Cracow, he afterward devoted himself to mathematics and astronomy, and in 1500 taught mathematics at Rome with great success. Returning to his own country he was made a canon in the cathedral of Frauenburg, and began now to work out his new system of astronomy. Doubting that the motions of the heavenly bodies could be so confused and so complicated as the Ptolemaic system made them, he was induced to consider the simpler hypothesis that the sun was the center round which the earth and the other planets revolve. Besides this fundamental truth Copernicus anticipated, for he can scarcely be said to have proved, many other of the principal facts of astronomical science, such as the motion of the earth round its axis, the immense distance of the stars which made their apparent position the same from any part of the earth's orbit, etc. His general theory also enabled him to explain for the first time many of the important phenomena of nature, such as the variations of the seasons and the precession of the equinoxes. The great work in which Copernicus explained his theory, De Orbium Cœlestium Revolutionibus (On the Revolutions of the Celestial Orbs), was completed in 1510, and published at Nuremberg in 1543. It was long among books forbidden to Roman Catholics. He died at Frauenburg, 24th May, 1543.

COP'PER, one of the most ancient known metals, deriving its name from Cyprus, large supplies having in Greek and Roman times come from that island. It is a metal of a pale red color tinged with yellow. Next to gold, silver, and platinum it is the most ductile and malleable of metals; it is more elastic than any metal except steel, and the most sonorous of all except aluminium. Its conducting power for heat and electricity is inferior only to that of silver. It has a distinct odor and a nauseous metallic taste. It is not altered by water, but tarnishes by exposure to the air, and becomes covered with a green carbonate. It occurs native in branched pieces, dendritic, in thin plates, and rarely in regular crystals, in the primitive and older secondary rocks. Blocks of native copper have sometimes been got weighing many tons. Its ores are numerous and abundant. Of these several contain sulphur and iron or other metal, such as copper glance or vitreous copper; gray copper or Fahlerz, one of the most abundant and important ores; and copper pyrites or yellow copper ore, and other abundant ore. The red oxide of copper forms crystals of a fine red color, and is used for coloring glass. There are two native carbonates, the blue and the green, the latter being the beautiful mineral malachite, the former also known as blue malachite. Blue Vitrol is a sulphate, and is used for dyeing and preparing pigments, as are various other copper compounds. Verdigris is an acetate. The arsenite of copper is the pigment Scheele's green. Schweinfurth green is another copper pigment. All the compounds of copper are poisonous. It is found in most European countries, in Australia and Japan, in Africa and in North and South America (especially in the vicinity of Lake Superior). In Britain the mines of Cornwall are the richest.

COP'PERAS, sulphate of iron or green vitriol, a salt of a peculiar astringent taste and of a fine green color. When exposed to the air it assumes a brownish hue. It is much used in dyeing black and in making ink, and in medicine as a tonic. The copperas of commerce is usually made by the decomposition of iron pyrites.

COPPER-HEAD, a venomous N. American serpent, of the rattlesnake family.

COPPER-HEADS, a name given to residents of the north during the civil war who either sympathized with the south, or opposed the prosecution of the war against the south.

COPPER-PLATE, a polished plate of copper on which the lines of some drawing or design are engraved or etched to be printed from; also a print or impression from such a plate.

COPPER PYRI'TES, or yellow copper ore, a double sulphide of copper and iron composed in equal parts of copper, sulphur, and iron. It occurs mostly in primary and metamorphic rocks, and is the chief copper ore of England.

COPTS, a name given to the Christian descendants of the Ancient Egyptian race, belonging mostly to the Jacobite or Monophysite sect. Reduced by a long course of oppression and misrule to a state of degradation, the number and national character of the Copts have greatly declined. At present they do not amount to more than perhaps 350,000. Their costume resembles that of the Moslems, but they are very generally in the habit of wearing a black turban for distinction's sake. In various other respects they resemble the Moslem, and they practice circumcision and abhor the flesh of swine. The women go out with veiled faces like the Moslem women. There are schools for the male children, but very few of the females are taught to read. Confession is required of all. Fasting holds a prominent place in the life of the Copt, who is, indeed, required to fast (that is, to abstain from all animal food except fish) during the greater part of every year. The head of the Coptic Church is the Patriarch of Alexandria, who is also head of the Abyssinian Church. He is regarded as the successor of St. Mark, by whom the Copts believe that Christianity was introduced among them. They are very strict and exclusive in their religion but a certain number have latterly been converted to Protestantism. The Copts are quiet and industrious, have a good capacity for business, but are said to be servile and crafty. The Coptic scribes form a close guild. What is called the Coptic language is no longer spoken, Arabic having taken its place. It is still used, however, in a formal way in their religious services. It is regarded as the direct descendant of the ancient sacred language of the Egyptians. There is a tolerably abundant Coptic Christian literature, chiefly lives of saints, homilies, etc. It is written in what is substantially the Greek alphabet with some additional letters.

COPYING MACHINES, devices for making several copies of a writing, the chief of which are the socalled mimeograph and the papyrograph, the former an invention of Edison. Various other devices consist of sheets of jelly-like substance upon which the original, written in colored ink, is pressed leaving a reversed copy upon the surface of the jelly and from which other copies are made. No perfectly satisfactory copying machine has yet been devised.

COPYRIGHT, the exclusive property right to reproduce in writing, engraving, printing, or by any other means, of an artistic or literary thing for the purpose of sale. In the U. States a copyright is obtained by sending to the librarian of congress at Washington two copies of the thing with a fee of 50 cents (or $1 if papers are desired), on or before the day of publication. Copyright was originated in the reign of Queen Anne of England and has been practiced in the U. States since the beginning of this government. The right extends only to the form of the thing copyrighted and not to its substance. The right is granted for a period of 28 years and this period may be extended for an additional period of 14 years. Interpretation of the law is somewhat plastic, and infringement is a matter that must be decided by a court. By the act of 1891 foreign works may be copyrighted in America if printed from plates made in this country and published simultaneously.

COQUELIN (ko'klan), Benoit Constant, a noted French actor, born at Boulogne-sur-Mer, Jan. 23, 1841. He visited the U. States in 1888, in 1893, and in 1894. His most celebrated character is that of Cyrano de Bergerac in Rostand's play. Died 1909.

COQUELIN, Ernest Alexandre Honore, brother of Constant Coquelin, a French actor, born in 1848. He is as well known for his success as a dramatic writer as for his histrionic talent.

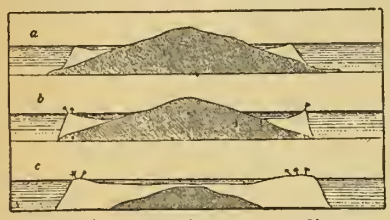
COQUIMBO (ko-kim'bō), or Laserena, a town of Chili, capital of the province of Coquimbo, stands near the sea, on a river of the same name. It is the see of a bishop. Pop. 13,000.—Porto Coquimbo, the port of the above, from which it is distant 7 miles to the s.w., has smelting works and a large export trade, chiefly in copper and the precious metals. Pop. 5100.—The province is rich in copper, silver, gold, and other metals, and is mountainous. Pop. 165,474.

COR'ACLE, a small boat or canoe of oval form and made of wicker-work covered with skins. It was used by the ancient Britons, and something similar is still in use among Welsh fishermen and on the Irish lakes.

COR'ACOID BONE, a bone in birds joining the sternum and shoulder-bone, and giving support to the wing. In mammals it is represented by the coracoid process of the scapula.

COR'AL, the name applied to the calcareous stony structures secreted by many of the sea-anemones, etc. Two

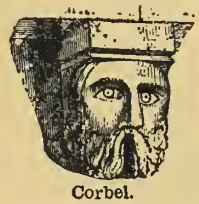
kinds of corals are distinguished by naturalists, those in which the calcareous skeleton is developed in the walls of the body, as in the reef-building corals, and those in which (as in the red coral of commerce) the skeleton is external or cuticular. Reproduction takes place by ova, but chiefly by budding, the new individual remaining in organic



Formation of coral reefs, according to Darwin.

union with the old. The coral masses grow not merely by the multiplication of individuals, but by the increase in height of each of the latter, which, as they grow, become divided transversely by partitions. The animal, distended with ova, collapses on their discharge, and thus becomes too small for the cup which it formerly occupied; it cuts off the waste space by a horizontal layer of coral, and the repetition of this process gradually adds to the height of the mass. It is in this way that the coral reefs and islands, occurring in such abundance in the Pacific, the Indian Ocean, and the Red Sea, are built up—works of such stupendous and astonishing bulk when compared with the tiny creatures that produce them.

COR'BEL, in architecture, a piece of stone, wood, or iron projecting from the vertical face of a wall, to support some superincumbent mass. Corbels are of a


Corbel.

Corbel-table.

great variety of forms, and are ornamented in many ways. They are sometimes used in rows to support a projecting course called a corbel-table.

CORCORAN ART GALLERY, a collection of paintings and sculptures in Washington, D. C., presented to that city by W. W. Corcoran, containing numerous famous pieces. It is housed in a white marble building given by Ernest Flagg.

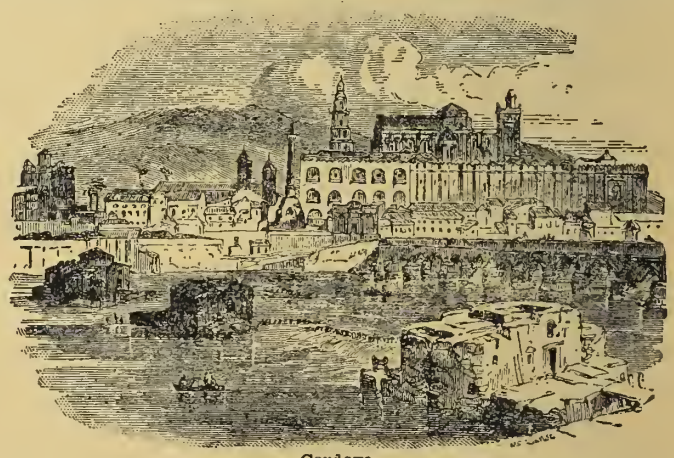
CORDAY D'ARMANS (kor-dā-dăr-măn), Marie Anne Charlotte, commonly called Charlotte Corday, was born in Normandy in 1768, of a family which counted the poet Corneille among its ancestors. Her lover, an officer in the garrison of Caen, was accused by Marat as a conspirator against the republic, and assassinated by villains hired for that purpose. This, as well as a deep-rooted hatred against all oppressors, determined Charlotte Corday to free her country from Marat. Having obtained an interview with Marat at his own house she plunged her dagger into his bosom, and gave herself up to the attendants who rushed in at his cries. When tried for the murder before the revolutionary tribunals, her air was dignified and her replies firm. In spite of the fervid eloquence of her advocate's defense she was condemned to the guillotine, and was executed on 17th July, 1793.

CORDELIERS (kor'de-lērz), originally an order of Franciscan monks who wore as part of their dress a girdle of knotted cords; afterward the name given to a society of Jacobins, to which the names of Marat, Danton and Camille Desmoulins gave some reputation. The club lasted from 1792 to 1794, and took its name from their place of meeting.

CORDITE, a new smokeless explosive for use in ordnance, so named from being made in cordlike forms.

COR'DON, in a military sense, troops so disposed as to keep up an uninterrupted line of communication, to preserve an area either from hostile invasion or from contagious diseases. In the latter sense it is called cordon sanitaire.

COR'DOVA, an ancient Spanish city on the Guadalquiver, in Andalusia, capital of a province of the same name. A part of the town is of Roman, a part


Cordova.

of Moorish origin. Pop. 55,614.—The province includes the fertile and beautiful valley of the Guadalquiver and the mountains of Sierra Morena. Area, 5188 sq. miles; pop. 420,728.

COR'DOVA, a town of the Argentine Republic, capital of province of same name. It occupies a beautiful site on the Primero, and has various important buildings and institutions, including a university. Pop. 58,275.—The province has an area of 54,000 sq. miles, a pop. of 456,000.

CORDUROY', a thick cotton stuff corded or ribbed on the surface.—Corduroy road, in N. America, a road constructed with logs laid together over swamps or marshy places for carriages to pass over.

CORD-WOOD, wood cut and piled for sale by the cord, in distinction from long wood; properly, wood cut to the length of 4 feet; but in this respect the practice is not uniform.

CORE'A, a kingdom of Asia, consisting chiefly of a peninsula lying north east of China, bounded n. by Manchuria, e. by the Sea of Japan, s. by a narrow

sea which parts it from the Japanese Islands, and w. by the Yellow Sea Pop. vaguely estimated at about 9,000,000 or more; area about 80,000 sq. miles. Söul or Seoul, is the capital. The peninsula is traversed through its length by a mountain range, abrupt and precipitous on the east, but forming a gentle slope on the west side, which, being watered by the principal rivers of the country is exceedingly fertile. In the north the only grain that can be grown is barley; but in the south, wheat, cotton, rice, millet, and hemp are grown extensively. The ginseng root is a production greatly valued in China and Japan. Tigers, panthers, foxes, wolves, and sables are abundant. The peninsula abounds in minerals, gold, silver, iron, copper, lead, and coal. Corea is governed by a king, whose sway is nominally absolute. Till recently China was suzerain of Corea, but the war with Japan ended this. Buddhism, Confucianism, and Taouism are the chief religions.

CORELLI, Marie. An English novelist, the adopted daughter of Charles Mackay, the poet. She was born in Italy in 1864, and educated in London and in a convent in France. A musical career was planned for her, but she early adopted literature instead. Among her

writings are: The Romance of Two Worlds; Thelma; The Sorrows of Satan; The Mighty Atom; The Murder of Delicia; Ziska; Jane; The Master-Christian; Boy; and Temporal Power.

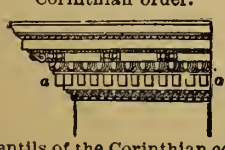
CO'REOP'SIS, An herbaceous annual or perennial plant of the order Compositæ, nearly all natives of eastern N. America, and popularly known as tick-seed, the fruit being in the shape of a small tick. It is often raised for its showy yellow or rose-purple flowers with yellow or brown discs. The perennials are grown in hardy borders; the annuals in the garden in almost any soil.

COR'FU, a Greek island in the Mediterranean, the most northerly of the Ionian Islands, at the mouth of the Adriatic, near the coast of Albania, about 40 miles long, and from 15 to 20 wide; square miles, 427. The surface rises at one point to the height of 3000 feet, the scenery is beautiful, the climate pleasant and healthy, the soil fertile. Oranges, citrons, grapes, honey, wax, oil, and salt are abundant.

COR'INTH, a once celebrated city upon the isthmus of the same name, which unites Peloponnesus with Northern Greece. It was renowned among the cities of Greece, commanded by its advantageous position a most important transit trade, and possessed all the splendor which wealth and luxury could create. St. Paul lived here a year and a half, and two of his epistles are addressed to the Corinthians.—New Corinth is a village on the shore of the gulf, several miles n. w. from the site of ancient Corinth; it is the seat of an archbishop. Pop. 3000.

CORINTHIAN ORDER, that order of Grecian architecture of which the most characteristic feature is the capital of the column, which is adorned with

Corinthian order.



a a, Dentils of the Corinthian cornice.

beautifully carved acanthus leaves, but varies considerably in minor details. The column is generally fluted, with a fillet between the flutings, and stands upon a base. The entablature is variously decorated, especially the cornice; the frieze may be quite plain, or sculptured with foliage and animals. The Corinthian order was not very common in Greece before the time of Alexander the Great; among the Romans it was much employed.

CORINTHIANS, Epistles to the, two epistles addressed to the church at Corinth about A.D. 57 or 58, which have been admitted as genuine writings of St. Paul by even the most critical assailants of the New Testament canon.

CORIOLA'NUS, the name given to an ancient Roman, Caius, or more properly Cneius, Marcius, because the city of Coriŏli the capital of the kingdom of the Volsci, was taken almost solely by his exertions. He was banished for seeking to deprive the plebeians of their hard-earned privileges, and in particular of the tribuneship; and seeking revenge, he took refuge among the Volsci, the bitterest enemies of Rome, and prevailed upon them to go to war with her. The story of Coriolanus, which is now regarded as legendary, forms the subject of one of Shakespeare's plays.

CORK, a city in the south of Ireland, capital of the county of Cork, situated on the river Lee. It is 15 miles from the sea, and besides an upper harbor at the city itself, and quays extending over four miles in length, there is a lower harbor at Queenstown, 11 miles below the town. The entrance, deep and narrow, is strongly fortified on each side. Cork is the third city in Ireland, and exports great quantities of grain, butter, bacon, hams, eggs, and live stock. The principal industries are tanning, distilling, brewing, and the making of tweeds and friezes. Pop. 100,022.—The county is the most southerly and the largest in Ireland, having an area of 2885 sq. miles, or 1,849,686 acres, of which less than a fourth is under crops. The county town is Cork; other towns are Queenstown, Fermoy, Youghal, Bandon, Mallow, and Kinsale. Pop. 404,813.

CORK is the external bark of a species of oak which grows in Spain, Portugal, and other southern parts of Europe and in the north of Africa, and is distinguished by the great thickness and sponginess of its bark, and by the leaves being evergreen, oblong, somewhat oval, downy underneath, and waved. The outer bark falls off of itself if left alone, but for commercial purposes it is stripped off when judged sufficiently matured, this being when the tree has reached the age of from fifteen to thirty years. The first stripping yields the coarsest kind of bark. In the course of eight or nine years, or even less, the same tree will yield another supply of cork of better quality, and the removal of this outer bark is said to be beneficial, the trees thus stripped reaching the age of 150 years or more. Cork is light, elastic, impervious to water, and by pressure can be greatly reduced in bulk, returning again to its original size. These qualities render it peculiarly serviceable for the stopping of vessels of different kinds, for floats, buoys, swimming-belts or jackets, artificial limbs, etc. Corks for bottles are cut either by hand or by means of a machine. The best corks are cut across the grain.

COR'MORANT (a sea-crow), the name of several large web-footed birds of the pelican family, or forming a family by themselves. They have a longish and strongly-hooked bill, long neck, short wings, and rather long rounded tail;

Common cormorant.

all the toes are united by a web, and, though excellent swimmers, they are able to perch on trees; color generally black or dark. The common cormorant of Europe is larger than a goose, but with smaller wings. It occupies cliffs by the sea, feeds on fish, and is extremely voracious. It dives and swims with great power, and pursues its prey beneath the surface of the water, often to a great depth. Among the Chinese cormorants have long been trained to fish for man. At first a ring is placed on the lower part of the bird's neck to prevent it swallowing the prey, and in time it learns to deliver the fish to its master without such a precaution being necessary.

CORMUS. See Corm.

CORN, a hardened portion of the cuticle of the foot, appearing as a sort of distinct growth, produced by pressure. Corns are generally found on the outside of the toes, but sometimes between them, on the sides of the foot, or even on the ball. They appear at first, as small dark points in the hardened skin, and in this state stimulants or escharotics, as nitrate of silver (lunar caustic), are recommended. Perhaps the most efficacious remedy for corns is the application of glacial acetic acid night and morning.

CORN is the generic term for all kinds of grain used for making bread, and is applied specifically to the principal breadstuff: in England to wheat, in the U. States generally to maize, and frequently in Scotland to oats.

CORN, Indian. See Maize.

CORNEILLE (kor-nā-yė), Pierre, the father of French tragedy and classic comedy was born at Rouen in 1606, at which place his father was advocate-general. He began his dramatic career with comedy, and a series of vigorous dramas, Mélite (1629), Clitandre, La Veuve, La Suivante, etc., announced the advent of a dramatist of a high order. In 1635 he entered the field of tragedy with Medea; but it was not till the appearance of his next work, the famous Cid, that Corneille's claim was recognized to a place amongst the great tragic poets. The Cid was an imitation of a Spanish drama,

and though gravely defective in the improbabilities of the plot and other respects, achieved an immense success for a certain sublimity of sentiment and loftiness of ideal, which are the native characteristics of Corneille's poetry. After the Cid appeared in rapid succession Horace (1639); Cinna (1639), his masterpiece, according to Voltaire; and Polyeucte (1640), works which show Corneille's genius at its best. He died in 1684.

CORNE'LIA, daughter of Scipio Africanus the elder, married Tiberius Sempronius Gracchus, censor B.C. 169, by whom she was the mother of the two tribunes, Tiberius and Caius Gracchus.

CORNE'LIAN, or Carnelian, a gem of a light-red or flesh color. It consists of silica along with minute quantities of the oxides of iron, aluminium, and sometimes of other metals, and is used for seals, bracelets, necklaces, and other articles.

CORNE'LIUS NEPOS, a Roman author of the 1st century B.C., the contemporary of Cicero and Catullus. The only extant work attributed to him is a collection of short biographies, probably an abridgment of a work written by Nepos. These biographies have long been a favorite school-book, and popular editions of them are very numerous.

CORNE'LIUS, Peter von, German painter, born at Düsseldorf in 1787, died in 1867. He early exhibited a taste for art, and studied the great masters, especially Raphael. In 1811 he went to Rome, where, in conjunction with Overbeck, Veit, and other associates, he may be said to have founded a new school of German art, and revived fresco-painting in imitation of Michael Angelo and Raphael. He left Rome in 1819 for Düsseldorf, where he had been appointed director of the academy, but he soon settled in Munich to give his whole attention to the painting of the Glyptothek and the Ludwigskirche there. In these two great works he was assisted by his Munich pupils. In 1833 he made another visit to Rome, and in 1839 he visited Paris. In 1841 he was invited to Berlin by Frederick William IV., who intrusted him with the painting of the royal mausoleum or Campo Santo. The most celebrated cartoon in this series is the Four Riders of the Apocalypse. The series consists of twelve paintings, which have been engraved. Cornelius, a true representative of modern German thought, introduced into art a metaphysical and subjective element which is easily liable to be abused; and in his work grandeur of conception and elevation of tone have to make up for the want of the finest natural effects.

CORNELL', Alonzo B., American politician, son of Ezra Cornell, was born at Ithaca, N. Y., in 1832. He was the Republican candidate for Lieutenant-Governor of New York in 1863, and from 1869 to 1873 was surveyor of customs in NewYork. He was chairman of the Republican State Committee from 1870 to 1878, and was three times Speaker of the New York Assembly. From 1880 to 1883 he was Governor of New York.

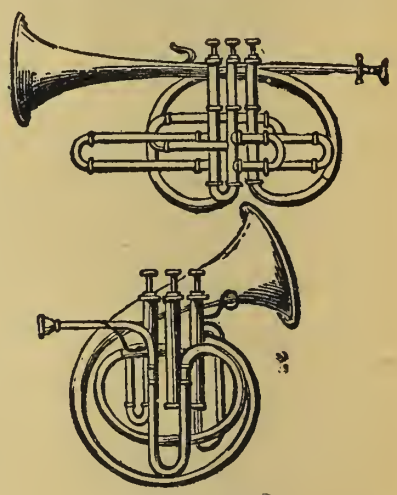
CORNELL, Ezra, American capitalist and philanthropist, founder of Cornell University was born in 1807 in Westchester County, N. Y. His attention being turned accidentally in 1842 to the project of constructing a telegraph line from Baltimore to Washington, he invented a machine for laying the wires under ground and was subsequently put in charge of the work. The insulation being poor, however, the plan had to be abandoned, and on Cornell's suggestion the wires were strung on poles, and the line was thus speedily completed. Subsequently Cornell devoted his attention almost wholly to the construction of telegraph lines and the organization of telegraph companies, and was instrumental in forming the Western Union Telegraph Company in 1855. He was a member of the first Republican National Convention in 1856, was president of the New York State Agricultural Society in 1862, and was a member of the State Assembly in 1862-63, and of the State Senate in 1864-67. In 1868 "The Cornell University," so founded, was formally opened. Mr. Cornell also built a public library at Ithaca. He died in 1874.

CORNELL UNIVERSITY, founded by Ezra Cornell at Ithaca, N. Y., in 1865. Cornell University comprises the following departments and colleges; The Graduate Department, having charge of all graduate studies pursued at the university under the several faculties. This department offers courses leading to the degrees of A.M., Ph.D., etc. Twenty-four fellowships, ranging from $500 to $600 a year, and 17 scholarships, of the annual value of $300 a year, are available for students. The Academic Department offers elective courses leading, whether sciences, letters, or the classics are mainly chosen, to the degree of A.B. The College of Law offers courses leading to the LL.B. degree. The Medical College, partially conducted at New York City, confers the degree of M.D. The College of Agriculture offers courses leading to the B.S.A. degree. Connected with this college is an agricultural experiment station, established by the Federal Government in 1887. The New York State Veterinary College confers the degree of D.V.M. The State College of Forestry confers the degree of F.E. The College of Architecture confers the degree of B.Arch. The College of Civil Engineering confers the degree of C.E. Sibley College of Mechanical Engineering and Mechanic Arts, consisting of the departments of mechanical, electrical, experimental engineering, the department of mechanic arts, etc., confers the degree of M.E.

The libraries, including the famous Andrew D. White collection on the French Revolution and the Fisk Dante collection, contain 261,852 volumes, besides 43,000 pamphlets. The income of the university from all sources is about $800,000 a year. The presidents since its inception have been: Andrew D. White, LL.D. (1865-85); Charles Kendall Adams, LL.D. (1885-92); Jacob Gould Schurman, LL.D (1892—).

CORNER, a trade term applied to the act of acquiring control of all or nearly all of a commodity, or of the stock-shares of a company (when they are to be bought in the market), the purpose being to force those who are bound to deliver the goods into buying the goods (or shares) from those who control them, at the latter's prices. When those who are engineering the corner are forced through lack of means, to throw their holdings on the market the corner is said to be smashed. Few corners have been successful.

CORNET, a wind-instrument of former times, originally curvilinear or serpentine in form and increasing in diameter from the mouthpiece to the lower end.



Cornet-à-pistons.

The modern cornet is a keyed bugle which has a very agreeable tone, and is much used in orchestras and military bands.

CORN-HUSKING, Corn-shucking, an assemblage of friends and neighbors at the house of a farmer to assist him in stripping the husks or shucks from his Indian corn.

CORN'ING, a city and one of the county seats of Steuben county, N. Y., 18 miles w.n.w. of Elmira; on the Chemung river, and on the New York Central, the Erie, and the Lackawanna railroads. Pop. 12,061.

CORN-LAWS, a name commonly given to certain statutes passed to protect the agricultural interest in Britain.

CORN'WALL, a maritime county of England, forming the southwestern extremity of the island, bounded e. by Devonshire, and surrounded on all other sides by the sea; area, 1350 sq. miles or 863,665 acres. The chief wealth of the county is in its minerals, especially its mines of copper and tin, though the value of both has diminished. Several mines exceed 350 fathoms in depth. In the Botallack Copper Mine, a few miles north of Land's End, the workings are carried below the sea. Cornwall, with the Scilly Isles, seems to have been the Cassiterides or Tin Islands of antiquity. The natives long maintained their independence against the Saxons, and their country was spoken of as West Wales. Their language also long continued to be Celtic. It gives the title Duke of Cornwall to the eldest son of the sovereign of Great Britain,

and forms a royal duchy, the revenues of which belong to the Prince of Wales for the time being. The dukedom was created for the Black Prince in 1337. Pop. 322,957.

CORN'WALLIS, Charles, Marquis of, son of the first Earl Cornwallis, born in 1738. On the outbreak of the American war he sailed with his regiment, served with distinction under Howe and Clinton, and in 1780 was left in independent command in South Carolina with 1000 men. He defeated Gen. Gates at Camden 1780, and General Green at Guilford in 1781, but six months afterward was besieged in Yorktown and compelled to surrender 19th Oct. 1781. This disaster proved decisive of the war. In 1786 Lord Cornwallis went out to India with the double appointment of commander-in-chief and governor-general, invaded

Lord Cornwallis.

Mysore in 1791, and obliged Tippoo Saib to surrender much territory. Having returned to Britain he was created a marquis (1792), appointed Lord-lieutenant of Ireland, and again in 1804 governor-general of India. He died the following year.

COROL'LA, in botany, the portion of the flower inside the calyx; the inner floral envelope. The corolla surrounds the parts of fructification and is composed of leaves called petals. When there are several free leaves it is called a polypetalous corolla, as in the rose; but when the petals are united by the margins into a continuous structure it is called monopetalous, or more correctly gamopetalous. It may generally be distinguished from the calyx by the fineness of its texture and the gayness of its colors; but there are many exceptions.

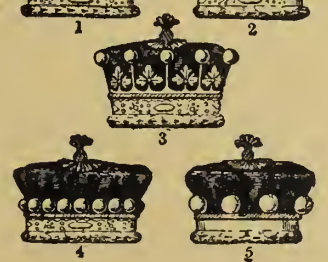
CORONA, the beautiful, brilliant streamers which are seen radiating from the opaque disc of the sun during a total eclipse. The nature of the corona is wholly unknown, although it is believed to be of electric or magnetic origin. As no two coronæ are alike the presumption is that the corona itself is a perpetually changing radiation. The streamers are hundreds of thousands of miles in length.

CORONA'TION, the placing of the crown on a monarch's head with solemn rites and ceremonies. Part of the ceremony usually consists in the oath which the monarch takes that he will govern justly, will always consult the real welfare of his people, and will conscientiously observe the fundamental laws of the state.

Corona.

COR'ONER, an official whose chief duty is to inquire into the cause of the death of persons killed or dying suddenly. His examination is made in all cases with the aid of a jury, in sight of the body, and at the place where the death happened. If the body is not found he cannot sit. If the jury have brought in a verdict of murder or manslaughter the coroner may commit the accused party to prison or admit him to bail.

COR'ONET, such a variety of crown as is worn by princes and noblemen. The coronet of a British duke is adorned with strawberry leaves; that of a marquis has



1, Coronet of a duke. 2, Do. of a marquis. 3, Do. of an earl. 4, Do. of a viscount. 4, Do. of a baron.

leaves with pearls interposed; that of an earl raises the pearls above the leaves; that of a viscount is surrounded with pearls only; that of a baron has only six pearls.

COROT (kō-rō), Jean-Baptiste-Camille, French artist, born at Paris in 1796. He exhibited for the first time in the Salon in 1827, but some years elapsed before the high qualities of his work were recognized. The fortune which he inherited from his father enabled him, however, to follow out the bent of his genius, and the last twenty-five years of his life were a continuous triumph. He died in 1875. He frequently painted figure subjects, including the large sacred pictures, the Flight into Egypt and the Baptism of Christ; but his most characteristic and successful work was in landscape. His woodland scenes, painted for the most part at dawn or twilight in a scheme of pale greens and silvery grays, show a singularly subtle feeling for this phase of nature, and are undoubtedly among the most important contributions of the century to landscape art.

COR'PORAL, a petty officer ranking just above the ordinary private and below the sergeant. He has charge of one of the squads of the company, places and relieves sentinels, etc.

CORPORA'TION, in English common law (the first modern definition of a corporation) a body with certain legal rights and powers. A corporation has essentially three factors—persons who are its members, persons who are its trustees, and a legal charter for its existence. A corporation consisting of only one person (as the sovereign of England, or the Roman Catholic archbishop of New York or Chicago) is called a sole corporation; and a corporation consisting of several persons is called an aggregate or sole corporation. Corporations may be ecclesiastical, civil, eleemosynary, and so on. Strictly speaking joint stock companies, such as railroads, modern "trusts," etc., are not corporations although generally so termed in the United States.

CORPS (kōr), a word often used as a military and a political term.—A corps d'armée, or army corps, one of the largest divisions of an army.—Corps diplomatique, the body of ministers or diplomatic characters.—Corps législatif (kōr lā-zhis-lā-tēf), the lower house of the French legislature in 1857-70.

COR'PULENCE, the unwieldy state of the human body due to the excessive deposition of fat. It is promoted by a diet too rich in fat-forming materials, fats, starch and sugars, bodily inactivity tranquillity of mind, etc. There is, however, a diseased state of the system, which, independently of all these influences, will increase the production and deposition of fat. If corpulence is excessive it becomes troublesome and at length dangerous. In curing corpulency due attention must be paid to the regulating of the diet, exercise, and sleep of the individual. Especial attention must be given to the kind of diet. Avoid all kinds of fat-forming food, such as fat, cream, butter, sugar, potatoes, farinaceous food and malt liquors, and indeed alcoholic liquors of all kinds. Little bread should be eaten: a moderate increase in animal foods, lean beef, fish, fowl, eggs, is allowed: green vegetables and fresh fruit may be partaken of. Regular exercise to suit the person's powers should be engaged in. A noted instance of corpulency is Daniel Lambert, who weighed over 50 stone, or more than 700 lbs. Moderate corpulence may be quite consistent with health.

CORPUS CHRISTI, the consecrated host at the Lord's supper, which, according to the doctrines of the R. Catholic Church, is changed by the act of consecration into the real body of Christ.

This doctrine caused the adoration of the consecrated host, and hence the R. Catholic Church has ordained for the host a particular festival, called the Corpus Christi feast. This was instituted in 1264 by Pope Urban IV. by a bull, in which he appointed the Thursday of the week after Pentecost for the celebration of the Corpus Christi festival throughout Christendom. Since then this festival has been kept as one of the greatest of the Catholic Church. Splendid processions, in which the host is carried by a priest in a precious box, form an essential part of it. In France it is known as the fête-dieu.

CORPUS'CULAR THEORY OF LIGHT, the older theory, which explained the phenomena of light by supposing that a luminous body emits excessively minute particles of matter, corpuscules at they were called which striking the eye produce the sensation of light. Newton held the corpuscular theory, and supported it with great ingenuity. This theory has long been displaced by the undulatory theory (which see).

CORRAL', in South America and elsewhere, a yard or stockade for cattle.

CORREGGIO (kor-rej'ō), Antonio Allegri, Italian painter, born at Correggio, near Modena, in 1494. Among his best pictures are Night, in which the chief light is the glory beaming from the Infant Savior; the St. Jerome; the Marriage of St. Catherine; several Madonnas, one of them (called La Zingarella, or the Gipsy Girl) said to represent his wife; the Pentitent Magdalene; the altar-pieces of St. Francis, St. George, and St. Sebastian; Christ in the Garden of Olives; the fresco of the Ascension in the Church of St. John, Parma; the Assumption of the Virgin in the cathedral of the same city; the Ecce Homo, and Cupid, Mercury, and Venus, both in the National Gallery, London. He died in 1534.

CORREZE (kor-rāz), an inland department, France; area, 2265 sq. miles; capital, Tulle. It belongs almost entirely to the basin of the Garonne. Except in a few valleys the soil is far from fertile, heaths occupying a great extent of surface, and agriculture being in a very backward state. Pop. 326,494.

CORRIEN'TES, a town, Argentine Republic, capital of the province of same name, on the Parana, near its confluence with the Paraguay, 390 miles n. Buenos Ayres. Pop. 15,500. Pop. of prov. 290,000.

CORRIGAN, Michael Augustine, an American Roman Catholic archbishop, born in New Jersey in 1839, died in 1902. From 1868 to 1873 he was president of Seton Hall College; in 1873 he was made bishop of Newark; in 1880 coadjutor to Cardinal McCloskey, archbishop of New York, and in 1885 archbishop of New York, which he remained until his death. Archbishop Corrigan was regarded as one of the ablest scholars of the American hierarchy.

CORRO'SIVES, in surgery, substances which eat away whatever part of the body they are applied to; such are glacial acetic acid, burned alum, white precipitate of mercury, red precipitate of mercury, butter of antimony, etc.

CORROSIVE SUBLIMATE, the bichloride of mercury, a white crystalline solid, and an acrid poison of great virulence. The stomach-pump and emetics are the surest preventives of its deleterious effects when accidentally swallowed; white of egg is also serviceable, in counteracting its poisonous influence on the stomach. It is a powerful antiseptic.

COR'RUGATED IRON, sheet-iron strengthened by being bent into parallel furrows. It is largely used for roofing, and when dipped in melted zinc, to give it a thin coating, is commonly known as galvanized iron.

CORRUPT PRACTICES, fraudulent methods used in public elections. The term is especially used in England and special laws have been enacted by parliament bearing on the matter. Most corrupt practices are provided for by common law, but statutes have been made in most of the United States providing for the punishment of fraud of every kind in elections.

COR'SAIRS, the Anglicized form of the term used in the south of Europe to denote those pirates who sailed from Algiers, Tunis, Tripoli, and the ports of Morocco.

CORSELET (kors'let): (1st) a cuirass or armor to protect the body from injury, worn formerly by pikemen, generally of leather, and pistol proof. (2d) The part of a winged insect which answers to the breast of other animals.

CORSET, a piece of underclothing worn to give shape to the body, consisting of a sort of closely-fitting jacket, usually stiffened by strips of steel, whalebone, or other means, and tightened by a lace. The materials of which it is made should be smooth and elastic, and it should be specially fitted for the individual wearer, as no two human figures are precisely alike. It should be remembered, also, that corsets are meant to preserve a good figure, not to make one, and any forcible compression of the shape, especially on young persons, will only end in destroying natural grace of movement and in serious injury to the health.

COR'SICA, an island in the Mediterranean, forming the French department of same name. It is separated from the island of Sardinia, on the south, by the Strait of Bonifacio, about 10 miles wide; length, n. to s., 110 miles; breath, near its center, 53 miles; area, 3377 sq. miles. The most distinguished men to whom Corsica has given birth are Paoli and Napoleon. Pop. 288,596.

COR'SO, an Italian term given to a leading street or fashionable carriage-drive.

CORT, Henry, the inventor of the processes of puddling and rolling iron, born at Lancaster in 1740. He died in 1800.

CORTES (kor'tes), the old assembly of the estates in Spain and Portugal. In early times the king was very dependent upon them, especially in the kingdom of Aragon. When the kingdoms of Aragon and Castile were united under Ferdinand and Isabella the crown succeeded in rendering itself more independent of the estates, and in 1538 Charles abolished the assembly of the estates in Castile altogether. Gradually the popular liberties were encroached upon, and the cortes at length were convened only for the purpose of homage or ceremony, or when a question regarding the succession arose. In 1808 Napoleon revived the cortes for his own ends. The present cortes of Spain are composed of a senate and congress equal in authority, and having the power along with the king to make laws. (See Spain.) The Portuguese cortes is coeval with the monarchy, and has had a history very similar to that of the Spanish.

COR'TEZ, or **CORTES,** Fernando, or Hernan, the conqueror of Mexico, was born in 1485 at Medellin, in Estremadura; died near Seville 1547. He went to the West Indies in 1504, where Velas-

Fernando Cortez.

quez, governor of Cuba, under whom he had greatly distinguished himself, gave him the command of a fleet, which was sent on a voyage of discovery. Cortez quitted Santiago de Cuba in 1518, with eleven vessels, about 700 Spaniards, eighteen horses, and ten small field-pieces. He landed on the shore of the Gulf of Mexico, where he caused his vessels to be burned, in order that his soldiers might have no other resource than their own valor. Having induced the Totonacs and Tlaxcalans to become his allies he marched toward Mexico, where he was amicably received; but, having seized their monarch Montezuma, and treated the people with great cruelty, they finally resisted. After a desperate struggle, in which 100,000 Mexicans are said to have perished, the city was taken, and soon after the whole country was subjugated. In 1528 he returned to Spain; but two years after he was again sent out to Mexico, where he remained for ten years, discovering meanwhile the peninsula of California. He returned once more to Spain, where, notwithstanding his great services, he was coldly received and neglected. After taking part in an expedition to Algiers in 1541 he passed the remainder of his days in solitude.

CORUN'DUM, the earth alumina as found native in a crystalline state. In hardness it is next to the diamond The amethyst, ruby, sapphire, and topaz are considered as varieties of this mineral, which is found in India and China, and is most usually in the form of a six-sided prism or six-sided pyramid. It is nearly pure anhydrous alumina, and its specific gravity is nearly four times that of water. Its color is various—green, blue, or red, inclining to gray, due to

traces of iron, copper, etc. Emery is a variety of corundum.

CORUN'A, a seaport of Spain, in the province of the same name in Galicia, on the northwest coast, on a peninsula at the entrance of the Bay of Betanzos.

Pop. 37,251.—The province is hilly and its inhabitants chiefly engaged in agriculture and fishing. Area, 3079 sq miles; pop. 616,043.

COR'VETTE, a vessel of war, ship-rigged, having a flush deck, with no quarter-deck and only one tier of guns; but the term is now somewhat loosely used. In the British navy there is a class of corvettes built of iron or steel, swift vessels, propelled by steam as well as by a large spread of canvas, and carrying heavy guns.

COR'VIDÆ, the crows, a family of birds, in which the bill is strong, of conical shape, more or less compressed, and the gape straight. The nostrils are covered with stiff bristle-like feathers directed forward. The family includes the common crow, rook, raven, magpie, jay, jackdaw, nut-cracker, cornish chough, etc.

CORYBAN'TES, frantic priests of Cybele, who celebrated the mysteries with orgiastic dances to the sound of drum and cymbal.

COR'YMB, in botany, that form of inflorescence in which the flowers, each on its own pedicel of different lengths, are so arranged along a common axis as to form a flat broad mass of flowers with a convex or level top, as in the hawthorn and candytuft.

CORYPHÆ'NA, a genus of fishes of the mackerel family. The body is elongated, compressed, covered with small scales, and the dorsal fin extends the whole length of the back, or nearly so. All the species, natives of the seas of warm climates, are very rapid in their motions, and very voracious. They are of brilliant colors, and are objects of admiration to every voyager.

CORYPHÆ'US, the leader of the chorus in the Greek dramas. His functions were often as wide as those of our stage-manager, conductor, and ballet-master. The name coryphée is now applied to a ballet-dancer.

COSMET'ICS, external preparations for rendering the skin soft, pure, and white, or for beautifying and improving the complexion. To these may be added preparations for preserving or beautifying the teeth, and those which are applied to the hair.

COSMIC DUST, the fine dust which falls upon the earth from regions beyond the earth. This may be observed often after a heavy rain in favorable places. The origin of this extra-terrestrial material is believed to be meteoric

COSMOG'ONY, a theory of the origin or formation of the universe. Such theories may be comprehended under three classes:—1. The first represents the world as eternal, in form as well as substance. 2. The matter of the world is eternal, but not its form. 3. The matter and form of the universe is ascribed to the direct agency of a spiritual cause; the world had a beginning, and shall have an end.

COSMOS, order or harmony, and hence the universe as an orderly and beautiful system. In this sense it has been adopted by Humboldt as the title of his celebrated work, which describes the nature of the heavens as well as the physical phenomena of the earth.

COSSACK POSTS, in the U. States army a system of outposts consisting of four men and a non-commissioned officer. They are used instead of the old style line of pickets and are claimed, by American army officers to be far more efficient and self-reliant, owing to the support which the members of the outpost lend to one another.

COS'SACKS, tribes who inhabit the southern and eastern parts of Russia, paying no taxes, but performing instead the duty of soldiers. They supply the empire with one of the most valuable elements in its national army, forming a first-rate irregular cavalry, and rendering excellent service as scouts and skirmishers. In 1570 they built their principal "stanitza" and rendezvous, called Tcherkask, on the Don, not far above its mouth. As it was rendered unhealthy by the overflowing of the island on which it stood, New Tcherkask was founded in 1805 some miles from the old city, to which nearly all the inhabitants removed. This forms the capital of the country of the Don Cossacks, which constitutes a government of Russia, and has an area of 61,900 sq. miles and a population of 1,474,133. It has a military organization of its own.

COSTA RICA, the most southern state of the republics of Central America; bounded n. by Nicaragua, e. and n. by the Caribbean Sea; e. and s. by Colombia; and s. and w by the Pacific. Area, about 23,200 sq. miles. The capital is San José, and the two established ports are Punta Arenas, on the Pacific side, and Port Limon, on the Caribbean Sea. It has been an independent state since 1821, from 1824 to 1839, forming a part of the Central American Confederation, but subsequently separate. Pop. 243,000, mostly of Spanish descent.

COSTER, Laurens (called Janszoon, that is, son of John), whose name is connected with the origin of printing, was born in Haarlem in 1370 or 1371, died about 1440. According to a statement first found in Junius' Batavia (1588), he was the original inventor of movable types, and on this ground the Dutch have erected statues in his honor.

COSTS, in law, are the expenses incurred by the plaintiff and defendant. As a rule these are paid by the loser in a suit, but there are always extra-judicial expenses incurred by both parties, which each has to pay whatever be the issue of the suit. In criminal cases the party accused may have his expenses if the court thinks the accusation unreasonable. In matrimonial suits, the wife, whether petitioner or respondent, is generally entitled to her costs from the husband.

COS'TUME, the style of attire characteristic of an individual, community, class, or people; the modes of clothing and personal adornment which prevail in any period or country.—Costume balls, also called fancy dress balls, are entertainments at which the guests adopt a style of dress different from the one usually worn. It may be one which was worn at another period, or one worn in another country, or a modern dress worn by some particular class of society A favorite plan is to make up as some well-known character in history or literature.

COTE-D'OR, an inland and eastern department of France, part of the old province of Burgundy, having Dijon as its capital. Area, 3382 sq. miles. The vineyards of the eastern slopes of the Côte-d'Or produce the celebrated wines of Upper Burgundy. Iron, coal, marble, etc., are found. Pop. 381, 574.

COTES-DU-NORD (kōt-du-nōr), a maritime department in the north of France, forming part of ancient Brittany; capital Brieuc. Area, 2659 sq. miles. Pop. 628,256.

COTIL'LION, a brisk dance of French origin, performed by eight persons together, resembling the quadrille which superseded it. The name is now given to a dance which often winds up a ball, and which is danced with any number of dancers and with a great variety of figures the pairs of dancers following in this the leading pair, and partners being successively changed.

COTTON, a vegetable fiber used extensively in the manufactures and highly valuable because of the ease with which it is grown and its structural value in the weaving arts. Cotton is cultivated in those parts of the globe

Cotton plant in bloom.

between the two thirty-fifth parallels of latitude (a region which contains the largest portion of the land surface of the globe), although its most profitable cultivation is between the twentieth and thirty-fifth parallels north of the equator. Within this belt lie the cotton districts of the United States, northern Mexico, Egypt, northern Africa, and Asia, except the extreme southern

parts of India and the Malay Peninsula. South of the equator cotton is grown in Brazil, nearly all of which country is said to be favorably adapted to its cultivation; in Australia, though not to any great extent; in Africa, where the extent of production is not known; and in the islands of the Pacific.

All the species are perennial shrubs, though in cultivation they are sometimes treated as if they were annuals. They have alternate stalked and lobed leaves, large yellow flowers, and a three or five celled capsule, which bursts open when ripe through the middle of the cell, liberating the numerous black seeds covered with the beautiful filamentous cotton. The North American cotton is produced by two well-marked varieties, the long-staple cotton, which has a fine soft silky fibre nearly two inches long, and the short-staple cotton, which has a fibre little over one inch long adhering closely to the seed. The long-staple variety known as Sea Island cotton holds the first place in the market. It is grown in some of the southern states of America, especially on islands bordering the coast. The mode of cultivation is usually as follows:—The seeds are sown in the spring in drills of about a yard in width, the plant appearing above ground in about eight days afterwards. The rows of young plants are then carefully weeded and hoed, a process which requires to be repeated at two or three subsequent periods. No hoeing takes place after the flowering has commenced, from which a period of 70 days generally elapses till the ripening of the seed. To prevent the lustre of the cotton wool from being tarnished, the pods must not remain ungathered longer than eight days after coming to maturity. The cotton wool is collected by picking with the fingers the flakes from the pods, and then spreading out to dry, an operation which requires to be thoroughly performed. The cotton now comes to be separated from the seeds, a process formerly effected by manual labour, but which is now generally accomplished by machinery. After being cleansed from the seeds, the cotton wool is formed into bales, and is now ready for delivery to the manufacturer.

Cotton has been cultivated in India and the adjacent islands from time immemorial. It was known in Egypt in the sixth century before the Christian era, but was then probably imported from India. It was not till a comparatively late period that the nations of the West became acquainted with this useful commodity, and even then it appears only to have been used as an article of the greatest luxury. The introduction of the cotton-shrub into Europe dates from the ninth century, and was first effected by the Spanish Moors, who planted it in the plains of Valencia. Cotton manufactories were shortly afterwards established at Cordova, Granada, and Seville; and by the 14th century the cotton stuffs manufactured in the Kingdom of Granada had come to be regarded as superior in quality to those of Syria. About the 14th century cotton thread began to be imported into England by the Venetians and Genoese. In China the cotton-shrub was known at a very early period, but it does not appear to have been turned to any account as an article of manufacture till the sixth century of the Christian era, nor was it extensively used for that purpose till nearly the middle of the 14th century. In the new world the manufacture of cotton cloth appears to have been well understood by the Mexicans and Peruvians long before the advent of Europeans. It was planted by the English colonists of Virginia in 1621, but only as an experiment, and the amount produced was long very small, the crop only amounting to about 2,000,000 pounds in 1791. After this it rapidly increased, and in 1810 94,000,000 pounds were exported The quantity now produced is enormous, the crop of 1906-7 being estimated at 13,551,000 bales, averaging 492 pounds each. The chief cotton growing states are Texas, Georgia, Mississippi, Alabama, South Carolina, Arkansas, Louisiana, North Carolina, Tennessee and Florida. The United States furnishes two-thirds of the cotton supply of the world. The raw cotton exported in 1907 was 9,036,434 bales of 500 pounds each.

As a general rule, cotton is a dry-weather plant, heavy rainfall interfering with both the culture and the stand, although an extremely dry spring interferes with the growth. The experiment stations in the southern states have aided in introducing improved methods of cultivating, fertilizing, and handling the crop. Rotation of crops and green manuring have been shown to be of great advantage. From the date of bloom, warm, dry weather is needful, until picking time, which usually commences from July 10 in Southern Texas, up to September 10 in Tennessee, and continues until frost puts a stop to further growth. During the harvest all available hands are called into full employment. The cotton is gathered into baskets or bags hung from the shoulders of the pickers, and when the crop has been secured it is spread out, dried, and then the fiber separated from the seeds. For long-staple or Sea Island cotton in South Carolina, the usual date to begin preparing land is February 1; planting begins April 1 and ends May 1; picking is from August 25 to December 10.

COTTON, Charles Stanhope, an American naval officer, born at Milwaukee, Wis., in 1843. He was graduated at the naval academy and took part in the battle between the Merrimac and Monitor in March, 1862. He was commander of the cruiser Harvard during the war with Spain.

COTTON-FAMINE, a term used to designate the stagnation of the cotton industry in England during the last years of the civil war, owing to the arrest by the war, of the industry of cotton growing in the U. States. Owing to this stagnation nearly 400,000 persons were thrown out of employment in England and maintained by charity for nearly two years.

COTTON-GIN, a machine invented by Eli Whitney in 1794 for separating the cotton fiber from the seed.

COTTON-GRASS, a kind of plant with long silky hairs upon the fruit. It grows freely in the U. States and is regarded as good food for sheep.

COTTON INSECTS, insects injurious to growing cotton, the chief of which is the larva of a moth. Millions of dollars are annually lost in crops owing to the ravages of this destructive insect. The moth is a night flier and deposits its eggs on the under side of the cotton leaf. Here they hatch during the summer and the worm feeds on the plant. The bud-worm is another insect destructive to cotton.

COTTON SEED, COTTON SEED OIL, the seed of the cotton plant and the oil extracted from it. After the oil has been pressed out of the cotton seed, the residuum is the pulp of the seed, called cotton seed stearine, or cotton seed cake. It is a highly valuable product for cattle food and fertilizer. The oil is used for cooking, for the adulteration of lard and lard oil, while the stearine is often used for the adulteration of lard. The hulls of the seed are used as a low grade food for animals.

COTTON-SPINNING, a term employed to describe in the aggregate all the operations involved in transforming raw cotton into yarn.

COTTONTAIL, the popular name of a small American hare.

COTTON-WOOD, a tree of the poplar kind, a native of N. America. The "cotton" from the seeds has been used in France and Germany for making cloth hats and paper, but the experiment was found unprofitable.

COTURNIX. See Quail.

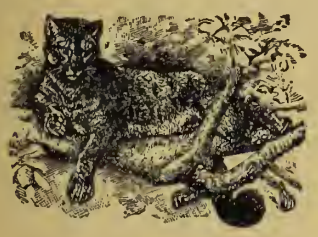
COTYLE'DONS, the seed-leaves or seed-lobes of the embryo plant, forming, together with the radicle and plumule, the embryo, which exists in every seed capable of germination. Some plants have only one cotyledon, and are accordingly termed monocotyledonous; others have two, and are dicotyledonous. These differences are accompanied by remarkable differences in the structure of the stems, leaves, and blossoms, which form the basis for the division of flowering plants into two great classes. The embryo plant of the Coniferæ has many (three to twelve) cotyledons, and is called polycotyledonous. The cotyledons contain a supply of food for the use of the germinating plant. In some plants the store is very large, and in germination the seed-leaves remain under the ground, as in the pea and oak; in others the store is not so large, and the seed-leaves appear above ground and perform the functions of true leaves; while there is a large class of seeds where the embryo is very small, and the food is stored up around it, as in wheat and the buttercup

COUCHANT, in heraldry said of a beast lying down with the head raised.

COUES, Elliott, an American zoologist and anatomist, born in New Hampshire in 1842, died 1899 He was naturalist for the Northern Boundary Commission in 1873–6 and from 1877 to 1887 was professor of anatomy at the National Medical college at Washington. He published numerous scientific works upon ornithology in which science he was a distinguished specialist

COUDERT, Frederic Rene, an American lawyer and diplomat, born in New York in 1832. He appeared for the U. States before the International Bering Sea Commission and was a member in 1896–8 of the Venezuela Boundary Commission.

COUGAR (kō'gär), or **PUMA,** a quadruped of the cat kind, inhabiting most parts of America. Its color is a uniform fawn or reddish-brown, without spots



Cougar.

or markings of any kind. It may attain a length of 9 feet, inclusive of the tail. In habits it is stealthy and cowardly, and seldom or never attacks man. It is by some called the panther or red tiger, and is one of the most destructive of all the animals of America, particularly in the warmer climates, where it carries off fowls, dogs, cats, and other domestic animals.

COUGH, a sudden and forcible expiration immediately preceded by closure of the glottis or narrowed portion of the box of the windpipe. The force for the action is obtained by a deep breath, then follows the closure of the glottis, succeeded by the expiratory effort forcing open the glottis. The action is performed by the expiratory muscles, that is the abdominal muscles, by whose contraction the diaphragm is forced up, and the muscles of the chest, by which the ribs are pulled down. The cavity of the chest being thus diminished air is driven out of the lungs. The object of the cough is usually to expel any foreign material in the lungs or air-tubes. The offending material may be there present as the result of inflammation, catarrh, etc. It may also have gained entrance from without. Thus the irritating material may be merely some food or drink which has slipped into the larynx, or it may be dust, etc., in the air inhaled, and the cough is the means of expelling the intruder. But cough may also be produced when there is no irritating material present. The larynx or windpipe may be in an inflamed and irritable condition, in which state even the entrance of cold air will excite coughing. Moreover, cough may be produced by irritation of nerves, distant from the lungs and air-passages, by what is called reflex action. Thus irritation of the stomach, irritation connected with the ear, irritation of certain nerves by pressure of growths, etc., may produce cough, when the respiratory organs are not directly affected at all. Irritation at the back of the throat, as of the tickling of a long uvula, and so on, also produces it. A catarrhal cough is generally considered unimportant, particularly if there be no fever connected with it. But every cough lasting longer than two or three days is suspicious, and ought to be medically treated.

COUNCIL, an assembly met for deliberation, or to give advice. The term specially applies to an assembly of the representatives of independent churches, convened for deliberation and the enactment of canons or ecclesiastical laws. The four general or œcumenical councils recognized by all churches are: 1, the Council of Nice, in 325, by which the dogma respecting the Son of God was settled; 2, that of Constantinople, 381, by which the doctrine concerning the Holy Ghost was decided; 3, that of Ephesus, 431; and 4, that of Chalcedon, 451; in which two last the doctrine of the union of the divine and human nature in Christ was more precisely determined. Among the principal Latin councils are that of Clermont (1096), in the reign of Urban II., in which the first crusade was resolved upon; the Council of Constance, the most numerous of all the councils, held in 1414, which pronounced the condemnation of John Huss (1415), and of Jerome of Prague (1416); the Council of Basel, in 1431, which intended a reformation, if not in the doctrines, yet in the constitution and discipline of the church; and the Council of Trent, which began its session in 1545, and labored chiefly to confirm the doctrines of the Catholic Church against the Protestants. On the 8th of December, 1869, an œcumenical council, summoned by a bull of Pope Pius IX., assembled at Rome. This council adopted a dogmatic Decree or Constitutio de Fide, and a Constitutio de Ecclesia, the most important article of which latter declares the infallibility of the pope when speaking ex cathedrâ.

COUNCIL BLUFFS, a city and important manufacturing center, Pottawattamie Co., Iowa, on the left bank of the Missouri, opposite Omaha City, with which it is connected by a bridge 2750 feet in length and 50 feet above high water. The name is derived from a council held here with the Indians in 1804. Pop. 35,000.

COUNCIL OF WAR, an assembly of officers of high rank called to consult with the commander-in-chief of an army or admiral of a fleet on matters of supreme importance.

COUNSEL, a person retained by a client to plead his cause in a court of judicature.

COUNT, in modern times the custom of styling all the sons of a count also counts makes this designation on the Continent very common, and the rank little more than nominal. In point of rank, the English earls are considered as corresponding to the continental counts, an earl's wife being styled a countess.

COUNT, in law, an independent part of a declaration or indictment, which, if it stood alone, would constitute a ground of action.

COUNTERFEITING, a term generally applied to the making of imitation money, coin or paper. The U. States secret service has examples of counterfeit coins and bills so like the original that they are distinguished only with the greatest difficulty by experts. An enormous amount of counterfeit money must be in constant circulation. The crime is a felony.

COUNTER-IRRITANT, in med. a substance employed to produce an artificial or secondary disease, in order to relieve another or primary one. The term is more specifically applied to such irritating substances, as, when applied to the skin, redden or blister it, or produce pustules, purulent issues, etc. The commonest counter-irritants are such as mustard, turpentine, cantharides or Spanish flies, croton oil, and the cautery.

COUN'TERPOINT, in music, a term equivalent to harmony, or the writing of a carefully planned accompanying part; or that branch of the art which, musical thought being given, teaches the development of it, by extension or embellishment, by transposition, repetition, or imitation throughout the different parts. Counterpoint is divided into simple, florid or figurate, and double. Simple counterpoint is a composition in two or more parts, the notes of each part being equal in value to those of the corresponding part or parts and concords. In florid counterpoint, two or more notes are written against each note of the subject, or canto-fermo, and discords are admissible. Double counterpoint is an inversion of the parts, so that the base may become the subject, and the subject the base, etc., thus producing new melodies and new harmonies.

COUN'TERSIGN, a private signal, word, or phrase given to soldiers on guard, with orders to let no man pass unless he first give that sign; a military watchword.

COUNTY, an administrative unit of a state or a government, or the territory ruled over by a count. In England the term shire is used instead of county. Counties in the U. States are in reality units of administration, which each send one or more representatives to the state legislature. Counties have taxing power, prosecute crime, and administer justice generally. Cities are parts of counties, a city often being conterminous with a county, as Chicago and Philadelphia. New York includes four counties. St. Louis has a separate charter and has no connection with the county, sending its own members to the legislature.

COUNTY COUNCILS, administrative bodies created by the British parliament in 1888 to replace the justices of the peace who had formerly administered county affairs and to give local self-government to the counties. These councils are elective administrative bodies, and were perfected in 1894 by the local self-government act.

COUNTY COURT, a tribunal of justice the jurisdiction of which is limited to the county in which it exists. In this much the English and the American county courts are much the same thing, although the county court in England is a relatively more important body.

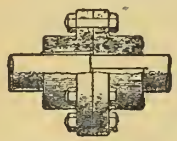
COUP (kō), a term used in various connections to convey the idea of promptness and force.—Coup de main, a prompt, vigorous, and successful attack. —Coup d'état, a sudden decisive blow in politics; a stroke of policy; specifically, an exertion of prerogative to alter the laws or the constitution of a country

without the consent or concurrence of the people expressed through their representatives, especially when such exertion is supported by armed force.—Coup de soleil. See Sunstroke.

COUPLE, in dynamics, two equal and parallel forces acting in different directions, and applied to the same body. The distance between their lines of action is called the arm of the couple, and the product of one of the two equal forces by this arm is called the moment of the couple.

COUPLET, two verses or lines of poetry of equal length and rhythm, often embodying an idea of the nature of an aphorism.

COUPLING, in machinery, a contrivance for connecting one portion of a system of shafting with another, and of which there are various forms. A common form is the flange or plate coupling, which consists of two flanges separately



Flange coupling.

fitted on to the two contiguous ends of the lengths of shaft to be connected, and firmly secured together by screws. The most useful kinds of couplings are those that are adjustable, or can be readily put on and off.—The term is also applied to an organ register, by which two or more rows of keys can be connected by a mechanism, so that they can be played together.

COUPON (kö'pan), an interest-certificate printed at the bottom of transferable bonds, and so called because it is cut off or detached and given up when a payment is made. Also one of a series of tickets which binds the issuer to make certain payments, perform some service, or give value for certain amounts at different periods, in consideration of money received.

COURIER, a bearer of special despatches, whether public or private; also an attendant on a party traveling abroad, whose especial duty is to make all arrangements at hotels and on the journey.

COURLAND, a government in Russia, bounded n. by Livonia and the Gulf of Riga, w. the Baltic, s. Kovno, and e. by Vitebsk; area, 10,535 sq. miles; pop. 712,700.

COURSING, a kind of sport in which hares are hunted by greyhounds, which follow the game by sight instead of by scent.

COURT, a term generally applied to the judicial part of a government's machinery, and sometimes to bodies with judicial powers to settle disputes outside of litigation, properly so called. Courts have existed in all ages and are an evolution from the power of the chief or king in savage or prehistoric peoples. In England and the United States courts are essentially the same and have the same powers, although there are a few minor differences. In the United States two distinct systems of courts exist, the federal courts which, with the exception of the supreme court (a constitutional creation) are the creation of the congress, and state courts which, (with the exception of the state supreme court) are creatures of the state legislature. In the federal system there is a court of claims, courts for the various territories, district courts and circuit courts, the judges of which are all appointed by the president and retain their positions on good behavior. The state courts consist of tribunals arranged with a view to the territory of the state and its divisions and the judges, as those also of the state supreme court are elected by the people. There are county courts, circuit courts, and appellate courts, the court of last appeal being the supreme court. The federal judiciary tries all cases concerned with the federal government, or cases of an interstate kind.

COURT, MILITARY, COURTS-MARTIAL, in the United States judicial bodies created by congress for the trial of offenses committed by soldiers. Soldiers, however, can be prosecuted in the civil courts for other than military offenses. Military courts are of several kinds, as general court, summary court, garrison court, regimental court, and court of inquiry.

COURT-PLASTER (so called because originally applied by ladies of the court as patches on the face), black, flesh-colored, or transparent silk varnished over with a solution of isinglass, which is often perfumed with benzoin, used for covering slight wounds.

COUSIN (kö-zan), Victor, French philosopher and writer, founder of the so-called Eclectic school of philosophy, was born at Paris 1792, died as Cannes 1867. The head and founder of the modern school of eclecticism in France, he borrowed from many sources. His eclecticism was based on the principle that every system, however erroneous, which has anywhere commanded assent, contains some elements of truth, by which its acceptance may be explained, and that it is the business of philosophical criticism to discover and combine these scattered elements of truth.

COUTHON (kö-tōn), Georges, a noted French revolutionist, was born in 1756, and was bred to the profession of a lawyer. Some time after the revolution he was chosen a member of the national assembly, and allying himself with Robespierre aided and abetted the latter in all his atrocities. On the downfall of Robespierre's party Couthon shared, along with him and St. Just, in the decree of arrest, and was guillotined, July 28, 1794.

COUVADE (kö-väd'), a singular custom prevalent in ancient as well as modern times among some of the primitive races in all parts of the world. After the birth of a child the father takes to bed, and receives the food and compliments usually given elsewhere to the mother. The custom was observed, according to Diodorus, among the Corsicans; and Strabo notices it among the Spanish Basques, by whom, as well as by the Gascons, it is still to some extent practiced. Travelers from Marco Polo downward have met with a somewhat similar custom among the Chinese, the Dyaks of Borneo, the negroes, the aboriginal tribes of North and South America, etc.

COV'ENANT, in law, an agreement between two or more parties in writing signed, sealed, and delivered, whereby they agree to do, or not to no, some specified act. In theology, the promises of God as revealed in the Scriptures, conditional on certain terms on the part of man, as obedience, repentance, faith, etc.

COVENAN'TERS, in Scottish history, the name given to the party which struggled for religious liberty from 1637 on to the revolution; but more especially applied to the insurgents who, after the passing of the act of 1662 denouncing the solemn league and covenant as a seditious oath, took up arms in defense of the Presbyterian form of church government.

COV'ENTRY, a city in England, county of Warwick, 85 miles northwest of London. Coventry is the center of the ribbon trade, and manufactures also silk fabrics, cambric frilling, cottons, watches, machinery, and bicycles. It sends one member to parliament. Pop. 69,877.

COV'ERDALE, Miles, the earliest translator of the Bible into English, was born in Yorkshire in 1487, died 1568.

COV'INGTON, a city of Kentucky, on the s. bank of the Ohio River, opposite Cincinnati, of which it is substantially a suburb, connected by means of bridges and ferries. It has a large general trade and manufacturing business. Pop. 50,145.

COW, the general term applied to the females of the genus Bos or ox, the most valuable to man of all the ruminating animals. Among the best breeds of dairy cows in Britain are the Devonshire, the Ayrshire, the shorthorn, the polled Angus or Aberdeenshire, and the Alderney. See Ox and cattle.

COW-BERRY, the red whortleberry, a procumbent shrub of high moorlands in Europe, Asia, and N. America, has evergreen box-like leaves, and produces a red acid berry used for jellies and preserves.

COWBOYS, a name first applied to cattle thieves during the war of the American Revolution and later to the herdsmen upon the large cattle ranches of Texas and the West. Cowboys are excellent horsemen and acquire great skill in catching and "rounding up" the cattle on a large range. They are proverbial for their generosity and manliness.

COW-BUNTING, an American bird about the size of the sky-lark. It drops its eggs into the nests of other birds to be hatched by them, but has never been known to drop more than one egg into the same nest. It is migratory spending its winters regularly in the lower parts of North and South Carolina and Georgia, and appearing in Pennsylvania about the end of March. These birds often frequent corn and rice fields in company with the red-winged troopials, but are more commonly found accompanying the cattle, feeding on seeds, worms, etc.

COWLEY (kou'li), Abraham, an English poet of great celebrity in his day, was born at London in 1618, died 1667.

He published his first volume, Poetic Blossoms, at the age of fifteen. He took a considerable interest in science, and was one of the founders of the Royal Society. His chief works are: Love's Riddle, a pastoral comedy; Da-

Young cow-bunting fed by female yellow-throat.

videis, a scriptural epic; Naufragium Joculare; The Mistress, a collection of love verses; Pindarique Odes; Liber Plantarum; etc.

COWPER (kō'pẽr or kou'pẽr), William, English poet, born at Berkhamstead in 1731, died at East Dereham, in Norfolk, 1800. In 1776, on the advice of Mrs. Unwin, he commenced a poem on the Progress of Error, which he followed by three other poems, Truth, Table-talk, and Expostulation; these with some others were published in a volume in 1782. The Task, together with Tirocinium, formed a second volume in 1785. The History of John Gilpin is also due to the suggestion of Lady Austen. The translation of Homer, begun in 1784, occupied him for the next six years, and was published in 1791. He removed during its progress, in 1786, from Olney to Weston. In the beginning of 1794 he was again attacked with madness, which was aggravated by the death of Mrs. Unwin in 1796. The revisal of his Homer, and the composition of some short pieces, occupied the latter years of his life. He is considered among the best of descriptive poets

COW-POX, the vaccine disease which appears on the teats of the cow, in the form of vesicles of a blue color, approaching to livid. These vesicles are elevated at the margin and depressed at the center; they are surrounded with inflammation and contain a limpid fluid. This fluid or virus is capable of communicating genuine cow-pox to the human subject, and of protecting against small-pox either completely, or, at least, against the virulent form of the disease. See Vaccination.

COW'SLIP, the popular name of several varieties of a favorite wild flower found in pastures. It has umbels of small, buff-yellow, scented flowers on short pedicels. Its flowers possess sedative properties, and have been used as an anodyne, a sort of wine being prepared from them.

COW-TREES, a name of various trees having an abundance of milky juice especially a South American tree, which, when wounded, yields a rich milky nutritious juice in such abundance as to render it an important article of food. This fluid resembles in appearance and quality the milk of the cow. The tree is common in Venezuela, growing to the height of 100 ft. The leaves are leathery, about 1 ft. long and 3 or 4 inches broad.

COX, Kenyon, an American painter, born in Ohio in 1856. He studied painting in Paris and on his return to New York painted several portraits which became well known.

COX, Palmer, an American artist and illustrator, born in Quebec in 1840. His most widely known work is his quaint Brownies, consisting of drawings and verses.

COX, Samuel Sullivan, an American author and legislator, born in Ohio in 1824, died in 1889. He was congressman from 1857 almost continually until his death representing districts in Ohio and New York to which state he removed in 1866. He was minister to Turkey in 1885–6. Cox published several light books of politics and travel. He was nicknamed "Sunset Cox" because of one of his glowing descriptions.

COYOTE, the American prairie wolf, several varieties of which inhabit the Western United States and British Columbia. The animal is noted for its disconcerting and continuous yelping during the night. It travels in packs, is as large as a setter dog, and seldom attacks men. The hair is reddish-yellow tipped with black.

CRAB, a popular name for all the ten-footed, short-tailed crustaceans comprising many genera, distinguished from the lobster and other long-tailed decapods by the shortness of their tail, which is folded under the body. Most inhabit the sea, others fresh water, some the land, only going to the sea to spawn. Of the crabs several species are highly esteemed as an article of food, and the fishery constitutes an important trade on many coasts.

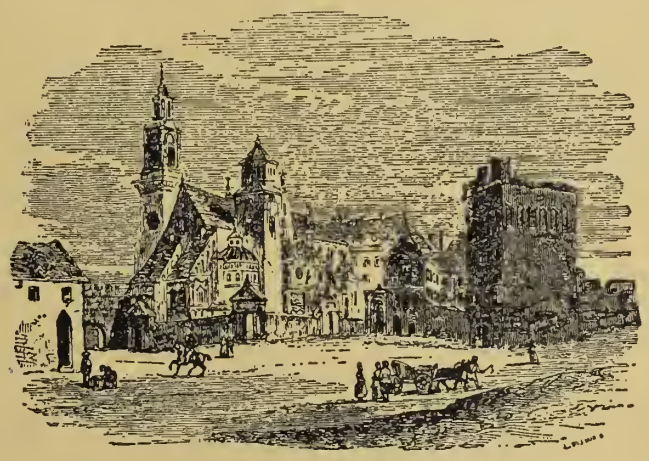
CRAB, a name given to various machines, especially to a kind of portable windlass or machine for raising weights, etc. Crabs are much used in building operations for raising stones or other weights, and in loading and discharging vessels.

CRAB-APPLE, a small, wild, very sour species of apple. See Apple.

CRACOW', the old captital of Poland, in 1815–46 capital of a republic of the same name now forming part of Austrian Galicia, is situated on the left bank of the Vistula, where it becomes navigable, and consists of Cracow proper, or the old city, and several suburbs. It is the see of a bishop, is well built and regularly fortified. The cathedral, a fine old Gothic edifice, contains monuments of many Polish kings, of Kosciusko, etc. The university was founded in 1364, but gradually fell into decay, and was reorganized in 1817. It has a library of 300,000 volumes. On a hill near the town stands the monument of Kosciusko, 120 feet high. Pop. 74,593 (21,000 being Jews); with all its suburbs, 94,696.

CRADLE OF LIBERTY, a name often applied to Faneuil Hall, Boston, owing to the early indignation meetings against British rule held there.

CRAFTS, James Mason, an American chemist, born in Boston in 1839. His investigations have been chiefly concerned with organic chemistry and also with physical chemistry. His method of making certain compounds synthetically is one of the most important of the recent discoveries in chemistry. Crafts has been honored with membership in several learned societies of Europe and America.



The cathedral, Cracow.

CRAIK, Dinah Maria, English novelist, born at Stoke-upon-Trent 1826, her father's name being Mulock She became the wife of George Lillie Craik in 1865. She published a volume of poems under the title of Thirty Years; many essays and papers on ethical and domestic subjects; books for young people, and about twenty-four novels, the best of which are: John Halifax, Gentleman; A Life for a Life; Agatha's Husband; and The Woman's Kingdom. She died in 1887.

CRAMP, an involuntary contraction of a voluntary muscle produced by cold or by long continued action. It can be removed by heat or friction. When a swimmer is attacked by cramp of the leg-muscles he should turn on his back, "float," and vigorously rub the

muscles of the legs. Cramp accompanies colic, cholera, and tetanus, and often attacks the muscles of persons who use the hands continuously, such as writers, telegraph operators, etc.

CRAMP, Charles Henry, an American ship builder born at Philadelphia in 1828, and head of the Cramp Ship Building Compoany. It was this company that built the battleship Maine which was destroyed in Havana Harbor Feb. 15, 1898.

CRAN'BERRY, a native of Europe, N. Asia, and N. America. The berry, when ripe, is globose and dark red, and a little more than ¼ inch in diameter. These berries form a sauce of exquisite flavor, and are used for tarts. The American cranberry, a native of Canada and the U. States, has larger berries than the European species, and is extensively cultivated in some localities.

CRANE, the common name of birds of the genus Grus. They are generally of considerable size, and remarkable for their long necks and stiltlike legs, which eminently fit them for living in marshes

Crowned crane.

and situations subject to inundations, where they usually seek their food. This is partly of vegetable matter, but they also devour insects, worms, frogs, lizards, reptiles, small fish, and the spawn of various aquatic animals. They build their nests among bushes or upon tussocks in marshes, and lay but two eggs. Cranes annually migrate to distant regions, and perform voyages astonishing for their great length. The common crane has the general plumage ash-gray, the throat black, the rump ornamented with long, stiff, and curled feathers, the head with bristly feathers; legs black; length about 4 feet. It inhabits Europe, Asia, and the north of Africa. The crowned crane has the general plumage bluish ash-gray, the tail and primary quills black, the wing coverts pure white; the head is crowned with a tuft of slender yellow feathers, which can be spread out at pleasure. It inhabits North and West Africa. The demoiselle crane is so called from the elegance of its form. It is ash-gray, and the head is adorned with two tufts of feathers formed by a prolongation of the ear-coverts. Its habitat is Africa and the south of Europe. Among North American species are the whooping crane, a larger species than the common crane, and the brown or sand-hill crane.

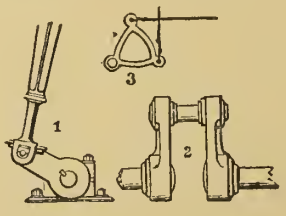
CRANE, a machine for raising great weights and depositing them at some distance from their original place, for example, raising bales from the hold of a ship and depositing them on the quay. Cranes are generally constructed on the principle of the wheel and axle, cog-wheel, or wheel and pinion. A very efficient wheel-and-pinion crane much used on quays consists of a jib or transverse beam, inclined to the vertical at an angle of from 40° to 50°, which, by means of a collar, turns on a vertical shaft. The upper end of the jib carries a fixed pulley, and the lower end a cylinder, which is put in motion by a wheel and pinion. The weight is made fast to a rope or chain which passes over the pulley and is wound round the cylinder. On turning the cylinder (either by a winch handle attached to the wheel which works in the pinion, or by the application of steam-power) the weight is raised as far as necessary. The jib is then turned on its arbor till the weight is brought immediately over the spot where it is to be deposited, and the moving power is withdrawn so as to allow the weight to descend by its own gravity.

CRANE, Stephen, an American writer, born in Newark, N. J., in 1870, died 1900. He was early a war-correspondent and published several military stories, the chief of which was The Red Badge of Courage (1896).

CRANE, William Henry, an American actor, born in Massachusetts in 1845. He became noted in 1877 for his power of comedy when he appeared with Stuart Robson in Our Boarding House. Crane for many years was the leading spirit in the joint performance with Robson in which the partners played the two Dromios in Shakespeare's Comedy of Errors. After his separation from Robson he attempted Falstaff but with poor success.

CRA'NIUM. See Skull.

CRANK, an iron axis with the end bent like an elbow, serving as a handle for communicating circular motion; as, the crank of a grindstone; or for changing circular into longitudinal motion, as in some saw-mills, or longitudinal into circular motion, as in a steam-engine. The single crank (1) can only be used on the end of an axis. The



1 Single crank 2, Double crank. 3, Bell crank.

double crank (2) is employed when it is necessary that the axis should be extended on both sides of the point at which the reciprocating motion is applied. An exemplification of this arrangement is afforded by the machinery of steam-boats. The bell-crank (3), so called from its being much used in bell-hanging, is for a totally different purpose to the others, being used merely to change the direction of motion, as from a horizontal to a vertical line.

CRAN'MER, Thomas, Archbishop of Canterbury, and famous for the part he played in the English reformation during the reign of Henry VIII., was born at Aslacton, Notts, in 1489; executed by burning at Oxford, 1556. An opinion which he gave on the question of Henry VIII.'s proposed divorce from Catharine brought him under the favorable notice of the king. Cranmer was sent for to court, made a king's chaplain, and commanded to write a treatise on the subject of the divorce. In 1530 he was sent abroad with others to collect the opinions of the divines and canonists of France, Italy, and Germany, on the validity of the king's marriage. At Rome he presented his treatise to the pope, but his mission was fruitless. In January, 1533, he was appointed Archbishop of Canterbury. Soon after he set the papal authority at defiance by pronouncing sentence of divorce between Henry and Catharine, and confirming the king's marriage with Anne Boleyn. The pope threatened excommunication, and an act of parliament was immediately passed for abolishing the pope's supremacy, and declaring the king chief head of the Church of England. In 1536 he pandered to Henry's passions by promoting the divorce of Anne Boleyn. He was sent to the Tower on the accession of Mary. He was tried and was sentenced to be degraded and deprived of office. After this flattering promises were made, which induced him to sign a recantation of his alleged errors, and become in fact, a Catholic convert. But when he was brought into St. Mary's Church, Oxford, to read his recantation in public, instead of confessing the justness of his sentence, and submitting to it in silence or imploring mercy, he calmly acknowledged that the fear of death had made him belie his conscience; and declaring that nothing could afford him consolation but the prospect of extenuating his guilt by encountering, as a Protestant penitent, with firmness and resignation, the fiery torments which awaited him. He was immediately hurried to the stake, where he behaved with the resolution of a martyr.

CRAPE, a light transparent stuff, like gauze, made of raw silk, gummed and twisted on the mill, woven without crossing, and much used in mourning.

CRAPS, a dice game. When the amount of the stake is decided upon the first player throws the dice. If the number thrown is two, three or twelve he loses. If seven or eleven he wins. If none of these numbers is thrown he keeps on "shooting" until he again throws the first number, when he wins, or seven, when he loses.

CRATER, the orifice or mouth of a volcano. Craters may be central or lateral, and there may be several subsidiary ones, which may shift their places, or become merged by subsidence into others.

CRAVAT', a neckcloth; an article of silk, muslin, or other material, worn by men about the neck; so called from Fr. cravate, a Croat, because this piece of dress was adopted in the 17th century

from the Croats who entered the French service.

CRAWFISH, or **CRAYFISH,** a name of various crustaceous animals, the common crawfish being the river lobster, a macrurous (long-tailed), ten-footed crustacean, resembling the lobster in appearance and habits. The crawfish by their burrowing habits injure mill-dams and the levees of the Mississippi. Crawfish are regarded by many as furnishing a delicate dish for the table.

CRAWFORD, Francis Marion, an American novelist, born in Italy in 1854. His first publication was Mr. Isaacs 1882, since which time he has produced an average of two novels a year. His principal stories are laid in Italy. Died 1909.

CRAY'ONS, colored pencils obtained from certain mineral substances in their natural state, but more commonly manufactured from a fine paste of chalk or pipe-clay colored with various pigments, and consolidated by means of gum, wax, etc. A kind of crayon painting (or pastel painting) is practiced to some extent, the coloring matter in a soft state being rubbed on with the finger. Its chief advantages consist in the great facility of its execution, and the soft beauty and richness of coloring of effects so easily produced. The paper used has a specially granulated surface.

CREAM, the yellowish, thick, oily layer which forms at the surface when new milk is allowed to remain at rest. When it is agitated or churned butter is formed.

CREAMERY, a name applied to a factory where butter is made. The growth of the creamery industry in the U. States has been enormous since its beginning in 1864. The creamery is usually situated in the middle of a milk producing region and the milk is delivered daily to the factory, and the butter is manufactured by machinery at a great reduction in cost. The largest creamery district in the U. States is that near Elgin, Ill.

CREAM OF TARTAR, or **POTASSIUM BITARTRATE,** exists in grapes, tamarinds, and other foods. It is prepared from the crystalline crust (crude tartar or argol) deposited on the vessels in which grape juice has been fermented. The argol is dissolved by boiling with water, the mixture filtered, and the cream of tartar allowed to crystallize out. The commercial product usually contains a small percentage of calcium tartrate. It is frequently employed in medicine for its diuretic, cathartic, and refrigerant properties; as a mordant in dyeing wool; and as an ingredient in baking-powder.

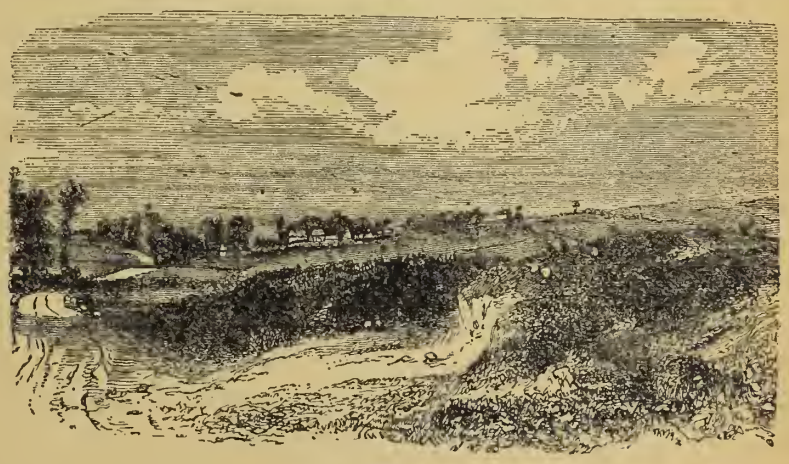
CRE'ASOTE, a substance discovered by Reichenbach about 1831 in wood-tar, from which it is separated by a tedious process. It is generally obtained, however, from the products of the destructive distillation of wood. In a pure state it is oily, heavy, colorless, has a sweetish burning taste and a strong smell of peat smoke or smoked meat. It is a powerful antiseptic. Wood treated with it is not subject to dry-rot or other disease. It has been used in surgery and medicine with great success.

CREASY (krē'si), Sir Edward Shepherd, English historian, was born at Bexley, Kent, in 1812, died 1878. His principal works are: The Rise and Progress of the British Constitution, and The Fifteen Decisive Battles of the World.

CREA'TIONISM, the doctrine that a soul is specially created for each human fetus as soon as it is formed in the womb: opposed to traducianism, which teaches that the souls of children as well as their bodies are begotten by reproduction from the substance of the parents; and to infusionism, which holds that souls are pre-existent, and that a soul is divinely infused into each human fetus as soon as it is formed by generation. Many theologians, however, regard the mode of the soul's coming into being as a part of the mystery which envelops the whole subject of the existence and transmission of life. The term creationism has also recently been applied to that theory of the origin of man which is opposed to evolution.

CRECHE (krāsh), a public nursery for the children of poor women who have to work out during the day, where for a small payment they are nursed and fed during the day, remaining with their parents at night. These institutions were first started in Paris in 1844; they were soon afterward introduced into Great Britain, and are now common in large towns in the U States.

CRECY, or Cressy, a small town of France, in the department of Somme, 9 miles north of Abbeville and 100 miles north of Paris; pop. 1,748. It is celebrated on account of a battle fought here, August 26, 1346, between the English and French. Edward III. and his son, the Black Prince, were both engaged, and the French were defeated with great slaughter, 30,000 foot and 1,200 horse being left dead on the field; among whom were the King of Bohemia, the Count of Alençon, Louis, count of Flanders, with many others of the French nobility.



Battlefield of Crécy.

CRED'IT, in economics, is the postponement agreed on by the parties of the payment of a debt to a future day. It implies confidence of the creditor in the debtor; and a "credit system" is one of general confidence of people in each other's honesty, solvency, and resources. By means of a credit system a comparatively small stock of money can be made to do duty for carrying on a number of different transactions; but it is indispensable for every good system of credit that money must be instantly available when required, and this principle applies to every species of transaction where postponed payment is concerned. Public credit is the confidence which men entertain in the ability and disposition of a nation to make good its engagements with its creditors; or the estimation in which individuals hold the public promises of payment, whether such promises are expressed or implied. The term is also applied to the general credit of individuals in a nation; when merchants and others are wealthy and punctual in fulfilling engagements; or when they transact business with honor and fidelity; or when transfers of property are made with ease. So we speak of the credit of a bank when general confidence is placed in its ability to redeem its notes, and the credit of a mercantile house rests on its supposed ability and probity, which induce men to trust to its engagements. When the public credit is questionable it raises the premium on loans.

CREDIT, Letter of, an order given by bankers or others at one place to enable a person to receive money from their agents at another place.

CREDIT FONCIER (krā-dē foṇ-syā), a peculiar mode of raising money on land in France, the peculiarity of which is that the advance must not exceed one-half of the value of the property pledged or hypothecated, and that the repayment of the loan is by an annuity terminable at a certain date. Several companies have been established by the French government with the privilege of making such loans.

CREDIT MOBILIER (krā-dē mō-bēl-yā), a scheme which originated in France in 1852, its objects being to undertake trading enterprises of all kinds on the principle of limited liability, to buy up existing trading companies, and to carry on the business of bankers and stock-jobbers

CREDITOR, one who has given credit to another Creditors are "general,"

when they have only right of action against the debtor; "secured," when they have a lien protecting them; "preferred" when the law secures them a special right in preference to other creditors. A judgment creditor is one who secured judgment against a debtor.

CREED, a summary of belief, from the Latin credo (I believe), with which the Apostles' and Nicene Creeds begin. These two creeds, together with the Athanasian Creed, are the most ancient authoritative Christian creeds, though numerous ancient formularies of faith are preserved in the writings of the early fathers, Irenæus, Origen, Tertullian, etc., which agree in substance, though with some diversity of expression. The Nicene Creed was so called from being adopted as the creed of the church at the Council of Nicæa or Nice, 325 A.D., though its terms were subsequently somewhat altered. The Apostles' Creed probably dates from the end of the 4th century; but there is no evidence of its being accepted in its present form till the middle of the 8th. The Athanasian Creed was certainly not drawn up by St Athanasius, as there is no sufficient evidence for its existence before the end of the 8th or beginning of the 9th century. In addition to these three creeds, the Roman Catholic Church has the creed of Pius IV., put forth in 1564, and consisting of the Nicene Creed with additional articles adopted by the Council of Trent, to which is now added a profession of belief in the definitions of the Vatican Council. The English Church adopts as "thoroughly to be received and believed" the three ancient creeds, which as part of her liturgy may be read in the Book of Common Prayer, but does not consider any of them to be inspired. Besides the creeds, there are numerous Confessions of Faith, which have been adopted by different churches and sects. The Thirty-nine Articles of the Book of Common Prayer form a confession of faith for the Anglican Church. The creed of the Church of Scotland and other Presbyterian churches is contained in the Confession of Faith, drawn up by the Westminster Assembly of Divines, and completed in 1646.

CREEDMOOR, a station on the Long Island railway, 11 miles east of the city of New York. It is much frequented by riflemen for target practice.

CREEK, a small inlet, bay, or cove; a recess in the shore of the sea or of a river. In America and Australia the term is often applied to a small river or rivulet.

CREEKS, American Indians formerly in Georgia and Alabama, but now planted in the Indian Territory. The number of warriors used to amount to about 6000, but altogether the tribe does not now exceed 15,000. They have made considerable progress in agriculture, and raise horses, cattle, fowls, and hogs, and cultivate tobacco, rice, and corn.

CREEPERS, a family of birds which strongly resemble the woodpeckers in their habit of creeping on the stems of trees with the aid of the strong quills which project from the tail-feathers, and of securing their insect food by an exsertile tongue. The common creeper is European, but is represented by American species. It is a pretty and interesting little bird, which builds its nest usually in holes or crevices of trees. The wall-creeper of Southern Europe searches for its insect food on rocks. The family is found in all parts of the world.

CREMA'TION, the burning of the bodies of the dead, a practice which was frequent in ancient times instead of burial, and which has recently been advocated on hygienic grounds by many scientific men in Europe and America on account of the dangers to the living caused by the presence of graveyards and cemeteries. Various methods of cremation have been proposed, the great difficulty being to consume the body without permitting the escape of noxious exhalations, and without mingling the ashes with foreign substances. In Siemens' process, a modification of a plan of Sir Henry Thompson, this is successfully accomplished. Cremation societies exist in many countries, and crematories have been erected in or near not a few towns

CREMO'NA, a city of Italy, capital of province of same name, on the left bank of the Po, 47 miles s e. by e. of Milan. It is surrounded by walls and wet ditches, its circumference being nearly five miles. The most remarkable edifice is the cathedral, begun in 1107 and completed about 1491. Close by and connected with the cathedral, is the Torazzo, one of the loftiest and most beautiful towers in Italy. Cremona is the seat of a bishopric, and has considerable manufactures of silk, wool, cotton, etc. It was at one time celebrated for its violins, especially those made by Antonius Straduarius, Joseph Guarnerius, and members of the Amati family. Pop. 37,693. The province has an area of about 500 sq. miles, and a population of 300,000.

CRE'OLE is the name which was originally given to all the descendants of Spaniards born in America and the West Indies. It is now used in a wider sense to signify the descendants of Europeans of any nation born in S. America and the West Indies, as well as in some other localities.

CREOSOTE. See Creasote.

CRESCENDO (kre-shen'dō), or Cres. (Italian), a musical term signifying that the notes of the passage over which it is placed are to be gradually swelled.

CRES'CENT, an emblem representing the moon in her horned state. This emblem is of very high antiquity, being that of the Greek goddess Artemis or Diana. It is found on medals of many ancient cities, particularly of Byzantium, from whence it is supposed to have been borrowed by the Ottomans. Since their establishment in Europe it has been the universal emblem of their empire. The crescent has given name to a Turkish order of knighthood from the form of the badge, instituted by Selim, sultan of Turkey, in 1801.

CRESS, the name of several species of plants. Water-cress is used as a salad, and is valued in medicine for its anti-scorbutic qualities. The leaves have a moderately pungent taste. It grows on the brinks of rivulets and in moist grounds

CRESSELLE (kre-sel'), a wooden rattle used in some Roman Catholic countries during Passion Week instead of bells, to give notice of divine worship.

CRESSET, a name which appears to have been given in the middle ages and later indifferently to the fixed candlesticks in great halls and churches, to the

Various forms of cressets.

great lights used as beacons and otherwise; and to lamps or fire-pans suspended on pivots and carried on poles in processions, municipal and military watches, etc.

CRESSY. See Crécy

CRETA'CEOUS (or Chalk) **SYSTEM,** in geol. the upper strata of the Secondary series, immediately below the Tertiary series, and superincumbent on the Oolite system. This group is common to Europe, and also to a part of Asia. It consists of chalk resting upon arenaceous and argillaceous deposits, which are also regarded as part of the system.

CRETE. See Candia.

CRET'INISM, a form of idiocy associated with a peculiar condition of the body, occurring in Switzerland and other mountainous countries. Cretins are usually affected with goitre, and are usually the offspring of goitrous parents They are ill grown and stunted, with swollen bellies. The skin is coarse, head large, the nose sunken and flattened at the bridge, the lips thick, chin protruding, mouth wide and gaping, the tongue large. The countenance is dull and heavy; there is general muscular weakness and slowness of sensibility. Associated with these are feebleness or want of intellect, varying in degree from absolute vacuity to a certain power of acquiring a little knowledge; sometimes deafness and dumbness, perhaps squinting and blindness. Careful training may do much for them, along with good food, cleanliness, exercise, etc.

CRETONNE (kre-ton'), a cotton cloth with various textures of surface, printed on one side with pictorial and other patterns, and used for curtains, covering furniture, etc.

CREUSE (kreuz), an inland department, France, comprising most part of the old province of Marche; area, 2150 sq. miles. Pop. 284,942.

CRIB'BAGE, a game at cards played with the whole pack. It may be played by two, three, or four persons; and when by two, five or six cards may be dealt to each. Five-card cribbage played by two persons is the most scientific game. Sixty-one-points make the game; there are no tricks and no trumps, the object being to make pairs, fifteens, sequences, or the go, or prevent the adversary from doing the same. Court

cards and tens count as ten each, and all the rest count for the number of "pips" upon them. Every pair, that is, every couple of cards of the same value belonging to different suits (two aces, two fours, two kings, etc.), counts two; and when there are three or four similar cards, as many pairs are counted as there are different combinations of the cards taken two at a time. Every combination of cards, the united pips of which make up fifteen, counts two. A sequence consists of three or more cards of any suit following one another in rank, and counts one for each card. When the player whose turn it is to play cannot play a card without going beyond thirty-one, the other player scores one for having been the nearest to thirty-one. This is called scoring one for "the go." The remaining cards after thirty-one, or the next point to it, is made, are thrown up, and each player's cards are counted. When all the cards in a hand, either with or without the turn-up card, are of one suit, or when all the cards in the crib, with the turn-up card, are of one suit, it is called a flush, and counts one for each card When the turn-up card is a knave the dealer scores two ("two for his heels"). When a knave of the same suit with the turn-up card is found in the hand of either player, the player in whose hand it is scores one ("one for his nob").

CRICHTON (krī'ton), James, surnamed the Admirable, a Scottish celebrity, son of Robert Crichton, lord-advocate, was born in 1560, died about 1585. He was educated at the University of St. Andrews, and according to the current accounts of him, before his twentieth year, had run through the whole circle of the sciences, could speak and write to perfection ten different languages and was equally distinguished for his skill in riding, fencing, singing, and playing upon all sorts of instruments. He visited Paris, Genoa, Venice, Padua, etc., challenging all scholars to learned disputations, vanquishing doctors of the universities, and disarming the most famous swordsmen of the time in fencing. He was latterly tutor to a son of the Duke of Mantua, and is said to have been stabbed to the heart in a dastardly manner by his pupil. The story of his achievements seems to be rather highly colored; but he was extravagantly praised by Aldus Manutius the printer of Venice, by whom he was well known. He left some Latin poems, which are said to be possessed of no remarkable quality.

CRICKET, the house-cricket is about an inch long, with antennæ of about an inch and a half, of a pale yellowish color mixed with brown By the friction of the peculiarly-formed wing-covers the males produce that stridulous sound by which these insects are so well known, and which has become associated with ideas of cheerful domestic comfort. They live in holes and crevices near fire places or in other warm situations, whence they come out at night to feed on crumbs and other fragments of food. The field-cricket makes a similar noise.

CRICKET, an open-air game played with bats, balls, and wickets on a place of smooth green sward. It is played by two opposite sets or sides of players, generally numbering eleven each. Two wickets of three stumps each are pitched fronting each other at a distance of about 22 yards apart, the stumps being upright rods stuck in the ground, and projecting 27 inches. On the top of each set of stumps are placed two small pieces of wood called bails. After the rival sides have tossed for the choice of either taking the bat or fielding, two men are sent to the wickets bat in hand. The opposite or fielding side are all simultaneously engaged; one (the bowler) being stationed behind one wicket for the purpose of bowling his ball against the opposite wicket, where his coadjutor (the wicket-keeper) stands ready to catch the ball should it pass near him; the other fielders are placed in such parts of the field as is judged most favorable for stopping the ball after it has been struck by the batsman or missed by the wicket-keeper. It is the object of the batsman to prevent the ball delivered by the bowler reaching his wicket either by merely stopping it with his bat or by driving it away to a distant part of the field. Should the ball be driven any distance the two batsmen run across and exchange wickets, and continue to do so as long as there is no risk in being "run out," that is, of having the stumps struck by the ball while they are out of their position near the wickets. Each time the batsmen run between the wickets is counted as a "run," and is marked to the credit of the striker of the ball. If the batsman allows the ball to carry away a bail or a stump, if he knocks down any part of his own wicket, if any part of his person stops a ball that would have otherwise reached his wicket, or if he strikes a ball so that it is caught by one of the opposite party before it reaches the ground he is "out," that is, he gives up his bat to one of his own side; and so the game goes on until all the men on one side have played and been put out. This constitutes what is called an "innings." The other side now take the bat and try to defend their wickets and make runs as their rivals did. Generally after two innings each have been played by the contestants the game comes to an end, that side being the victors who can score the greatest number of runs.

CRILLON (krē-yōn), Louis des Balbes de Berton de, great French warrior of the 16th century, born in 1541, died 1615. He distinguished himself in five successive reigns.

CRIME, a term used to indicate sometimes a violation of the higher moral law, sometimes more specifically the violation of a certain group of the laws formulated by a nation. This group properly comprises in its scheme all offenses endangering the welfare of the community, as distinct from civil or private injuries, which are as between person and person, and terminate with the compensation of the injured. Hence, from the legal point of view crime is sometimes defined as an offense punishable by law directly, as opposed to an offense which the law punishes indirectly by granting damages to the person wronged. (See Criminal Law.) Whether used in the legal or the moral sense crime implies freedom of will, the power of distinguishing between right and wrong, and a fulfilled intention. Hence, though the theoretic rule of common law is that all infraction of law is criminal and penal, it is held that young children, madmen, and idiots cannot commit crimes.

CRIME'A, The, a peninsula of southern Russia; area, 10,000 sq. miles. Three-fourths of the Crimea belongs to the regions of steppes, but the other part, confided entirely to the south, and stretching along the coast from west to east, abounds in beautiful mountain scenery. Here the valleys looking southward are luxuriant with vines and olive and mulberry plantations, while the northern slope gives a large yield in cereals and fruits. The climate, however, is unequal, and in winter is severe. The forests are of limited extent. Pop. estim. at 450,000. The chief town and port is Sebastopol. In 1783 the Russians took possession of the country; and with the view of overawing the Turks the great naval arsenal of Sebastopol, occupying the most commanding position in the Black sea, was begun by Catharine II. in 1786. Its military resources were steadily developed up to the time of the Anglo-French campaign (see Crimean War) of 1854, when it fell into the hands of the allies.

CRIME'AN WAR, the struggle between England, France, and Turkey on the one hand, and Russia on the other, to prevent the undue preponderance of Russia in the east of Europe; 1854 to 1856. The old plans for the extension of Russian power conceived by Catharine II. and Potemkin were resuscitated by Nicholas I., who, believing that he had secured himself from interference on the part of Austria and Prussia, and that an Anglo-French alliance was impossible, prepared to carry them into action. Servia, Bosnia, Bulgaria, and the principalities of the Danube were to become Russian protectorates, and Constantinople was to be provisionally occupied by Russian troops. The first markedly aggressive step—the demand by Russia for a protectorate over the Greek Church throughout the Turkish empire—brought matters to a crisis. An ultimatum presented by Menschikoff in May, 1853, was rejected by the Porte; the Russians occupied the Danubian principalities; and war was declared by the Porte in October, 1853, by France and England in 1854, and by Sardinia in 1855. A French and English fleet entered the Baltic and captured Bomarsund and one of the Aland Islands, and in the south the allies landed at Varna, under Lord Raglan and Marshal St. Arnaud as commanders-in-chief. While the allies were making preparations Prussia and Austria demanded the evacuation of the Danubian principalities, and on evacuation being ordered by Nicholas, "for strategic reasons," the principalities were provisionally occupied by the Austrians. It soon became obvious that the Crimea must be the seat of the war, and 50,000 French and English troops with 6000 Turks were landed at Eupatoria (Sept. 1854). Five days later the

battle of Alma was won by the allies (20th Sept.), and the march continued toward the south side of Sebastopol. Soon after St. Arnaud died and was succeeded by Canrobert. The siege of Sebastopol was commenced by a grand attack which proved a failure, and the Russians under Liprandi retaliated by attacking the English at Balaklava (Oct. 25), but were defeated with heavy loss. It was at this battle that the famous, but useless, charge was made by the Light Brigade. A second attack at Inkerman was again repulsed by the allies, but the siege works made slow progress during the winter, in which the ill-supplied troops suffered great privations. The death of Nicholas and succession of Alexander II., in March, 1855, brought no change of policy. Canrobert resigned in favor of Pélissier; and shortly after an unsuccessful attack on those parts of the fortification known as the Malakhoff and Redan Lord Raglan died, and was succeeded by Simpson. The bombardment was continued, and in September the French successfully stormed the Malakhoff, the simultaneous attack on the Redan by the British proving a failure. The Russians, however, then withdrew from the city to the north forts and the allies took possession. The chief subsequent event was the capture of Kars, in Asia, by the Russians after a splendid defense by the Turks under General Williams By this time, however, the allies had practical possession of the Crimea, and overtures of peace were gladly accepted. A treaty was accordingly concluded at Paris on 27th April, 1856, by which the independence of the Ottoman Empire was guaranteed. See Paris, Treaty of.

CRIMINAL LAW, the law relating to crimes The general theory of the common law is, that all wrongs are divisible into two species: first, civil or private wrongs or torts; secondly, criminal or public wrongs. The former are to be redressed by private suits or remedies instituted by the parties injured. The latter are redressed by the state acting in its sovereign capacity. The general description of the private wrongs is, that they comprehend those injuries which affect the rights and property of the individual, and terminate there; that of public wrongs or offenses being, that they comprehend such acts as injure, not merely individuals, but the community at large, by endangering the peace, the comfort, the good order, the policy, and even the existence of society. In the first, therefore, so far as the law is concerned, the compensation of the individual, whose rights have been infringed is held to be a sufficient atonement; but in the second class of offenses it is demanded that the offender make satisfaction to the community as acting prejudically to its welfare. The exact boundaries between these classes are not, however, always easy to be discerned, even in theory; for there are few private wrongs which do not exert an influence beyond the individual whom they directly injure. The divisions, torts and crimes, are thus not necessarily mutually exclusive, cases sometimes occurring in which the person injured obtains damages, while at the same time the criminal is subjected to punishment, not as against the individual, but as against the state. It is, moreover, obvious that legal criminality is not in any strict sense the measure of the morality of actions, though the legal enactment tends to enforce itself as a moral law. In large part it is only an approximate expression of the current sense of justice, this expression being both aided and hindered by the historical and constantly reflexive character of legal method. The basis of the criminal law of Britain and the United States is to be found in a series of loose definitions and descriptions, of which many, and those among the more important, date from the 13th century. The irregular superstructure reared upon these consists mainly of parliamentary enactments which originated in the 18th century.

In the United States the common law of England generally obtains, in some states more than in others, while in all there is a criminal code, or a mass of statutes defining crime and fixing the punishment. On the other hand, the United States itself has a criminal code consisting of congressional enactments. The various states have wide differences in their statutory laws with reference to crime.

CRIMINOLOGY, the science which deals with crime and its social and individual causes. Criminology in its most rational form, is embodied in the writings of Cesare Lombroso, the Italian alienist, but the attempts of less capable persons, such as professors of sociology, prison chaplains, wardens, "students," and uncultured physicians, have, especially in the United States, reduced the entire discussion to the level of a farce. Intelligently to understand criminology one must first master the main facts of organic evolution, anthropology, and human anatomy.

CRIMSON, a rich deep red color, a red that owes its characteristic tint to a certain admixture of blue.

CRIN'OLINE, properly a kind of fabric made chiefly of horse-hair, but afterward generally applied to a kind of petticoat supported by steel hoops, and intended to distend or give a certain set to the skirt of a lady's dress. Hooped skirts (farthingales or fardingales), supported by whalebone, were worn in the time of Queen Elizabeth and James I., and the fashion was again introduced in the time of George II. The crinoline proper came in about 1856, and was worn by women of all ranks, sometimes proving by their portentous dimensions a source of much inconvenience and no little danger. The immense bell-shaped crinolines happily fell into disuse about 1866. Crinoline wire was for years a leading branch in the steel trade. A horse-hair and cotton fabric used as a material for making ladies' bonnets is also called crinoline.

CRIP'PLE CREEK, a town and county-seat of Teller County, Col., 30 miles west-southwest of Colorado Springs. It was founded in 1890, developed rapidly after 1893, and was nearly destroyed by fire in 1896. Population, 10,147; the district contains about 50,000.

CRI'SIS, in medicine, the turning-point in a disease at which a decided change for the better or the worse takes place. In regular fevers the crisis takes place on regular days, which are called critical days (the 7th, 14th, and 21st) sometimes, however, a little sooner or later, according to the climate and the constitution of the patient. The word crisis is also figuratively used for a decisive point in any important affair or business, for instance, in politics and commerce. Commercial crises have been in an especial degree the subjects of study at the hands of economists with the result of establishing a curious periodicity in their recurrence.

CRISP, Charles Frederic, an American politician and lawyer, born in England in 1845, died 1896. He came to the United States as a child. He fought in the Confederate army and from 1891 to 1895 was speaker of the national house of representatives.

CRISPI, Francesco, an Italian statesman born in Sicily in 1819, died in 1901. He was a helper of Garibaldi, and in 1876 he was elected president of the Chamber of Deputies. From that time to 1898 he was prominent in European politics as cabinet officer and prime minister of Italy. In 1898 he retired to the practice of law and occasionally wrote for popular magazines on questions of European policy.

CRIT'TENDEN, John Jordan, an American statesman, born in Kentucky in 1787, died in 1863. He served in the war of 1812, was United States senator for 20 years, governor of Kentucky in 1848–50, and twice United States attorney-general. He proposed the Crittenden compromise, which aimed at the permanent retention of slavery in all states in which slavery existed.

CROA'TIA, a country which forms with Slavonia and the former "Military Frontiers" a province of the Hungarian portion of the Austrian monarchy, partly bounded by the Adriatic; total area, 16,411 sq. miles. The inhabitants are Croats and Serbs (both Slavs by race), with a mixture of Germans, Hungarians, Jews, and Gypsies. About three-fourths of the population are R. Catholics, the rest belong chiefly to the Greek Church. The chief towns are Agram (the capital), Warasdin, and Karlstadt. Pop. 2,184,414.

CROCHET (krō'sha), a species of knitting performed with a small hook, of ivory, steel, or wood, the material used being woolen, cotton, or silk thread. Various fancy articles are made in crochet-work.

CROCKETT, David, an American backwoodsman, born in Tennessee in 1786, died in 1836. He was the originator of the aphorism "Be sure you're right, then go ahead." Crockett was the ideal of the American pioneer. He fought in the Indian war under Jackson and was elected to congress and was killed while defending the Alamo.

CROC'ODILE, a genus, family, and order of saurian reptiles, comprising the largest living forms of reptiles. The characters of the order Crocodilia are as follows:—The skin is covered with square bony plates; the tail is long and

compressed laterally. The four feet are short, and there are five toes on each of the two fore-feet, and four on each of the two hind-feet, the latter more or less webbed; the limbs are feeble. The jaws are long and their gape of enormous width. The nostrils are at the extremity of the snout, and capable of being closed to prevent ingress of water. The heart is four-chambered. Crocodiles have unequal teeth and no

Crocodile.

abdominal plates, and the cervical and dorsal plates are distinct for the most part. The crocodile of the Nile is the best-known member of the order; another species is met with in South Asia, Sunda, and the Moluccas. The crocodile is formidable from its great size and strength, but on shore its shortness of limb, great length of body, and difficulty of turning enable men and animals readily to escape pursuit. In the water it is active and formidable. It is exclusively carnivorous, and always prefers its food in a state of putrefaction. In Egypt it is no longer found except in the upper or more southern parts, where the heat is greatest and the population least numerous. Crocodiles are still common enough in the river Senegal, the Congo, Niger, etc. They grow sometimes to a length of 30 feet, and apparently live to a vast age.

CROCUS, a genus of plants, forming one of the most common ornaments of the garden. They may be divided, according to their period of flowering, into vernal and autumnal. Among the vernal crocuses may be mentioned the white and purple, distinguished by the yellow tube of its flower bearded with hairs, and its sweet scent; the Scotch crocus, with beautiful pencilled sepals, and clear or bluish-white petals. Among the autumnal species are two whose long, reddish-orange, drooping stigmas, when dried, form saffron. See Saffron.

CRŒSUS, the last king of Lydia, son of Alyattes, whom he succeeded in 560 B.C., extending the empire from the northern and western coasts of Asia Minor to the Halys on the east and Mount Taurus on the south, including the Greek colonies of the mainland. His riches, obtained chiefly from mines and the gold-dust of the river Pactolus, were greater than those of any king before him, so that his wealth became proverbial.

CROFTERS, petty farmers renting a few acres of land, with sometimes the right of grazing their cattle in common on a piece of rough pasture. Crofters are numerous in the Highlands and in the Western Islands of Scotland, as well as in some other localities.

CROKER, Richard, an American politician born in Ireland in 1843, emigrated to N. Y. City as a child. He began life as a laborer and entered politics as a ward worker. He served as alderman, rose in power in Tammany Hall, and in 1886 became the democratic leader of New York City politics. In 1902 he resigned from Tammany and went to England to live.

CROLY, Jane Cunningham, (Jennie June), an American writer, born in England in 1831, emigrated to the United States as a girl. She died in 1901. She was widely known for the part she took in women's reform movements and women's clubs. She was a liberal contributor to newspapers and magazines and published several books for women.

CROMLECH (krom'lek), an ancient monument consisting of two or more columns of unhewn stone supporting a large tabular block so as to form a rectangular chamber, beneath the floor

Cromlech at Lanyon, Cornwall.

of which is sometimes found a cist inclosing a skeleton and relics. Sometimes the cromlech was encircled by a ring of standing-stones, as in the case of the standing-stones of Stennis, in Orkney; and sometimes it was itself buried beneath a large mound of earth.

CROM'WELL, Oliver, Lord-protector of the Commonwealth of England, Scotland, and Ireland, was born at Huntingdon April 25, 1599. The first really authentic fact in his biography is his leaving school at Huntingdon and entering Sidney-Sussex College, Cambridge, April 23, 1616. On the death of his father in 1617 he returned home, and in 1620 married Elizabeth, daughter of Sir James Bourchier. In 1628 he

Oliver Cromwell.

was member of parliament for the borough of Huntingdon, to which he returned on the dissolution in 1629. During the short and long parliaments he represented Cambridge, his influence gradually increasing. At the battle of Winceby (1643) he led the van narrowly escaping death, and in the following year he led the victorious left at Marston Moor, deciding the result of the battle. As the result of the discipline introduced by Cromwell the decisive victory of Naseby was gained in 1645, and Leicester, Taunton, Bridgewater, Bristol, Devizes, Winchester, and Dartmouth fell into the hands of the parliament. On the occasion of the surrender of Charles by the Scottish army in 1646 Cromwell was one of the commissioners. Though at first supporting parliament in its wish to disband the army, which refused to lay down its arms till the freedom of the nation was established, he afterward saw reason to decide in favor of the latter course. Hastily suppressing the Welsh rising, he marched against the Scottish royalists, whom he defeated with a much inferior force at Preston (Aug. 17, 1648). Then followed the tragedy of the king's execution, Cromwell's name standing third in order in the death-warrant. Affairs in Ireland demanding his presence, he was appointed lord-lieutenant and commander-in-chief; and by making a terrible example of Drogheda (September, 1649), crushed the royalist party in that country within six months. Resigning the command to Ireton, he undertook, at the request of the parliament, a similar expedition against Scotland, where Charles II. had been proclaimed king. With an army greatly reduced by sickness he saved himself from almost inevitable disaster by the splendid victory at Dunbar (Sept. 3, 1650), and a year later put an end to the struggle by his total defeat of the royalists at Worcester (Sept. 3, 1651).

He already exerted a weighty influence in the supreme direction of affairs, being instrumental in restoring the continental relations of England, which had been almost entirely dissolved, and regulating them so as to promote the interests of commerce. The navigation act, from which may be dated the rise of the naval power of England, was framed upon his suggestion, and passed in 1651. The rump parliament, as the remnant of the long parliament was called, had become worse than useless, and on April 20, 1653, Cromwell, with 300 soldiers, dispersed that body. He then summoned a council of state, consisting mainly of his principal officers, which finally chose a parliament of persons selected from the three kingdoms, nicknamed Barebone's Parliament, or the Little Parliament. Fifteen months after a new annual parliament was chosen; but Cromwell soon prevailed on this body, who were totally incapable of governing, to place the charge of the commonwealth in his hands. The chief power now devolving again upon the council of officers (Dec. 12, 1653), they declared Oliver Cromwell sole governor of the commonwealth, under the name of Lord-protector, with an assistant council of twenty-one men. The new protector behaved with dignity and firmness. Despite the innumerable difficulties which beset him from adverse parliaments, insurgent royalists, and mutinous republicans, the early months of his rule established favorable treaties with Holland, Sweden, Portugal, Denmark, and France. In Sept. 1656 he called a new parliament, which undertook the revisal of the constitution and offered Cromwell the title of king. On his refusal he was again installed as Lord-protector. but with his powers

now legally defined. Early in the following year, however, he peremptorily dissolved the house, which had rejected the authority of the second chamber. Abroad his influence still increased, reaching its full height after the victory of Dunkirk in June, 1658. But his masterly administration was not effected without severe strain, and upon the death of his favorite daughter, Elizabeth Claypole, in the beginning of August, 1658, his health began to fail him. Toward the end of the month he was confined to his room from a tertian fever, and on Sept. 3, 1658, died at Whitehall, in the sixtieth year of his age. He was buried in King Henry VII.'s Chapel, in Westminster Abbey, but after the restoraton his body was taken up and hanged at Tyburn, the head being fixed on a pole at Westminster Abbey, and the rest of the remains buried under the gallows.—Great as a general, Cromwell was still greater as a civil ruler.

CRONSTADT (kron'stât), a town of Austria, in Transylvania, after Hermannstadt the principal seat of the industry and trade of the province, lying in a mountainous but well-wooded and romantic district near its southeast corner. Pop. 34,511.

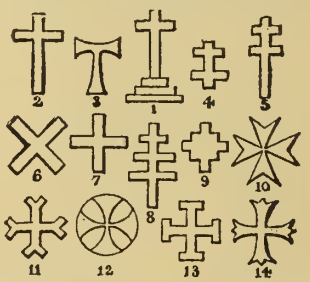
CRONSTADT, a maritime fortress of Russia, about 20 miles w. St. Petersburg, both by its position and the strength of its fortifications, the bulwark of the capital, and being also the most important naval station of the empire. Cronstadt used to be the commercial port of St. Petersburg, but since the construction of a canal giving large vessels direct access to the capital it has lost this position. Pop. 48,276.

CROOKES, Sir William, a noted British chemist and physicist, born in London in 1832. He was one of the earliest physicists to study radio-activity, and invented the term "radiant matter." He did most valuable work in spectroscopy, in the chemistry of dyes, and devised the Crookes tubes which led to the discovery of the X-ray. His radiometer, a little instrument which is moved by light-rays, is familiar to almost everyone who has looked into the show-window of an optician.

CROQUET (krō'ka), an open-air game played with balls, mallets, hoops, and pegs on a level area, which should be at least 30 yards long by 20 wide. The iron hoops (shaped like the letter U) are fixed with their two ends in the ground, arranged in a somewhat zigzag manner over the ground; they are usually ten in number. The posts or pegs (two in number) are placed at the near and far end of the field respectively, marking the starting and turning points. The game may be played by any number of persons up to eight, either individually, or arranged in couples or in sides. The object of the players is to drive with the mallets the balls belonging to their own side through the hoops and against the posts in a certain order, and to prevent the balls of their opponents from completing the journey before their own by playing them against those of the enemy, and driving them as far as possible from the hoop or post to be played for; the player or players whose balls first complete the course claiming the victory.

CROSBY, Frances Jane, an American writer of hymns, born in New York in 1820. She became blind when a child, a fact which probably influenced her religious emotionality. Among her well known hymns are "Safe in the Arms of Jesus," and "Pass Me Not O Gentle Savior."

CROSS, one straight body laid at any angle across another, or a symbol of similar shape. Among the ancients a piece of wood fastened across a tree or upright post formed a cross, on which were executed criminals of the worst class It had, therefore, a place analogous to that of the modern gallows as an instrument of infamous punishment until it



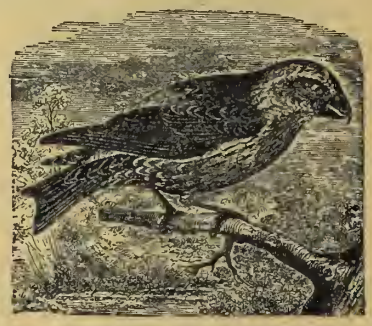
1, Cross of Calvery, a cross on three steps. 2, Latin Cross, a cross the transverse beam of which is placed at one-third the distance from the top of the perpendicular portion, supposed to be the form of cross on which Christ suffered. 3, Tau Cross, (so called from being formed like the Greek letter r, tau), or cross of St. Anthony, one of the most ancient forms of the cross. 4, Cross of Lorraine. 5, Patriarchal Cross. 6, St. Andrew's Cross, the form of cross on which St. Andrew, the national saint of Scotland, is said to have suffered. 7, Greek Cross, or cross of St. George. the national saint of England, the red cross which appears on British flags. 8, Papal Cross. 9, Cross nowy quadrat, that is, having a square expansion in the center. 10, Maltese Cross, formed of four arrow-heads meeting at the points; the badge of the Knights of Malta. 11, Cross fourchée or forked. 12, Cross pattée or formée. 13, Cross potent or Jerusalem Cross. 14, Cross fleury, from the fleur de lis at its ends.

acquired honor from the crucifixion of Christ. The custom of making the sign of the cross in memory of Christ may be traced to the 3d century. Constantine had crosses erected in public places, palaces, and churches, and adopted it, according to a legend, as the device for a banner in consequence of a dream representing it as the symbol of victory. In his time also Christians painted it at the entrance of their houses as a sign of their faith, and subsequently the churches were for the most part built in the form of a cross. It did not, however, become an object of adoration until after the alleged discovery of the true cross by the Empress Helena (A.D. 326). Its adoption as the Christian symbol may be held to connect itself with the fact that it was used emblematically long before the Christian era, in the same way that traces of belief in a trinity, in a war in heaven, in a paradise, a flood, a Babel, an immaculate conception, and remission by the shedding of blood, are to be found diffused amongst widely sundered peoples. The general meaning attached to the sign appears to have been that of life and regeneration Since its adoption by Christianity it has undergone many modifications of shape, and has been employed in a variety of ways for ornaments, badges, heraldic bearings, etc. After the introduction of the cross into the military ensigns of the crusaders its use in heraldry became frequent, and its form was varied more than that of any other heraldic ordinary, some of the varieties being of great beauty. The name cross is also given to various architectural structures, of which a cross in stone was a prominent feature; thus we have market crosses, peaching crosses, monumental crosses, etc

CROSS, Exaltation of the, a Catholic festival celebrated on the 14th of September in honor of the recovery of a portion of the true cross from the Persians by Heraclius (628 A.D.) and its erection on Mount Calvary.

CROSS, Victoria. See Victoria Cross

CROSS'BILL, a genus of birds of the finch family, deriving their name from a peculiarity of their bill, the mandibles of which are curved at the tips, so as to



American crossbill.

cross each other, sometimes on the one side and sometimes on the other. The form of the bill enables them to extract with ease the seeds of the pine, their usual food, from underneath the scales of the cones. They build and also breed at all seasons of the year, in December, as in March, April, or May

CROSS-BILL, a bill brought by a defendent against he complainant in an action at law. It is used in equity or chancery cases, and its purpose is to bring the details of the case more fully before the court.

CROSS-BOW, or **ARBALIST,** formerly a very common weapon for shooting, consisting of a bow fastened athwart a stock. The bow, which was often of steel, was usually bent by a lever windlass, or other mechanical contrivance, the missile usually consisting of a square-headed bolt or quarrel, but occasionally of short arrows, stones, and leaden bullets. Though largely used on the European continent the cross-bow was superseded at an early period in England by the more efficient long-bow, from which twelve arrows could be despatched per minute to three bolts of the cross-bow

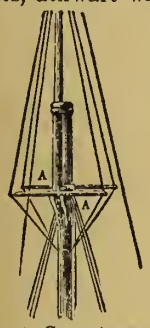
CROSS-BREEDING, the breeding together of animals of different races or stocks. See Breeding.

CROSS-EXAMINATION, a term applied to the examination given a witness by one party to a suit after the other party has finished the direct examination. Cross examination always assumes previous examination There

is re-cross examination (when re-direct examination has been taken up after cross-examination) and cross-examination "in rebuttal"—to re-direct examination. Cross examination must be limited to matters touched upon by direct examination. Its purpose is to weaken the value of the witness's testimony.

CROSS-FERTILIZATION, in botany, the fertilization of the ovule of one flower by the pollen of another, usually effected by the agency of insects, the action of the wind, water, etc. See Botany.

CROSS-TREES, in ships, certain pieces of timber at the upper ends of the lower and top masts, athwart which they are



A A, Cross-trees.

laid, to sustain the frame of the tops in the one, and extend the top-gallant shrouds on the other.

CRO'TON, a genus of herbaceous plants, shrubs, and trees, order Euphorbiaceæ, comprehending a great number of species, many of which possess important medical properties. See Croton Oil.

CROTON-OIL, a vegetable oil expressed from the seeds of the Croton. It is so strongly purgative that one drop is a full dose, and half a drop will sometimes produce a powerful effect, and it should never be used except by the direction of an experienced physician. When applied externally it causes irritation and suppuration, and thus it is used as a counter-irritant in neuralgia, etc.

CROUCH, Frederick Nicholls, an American musician born in London in 1808, died in Maine in 1896. His principal works were Kathleen Mavourneen, The Soldier's Grave, The Emigrant's Lament, Friendship, and Twenty Years Ago.

CROUP (krōp). Two diseases are commonly confounded under the term "croup," one a simple and, if promptly treated, a readily subdued disease, the other most fatal. The former is simple inflammation of the inner lining membrame of the larynx—the box of the windpipe—or of the windpipe itself, or of both. It is common in children, and as the air-passage of children is narrow, the swelling produced by the inflammation so diminishes the fair-way that difficult breathing, hoarseness of voice, and a cough like a muffled bark are quickly produced, while the breathing sounds loud and harsh. The other disease is diphtheria of the larynx or windpipe, or both, in which a false membrane is formed which lines the air-passages, and so narrows them. Croup frequently proves fatal by suffocation, induced either by spasm affecting the glottis, or by a quantity of matter blocking up the air-passages. The earliest symptoms should be noted, and the treatment in the absence of immediate medical advice should consist in the application of hot poultices to the upper part of the chest, while at the same time the child is made to inhale the steam from hot water. Hot drinks are beneficial, and the bowels should be freely opened.

CROW, a genus of birds, type of the family Corvidæ. It includes, as British species, the carrion-crow, the hooded or Royston crow, the raven, the rook, and the jackdaw, the last three of which are described under their respective heads. The carrion-crow, or simply the crow, is 18 or 19 inches in length, and about 36 between the tips of the wings. Its plumage is compact and glossy blue-black with some greenish reflections. Its favorite food is carrion of all kinds; but it also preys upon small quadrupeds, young birds, frogs, lizards, etc., and is a confirmed robber of the nests of game birds and poultry. It is not gregarious, being generally met with either solitary or in pairs. It builds a large isolated nest, with from four to six eggs, generally of a bluish-green with blotches of brown. The carrion-crow is easily tamed, and may be taught to articulate words. The American crow is similar to the foregoing, but is smaller and less robust, and is somewhat gregarious. This crow is common in all parts of the U. States, and is deemed a great nuisance by farmers from preying on their corn. The fish-crow, another American crow, resembling the preceding but smaller, is abundant in the coast districts of the southern states. Its favorite food is fish, but it also eats all kinds of garbage, mollusca, etc. In winter its food is chiefly fruit, and it is then fat and considered good eating.

CROW-BLACKBIRD, the name of certain American birds. The great crow-blackbird, found in the southern states, Mexico, and the West Indies, is 16 inches long, and of a glossy black plumage. The female is of a light-brown above and whitish beneath. The purple grackle, lesser or common crow-blackbird, is similar in color to the preceding, but smaller. They reach the middle states of America from the south in flocks in the latter part of March, and build in April in the tall pines or cedars On their first arrival they feed upon insects, but afterward commit great ravages upon the young corn. In November they fly southward again.

CROWN, a circular ornament for the head. As now used the name is limited to the head-dress worn by royal personages as a badge of sovereignty, but it was formerly used to include the wreaths or garlands worn by the ancients upon special occasions. Thus, among the Greeks and Romans, crowns made of grass, flowers, twigs of laurels, oak, olive, parsley, etc., and latterly of gold, were made use of as honors in atheletic contests, as rewards for military valor, and at feasts, funerals, etc. It is, however, with the eastern diadem rather than with the classic corona that the crown as a symbol of royalty is connected; indeed, is was only introduced as such a symbol by Alexander the Great, who followed the Persian usage. Antony wore a crown in Egypt, and the Roman emperors also wore crowns of various forms, from the plain golden fillet to the radiated or rayed crown In modern states they were also of various forms until heralds devised a regular series to mark the grades of rank from the imperial crown to the baron's coronet. The English crown

1, Crown of England. 2, Russian Crown. 3, French Crown. 4, Austrian Crown. 5, Imperial Crown (Charlemagne's).

has been gradually built up from the plain circlet with four trefoil heads worn by William the Conqueror. This form was elaborated and jeweled, and finally arched in with jeweled bands surmounted by the cross and scepter. As at present existing the crown of England is a gold circle, adorned with pearls and precious stones, having alternately four Maltese crosses and four fleurs-de-lis. From the top of the crosses rise imperial arches, closing under a mound and cross. The whole covers a crimson velvet cap with an ermine border. The crown of Charlemagne, which is preserved in the imperial treasury of Vienna, is composed of eight plates of gold, four large and four small, connected by hinges. The large plates are studded with precious stones, the front one being surmounted with a cross; the smaller ones, placed alternately with these, are ornamented with enamels representing Solomon, David, Hezekiah, and Isaiah, and Christ seated between two flaming seraphim. The Austrian crown is a sort of cleft tiara, having in the middle a semi-circle of gold supporting a mound and cross; the tiara rests on a circle with pendants like those of a miter. The royal crown of France is a circle ornamented with eight fleurs-de-lis, from which rise as many quarter-circles closing under a double fleur-de-lis. The triple crown of the popes is more commonly called tiara.

CROWN, a British silver coin value five shillings ($1.20), first coined by Henry VIII. None were coined from 1851 to 1887. In 1847 and 1848 some pattern crowns were struck with a gold center, but the experiment was carried no further.

CROWN'INSHIELD, Arthur Schuyler, an American naval officer, born in 1843 and educated at the naval academy. He took part in the naval battles of the civil war, and during the Spanish war was a member of the Board of Naval

Strategy which sat at Washington, D. C. He died in 1809.

CROWN LANDS, the lands belonging to the British crown. These are now surrendered to the country at the beginning of every sovereign's reign in return for an allowance (the civil list) fixed at a certain amount for the reign by parliament. They are placed under commissioners, and the revenue derived from them becomes part of the consolidated fund.

CROWN SOLICITOR, in England, the solicitor to the treasury, who instructs counsel in all state prosecutions. In Ireland, an officer attached to each circuit, paid by a salary, whose duty it is to take charge of every case for the crown in criminal cases.

CROY'DON, a mun., parl., and co., borough, England, in county Surrey, 10 miles s. of London, of which it is practically a suburb, near the sources of the Wandle, and near the Banstead Downs. Of special interest are the remains of the ancient palace, long a residence of the Archbishops of Canterbury. Pop. 133,885.

CROZIER. See Crosier.

CRU'CIBLE, a vessel employed to hold substances which are to be submitted to a high temperature without collecting the volatile products of the action. It is usually of a conical, circular, or triangular shape, closed at the bottom and open at the top, and is made of various materials, such as fire-clay, platinum, a mixture of fire-clay and plumbago, porcelain, etc.

CRU'CIFIX, a cross bearing the figure of Christ. As a rule the figures on the most ancient crucifixes were not carved, but were engraved on gold, silver, or iron crosses. At a later period they were painted on wood, and it is only in the 9th century in the pontificate of Leo III., that the figure of Christ appears carved upon the cross in bas-relief. Originally the body was represented clothed in a tunic reaching to the feet; afterward the clothing was removed with the exception of a cloth round the loins. Until the 11th century Christ is represented alive; since that period he has been represented as dead. In the earlier crucifixes, also, the number of nails by which Christ is fixed to the cross is four, one through each hand and each foot, while in the more modern ones one foot is laid above the other and a single nail driven through both. Many crucifixes bear also the superscription in an abbreviated form, and accessory symbols and figures.

CRUCIFIXION, a mode of inflicting capital punishment, by affixing criminals to a wooden cross, formerly widely practiced, but now chiefly confined to the Mohammedans. Different kinds of crosses were employed, especially that consisting of two beams at right angles, and the St. Andrew's cross.

CRUDEN, Alexander, compiler of the Concordance to the Scriptures, was born at Aberdeen in 1701. He took the degree of M. A., at Marischal College, and in 1722 proceeded to London. His great work appeared in 1737, under the title of A Complete Concordance of the Holy Scriptures of the Old and New Testament. He died in Islington in 1770.

CRUELTY TO ANIMALS, in the modern sense the wanton maltreatment of beasts. Until recent times the sentiment against cruelty to animals did not take definite form until 1826, when the first society of prevention was organized in England. The first apostle of prevention in the U. States was Henry Bergh, through whose efforts almost all states have been led to adopt laws severely punishing cruelty to animals.

CRUELTY TO CHILDREN, the modern notion that it is a crime to mistreat one's own children. In 1875 the New York Society for the Prevention of Cruelty to Children was organized and has been widely copied in other cities. These societies do not concern themselves with child labor, which is cruelty to children on a social scale and one of the greatest crimes of which society is guilty.

CRUIKSHANK, George, the greatest of English pictorial satirists after Hogarth, born in London 1792, of Scottish extraction. The earliest of his drawings known is dated 1799, when he was only seven years of age, and when fifteen he was comparatively distinguished. In 1837 he commenced in Bentley's Miscellany his famous series of etchings on steel illustrative of Dickens' Oliver Twist, followed two years later by those for Ainsworth's Jack Sheppard, and then by those for Windsor Castle and the Tower of London. Having connected himself with the temperance movement he produced the Bottle, a powerful and popular series of designs, but marking clearly the limits of his art. His temperance connection and his absurd claims to having suggested the idea of Dicken's Oliver Twist, undermined his artistic reputation. Poorly paid for work by which others profited, he was latterly obliged to part with the vast collection of his works, and in 1866 $250.00 a year was settled on him from the Royal Academy's Turner Annuities. He latterly turned his attention to oil-painting, his most noteworthy pictures being Tam o' Shanter, Disturbing a Congregation, and The Worship of Bacchus. He died in 1878.

CRUSADES, the wars carried on by the Christian nations of the West, from the end of the 11th till the latter half of the 13th century, for the conquest of Palestine. They were called Crusades, because the warriors wore the sign of the cross. The antagonism between the Christian and Mohammedan nations had been intensified by the possession of the Holy Land by the Turks and by their treatment of pilgrims to Jerusalem; and the first strenuous appeal was assured of response alike from the pious, the adventurous, and the greedy. The immediate cause of the first crusade was the preaching of Peter of Amiens, or Peter the Hermit, who in 1093 had joined other pilgrims on a journey to Jerusalem. A well-conducted regular army of 80,000 men was headed by Godfrey of Bouillon; Hugh of Vermandois, brother to Philip, king of France; Baldwin, brother of Godfrey; Robert II. of Flanders; Robert II. of Normandy, brother of William II., king of England; Raymond of Toulouse; and other heroes. After remaining nearly a year in the neighborhood of Antioch they commenced, in May, 1099, their march against Jerusalem, the siege of which they commenced in June. Their numbers were now reduced to little more than 20,000 men; but after a fierce struggle the town was taken by storm on July 15, and Godfrey of Bouillon was chosen king of Jerusalem, or, as he preferred to term himself, Protector of the Holy Sepulcher. At his death in 1100 he was succeeded by his brother Baldwin, who had in the early part of the crusade established himself in Edessa, and made himself ruler of an extensive territory stretching over the Armenian mountains and the plain of Mesopotamia.

The second great and regularly-conducted crusade was occasioned by the loss of Edessa, which the Saracens conquered in Dec., 1144. Fearing still graver losses, Pope Eugenius III., seconded by Bernard of Clairvaux, exhorted the German emperor Conrad III., and the King of France, Louis VII., to defend the cross. Both these monarchs obeyed, and in 1147 led large forces to the East, but returned without accomplishing anything in 1149.

The third crusade was undertaken after the capture of Jerusalem by Saladin in 1187, the monarchs Frederick I. (Barbarossa) of Germany, Philip Augustus of France, and Richard I. (Cœur de Lion) of England, leading their armies in person. Richard defeated Saladin and occupied Jaffa or Joppa; but having twice vainly set out with the design of besieging Jerusalem, he concluded (Sept. 2, 1192) a truce of three years and three months with Saladin, who agreed that pilgrims should be free to visit the Holy Sepulcher, and that the whole sea-coast from Tyre to Jaffa (including the important fortress of Acre) should belong to the crusaders.

The fourth crusade was set on foot by Pope Innocent III., who commissioned Fulk of Neuilly to preach it in 1198. Among its chief promoters was Godfrey of Villehardouin, seneschal of Champagne; Baldwin, count of Flanders and Hainaut; Dandolo, the aged doge of Venice; and the Marquis of Montferrat, who was chosen leader. The crusaders assembled at Venice in the spring of 1201, but were diverted from their original purpose first by the capture of the Dalmatian town of Zara, and then by the expedition which ended in the sack of Constantinople and the establishment of a Latin empire there (1204)'.

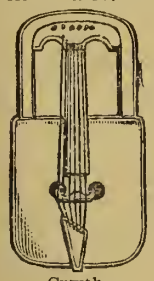
The fifth crusade, undertaken by Andreas of Hungary in 1217, and shared in by John of Brienne, to whom the title of King of Jerusalem was given had little other result than the temporary occupation of the Nile delta.

The sixth crusade, that of Frederick II., emperor of Germany, was undertaken at the instance of Popes Honorius III. and Gregory IX. The seventh and eighth Crusades were led by St. Louis of France (Louis IX.) in person.

Despite their want of success, the crusades were of considerable indirect value in that by these joint enterprises the European nations became more connected with each other, the class of citizens increased in influence, partly because the nobility suffered by extravagant contributions to the Crusades, and partly because a more intimate commercial intercourse greatly augmented the wealth of the cities, and a number of arts and sciences, till then unknown in Europe, were introduced.

CRUSTA'CEA, one of the primary branches into which is divided the great group of Articulate or Annulose animals. The body is divided into head, thorax, and abdomen, of which the two former are united into a single mass, cephalothorax, covered with a shield or carapace, and the abdomen usually presents the appearance of a tail. In some—the sand-hopper, wood-louse, etc.—the head is partially distinct from the thorax. The Crustacea breathe by branchiæ or gills, or by membraneous vesicles, or by the general surface; and the body is composed of a series of rings more or less distinct. They possess the faculty of reproducing lost parts in an eminent degree.

CRWTH (kruth), a Welsh name for a kind of violin with six strings, formerly much used in Wales. Four of the



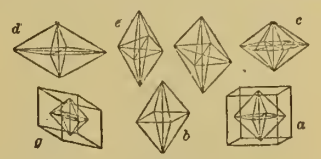
Crwth.

strings were played on by a bow, and two were struck or twitched by the thumb. Its general length was 22 inches, and its thickness 1½ inch.

CRYPT, originally a subterranean cell or cave, especially one constructed for sepulture. From the usage of these by the early Christians crypt came to signify a church underground or the lower story of a cathedral or church. It is usually set apart for monumental purposes, but is sometimes used as a chapel. The crypt is a common feature of cathedrals, being always at the east end, under the chancel or apse. The largest in England is that of Canterbury Cathedral; that of Glasgow Cathedral, formerly used as a separate church, is one of the most perfect pieces of architecture in Britain.

CRYPTOG'RAPHY, the art of writing in secret characters or cipher, or with sympathetic ink. The simplest method consists in choosing for every letter of the alphabet some sign, or another letter or group of letters. Thus the letter of Charles I. to the Earl of Glamorgan with respect to the Catholics of Ireland was composed in an alphabet of 24 strokes variously placed about a line. The names in the records of the Clan-na-Gael Society were, according to the Times newspaper, written in a cipher formed by taking in each case the letter previous to that intended; and the cipher devised by Lord Bacon consisted in an alphabet formed by different arrangements of the letters a and b in groups of five. All these methods, however, are easily deciphered by experts, as also is that employed by the Earl of Argyle in his plot against James II., in which the words of the letter were set down at concerted distances, the intervals being filled up with misleading words. Even the more complex, however, present, as a rule, only temporary difficulty to an expert. The fact that the most frequently recurring letter in the English language is the letter e; that the most common double vowels are ea and ou, that r, s, and t are the most frequent terminal letters, etc., are of no small assistance in forming a key to any given cryptogram.

CRYSTAL, in chemistry and mineralogy, any body which, by the mutual attraction of its particles, has assumed the form of some one of the regular



Crystals.

geometric solids, being bounded by a certain number of plane-surfaces. The chemist procures crystals either by fusing the bodies by heat and then allowing them gradually to cool, or by dissolving them in a fluid and then abstracting the fluid by slow evaporation. A crystal consists of three parts. 1st, Plane surfaces, called faces, which are said to be similar when they are equal to one another and similarly situated; dissimilar, when they are unequal or have a different position. 2d, Edges, formed by the meeting of two faces. They are said to be similar when formed by similar faces; dissimilar, by dissimilar faces. Equal edges are formed when the faces are inclined at the same angle to one another; unequal, when they are inclined at different angles. 3d, Solid angles, formed by the meeting of three or more faces; and in this case also there are similar and dissimilar, equal and unequal solid angles, according as they are formed by similar or dissimilar faces, and equal or unequal angled edges. The angles of crystals are measured by an instrument called the goniometer.

CRYSTAL'LOMANCY, a mode of divining by means of a transparent body, as a precious stone, crystal globe, etc. The operator first muttered over it certain formulas of prayer, and then gave the crystal (a beryl was preferred) into the hands of a young man or virgin, who received an answer from the spirits within the crystal.

CUBA, the largest and most westerly of the West India Islands, lying at the entrance to the Gulf of Mexico, about 150 miles from Florida and Yucatan. Its length is 750 miles; breadth, 20 to over 120; area, 43,220 sq. miles. Since the Spanish-American war of 1898 Cuba has been independent, and is now under its own republican government The navigation of the coast is unsafe, on account of rocks and shoals, but there are many excellent and easily-accessible ports and anchoring places. The chief commerical ports and harbors are, on the north, Havana (the capital), Matanzas, Cardenas, Sagua, Remedios; on the south, Santiago, Trinidad, Cienfuegos, and Guantanamo. The surface exhibits various chains or groups of hills extending from west to east, and in the extreme southeast is a mountain range rising to the height of over 8000 feet. At the foot of the hills the country opens into extensive savannahs. A considerable number of small streams water the island on both sides. Cuba is rich in minerals; those worked are chiefly copper and iron. Bitumen is plentiful, both in a liquid form and in a soft resinous state. There are many mineral springs, and on the north coast are extensive lagoons, which in dry years produce immense quantities of marine salt. The climate is hot and dry during greater part of the year, but is, on the whole, more temperate than that of some other islands in the same latitude. Rain often descends in torrents from July to September, but no snow is known to fall on the highest mountains, though frost occurs occasionally. The soil is fertile and the vegetation is exceedingly luxuriant. Forests of mahogany, ebony, cedar, fustic, and other useful woods, abound; and the fields are covered with flowers and odoriferous plants. The principal cereal cultivated is the indigenous maize, or Indian corn. Rice is also produced in many districts; but the principal crops are sugar and tobacco, with a little cotton, cocoa, coffee, indigo, etc. The best tobacco is grown in the district of Vuelta Abajo, near Havana. A considerable extent of country is appropriated also to cattle-breeding farms, and to farms on which fruit and vegetables are raised. The principal fruits are the pine-apple, oranges, shaddocks, plantains, bananas, melons, lemons, and sweet limes; figs and strawberries are also to be had. The most valuable domestic animals are the ox, horse, and pig, which form a large proportion of the wealth of the island; the sheep, goat, and mule are inferior in quality and numbers. Among the few indigeneous mammals are two species of aguti and an opossum. The sylvan birds are numerous and in great variety; but birds of prey are few, and snakes and reptiles are not very numerous. The shores abound with turtle, and in the deep gulfs and bays the alligator is found. The manati is met with in the deep pools of fresh water, and the iguana is not uncommon. The manufactures are confined to the making of sugar, rum, molasses, and cigars, and these, with tobacco, form the chief exports. Next in commercial importance rank mahogany and other valuable timber and fruit. The chief imports are grain and flour, salted provisions, brandy, wines, hardware, and cotton, linen, and woolen manufactures. The great bulk of the trade is with the U. States. There is also a considerable trade between Cuba and Great Britain. The legal system of money, weights, and

measures of Cuba are the same as those of Spain. The internal traffic of the island has been greatly facilitated by road improvements and by railways, the length of which in operation now amounts to about 1000 miles. Steam-vessels ply between Havana and other parts of the coast. Under Spain Cuba was governed by a captain-general. Cuba was first discovered on October 28, 1492, by Columbus, who revisited it in 1494, and again in 1502. In 1511 the Spaniards formed the first settlement on the island, and the native inhabitants were soon extirpated. Negro slaves were introduced in 1524 Attempts to put an end to slavery were made in 1820 and 1845 without result; but in 1868 a law, designed gradually to put an end to slavery, was passed. In that year commenced an insurrectionary struggle against the mother country, which lasted for ten years. The final abolition of slavery dates only from 1886. In 1895 began another insurrection, which continued till the war with the U. States. The pop. is 1,772,797, of whom over 500,000 are colored. During 1906 an insurrection took place against the Palma government which necessitated, on the appeal of the Cubans, the placing of an American military governor with forces on the island pending the settlement of the troubles. Reciprocity with the United States was adopted in 1903. The U. S. troops were withdrawn in 1909.

CUBATURE OF A SOLID, the finding of the solid or cubic contents of it

CUBE, in geometry, a regular solid body with six equal square sides. The solid content of any cube is found by multiplying the superficial area of one of the sides by the height; or, what comes to the same thing, by multiplying the number that expresses the length of one of the edges by itself, and the product thus found by that number again. Cubes are to one another in the triplicate ratio of their diagonals.—Cube, or cubic number, in arithmetic, that which is produced by the multiplication of a square number by its root; thus 64 is a cube number, and arises by multiplying 16, the square of 4, by the root 4.

CUBE ROOT, the number or quantity which, multiplied into itself and then into the product, produces the cube; or which, twice multiplied into itself, produces the number of which it is the root: as 2 is the cube root of 8, because twice 2 are 4, and twice 4 are 8.

CUBIC FOOT of any substance, so much of it as is contained in a cube whose side is 1 foot.

CUBIT, in the mensuration of the ancients, a long measure, equal to the length of a man's arm from the elbow to the tip of the fingers, or, say equal to 18 inches.

CUCK'OO, a scansorial or climbing bird. The note from which it derives its name is a love-call used only in the mating season. The greater number of species belonging to the genus are confined to hot countries, more especially India and Africa, though some are summer visitants of colder climates. In America no true cuckoos are found, the genus to which the so-called American cukcoo belongs, differing very essentially from them in its habits.

CU'CUMBER, the fruit of the plant belonging to the Cucurbitaceæ or gourd order, and supposed to have been originally imported into Europe from the Levant. Though grown in England in the 14th century, it did not become generally used until after the reign of Henry VIII. It is an annual with rough trailing stems, large angular leaves, and yellow male and female flowers set in the axils of the leaf-stocks Other species of the cucumber genus are the common melon, and the water melon.

CUCUMBER-TREE, a fine American forest tree, so named from the appearance of its fruit.

The cuckoo.

CUD'DAPAH, or KADAPA, a district and town, Hindustan, presidency Madras. The district area is 8745 sq.miles. The forests contain much valuable timber, and the minerals include iron ore, lead, copper, diamonds, etc. Pop. 1,272,072. —The town lies on a small river of same name, an affluent of the Pennar, 140 miles n.w. Madras. It exports indigo and cotton. Pop. 17,387.

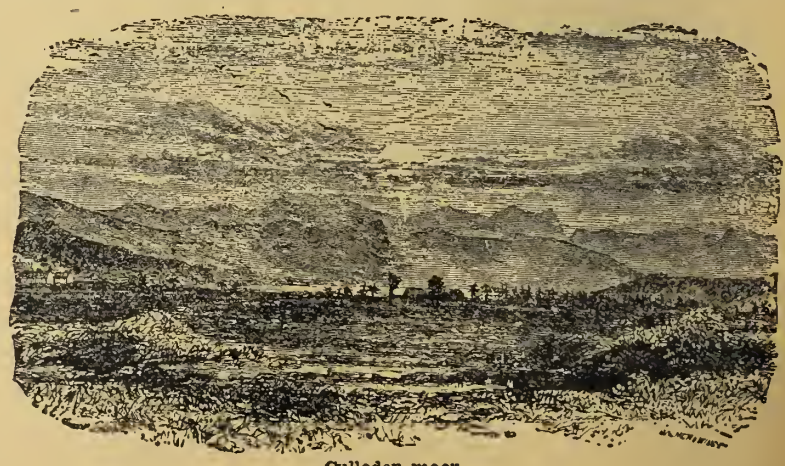
CUIRASS (kwi-ras'), an article of defensive armor, protecting the body both before and behind, and composed of leather, metal, or other materials variously worked. It was in common use throughout Europe in the 14th century. In England it fell into disuse in the time of Charles II., and in France a little later. It was reintroduced by Napoleon I., and the achievements of his cuirassiers led to its adoption for regiments of heavy cavalry in most European armies.

CULLO'DEN MOOR, a heath in Scotland, 4 miles e. of Inverness, celebrated for the victory obtained April 27, 1746, by the Duke of Cumberland over Prince Charles Edward Stuart (the Pretender) and his adherents. The battle was the last fought on British soil, and the termination of the attempts of the Stuart family to recover the throne of England.

CULLOM, Shelby Moore, an American senator, born in Kentucky in 1829, removed to Illinois in 1855 as a lawyer. He served in the state legislature and was twice speaker of the house (1861 and 1873), was a member of congress for three terms, governor of Illinois from 1876 to 1883 and since then has been United States senator. He is one of the leaders of the republican party in Illinois.

CULMINATION, in astronomy, the passing of a star through the meridian, because it has at that moment reached the highest point of its apparent path in the sky.

CUM'BERLAND, the extreme northwestern county of England. Length, north to south, 75 miles; extreme breadth, 45 miles; area, 970,161 acres, rather more than a half of which is under cultivation. There is great variety of surface in different parts. The two largest rivers are the Eden and the Derwent The county embraces part of the "lake country" of England. The largest lakes are Derwentwater, Bassenthwaite, Loweswater, Crummock, Buttermere, Ennerdale, Wastwater, Thirlmere, and part of Ullswater. Cumberland is rich in minerals, including lead, gypsum, zinc, and especially coal and rich hematite iron-ore. In the western division of the county there are a great many blast-furnaces, and works for the manufacture of steel and finished iron. The principal crops raised are oats, barley, wheat, and turnips, but the bulk of the inclosed lands is sown in clover and grass. The rearing of cattle and sheep



Culloden moor.

and dairy farming are engaged in to a considerable extent. Pop. 266,549.

CUMBERLAND, county seat of Allegany county, Maryland, on the Potomac, 179 miles by rail from Baltimore. It is on the edge of the great coal-basin of the same name, and iron is also largely worked in the vicinity. Pop. about 19,000.

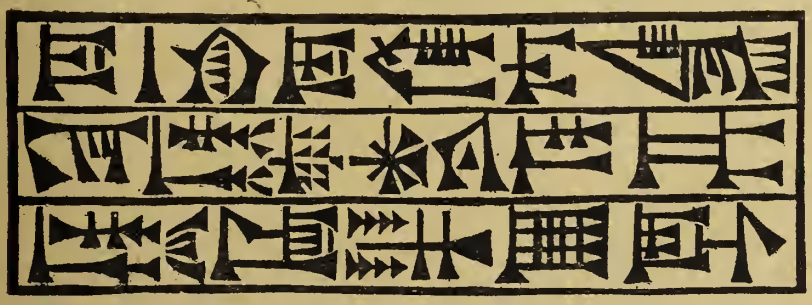
CUMBERLAND, a river of the U. States which runs through Kentucky and Tennessee into the Ohio, having a course of about 600 miles, navigable for steamboats to Nashville, near 200 miles.

CUMBERLAND MOUNTAINS, in Tennessee, part of a range of the Appalachian system, rarely exceeding 2000 feet in height.

CUMBERLAND PRESBYTERIANS, a small American sect, so named from the Cumberland country in Tennessee, founded early in the last century, and holding Calvinistic doctrines, except in regard to predestination. It has three universities and several colleges connected with it.

CUMBRIAN MOUNTAINS, a range of hills, England, occupying part of the counties of Cumberland, Westmoreland, and North Lancashire. The mountains rise with steep acclivities, inclosing in some parts narrow but well-cultivated valleys, with numerous picturesque lakes, this being the English "Lake Country" so much frequented by tourists.

CUMMINS, Maria Susanna, an American story writer, born in Massachusetts in 1827, died in 1866. Her principal success was The Lamplighter (1854), which is still read.



Part of a Babylonian brick, with cuneiform writing.

CU'MULATIVE VOTE, the system by which every voter is entitled to as many votes as there are persons to be elected, and may give them all to one candidate, or may distribute them among the candidates, as he thinks fit.

CUM'YN, COMYN, or **CUMMING,** a family whose name appears frequently in the early history of England and Scotland. It had its original possessions near the town of Comines in France, and from one of the branches sprang the historian Philip de Comines. The English Comyns came over with the Conqueror, and Robert Comyn was sent by William with 700 men to reduce the northern provinces. His nephew became chancellor of Scotland about 1133, and in the middle of the 13th century the family counted among its members four Scottish earls. In the beginning of the 14th century it was almost annihilated by Robert Bruce, who slew the son of its head (the Lord of Badenoch) in Dumfries. The Comyns who escaped settled down in the English court, and established important connections. See Comyn.

CUNDINAMARCA, one of the departments of the Republic of Colombia. Area, estim. 79,810 square miles; pop. 537,658.

CUNE'IFORM WRITING, the name applied to the wedge-shaped characters of the inscriptions on old Babylonian and Persian monuments; sometimes also described as arrow-headed or nail-headed characters. They appear to have been originally of the nature of hieroglyphs, and to have been invented by the primitive Accadian inhabitants of Chaldea (a Turanian race), from whom they were borrowed with considerable modification by the conquering Babylonians and Assyrians, who were Semites by race and spoke an entirely different language. The use of the character, however, ceased shortly after the reign of Alexander the Great; and after the lapse of nearly two thousand years it was doubted by many if the signs had ever had an intelligible meaning. They were even regarded by some as the work of a species of worm, by others as mere talismanic signs, astrological symbols, and the like. The first hints toward decipherment were given by Karstens Niebuhr late in the 18th century; and the labors of Grotefend, Rask, Burnouf, Lassen, Rawlinson, and other investigators slowly perfected the means of translation. Most of the inscriptions first discovered were in three different languages and as many varieties of cuneiform writing, the most prominent, and at the same time the simplest and latest, being the Persian cuneiform writing with about sixty letters. Next older in time and much more complex is what is designated the Assyrian or Babylonian system of writing, consisting of from 600 to 700 characters, partly alphabetic, partly syllabic, or representing sound groups Lastly comes the Accadian inscriptions, the oldest of all, originally proceeding from a people who had reached a high state of civilization three thousand years before Christ, and whose language (allied to Turkish) ceased to be a living tongue about 1700 B.C. The most celebrated trilingual inscription is that at Behistun, cut upon the face of a rock 1700 feet high, and recording a portion of the history of Darius. The British Museum contains many thousands of inscribed clay tablets, cylinders, prisms, etc., the decipherment of which is in progress.

CU'PID, the god of love; corresponding with the Greek Erōs. He is represented as a winged infant, naked, armed with a bow, and a quiver full of arrows.

CUPPING, a surgical operation consisting in the application of the cupping-glass in cases where it is desirable to abstract blood from, or draw it to, a particular part When blood is removed the operation is simply termed cupping; when no blood is abstracted, it is dry-cupping.

CURAÇAO (kō-rȧ-sȧ'ō), an island, Dutch West Indies, Carribbean Sea, 46 miles n. the coast of Venezuela; 36 miles long and 8 miles broad; capital Willemstad, principal harbor Santa Anna. The tamarind, cocoa-palm, banana, and other useful trees are reared—among them three varieties of orange, from one of which the Curaçao liquor is made. Sugar, tobacco, cochineal, and maize are also produced, but the staple exports are salt, and a valuable phosphate of lime used as a manure in its natural state, or made to yield valuable superphosphates. Pop. 44,066.

CURACAO, or Curacoa, a liquor or cordial prepared from a peculiar kind of bitter oranges growing in Curaçao, which have a persistent aromatic odor and taste. It is prepared from the yellow part of the rind, which is steeped in strong alcohol, the infusion being afterward distilled and rectified and mixed with syrup. For the true orange, the common bitter orange of Europe is often substituted, and the genuine deep-yellow color imitated by caramel, etc.

CURAS'SOW, or Hocco, the name given to gallinaceous birds natives of the warm parts of America. The crested

Crested curassow.

curassow found in Guiana, Mexico, and Brazil, is a handsome bird, nearly as large as the turkey and more imposing in appearance, being of a dark violet color, with a purplish-green gloss above and on the breast; the abdomen is snow-white, and the crest golden. Another species is the red curassow, also a native of South America, and about the size of a turkey.

CURD. See Cheese and Milk.

CUR'FEW, a practice originated in England by William the Conqueror, who directed that at the ringing of the

bell at eight o'clock all fires and lights should be extinguished. The law was repealed by Henry I. in 1100, but the bell continued to be rung in many dis-

Curfew for fire.

tricts to modern times, and probably may still be heard. The name was also given formerly to a domestic utensil for covering up a fire.

CURICO', a town of Chili, capital of prov. of same name Pop. 9000. Area of prov. 2913 sq. miles; pop. 102,647.

CURIE, Pierre and Madame, discoverers of the metal radium. Professor Curie and Madame Curie were collabo-

M. Curie.

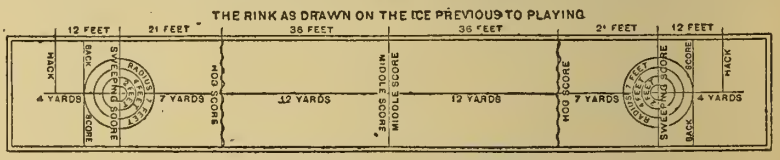
rators in physics at one of the Paris institutes. In 1903 they were awarded the Nobel prize for their discovery. Professor Curie was killed in a street accident at Paris on April 19, 1906, his wife taking his place as lecturer in the Sarbonne.

CURLEW, a genus of birds belonging to the same family as the snipe and woodcock. The genus is characterized by a very long, slender, and arcuated bill, tall and partly naked legs, and a short somewhat rounded tail. The bill is more or less covered with a soft sensitive skin by which the bird is enabled to detect its food in the mud. Three species of curlew are inhabitants of America—the long-billed curlew, about 29 inches long, with a bill 7 to 9 inches in length; the Hudsonian, or short-billed curlew; and the Esquimo curlew

CURLING, a favorite Scottish winter amusement on the ice, in which contending parties slide large smooth stones having somewhat the shape of a flattened hemisphere, weighing from 30 to 45 lbs. each, with an iron or wooden handle at the top, from one mark to another. The space within which the stones move is called the rink, and the hole or mark at each end the tee The length of the rink from tee to tee varies from 30 to 50 yards. The players are arranged in two parties, each headed by a skip or director. The number of play-

Curling stones.

ers upon a rink is eight or sixteen—eight when the players use two stones each, and sixteen when they use one stone each. There may be one or more rinks according to the number of curlers. The object of the player is to lay his stone as near to the mark as possible, to guard that of his partner which has



The rink as drawn on the ice.

been well laid before, or to strike off that of his antagonist. When the stones on both sides have been all played the stone nearest the tee counts one, and if the second, third, fourth, etc., belong to the same side, each counts one more, the number played for being generally twenty-one. If a player's stone does not cross a line, called the hog-score, at some distance in front of the tee his shot goes for nothing and the stone is removed from the rink. The set matches are termed bonspiels.

CUR'RANT, the name of two well-known shrubs, cultivated for their fruit. The red currant, the fruit of which is used principally for tarts and jellies, is a native of S. Europe, Asia, and N. America. The white currant is a cultivated variety of the red, and is used chiefly for dessert and for conversion into wine. The black currant, a native to most parts of Europe, and found abundantly in Russia and Siberia, is used for tarts and puddings and for a fine jelly recommended in cases of sore throat.

CURRANTS, a small kind of dried grape imported from the Levant, chiefly from the vicinity of Patras in the Morea, as also from Zante, Cephalonia, and Ithaca, of which islands they are the staple produce. The plant is delicate and the crop precarious, and as the plantation must be six or seven years old before it bears, its cultivation requires a great outlay of capital After being dried the currants are exported in large butts.

CURRANT WINE, a wine made of the juice of the white or red currant (preferably the former). A pint of water is added to every four pints of berries and afterward a pound and a half of sugar to each pint, a little spirits being mixed in the liquor before it is set aside to ferment. Fermentation requires several weeks, and the wine is not fit for use for some months. For black-currant wine the berries are first put over the fire and heated to the boiling point in as small a quantity of water as possible.

CURRENCY, the medium of exchange used in ordinary business and industry. It is generally in the form of coin or paper, and circulates from hand to hand. The currency of the civilized world is based on gold or silver, and large quantities of safe currency in paper are thus kept afloat. The total currency of the United States is considerably above $2,000,000,000, although all of this is never in circulation. Paper currency consists of the promissory notes of the government or of banks, and certificates for gold and silver coin, good for their face amount in the coin specified at the United States treasury.

CURRENTOM'ETER, Current Gauge, an instrument for measuring the velocity of currents. It may be constructed in various ways, e.g. a simple tube which is bent and has its lower end open to the current, the ascension of water in the vertical part indicating the velocity of the current.

CURRENTS, Marine, masses of sea-water flowing or moving forward in the manner of a great stream. They are phenomena of the highest importance, both on account of their influence upon the climate of many maritime regions—an influence often reaching far inland —and their practical relation to the art of navigation. These currents are very numerous, and taken together constitute an oceanic circulation the intricacy and irregularity of whose form is owing to the number and variety of the agencies at work. Among the theories which have been put forward to account for the existence of currents the chief place belongs to the theory of a circuit maintained between equatorial and polar waters. According to this theory there is in either hemisphere an area within which the waters of the ocean are colder, and hence by many degrees denser, than within the belt of the tropics. The natural result is a tendency of the colder and heavier water to sink and to diffuse itself over the lower portion of the ocean-bed, and a movement of the warmer and lighter water in the direction of the surface, over which it tends to become diffused. In other words, the colder waters will move beneath the surface in the direction of the equator, and the warmer waters will flow along the surface in the direction of either pole. Hence, in either half of the globe two great and opposite currents—a cold current flowing from the pole toward the equator, and a

warm current flowing from the equator in the direction of the pole. This theory has been excellently illustrated by Dr. Carpenter's experiment, in which a trough of glass filled with water and having a lump of ice at one end and a heated bar of iron at the other exhibits a similar circulation of hot and cold currents. To this theory Sir C. Wyville Thomson opposed a theory of evaporation as the general cause of the movement, holding that in the Antarctic Ocean at least the return of moisture to the south to balance the cold indraft of water that comes from thence takes place in a large measure through the atmosphere. Another great general cause of currents is to be found in the axial rotation of the earth eastward, by which the movement of tropical waters toward the pole is deflected eastward, and becomes in the northern hemisphere a north-eastwardly current and in the southern a southeastwardly one. Under the operation of the same laws the opposite currents from polar latitudes to the equator are deflected in southwesterly and northwesterly directions respectively. It is to such influences that we may in the main attribute the well-known differences between the climates of North America and Europe within correspondent parallels.

CURRIC'ULUM, originally, in Latin, the course over which the race was run, hence the whole course of study at a university necessary to qualify for a particular degree.

CURRY, an Eastern condiment, a powder composed of cayenne-pepper, coriander, ginger, turmeric, and other strong spices.

CURRYING is the art of dressing cow-hides, calves'-skins, seal-skins, etc., principally for shoes, saddlery, or harness, after they have come from the tanner In dressing leather for shoes the leather is first soaked in water until it is thoroughly wet; then the flesh side is shaved to a proper surface with a knife of peculiar construction, rectangular in form with two handles and a double edge. The leather is then thrown into the water again, scoured upon a stone till the white substance called bloom is forced out, then rubbed with a greasy substance and hung up to dry. When thoroughly dry it is grained with a toothed instrument on the flesh side and bruised on the grain or hair side for the purpose of softening the leather. A further process of paring and graining makes it ready for waxing or coloring, in which oil and lamp-black are used on the flesh side. It is then sized, dried, and tallowed. In the process the leather is made smooth, lustrous, supple, and water-proof.

CURTIN, Andrew Gregg, an American politician and governor, known as the "war governor" of Pennsylvania. He was born in Pennsylvania in 1817 and died in 1894. He early allied himself with the republican party and was governor of Pennsylvania during the civil war. He was subsequently a member of congress and minister to Russia.

CURTIS, George Ticknor, an American jurist, born in Massachusetts in 1812, died, 1894. He appeared as counsel in the Dred Scott case, in the legal tender cases, the sewing machine cases, and the Colt revolver suits. He published in its complete form in 1896 his Constitutional History of the United States, and he was the author also of numerous valuable treatises on law, and a Life of Daniel Webster.

CURTIS, George William. an American publicist, editor, and critic, born in Rhode Island in 1824 and died in 1892. He was a member in 1842 of the famous Brook Farm Community, traveled in the Orient, and in 1853 was placed in charge of the Editor's Easy Chair, a department of Harper Bros.' periodicals. In this he continued until his death. He published a number of volumes of essays and critiques and a few novels.

CURVE, a line which may be cut by a straight line in more points than one; a line in which no three consecutive points lie in the same direction. The doctrine of curves and of the figures and solids generated from them constitutes what is called the higher geometry, and forms one of the most interesting and important branches of mathematical science. Curve lines are distinguished into algebraical or geometrical and transcendental or mechanical. The varieties of curves are innumerable; that is, they have different degrees of bending or curvature. The curves most generally referred to, besides the circle, are the ellipse, the parabola, and the hyperbola, to which may be added the cycloid.

CUR'ZON, George Nathaniel, Baron Curzon of Kedleston, an English statesman and author, born at Kedleston in 1859. He served in parliament from 1886 to 1898, in 1891–2 was under-secretary of state for India, and subsequently under-secretary of state for foreign affairs. In 1898 he was appointed viceroy and governor-general of India. He is the author of several important books on the Orient.

CUSCO. See Cuzco.

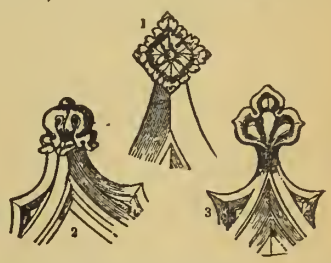
CUSCO-BARK, the bark of a tree, which comes from Cuzco, in S. America, and is exported from Arequipa. It contains a peculiar alkaloid called cusco-cinchonine, or cusconine, which resembles cinchonine in its physical qualities, but differs from it in its chemical properties. When applied medicinally it excites warmth in the system, and is therefore recommended to be given in cold intermittents and low typhoid states of the system.

CUSH, the eldest son of Ham, and also a country frequently mentioned in the Old Testament, probably in Africa, south of Egypt. In other places it is evident that the name Cush must also be understood as referring to some part of Arabia.

CUSHING, Caleb, an American diplomat and statesman, born in Massachusetts in 1800, died in 1879. In 1844 he was appointed the first American minister to China. He assisted in the work of the treaty of Nankin and established the rights of Christian missionaries in China. Cushing fought in the Mexican war, was attorney-general in Pierce's cabinet, was counsel for the United States in the Alabama claims case and was latterly minister to Spain. He was one of the most talented of American statesmen.

CUSHMAN, Charlotte, an American actress, born at Boston in 1816, died, 1876. She made her first appearance as an opera singer in 1835 but, on the failure of her voice, took up the drama. She became noted for her fine rendition of rôles such as Lady Macbeth, Meg Merrilies, Queen Gertrude, and Ophelia, and for many years was the foremost actress of the American stage.

CUSP, the point at which two converging curves meet and have a common tangent. Such points are numerous in architecture in the internal curvings of trefoils, heads of Gothic windows, etc. In the Decorated and



Architectural Cusps.—1, Henry VII.'s chapel. 2, Monument of Sir James Douglas, Douglas church. 3, Beauchamp chapel, Warwick.

perpendicular styles the cusps, in addition to leaves, flowers, etc., were frequently ornamented with heads or animals. In the romanesque and norman styles they were often ornamented with a small cylinder which bore a flower or similar ornament.

CUS'TARD, a composition of milk or cream and eggs, sweetened with sugar and variously flavored. It may be cooked in the oven or stew-pan.

CUSTARD-APPLE, a delicious fruit, a native of the West Indies, but cultivated in most tropical countries. The fruit is large, and heart-shaped, with a thick, rough exterior, and containing a pulp of a sweet flavor, very cooling and agreeable.

CUSTER, George Armstrong, an American soldier, born in Ohio in 1839, and was killed in the summer of 1876 by the Indians of Sitting Bull and Crazy Horse in the Black Hills in

George A. Custer.

Montana. Custer fought during the civil war in the Richmond campaign and was brevetted major-general of the regular army with the actual rank of lieutenant-colonel in 1866. He led Terry's column against the Sioux in the Black Hills in 1876. Coming upon a large encampment on the Little Big Horn River he divided his regiment in

two, ordering one detachment to attack the Indians from the rear while he himself led the attack in front. The force attacking the rear was driven back and then the Indians turned on Custer's detachment and massacred him and his entire force.

CUSTOM, social habit. In law custom has the force of law, and law itself is largely codified custom. General custom constitutes the body of common law, and particular custom binds the inhabitants of special districts, occupations, etc. As an example of the force of general custom is the right of the inhabitants of a country to the use of the sea shore.

CUSTOM-HOUSE, an establishment where commodities are entered for importation or exportation and the duties, bounties, etc., on the same are payable.

CUSTOMS, duties charged upon goods exported from or imported into a country. The revenue derived from this source in the U. States is nearly three hundred million dollars.

CUTCH, a state in the west of India, lying to the south of Sind, under British protection; area, 6500 sq. miles. Pop. 558,415.

CU'TICLE, the epidermis or outermost layer of the skin, a thin, pellucid, insensible membrane that covers and defends the true skin.

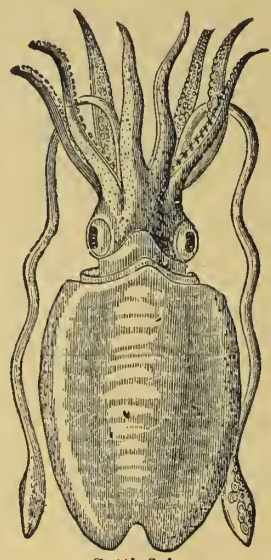
CUT'LASS, a short sword used by seamen. A guard over the hand is an advantage. It is, if well understood, a very effectual weapon in close contact: on account of its shortness it can be handled easily, and yet is long enough to protect a skilful swordsman.

CUT'LERY is a term applied to all cutting instruments made of steel. The finer articles, such as the best scissors, penknives, razors, and lancets are made of cast-steel. Table-knives, plane-irons, and chisels of a very superior kind are made of shear-steel, while common steel is wrought up into ordinary cutlery.

CUTTACK, a town of Hindustan, in Orissa, on the right bank of the Mahanuddy, 60 miles from its embouchure and 230 s.s.w. Calcutta. It has little trade, and is known mainly for its beautiful filagree work in gold and silver. Pop. 51,364.—The district of Cuttack has an area of 3517 sq. miles. It is well watered, and rice, pulse, sugar, spices, dye-stuffs, etc., are grown along the coast, which is low and marshy, and wheat and maize in the hilly regions. On the coast salt is extensively manufactured. Pop. 1,937,671.

CUTTER, a small vessel resembling a sloop, with one mast, and a straight running (not fixed) bowsprit, the sails being usually a fore-and-aft mainsail, gaff topsail, stay foresail, and jib.

CUTTLEFISH, any one of many mollusks, the species of which are numerous and almost world-wide in distribution. They are characterized by the presence of an ink-bag filled with black or brown "sepia," a substance which the animal ejects when pursued, so as to conceal itself from view by coloring the waters around it. Cuttle-bone is in reality the calcareous internal shell of these animals. When powdered it is sold under the name of "pounce," and is used for polishing, for tooth-powder, and in making molds for delicate castings. It was formerly much used in medicine, but is valuable only for its feebly antacid properties. In



Cuttlefish.

the tropical seas cuttlefish have been found weighing 2 tons. They are all marine. Many fossil species occur. Several species are found on the Atlantic coast of the U. States. See Squid.

CUTWORM, any worm or grub which is destructive to cultivated plants, as cabbage, corn, beans, etc.

CUVIER (küv-ya), Georges Léopold Chrétien Frédéric Dagobert, Baron, a distinguished modern naturalist, was born, Aug. 23, 1769, at Montbéliard, then belonging to the duchy of Würtemberg. A natural classification of worms was his first labor. The ability and knowledge shown in this work procured him the friendship of the greatest naturalists of France. He was invited to Paris, established at the Central School there, and received by the Institute as a member of the first class. His lectures on natural history, distinguished not less for the elegance of their style than for profound knowledge and elevated speculation, were attended by all the accomplished society of Paris. In Jan. 1800, be was appointed to the Collège de France. Under Napoleon, who fully recognized his merits, Cuvier held important offices in the department of public instruction. In 1819 he was received among the forty members of the French Academy. He died at Paris, 13th May, 1832.

CUZCO, an ancient city in Peru, capital of a department of the same name, is situated in a wide valley about 11,300 feet above sea-level, between the Apurimac and Urubamba. The houses are built of stone, covered with red tiles, and are many of them of the era of the Incas. The ruins of the fortress built by the Incas, a stupenduous specimen of cyclopean architecture, are still to be seen, as well as other massive specimens of ancient Peruvian architecture. The inhabitants manufacture sugar, soap, cotton, and woolen goods, etc. There is a university, a cathedral, etc. Cuzco is the most ancient of the Peruvian cities, and was at one time the capital of the empire of the Incas. In 1534 it was taken by Pizarro. Pop. 18,730. Area of the department, 95,547 sq. miles; pop. 238,445.

CY'ANIDE, a combination of cyanogen with a metallic base. Cyanide of potassium is used in photography and to separate gold from ores, especially in treating "tailings."

CY'ANIN, the blue coloring matter of certain flowers, as of the violet, cornflower, etc.

CY'ANITE, a mineral of the garnet family found both massive and in regular crystals. Its prevailing color is blue but of varying shades. It is found only in primitive rocks.

CYAN'OGEN, a compound radical composed of one atom of carbon and one of nitrogen. It is a gas of a strong and peculiar odor, resembling that of crushed peach leaves, and burning with a rich purple flame. It is unrespirable and highly poisonous. It unites with oxygen, hydrogen, and most non-metallic elements, and also with the metals, forming cyanides. Combined with hydrogen it forms prussic acid.

CYANOM'ETER, is the name of an instrument invented by Saussure for ascertaining the intensity of color in the sky. It consists of a circular piece of metal or pasteboard, with a band divided by radii into fifty-one portions, each of which is painted with a shade of blue, beginning with the deepest, not distinguishable from black, and decreasing gradually to the lightest, not distinguishable from white. The observer holds this up between himself and the sky, turning it gradually round till he finds the tint of the instrument exactly corresponding to the tint of the sky.

CYAN'OTYPE PROCESS, a photographic picture obtained by the use of a cyanide. This process is in very common use by architects and engineers for copying plans, producing an image with white lines upon a blue ground. Sensitive paper is made by brushing it over with a solution of ferric oxalate; it is then exposed under the positive and treated with a solution of potassium ferricyanide, by which the image is developed. The color of the ground is deepened by subsequent washing with solution of potassium bisulphate.

Cyclamen.

CY'CLAMEN, a genus of bulbous plants, nat. order Primulaceæ or primroses. The species are low-growing

herbaceous plants, with very handsome flowers. Several of them are favorite spring-flowering green-house plants. The fleshy root-stalks, though acrid, are greedily sought after by swine; hence the vulgar name, sowbread.

CYCLE is used for every uniformly-returning succession of the same events. On such successions or cycles of years rests all chronology, particularly the calendar. Our common solar year, determined by the periodical return of the sun to the same point in the ecliptic, everybody knows contains fifty-two weeks and one day, and leap-year a day more. Consequently in different years the same day of the year cannot fall upon the same day of the week. And as every fourth year is a leap-year, it will take twenty-eight years (4x7) before the days return to their former order according to the Julian calendar. Such a period is called a solar cycle. The cycle of the moon, or golden number, or Metonic cycle is a period of nineteen years after which the new and full moons return on the same days of the month.

CYCLING, the art of locomotion by means of a machine consisting of two, three, or sometimes four wheels connected by a light framework of steel and having a seat or seats for one or more riders. It is propelled by the pressure of the rider's feet on two cranks attached to an axle. To the practiced cyclist his cycle is a rapid and easy mode of traveling, and on it he can cover as much as 300 miles in a day. Fully 500 miles have been accomplished by a professional in 24 hours on a prepared track. A remarkable cycling feat was the journey of 12,000 miles by Mr. Thomas Stevens across the continents of America, Europe, and Asia on a bicycle. Commencing in April, 1884, he crossed first America, then Europe, then Asia, finishing at Yokohama in December of the same year. The cycle is now made use of for various practical purposes, in business, military affairs, etc. See Bicycle and Tricycle.

CYCLONE (sī'klōn), a circular or rotatory storm or system of winds, varying from 50 to 500 miles in diameter revolving round a center, which advances at a rate that may be as high as 40 miles an hour, and toward which the winds tend. Cyclones of greatest violence occur within the tropics, and they revolve in opposite directions in the two hemispheres—in the southern with, and in the northern against, the hands of a watch—in consequence of which, and the progression of the center, the strength of the storm in the northern hemisphere is greater on the south of the line of progression and smaller on the north, than it would be if the center were stationary, the case being reversed in the southern hemisphere.

CYCLOPÆDIA. See Encyclopædia.

CYL'INDER, a geometrical solid which, in popular language, may be described as a long round solid body, terminating in two flat circular surfaces which are equal and parallel. There is a distinction between right cylinders and oblique cylinders. In the first case, the axis, that is, the straight line joining the center of the two opposite bases, must be perpendicular, and it may be regarded as described by the revolution of a rectangular parallelogram round one of its longer sides (the axis); in the second, the axis must form an angle with the inferior base.—In steam-engines, the cylinder is the chamber in which the force of the steam is exerted on the piston.

CYLIN'DRICAL LENS, a lens whose surfaces are cylindrical, instead of spherical which is usually the case. A convex cylindrical lens brings the image of a source of light to a focus in a line instead of in a point. They are usually plano-cylindrical, that is, cylindrical on one side and flat on the other.

CYLIN'DRICAL VAULTING, in arch. the most ancient mode of vaulting, called also a wagon, barrel, or tunnel roof. It is a plain half-cylinder without either groins or ribs.

CYM'BALS, musical instruments consisting of two hollow basins of brass, which emit a ringing sound when struck together. They are military instruments, but are now occasionally used in orchestras.

CYNICS (sin'iks), a sect of philosophers among the ancient Greeks, founded by Antisthedes, a scholar of Socrates, at Athens, about 300 B.C. Their philosophy was a one-sided development of the Socratic teaching by Antisthenes and his followers, who looked only to the severer aspect of their master's doctrines, and valued themselves on their contempt of arts, sciences, riches, and all the social civilization of life. They made virtue to consist in entire self-denial and independence of external circumstances. In time this attitude degenerated into a kind of philosophic savagery and neglect of decency, and the cynics fell into contempt.

CY'PRESS, a genus of coniferous trees. The common cypress is a dark-colored evergreen with extremely small leaves, entirely covering the branches. It has

Cypress.

a quadrangular, or, where the top branches diminish in length, pyramidal shape. Cypress-trees, though of a somewhat somber and gloomy appearance, may be used with great effect in shrubberies and gardens. They are much valued also on account of their wood, which is hard, compact, and very durable, of a reddish color and a pleasant smell. The deciduous cypress of the U. States and Mexico, is frequently called the Virginian cypress. Its timber is valuable, and under water is almost imperishable. In parts of the U. States this cypress constitutes forests hundreds of miles in extent.

CY'PRUS, an island lying on the south of Asia Minor, and the most easterly in the Mediterranean. Its greatest length is 145 miles, maximum breadth about 60 miles; area, 3678 sq. miles. The chief features of its surface are two mountain ranges, both stretching east and west, the one running close to the northern shore, and extending through the long north-eastern horn or prolongation of the island, the other and more massive (Mt. Olympus) occupying a great part of the south of the island, and rising in Troödos to 6590 feet. Between them is the bare and mostly uncultivated plain called Messaria. There is a deficiency of water. The climate is in general healthy. The mountains are covered with forests of excellent timber (now under government supervision), and the island is esteemed one of the richest and most fertile in the Levant. Agriculture, however, is in a very backward state, and locusts sometimes cause great damage. Wheat, barley, cotton, tobacco, olives, raisins, and carobs are the most important vegetable products. The wine is famous, especially that known as commandery. Silk-worms are reared, and a coarse kind of silk is woven. Salt in large quantities is produced. The minerals are valuable; the copper-mines were of great importance in ancient times (the name copper is derived from that of this island), and are again being worked. Large numbers of sheep and goats are reared on the extensive pasture lands of the island. The principal towns are Lefkosia or Nicosia, the capital, the only considerable inland town, and the seaports are Larnaca and Limassol. The chief exports are carobs, wine, and cotton, with cheese, raisins, cocoons, wool, etc.

After belonging successively to the Phœnicians, Greeks, Egypt, Persia, and again Egypt, Cyprus in 57 B.C. became a Roman province, and passed as such to the eastern division of the empire. In 1191 it was bestowed by Richard of England (who had conquered it when engaged in the third crusade) on Guy de Lusignan, and after his line was extinct it fell into the hands of the Venetians (1489), with whom it remained till it was conquered by the Turks in 1571 and annexed to the Ottoman Empire. In 1878 it was ceded to Britain by the convention of Constantinople concluded between England and Turkey, its reversion to Turkey being provided if Russia should give up Batoum and Kars The island has become much more prosperous under British administration, and roads, harbor-works, etc., have been constructed, trees planted, and schools opened. The head of the government is the high commissioner, and there is a legislative council of twelve elected and six official members, nine of the former being Greeks, the others Mohammedans. Pop. 237,022, of whom three-fourths belong to the Greek Church.

CY'RUS, King of Persia, a celebrated conqueror. Cyrus conquered his grandfather (B.C. 559), and thus became king of Media and Persia. In 546 he conquered Crœsus of Lydia, and two years later took Babylon. He also subdued Phœnicia and Palestine, and restored the Jews from their Babylonish captivity. He was slain in battle with a Scythian nation in B.C. 529.

CZAR (zär or tsär), a title of the Autocrat of all the Russias, not improbably a corruption of the Roman title Cæsar. It was first adopted in 1579 by Ivan II. The feminine of czar is czarina, meaning the Empress of Russia.

CZAREV'NA, the wife of the czarowitz.

CZAROWITZ or **CZAREVITCH** (zä'rovits, zä're-vich), the title of the eldest son of the Czar of Russia.

CZECHS (che*h*s), the most westerly branch of the great Slavonic family of races. The Czechs have their headquarters in Bohemia, where they arrived in the 5th century. The original of the name is unknown. The total number of the Czechs (including Moravians, Slovaks, etc.) is about 7,500,000, nearly all of whom live in the Austrian Empire. The Czechs proper, in Bohemia, number about 3,200,000. They speak a Slavonic dialect of great antiquity and of high scientific cultivation. The Czech language is distinguished as highly inflectional, with great facility for forming derivatives, frequentatives, inceptives, and diminutives of all kinds. Like the Greek it has a dual number, and its manifold declensions, tenses, and participial formations, with their subtle shades of distinction, give the language a complex grammatical structure. The alphabet consists of forty-two letters, expressing a great variety of sound. In musical value the Czech comes next to Italian.

CZENSTOCHOWA (chen-sto-*h*ō'vä), a town in Russian Poland, government of Petrokow. There is here a convent containing a famous picture of the Virgin, which is visited by vast numbers of pilgrims. Pop. 65,000.

CZERNOWITZ (cher-nō'vits), a city of Austria, chief town of Bukowina, 138 miles s.e. of Lemberg. It has manufactures of clocks, silver-plate, carriages, toys, etc. Pop. (including suburbs), 54,171, a considerable proportion being Jews.

CZERNY (cher'ni), George, hospodar of Servia, born in the neighborhood of Belgrade about 1770; beheaded by the Turks July, 1817. His true name was George Petrovitch, but he was called Czerny or Kara George, i. e., Black George. In 1801 he organized an insurrection of his countrymen against the Turks, took Belgrade, and forced the Porte to recognize him as hospodar of Servia. In 1813, however, he had to retire before a superior force and took refuge in Austria. Returning to his country in 1817 he was taken and put to death.

CZERNY (cher'ni), Karl, pianist and musical composer, born 1791, died 1857. Among his pupils were Liszt, Thalberg, and other distinguished musicians.

CZOLGOSZ (chol'gotch), Leon, the assassin of President McKinley. He was born at Detroit in 1873 and he was therefore only 28 when he killed McKinley. He was a fanatical anarchist, a dreamer, but was said to be sane. He was executed Oct. 29, 1901. (See McKinley, William.)

D

D, the fourth letter in our alphabet, representing a dental sound formed by placing the tip of the tongue against the foot of the upper teeth, and then forcing up vocalized breath, or voice, into the mouth, the soft palate being raised to prevent its escape through the nose. T is formed in the same way, except that it is uttered with breath merely and not with voice. As a numeral D represents 500.

DAB, a fish belonging to the family of flat-fishes, comprising also the sole, turbot, halibut, plaice, and flounder, the last two being included in the same

Dab.

genus with the dab It is of a pale-brownish color spotted with white on the side which it usually keeps uppermost, and white on the underside, and has rougher scales than the other members of the same genus. It is preferred to the flounder for the table.

DACCA, a commissioner's division of Hindustan in Bengal, at the head of the Bay of Bengal; area, 15,000 sq. miles. It is one of the richest districts in India, and produces such quantities of rice as to be called the granary of Bengal. Pop. 9,844,127, Mohammedans being in a decided majority. Dacca, its capital, is about 150 miles northeast of Calcutta, being free from violent heats, is one of the healthiest and pleasantest stations in Bengal. Pop. 90,542.

DACE, a small river fish of the family Cybrindiæ, and resembling the roach but longer and thinner. It is a gregar-

Dace.

ious fish swimming in shoals and inhabiting chiefly deep clear streams with a gentle current. It seldom exceeds a pound in weight.

DACHSHUND (daks'hunt). See Badger Dog.

DACRYO'MA, a disease of the lachrymal duct of the eye, by which the tears are prevented from passing into the nose and consequently trickle over the cheek.

DAC'TYL, in versification, a foot consisting of one long followed by two short syllables, or, in English, one accented and two unaccented, as happily.

DADDY-LONG-LEGS, a name given to a species of the crane-fly, and to a species of the common house spider.

DA'DO, in classical architecture, the middle part of a pedestal, that is to say, the solid rectangular part between the plinth and the cornice; also called the die. In the interior of houses it is applied to a skirting of wood several feet high round the lower part of the walls, or an imitation of this by paper or painting.

DAFF'ODIL, the popular name of a plant which is one of the earliest ornaments of woods and meadows. Many varieties of the daffodil are in cultivation, differing chiefly in bulk and in the form of the flower, which is of a bright primrose-yellow color. There are other forms of the name in local or partial use.

DAGGER, a weapon resembling a short sword, with sharp-pointed blade. In single combat it was wielded in the left hand and used to parry the adversary's blow, and also to despatch him when vanquished.

DAGHESTAN', a province of Russia, in the Caucasus, stretching along the west side of the Caspian Sea; area, 11,036 square miles. Pop. 601,987.

DA'GOBA, in Buddhist countries and those which at one time held the Buddhist faith, a solid structure erected to contain some sacred relic or relics, as distinguished from the term stupa or

Ceylonese dagoba.

tope, which in its specific application is usually restricted to monuments which commemorate some event or mark some spot sacred to the followers of Buddha. Dagobas are built of brick or stone, are circular in form, generally with a dome-shaped top, and are erected on natural or artificial mounds, while the stone or brick structure itself sometimes rises to an immense height. These dagobas have always been held in the highest veneration by the Buddhists, and a common mode of testifying

their veneration is to walk round them, repeating prayers the while.

DAGUERRE (dä-gār), Louis Jacques Mandé, was born in 1789 at Cormeilles, dep. Seine-et-Oise. He was a scene-painter at Paris, and as early as 1814 had his attention directed to the subject of photographic pictures on metal. but it was not till July 5, 1833, that Daguerre succeeded in perfecting the process since called daguerreotype. The new process excited the greatest interest. Daguerre was made an officer of the Legion of Honor, and an annuity of 6000 francs was settled on him. Daguerre died July 10, 1851.

DAGUERREOTYPE PROCESS (dager'ro-tīp), the original photographic process, consisting in sensitizing a silver plate with the vapor of iodine, and then placing it in a camera obscura previously focussed, and afterward developing the picture by vapor of mercury. It is then fixed by immersion in hyposulphate of sodium. After thorough washing and drying the picture is covered with glass to prevent its being rubbed off. Daguerreotype has now been superseded by the collodion and other processes.

DAHABIEH (dä-hä-be'e), a boat used on the Nile for conveyance of travelers. It varies considerably in size; has one or

Dahabieh.

two masts with a very long slanting yard on each mast supporting a triangular sail, and accommodates from two to eight passengers.

DAHLGREN, John Adolf, an American naval officer born in Philadelphia in 1809, died in 1870. In 1850 he invented the Dahlgren gun which was found to be very efficient during the civil war. In 1862 he was made chief of the bureau of ordnance, in 1863 became a rear-admiral, commanded the South Atlantic Squadron during the siege of Charleston, silenced Fort Sumter, and performed other valuable services during the war. After the war he was placed in charge of the U. S. Navy Yard in Washington where he remained until his death.

DAHLGREN (däl'gren) **GUNS,** an improved kind of cannon invented by John A. Dahlgren, admiral of the United States navy. Their chief peculiarity consists in their having less metal between the muzzle and the trunnions than ordinary cannons.

DAHO'MEY, a French possession in West Africa, formerly a negro kingdom, notorious for the savagery of its inhabitants, and especially for the human sacrifices or "customs" offered up by the king. It lies between the German colony of Togoland on the west and the British territories of Lagos, etc., on the east, and extends inland for about 130 miles with a breadth of about 70.

It is well wooded and watered, and very fertile. The chief export is palm-oil. The king used to keep up an army of 10,000, a number being female warriors. The capital is Abomey, the chief port Whydah. In 1890 the king granted France a protectorate over the coast. A year or two after, hostilities broke out with the French, who defeated the king and have made Dahomey a colonial possession. Pop 600,000.

DAIRY, the department of a farm which is concerned with the production of milk and its manufacture into butter and cheese. As a rule the soil and climate of a country, and the nearness of suitable markets, determine in a great measure the choice between tillage and dairy husbandry. For milk dairies cows that yield abundantly are selected, while for butter and cheese dairies the rich quality of the milk is the principal point. Regularity in feeding is very important, and the nature of the food given has a great effect on the quality of the milk. The younger the cow is the richer is her milk, and the second and third years, therefore, are generally the most profitable, both quantity and quality being taken into account. In general, after the seventh or eighth year it is not considered advisable to continue the cow longer in milk, as her milk is fast deteriorating and she consumes more food than a young one.

DAIS, a platform or raised floor at the upper end of an ancient dining-hall, where the high table stood; also a seat with a high wainscot back, and sometimes with a canopy, for those who sat at the high table. The word is also sometimes applied to the high table itself.

DAISY, the name of a plant which is very familiar, and a great favorite. It never ceases to flower, is found in all pastures and meadows, and ascends nearly to the summit of the highest mountains. Its name is literally day's eye, being given because it opens and closes its flower with the daylight.

DAKOITY. See Dacoity.

DAKOTA, North. See North Dakota.

DAKOTA, South. See South Dakota.

DAKOTA INDIANS. See Sioux.

DALHOUSIE (dal-hō'zi), James Andrew Brown Ramsay, tenth Earl and first Marquis of, born in 1812; British statesman. After filling the offices of vice-president (1843), and president of the board of trade (1844), he was appointed governor-general of India (1847). In this post he showed high administrative talent, establishing railway lines, telegraphs, irrigation works, etc., on a vast scale. He greatly extended the British empire in India, annexing the Punjab, Oude, Berar, and other native states, as well as Pegu in Burmah. In 1849 he was made a marquis, and obtained the thanks of both houses of parliament. He outstayed his term of office to give the government the aid of his experience in the annexation of Oude; and when he returned to Europe in 1856 it was with a constitution so completely shattered that he was never able to appear

Marquis of Dalhousie.

again in public life, and died on 19th December, 1860. As he left no direct male issue, his marquisate expired with him.

DALLAS, a city of Texas, county seat of Dallas County, on the five principal railroads running through Texas. The city has large grain and manufacturing interests, and is one of the largest distributing centers of agricultural instruments in the United States. It has a Roman Catholic and a Protestant Episcopal Cathedral, a $300,000 court house, a hospital, a handsome confederate monument and many beautiful residences. The population is 90,000.

DALLAS, George Mifflin, an American statesman, born in Philadelphia in 1792, died 1864. He accompanied Gallatin on his mission to St. Petersburg, studied law, was elected to the United States senate in 1831, was made minister to Russia in 1837, vice-president of the United States from 1845 to 1849, and minister to Britain from 1856 to 1861. Dallas's forte lay in his talent as a diplomat.

DALLES (dalz), the name given to various rapids and cataracts in North America. The Great Dalles of the Columbia are about 200 miles from its mouth, where the river is compressed by lofty basaltic rocks into a roaring torrent about 58 yards in width; the Dalles of the St. Louis are a series of cataracts near Duluth, Minnesota.

DALMA'TIA, a province of Austria, with the title of kingdom, the most southern portion of the Austrian dominions. It consists of a long narrow triangular tract of mountainous country and a number of large islands along the northeast coast of the Adriatic Sea, and bounded n. by Croatia, and n.e. by Bosnia and Herzegovina. In breadth it is very limited, not exceeding 40 miles in any part; its whole area is 4940 English square miles. Pop. 527,426.

DALMATIAN DOG, a variety of dog, called also the Danish, spotted, or coach dog. See Coach-dog.

DALMAT'IC, or **DALMATICA,** an ecclesiastical vestment worn by the deacon at mass, so called because it was an

imitation of Dalmatian costume. It is worn also by bishops under the chasuble. It is a long robe with large full sleeves with black or red longitudinal stripes and partially unclosed sides. A similar robe was worn by kings and emperors at high solemnities, and continues still to be worn by the sovereigns of England on such occasions.

Dalmatica, cathedral of Chartres (twelfth century).

DALTON, John, an English chemist and natural philosopher, born in 1766. After teaching for twelve years at Kendal, in 1793 his reputation as a mathematician won for him the chair of mathematics at the New College, Manchester. Here he continued to reside (though the college was removed in 1799), publishing from year to year valuable essays and papers on scientific subjects, while he also lectured in London, and visited Paris. In 1808 he announced (New System of Chemical Philosophy) his atomic theory of chemical action, the discovery of which spread his fame over Europe. Various academic and other honors were bestowed upon him, and in 1833 he received a pension of $750, afterward increased to $1500. He died July 27, 1844.

DALY, John Augustin, an American theatrical manager, born in North Carolina in 1838, died in 1899. In 1869 he opened the Fifth Avenue Theater in New York in which appeared Fanny Davenport, Mrs. Scott Siddons, E. L. Davenport, Clara Morris and others. In 1879, after a visit to Europe, he opened Daly's Theater on Broadway. He produced many of the best of American plays and was one of the most efficient managers in the development of the American stage.

DAM, a bank or construction of stone, earth, or wood across a stream for the purpose of keeping back the current to give it increased head, for holding back supplies of water, for flooding lands, or for rendering the stream above the dam navigable by increased depth. Its material and construction will depend on its situation and the amount of pressure it has to bear. For streams which are broad and deep strong materials are required, usually stone masonry bound in hydraulic cement and a strong framework of timber. The common forms of a dam are either a straight line crossing the stream transversely, or one or two straight lines traversing it diagonally, or an arc with its convex side toward the current. See Embankment and Reservoir.

DAM, Tinker's, a small bank of clay or dough which a tinker places around his solder until it sets. The phrase is used facetiously, as in the expression, "not to give a tinker's dam," deriving its force from the insignificance of the instrument itself and its worthlessness after it has served its purpose.

DAM'AGES, in law, pecuniary compensation paid to a person for loss or injury sustained by him through the fault of another. It is not necessary that the act should have been a fraudulent one; it is enough that it be illegal, unwarrantable, or malicious. If, however, a person has suffered a loss through fraud or delict on the part of another, that person has not only a claim to ordinary damages, but may also claim remote or consequential damages, and may estimate the amount of the loss he has sustained not at its real value, but at the imaginary value which he himself may put upon it, subject, however, to the modification of a judge or a jury. In other cases the damages cover only the loss sustained estimated at its real value, together with the expenses incurred in obtaining damages.

DAMAN (dä-män'), a seaport, Hindustan, at the mouth of the Gulf of Cambay, 100 miles north from Bombay. It belongs to the Portuguese; area, 82 sq. miles; pop. 49,084.

DAMAS'CUS, a celebrated city, capital of the Turkish vilayet of Syria, supposed to be the most ancient city in the world. It is beautifully situated on a plain which is covered with gardens and orchards and watered by the Barrada. The appearance of the city, as it first opens on the view, has been rapturously spoken of by all travelers; but the streets are narrow, crooked, and in parts dilapidated, and, except in the wealthy Moslem quarter, the houses are low, with flat-arched doors and accumulations of filth before the entrance. Within, however, there is often a singular contrast, in courts paved with marble and ornamented with trees and spouting fountains, the rooms adorned with arabesques and filled with splendid furniture. Damascus is an important emporium of trade in European manufactures; it is also a place of considerable manufacturing industry in silk, damasks, cotton and other fabrics, tobacco, glass, soap, etc. Saddles, fine cabinet-work, and elegant jewelry are well made; but the manufacture of the famous Damascus blades no longer exists. It is one of the holy moslem cities, and continues to be the most thoroughly oriental in its features of any city. Of its origin nothing certain is known; but it is mentioned as a place of some note in Gen. xiv. 15. After being held by the Israelites, Assyrians, Persians, Greeks, Romans, and Arabs, it passed in 1516 to the Turks. It now has gas-works and tramways, and railways connect it with Beyrout and the Hauran. Pop. 215,000.

DAMASKEEN'ING, the ornamenting of iron and steel with designs produced by inlaying or incrusting with another metal, as gold, silver, etc., by etching, and the like.

DAMIENS (dä-mē-äṇ), Robert François, notorious for his attempt to assassinate Louis XV., born in 1715 in the village of Tieulloy. On Jan. 5, 1757, as Louis XV. was getting into his carriage to return from Versailles to Trianon, he

was stabbed by Damiens in the right side. The wound was of a trifling nature, and Damiens, who made no attempt to escape, declared he never intended to kill the king. Damiens was condemned and torn in quarters by horses March 28, 1757, on the Place de Grève at Paris.

DAM'OCLES, a native of Syracuse, and one of the courtiers and flatterers of the tyrant Dionysius the elder. One day he was extolling the grandeur and happiness of Dionysius, whereupon the latter invited him to a magnificent banquet, where he would be regaled with regal fare and regal honors. In the midst of the entertainment, however, Damocles happened to look upward, and perceived with dismay a naked sword suspended over his head by a single hair, and was thus taught to form a better estimate of royal honors.

DAMON AND PYTHIAS, two illustrious Syracusans, celebrated as models of constant friendship. Pythias had been unjustly condemned to death by Dionysius the younger, tyrant of Sicily; but, having to leave Syracuse to arrange his affairs, his friend Damon was taken as a pledge that Pythias should return on the day fixed. Pythias, however, being unexpectedly detained, had great difficulty in reaching Syracuse in time to save Damon being executed in his place; and Dionysius was so affected by this proof of their friendship that he pardoned Pythias.

DAMPERS, certain movable parts in the internal frame of a pianoforte, which, whenever the finger leaves the key, descend upon the wires and instantly check the vibration.—Dampers also denote the iron plates used to regulate the draft of flues.

DAMPS, noxious exhalations issuing from the earth, and deleterious or fatal to animal life. Damps exist in wells which continue long covered and not used, and in mines and coal-pits; and sometimes they issue from the old lavas of volcanoes. These damps are distinguished by miners under the names of choke-damp, consisting chiefly of carbonic acid gas, which instantly suffocates; and fire-damp, consisting chiefly of light carburetted hydrogen, so called from its tendency to explode.

DAM'ROSCH, Leopold, a German-American composer and conductor, born in Pasen, Prussia, in 1832, died in 1885. In 1855 he began his musical career as a violinist, and became prominent in Germany as a composer and director. In 1871 he removed to New York as director of the Arion Society. In 1884 he established German opera in New York and in other ways aided musical growth in the U. States.

DAM'ROSCH, Walter Johannes, an American musician, son of Leopold Damrosch, born in Breslau, Prussia, in 1862, and was brought to the U. S. by his parents in 1871. He has been conductor of several important musical organizations and opera performances and in 1896 produced the Scarlet Letter, an opera founded on Hawthorne's novel.

DAM'SON, a variety of the common plum. The fruit is rather small and oval, and its numerous sub-varieties are of different colors: black, bluish, dark purple, yellow, etc. The damson (curruption of Damascene), as its name imports, is from Damascus.

DAN, one of the sons of Jacob by his concubine Bilhah. At the time of the exodus the Danites numbered 62,700 adult males, being then the second tribe in point of numbers. The territory assigned them in Canaan lay on the coast, in the immediate neighborhood of the hardy and well-equipped Philistines, and the Danites were pushed back into a more mountainous region. The tribe also possessed an isolated portion of territory in the extreme north of Canaan, containing the town of Laish or Dan, which gave rise to the proverbial expression "from Dan to Beersheba." The most notable person connected with the tribe was Samson.

DA'NA, Charles Anderson, an American journalist born in New Hampshire in 1819, died in 1897. He was one of the socialists of the Brook Farm experiment and from 1847 to 1862 was connected with the New York Tribune. In 1863–4 he was assistant secretary of war, and after the war became the proprietor of the New York Sun, which he remained until his death.

DANA, James Dwight, a noted American geologist, born in New York in 1813, died in 1895. His principal work was done as a member of the Wilkes Exploring Expedition (U. States government) the results of which were published by the government in 1846, 1849, and 1852. From 1846 he was the editor of the American Journal of Science. Dana was honored by foreign scientific societies perhaps more than any other American. Since 1850 he had been professor of natural science at Yale.

DANA, Richard Henry, an American writer and poet, born in Massachusetts in 1787, died 1879. In 1815 he was made editor of the North American Review, and later worked in conjunction with Bryant in a journalistic venture called the Idle Fellow. His collected works were published in 1850.

DANA, Richard Henry, an American writer, son of Richard Henry Dana, the poet. He was born in Massachusetts in 1815, and died in 1882. He contributed to periodicals and published several works dealing with travel and nautical life. He left no lasting work.

DAN'AE, in Greek mythology, daughter of Acrisius, king of Argos. She was shut up by her father in a brazen tower, but Zeus, inflamed with passion for her, transformed himself into a golden shower, and descended through the apertures of the roof into her embraces. Set adrift on the waves by her father, she reached safely one of the Cyclades, where her child, Perseus, was brought up.

DAN'BURY, a town in Connecticut, about 53 miles n.n.e. of New York. It has notable manufactures of hats, shirts, and sewing-machines. Pop. 18,140.

DANCE OF DEATH. See Death, Dance of.

DANCING, a studied and rhythmical movement of the limbs generally adjusted to the measure of a tune. In ancient times it was generally an expression of religious, patriotic, or military feeling, as in the case of the dance of David before the ark, the choric dances, or the Pyrrhic dance of the Greeks. The Romans, however, like the orientals, had their dancing done by hired slaves. This solemn character of the dance has declined with the progress of refinement and civilization, and it is now nothing more than an elegant social amusement and an agreeable spectacle at public entertainments.

DANCING FAUN, a bronze sculpture found in Pompeii in 1853, which has given the name to the ruined house in which it was discovered.

DANCING GIRLS, the Nautch girls of India.

DANCING MANIA, a form of hysteria in medieval Europe, in which men and women, apparently crazed, danced in the streets of Aix-la-Chapelle, until they fell exhausted. This frenzy was of a religious order and spread over many cities of Europe. The mania seemed to yield to the exorcisms of the priests.

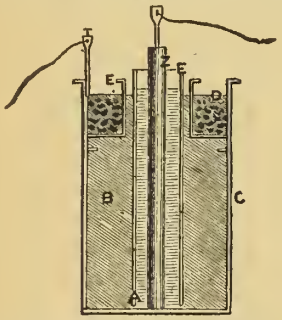
DANDELI'ON, a plant indigenous to Europe, but now also common in America. The leaves are all radical, and runcinate or jagged on the margin. From this circumstance has been derived its French name dent de lion (lion's tooth), of which the English appellation is a corruption. The stems are hollow and have one large bright-yellow flower and a tapering milky perennial root, which acts as an aperient and tonic, and is much esteemed in affections of the liver. The whole plant is full of a milky and bitter juice. The seed of the plant is furnished with a white pappus, and is transported far and wide by the wind.

DANE'GELT, Dane'geld (that is, "Dane tax"), in English history, an annual tax laid on the English nation for maintaining forces to oppose the Danes, or to furnish tribute to procure peace. It was at first one shilling, and ultimately seven, for every hide of land, except such as belonged to the church, When the Danes became masters of England the danegelt was a tax levied by the Danish princes on every hide of land owned by the Anglo-Saxons.

DAN'IEL, the prophet, a contemporary of Ezekiel, was born of a distinguished Hebrew family. In his youth, B.C. 605, he was carried captive to Babylon, and educated in the Babylonish court for the service of King Nebuchadnezzar. Thrown into the lions' den for conscientiously refusing to obey the king he was miraculously preserved, and finally made prime-minister in the court of the Persian king Darius. He ranks with what are called the "greater prophets." The book of the Old Testament which bears his name is divided into a historical and a prophetic part. Modern criticism generally regards it as written during the oppression of the Jews under Antiochus, about 170 B.C. It is partly in Chaldee.

DANIELL'S BATTERY, a galvanic battery the cells of which were originally constructed in the following way. A tall cylindrical copper vessel was nearly filled with saturated solution of sulphate of copper. A rod of amalgamated zinc

was inclosed in a skin or bladder, which was filled with dilute sulphuric acid, and was suspended in the copper cylinder. When the zinc rod is connected by a wire with the copper vessel, which itself forms one of the plates of the battery, the current passes, according to common phraseology, from the copper through the wire to the zinc. Instead of the bladder or skin porous earthenware pots are now employed to contain the dilute sulphuric acid in which the zinc is immersed. In improved modifications of Daniell's battery the most important change is that of substituting for the dilute sulphuric acid that surrounds the zinc, solution of sulphate of zinc, and in this case the zinc is not amalgamated. By doing away with the sulphuric acid local waste of the zinc is to a great extent prevented,



Daniell's Battery.—Section of Cell.

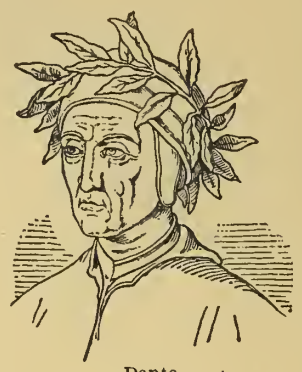
c, Outer copper cell. B, Solution of sulphate of copper. D, Shelf for sulphate of copper. E, Porous cell. A, Sulphuric acid. Z, Zinc.

and the solution of sulphate of zinc is used instead of pure water on account of the very high resistance of water impregnated with salts.

DAN'ITES, the band of assassins and "avengers on the gentiles" which was organized among the Mormons in 1837; also called "the destroying angels." Many crimes were attributed to the Danites, whose existence, by the way, has always been denied by the Mormons themselves.

DAN'NAT, William T., an American painter, born in New York in 1853. He became a resident of Paris, a teacher in the Ecole des Beaux Arts, and has exhibited at numerous European exhibitions. Dannat has lived continuously in Europe since boyhood and is an American only in name.

DANTE ALIGHIERI (dän'tā à-lē-gē-ā'rē), the greatest of Italian poets, was born in Florence about the end of May, 1265. He seems to have been quite a boy, no more than nine years of age, when he first saw Beatrice Portinari and the love she awakened in him he has described in that record of his early years, the Vita Nuova, as well as in his later great work, the Divina Commedia, in terms which make it hard to distinguish the real personality of Beatrice from some ideal power of beauty and virtue of which she is to Dante the symbol. Their actual lives at least went far enough apart, Beatrice marrying a noble Florentine, Simone Bardi, in 1287, and dying three years afterward; while the year following Dante married Gemma dei Donati, by whom he had seven children. He died Sept., 1321. His great poem, the Divina Commedia (Divine Comedy), is divided into three parts, entitled Hell, Purgatory, and Paradise. The poet dreams that he has wandered into a dusky forest, when the



Dante.

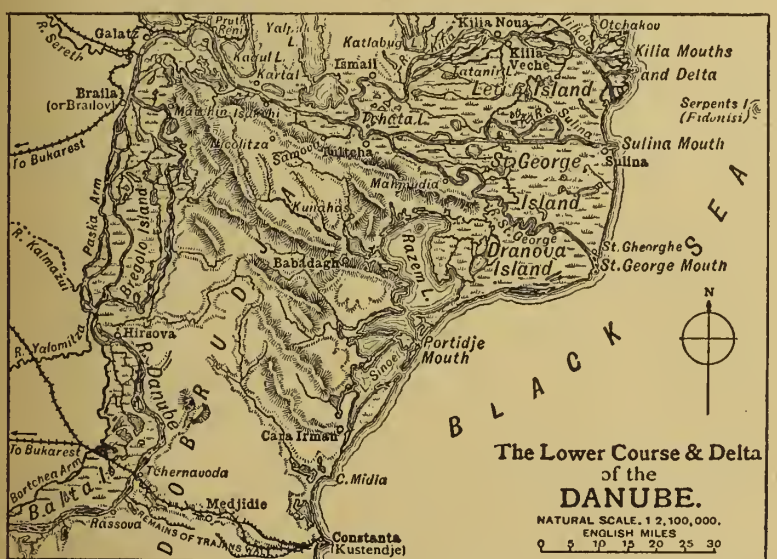
shade of Virgil appears and offers to conduct him through hell and purgatory. Further the pagan poet may not go, but Beatrice herself shall lead him through paradise. The journey through hell is first described, and the imaginative power with which the distorted characters of the guilty and the punishments laid upon them are brought before us; the impressive pathos of these short histories—often compressed in Dante's severe style into a couple of lines—of Pope and Ghibelline, Italian lord and lady; the passionate depth of characterization, the subtle insight and intense faith, make up a whole which for significance and completeness has perhaps no rival in the work of any one man. From hell the poet, still in the company of Virgil, ascends to purgatory, where the scenes are still mostly of the same kind though the punishments are only temporary. In the earthly paradise Dante beholds Beatrice in a scene of surpassing magnificence, ascends with her into the celestial paradise, and after roaming over seven spheres reaches the eighth, where he beholds the "glorious company which surrounds the triumphant Redeemer." In the ninth Dante feels himself in presence of the divine essence, and sees the souls of the blessed on thrones in a circle of infinite magnitude. The Diety himself, in the tenth he cannot see for excess of light.

DANTON (dän-tōn), Georges Jacques, an advocate by profession, and one of the great figures in the French Revolution, born 1759. His colossal stature, athletic frame, and powerful voice contributed not a little, together with his intellectual gifts and audacity, to win him a prominent position among the revolutionaries. He founded the club of the Cordeliers, was foremost in organizing and conducting the attack on the Tuileries, Aug. 10, 1792, and as a reward for such services was made minister of justice and a member of the provisional executive council. When the advance of the Prussian army spread consternation among the members of the government Danton alone preserved his courage, and in a celebrated speech summoned all Frenchmen capable of bearing arms to march against the enemy. He voted for the capital punishment of all returning aristocrats, but undertook the defense of religious worship, and along with Robespierre brought Hébert and the worshipers of the goddess Reason to the scaffold. But the rivalry of the two great leaders had now reached a point when one must succumb, and the crafty Robespierre succeeded in having Danton denounced and thrown into prison, 31st March, 1794. Five days afterward he was condemned by the revolutionary tribunal as an accomplice in a conspiracy for the restoration of monarchy, and executed the same day.

DANTZIG, or **DANZIG** (dänt'zih), a fortified town and port, Prussia, capital of the province of West Prussia, 253 miles n.e. Berlin, on the left bank of the west arm of the Vistula, about 3 miles above its mouth in the Baltic, and intersected by the Mottlau, which here divides into several arms. It is one of the most important seaports in the Prussian monarchy. The prosperity of the town is founded chiefly on its transit trade, particularly in wheat from Poland. There is also a considerable trade in amber. Pop. 140,539.

DAN'UBE, a celebrated river of Europe, originates in two small streams rising in the Schwarzwald, or Black Forest, in Baden, and uniting at Donaueschingen. The direct distance from source to mouth of the Danube is about 1000 miles, and its total length, including windings, about 1670 miles. From its source the Danube flows in a northeasterly direction to Ulm, in Würtemberg, where it becomes navigable for vessels of 100 tons; thence to Ratisbon in Bavaria, where it becomes navigable for steamers. Here it turns in a southeasterly direction, entering Austria at Passau, passing Vienna and Budapest, above which latter town it suddenly turns due south, holding this direction till it is joined by the Drave, after which it runs s.s.e. and enters Servia at Belgrade. Continuing its general course eastward it forms for a long distance the boundary line between Roumania and Bulgaria. At Silistria it once more turns northward, and flowing between Roumania and Bessarabia falls into the Black Sea by three different outlets. In the upper part of its course, through Würtemberg and Bavaria, the Danube flows through some of the most fertile and populous districts of its basin. Its principal affluents here are the Iser and Lech. In Austria it passes through a succession of picturesque scenery till past Vienna, the land on both sides being

well peopled and cultivated. The principal affluents are the March, or Morawa, and the Ens. After passing through what is called the Carpathian Gate, at Pressburg, where it enters Hungary, it gives off a number of branches, forming a labyrinth of islands known as Schütten, but on emerging it flows uninterruptedly southward through wide plains interspersed with pools, marshes, and sandy wastes. The principal affluents here are the Save, the Drave, and the Theiss. Sixty miles before entering Roumania the river passes through a succession of rapids or cataracts which it has made in cutting a passage for itself through the cross chain of hills which connect the Carpathian Mountains with the Alps. The



last of these cataracts, at Old Orsova, is called the Iron Gate. The lower course of the Danube, in Roumania and Bulgaria, is through a flat and marshy tract, fertile but badly cultivated and thinly peopled. In this part it increases its width from 1400 to 2100 yards, and latterly forms an expanse like a sea, and is studded with islands. Of the three outlets the Sulina Mouth is the deepest, and is usually chosen by ships bound up the river. The Danube is navigable for steamers up to Regensburg (Ratisbon), nearly 1500 miles from its mouth. Some of its tributaries, such as the Save, the Theiss, and the Drave, are also navigable, so that the water system of the Danube may be estimated as admitting of about 2500 miles of steam navigation.

DANUBIAN PRINCIPALITIES. See Roumania.

DAN'VERS, a town including several villages, in Essex Co., Mass., four miles northwest of Salem; on the Boston and Maine Railroad. The manufactures include shoes, leather, morocco, brick, motor vehicles, electric lamps, iron, rubber, soap, etc. Pop. 10,100.

DAN'VILLE, a city and county seat of Vermilion Co., Ill., 125 miles south of Chicago; on the Vermilion River, and on the Wabash, the Chicago and Eastern Illinois, and the Cleveland, Cincinnati, Chicago and Saint Louis railroads. It has coal-mining interests, foundries, and manufactures of woolen goods, glass, and bricks. Pop. 1900, 18,354.

DANVILLE, a borough and county-seat of Montour co., Pa., on the north branch of the Susquehanna River, 12 miles from its intersection with the West Branch, and on the Pennsylvania, the Lackawanna, and the Philadelphia and Reading railroads. Pop. 10,100.

DANVILLE, a city in Pittsylvania co., Va., 141 miles southwest of Richmond; on the Dan River and on railroads of the Southern Railway System. It was for a short time the seat of government of the Southern Confederacy during its last days. Pop. 17,424.

DAPH'NE, the Greek name for laurel, in Greek mythology a nymph beloved by Apollo. Deaf to the suit of the god, and fleeing from him, she besought Zeus to protect her. Her prayer was heard, and at the moment Apollo was about to encircle her in his arms she was changed into a laurel, a tree thenceforth consecrated to the god.

DARBHAN'GAH, a town of Hindustan, in the Patná division of Behar, in a low-lying district subject to inundation; it is the residence of the Maharaja of Darbhangah, who has a fine new palace here. Pop. 66,244.

DAR'DANELLES (-nelz), a narrow channel which connects the Sea of Marmora with the Grecian Archipelago, and at this particular point separates Europe from Asia. It is about 40 miles in length, and varies in breadth from 1 to 4 miles. On both shores there are numerous forts and batteries. Two castles on the opposite shores occupy the sites of ancient Sestos and Abydos, and recall the story of Hero and Leander. By treaty made in 1841 between the five great powers and Turkey, confirmed by the Peace of Paris in 1856, it is settled that no non-Turkish man-of war shall pass the strait without the express permission of the Turkish government.

DARFUR', or **DARFOOR',** a considerable region of Central Africa, forming a large oasis in the s.e. corner of the Great Desert. The inhabitants are Mohammedans and negroes, and semi-barbarous. Their occupation is chiefly agriculture, and cattle form their principal wealth. The commerce with Egypt is extensive, and is carried on entirely by the African system of caravans. It exports slaves, ivory, ostrich feathers, gum, copper, etc., and receives in exchange sugar, cotton cloth, hardware, fire-arms, etc. Unlimited polygamy is allowed, and the morals and manners of the natives are of a very degraded kind. Darfur is part of the Egyptian Soudan. Pop. estimated at 4,000,000.

DARIC, an ancient Persian gold coin of Darius, weighing about 129 grains, value about $6.00, and bearing on one

Golden daric, from British museum.

side the figure of an archer. In later times the name has been applied to a silver coin having the figure of an archer.

DA'RIEN, Gulf of, a gulf of the Caribbean Sea at the north extremity of South America, between the Isthmus of Panamá and the mainland.

DARIEN, Isthmus of, often used as synonymous with the Isthmus of Panamá, but more strictly applied to the neck of land between the Gulf of Darien and the Pacific.

DARIEN SCHEME, a celebrated financial project, conceived and set afloat by William Paterson, a Scotchman, toward the close of the 17th century. He proposed to form an emporium on each side of the Isthmus of Darien or Panamá for the trade of the opposite continents. The settlement thus formed would become the entrepôt for an immense exchange between the manufactures of Europe and the produce of South America and Asia. In 1698 five large vessels laden with stores, etc , and with 1200 intending colonists, sailed for the Isthmus of Darien. The settlement was found in a suitable position, and the colonists fortified a secure and capacious harbor; but nothing else had been rightly calculated. For eight months the colony bore up, but at the end of that time the survivors were compelled by disease and famine to abandon their settlement and return to Europe. Two of the ships were lost on the way home, and only about thirty, including Paterson, reached Scotland.

DARI'US, the name of several Persian kings. (1) Darius I., fourth king of Persia, son of Hystaspes, a prince of the royal family of the Achæmenidæ, attained the throne in B.C. 521. His reign was distinguished by many important events. died B.C. 485.—(2) Darius II , ascended the throne in 423, and died in 404. His son Cyrus is familiar to us through Xenophon's Anabasis.—(3) Darius III., grandson of Darius II., was the twelfth and last king

of Persia. He ascended the throne B.C. 336, died 330 B.C.

DARJEEL'ING, a district of India, in the extreme north of the lieutenant-governorship of Bengal, division of Cooch-Behar; area, 1234 sq. miles. Tea, coffee, cinchona, and cotton are cultivated more or less, and the cultivation of the tea-plant and the making of tea is now the staple industry. Pop. 223,314. — Darjeeling, the chief town in the district, is a sanatory station for the British troops, and though little more than 36 miles from the plains stands at an elevation of 7400 feet above sea-level, on a ridge with deep valleys on either side, in a bleak but healthy situation. There is a residence of the lieutenant-governor, barracks, a sanitarium, etc. Pop. 13,037, much increased in the hot weather.

DARK HORSE, an American political term used to designate an unlooked-for, or comparatively unknown, candidate in a political convention who suddenly comes to the front and wins the nomination. The term originated in the story of the trotting race in which a dark horse, upon which nobody counted, turned up winner.

DARLING, Grace, a celebrated English heroine, was born in 1815 in the Longstone Lighthouse (Farne Islands, coast of Northumberland), of which her father was keeper. In 1838 the steamer Forfarshire, with forty-one passengers on board besides her crew, became disabled off the Farne Islands during a storm, and was thrown on a rock where she broke into two, part of the crew and passengers being left clinging to the wreck. Next morning William Darling descried them from Longstone, about a mile distant, but he shrank from attempting to reach the wreck through a boiling sea in a boat. His daughter Grace, however, implored him to make the attempt and let her accompany him. At last he consented, and father and daughter each taking an oar, they reached the wreck and succeeded in rescuing nine sufferers. The news of the heroic deed soon spread and the brave girl received testimonials from all quarters. Four years afterward she died of consumption, 20th October, 1842.

DARMSTADT (dârm'stât), Germany, capital of the Grand-duchy of Hesse, in a sandy plain, on the Darm, 15 miles s. Frankfort. Among the remarkable buildings are the old palace (with a library of 500,000 volumes and 4000 MSS., a picture-gallery, and a rich museum of natural history), the Roman Catholic Church, and the Rathhaus or town-hall, built in 1580. Pop. 56,399.

DARMSTADT, or **HESSE-DARMSTADT.** See Hesse.

DARN'LEY, Henry Stuart, Lord, son of the Earl of Lennox and Lady Margaret Douglas, a niece of Henry VIII., and by her first marriage queen of James IV., born 1541. In 1565 he was married to Mary Queen of Scots. It was an unfortunate match, and ere long gave rise first to coolness, then to open quarrel, and finally to deadly hate, which the murder of Rizzio, to which Darnley was a party, only increased. Mary affected, however, to be reconciled to him, but could not long conceal her contempt for the handsome imbecile. After the birth of a son, subsequently James VI., Darnley was seized at Glasgow with smallpox, from which he had barely recovered when Mary visited him, and had him conveyed to an isolated house called Kirk of Field, close to the Edinburgh city walls. This dwelling, which belonged to a retainer of Bothwell's, the rapidly rising favorite, was blown into the air with gunpowder (10th February, 1567). The dead bodies of the king and his page were found in a field at a distance of 80 yards from the house, quite free from any mark which such an explosion would cause. Strong circumstantial evidence points to Bothwell as the murderer, and to Mary as an accomplice in the crime.

DARRANG, an administrative district of Hindustan, forming a portion of the upper valley of the Brahmaputra, in the prov. of Assam; area, 3418 sq. miles; pop. 307, 761. Virgin forests cover a large portion of the region.

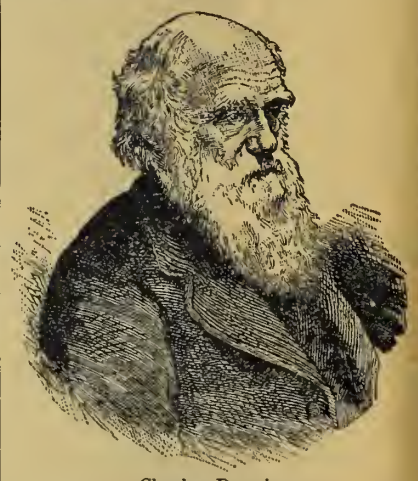
DARTMOOR', an extensive upland tract in England, in the western part of Devonshire, often called the Forest of Dartmoor, and belonging to the Duchy of Cornwall; reaching from Brent s., to Oakhampton n., 22 miles, with a breadth of about 20 miles, and occupying from 130,000 to 150,000 acres. Cattle and sheep are fed on the coarse grass during the summer months. Several of the rugged granite hills (here called tors) are of considerable height, Yes Tor rising 2050 feet above the plain. Dartmoor prison, built in 1809 as a state-prison, is now a convict depôt.

DARTMOOR MASSACRE, an incident of the war of 1812, in which a number of American prisoners in Dartmouth prison, England, were shot by a company of British troops. The charge was made that the Americans were at the bottom of a conspiracy to escape. The massacre was justified by a joint high commission, although the prisoners were found guiltless and the British government made ample provision for the injured and the families of the dead.

DARTMOUTH COLLEGE, situated at Hanover, N. H., and organized in 1750 at Lebanon, Conn. Besides the collegiate department there is a medical school, an engineering school, a finance school, and an agricultural school. There are 800 or more students and 90,000 volumes in the library.

DARTMOUTH COLLEGE CASE, an important law case concerning the charter of Dartmouth college. The charter was originally granted by Britain but in 1816 the New Hampshire legislature passed a law taking over the school. The Dartmouth trustees rejected the new charter and in this they were upheld by the decision of the supreme court.

DAR'WIN, Charles Robert, English naturalist, born at Shrewsbury in 1809, died at Down, near Beckenham in Kent, 1882. He early devoted himself to the study of natural history, and in 1831 he was appointed naturalist to the surveying voyage of H. M. S. Beagle. The vessel sailed in Dec. 1831, and did not return till Oct. 1836, after having circumnavigated the globe. In 1839 he married his cousin Emma Wedgwood. In 1859 his name attained its great celebrity by the publication of The Origin of Species by Means of Natural Selection. This work, scouted and derided though it was at first in certain quarters, may be said to have worked nothing less than a revolution in biological science. In it for the first time



Charles Darwin.

was given a full exposition of the theory of evolution as applied to plants and animals, the origin of species being explained on the hypothesis of natural selection. The rest of his works are largely based on the material he had accumulated for the elaboration of this great theory. Mr. Darwin was buried in Westminster Abbey.

DAR'WINISM, the views, especially regarding the origin and development of animals and plants, expressed in detail and advocated with much earnestness in the works of Charles Darwin. See Evolution, Natural Selection, etc.

DATE, that addition to a writing which specifies the year, month, and day when, and usually the place where, it was given or executed; also the time when any event happened, when anything was transacted, or when anything is to be done.

DATE, the fruit of the date-palm or the tree itself. The fruit is used extensively as an article of food by the natives of Northern Africa and of some countries of Asia. It consists of an external pericarp, separable into three portions, and covering a seed which is hard and horny in consequence of the nature of the albumen in which the embryo plant is buried. Next to the cocoanut tree the date is unquestionably the most interesting and useful of the palm tribe. Its stem shoots up to the height of 50 or 60 feet without branch or division, and of nearly the same thickness throughout its length. From the summit it throws out a magnificent crown of large feather-shaped leaves, and a number of spadices, each of which in the female plant bears a bunch of from 180 to 200 dates, each bunch weighing from 20 to 25 lbs. The fruit is eaten fresh or dried. Cakes of dates pounded and kneaded together are the food of the Arabs who traverse the deserts. A liquor resembling wine is made from dates by fermentation.

Persia, Palestine, Arabia, and the north of Africa are best adapted for the culture of the date-tree, and its fruit is in these countries an important article of food.

Date palm.

DATIA (*dat'-ia*), a native state in Bundelkhand, Hindustan, under the Central India Agency. Area, 836 sq. miles; pop. 186,440.—Datia, the chief town of the state, is situated 125 miles s.e. of Agra. Pop. 24,071.

DAUDET (dō-dā), Alphonse, French novelist, born at Nîmes 1840. He settled in Paris in 1857, and wrote poems, essays, plays, etc., without much success, till he discovered his powers as a novelist, when he speedily became famous. He died in 1897.

DAUGHTERS OF THE AMERICAN REVOLUTION, Society of, a patriotic society for women, organized in Washington, D.C., Oct. 11, 1890. Its purpose is to perpetuate traditions of the American Revolution and membership is restricted to female descendents of ancestors who aided the revolution. The society has from 40,000 to 50,000 members, scattered in state chapters throughout the Union.

DAUGHTERS OF THE CONFEDERACY, The United. (See Confederacy, United Daughters of).

DAUGHTERS OF THE KING, a Protestant Episcopal organization for women, organized in New York City in 1885 for the purpose of promoting work in the church. It has a membership of about 18,000.

DAUGHTERS OF THE REVOLUTION, Society of, a patriotic society for women, organized in New York City in 1891, with objects similar to those of the Daughters of the American Revolution, but with a membership restricted to lineal female descendents who by assisting the revolution because guilty of treason to Britain. The membership is about 5,000.

DAU'PHIN, the title of the eldest son of the King of France prior to the revolution of 1830, said to be derived from the dolphin, the crest of the lords of Dauphiny. The name was assumed towards the middle of the 9th century by the lord of Dauphiny, which province was bequeathed by Humbert II. to the King of France in 1349, on condition that the heir of the throne should bear the title of Dauphin of Viennois

DAVENPORT, a city of Iowa, on the Mississippi River about 300 miles north of St. Louis. Connecting it with Rock Island are two iron bridges built at a cost of $2,000,000. Davenport has splendid transportation facilities by water and rail. It has a public library, two theaters, several important educational institutions, and a number of large factories. The town was founded in 1851 by George Davenport. It has a population of 50,000.

DAVENPORT, Charles Benedict, an American zoologist born in Connecticut in 1866. He has written a number of monographs on zoological subjects.

DAVENPORT, Edward Loomis, an American actor, born in Boston in 1816, died in 1877. He made his first appearance at Providence, R. I., as Sir Giles Overreach and subsequently became noted as a most excellent interpreter of Shakespearean rôles.

DAVENPORT, Fanny Lily Gipsy, an American actress, daughter of E. L. Davenport, born in England in 1850, died in 1898. She began her stage career as a little girl, and by 1883 had appeared with great success in a variety of parts of wide range. In the last mentioned year she began to appear in Sardou's dramas in which she disclosed new power. She married Willet Melbourne Mac Dowell in 1889.

DAVID, King of Israel, the youngest son of Jesse, a citizen of Bethlehem, and descended through Boaz from the ancient princes of Judah. The life of David is recorded in the first and second books of Samuel and the first book of Chronicles. The book of Psalms, a large portion of which has been attributed to him (see Psalms), also contains frequent allusions to incidents in his life. He reigned from 1055 B.C. to 1015 B.C., according to the usual chronology, but recent investigations put the dates of David's reign from 30 to 50 years later. Under David the empire of the Israelites rose to the height of its power, and his reign has always been looked on by the Jews as the golden age of their nation's history.

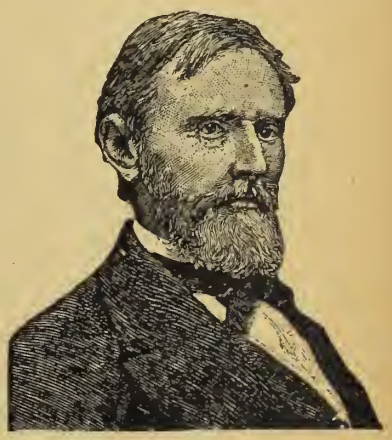
DAVID I., King of Scotland, son of Malcolm Canmore; born about 1080; succeeded his brother Alexander I. in 1124; died 1153. He was the first to introduce feudal institutions and ideas into his native land.

DAVID II., King of Scotland, son of Robert Bruce, born 1322; succeeded to the throne 1329; died 1370.

DAVID, Jacques Louis, the founder of the modern French school of painting, born at Paris 1748, died at Brussels 1825. What is considered his masterpiece, The Rape of the Sabines, was painted in 1799. He was appointed first painter to Napoleon about 1804; and after the second restoration of Louis XVIII. he was included in the decree which banished all regicides from France, when he retired to Brussels.

DAVID, Pierre Jean, a French sculptor, born at Angers in 1789 (hence commonly called David d'Angers), died 1856. In 1831 he began the magnificent sculptures of the Pantheon, his most important work, which he finished in 1837. He executed a great number of medallions, busts, and statues of celebrated persons of all countries, among whom we may mention Walter Scott, Canning, Washington, Lafayette, Guttenberg, Cuvier, Victor Hugo, Béranger, Paganini, and Madame de Staël.

DAVIS, Jefferson, president of the Confederate States of America during the civil war; born in Kentucky 1808. He was trained at West Point Military



Jefferson Davis.

Academy, and from 1828 to 1835 saw a good deal of service on the frontier. At the latter date he became a cotton planter in the State of Mississippi. He was elected to congress in 1845, but at the commencement of the Mexican war he left congress and engaged actively in the contest. He entered the senate in 1847, and held various posts in the government, upholding the policy of the slave states and the doctrine of slave rights. On the outbreak of the civil war he was chosen president of the Southern States, was taken prisoner after the fall of Richmond, imprisoned for two years in Fortress Monroe, and set at liberty by the general amnesty of 1868. He subsequently wrote a history of the war. He died in 1889.

DAVIS, John Chandler Bancroft, an American diplomat, born in Massachusetts in 1822. He was an agent of the United States in the Alabama claims case and was minister to Germany from 1874 to 1877.

DAVIS, John D., an American oriental scholar, born in Pennsylvania in 1854. He has published (1898) a Dictionary of the Bible, and (1894) Genesis and Shemitic Tradition.

DAVIS, Nathan Smith, an American physician born in New York in 1817, and educated in the College of Physicians and Surgeons of Western New York. He was the projector and founder of the American Medical Association in 1845 and soon afterward removed to Chicago where he become associated with the

Rush Medical College. He became noted as an advocate of tcetotalism.

DAVIS, Rebecca Harding, an American writer, born in 1831 in Pennsylvania. She has written several short stories which have received considerable praise.

DAVIS, Richard Harding, an American editor and short story writer, born in Philadelphia in 1864. He was for a time editor of Harper's Weekly and in 1891 published his first successful short story book called Gallagher and Other Stories. This was followed by numerous other such books, and a number of books made up of descriptive articlcs previously published in magazines. His style is vigorous and interesting.

DAVIS, Varina Anne Jefferson, daughter of Jefferson Davis, born in Richmond, Va., in 1864, died in 1898. She was known as "The Daughter of the Confederacy."

DAVIS, William Morris, an American astronomer and meteorologist, born in Philadelphia in 1850. He has been for many years a teacher at Harvard University.

DAVIS' STRAIT, a narrow sea which separates Greenland from Baffin's Land, and unites Baffin's Bay with the Atlantic Ocean; lat. 60° to 70° n.

DA'VITS, two projecting pieces of wood or iron on the side or stern of a vessel, used for suspending or lowering and hoisting the boats by means of sheave and pulley. They are fixed so as to admit of being shipped and unshipped at pleasure.

DA'VITT, Michael, an Irish patriot, politician and parliamentarian, born in Mayo in 1846. He began his career as a journalist, began anti-landlord agitation in 1867 and was several times elected member of parliament. Davitt visited the U. States on a number of occasions to raise money for the Irish cause. He was one of Parnell's most bitter opponents. He died in 1906.

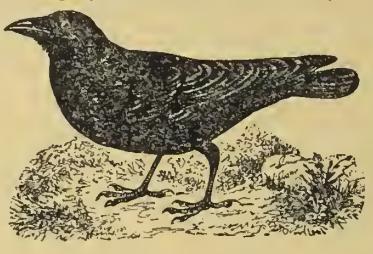
DA'VY, Sir Humphry, Bart., distinguished English chemist, was born at

Sir Humphry Davy.

Penzance, 1778, died at Geneva 1829. His discoveries with the galvanic battery, his decomposition of the earths and alkalies and ascertaining their metallic bases, his demonstration of the simple nature of the oxymuriatic acid (to which he gave the name of chlorinc), etc., obtained him an extensive reputation; and in 1810 received the prize of the French Institute. The numerous accidents arising from fire-damp in mines led him to enter upon a series of experiments on the nature of the explosive gas, the result of which was the invention of his safety-lamp. He was knighted in 1812, and created a baronet in 1818.

DAVY-LAMP. See Safety-lamp.

DAW, or JACKDAW; a bird of the crow family, found in Europe, Asia and Africa; 14 inches long, black, with a smoky-gray neck. Daws are very cun-



Daw, or jackdaw.

ning, social, and active birds, often nesting in church-towers and old castles. They build a nest of sticks, of which they sometimes collect a large quantity

DAY, either the interval of time during which the sun is continuously above the horizon, or the time occupied by a revolution of the earth on its axis, embracing this interval (the period of light) as well as the interval of darkness. The day in the latter sense may be measured in more than one way. If we measure it by the apparent movement of the stars, caused by the rotation of the earth on its axis, we must call day the period between the time when a star is on the meridian and when it again returns to the meridian; this is a sidereal day. It is uniformly equal to 23 hours, 56 minutes, 4 098 seconds. But more important than this is the solar day, or the interval between two passages of the sun across the meridian of any place. The latter is about 4 minutes longer than the former, owing to the revolution of the earth round the sun, and it is not of uniform length, owing to the varying speed at which the earth moves in its orbit and to the obliquity of the ecliptic. For convenience an average of the solar day is taken, and this gives us the mean solar or civil day of 24 hours, the difference between which and the actual solar day at any time is the equation of time.

The length of the days and nights at any place varies with the latitude and season of the year, owing to the inclination of the earth's axis. In the first place, the days and nights are equal (twelve hours each) all over the world on the 21st of March and the 21st of September, which dates are called the vernal (spring) and autumnal equinoxes (Lat. æquus, equal; nox, night). Again, the days and nights are always of equal length at the equator, which, for this reason, is sometimes called the equinoctial line. With these exceptions, we find the difference between the duration of the day and the night varying more and more as we recede from the equator. This will be easily understood from a consideration of the accompanying figure, which represents the position of the earth at the northern summer solstice. Let s a, s′d, s″b represent the sun's rays, then the vertical circle a f b g will be the circle of illumination, that is, the line which separates the illuminated and dark hemispheres of the earth. Consider a place f. As the earth turns round it would describe a circle f d g h, the greater part of which, f d g, is performed in the sunlight, and the smaller part, g h f, in the dark. In other words, the day for the place f would be longer than its night. It will be also seen that for any place within the Arctic circle a k the sun does not set, while in the Antarctic circle the sun never rises so long as the earth is in this position. At the northern winter solstice the reverse of all this is the case—the Arctic circle never comes into the light area, and places within the Antarctic circle never enter into the dark. From this it will be seen that at both poles the year consists of one day of six months' duration, and one night of the same length.

The Babylonians began the day at sun-rising; the Jews at sun-setting; the Egyptians and Romans at midnight, as do most modern peoples. The civil day in most countries is divided into two portions of twelve hours each. The abbreviations p.m. and a. m. (the first signifying postmeridian, Latin for afternoon; the latter antemeridian, forenoon) are requisite, in consequence of this division of the day. The Italians in some places reckon the day from sunset to sunset, and enumerate the hours up to twenty-four; the Chinese divide it into twelve parts of two hours each. For astronomical purposes the day is divided into twenty-four hours instead of two parts of twelve hours. Formerly it began at noon, but since 1st Jan. 1885, the day of twenty-four hours begins at midnight at Greenwich Observatory; and this reckoning is now generally adopted for astronomical purposes elsewhere than at

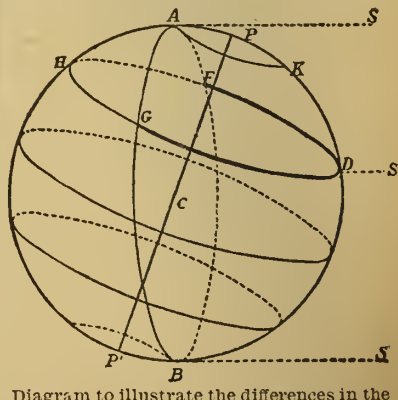


Diagram to illustrate the differences in the length of day and night.

Greenwich. The Greenwich day practically determines the date for all the world. At mid-day at Greenwich the date (day of the week and month) is everywhere the same, though there are

all possible differences in naming the hour of the day. But mid-day at Greenwich is the only instant at which we ever have the same date all over the world. The meridian of midnight, which is then at 180° e. or w., goes on revolving, gradually bringing a new date to every place to the west of that line, but obviously not bringing that new date to the places immediately to the east of that line till twenty-four hours after. From this it follows that whereas places on the one side of the globe never have a different date except when midnight lies between them, places on the opposite side of the globe, and on different sides of the meridian of 180° e. or w., never have the same date except when midnight lies between them. The actual difference of time between Wellington in New Zealand and Honolulu in the Sandwich Islands is only about 2 hours; yet a person at Wellington may date a letter 9 o'clock a. m. 26th June, while another writing at the same instant at Honolulu dates his 11 o'clock a. m. 25th June.

DAY, William Rufus, an American jurist and statesman, born in Ohio in 1849, studied law, and in 1897 was appointed assistant secretary of state, and subsequently secretary of state in succession to John Sherman. In 1899 he was made judge of the sixth circuit of the U. States circuit court.

DAY-BOOK, a journal of accounts; a book in which are recorded the debts and credits or accounts of the day. See Book-keeping.

DAYS OF GRACE are days allowed for the payment of a promissory note or bill of exchange after it becomes due. The time varies in different countries.

DAYTON, a town in Ohio, capital of Montgomery county, at the confluence of the Mad and Great Miami rivers, 52 miles n.e. of Cincinnati. It is a place of great industrial activity, a center of railway communication, and in the variety and extent of its manufactures it stands in the front rank of western towns of its size. The National Home for Disabled Soldiers and Sailors is situated here. The city is laid out with wide streets adorned with numerous handsome buildings. There is a Greek courthouse, a fine high school, several hospitals, and a public library. Pop. 130,000.

DEACON, ecclesiastically, a person in the lowest degree of holy orders. The office of deacon was instituted by the apostles, and seven persons were chosen at first to serve at the feasts of Christians, and distribute bread and wine to the communicants, and to minister to the wants of the poor. In the Roman Catholic Church the deacon is the chief minister at the altar. He assists the priest in the celebration of mass, and on certain conditions can preach and baptize. In the Church of England the deacon is the lowest of the three orders of priesthood, these being bishops, priests, and deacons. The deacon may perform all the ordinary offices of the Christian priesthood except consecrating the elements at the administration of the Lord's Supper, and pronouncing the absolution. In Presbyterian churches the deacon's office is to attend to the secular interests, and in Independent churches it is the same, with the addition that he has to distribute the bread and wine to the communicants.

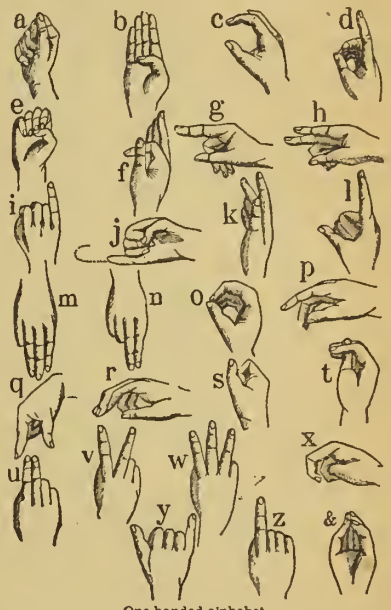
DEAD, BOOK OF THE, a name applied to a number of texts and other writings in the religious system of Egypt. The origin of the name lay in the belief of the ancient Egyptians that this book, or these texts were of great assistance to the dead in the wandering of their souls in the spiritual world. The book was placed in the coffin with the dead person, or under his arm.

DEAD-LETTER, a letter which lies for a certain period uncalled for at the post-office, or one which cannot be delivered from defect of address, and which is sent to the general post-office at Washington to be opened and returned to the writer. The department which deals with such letters is now called the Returned Letter Office.

DEAD RECKONING, the calculation of a ship's place at sea without any observation of the heavenly bodies. It is obtained by keeping an account of the distance which the ship has run by the log, and of her course steered by the compass, and by rectifying these data by the usual allowance for drift, leeway, etc., according to the ship's known trim.

DEAD SEA, a celebrated lake in Asiatic Turkey, near the south extremity of Palestine, in the pashalic of Damasus. The basin or hollow in which the Dead Sea reposes forms the south termination of the great depression through which the Jordan flows, that river entering it at its north extremity. It receives several other tributaries, but has no outlet. The surface is 1312 feet below the level of the Mediterranean, and 984 feet below Lake Tiberias, from which the Jordan issues. It lies deeply imbedded between lofty cliffs of naked limestone, its shores presenting a scene of indescribable desolation and solitude, encompassed by desert sands, and bleak, strong salt hills. Sulphur and rock salt, lava, and pumice, abound along its shores. The water is nauseous to the taste and smell, and so buoyant that the human body will not sink in it. At about a third of its length from the north end it attains a maximum depth of 1308 feet. The southern portion is a mere lagoon, 12 feet deep in the middle and 3 at the edges.

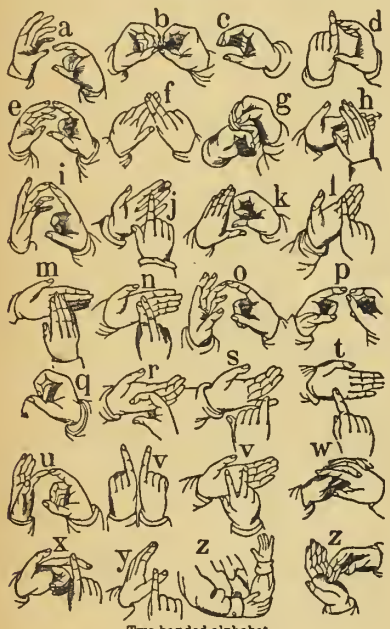
DEAF AND DUMB, or Deaf-mutes, persons both deaf and dumb, the dumbness resulting from deafness which has either existed from birth or from a very early period of life. Such persons are unable to speak simply because they have not the guidance of the sense of hearing to enable them to imitate sounds. Among the causes assigned for congenital deafness are consanguineous marriages, hereditary transmission, scrofula, certain local or climatic conditions, ill health of the mother during pregnancy, etc. Acquired or accidental deafness, which occurs at all ages, is frequently due to such diseases as smallpox, measles, typhus, paralysis, hydrocephalus, and other cerebral affections, but more particularly to scarlet fever, which is somewhat apt to leave the patient deaf owing to the inflammatory state of the throat extending to the internal ear, and thus causing suppuration and destruction of the extremely delicate parts of the auditory apparatus. In the greater proportion of deaf-mutes no defect is visible, or can be detected by anatomical examination, and no applications yet discovered appear to be



One-handed alphabet.

useful. The necessity of communication, and the want of words, oblige the deaf-mute to observe and imitate the actions and expressions which accompany various states of mind and of feeling, to indicate objects by their appearance and use, and persons by some peculiar mark, and to describe their actions by direct imitation. In this way he and his friends are led to form a dialect of that universal language of attitude, gesture, and expression which becomes a substitute for words in the hands of the pantomimic actor, and which adds force and clearness to the finest effusions of the orator; in other words, the natural sign language. This language, in its elements, is to be found among all nations, and has ever been the medium of communication between voyagers and the natives of newly discovered countries. It is employed by many savage tribes to supply the paucity of expression in their language and to communicate with other tribes. Among some of the Indians of North America it exists as a highly-organized language Such a means of communication is after all very imperfect, however, and various more perfect systems have been devised to enable deaf-mutes to communicate with one another and with the rest of mankind, and thus to gain such an education as people in general possess. In 1648 John Bulwer published the earliest work in English on the instruction of the deaf and dumb. This was followed by Dalgarno's Ars Signorum (Art of Signs) in 1661, and Dr. W. D. Holder's Elements of Speech. Dalgarno, who was a native of Scotland, likewise published, in 1680, Didascalocophus; or. the Deaf and Dumb Man's Tutor, a work of considerable merit.

To Dr. John Wallis, however, Savilian professor of mathematics at Oxford, is generally ascribed the merit of having been the first Englishman who succeeded in imparting instruction to deaf-mutes. In 1743 the practicability of instructing deaf-mutes was first publicly demonstrated in France by Pereira, a Spaniard, before the Academy of Sciences, which gave its testimony to the success of the method. About the same time the Abbé de L'Epée, who devoted his life and fortune to this subject, introduced a system for the instruction of the deaf and dumb, which was taught with great success in the Royal Parisian Institution, and afterward still further



Two-handed alphabet.

developed by his pupil and successor, the Abbé Sicard. In 1779 a public institution for the education of deaf-mutes was established at Leipzig, through the labors of Samuel Heinicke, the great upholder of the vocal or articulatory system, which is still retained at Vienna and throughout Germany. About twenty years previously Thomas Braidwood had established near Edinburgh in 1760 a deaf and dumb school on the articulating system, which was visited by Dr. Johnson during his tour in Scotland. The first public institution in Great Britain for the gratuitous education of the deaf and dumb was founded at Bermondsey in 1792 by the Rev. Messrs. Townsend and Mason. From this establishment originated the London Asylum in Kent Road, which was opened in 1807. In 1810 a school for affording instruction gratuitously to the dumb was founded in Edinburgh, and others of a similar description were subsequently established at Birmingham, Glasgow, Manchester, and other towns. An association for the oral instruction of the deaf and dumb was founded in London in 1871.

The two chief methods of conveying instruction to the deaf and dumb are by means of the manual alphabet, and by training them to watch the lips of the teacher during articulation. There are two kinds of manual alphabet: the double-handed alphabet, where the letters are expressed by the disposition of the fingers of both hands; and the single-handed, in which the letters are formed with the fingers of one hand. Particular gestures which are attached to each word as its distinctive sign are largely used, as are also real objects and models, pictures, etc. The method of teaching by articulation, the pupil learning to recognize words, and in time to utter them, by closely watching the motions of the lips and tongue in speech, and by being instructed through diagrams as to the different positions of the vocal organs, is now receiving much attention, and has given excellent results, cases being known where persons have conversed with the deaf and dumb and remained ignorant that those to whom they were speaking were afflicted in this way. It is by no means a novel system, but of late it has vastly increased in favor with authorities. A new mode of teaching articulation has recently been brought into notice, consisting in the use of the system of visible speech devised by Mr. Melville Bell. The characters of the alphabet on which this system is founded are intended to reveal to the eye the position of the vocal organs in the formation of any sound which the human mouth can utter. Its practical value as a means of instruction with all classes of the deaf and dumb has not as yet been sufficiently tested.

DEAFNESS, the partial or total inability to hear. This is a symptom of most affections of the ear. It may be due simply to an accumulation of wax. If it come on suddenly without pain in a healthy person this is probably the cause. When it comes on with a cold in the head it is the result of a cold or catarrh, and is likely to pass off in a few days. Attended by pain, ringing in the ears, etc., some degree of inflammation is likely present. The most intractable form of deafness comes on very gradually and painlessly, and is connected with disease of the middle ear. If a skilled ear-surgeon were consulted in time much might probably be done to stay its progress. Deafness due to the disease of the nerve of hearing is usually very intense, comes on suddenly or advances very rapidly, and is not easily reached by treatment. As to other causes of complete deafness see Deaf and Dumb.

DEAL, the division of a piece of timber made by sawing; a board or plank. The name deal is chiefly applied to boards of fir above 7 inches in width and of various lengths exceeding 6 feet. If 7 inches or less wide they are called battens, and when under 6 feet long they are called deal-ends. The usual thickness is 3 inches, and width 9 inches. The standard size, to which other sizes may be reduced, is 1½ inch thick, 11 inches broad, and 12 feet long. Whole deal is deal which is 1½ inch thick; slit deal, half that thickness.

DEAN, an ecclesiastical dignitary, said to have been so called because he presided over ten canons or prebendaries; but more probably because each diocese was divided into deaneries, each comprising ten parishes or churches, and with a dean presiding over each.

DEAN OF FACULTY.—(1) In some universities, as that of London and those of Scotland, the chief or head of a faculty (as of arts, law, or medicine); in the United States, a registrar or secretary of the faculty in a department of a college, as in a medical, theological, or scientific department. (2) The president for the time being of an incorporation of barristers or law practitioners; specifically, the president of the incorporation of advocates in Edinburgh.

DEATH is that state of a being, animal or vegetable, but more particularly of an animal, in which there is a total and permanent cessation of all the vital functions, when the organs have not only ceased to act, but have lost the susceptibility of renewed action. Death takes place either from the natural decay of the organism, as in old age, or from derangements or lesions of the vital organs caused by disease or injury. The signs of actual death in a human being are the cessation of breathing and the beating of the heart; insensibility of the eye to light, pallor of the body, complete muscular relaxation, succeeded by a statue-like stiffness or rigidity which lasts from one to nine days; and decomposition, which begins to take place after the rigidity has yielded, beginning first in the lower portion of the body and gradually extending to the chest and face. What becomes of the mind or thinking principle, in man or animal, after death, is a matter of philosophical conjecture or religious faith.

DEATH, Dance of, a grotesque allegorical representation in which the figure of Death, generally in the form of a skeleton, is represented interrupting people of every condition and in all situations, and carrying them away; so called from the mocking activity usually displayed by the figure of Death as he leads away his victims.

DEATH-RATE, the proportion of deaths among the inhabitants of a town, country, etc. In the U. S. it is usually calculated at so many per thousand per annum.

DEATH VALLEY, a stretch of desert in Inyo County, Cal., surrounded by four small ranges of mountains. The length of the valley is about 150 miles and its breadth from 10 to 20 miles. Its lowest level is nearly 500 feet below the level of the sea. The soil is destitute of vegetation, the temperature rises to 122 degrees Fahr. in the shade, and sand storms are common. The desert is occupied by reptiles only.

DEATH-WATCH, the popular name of the insect that inhabits the woodwork of houses. In calling to one an-

Death-watch beetle—1, Natural size. 2, Magnified. 3, Head as seen from underneath.

other they make a peculiar ticking sound, which superstition has interpreted as a forerunner of death.

DEBEN'TURE, a deed-poll given by a public company in acknowledgment of borrowed money. It gives the holder the first claim for dividends, while the capital sum lent is usually assured on the security of the whole undertaking. With the deed, coupons or warrants for the payment of interest at specified dates are generally issued. Custom-house certificates of drawback are also termed debentures.

DEBRECZIN (de-bret'sin), a town of Hungary, on the edge of the great central plain 113 miles e. of Budapest. Debreczin is considered the head-quarters of Hungarian Protestantism. Pop. 72,351.

DEBS, Eugene Victor, an American socialist and labor leader born in Indiana in 1855. He was early a locomotive fireman, was an Indiana legislator, and led the strike of the American Railway Union in 1894. In 1900 he was the candidate of the Social democratic party for president of the United States.

DEBT, National. See National Debt.

DECADE (dek'ād), is sometimes used for the number ten, or for an aggregate of ten. In the French revolution, decades, each consisting of ten days, took the place of weeks in the division of the year. The term is now usually applied to an aggregate of ten years.

DEC'AGON, in geometry, a figure of ten sides and angles.

DECALOGUE dek'a-log), the ten commandments, which, according to Exod. xx. and Deut. v., were given by God to Moses on two tables. The Jews call them the ten words. Jews and Christians have divided the ten commandments differently; and in some Catholic catechisms the second commandment has been united with the first, and the tenth has been divided into two.

DECAM'ERON. See Boccaccio.

DECANDOLLE (dē kăn-dol), Augustin Pyrame, one of the most illustrious of modern botanists, whose natural system of classification, with some modifications is the one still generally used, was born at Geneva in 1778, died there 1841. In 1804 he lectured in the College of France on vegetable physiology; and the following year published an outline of his course, under the title of Principes de Botanique, prefixed to the third edition of Lamarck's Flore Française. In this outline he laid the basis of the system of classification which he afterward developed in larger and more celebrated works. In 1816 he returned to Geneva, where a chair of natural history was expressly created for him, and where he continued for many years to extend the boundaries of his favorite science by his lectures and publications.

DECAPITATION, beheading, capital punishment inflicted by the sword, ax, or guillotine.

DECA'TUR, a city and important railway center of Illinois, 39 miles e. of Springfield. It has a large rolling-mill, and is a place of considerable trade. Pop. 23,750.

DECA'TUR, Stephen, American naval commander, born 1779, killed in a duel 1820. Among the chief exploits of his life were the capture of the British frigate Macedonian in 1812; his attempted escape from the blockade of New York harbor, 1813—14; and his chastisement of the Algerines, 1815.

Stephen Decatur.

DECEASED WIFE'S SISTER, a term used in the old English law which forbade the marriage of a widower with his deceased wife's sister. The law originated among the Jews.

DECEDENT, in law, a deceased person, the term being used only of a person who has left a will, or an estate to be administered, and almost always now used of a person who has died intestate.

DECEIT, a term of law designating an act by which through trick or misrepresentation legal injury or damage is done to another.

DECEM'BER, the twelfth month of our year, from the Latin decem, ten, because in the Roman year instituted by Romulus it constituted the tenth month, the year beginning with March. In December the sun enters the tropic of Capricorn, and passes the winter solstice.

DECEM'VIRS, the ten magistrates who had absolute authority in ancient Rome (B.C. 451–449). See Appius Claudius.

DECID'UOUS is a term applied in botany to various organs of plants, particularly leaves, to indicate their annual fall. A tree of which the leaves fall annually is called a deciduous tree, and the same term is applied to the leaves themselves. The term is also applied in zoology to parts which fall off at a certain stage of an animal's existence, as the hair, horns, and teeth of certain animals.

DECIMAL FRACTIONS. See Fractions.

DECIMAL SYSTEM is the name given to any system of weights, measures, or money in which the unit is always multiplied by 10 or some power of 10 to give a higher denomination, and divided by 10 or a power of 10 for a lower denomination. This system has been rigidly carried out in France, and the principle obtains in the coinage of Belgium, Italy, Spain, Portugal, the United States, and other countries. To express the higher denominations, that is to say, the unit multiplied by 10, 100, 1000, 10,000, the French make use of the prefixes déca, hecto, kilo, myria, derived from the Greek; thus, the mètre being the unit of length, décamètre is 10 mètres, hectomètre 100 mètres, kilomètre 1000 mètres. To express lower denominations, that is, tenths, hundredths, etc., the Latin prefixes déci, centi, milli are used in the same way; thus a centilitre is the hundredth part of a litre, décilitre the tenth part of a litre. The basis of the whole system is the linear measure, the unit of which is the mètre, supposed to be the ten-millionth part of a quadrant of the earth's meridian (39·37 inches). The square of 10 mètres, or square décamètre, called an arc, is the unit of surface measure. The cube of the tenth part of the mètre, or cubic décimètre, called a litre, is the unit of liquid capacity. The cube of the mètre, called a stère, is the unit of solid measure. The weight of a cubic centimètre of distilled water at 39°·2 Fahr.; (4° centigrade), called a gramme, is the unit of weight. The unit of money is the franc, which is divided into décimes and centimes.

DECK, a horizontal platform or floor, extending from side to side of a ship, and formed of planking supported by the beams. In ships of large size there are several decks one over the other. The quarter-deck is that above the upper-deck, reaching forward from the stern to the gangway.

DECLARATION, an avowal or formal statement; especially a simple affirmation, or affidavit, which English law allows in a variety of cases, such as those which relate to the revenues of customs or excise, the post-office, and other departments of administration. Justices of the peace, notaries, etc., are also empowered in various cases to take voluntary declarations in lieu of oaths, solemn affirmations and affidavits.—Declaration of war, the formal notice which by the usage of nations belligerents are expected to give before commencing hostilities. — Declaration of rights, or bill of rights. See Bill.

DECLARATION, DYING, the ante-mortem statement made by a person injured by another as to the cause of his death. Such a statement has force in a trial but only such parts of it as the deceased would be allowed to testify to were he alive.

DECLARATION OF INDEPENDENCE, AMERICAN, the document proclaiming the independence of the American colonies, uttered by the continental congress on July 4, 1776. It was drafted by Thomas Jefferson and from the beginning has been almost continuously in the possession of the Department of State. Facsimiles of the paper have been made, and the original in 1894 was withdrawn from public view and carefully sealed from the light and air to prevent decomposition. The full text of the declaration, and the signers, follow:

THE UNANIMOUS DECLARATION OF THE THIRTEEN UNITED STATES OF AMERICA.

When, in the course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume, among the powers of the earth, the separate and equal station to which the laws of nature and of nature's God entitled them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.

We hold these truths to be self-evident —that all men are created equal; that they are endowed by their Creator with

DECLARATION OF INDEPENDENCE

certain unalienable rights; that among these are life, liberty, and the pursuit of happiness. That to secure these rights, governments are instituted among men, deriving their just powers from the consent of the governed; that whenever any form of government becomes destructive of these ends, it is the right of the people to alter or to abolish it, and to institute a new government, laying its foundation on such principles, and organizing its powers in such form, as to them shall seem most likely to effect their safety and happiness. Prudence indeed, will dictate that governments long established should not be changed for light and transient causes; and, accordingly, all experience hath shown, that mankind are more disposed to suffer, while evils are sufferable, than to right themselves by abolishing the forms to which they are accustomed. But when a long train of abuses and usurpations, pursuing invariably the same object, evinces a design to reduce them under absolute despotism, it is their right, it is their duty, to throw off such government, and to provide new guards for their future security. Such has been the patient sufferance of these colonies, and such is now the necessity which constrains them to alter their former systems of government. The history of the present king of Great Britain is a history of repeated injuries and usurpations, all having, in direct object, the establishment of an absolute tyranny over these states. To prove this, let facts be submitted to a candid world:

He has refused his assent to laws the most wholesome and necessary for the public good.

He has forbidden his governors to pass laws of immediate and pressing importance, unless suspended in their operation till his assent should be obtained; and, when so suspended, he has utterly neglected to attend to them.

He has refused to pass other laws for the accommodation of large districts of people, unless those people would relinquish the right of representation in the legislature; a right inestimable to them, and formidable to tyrants only.

He has called together legislative bodies at places unusual, uncomfortable, and distant from the depository of their public records, for the sole purpose of fatiguing them into compliance with his measures.

He has dissolved representative houses repeatedly for opposing with manly firmness his invasions on the rights of the people.

He has refused, for a long time after such dissolutions, to cause others to be elected; whereby the legislative powers, incapable of annihilation, have returned to the people at large for their exercise; the state remaining, in the meantime, exposed to all the danger of invasion from without and convulsions within.

He has endeavored to prevent the population of these states; for that purpose obstructing the laws for the naturalization of foreigners; refusing to pass others to encourage their migration hither, and raising the conditions of new appropriations of lands.

He has obstructed the administration of justice by refusing his assent to laws for establishing judiciary powers.

He has made judges dependent on his will alone, for the tenure of their offices, and the amount and payment of their salaries.

He has erected a multitude of new offices, and sent hither swarms of officers to harass our people and eat up their substance.

He has kept among us, in times of peace, standing armies, without the consent of our legislatures.

He has affected to render the military independent of, and superior to, the civil power.

He has combined, with others, to subject us to a jurisdiction foreign to our constitution, and unacknowledged by our laws, giving his assent to their acts of pretended legislation:

For quartering large bodies of armed troops among us;

For protecting them, by a mock trial, from punishment, for any murders which they should commit on the inhabitants of these states;

For cutting off our trade with all parts of the world;

For imposing taxes on us without our consent;

For depriving us, in many cases, of the benefits of trial by jury;

For transporting us beyond seas to be tried for pretended offenses;

For abolishing the free system of English laws in the neighboring province, establishing therein an arbitrary government, and enlarging its boundaries, so as to render it at once an example and fit instrument for introducing the same absolute rule into these colonies;

For taking away our charters, abolishing our most valuable laws, and altering, fundamentally, the powers of our governments;

For suspending our own legislatures, and declaring themselves invested with power to legislate for us in all cases whatsoever.

He has abdicated government here, by declaring us out of his protection, and waging war against us.

He has plundered our seas, ravaged our coasts, burnt our towns, and destroyed the lives of our people.

He is, at this time, transporting large armies of foreign mercenaries to complete the works of death, desolation, and tyranny, already begun, with circumstances of cruelty and perfidy scarcely paralleled in the most barbarous ages, and totally unworthy the head of a civilized nation.

He has constrained our fellow-citizens, taken captive on the high seas, to bear arms against their country, to become the executioners of their friends and brethren, or to fall themselves by their hands.

He has excited domestic insurrections among us, and has endeavored to bring on the inhabitants of our frontiers, the merciless indian savages, whose known rules of warfare is an undistinguished destruction of all ages, sexes, and conditions.

In every stage of these oppressions we have petitioned for redress in the most humble terms; our repeated petitions have been answered only by repeated injury. A prince whose character is thus marked by every act which may define a tyrant, is unfit to be the ruler of a free people.

Nor have we been wanting in attention to our British brethren. We have warned them from time to time of attempts made by their legislature to extend an unwarrantable jurisdiction over us. We have reminded them of the circumstances of our emigration and settlement here. We have appealed to their native justice and magnanimity, and we have conjured them, by the ties of our common kindred, to disavow these usurpations, which would inevitably interrupt our connection and correspondence. They, too, have been deaf to the voice of justice and consanguinity. We must, therefore, acquiesce in the necessity which denounces our separation, and hold them, as we hold the rest of mankind, enemies in war, in peace, friends.

We, therefore, the representatives of the United States of America, in general congress assembled, appealing to the supreme judge of the world for the rectitude of our intentions, do, in the name and by the authority of the good people of these colonies, solemnly publish and declare: That these United Colonies are, and of right ought to be, free and independent states; that they are absolved from all allegiance to the British crown, and that all political connection between them and the state of Great Britain is, and ought to be, totally dissolved; and that, as free and independent states, they have full power to levy war, conclude peace, contract alliances, establish commerce, and to do all other acts and things which independent states may of right do. And, for the support of this declaration, with a firm reliance on the protection of Divine Providence, we mutually pledge to each other, our lives, our fortunes, and our sacred honor.

The fifty-six signers of the Declaration were as follows: Roger Sherman, Samuel Huntington, William Williams, and Oliver Wolcott, of Connecticut; Cæsar Rodney, George Read, and Thomas McKean, of Delaware; Button Gwinnett, Lyman Hall, and George Walton, of Georgia; Samuel Chase, William Paca, Thomas Stone, and Charles Carroll of Carrollton, of Maryland; John Hancock, Samuel Adams, John Adams, Robert Treat Paine, and Elbridge Gerry, of Massachusetts; Josiah Bartlett, William Whipple, and Matthew Thornton, of New Hampshire; Richard Stockton, John Witherspoon, Francis Hopkinson, John Hart, and Abraham Clark, of New Jersey; William Floyd, Philip Livingston, Francis Lewis, and Lewis Morris, of New York; William Hooper, Joseph Hewes, and John Penn, of North Carolina; Robert Morris, Benjamin Rush, Benjamin Franklin, John Morton, George Clymer, James Smith, George Taylor, James Wilson, and George Ross, of Pennsylvania; Stephen Hopkins and William Ellery, of Rhode Island; Edward Rutledge, Thomas Heyward, Jun., Thomas Lynch, Jun., and Arthur Middleton, of South Carolina; and George Wythe, Richard Henry Lee, Thomas Jefferson, Benjamin Harrison, Thomas Nelson, Jun., Francis Lightfoot Lee, and Carter Braxton, of Virginia.

JUNE 22, 1933

Mrs. Brown, Formerly of Paxton, Dies

Mrs. L. F. Erickson, of 108 North Busey, Urbana, and children were enroute Saturday to Springdale, Wash., upon being notified of the accidental death of her sister, Mrs. Herbel Brown.

They left late Thursday night, upon getting a message telling of the death. Details of the accident were not given.

Mrs. Brown, about 30, was a former resident of Paxton, moving West in 1921. Before her marriage, she was Herbel Stephens. Besides her husband, she leaves two children, Beverly and Dana, and her mother; three sisters and one brother.

Mrs. Brown's home was in Wenatchee, near Springdale. Funeral and burial will be in the [illegible].

It's naughty!
It's screaming-ly funny!
It's perfectly acted!

JOHN BAR

in the ent

REU

IN VI

with DIAN

FRANK MOR
MAY ROBSO

ALREADY it is bein
choice

DECLARATION OF PARIS, an agreement defining the regulations of maritime war, which was signed at Paris April 16, 1856, by France, Britain, Austria, Prussia, Russia, Turkey, and Sardinia. By it privateering was abolished, neutral goods under enemy's flag cannot be captured, and blockades must be effective in order to be binding. These rules are still in force and were observed during the late Spanish American war.

DECLARATION OR AFFIRMATION, SOLEMN, terms applied to the asseveration made by a witness who, for any reason, declines taking the oath. Although the oath is not administered in such cases, violation of the affirmation constitute perjury.

DECLINATION, in astronomy, the distance of a heavenly body from the celestial equator (equinoctial), measured on a great circle passing through the pole and also through the body. It is said to be north or south according as the body is north or south of the equator. Great circles passing through the poles, and cutting the equator at right angles, are called circles of declination. Twenty four circles of declination, dividing the equator into twenty-four arcs of 15° each, are called hour circles or horary circles —Declination of the compass or needle, or magnetic declination, is the variation of the magnetic needle from the true meridian of a place. This is different at different places, and at the same place at different times. The declination at London was 11° 15′ e. in 1576, 0° in 1652, 19° 30′ w. in 1760, 24° 27′ w., its maximum, in 1815, 21° 6′ w. in 1865, 19° 15′ w. in 1870, and 17° 4′ in 1894.

DECOMPOSITION, Chemical, is the separation of the constituents of a body from one another. Roughly speaking—for it is a difference of degree rather than of kind—decomposition is either artificial or spontaneous. Artificial decomposition is produced in bodies by the action of heat, light, electricity or chemical reagents; spontaneous, in bodies which quickly undergo change in ordinary circumstances, unless special precautions are taken to preserve them. The bodies of the mineral, and the definite crystallized principles of the organic world, belong to the first; organized matter, such as animal and vegetable tissues, organic fluids, such as blood, milk, bile, and the complex non-crystallized bodies, albumen, gelatine, emulsine, etc., belong to the second.

DEC'ORATED STYLE, in architecture, the second style of pointed (Gothic) architecture, in use in Britain from the end of the 13th to the beginning of the 15th century, when it passed into the Perpendicular. It is distinguished from the Early English, from which it was developed, by the more flowing or wavy lines of its tracery, especially of its windows, by the more graceful combinations of its foliage, by the greater richness of the decorations of the capitals of its columns, and of the moldings of its doorways and niches, finials, etc., and generally by a style of ornamentation more profuse and naturalistic, though perhaps somewhat florid. The most distinctive ornament of the style is the ball-flower, which is usually inserted in a hollow molding. The Decorated style has been divided into two periods, viz. the Early or Geometrical Decorated period, in which geometrical figures are largely introduced in the ornamentation; and the Decorated style proper, in which the peculiar characteristics of the style are exhibited. To this latter period belong some of the finest monuments of British architecture.

Decorated style—York cathedral, west front.

DECORATION DAY, a memorial day, May 30, observed in the northern states by decorating with flowers the graves of soldiers who perished in the civil war. It is observed in the south by decorating the graves of the confederate dead.

DECREE′, in general, an order, edict, or law made by a superior as a rule to govern inferiors. In law it is a judicial decision or determination of a litigated cause.

DEDICA'TION, the act of consecrating something to a divine being, or to a sacred use, often with religious solemnities. Also an address prefixed to a book, and formerly inscribed to a patron, testifying respect and recommending the work to his protection and favor; now chiefly addressed to friends of the author, or to public characters, simply as a mark of affection or esteem.

DEDUC'TION, in reasoning, the act or method of drawing inferences, or of deducing conclusions from premises; or that which is drawn from premises. See Logic.

DEED, in law, a writing containing some contract or agreement, and the evidence of its execution, made between parties legally capable of entering into a contract or agreement; particularly an instrument on paper or parchment, conveying real estate to a purchaser or donee.

DEEM'STER, an officer formerly attached to the high court of justiciary in Scotland, who formally pronounced the doom or sentence of death on condemned criminals. The office was conjoined with that of executioner. The name is now given in the Isle of Man to two judges who act as the chief-justices of the island, the one presiding over the northern, the other over the southern division. They hold courts weekly at Douglas, Ramsey, and other places.

DEEP SEA EXPLORATION, investigation of the physical and organic conditions at the bottom of the sea. This kind of investigation had its systematic beginnings in 1873 with the Challenger expedition backed by the British government. Since that time much of interest has been discovered by various explorations. The deepest sounding was that at Guam, of nearly six miles. Deep sea dredging has disclosed numerous forms of life unknown before.

DEER, a general name for the ungulate or hoofed ruminating animals constituting the family Cervidæ, of which the typical genus is the stag or red-deer. The distinguishing characteristics of the genus are, that the members of it have solid branching horns which they shed every year, and eight cutting teeth in the lower jaw and none in the upper. The horns or antlers always exist on the head of the male, and sometimes on that of the female. The forms of the horns are various; sometimes they spread into broad palms which send out sharp snags around their outer edges; sometimes they divide fantastically into branches, some of which project over the forehead, whilst others are reared upward in the air; or they may be so reclined backward that the animal seems almost forced to carry its head in a stiff erect posture. They are used as defensive and offensive weapons, and grow with great rapidity. There are many species of deer, as the red-deer or stag, the fallow-deer, the roebuck, the reindeer, the moose, the elk. Deer are pretty widely distributed over the world though there are none in Australia and few in Africa, where the antelopes (whose horns are permanent) take their place. The rein deer alone has been domesticated.

Blacktail, or mule-deer.

DEERHOUND. See Staghound.

DEER-MOUSE, the common name of the animals belonging to an American genus of rodent animals allied to the mice and the jerboas of the Old World. The deer-mouse of Canada is a pretty animal of the size of a mouse, with very long hind-legs and tail, and very short fore-legs.

DEER-STALKING, an exciting but laborious mode of hunting the red-deer, in which, on account of the extreme shyness of the game, their far-sightedness and keen sense of smell, they have to be approached by cautious maneuvering before a chance of obtaining a shot oc-

curs. Great patience and tact and a thorough knowledge of the ground are essential to a good stalker, who has to undergo many discomforts in crouching, creeping, wading through bogs, etc. Advance from higher to lower ground is usually made, since the deer are always apt to look to the low ground as the source of danger. "Deer-driving" toward a point where the shooters are concealed is often practiced, but is looked on as poor sport by the true deer-stalker.

DE FACTO, a legal term meaning in very fact, as opposed to de jure, which means by legal right. The exercise of de facto authority is always a usurpation.

DEFAMATION OF CHARACTER, the publication or circulation of a report injurious to the character or reputation of a person. It is actionable when damage has been done the individual defamed.

DEFAULT', in law, signifies generally any neglect or omission to do something which ought to be done. Its special application is to the non-appearance of a defendant in court when duly summoned on an appointed day. If he fail to appear judgment may be demanded and given against him by default.

DEFEND'ANT, in law, the party against whom a complaint, demand, or charge is brought; one who is summoned into court, and defends, denies, or opposes the demand or charge, and maintains his own right. The term is applied even if the party admits the claim.

DEFENDER OF THE FAITH, a title belonging to the King of England, as Catholicus to the King of Spain, Christianissimus to the King of France, etc. Leo X. bestowed the title of Defender of the Faith on Henry VIII. in 1521, on account of his book against Luther, and the title has been used by the sovereigns of England ever since.

DEFENSE, in law, the repulsion of an attack on the person, the property, or the family of an individual. There are certain limitations to the rights which vary in different states.

DEFILE, a narrow passage or way in which troops may march only in a file, or with a narrow front; a long narrow pass, as between hills, etc.

DEFINITION, a brief and precise description of a thing by its properties; an explanation of the signification of a word or term, or of what a word is understood to express.

DEFOE (dē-fō'), Daniel, an English writer of great ingenuity and fertility, was born in 1661 in London. In 1719 appeared the most popular of all his writings: The Life and Surprising Adventures of Robinson Crusoe, the favorable reception of which was immediate and universal. The success of Defoe in this performance induced him to write a number of other lives and adventures in character; as Moll Flanders, Captain Singleton, Roxana, Duncan Campbell, The Memoirs of a Cavalier, Journal of the Plague, etc. He died in London in 1731.

DEFORCEMENT, in law, the holding of lands or tenements to which another person has a right; a general term including any species of wrong by which he who has a right to the freehold is kept out of possession. In Scots law, it is the resisting of an officer in the execution of law.

DEFORMITY, a malformation whether congenital or not, which mars the symmetry of the body. It was formerly believed that congenital deformities, so called birth marks, were produced by shocks to the mind of the mother while bearing young. This idea is wholly false. The child is never affected in this way by the mental state of the mother. Strawberry marks, and other fancied resemblances of that kind, are due to causes entirely apart from the mother's "state of mind." These stories are chiefly old women's tales.

DEGENERACY, a very loose, unscientific term used to describe any state of mind or body which deviates highly from the normal type. Results of atavism, reversion to ancestral type, effects of nutrition, and numerous other and more obscure traits have been called degenerate. The term degeneracy has also been applied to epilepsy in its thousand forms. The use of the term is confusing and leads to unending misunderstanding.

DEGREDATION, the ecclesiastical censure by which a clergyman is divested of his holy orders.

DEGREE', in geometry or trigonometry, the 360th part of the circumference of any circle, the circumference of every circle being supposed to be divided into 360 equal parts, called degrees. A degree of latitude is the 360th part of the earth's circumference north or south of the equator, measured on a great circle at right angles to the equator, and a degree of longitude the same part of the surface east or west of any given meridian, measured on a circle parallel to the equator. Degrees are marked by a small ° near the top of the last figure of the number which expresses them; thus 45° is 45 degrees. The degree is subdivided into sixty equal parts called minutes; and the minute is again subdivided into sixty equal parts called seconds. Thus, 45° 12′ 20″ means 45 degrees, 12 minutes, and 20 seconds. The magnitude or quantity of angles is estimated in degrees and parts of a degree, because equal angles at the center of a circle are subtended by equal arcs, and equal angles at the centers of different circles are subtended by similar arcs, or arcs containing the same number of degrees and parts of a degrees. An angle is said to be so many degrees as are contained in the arc of any circle intercepted between the lines which contain the angle, the angular point being the center of the circle. Thus we say an angle of 90°, or of 45° 24′. It is also usual to say that a star is elevated so many degrees above the horizon, or declines so many degrees from the equator, or such a town is situated in so many degrees of latitude or longitude. The length of a degree depends upon the radius of the circle of the circumference of which it is a part, the length being greater the greater the length of the radius. Hence the length of a degree of longitude is greatest at the equator, and diminishes continually toward the poles, at which it = 0. Under the equator a degree of longitude contains 60 geographical, and 69½ statute miles. The degrees of latitude are found to increase in length from the equator to the poles, owing to the figure of the earth. Numerous measurements have been made in order to determine accurately the length of degrees of latitude and longitude at different parts of the earth's surface and thus settle its dimensions and magnitude. When the French determined to establish their system of measures and weights based upon the mètre (see Decimal System), they settled that this basis was to be the ten-millionth part of the distance from the equator to the pole, which distance had to be found by accurate measurement. Ten degrees of latitude were accordingly measured, from Dunkirk to Formentera, one of the Balearic islands. Similar measurements having been made in Britain, the length of a total arc of twenty degrees has been found. Many measurements have also been made elsewhere. The term is also applied to the divisions, spaces, or intervals marked on a mathematical, meteorological, or other instrument, as a thermometer or barometer.

DEGREE, in universities, a mark of distinction conferred on students, members, or distinguished strangers, as a testimony of their proficiency in the arts or sciences, or as a mark of respect, the former known as ordinary, the latter as honorary degrees. The degrees are bachelor, master, and doctor, and are conferred (though not all of them) in arts, letters or literature, science, medicine, surgery, law, philosophy, divinity, and music. Various universities now admit women to degrees.

DEGREE, in algebra, a term used in speaking of equations, to express what is the highest power of the unknown quantity. Thus if the index of that power be 3 or 4 (x^3, y^4), the equation is respectively of the third or fourth degree.

DEHORNING, the art of depriving cattle of their horns. It is done by a huge pair of clippers, and although painful to the animal, works out a great saving in the long run by preventing the animals from injuring one another. After the operation the animal becomes docile. The horn does not regenerate.

DEI GRATIA (dē'ī grā'shi-a), a formula which sovereigns add to their title. The expression is taken from several apostolical expressions in the New Testament.

DE'ISM, a philosophical system which, as opposed to Atheism, recognizes a great First Cause; as opposed to Pantheism, a Supreme Being distinct from nature or the universe; while, as opposed to Theism, it looks upon God as wholly apart from the concerns of this world. It thus implies a disbelief in revelation, skepticism as regards the value of miraculous evidence, and an assumption that the light of nature and reason are the only guides in doctrine and practice. It is thus a phase of Rationalism. In the 18th century there were a series of writers who are spoken of distinctively as the English deists. They include Collins, Toland, Tindal, etc.

DE KOVEN, Henry Louis Reginald, an American song and light opera writer, born in Connecticut in 1859. He studied music in Europe and in 1882 settled in Chicago where he wrote and produced Robin Hood, The Begum, The Fencing Master, Rob Roy, The Highwayman, Maid Marian and other small operas.

DELACROIX (dė-là-krwä), Ferdinand Victor Eugène, an eminent French painter, born 1799, died 1863. He is considered the chief of the modern French romantic school of painters. His chief pictures up to 1830 are: Dante and Virgil in the Infernal Regions, Massacre in Scio, the Execution of the Doge Marino Falieri, the Death of Sardanapalus, the Murder of the Bishop of Liège. In 1831 he joined the embassy sent by Louis Philippe to the Emperor of Morocco. To this journey we are indebted for several pictures remarkable for their vivid realization of oriental life as well as their masterly coloring. They are: The Jewish Marriage, Muley Abderrhaman With His Body-guard, Algerian Ladies in Their Chamber, Moorish Soldiers at Exercise, and several scenes of common life. He decorated several of the public buildings of Paris, and was admitted into the Institute in 1857.

DELAGO'A BAY, in Southeast Africa, a large sheet of water partly separated from the Indian Ocean by the peninsula and island of Inyack. The bay stretches north and south upward of 40 miles, with a breadth of from 16 to 20 miles, and is situated near the southern extremity of the Portuguese possessions here, which surround it.

DELAROCHE (dė-là-rosh), Hippolyte, probably the greatest painter of the French school, born in Paris in 1797, died 1856. He studied landscape-painting for a short time, but applied himself

Hippolyte Delaroche.

afterward to historical painting, and rapidly rose to eminence. His subjects are principally taken from French and English history. His merits consist in correct drawing, appropriate expression, harmonious color, and great distinctness and perspicuity in treatment, rendering the story of his pictures at once intelligible. He held a middle place between the classical and the romantic schools, and is regarded as the leader of the so-called "eclectic school."

DEL'AWARE, a river of the United States, which rises in Catskill Mountains in New York, separates Pennsylvania from New York and New Jersey, and New Jersey from Delaware, and loses itself in Delaware Bay. It has a course of about 300 miles, and is navigable for smaller craft to the head of tidewater at Trenton (155 miles).

DELAWARE, one of the original thirteen United States of North America, and, next, to Rhode Island, the smallest state in the Union, named after Lord Delaware, one of the early gover-

nors of Virginia. It is bounded north by Pennsylvania, east by the Delaware River and Bay and by the ocean, south and west by Maryland; area, 2120 square miles. It is divided into three counties, Kent, Newcastle, and Sussex, and has nearly the form of a right-angled triangle (hence its popular name "the diamond state"). In the south and toward the coast the surface is very level, but the north part is rather hilly. An elevated swampy table-land toward the west traverses the state, forming the water-shed between the Bay of Chesapeake and the Delaware.

Situated on the eastern coast of the continent, Delaware has a temperate climate, with a considerable range of temperature and an ample rainfall.

The soils are sedimentary, derived from the underlying tertiary rocks. In the rolling northern portion of the state the soil is clay, passing through the various gradations from a heavy clay to a loamy clay, and is well adapted to raising fruits, grasses, grains. In the undulating middle section, approximately covered by Kent County, the soil is generally loamy. Here fruits, berries, vegetables, and the vine flourish. In the flat southern section of Sussex County the soil is sandy, with here and there outcrops of loamy clay. This region is best adapted for strawberry and peach culture, and the canning and drying of fruits are important industries.

Agriculture is the leading industry, farms constituting 85 per cent of the total land surface. During the last half-century there has been a continuous and marked increase in the number of farms, and a corresponding decrease in the average size.

In no state have fertilizers become so generally used, the average amount per farm ($55.65) being three times that for the North Atlantic states. There has been a marked increase during the decade in the two principal crops—corn and wheat. The wheat acreage is several times that for all the New England states. The other cereals are relatively unimportant. The oats crop has decreased to one-third the acreage of 1890. Hay ranks third in acreage. Orchard and small fruits have long constituted one of the main sources of income.

The manufacturing industry employs over 22,000 people, and rivals agriculture in importance. The falls near the mouth of the Brandywine have been, from an early date extensively utilized for manufacturing purposes. The manufacture of iron and steel products leads in importance. This industry includes steel and rolling mills, car-shops, foundry and machine shops, and ship-building yards.

A number of the trunk lines connecting the East with the South and West pass through the northern part of the state. Chesapeake and Delaware bays are connected by a canal 13½ miles long, 66 feet wide, and 10 feet deep. This work was completed in 1829, at a cost of $2,250,000. The massive breakwater at Lewes was begun in 1828, and completed in 1869, at a cost of over $2,000,000. There is some foreign commerce direct through Wilmington, but such trade is generally through Baltimore or some northern port. The coasting trade is important, especially with New York, with which Wilmington is connected by a line of steamers. Wilmington is a customs district, and there are deputy collectors at New Castle and Lewes. The capital is Dover. In National elections the state in 1888 and 1892 went Democratic; in 1896, 1900, 1904 and 1908, Republican. Pop, 1909, 200,000.

DELAWARE, a city and the county-seat of Delaware County, Ohio, 24 miles north of Columbus, on the Whetstone (Olentangy) River, and on the Cleveland, Cincinnati, Chicago and Saint Louis, the Columbus, Sandusky and Hocking, and the Columbus, Hocking Valley and Toledo railroads. Population, 11,000.

DELAWARE BAY, an estuary or arm of the sea between the states of Delaware and New Jersey. At the entrance, near Cape Henlopen, is situated the Delaware Breakwater, which affords vessels a shelter within the cape. It was erected by the Federal government and cost about $300,000.

DELAWARE COLLEGE, founded at Newark, Del., in 1833. It has an annual income of $45.000 and a library of 13,000 volumes. There is also here a valuable government agricultural experiment station.

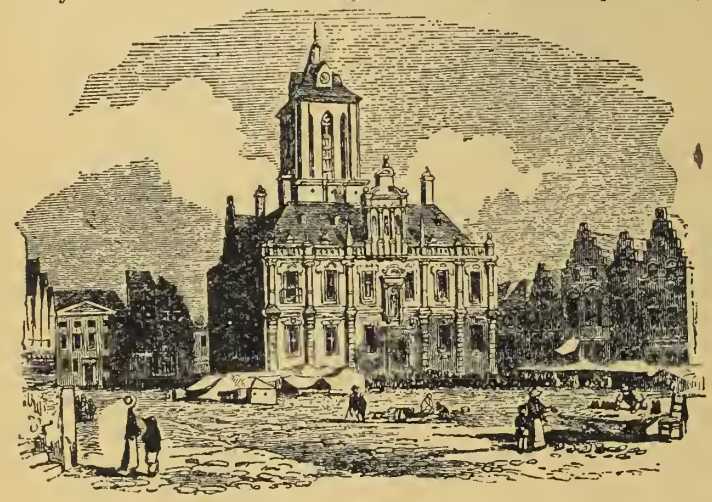
DELAWARE INDIANS, a tribe belonging to the Algonquin family, originally known as living on the Delaware river, and called by themselves Lenni Lenape. They had to leave their original settlements about the middle of last century, going farther west, and latterly they were removed to the Indian Territory. Their numbers are now insignificant.

DELAWARE WATER GAP, a gorge in the Appalachian chain near Stroudsburg, Pa. The Delaware River flows through it, 1400 feet below the top of the sides of the gorge.

DEL'EGATE, a person appointed and sent by another or by others, with

powers to transact business as his or their representative. The title was given to members of the first continental congress in America, 1774. Representatives to congress from the U. S. territories are still designated by this term. They have the right of discussion, but have no vote.

DELFT, formerly Delf, a town, Holland, 8 miles n.w Rotterdam, intersected in all directions by canals. Delft was formerly the center of the manufacture of the pottery called delft-ware; its chief industries now embrace carpets, leather, soap, oil, gin, etc. Pop. 27,131.



The town-hall, Delft.

DELFT-WARE, or Delf, is a kind of pottery covered with an enamel or white glazing which gives it the appearance of porcelain. It was originally manufactured in Delft in the 14th century, is now considered coarse, but was among the best of its day.

DELHI (del'i), a city of Hindustan, in the Punjab, anciently capital of the Patan and Mogul Empires, about 954 miles n.w. Calcutta. It was at one time the largest city in Hindustan, covering a space of 20 square miles, and having a population of 2,000,000. A vast tract covered with the ruins of palaces, pavilions, baths, gardens, mausoleums, etc., marks the extent of the ancient metropolis. The present city abuts on the right bank of the Jumna, and is surrounded on three sides by a lofty stone wall 5½ miles long. The palace or residence of the Great Mogul, built by Shah Jehan, commenced in 1631, and now known as "the fort," is situated in the east of the city, and abuts directly on the river. It is surrounded on three sides by an embattled wall of reddish sandstone nearly 60 feet high, with round towers at intervals, and a gateway on the west and south. Since the mutiny in 1857 a great portion has been demolished in order to make room for military barracks. One of the most remarkable objects in the city is the Jamma Musjid or Great Mosque, a magnificent structure in the Byzantine-Arabic style, built by the Emperor Shah Jehan in the 17th century. The East Indian Railway enters the city by a bridge over the Jumna. The s.w quarter of the town is densely occupied by the shops and dwellings of the native population; the streets are narrow and turtuous, but some of the main thoroughfares of the city are splendid streets, the chief being the Chandni Chauk, or Silver Street. During the mutiny Delhi was seized by the Sepoys, who held possession for four months, during which many atrocities were committed. Pop. 208,385.

DELIQUES'CENCE, a change of form from the solid to the liquid state, by the absorption of moisture from the atmosphere. It occurs in many bodies, such as caustic potash, carbonate of potassium, acetate of potassium, chloride of calcium, chloride of copper, chloride of zinc, etc.

DELIR'IUM, a temporary disordered state of the mental faculties occurring during illness either of a febrile or of an exhausting nature. It may be the effect of disordered or inflammatory action affecting the brain itself, or it may be sympathetic with active disease in other parts of the body, as the heart; it may be caused by long-continued and exhausting pain, and by a state of inanition of the nervous system.

DELIR'IUM TRE'MENS, an affection of the brain which arises from the inordinate and protracted use of ardent spirits. It is therefore almost peculiar to drunkards. The principal symptoms of this disease, as its name imports, are delirium and trembling. The delirium is a constant symptom, but the tremor is not always present, or, if present is not always perceptible. Frequently the sufferer thinks he sees the most frightful, grotesque, or extraordinary objects, and may thus be put into a state of extreme terror. It is properly a disease of the nervous system. The common treatment is to administer soporifics so as to get the patient to sleep.

DE LONG, George Washington, an American explorer and naval officer, born in New York City in 1844, died in 1881. He was an officer of the Juniata when that ship went to search for the Polaris in 1873. He commanded the Jeanette in her polar expedition of 1879 and perished of starvation in that expedition. His body was found in 1882.

DE'LOS, an island of great renown among the ancient Greeks, fabled to be the birthplace of Apollo. It was a center of his worship, and the site of a famous oracle. It is the central and smallest island of the Cyclades, in the Ægean Sea, a rugged mass of granite about 12 square miles in extent. Abundant ruins of its former magnificence yet exist, and excavations resulting in interesting archæological discoveries have recently been made.

DELPHI, an ancient Greek town, originally called Pytho, the seat of the famous oracle of Apollo, was situated in Phocis, on the southern side of Parnassus, about 8 miles north of the Corinthian Gulf. It was also one of the meeting-places of the Amphictyonic Council, and near it were held the Pythian games. The oracles were delivered by the mouth of a priestess who was seated on a tripod above a subterranean opening, whence she received the vapors ascending from beneath, and with them the inspiration of the Delphian god. The oracular replies were always obscure and ambiguous; yet they served, in earlier times, in the hands of the priests, to regulate and uphold the political, civil and religious relations of Greece.

DELTA, the name of the Greek letter Δ, answering to the English D. The island formed by the alluvial deposits between the mouths of the Nile, from its resemblance to this letter, was named Delta by the Greeks; and the same name has since been extended to those alluvial tracts at the mouths of great rivers which, like the Nile, empty themselves into the sea by two or more diverging branches.

DEL'UGE, the universal inundation which, according to the Mosaic history, took place to punish the great iniquity of mankind. It was produced, according to Genesis, by a rain of forty days; and covered the earth 15 cubits above the tops of the highest mountains, and killed every living creature except Noah, with his family, and the animals which entered the ark by the command of God. Many other nations mention, in the mythological or prehistoric part of their history, inundations which, in their essential particulars, agree with the Scriptural account of Noah's preservation, each nation localizing the chief events and actors as connected with itself.

DEMAGOGUE (dem'a-gog), originally simply one who leans or directs the people in political matters; now it usually means one who acquires influence with the populace by pandering to their prejudices or playing on their ignorance.

DEMAND AND SUPPLY, the law which, it was formerly believed, regulated prices. Price really determines demand, not the reverse. The whole quantity of goods in the market represents the demand for goods in the market. Demand and desire for goods are not the same thing. Demand is desire for commodities plus the ability to pay. When the supply of a commodity is large, the price is low and the demand great. When the supply is small the price is high and the demand small.

DEMEN'TIA, a form of insanity in which unconnected and imperfectly defined ideas chase each other rapidly through the mind, the powers of continued attention and reflection being lost. It often implies such general feebleness of the mental faculties as may occur in old age.

DEMERA'RA, or Demarara, a division of British Guiana, which derives its name from the river Demarara or Demerara. It extends about 100 miles along the coast, lying on the east of Essequibo and on the west of Berbice. The soil is very fertile, producing abundant crops of sugar, coffee, cotton, rice, etc. Chief town, Georgetown. Pop. of province, 125,000.—The river, after a course of about 120 miles, flows into the Atlantic.

DEMESNE (de-mān'), or Domain, in law, a manor-house and the land adjacent or near, which a lord keeps in his own hands or immediate occupation, for the use of his family, as distinguished from his tenemental lands, distributed among his tenants.

DEMET'RIUS, or **DMITRI,** the name of a series of impostors who usurped supreme authority in Russia, and led to some of its remarkable revolutions.

DEMET'RIUS, king af ancient Macedonia, son of Antigonus, a successor of Alexander the Great, was born about B.C. 339, and died in Syria 283 B.C.

DEMI-MONDE, an expression first used by the younger Dumas in a drama of the same name (first performed in 1855), to denote that class of gay female adventurers who are only half-acknowledged in society; popularly, disreputable female society; courtezans.

DEMISE', in law, a grant by lease; it is applied to an estate either in fee-simple, fee-tail, or for a term of life or years. As applied to the crown of England, demise signifies its transmission to the next heir on being laid down by the sovereign at death.

DEMISEMIQUAVER, in music, half a semiquaver, or the thirty second part of a semibreve.

DEMOC'RACY, the rule of a people by the people themselves; that form of government in which the sovereignty of the state is vested in the people, and exercised by them either directly, as in the small republics of ancient Greece, or indirectly, by means of representative institutions, as in the constitutional states of modern times. The term is also applied in a collective sense to the people or populace, especially the populace regarded as rulers. See also next article.

DEM'OCRAT, one who adheres to democracy. In the U. States, a member of one of the two great political parties into which that country is divided; opposed to republican. The main features of their system of principles are decentralization and self-government of the states.

DEMOC'RITUS, a Greek philosopher of the new Eleatic school, a native of Abdēra, who was born between 470 and 460 B.C. He explained the origin of the world by the eternal motion of an infinite number of invisible and indivisible bodies or atoms, which differ from one another in form, position, and arrangement, and which have a primary motion, which brings them into contact, and forms innumerable combinations, the result of which is seen in the productions and phenomena of nature. In this way the universe was formed, fortuitously, without the interposition of a First Cause. The eternal existence of atoms (of matter in general) he inferred from the consideration that time could be conceived only as eternal and without beginning. He applied his atomical theory, also, to natural philosophy and astronomy. Even the gods he considered to have arisen from atoms, and to be perishable like the rest of things existing. In his ethical philosophy Democritus considered the acquisition of peace of mind as the highest aim of existence. He is said to have written a great deal; but nothing has come to us except a few fragments. He died 370 B.C., at an advanced age. His school was supplanted by that of Epicurus.

DE'MON, a spirit or immaterial being of supernatural but limited powers, especially an evil or malignant spirit. Among the ancient Greeks the name was given to beings similar to those spiritual existences called angels in the Bible. In the New Testament evil spirits are called demons (commonly translated "devils"). A belief in demons is found in the oldest religions of the East. Buddhism reckons six classes of beings in the universe: two, gods and men, are accounted good; the other four are malignant spirits. The Persians and the Egyptians had also a complete system of demons; and in Europe, up till the middle ages, the divinities of oriental, classical, and Scandinavian mythology often figure, from the Christian point of view, as evil spirits. In later times phases of demonology may be seen in the witchcraft mania and the spiritualism of the present day.

DEMO'NIAC, a person whose mental faculties are overpowered, and whose body is possessed and actuated by some created spiritual being; especially a person possessed of or controlled by evil spirits. The New Testament has many narratives of demoniacs, and various opinions are entertained in regard to the character of their affliction.

DEMONOLOGY, the science which studies the various beliefs and superstitions of men concerning the existence of personal devils, or evil powers invisible to human eyes, but exerting an important influence or human affairs. Demons have existed in the beliefs of all peoples and do still exist in the belief of many. Faith in a personal devil is one of the scriptural qualifications of a Christian, however much the idea may be ridiculed by modern teachers. Numerous works have been written upon the science of demonology. (See Demon).

DEMONSTRATION, in a logical sense, any mode of connecting a conclusion with its premises, or an effect with its cause. In a more rigorous sense it is applied only to those modes of proof in which the conclusion necessarily follows from the premises. In ordinary language, however, demonstration is often used as synonymous with proof.

DEMOS'THENES (-nēz), the famous ancient Greek orator. He was born in 382 (according to some in 385) B.C. He thundered against Philip of Macedon in his orations known as the Philippics, and endeavored to instil into his fellow-citizens the hatred which animated his own bosom. He labored to get all the Greeks to combine against the encroachments of Philip, but their want of patriotism and Macedonian gold frustrated his efforts. He was present at the battle of Chæroneia (380 B.C.), in which the Athenians and Bœotians were defeated by Philip, and Greek liberty crushed. On the accession of Alexander in 336 Demosthenes tried to stir up a general rising against the Macedonians, but Alexander at once adopted measures of extreme severity, and Athens sued for mercy. It was with difficulty that Demosthenes escaped being delivered up to the conqueror. In 324 he was imprisoned on a false charge of having received a bribe from one of Alexander's generals, but managed to escape into exile. On the death of Alexander next year he was recalled, but the defeat of the Greeks by Antipater caused him to seek refuge in the temple of Poseidon, in the island of Calauria, on the coast of Greece, where he poisoned himself to escape from the emissaries of Antipater (322 B.C.). The character of Demosthenes is by most modern scholars considered almost spotless. His fame as an orator is equal to that of Homer as a poet. Cicero pronounces him to be the most perfect of all orators. He carried Greek prose to a degree of perfection which it never before had reached. Everything in his speeches is natural, vigorous, concise, symmetrical

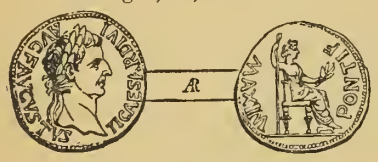
DEMURR'AGE, in maritime law, the time during which a vessel is detained by the freighter beyond that originally stipulated, in loading or unloading. When a vessel is thus detained she is said to be on demurrage. The name is also given to the compensation which the freighter has to pay for such delay or detention. Demurrage must be paid though it be proved the delay is inevitable; but it cannot be claimed where it arises from detention by an enemy, tempestuous weather, or through the fault of the owner, captain, or crew. The term is applied also to detention of freight by railroads.

DEMURRER, in law, a stop at some point in the pleadings, and a resting of the decision of the cause on that point; an issue on matter of law. A demurrer confesses the fact or facts to be true, but denies the sufficiency of the facts in point of law to support the claim or defense.

DEMY', a size of writing paper 16x21 inches intervening between cap 14x17 inches and folio 17x22 inches. Printing demy measures 24x36 inches. Double demy is 36x48 inches.

DENARIUS, a Roman silver coin worth 10 asses or 10 lbs. of copper originally, and afterward considered equal to 16 asses, when the weight of the as was reduced to an ounce on account of the scarcity of silver. The denarius was equivalent to about 15 cents There was also a gold denarius equal in value to 25 silver ones.

DENBIGH (den'bi), a county of North Wales, on the Irish Sea; area, 392,005 acres, of which about a fourth is arable. Barley, oats, and potatoes are grown on the uplands; and in the rich valleys wheat, beans, and pease. Cattle and sheep are reared, and dairy husbandry is carried on to a considerable extent. The minerals consist of lead, iron, coal, freestone, slate, and millstone. Flannels, coarse cloths, and stockings are manufactured. The principal rivers are the Clwyd, the Dee, and the Conway Pop. 129,933.—The county town Denbigh is a municipal and parliamentary borough near the center of the Vale of Clwyd, 25 miles w. of Chester. Pop. 6439; of dist. of boroughs, 26,934.



Denarius of Tiberius Cæsar.

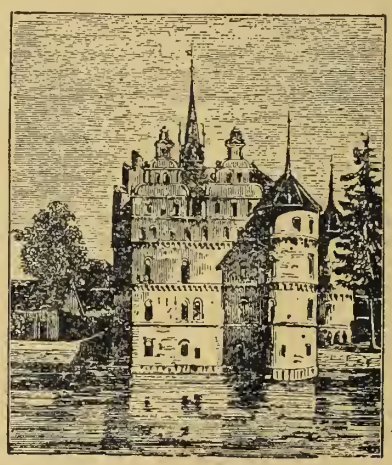
DEN'DRITE, a stone or mineral, on or in which are figures resembling shrubs, trees, or mosses. The appearance is due to arborescent crystallization, resembling the frostwork on our windows. The figures generally appear on the surfaces of fissures and in joints in rocks, and are attributable to the presence of the hydrous oxide of manganese, which generally assumes such a form.

DENIS, St., a town in France, department of the Seine, 6 miles north of Paris, lying within the lines of forts surrounding the capital. It contains the famous abbey church of St. Denis, a noble Gothic structure in part dating from the 11th century or earlier. The church is about 354 feet long and 92 high. The town has tanneries, breweries, manufactories of calicoes, gelatine, soda, etc. Pop. 50,992.

DENISON, a city in Grayson county, Tex., 72 miles north by east of Dallas, on the Missouri, Kansas and Texas, the Texas and Pacific, the Houston and Texas Central, and the Saint Louis and San Francisco railroads. Pop. 13,510.

DEN'MARK, a northern kingdom of Europe, consisting of a peninsular portion called Jutland, and an extensive archipelago lying east of it and comprising the islands of Seeland (or Själland), Fünen (or Fyen), Laaland (or Lolland), Falster, Langeland, Möen, Samsö, Lasö, Arrö, Bornholm, and many smaller ones. Besides these there are the outlying possessions of Iceland, Greenland, and the Faroe Islands in the Atlantic Ocean, and Santa Cruz, St. Thomas, and St. John in the West Indies. The area of the home possessions is 15,388 sq. miles of which Jutland occupies 9755; the pop. in 1908, 2,585,660. Including Iceland, part of Greenland, etc., the total area of the Danish possessions is 102,022 sq. miles; pop. 2,706,550. Copenhagen is the capital. For administrative purposes Denmark is divided into eighteen provinces or districts, besides the capital, nine of these making up Jutland, while the others embrace the islands.

On the south Denmark is bounded by Germany and the Baltic: on the west it is washed by the North Sea; northward it is separated from Norway by the Skagerrack; eastward it is separated from Sweden by the Kattegat and the Sound. Denmark, whether insular or mainland, is a very low-lying country, the eastern side of Jutland where the highest elevation occurs, not exceeding 550 feet. The country was once covered with great forests, but these have disappeared, and Denmark is largely dependent on other countries for her supplies of timber. Woods of some extent still exist, however, especially in the islands. In earliest perhistoric times (the stone age) the Scotch fir was the prevailing tree and subsequently the oak. The principal tree now is the beech, the oak forming but a small portion of the timber of Denmark. The elm, ash, willow, aspen, and birch are met with in small numbers or singly. Pine forests have been planted in the north of Jutland and elsewhere. Denmark has numerous streams but no large rivers; the principal is the Guden, which flows northeast through Jutland into the Kattegat. It is navigable for part of its course. The lakes are very numerous but not large, none exceeding 5½ miles in length by about 1½ miles broad. Copenhagen, Aalborg, Aarhuus, and Randers are the chief seaports. Owing to the lowness of the



Danish mansion—Castle on the island of Fünen.

land and its proximity to the sea on all sides, the climate is remarkably temperate for so northerly a region, though the thermometer in winter may sink to 22° below zero, and in summer rise to 89°. Violent winds are frequent, and rains and fogs prevalent, but the climate is favorable to vegetation.

The agricultural land is greatly subdivided, as the law interdicts the union of small farms into larger. Among crops the greatest area is occupied by oats, which are grown all over the country, but best in Jutland. Barley is grown chiefly in Seeland, and is largely used in brewing beer, the common beverage of the country. Rye is extensively raised, and the greater part of the bread used in Denmark is made from it. Turnips, beans, pease, flax, hemp, hops, tobacco, etc., are also grown; but in general cattle-breeding, grazing, and the dairy take up most of the farmers' attention in Denmark.

The commerce of Denmark is carried on chiefly with Great Britain, Germany, Norway, Sweden, and Russia, Great Britain possessing the larger share, and Germany coming a little behind her. The chief imports are textile manufactures, metal goods, coal, timber, oil, coffee, sugar, tobacco, fruit, etc. The chief exports are butter (the most important item), cattle, horses, and swine, bacon, grain, hides, eggs, and other edibles. The Danish mercantile marine has a total tonnage of about 416,500 tons. The railways have a length of about 1300 miles.

The population of Denmark is composed almost exclusively of Danes, with a few thousand Jews and others. The Danes have regular features, fair or brownish hair, and blue eyes. At the head of the educational institutions stand the University of Copenhagen and the Holberg Academy at Soröe. The provinces are well supplied with gymnasia and middle schools, and primary instruction is given at the public expense in the parochial schools. It is rare to meet a peasant who cannot read and write even among the poorer class.

The government of Denmark was originally an elective monarchy. In 1661 it became a hereditary and absolute monarchy, and in 1849 a hereditary constitutional one, the legislative power being in the king and diet jointly. The diet or Rigsdag consists of two chambers, the Landsthing or upper house, the Folkething or lower house. The army consists of all the able bodied young men of the kingdom who have arrived at the age of twenty-one years. The time of service is eight years in the regular troops, and afterward eight more in the reserve. Every corps has to drill for thirty to forty-five days every year. The army on a war footing has a total strength of about 60,000 men. The navy is of no great strength.

History.—The oldest inhabitants of Denmark whom we find mentioned by name were the Cimbri, who dwelt in the peninsula of Jutland, the Chersonesus Cimbrica of the Romans. They first struck terror into the Romans by their incursion, with the Teutones, into the rich provinces of Gaul (113–101 B.C.). After this, led by the mysterious Odin, the Goths broke into Scandinavia, and appointed chiefs from their own nation over Denmark, Norway, and Sweden. For a considerable time Denmark was divided into a number of small states, whose inhabitants lived mostly by piracy along the neighboring coasts. In 787 they began to make their descents on the eastern coasts of England, and along with other inhabitants of Scandinavia they conquered Normandy in 876–7. Under Gorm the Old all the small Danish states were united in 920, and his grandson Sweyn, now the head of a powerful kingdom, commenced the conquest of Norway and of England, which was ultimately completed by his son Canute Canute died in 1035, leaving a powerful kingdom to his successors, who, in 1042, lost England, and in 1047 Norway. In 1047 Sweyn Magnus Estridsen ascended the throne, but with the exception of

the great Waldemar the new dynasty furnished no worthy ruler, and the power of the kingdom decayed considerably till the accession of the politic Queen Margaret in 1387, who established the union of Calmar in 1397 uniting under her rule Denmark, Sweden, and Norway. In 1448 Christian I., count of Oldenburg was elected to the throne, thus founding the royal family of Oldenburg, which kept possession of the throne till 1863. Under the rule of Christina, Norway, Sweden, Schleswig, and Holstein were connected with the crown of Denmark, but under his successor Christian II. Sweden established its independence. Under Frederick I. (1523–33) the reformation was introduced. Christian IV of Denmark ascended the throne in 1588, took part in the Thirty Years' war, and engaged twice in a war with Sweden, with most unfortunate results. Frederick III. again engaging in war with Sweden in 1657 was equally unsuccessful, Christian V. and Frederick IV. were conquered in the war with Charles XII. Denmark, however, after the fall of Charles XII., gained by the Peace of 1720 the toll on the Sound, and maintained possession of Schleswig. After this Denmark enjoyed a long repose. In 1800, having acceded to the northern confederacy, the kingdom was involved in a war with Great Britain, in which the Danish fleet was defeated at Copenhagen April 2, 1801. In 1807, there being reason to think that Denmark would join the alliance with France, a British fleet was sent up the Sound to demand a defensive alliance or the surrender of the Danish fleet as a pledge of neutrality. Both were denied, till the Danish capital was bombarded and forced to capitulate, the whole fleet being delivered up to the British. The war, however, was continued, Denmark forming new alliances with Napoleon till 1814, when a peace was concluded by which she ceded Heligoland to England in exchange for the Danish West India Islands, and Norway to Sweden in exchange for Swedish Pomerania and Rügen, which, however, she shortly after surrendered to Prussia, receiving in return Lauenburg and a pecuniary compensation. In June 1815 the king entered into the German confederacy as representing Holstein and Lauenburg. In 1848 Schleswig and Holstein revolted and were not finally subdued till 1852. In 1857 the Sound dues were abolished. Frederick VII. died in 1863 and with him the Oldenburg line became extinct. He was succeeded by Christian IX. (Prince of Sonderburg-Glücksburg). At the commencement of 1864 the Danish territory was politically distributed into four parts, viz. Denmark Proper (consisting of the Danish islands and North Jutland), the duchy of Schleswig or South Jutland, with a population more than one-half Danish, the remainder Frisian and German; the duchy of Lauenburg, also German. The measures of the Danish government compelling the use of the Danish language in state schools having given great umbrage to the German population of the duchies, the disputes resulted in the intervention of the German confederation, and ultimately Holstein was occupied by the troops of Austria and Prussia (1864). After a short campaign the Prussians captured Alsen, overran the greater part of Jutland, and forced the Danes to accept a peace (Aug. 1), by which they renounced their right to the duchies of Schleswig, Holstein, and Lauenburg. A difference now arose between Austria and Prussia as to what should be done with the duchies, and Prussia showing an evident intention of annexing them, the result was a war between the two powers, which ended in the total defeat of Austria at Sadowa, or Königgrätz, 3d July, 1866. By the treaty which followed Austria relinquished all claim to the duchies, which thus fell to Prussia. The chief events since then have been the prolonged struggle between the government and the Folkething; the celebration of the centenary of the emancipation of the Danish peasants and the jubilee of King Christian (1888) and the strengthening of the national defenses. King Christian died in 1906 and was succeeded by his son, Frederick VIII.

DENNISON, William, an American cabinet officer and governor, born in Cincinnati in 1815, died in 1882. He was governor of Ohio during the civil war and raised 30,000 troops for the Union side. He was postmaster-general in the cabinets of Lincoln and Johnson.

DENOUEMENT (dā-nö-mäṅ), a French term naturalized in England, and signifying the winding up or catastrophe of a plot, the solution of any mystery, etc.

DEN'SITY, in physics, the quantity of matter contained in a body under a given bulk. If a body of equal bulk with another contains double the quantity of matter it is of double the density. Or if a body contain the same quantity of matter as another, but under a less bulk, its density is greater in proportion as its bulk is less than that of the other. Hence the density is directly proportional to the quantity of matter, and inversely proportional to the bulk or magnitude. The relative quantities of matter in bodies are known by their gravity or weight, and when a body, mass, or quantity of matter is spoken of, its weight or gravity is always understood, that being the proper measure of the density or quantity of matter. The weights of different bodies, of equal bulks, indicate their relative densities. The density of solids, fluids, and gases, as compared with that of water, is their Specific Gravity (which see). As for the density of the earth see Earth.

DENTAL FORMULA, an arrangement of symbols and numbers used to signify the number and kinds of teeth of a mammiferous animal. The dental formula of man is:

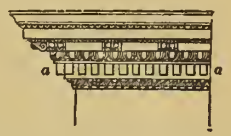
I. $\frac{2-2}{2-2}$, C. $\frac{1-1}{1-1}$, P.M. $\frac{2-2}{2-2}$, M. $\frac{3-3}{3-3}$ = 32,

which is read thus: Two incisors on each side of both jaws, one canine tooth on each side of both jaws, two præmolars on each side of both jaws, and three true molars on each side of both jaws, in all 32 teeth.

DENTA'RIA, coral-root, a genus of plants. There are about twenty species, natives of temporate countries. They are ornamental herbs, with creeping singularly toothed root-stocks, from which they received the names of coral-root and tooth-wort. The stem-leaves are opposite or in whorls of three, and the flowers are large and purple.

DEN'TIFRICE, a preparation for cleaning the teeth, of which there are various kinds in the form of tooth-powders, tooth-washes, or tooth-pastes. Cuttle-fish bone, finely-powdered chalk, and charcoal are common dentifrices. Rhatany, catechu, myrrh, and mastic are also often employed.

DEN'TILS, in arch., the little cubes resembling teeth, into which the square



a a, Dentils of the Corinthian cornice.

member in the bed-molding of an Ionic, Corinthian, or Composite cornice is divided.

DEN'TINE, the ivory tissue lying below the enamel and constituting the body of a tooth. It consists of an organic basis disposed in the form of extremely minute tubes and cells, and of earthy particles.

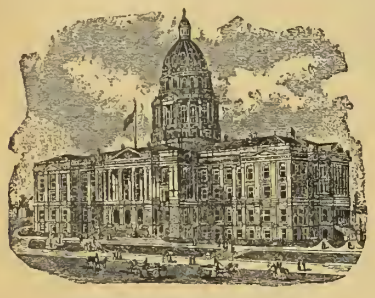
DENTISTRY, the art of curing, repairing, extracting, and treating the teeth. Dentistry was practiced in a crude way among the ancients, and modern dentistry is an almost wholly American art. The art is divided into mechanical dentistry and operative or surgical dentistry, the former having to do with the cleaning, filling, and replacing of teeth (except the transplanting of teeth, which would fall under the surgical division). The oldest dental school in the world is the Baltimore College of Dental Surgery, founded in 1839, the second oldest is the Ohio College of Dental Surgery founded in 1845. Almost all large universities and medical schools now have dental colleges. This increase in the educational facilities of dentistry has placed the modern dentist on a professional level as high as that of the medical doctor and has opened up a new art of surgery called stomatology, or the science of diseases of the mouth. By means of mechanical appliances the jaw can be lengthened and the expression of face entirely altered. Dentistry, in a somewhat high form, has been practiced for centuries by the chinese.

DENTITION. See Teeth, Teething.

DENUDA'TION, in geology, the act of washing away the surface of the earth by water, either in the form of constant currents or of occasional floods.

DENVER, a city and important railway center; capital of Colorado and of Arapahoe County; beautifully situated on South Platte river, 15 miles e. of the base of the Rocky Mountains; 5200 feet above the level of the sea. It commands a magnificent view of mountain scenery, including Pike's, Long's, and other noted peaks perpetually covered with snow. The streets are wide and shady, and the residences and public buildings, built largely of brick and yellow stone, are stately, handsome, and attractive. Denver is appropriately called "The Queen City of the Plains."

The city has over 150 churches, among them St. John's Cathedral (Protestant Episopal), noted for its stained glass window representing the crucifixion. The public school system is excellent. There are ten public and private libraries. The city is also the seat of Denver University, three medical colleges, and several private schools. The State capitol is 383 feet long and 313 feet wide. It stands on Capitol Hill, where is ob-



State capitol, Denver, Col.

tained the best view of the city. Other prominent buildings are the city-hall, the county court-house, and especially the U. States court-house and post-office. Denver has 143 miles of electric street railways, and is lighted by gas and electricity It has an excellent system of water-works; water is brought from the mountains Seven railways center here, and there is a large and commodious union depot. All the eastern trunk lines maintain offices here. Denver has eleven parks, the largest, City Park, containing 340 acres. It is an important center for mining, agriculture, and stock-raising, the leading industries of the state. It has a branch U. States mint and many important manufactories.

The city was settled as a mining-camp in 1858–59. Its growth has been rapid and steady. Pop. 1909, 200,000.

DENVER, UNIVERSITY OF, founded at Denver, Colo., in 1864, by methodists. It has collegiate, medical, law, music, dental, and theological schools, an endowment of nearly $1,000,000, nearly 2,000 students, and 200 instructors.

DEODORI'ZERS, chemical substances which have the power of destroying fetid effluvia, as chlorine, chloride of lime, etc.

DEPART'MENT, the name given to the principal territorial divisions of France. At the time of the French revolution department replaced the old division into provinces, the change being voted in the constituent assembly in 1789. There are at present eighty-seven departments, each of which is subdivided into arrondissements.

DE PAUW UNIVERSITY, at Greencastle, Putnam county, Indiana, one of the chief institutions of learning maintained by the methodist church in America, constituted in 1837. It is excellently endowed, mainly by the liberality of the Hon. W. C. de Pauw, has a staff of 40 professors and teachers, and over 900 students.

DEPENDENT CHILDREN, children, who, although not defective, must be supported by others than their parents. In the United States there are numerous children's aid societies and homes for dependent children, and large sums of money are devoted to the proper rearing of such children. After a good training the children are placed in private families whose desirability has been specially investigated.

DEPEW, Chauncey Mitchell, an American lawyer, senator, and railroad president, born in New York in 1834. Since 1866 he has been identified with the Vanderbilt railroads and in 1899 was elected to the United States senate.

DEPO'NENT, (1) in grammar, a verb passive in form but active or neuter in signification. (2) In law, a person who makes an affidavit, or one who gives his testimony in a court of justice; a witness upon oath.

DEPOS'IT, in law, something given or entrusted to another as security for the performance of a contract, as a sum of money or a deed. In commerce, a deposit is generally either money received by banking or commercial companies with a view to employ it in their business, or documents, bonds, etc., lodged in security for loans. In the first case interest is usually paid to the depositor. The receipt given by the banker for money deposited with him is called a deposit receipt.

DEPOSIT, in geology, a layer of matter formed by the settling down of mud, gravel, stones, detritus, organic remains, etc., which had been held in suspension in water.

DEPOSITION, in law, the testimony given in court by a witness upon oath. It is also used to signify the attested written testimony of a witness by way of answer to interrogatories. Depositions are frequently taken conditionally, or de bene esse, as it is called; for instance, when the parties are sick, aged, or going abroad, depositions are taken, to be read in court in case of their death or departure before the trial comes on.

DEPOT (dā'pō or dep'ō), a French word in general use as a term for a place where goods are received and stored; hence, in military matters, a magazine where arms, ammunition, etc., are kept. The term is now usually applied to those companies of a regiment which remain at home when the rest are away on foreign service. In America it is the common term for a railway-station.

DEPRIVATION, the removing of a clergyman from his benefice on account of heresy, misconduct, etc. It entails, of course, loss of all emoluments, but not the loss of clerical character.

DE PROFUNDIS, in the liturgy of the Roman Catholic Church, one of the seven penitential psalms, the 130th of the Psalms of David, which in the vulgate begins with these words, signifying "Out of the depths." It is sung when the bodies of the dead are committed to the grave.

DEPTFORD (det'ford), a parl. and mun. borough, England, in the counties of Kent and Surrey, on the right bank of the Thames, forming now part of London. It has some manufactures of pottery, chemicals, soap, etc. Pop. 110,513.

DEP'UTY, one who exercises an office as representing another.—Chamber of Deputies, the lower of the two legislative chambers in France and in Italy, elected by popular suffrage, and corresponding in some respects to the House of Commons in Britain. See France, Italy.

DE QUINCEY, Thomas, author of Confessions of an English Opium Eater was born at Greenhay, near Manchester, on 15th August, 1785. He died at Edinburgh December 8, 1859. His writings, nearly all contributions to magazines, are distinguished by power of expression, subtle thought, and an encyclopædic abundance of curious information.

DERA GHAZI KHAN, a district and town in the Punjab, Hindustan. The former, which is in Derajat division, has an area of 5606 sq. miles and a population of 404,031. The town has a population of 23,731, half Hindus and half Mohammedans. It has extensive manufactures of silk, cotton, and coarse cutlery.

DERAJAT (-jät'), a commissionership of Hindustan, in the west of the Punjab, occupying part of the valley of the Indus. It is well watered and fertile, and contains numerous towns and villages. Pop. 1,643,603, mostly Mohammedans.

DERBY, a municipal, parl., and county borough in England, capital of Derbyshire, 115 miles n.n.w. London. Derby is one of the oldest towns in the kingdom, and is supposed to owe its origin to a Roman station, Derventio. Under the Danes it took the name of Deoraby. Richardson, the novelist and Herbert Spencer were natives. Pop. 105,785.—The county of Derby in the center of the kingdom, is about 55 miles long and from 15 to 30 broad; area, 658,624 acres, or 1029 square miles, five-sixths being arable or in permanent pasture. The principal rivers are the Derwent, the Trent, the Wye, the Erwash, the Dove, and the Rother. Oats and turnips are important crops, and dairy-husbandry is carried on to a large extent. Coal is abundant in various parts of the county, iron ore is also plentiful, and lead, gypsum, zinc, fluor-spar, and other minerals are obtained. The manufactures are very considerable, especially of silk, cotton, and lace, machinery, and agricultural implements. Pop. 620,196.

DERBY, Edward Geoffrey Smith

Edward, 14th Earl of Derby.

Stanley, fourteenth Earl of, an English statesman, born in Knowsley Park, Lancashire, March 29, 1799; died there

Oct. 23, 1869. In 1820 he was returned to the House of Commons as member for Stockbridge, and in 1830 became chief secretary for Ireland, in Lord Grey's government. In 1841 he became colonial secretary under Sir Robert Peel, but resigned on Peel's motion for repeal of the corn-laws. In 1851 and 1858 he formed ministries which held office only for a short period; and again in 1866, when his administration signalized itself by the reform of the government in India, the conduct of the Abyssinian war, and the passing of a bill for electoral reform (1867).

DERBY-DAY, the great annual London holiday, on which the horse-race for the stakes instituted by Lord Derby in 1780 is run. It always falls on a Wednesday, being the second day of the grand race meeting which takes place in the week after Trinity Sunday. The race is run on Epsom Downs, an extensive plain in the neighborhood of London. The entry-money for each subscriber is fifty guineas, and the stakes are run for by colts of three years. In the first year of the Derby there were only thirty-six entries, but now they are so numerous that the value of the stakes reaches several thousand pounds. The Epsom races are the most popular of the English horse-races. The Ascot races are patronized by royalty, the world of fashion is to be seen at Goodwood, but on Epsom Downs, on the Derby-day, are assembled all classes, high and low.

DER'ELICT, a vessel or anything relinquished or abandoned at sea, but most commonly applied to a ship abandoned by the crew and left floating about.

DERIVATION. See Etymology.

DERMA, Dermis, the true skin, or under layer of the skin, as distinguished from the cuticle, epidermis, or scarf-skin.

DERMATOLOGY, the branch of medicine which treats of the skin and its diseases.

DER'RICK, a lifting apparatus, consisting of a single post or pole, supported by stays and guys, to which a boom with a pulley or pulleys is attached, used in loading and unloading vessels, etc. Floating derricks of the strongest construction, with an immense boom and numerous blocks, are also used.

DERRICK-CRANE, a kind of crane combining the advantages of the common derrick and those of the ordinary crane. The jib of this crane is fitted with a joint at the foot, and has a chain instead of a tension-bar attached to it at the top, so that the inclination, and consequently the sweep, of the crane can be altered at pleasure.

DERRY. See Londonderry.

DER'VISH, a Mohammedan devotee, distinguished by austerity of life and the observance of strict forms. There are many different orders of them. Some live in monasteries, others lead an itinerant life, others devote themselves to menial or arduous occupations.

DESCARTES (dā-kärt), René, a great French philosopher and mathematician, with whom the modern or new philosophy is often considered as commencing, was born Mareh 31, 1596, at La Haye, in Touraine. Descartes, seeing the errors and inconsistencies in which other philosophers had involved themselves, determined to build up a system anew for himself, divesting himself first of all the beliefs he had acquired by education or otherwise, and resolving to accept as true only what could stand the test of

Traveling dervish of Khorasan.

reason. Proceeding in this way he found that there was one thing that he could not doubt or divest himself of the belief of and that was the existence of himself as a thinking being, and this ultimate certainty he expressed in the celebrated phrase "I think, therefore I am." Here, then, he believed he had found the test of truth. Starting from this point Descartes found the same kind of certainty in such propositions as these: that the thinking being or soul differs from the body (whose existence consists in space and extension) by its simplicity and immateriality and by the freedom that pertains to it; that every perception of the soul is not distinct; that it is so far an imperfect finite being; that this imperfection of its own leads it to the idea of an absolutely perfect being; and from this last idea he deduces all further knowledge of the truth. Descartes also contributed greatly to the advancement of mathematics and physics. The higher departments of geometry were greatly extended by him. His works effected a great revolution in the principles and methods of philosophizing. In 1647 the French court granted him a pension and two years later, on the invitation of Christina of Sweden, he went to Stockholm, where he died Feb. 11, 1650.

DESCENDANTS. See Descent.

DESCENT', in law, is the transmission of the right and title to lands to the heir, on the decease of the proprietor, by the mere operation of law. The rule determining to whom an estate belongs, on the decease of the proprietor, is that of consanguinity, or relationship by blood, though with some exceptions, as in the case of the portion, or the use of a portion, of a man's property given by the law to his widow. The rules of descent, designating what relations shall inherit, and their respective shares, will be determined by the genius and policy of the government and institutions. Hence the practice of entailments in the feudal system. And wherever the government is founded in family privileges, or very intimately connected with them, as is the case in all governments where the hereditarily aristocratical part of the community have a great preponderance, the sustaining of families will very probably be a characteristic feature in the code of laws. Thus, in Britain, all the lands of the father, unless otherwise directed by will go to the eldest son. In the U. States this distinction in favor of the eldest son has been abolished, and the laws are founded upon the principle of equal distribution both of real and personal estate among heirs of the nearest surviving degree. Kindred in blood are divided into three general classes, viz. 1, descendants; 2, ancestors; 3, collateral relatives, that is, those who have descended from the same common ancestor. The civil law computes the degrees by counting the generations up to the common ancestor, as father, grandfather, great-grandfather; or mother, grandmother, great-grandmother; and from him or her down to the collateral relative, as brother, cousin, etc., making the degree of relationship the sum of these two series of generations. Every person has two sets of ancestors, the paternal and maternal, and therefore two sets of collateral relatives. There is also a distinction of collateral kindred, into those of the whole blood and those of the half blood.

DES'ERET. See Utah.

DES'ERT, a term more particularly applied to vast barren plains such as are found in Asia and Africa, but which may also be used to designate any solitude or uninhabited place whether barren or not. See Sahara and Gobi.

DESERT'ER, a soldier or sailor who quits the service without leave. Deserters are tried by court-martial, which may inflict death as the extreme punishment, or a less severe punishment, according to the circumstances of the case.

DESERTION, by husband or wife, without due cause, is ground for a judicial separation. A wife may obtain an order to protect any money or property she may have acquired since desertion, against her husband or his creditors.

DESICCATION, a process of dispelling moisture by the use of air, heat, or chemical agents such as chloride of calcium, quicklime, oil of vitriol, and fused carbonate of potash.—Desiccation cracks, in geology, are the fissures caused in clayey beds by the sun's heat, and seen in various rock strata.

DESIGN, the art of creating ornamental devices of any kind, or for any purpose. Design is one of the most ancient of arts and has been carried to its highest complexity and development in the orient. Schools of design were originated in France during the reign of Louis XIV. and were later introduced into England and other countries, and most recently in America. Principles of design are taught in these schools, covering the designing of patterns for laces, rugs, carpets, wall paper, glassware, in short, everything to which an ornamental design can add beauty.

DES MOINES (dē moin), capital of the state of Iowa and of Polk county, on the Des Moines River, about 350 miles west of Chicago. Among its chief buildings are the state house, the state arsenal, colleges, opera-houses, etc. There are

coal-mines in the vicinity, and the manufactures and other industries are varied and increasing. Pop. 1909, 80,000.

DES MOINES, the largest river in the state of Iowa, rises in the s.w. of Minnesota and flows in a south-easterly

State capitol, Des Moines, Ia.

direction till it falls into the Mississippi about 4 miles below Keokuk, after a course of 300 miles.

DESMOL'OGY, that branch of anatomy which treats of the ligaments and sinews.

DESMOULINS (dā-mö-laṇ), Benoît Camille, born in 1760 or 1762, was conspicuous during the first period of the French revolution. He was among the most notable of the pamphleteers and orators who urged the multitude forward in the path of revolution. In 1793 he gave his vote for the death of the king. Having become closely connected with Danton and the party of opposition to Robespierre, and inveighing against the reign of blood and terror, he was arrested on the order of the latter on 30th March, 1794, tried on the 2d April, and executed on the 5th. He met his fate in an agony of despair.

DE SOTO, Hernando, a Spanish explorer and discoverer of the Mississippi, born about 1496, died in 1542. He accompanied expeditions to the New World under Davila and Pizarro, and played a distinguished part in the conquest of Peru. In 1536 he led an expedition to Florida, whence after many difficulties he penetrated to the Mississippi, where he was attacked with fever and died.—The name De Soto has been given to a county in the n.w. of Mississippi, and to several places in the U. States.

DES'POT, originally a master, a lord; at a later period it became an honorary title which the Greek emperors gave to their sons and sons-in-law when governors of provinces. At present despot means an absolute ruler, as the Emperor of Russia, and in a narrower sense a tyrannous one.

DESSAU (des'ou), a town in Germany, capital of the duchy of Anhalt. The manufactures consist of woolens, woolen yarn, carpets, machinery, tobacco, etc. The ducal palace has a picture-gallery and interesting relics and antiquities. Pop. 50,677.

DETACH'MENT, a body of troops selected from the main army for some special service.

DET'ONATING POWDERS, certain chemical compounds, which, on being exposed to heat or suddenly struck, explode with a loud report, owing to one or more of the constituent parts suddenly assuming the gaseous state. The chloride, and iodide of nitrogen are very powerful detonating substances. The compounds of ammonia with silver and gold, fulminate of silver and of mercury, detonate by slight friction by means of heat, electricity, or sulphuric acid.

DETROIT, the principal city of Michigan, a port of entry and county-seat of Wayne county, situated on the Detroit River, 285 miles northeast of Chicago, connecting Lakes Erie and St. Clair. Pop. 1909, 400,000.

The city has an area of 29 sq. miles, and is finely situated on ground rising gradually from the river. It has broad, clean, well shaded and paved streets. Most of the streets cross at right angles, but these are intersected by several broad avenues, radiating from the Grand Circus, a semicircular park of five and a half acres in the heart of the city. Woodward Avenue extends through this, and divides the city into nearly equal portions.

Detroit has a superb park system the central feature of which is Belle Isle, an island park of 707 acres. The city contains a number of institutions of higher education, an excellent public school system, and numerous hospitals and charitable institutions. In trade it ranks among the Canada export cities of the United States and it is also a very large manufacturing center. It was settled by the French in 1810.

DETROIT RIVER, or **STRAIT OF ST. CLAIR,** a river or strait of North America, which runs from Lake St. Clair to Lake Erie. It is 28 miles long, and of sufficient depth for the navigation of large vessels. It is about ¾ mile wide opposite Detroit and enlarges as it descends.

DEUTERON'OMY, the last of the books of the Pentateuch, so called from its consisting in part of a restatement of the law as already given in Exodus, Leviticus, and Numbers, and containing also, in addition to special commands and admonitions not previously given, an account of the death of Moses. See Pentateuch.

DEVIATION OF THE COMPASS, the deviation of a ship's compass from the true magnetic meridian, caused by the near presence of iron. In iron ships the amount of deviation depends upon the direction, with regard to the magnetic meridian, in which the ship lay when being built. It is least when the ship has been built with her head south. Armor-plated ships should be plated with their head in a different direction from that in which they lay when built. The mode now generally employed to correct deviation is by introducing on board ship masses of iron and magnets to exactly neutralize the action of the ship's magnetism. Compasses are sometimes carried on masts in iron vessels as a means of removing them from the disturbing influence of the iron of the hull. In this position they serve as standards of comparison for the binnacle compass. Wooden ships are also affected, though in a far less degree, by the direction in which they lie when building.

DEVICE', a name common to all figures, ciphers, characters, rebuses, mottoes, etc., which are adopted by a person or a family by way of badge or distinctive emblem, often a representation of some natural body, with a motto or sentence applied in a figurative sense.

DEVIL, in theology, an evil spirit or being; specifically the evil one, represented in Scripture as the traducer, father of lies, etc. Most of the old religions of the East acknowledge a host of devils. The doctrine of Zoroaster, who adopted an evil principle called Ahriman, opposed to the good principle and served by several orders of inferior spirits, spread the belief in such spirits among the people. The Greek mythology did not distinguish with the same precision between good and bad spirits. With the Mohammedans Eblis, or the devil, was an archangel whom God employed to destroy a pre-Adamite race of jinns, or genii, and who was so filled with pride at his victory that he refused to obey God. The Satan of the New Testament is also a rebel against God. He uses his intellect to entangle men in sin and to obtain power over them. But he is not an independent self-existent principle like the evil principle of Zoroaster, but a creature subject to omnipotent control. The doctrine of Scripture on this subject soon became blended with numerous fictions of human imagination, with the various superstitions of different countries, and the mythology of the pagans. The excited imaginations of hermits in their lonely retreats, sunk as they were in ignorance and unable to account for natural appearances, frequently led them to suppose Satan visibly present; and innumerable stories were told of his appearance, and his attributes—the horns, the tail, cloven foot, etc.—distinctly described. In consequence of the cures which Christ and his apostles performed on the possessed, the early church believed in a power connected with the consecration of priests to drive out evil spirits. (See Exorcism.) The belief in evil spirits, witches, etc., was in the 17th century so common that they became the objects of judicial process. With the progress of the natural sciences, however, in the 18th century many wonderful phenonema became explained, and less was heard of witchcraft.

DEVIL, the machine through which cotton or wool is first passed to prepare it for the carding-machines; a teasing-machine.

DEVIL-FISH, the popular name of various fishes, one of them being the angler (which see). Among others the name is given to several large species of ray occasionally captured on the Atlantic and Pacific coasts of America, and much dreaded by divers, whom they are said to devour after enveloping them in their vast wings. During gales of wind or from strong currents these immense fish are driven into shoal water, and being unable to extricate themselves, fall an easy prey to the vigilance of the fishermen, who obtain considerable quantities of oil from their livers.

DEVIL'S PUNCH-BOWL, a small lake of Ireland, near the Lakes of Killarney, between 2,000 and 3,000 feet above the sea, supposed to be the crater of an ancient volcano.

DEVIL-WORSHIP, the worship paid to the devil, an evil spirit, a malignant deity, or the personified evil principle in nature, by many of the primitive tribes of Asia, Africa, and America, under the assumption that the good deity does not trouble himself about the world; or that the powers of evil are as mighty as the power of good, and have in consequence to be bribed and reconciled. There is a sect called devil-worshipers inhabiting Turkish and Russian Armenia and the valley of the Tigris, who pay respect to the devil, to Christ, and to Allah or the supreme being, and also worship the sun.

DE VINNE, (dē-vin'-ne), Theodore Low, an American printer, born in Connecticut in 1828. He is the founder of the Typothetæ Society and has done much for the improvement of typographical art in the United States.

DEVON, Devonshire, a maritime county in the s. w. of England, its northern coast being on the Bristol Channel and its southern on the English Channel; area, 1,655,208 acres, or 2586 square miles, the county being the third largest of England. Tin, lead, iron, copper, manganese, granite, and the clay used by potters and pipe-makers are the chief mineral products. The geological formation of the Old Red Sandstone is so largely developed that the term Devonian has to some extent become its synonym. Agriculture is in a somewhat backward state, owing, probably, to the general preference given to dairy husbandry, for which the extent and richness of its grass lands make the county most suitable. Wheat, barley, beans, pease, and potatoes are the principal crops. Pop. 660,444.

DEVO'NIAN SYSTEM, in geology, a name originally given to rocks of Devonshire and Cornwall, intermediate between the silurian and carboniferous strata, and consisting of sandstones of different colors, calcareous slates and limestones, etc. They are divided into lower, middle, and upper groups, all containing fossils, but the middle most abounding in them, including corals, crinoids, crustaceans, mollusca (especially brachiopods), and cephalopods. Devonian rocks occupy a large area in Central Europe, as well as in the United States, Eastern Canada, and Nova Scotia. The term has been often used as equivalent to Old Red Sandstone.

DEV'ONPORT, a municipal, parl., and county borough and port of England, county of Devon, contiguous to Plymouth. It is the seat of one of the royal dockyards, and an important naval and military station. Pop. 69,674.

DEVONSHIRE. See Devon.

DEVONSHIRE, Duke of. See Cavendish.

DEW is a deposition of water from the atmosphere upon the surface of the earth in the form of minute globules. During the day the earth both absorbs and emits heat, but after sunset its supply of warmth is cut off, while it still continues to radiate heat into the surrounding space. Grass, flowers, and foliage being good radiators, lose after sunset the heat which has previously been absorbed by them, without receiving any in return, and their temperature consequently falls considerably below that of the atmosphere. From the proximity of these cold substances the particles of vapor in the adjoining air are condensed and deposited upon their surfaces in the form of dew, or of hoar-frost where the temperature of the earth is below 32°. When the sky is clouded the heat abstracted from the earth's surface by radiation is restored by the clouds, which, being good radiators, send back an equal amount of heat to what they receive; and a balance of temperature being thus maintained between the earth and the surrounding atmosphere, no dew is formed. The deposition of dew is likewise prevented by wind, which carries away the particles of air before the vapor contained in them has been condensed. Horizontal surfaces, and those which are exposed to a wide expanse of sky, receive a greater supply of dew than sheltered or oblique surfaces, where circumstances diminish the amount of radiation. The radiation from the earth's surface is one of those happy provisions for the necessities of living beings with which nature everywhere abounds. The heavy dews which fall in tropical regions are in the highest degree beneficial to vegetation, which, but for this supply of moisture, would, in countries where scarcely any rain falls for months, be soon scorched and withered. But after the high temperature of the day the ground radiates under these clear skies with great rapidity, the surface is quickly cooled, and the watery vapor, which, from the great daily evaporation, exists in large quantities in the atmosphere, is deposited abundantly. This deposition is more plentiful also on plants, from their greater radiating power; while on hard, bare ground and stones, where it is less wanted, it is comparatively trifling. In cold climates the earth, being cold and sufficiently moist, requires little dew; accordingly the clouds, which are so common in damp and chilly regions, prevent the radiation of heat; the surface is thus preserved warm, and the deposition of dew is, in a great measure, prevented.

DEWAS, a native state of Central India consisting of two combined states with two chiefs. Total pop. 152,073. Dewás, the chief town, has a pop. of 15,100.

DE WET, Christian, a Boer soldier born in South Africa in 1853. He fought with distinction in the Anglo-Boer war of 1880–1 and later in that of 1899–1902. He finally submitted to the English.

DEWEY, George, an American admiral, born in Vermont in 1837. He served under Farragut during the civil war, and at the opening of the Spanish-American he was the commodore commanding the oriental station. Dewey at once proceeded to Manila, destroyed the Spanish ships there and took possession of Manila. On his return home in 1899 he was given a popular ovation and promoted to the rank of admiral, a rank which Farragut and Porter only had won before him.

DEWEY, Melvil, an American librarian born in New York state in 1851. His principal work is the invention of a decimal system of cataloguing.

George Dewey.

DE WITT, Jan, Grand-pensionary of Holland, celebrated as a statesman and for his tragical end, was born in 1625 or 1632. He became the leader of the political party opposed to the Prince of Orange, and in 1652, two years after the death of William II., was made grand-pensionary. In 1665 the war with England was renewed and conducted by De Witt with great ability till its termination in 1665. In 1672 Louis XIV. invaded the Spanish Netherlands and involved Holland in war. De Witt's popularity, already on the decline, suffered still further in the troubles thus occasioned, and he felt it necessary to resign his office of grand-pensionary. At this time his brother Cornelius, who had been tried and put to torture for conspiring against the life of the young Prince of Orange, lay in prison. Jan de Witt went to visit him, when a tumult suddenly arose among the people, and both brothers were murdered, Aug. 20, 1672. De Witt was a man of high character, simple and modest in all his relations.

DEW-POINT, the temperature at which condensation of the vapor in the air takes place. When the temperature of the air has been reduced by radiation to the dew-point, dew is deposited and an amount of heat set free which raises the temperature of the air. Thus the dew-point will indicate what the minimum temperature of the night is likely to be, a knowledge of which is useful to the horticulturist.

DEY, a title formerly assumed by the rulers (under the Turkish Sultan) of Algiers, Tripoli, and Tunis.

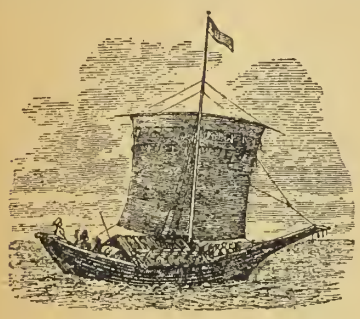
DHAR (dhár), a small native state in Central India, with an area of about 1740 sq. miles. The soil is fertile, and yields wheat, rice, opium, etc. Pop. 169,474.

DHARWAR, the chief town of Dhárwár district, in the Bombay presidency, Hindustan. Pop. 32,841. The Dhárwár district has an area of 4535 sq. miles; pop. 1,051,314.

DHOLPUR, native state of Central India, Rajputána; area, 1200 square miles; pop. 279,657. The capital is also called Dholpur. Pop. 15,833.

DHOW (dou), an Arab sea-going vessel, ranging from a comparatively small size up to 250 tons burden, with one mast and a large square sail. It is

used for merchandise and is often employed in carrying slaves from the east coast of Africa to Arabia.



Slave dhow, east coast of Africa.

DIABE'TES, a disease of which the most remarkable symptoms are: a great increase in the quantity of urine, a voracious appetite, a stoppage of the cutaneous perspiration, thirst, emaciation, and great muscular debility. In true diabetes the composition of the urine is also greatly affected, an abundance of saccharine matter (diabetic sugar) being found in it. This disease usually attacks persons of a debilitated constitution and often without any obvious cause. With respect to treatment a diet should be employed of which farinaceous or saccharine matter (starch and sugar) forms no part, ordinary bread or biscuits, rice, arrow-root, pastry, and fruits being accordingly forbidden, though almost any kind of animal food, including eggs, cheese, butter, cream, etc., as also various vegetables may be eaten. Tea, coffee, dry wines, spirits, and bitter ale may be drunk. Milk should be taken only sparingly. The disease is essentially a chronic one, though death may occur with great rapidity. Diseases of the lungs are liable to attack a diabetic person.

DIABETIC SUGAR, the sweet principle of diabetic urine. It is identical with starch-sugar, grape-sugar, etc. It is a constant though trifling constituent of healthy urine, but in diabetes amounts to 8 or 10 per cent, and in some cases more.

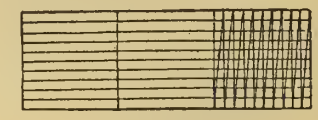
DIACOUS'TICS, the science or doctrine of sounds as they are refracted by passing through different mediums.

DI'ADEM, an ancient ornament of royalty. It was originally a head-band or fillet made of silk, linen, or wool, worn round the temples and forehead, the ends being tied behind and let fall on the neck, as seen in old representations of the diadem of the Indian Bacchus. Latterly it was usually set with pearls and other precious stones. The term is also used as equivalent to crown or coronet.

DIAGNO'SIS, in medicine, the discrimination of discases by their distinctive marks or symptoms; the discovery of the true nature and seat of a disease.

DIAG'ONAL, in geometry, a straight line drawn between the opposite angles of a quadrilateral figure.

DIAG'ONAL SCALE, a scale which consists of a set of parallel lines drawn on a ruler, with lines crossing them at right angles and at equal distances. One of these equal divisions, namely, that at the extremity of the ruler, is subdivided into a number of equal parts, and lines are drawn through the points of division obliquely across the parallels.



Diagonal scale.

With the help of the compasses such a scale facilitates the laying down of lines of any required length to the 200th part of an inch.

DI'AGRAM, a figure or geometrical delineation applied to the illustration or solution of geometrical problems, or any illustrative figure in which outlines are chiefly presented, and the details more or less omitted.

DIAL, or **SUN-DIAL,** an instrument for showing the hour of the day from the shadow thrown while the sun is shining by a stile or gnomon upon a graduated surface. This instrument has been known from the earliest times among Egyptians, Chaldeans, and Hebrews. From those eastern nations it came to the Greeks. It was introduced into Rome during the first Punic war. Dials are of various constructions, horizontal, inclined, or upright, the principle in every case being to show the sun's distance from the meridian by means of the shadow cast by the stile or gnomon. The stile is made parallel with the earth's axis, and may be considered as coinciding with the axis of the diurnal rotation. Consequently as the sun moves westward the shadow of the stile moves round in the opposite direction, falling on the meridian lines so marked as to represent the hours of the day. The dial of course gives solar time, which, except on four days of the year, is slightly different from that of a well-regulated clock. Dials are now rather articles of curiosity or ornament than of use.

DI'ALECT, the language of a part of a country, or a distant colony, deviating either in its grammar, vocabulary, or pronunciation, from the language of that part of the common country whose idiom has been adopted as the literary language, and the medium of intercourse between well-educated people.

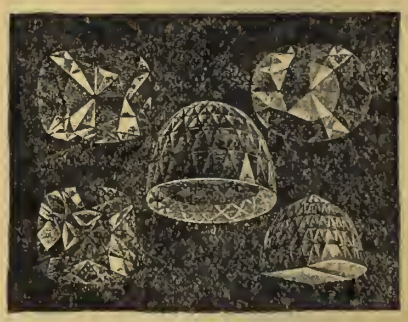
DIALEC'TICS, the old name of logic, or the art of reasoning, but used in Kant's philosophy to mean the logic of appearance, or that logic which treats of inevitable tendencies toward error and illusion in the very nature of reason.

DI'ALOGUE, a conversation or discourse between two or more persons. The word is used more particularly for a formal conversation in theatrical performances, and for a written conversation or composition, in which two or more persons carry on a discourse. This form was much in favor among the ancient philosophers as a medium for expressing their thoughts on subjects. The Dialogues of Plato are the finest example. Many of the great French and Italian writers have used this form. Landor's Imaginary Conversations is the best production of this kind in English.

DIAMAGNET'IC, a term applied to substances which, when under the influence of magnetism and freely suspended, take a position at right angles to the magnetic meridian, that is, point east and west. From the experiments of Faraday it appears that all matter is subject to the magnetic force as universally as it is to the gravitating force, arranging itself into two great divisions, the paramagnetic and diamagnetic. Among the former are iron, nickel, cobalt, platinum, palladium, titanium, and a few other substances; and among the latter are bismuth, antimony, cadmium, copper, gold, lead, mercury, silver, tin, zinc, and most solid, liquid, and gaseous substances. When a paramagnetic substance is suspended freely between the poles of a powerful horseshoe magnet it points in a line from one pole to the other, which Faraday terms the axial line. On the other hand, when a diamagnetic substance is suspended in the same manner it is repelled alike by both poles, and assumes an equatorial direction, or a direction at right angles to the axial line.

DIAM'ETER, the straight line drawn through the center of a circle, and touching the two opposite points of the circumference. It thus divides the circle into two equal parts, and is the greatest chord. The length of the diameter is to the length of the circumference of the circle as 1 to 3·14159265..., the latter number being an interminable decimal.

DIAMOND, the hardest and most valuable of gems and the purest form in which the element carbon is found. A diamond and a piece of charcoal are the same thing, that is, both are carbon, only that the molecules are differently arranged. Diamonds can be made artificially, but the expense attaching to the work is too great to give the process a commercial value. Previous



Five of the great diamonds of the world. The "Great Mogul" in the middle; left hand upper corner, "Star of the South"; right hand, "Koh-i-nûr"; left hand lower, "Regent"; right hand, "Orloff." About one-half actual size.

to the discovery of the Brazilian mines Borneo and India were chief sources of supply. The South African mines, it is believed, now absolutely control the diamond market of the world.

The most valuable gems, among which there are some exceeding 100 carats in weight, are generally owned by royal families or are treasured by governments as state jewels. One

of the largest is the Orloff, owned by the Czar of Russia, which weighs 195 carats, and is cut in rose form. Its origin is doubtful; according to one account, it was stolen from a Brahman temple in India, while another indicates that it was owned by Nadir Shah of Persia, and came after his death into the hands of an Armenian merchant. In 1772 it was purchased by the Empress Catharine II., at a price said to have been $450,000, besides an annuity of $4,000 and a Russian title. The Koh-i-nur, weighing 102¾ carats, and owned by the royal family of England, was found, according to legend, in India long before the Christian Era. After having been handed down through a long line of Indian princes, it was seized during the British invasion of the Punjab, and carried to England. The stone is said to have weighed originally 794 carats, having been reduced to its present size by repeated cutting. The Regent or Pitt diamond, in the Louvre in Paris, weighs 136 carats, and is valued at $2,500,000. It is perhaps the finest of large brilliants. The Hope diamond, weighing 44½ carats, is a beautiful blue stone, valued at $125,000. A light green diamond of 48¾ carats, in the Green Vault at Dresden, and a red diamond of 10 carats among the crown jewels of Russia, are unique specimens. Among the most valuable stones found in recent times are the Victoria, weighing 180 carats, which was purchased by the Nizam of Hyderabad; the De Beers, weighing 225 carats; and the Tiffany, weighing 125 carats.

DIAMOND NECKLACE, an affair of some note in French history immediately preceding the Revolution.

DIAN'A, in mythology, an ancient Italian goddess whom the Romans latterly identified with the Greek Artĕmis, with whom she had various attributes in common, being the virgin

Diana—Antique statue in the Louvre.

goddess of the moon and of the chase, and having as attributes the crescent moon, bow, arrows, and quiver. The name is a feminine form of Janus. She seems to have been originally the patron divinity of the Sabines and Latins. She was worshiped especially by women as presiding over births, no man being allowed to enter her temple. See Artemis.

DIANA OF POITIERS, Duchess of Valentinois, born in 1499. She was the mistress of King Henry II. of France, and descended from the noble family of Poitiers, in Dauphiny. At an early age she married the Grand-seneschal of Normandy, Louis de Brezé, became a widow at thirty-one, and some time after the mistress of the young Duke of Orleans. On his accession to the throne, in 1547, as Henry II., Diana continued to exercise an absolute empire over him till his death in 1559. After that event she retired to her castle of Anet, where she died in 1566.

DIAPA'SON, in music, the concord of the first and last notes of an octave. The word is also used for the most important foundation-stops of an organ. They are of several kinds, as open diapason, stopped diapason, double diapason. The French use the term as equivalent to pitch in music.

DI'APER, a kind of textile fabric much used for towels and napkins, and formed either of linen or cotton, or a mixture of the two, upon the surface of which a flowered or figured pattern is produced by a peculiar mode of twilling.

DIAPHORET'ICS are agents used in medical practice for producing a greater degree of perspiration than is natural, but less than in sweating. The Turkish bath and a large part of hydropathic treatment, diluent drinks, etc., are employed for this purpose. Diaphoretics increase only the insensible perspiration, while sudorifics excite the sensible discharge called sweat.

DIAPHRAGM (dī'a-fram), in anatomy, a muscular membrane placed transversely in the trunk, and dividing the chest from the abdominal cavity. In its natural situation the diaphragm is convex on the upper side and concave on its lower, but when the lungs are filled with air it becomes almost flat. It is the principal agent in respiration, particularly in inspiration. A complete diaphragm is found only in mammalia.

DIARRHŒ'A, a very common disease, which consists in an increased discharge from the alimentary canal, the evacuations being but little affected, except in their assuming a more liquid consistence. They are generally preceded or accompanied by flatulence and a griping pain in the bowels, and frequently by sickness. Diarrhœa is often produced by indigestible food, repletion of the stomach, cold applied to the surface of the body, impressions on the nervous system. It is often also a symptom of some other disease. In its simple form diarrhœa is not difficult of cure, mild purgatives given in small doses and accompanied by quantities of mild diluents being frequently successful. Castor-oil, rhubarb, magnesia are the most generally applicable. The food should be of the least stimulating kind.

DIARY, a daily record of any kind, customarily kept in a blank book with forms printed for this purpose. The diary form of narration is often made use of by novelists to relieve the monotony of an otherwise tiresome narration.

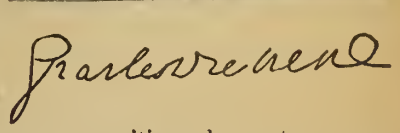
DIATH'ESIS, in medicine, a certain general habit or constitution of body as predisposing to certain diseases.

DIAZ (dē-as), Porfirio, a Mexican statesman and soldier, president of Mexico, born at Oaxaca in 1830. As a youth he entered the army, led a battalion against Santa Anna, was a member of congress in 1861, and took Puebla in 1867 after the evacuation of the French. In 1867 he became a candidate for the presidency but was defeated. He revolted successfully against the government and in 1877 was elected president, a post he has held almost continuously since that time. He has ruled Mexico with a hand of iron, but the people like him, and he has been very successful in bringing foreign capital into the country.

DICE, cubical pieces of bone or ivory, marked with dots on each of their six faces, from one to six, according to the number of faces. They are shaken in a small box and then thrown on the table. Dice are often loaded or falsified in some way so as to make the high or low side turn down. Dice are very ancient, being well known among the Egyptians and Greeks.

DICHROSCOPE (dī'kro-skōp), an optical instrument, usually consisting of an achromatized double-image prism of Iceland-spar, fixed in a brass tube, which has a small square hole at one end and a convex lens at the other, of such a power as to give a sharp image of the square hole. On looking through the instrument the square hole appears double, and if a dichroic crystal is placed in front of it the two images will appear of different colors.

DICKENS, Charles, one of the greatest English novelists, was born February 7th, 1812, at Landport, Portsmouth, died 1870. Having perfected himself in shorthand, however, he became a



newspaper critic and reporter, was engaged on the Mirror of Parliament and the True Sun, and in 1835 on the Morning Chronicle. For some time previously he had been contributing humorous pieces to the Monthly Magazine; but at length, in 1835, appeared in the Sketches by Boz which brought Dickens

into fame. In 1836 he was engaged to prepare the letterpress for a series of comic sketches on sporting subjects, the result being the immortal Pickwick Papers. The great characteristics of Dickens' genius were now fully apparent, and his fame rose at once to the highest point it was possible for a writer of fiction to reach. He was buried in Westminster Abbey. Dickens' work as a novelist is firmly based upon a wide and keen observation of men. It is true that most of his characters suffer from being created to exhibit little more than one trait or quality alone, and thus receive an air of grotesqueness and exaggeration which approaches caricature. But the single trait of quality which they embody is so truly conceived, and exhibited with such vitality and humor, as to place Dickens, in spite of all that is grotesque and overstrained in his work, among the great artists.

DICKINSON COLLEGE, founded in 1783 at Carlisle, Pa., and named for John Dickinson. It has a preparatory, a collegiate, and a law school, about 500 students, property worth $1,000,000, and a library of 30,000 volumes.

DICKINSON, John, an American political writer, known as "the penman of the revolution." He was born in Maryland in 1732 and died in 1808. Dickinson studied law in London and early allied himself with the revolutionary movement. He was a member of several of the early and later conventions, but was chiefly distinguished for his state papers and pamphlets. He refused to sign the declaration of independence, which caused his influence to wane.

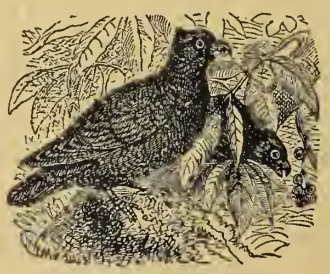
DICTA'TOR, an extraordinary magistrate of the Roman Republic, first instituted B.C. 501. The power of naming a dictator when an emergency arose requiring a concentration of the powers of the state in a single superior officer, was vested by a resolution of the senate in one of the consuls. The dictatorship was limited to six months, and the person who held it could not go out of Italy. This rule was laid aside during the first Punic war. The dictator was also forbidden to appear in Rome on horseback without the permission of the people, and he had no control over the public funds without the permission of the senate. He had the power of life and death, and could punish without appeal to the senate or people. All the other magistrates were under his orders.

DICTIONARY, a book containing the words, or subjects, which it treats, arranged in alphabetical order. It may be either a vocabulary, or collection of the words in a language, with their definitions; or a special work on one or more branches of science or art prepared on the principle of alphabetical arrangement, such as dictionaries of biography, law, music, medicine, etc. The best-known American dictionary of the English language is that by Noah Webster, published in 1828, and since entirely recast. The largest complete English dictionary is the Century Dictionary, Webster's International Dictionary and The Standard Dictionary are other well known American works.

DIDACTIC POETRY, that kind of poetry which professes to give a kind of systematized instruction on a definite subject or range of subjects. In a larger sense of the word most great poems might be called didactic, since they contain a didactic element in the shape of history or moral teaching, Dante's Divina Commedia, Milton's Paradise Lost, or Goethe's Faust, for example. The difference may be said to be this, that in the one case the materials are limited and controlled by nothing but the creative fancy of the poet, while in the other they are much more determined by the actual nature of the subject treated of.

DIDEROT (dēd-rō) Denis, a French writer and philosopher, was born in 1713, at Langres, in Champagne. In 1749 he had begun along with D'Alembert and some others the Encyclopædia. At first it was intended to be mainly a translation of one already published in English by Chambers. Diderot and D'Alembert, however, enlarged upon this project, and made the new Encyclopædia a magnificently comprehensive and bold account of all the thought and science of the time. Diderot, besides revising the whole, undertook at first the mechanical arts, and subsequently made contributions in history, philosophy, and art criticism. But the profits of all his labor were small, and it was only the liberality of the Empress Catharine, who purchased his library for 50,000 livres and made him a yearly allowance of 1000 livres, that saved Diderot from indigence. In 1773 he visited St. Petersburg to thank his benefactress and was received with great honor. On his return to France he lived in retirement, and died in 1784.

DIDUN'CULUS, a genus of birds allied to the pigeons. This bird is of special interest as being the nearest living ally of the extinct dodo. It has a length of about 14 inches, with a glossy plumage



Didunculus strigirostris.

verging from a velvety black on the back to greenish black on the head, breast, and abdomen. The large beak, which is nearly as long as the head, is greatly arched on the upper half, while the lower is furnished with two or three tooth-like indentations.

DIE, a metallic stamp for impressing a design or figure upon coins or other metallic objects. See Die-sinking.

DIEFFENBACH (dē'fen-bäh), Johann Friedrich, German surgeon, born at Königsberg in 1792. Surgery is particularly indebted to him for new methods of forming artificial noses, eyelids lips, etc., and curing squinting, stammering, etc. He died in 1847.

DI'ELECTRIC, a name applied by Faraday to any medium through or across which electrostatic induction can take place. Faraday first showed that electrostatic induction was not action at a distance, but took place by means of the insulating medium separating the two conductors. The medium he named a dielectric, and measured its specific inductive capacity by taking that of common air as unity.

DIEPPE (dē-ep'), a seaport town, France, department Seine-Inférieure, on the English Channel, at the embouchure of the Arques, 93 miles n.n.w. Paris. The port is spacious, admitting vessels of 1200 tons burden; but it cannot be entered at low water. Dieppe is one of the chief watering-places of France, and is much frequented by visitors in summer and autumn. The manufactures include works in ivory, the most famed in Europe; works in horn and bone, lace-making, sugar-refining, ship-building, etc. Pop. 20,804.

DIE-SINKING is the art of preparing dies for stamping coins, buttons, medallions, jewelry, fittings, etc. The steel for the manufacture of dies is carefully selected, forged at a high heat into the rough die, softened by careful annealing, and then handed over to the engraver. After the engraver has worked out the design in intaglio the die is put through the operation of hardening, after which, being cleaned and polished, it is called a matrix. This is not, however, generally employed in multiplying impressions, but is used for making a punch or steel impression for relief. For this purpose another block of steel of the same quality is selected, and, being carefully annealed or softened, is compressed by proper machinery upon the matrix till it receives the impression. When this process is complete the impression is retouched by the engraver, and hardened and collared like the matrix. Any number of dies may now be made from this punch by impressing upon it plugs of soft steel. In place of this process patterns are now frequently engraved upon rollers for transference to sheet metal by rolling pressure.

DI'ET, a meeting of some body of men held for deliberation or other purposes; a term especially applied to the legislative or administrative assemblies of the German empire, Austria, etc.

DIETET'ICS, that part of medicine which relates to the regulation of diet. The ideal diet is clearly that which, without burdening the viscera uselessly, furnishes all necessary nutritive elements, with due consideration for special physiological conditions in any given case. No single substance contains the elements needed to replace this waste in their requisite proportions, and a mixed diet is therefore necessary. For instance to secure the required amount of carbon a man would need to eat about 4 lbs. of lean beef, while 1 lb. would yield all the nitrogen required; thus, apart from the labor of digesting 4 lbs. of beef, the body would be compelled to get rid of the excess of nitrogen. Bread, on the other hand, has carbon in abundance, but is deficient in nitrogen; so that by

uniting 2 lbs. of bread with ¾ lb. of lean meat, the due proportion of carbon and nitrogen is satisfactorily supplied. Milk and oatmeal taken together also contain nitrogenous and non-nitrogenous substances in nearly the required proportions. A certain proportion of saline matter is also necessary. The nature of the food most suitable for a healthy man is dependent in part upon general conditions such as climate and season, and in part upon special conditions of individual habit. The inhabitants of the arctic regions need large quantities of oleaginous food; those of the tropics live chiefly on starchy products. With increased activity and exertion, as in training, an increase in the nitrogenous foods becomes necessary. In a state of health we need not draw hair-breadth distinctions as to the superior salubrity of the several sorts of diet, the quantity rather than the quality of food being the main consideration. Those persons who have been most remarkable for health and long life have generally been contented with two moderate meals a day which are certainly quite sufficient during a state of health.

In all diseases attended with much fever or quickness of pulse the stomach loathes animal food, and there is generally a great increase of thirst, to quench which water, either quite cold, or iced, or tepid, or rendered acid, may be freely indulged. Infusions, too, of barley, sage, balm, etc., may be taken. In chronic diseases attended with hectic fever, milk is the most proper diet. The best food for infants is, of course, their mother's milk; but whenever they begin to cut teeth a little animal food, such as soft-boiled eggs, beef-tea, and even chicken minced very fine, may be given. Many infants suffer from having too much sugar given them in their food.

DIEU ET MON DROIT (dyeu e mon drwä), the motto of the arms of England, first assumed by Richard I., and revived by Edward III. when he claimed the crown of France. Except during the reigns of Elizabeth and Anne, who used the motto Semper eadem, and of William III., who personally used Je maintiendray, it has ever since been the royal motto of England.

DIFFERENTIAL CALCULUS. See Calculus.

DIFFERENTIAL THERMOMETER, an instrument for determining very minute differences of temperature. Leslie's differential thermometer consists of two glass bulbs containing air connected by a bent tube containing some sulphuric acid, the movement of which (as the air expands and contracts) serves to indicate any slight difference of temperature between the two bulbs.

DIFFRAC'TION, a term applied to certain phenomena connected with the modification that rays of light undergo in passing close to the edge of an opaque body. Thus when a beam of direct sunlight is admitted into a dark room through a narrow slit, and falls upon a screen placed to receive it, there appears a line of white light bordered by colored fringes; these fringes are produced by diffraction. See Interference.

DIFFU'SION, the gradual dispersion of particles of one liquid or gas among those of another. Thus, in the case of gases, when a jar of oxygen and a jar of hydrogen are connected together by a tube or opening of any kind, they rapidly become mixed; and their mixture does not depend on gravity, but takes place in opposition to that force, as may be shown by placing the jar of hydrogen gas above the other. Oxygen is sixteen times heavier than hydrogen, bulk for bulk, but the heavier gas moves upward and the lighter downward, and the process of intermixture, or diffusion, goes on till the two gases are apparently equably distributed throughout the whole space. After that they have no tendency whatever to separate. Similarly, if two vessels, one containing oxygen and the other hydrogen, be connected by a tube which is stuffed with a plug of porous material, such as plaster of Paris, the gases gradually diffuse one into the other through the porous plug. The two gases, however, do not pass through the porous separator at equal rates, but in inverse proportion to the square roots of the densities of the gases. Thus in the case of two vessels, one containing hydrogen and the other oxygen, which is sixteen times as heavy as hydrogen, the hydrogen will pass toward the oxygen jar four times as quickly as the oxygen will pass toward the hydrogen jar. Kindred phenomena occur when two liquids that are capable of mixing, such as alcohol and water, are put in contact, the two gradually diffusing one into the other in spite of the action of gravity. In some cases, however, as where ether and water are employed, the diffusion is only partial, extending a comparatively small distance on either side of the original line of separation. When solutions of various solid bodies are placed in contact, interdiffusion also takes place. On the results of his examination of the phenomena of diffusion of liquids and salts across porous membranes or septa, Graham founded a method of separating colloid from crystalloid bodies, which he called dialysis.

DI'GEST, a name originally given to a collection or body of Roman laws, digested or arranged under proper titles by order of the emperor Justinian. Hence applied to any somewhat similar collection.

DIGES'TER, a strong vessel of copper or iron, on which is screwed an air-tight cover with a safety-valve, the object being to prevent loss of heat by evaporation. Water may be thus heated to 400° Fahr.; at which temperature its solvent power is so greatly increased that bones are converted into a jelly.

DIGES'TION is that process in the animal body by which the aliments are so acted upon that the nutritive parts are prepared to enter the circulation, and separated from those which cannot afford nourishment to the body. The organs effecting this process are called the digestive organs, and consist of the stomach, the great and small intestines, etc. (see Intestine, Stomach), the liver, and pancreas. When the aliments, after being properly prepared and mixed with saliva by mastication, have reached the stomach, they are intimately united with a liquid substance called the gastric juice, by the motion of the stomach. By this motion the aliments are mechanically separated into their smallest parts, penetrated by the gastric juice, and transformed into a uniform pulpy or fluid mass. The gastric juice acts upon the albuminous parts of the food, converting them into peptones, which can pass through organic membranes and thus enter the blood. This action is aided by the warmth of the stomach. The pulpy mass, called chyme, proceeds from the stomach, through the pylorus, into that part of the intestinal canal called the small intestine, where it is mixed with the pancreatic juice, bile, and intestinal juice. The pancreatic juice converts starch into sugar, albumins into peptones, and emulsionizes fats, so that all these kinds of food are rendered capable of absorption. The process is aided by the intestinal juice. The bile also acts upon fats, and thus the food is formed into the chyle, which is absorbed into the system by the capillary vessels called lacteals while the non-nutritious matters pass down the intestinal canal and are carried off.

DIGIT (dij'it), in arithmetic, any one of the ten numerals, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0. Digit is also a measure of a finger's breadth, equal to ¾ inch.—Digit, in astronomy, is the measure by which we estimate the quantity of an eclipse. The diameter of the sun or moon's disc is conceived to be divided into twelve equal parts, called digits; and according to the number of those parts or digits which are obscured, so many digits are said to be eclipsed.

DIJON (dē-zhōn), a town in Eastern France, capital of the department Côte-d'Or, in a fertile plain, at the foot of a range of vineclad slopes, formerly surrounded by ramparts, which now furnish beautiful promenades. At some distance it is surrounded by a series of forts. Some of the buildings belong to the period when Dijon was capital of the dukedom of Burgundy, the chief being the cathedral, a building of vast extent with a lofty wooden spire above 300 feet high; the churches of Notre Dame and St. Michael; the ancient palace of the dukes of Burgundy, now used as the hôtel de ville and museum; and the palais de justice, formerly the parliament house of Burgundy. It has important educational institutions and a valuable library. Industries: woolens, hosiery, candles, mustard, vinegar, chemicals, paper-hangings, etc., tanneries, foundries, machine factories, cotton and oil mills. The trade is considerable, particularly in the wines of Burgundy. Pop. 65,428.

DIKE, or **DYKE,** a word variously used in different localities to represent a ditch or trench, and also an embankment, rampart, or wall. It is specially applied to an embankment raised to oppose the incursions of the sea or of a river, the dikes of Holland being notable examples of work of this kind. These are often raised 40 feet above the high-water mark, and are wide enough at the top for a common roadway or canal, sometimes for both. The Helder Dike, one of the largest, is about 6 miles in length and involves an annual outlay of over $30,000.

DIKE, DYKE, in geology, a term applied to intrusions of igneous rock, such as basalt, greenstone, etc., which fill up veins and fissures in the stratified systems, and sometimes project on the surface like walls.

DILEM'MA, in logic, a form of argument used to prove the falsehood or absurdity of some assertion, as in the following instance: If he did go he must be either foolish or wicked; but we know he is neither foolish nor wicked; therefore he cannot have done so. The two suppositions, which are equally untenable, are called the "horns" of the dilemma.

DILETTANTE (di-let-tän'tā), an Italian expression, signifying a lover of the arts and sciences, who devotes his leisure to them as a means of amusement and gratification, being thus nearly equivalent to amateur.

DILL, an umbelliferous plant, a native of the southern countries of Europe, the fruits, commonly but erroneously called seeds, of which are moderately warming, pungent, and aromatic, and are employed medicinally as a carminative. In appearance it resembles the fennel. Dill-seeds yield dill-water, which is used as a remedy in flatulency and gripes of children.

DIL'UENTS, in medicine, are those substances which are taken to increase the proportion of fluid in the blood. They consist of water and watery liquors.

DILU'VIUM, the name formerly given by geologists to certain gravels and comparatively recent deposits, which seem to have been the result of a rush of water or deluge.

DIME, the term for a silver coin, the tenth part of a dollar or ten-cent piece in the United States.

DIMIN'UTIVE, in grammar, a word having a special affix which conveys the idea of littleness, and all other ideas connected with this, as tenderness, affection, contempt, etc. The opposite of diminutive is augmentative. In Latin, diminutives almost always ended in lus, la, or lum; as Tulliola, meum corculum, little Tullia, my dear or little heart; homunculus, a manikin. The Italian is particularly rich in diminutives and augmentatives, such compound diminutives as fratellinucciettinetto (a diminutive of frate, brother) being sometimes employed. Among English diminutive affixes are kin, as in manikin, a little man; pipkin, a little pipe; ling, as in gosling, a little goose; darling, that is, dearling, or little dear; and et, as in pocket, from poke, a bag or pouch; tablet, a little table. Diminutives are also formed, in colloquial and familiar language, by adding y or ie to the names, as Charley, Mousie, etc.

DIM'ITY, a stout cotton fabric, ornamented in the loom either by raised stripes or fancy figures. It is usually employed white, as for bed and bedroom furniture.

DINAJPUR', a town, Hindustan, Bengal, capital of a district of same name, 205 miles north of Calcutta; pop. 12,000. The district covers an area of about 4118 square miles; pop. 1,555,835.

DINGO, the native wild dog of Australia, of a wolf-like appearance and extremely fierce. The ears are short and erect, the tail rather bushy, and the hair of a reddish-dun color. It is very destructive to the flocks, killing more than it eats.

DINO'CERAS, a fossil mammal found in the Eocene strata of N. America, in some respects akin to the elephant and of equal size, but without a proboscis. Its bones were very massive; it had two long tusks in the upper jaw, three pairs of horns, and the smallest brain, proportionally, of any known mammal.

DINOR'NIS, an extinct genus of large wingless birds—classed among the Struthionidæ or ostrich tribe—the bones of five species of which have been found in

Dinornis (pelvic and leg bones and outline of body).

New Zealand. The largest must have stood at least 14 feet in height, several of its bones being at least twice the size of those of the ostrich. The body seems to have been even more bulky in proportion, the tarsus being shorter and stouter in order to sustain its weight. They do not appear to have become extinct until the 17th or 18th century, and are spoken of as moas by the natives, who buried the eggs with their dead as provision for their journey to the other world.

DINOSAU'RIA, a group of colossal lizards, resembling the pachydermatous mammals in general appearance, but in reality intermediate between the struthious birds and lizards. The majority, as the Megalosaurus, which attained to 40 feet in length, were carnivorous; the Iguanodon, however, was herbivorous. They were the land reptiles of the Jurassic, Wealden, and inferior Cretaceous continents.

DINOTHE'RIUM, a genus of extinct gigantic mammals, the remains of which occur in Tertiary formations in several parts of Europe. The largest species is

Dinotherium restored.

calculated to have attained the length of 18 feet. It had a proboscis and also two tusks placed at the anterior extremity of the lower jaw, and curved downward somewhat after the manner of those in the upper jaw of the walrus. The zoological position of the Dinotherium is that of a proboscidean allied to the elephant. The skull, molar teeth, and scapular bone are the only portions yet discovered. Kaup regards it as intermediate between the mastodons and tapirs, and terrestrial; while Blainville and Pictet regard it as allied to the sea-cows, and inhabiting the embouchure of great rivers.

DI'OCESE, the circuit or extent of a bishop's jurisdiction. Each diocese is divided into archdeaconries, each archdeaconry (nominally) into rural deaneries, and each deanery into parishes.

DIOCLE'TIAN, a native of Dalmatia, proclaimed Emperor of Rome by the army 284 A.D. He was compelled by the dangers threatening Rome to share the government with M. Aurelius Valerius Maximian. In 292 C. Galerius and Constantius Chlorus were also raised to a share in the empire, which was thus divided into four parts, of which Diocletian administered Thrace, Egypt, Syria, and Asia. As the result of his reconstitution of the empire there followed a period of brilliant successes in which the barbarians were driven back from all the frontiers, and Roman power restored from Britain to Egypt. In 305, in conjunction with Maximian, he resigned the imperial dignity at Nicomedia, and retired to Salona in Dalmatia, where he cultivated his garden in tranquillity until his death in 313. In the latter part of his reign he was induced to sanction a persecution of the Christians.

DIOGENES of Sinopē, (on the Black Sea) the most famous of the Cynic philosophers, born about 412 B.C. Having been banished from his native place with his father, who had been accused of coining false money, he went to Athens, and thrust himself upon Antisthenes as a disciple. Like Antisthenes he despised all philosophical speculations, and opposed the corrupt morals of his time; but while the stern austerity of Antisthenes was repulsive, Diogenes exposed the follies of his contemporaries with wit and good humor. As an exemplar of Cynic virtue he satisfied his appetite with the coarsest food, practiced the most rigid temperance, walked through the streets of Athens barefoot, without any coat, with a long beard, a stick in his hand, and a wallet on his shoulders, and by night, according to the popular story, slept in a tub (or large earthenware vessel). On a voyage to the island of Ægina he fell into the hands of pirates, who sold him as a slave to the Corinthian Xeniades in Crete. The latter emancipated him, and intrusted him with the education of his children. He attended to the duties of his new employment with the greatest care, commonly living in summer at Corinth and in winter at Athens. He died 323 B.C., at a great age.

DIOMEDES (dī-o-mē'dēz), in Greek mythology, (1) A king of the Bistŏnes, who fed his horses on human flesh, and used to throw all strangers who entered his territories to those animals to be devoured. He was killed by Hercules, who carried off the horses. (2) One of the heroes at the siege of Troy, the son of Tydeus and Deipyle, and king of

Argos, one of the suitors of Helen. After she was carried off Diomedes engaged in the expedition against Troy, in which his courage and the protection of Pallas rendered him one of the most distinguished heroes. He wounded Aphrodite and Ares, and thrice assailed Apollo; and by carrying off the horses of Rhœsus from the enemies' tents, and aiding Ulysses in the removal of Philoctetes from Lemnos, he fulfilled two of the conditions on which alone Troy could be conquered. Finally he was one of the heroes concealed in the wooden horse by whom the capture of Troy was at length accomplished. Different accounts were given of his after-life. He is often called Diomede.

DIONYSIUS of Halicaonassus, in Caria, a Greek critic and teacher of eloquence, born about 70 B.C. He went to Rome about 30 B.C., where he wrote his Roman Antiquities, in twenty books, in which he relates (in Greek) the early history of Rome and its government up to the times of the first Punic war.

DIONYSIUS the Areopagite, that is, one of the judges of the Areopagus, at Athens, a convert to Christianity by the Apostle Paul about the middle of the first century, and the first bishop at Athens, where he suffered martyrdom.

DIONYSIUS the Elder, in Greek history, tyrant or absolute ruler of Syracuse, born about 430 B.C. of obscure parentage. He obtained the rank of general, and afterward of commander-in-chief; and gaining the support of the army, he seized the supreme power in Syracuse, though only twenty-five years of age. He gained a complete victory over the Carthaginians under the walls of Syracuse. In 368 he commenced a new war against the Carthaginians, but failed to drive them entirely out of Sicily. He is said to have died from a potion administered at the instigation of his son Dionysius the Younger (367 B.C.).

DIONYSIUS the Little, a Scythian monk who was abbot of a monastery at Rome in the beginning of the 6th century, and died about the year 530, celebrated as the author of the computation of time from the Christian era. This mode of computation, however, was not publicly used until the 8th century.

DIONYSIUS the Younger, a tyrant of Syracuse, who in 367 B.C. succeeded his father, Dionysius the Elder. For the purpose of recalling him from the excesses to which he was addicted Dionysius persuaded him to invite Plato to his court, but the influence of the philosopher effected no permanent change. Timoleon, who came to Syracuse with aid from Corinth against the Carthaginians, desposed him in 344 B.C.

DIOP'TRICS, that part of optics which treats of the refraction of light passing through different mediums, as through air, water or glass, and especially through lenses. These phenomena, however, are now more commonly treated under the head of refraction.

DIORA'MA, a mode of painting and of scenic exhibition invented by Messrs. Daguerre and Bouton, and first exhibited in 1823. It secures a higher degree of illusion than the ordinary panorama, by a mode of uniting transparent painting to the usual opaque method, and causing the light to fall upon the picture both from before and behind. At the same time, by means of colored transparent blinds, suspended both above and behind the picture, the rays of light can be intercepted and made to fall at pleasure in graduated tints upon every part of the picture in succession.

DIP of the horizon, an allowance made in all astronomical observations of altitude for the height of the eye above the level of the sea.

DIP, in geology, the inclination or angle at which strata slope or dip downward into the earth. The degree of inclination or amount of the dip, which is easily measured by a special instrument, is determined by the angle which a line drawn perpendicular to the direction of the stratum makes with the horizon. The line in which such strata cut the surface is called the strike, and is always at right angles to the dip.

DIPHTHE'RIA, a malignant disease characterized by the formation of a thick leathery false membrane in the throat, and allied to croup, which, indeed, is often considered a form of it, the disease being called diphtheria when it attacks principally the tonsils and parts in their neighborhood, and croup when it principally attacks the larynx. (See Croup.) It has only in recent times attracted public attention by its frequency and peculiar symptoms. It is a most fatal disease, resulting from the introduction into the body of a specific poison, is contagious, often epidemic, and in some places endemic. It is always accompanied by a very low state of the system, indicating the necessity of giving stimulating nourishment very freely. The membrane may spread more or less, going down into the windpipe or up the nose, and death may be caused by suffocation and exhaustion, or the violence of the poison may cause it without the formation of a membrane. The patient's strength must be well kept up, and antiseptic agents applied. Injection of antitoxic serum, from the blood of a horse previously inoculated with the disease, is now successfully employed.

DIPHTHONG, a coalition or union of two vowels pronounced in one syllable. In uttering a proper diphthong both vowels are pronounced; the sound is not simple, but the two sounds are so blended as to be considered as forming one syllable, as in void, bough. The term improper diphthong is applied to the union in one syllable of two or more vowels, of which only one is sounded, as in bean.

DIPLEI'DOSCOPE, an instrument for indicating the passage of the sun or a star over the meridian, by the coincidence of two images of the object, the one formed by single and the other by double reflection. It consists of an equilateral hollow prism, two of whose sides are silvered on the inside so as to be mirrors, while the third is formed of glass. The prism is adjusted so that one of the silvered sides shall be exactly in the plane of the meridian, and the transparent side toward the object.

DIPLO'MA, literally a document folded but once, and therefore divided into two parts. It is used to signify a document signed and sealed, in which certain rights, privileges, dignities, etc., are conferred, especially a university degree.

DIPLO'MACY, the science or art of conducting negotiations, arranging treaties, etc., between nations; the branch of knowledge which deals with the relations of independent states to one another; the agency or management of envoys accredited to a foreign court; the forms of international negotiations. Diplomatic agents are of several degrees: 1, ambassadors; 2, envoys extra ordinary and ministers plenipotentiary; 3, ministers resident; 4, chargés d'affaires; 5, secretaries of legation and attachés. Their rank was regulated in Europe, in the above order, by the congress assembled at Vienna in 1814. Among the European powers it is agreed that of ministers of the same rank he who arrives first shall have the precedence over his colleagues.

DIPPER, a bird of the genus Cinclus, allied to the thrushes. The common dipper is about 7 inches in length, with a very short tail, small rounded wings, and large powerful feet; the bill

Dipper.

is of moderate length, straight, and slender. The male has the upper part of the body dark brown, the throat and breast white, belly rusty. The dipper frequents streams, and feeds largely on water-insects and larvæ. It can dive and walk under water, effecting its progress by grasping the stones with its feet. The song is sweet and lively.

DIPPING-NEEDLE, or **INCLINATION COMPASS,** an instrument for showing the direction of one of the components of the earth's magnetism. In essentials the instrument consists of a light magnetized steel bar supported on a horizontal axis which passes, as nearly as possible, through the center of inertia of the bar. When a needle thus mounted is placed anywhere not in the magnetic equator, it dips or points downward; and if the vertical plane, in which it moves, coincides with the magnetic meridian the position of the needle shows at once the direction of the magnetic force. The intersection of two or more directions found by making the experiment at different places, indicates the place of the magnetic pole.

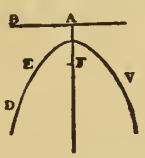
DIPSOMA'NIA, a term recently introduced to denote an insane craving for intoxicating liquors, when occurring in a confirmed or habitual form. It is often of hereditary origin, but may result from sunstroke, from some injury to the brain, or from disease. The only remedy appears to be seclusion, with enforced abstinence and healthy occupation.

DIP'TERA, an order of two-winged insects, of which the common house-fly and blue-bottle are familiar examples.

DIRECTORS, persons elected to meet together at short fixed intervals and consult about the affairs of corporations or joint-stock companies, and to advise and assist the manager. Directors are appointed by a general meeting of the shareholders in the undertaking, and a certain number of them, usually a third, retire every year. Ordinary directors are granted a certain remuneration for their services. The duties and responsibilities of directors are defined by the constitution of the company, or by the various acts of the legislature affecting joint-stock and other companies.

DIREC'TORY, the name given to a body of five officers to whom the executive authority in France was committed by the constitution of the year III. (1795). The two legislative bodies, called the councils, elected the members of the directory: one member was obliged to retire yearly, and his place was supplied by election. This body was invested with the authority, which, by the constitution of 1791, had been granted to the king. By the revolution of the 18th Brumaire the directory and the constitution of the year III. were abolished. It was succeeded by the consulate.

DIREC'TRIX, in math. a line perpendicular to the axis of a conic section, and so placed that the distance from it of any point in the curve is to the distance of



Directrix of a parabola.

the same point from the focus in a constant ratio; also, the name given to any line, whether straight or not, that is required for the description of a curve. The directrix of a parabola is a line perpendicular to the axis produced, and whose distance from the vertex is equal to the distance of the vertex from the focus. Thus A B is the directrix of the parabola V E D, of which F is the focus.

DIRK, a kind of dagger formerly used as a weapon of offense by the Highlanders of Scotland. Dirks are worn by midshipmen and cadets of the English navy, and still form part of the full highland costume.

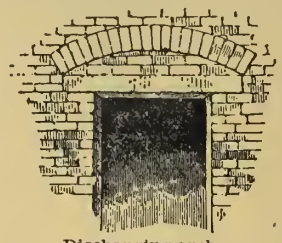
DISABILITY, in law, incapacity to do any legal act. It is either absolute, which wholly disables the person; such as outlawry or excommunication — or partial, such as infancy, coverture, insanity or drunkenness.

DISBANDING, the breaking up of a regiment or other body of military, and releasing them from service, when they are no longer required, or it may be on account of insubordination.

DISBARRING, expelling an attorney from the bar. The party disbarred may lodge an appeal with the judges in their capacity of citizen.

DISC, DISK, the central part of a radiate compound flower surrounded by the ray. Also a part, sometimes cup-shaped, at the base of the stamens, consisting in some cases of rudimentary stamens, in others of the modified receptacle.—In astronomy the term is applied to the face or circular figure exhibited by the sun, moon, or a planet in the sky.

DISCHARGING ARCH, an arch formed in the substance of a wall to relieve the part which is below it from the super-


Discharging arch.

incumbent weight. Such arches are commonly used over lintels and flat-headed openings.

DISCIPLES OF CHRIST, also called Christians, a religious denomination formed by Thomas Campbell and his son Alexander, their general principle being announced in the aphorism, "Where the scriptures speak, we speak; where the scriptures are silent, we are silent." The denomination sprang up in 1812 in Pennsylvania, and has grown very rapidly until today it numbers nearly 1,500,000. The Christians accept the inspiration of the scriptures, baptize by immersion, and in church government are congregational.

DISCLAIM'ER, in its stricter legal sense, a plea containing renunciation or a denial of some claim alleged to have been made by the party pleading.

DIS'CORD, in music, a dissonant or inharmonious combination of sounds, so called in opposition to the concord. See Dissonance.

DIS'COUNT, the charge made by a banker for interest of money advanced by him on a bill or other document not presently due. In advancing money on such security the banker deducts the charge for interest on his advance from the total amount represented on the security, pays the difference, which is called the proceeds of the bill, to the person parting with it, and collects the full amount to reimburse himself for outlay and interest at maturity. Popularly the term discount is applied to any deduction from the full amount of an account made by the party to whom it is paid, especially on prompt or early payment. When a bill which has been discounted is paid by the acceptor before it is due, the discount allowed for prepayment is called rebate.

DISCOV'ERY, in law, the act of revealing or making known any matter by a defendant in his answer to a bill in chancery. The word is also used in reference to the disclosure by a bankrupt of his property for the benefit of his creditors.

DISCRIMINATION, a term applied to the practice of railroads or other common carriers of favoring certain users of the road, or other utility to the prejudice of other users, particularly in the matter of charges. Railway discrimination has been continuously practiced in the U. States for many years and much legislation has been directed against it, without, it would seem, any useful or efficient result. Federal and state laws against discrimination seem all to be mere dead letters. Similar legislation in England seems to have fallen as far short of the mark as in the U. States.

DISCUS, DISC, or **DISK,** among the Greeks and Romans a quoit of stone or metal, convex on both its sides, sometimes perforated in the middle. The players aimed at no mark, but simply tried to throw the quoit to the greatest possible distance. It was sometimes furnished with a thong of leather to assist in the throwing.

DISEASE, any morbid state of the body, or of any organ or part of the body. Diseases are described as local or constitutional, idiopathic, symptomatic, epidemic, endemic, contagious, acute, chronic, etc. The influence of the parents on the organization of the child is so great that not only peculiarities of external form, but the peculiar constitution, the greater or less activity and development of the organs, are found to pass from parent to child. As it is in the particular state of the several organs and functions that a very great part of diseases have their foundation, the liability to certain diseases is inevitably inherited with the organic structure, and the son is not unfrequently attacked by various complaints at the same period of life in which his father was. These diseases are called hereditary; but it is only the predisposition to them that is, properly speaking, inherited. Hence the actual development of hereditary diseases requires certain cooperating circumstances. Constitutional diseases are very often not hereditary, but depend on circumstances which affect the fetus during pregnancy. Among the diseases which are most frequently hereditary are scrofula, bleeding (especially at the lungs) and hemorrhoids, consumption, gout, the gravel and stone, cancer, disorders of the mind and spirits, hysterical and hypochondriac affections, apoplexy, epilepsy, and organic diseases of particular parts, especially of the heart. Inherited diseases are much more difficult to cure than those which originate in accidental external causes, and special care should therefore be taken to adopt an environment and mode of life calculated to counteract the inherited predisposition. As to the origin of certain diseases see Germ Theory.

DISEASE, FEIGNING OF, a practice used by many persons for the attainment of an end, sometimes fraudulent, sometimes not. A disease commonly simulated is epilepsy, the simulator using a little soap in the mouth for the making of foam at the lips. The detection of such fraud is often quite difficult, but there are certain physiological tests unknown to malingerers which generally disclose the fraud.

DISEASES OF PLANTS may be divided into two main classes: those produced by temperature, excess or deficiency of moisture and light, impure air, the composition of the soil, and other mechanical or chemical agencies; and those produced by other organized be-

ings, whether belonging to the animal or vegetable world.

DISHONOR OF A BILL, the refusal or neglect to accept or pay when due, a bill of exchange, or promissory note, or draft on a banker. It is absolutely necessary that the holder of a dishonored bill should give immediate notice of the non-payment to the drawer or indorsers.

DISINFEC'TANT, any substance that destroys the germs of contagious and infectious diseases. The most important for practical purposes are chlorine, carbolic acid, sulphurous acid, manganate and permanganate of potash, chloride of zinc. Carbolic acid is one of the most effective, needing, however, some little care in the handling, as it sometimes causes severe burns. It does not in its common form mix with water, but floats on the surface undiluted. In cases of infectious or contagious disease, disinfectants such as chlorinated lime or carbolic acid should at once be placed about the house, especially in the sick room and in the passages and landing outside it. A large sheet also should be nailed so as to hang across the door, and this should be kept constantly wet with carbolic acid. All excretions should be instantly disinfected and also the closet which receives them. In a country place it is best to bury them in a considerable depth of earth. Every article of clothing and furniture should be carefully treated, as the germs may lurk in them and break out after a lapse of months or years.

DISIN'TEGRATOR, a machine for pulverizing and sometimes for mixing various materials, such as rock, asphalt, ore, artificial manures, sugars, corn, the ingredients of mortar, etc.

DISLOCA'TION, a surgical term applied to cases in which the articulating surfaces of the bones have been forced out of their proper places. The particular dislocation takes its name either from the joint itself or its furthest bone, and is called compound when accompanied with an external wound. The most common dislocations are those of the hip, shoulder, elbow, knee, and ankle, and the chief obstacle to their reduction is the spasmodic and violent contraction of the muscles consequent upon them, the application of considerable force being often necessary to set the joint. Chloroform is of great use, not only in preventing pain but in relaxing the muscles. The most dangerous dislocations are those of the bones of the spine. —In geology it signifies the displacement of parts of rocks or portions of strata from the situations they originally occupied.

DISMAL SWAMP, a large tract of marshy land in America, beginning a little south of Norfolk, in Virginia, and extending into North Carolina, containing 150,000 acres: 30 miles long, from north to south, and 10 broad. This tract was entirely covered with trees, with almost impervious brushwood between them, but it has now in part been cleared and drained.

DISPEN'SARY, a charitable institution for the free supply of medicine to the poor. Each institution has one or more physicians, surgeons, and apothecaries, who attend at stated times in order to prescribe for the sick, and, if necessary, to visit them at their own habitations. A note from a subscriber or governor is usually required by would-be patients. Provident dispensaries are similar institutions in which a small fee is exacted.

DISPERSION, an optical term applied to the angular separation experienced by the component rays of a pencil of light on emerging from a refracting medium, whose surfaces are not parallel to each other, c. g. the common prism. The length of the spectrum and the relative space occupied by the colored rays vary greatly according to the refracting medium, the spectrum from a prism of oil of cassia being two or three times longer than one formed by a glass prism.

DISRAELI, Benjamin. See Beaconsfield.

D'ISRAELI (diz-rā'e-li), Isaac, man of letters, and father of the well-known statesman, was born at Enfield, Middlesex, in 1766. An anonymous reply to Peter Pindar, entitled On the Abuse of Satire, was followed in 1791–1793 by the appearance of his Curiosities of Literature, the success of which determined much of his afterwork. He died in 1848.

DISSEN'TERS, the common name by which in Britain all Christian denominations, excepting that of the Established Churches, are usually designated, though in acts of parliament it generally includes only Protestant dissenters, Roman Catholics being referred to under their specific name.

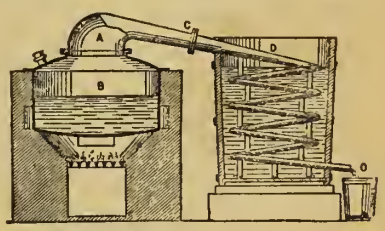
DISSOCIATION, a chemical term used to express the partial decomposition which takes place when chemical compounds are exposed to a high temperature; as when by the passage of steam through a white-hot platinum tube some of it is decomposed and an explosive mixture of oxygen and hydrogen may be collected.

DISSOLVING VIEWS are paintings upon glass magnified and thrown with great distinctness upon a screen by means of one or two magic lanterns with strong lenses, and illuminated by the oxyhydrogen light. If one lantern is used the picture is drawn out of focus gradually, and a second substituted, which is brought gradually into focus, thus producing the haze and brilliancy which have gained this sort of exhibition its name. If two lanterns are used, they are placed side by side with their lens tubes slightly convergent, so that the images may be superposed on the screen. By means of a revolving shutter either lantern can be wholly or partially shut off and the image of other lanterns be correspondingly disclosed.

DIS'TAFF, the first instrument employed in spinning. It consisted of a staff, on one end of which the wool or flax was rolled. The spinner held it in the left hand, and drew out the fibers with the right, at the same time twisting them. A small piece of wood called a spindle was attached to the thread, the weight of which carried it down as it was formed. When the spindle reached the ground the thread which had been spun was wound round it, and it was then again fastened near the beginning of the new thread.

DISTEMP'ER, a disease of the dog commonly considered as of a catarrhal nature. In most cases a running from the nose and eyes is one of the first and chief symptoms, the defluction becoming after some time mucous and purulent. The animal is subject to violent fits of coughing combined with vomiting, loses its appetite, its flesh begins to waste, and if the disease be virulent, symptoms of affection of the brain manifest themselves, accompanied by fits, paralysis, or convulsive twitchings. In the first stage of the disease laxatives, emetics, and occasional bleeding are the principal remedies; diarrhœa should be checked by astringents, and to reduce the violence of the fits warm bathing and antispasmodics should be resorted to. The distemper is generally contagious, and occurs but once in a lifetime.

DISTILLATION, the volatilization and subsequent condensation of a liquid by a special apparatus, resulting in the separation of the liquid from a mixture. The operation is performed by heating



Distilling apparatus.

the crude liquid or mixture in a retort or vessel known as the body of the still. This is made of various shapes and materials, and is closed with the exception of a slender neck which opens into the condenser, a long tube through which the hot vapor from the still is passed. The tube is kept at a sufficiently low temperature to cause the vapor to condense, the common method of securing this being to surround the tube with a constantly renewed stream of cold water. In some cases ice or a freezing mixture may be required to effect condensation. On a large scale the condensing tube is coiled round and round in a tub or box, and is known as a worm. From the end of it the vapor condensed into a liquid drops or distils into a receiver. The simplest case of distillation is that of water containing solid matter in solution, the solid matter remaining behind in the still or retort while the water trickles pure into the receiver. The cut which represents a simple form of still, shows b, a copper boiler, the "body" of the still, a being the "head," and c the "neck," which communicates with the spiral worm d placed in a vessel which contains cold water, the distilled liquid trickling out at o. The cold water round the worm requires to be continually renewed, as otherwise it gets heated. When the mixture to be distilled consists of two or more fluids of different boiling-points, such as alcohol and water the more volatile comes off first, accompanied by a certain proportion of the vapor of the other, so that it is hardly possible completely to separate bodies by one distillation. This is effected by

repeated successive distillations of the liquid with or without the addition of substances to retain the impurities. When the production of one of the ingredients only is aimed at by this process, it is called rectification, but when it is desired to separate and collect all the liquids present, or to divide a mixture into portions lying within certain ranges of temperature ascertained either by the thermometer or by the amount of liquor run off, or by the appearance of the distillate, etc., the process is called fractional distillation. In the laboratory, distillation is employed for purifying water, for recovering alcohol and ether, for the preparation, purification, and separation of a great number of bodies. On the large scale distillation is employed in the preparation of potassium, sodium, zinc, mercury; of sulphuric acid, ether, chloroform, sulphide and chloride of carbon, essential oils and perfumes; purification of coal and wood tar, and the products obtained from them; and most extensive of all, the manufacture of whisky, brandy, or other spirit. Sea-water is also distilled in many cases for drinking or cooking purposes. Destructive distillation differs from the preceding in this respect, that the original substance is not merely separated into the bodies by the mixture of which it is formed, but is so acted on that it is completely decomposed, and bodies are produced which had no existence in the original matter. The term is restricted to the action of heat upon complex organic substances out of contact with the air. The products of destructive distillation are numerous and varied. On the manufacturing scale the process is conducted sometimes for one part, sometimes for another part of the products. Coal, for example, is distilled primarily for the gas, but also for ammoniacal water, benzol, anthracene, and sometimes for the sake of the fixed carbon or coke, the volatile portions being neglected and practically wasted. Wood is distilled partly for the sake of the pyroligeneous acid and the tar, partly for the charcoal. Bones are distilled for the sake of the charcoal, though the oil is also collected. Shale is distilled solely for the sake of the oil.

DISTRESS', in law, is the taking of a personal chattel of a wrong-doer or a tenant, in order to obtain satisfaction for the wrong done, or for rent or service due. If the party whose goods or cattle are seized disputes the injury, service, duty, or rent, on account of which the distress is taken, he may replevy the things taken, giving bonds, at the same time, to return them or pay damages in case the party making the distress shows that the wrong has been done, or the service or rent is due. Another description of distress is that of attachment, to compel a party to appear before a court when summoned for this purpose. The distresses most frequently made in England are on account of rent and taxes and damage-feasance.

DISTRICT ATTORNEY, a public prosecutor of the federal district or (in many states) the county courts. U. States district attorneys are appointed by the president and their compensation is in the form of fees.

DISTRICT COURT, a court the jurisdiction of which is restricted to one section of territory. Several of the states are so divided into districts. In the federal judiciary, a court having jurisdiction in one of the districts into which each of the nine circuits of the U. States is divided.

DISTRICT OF COLUMBIA, a territory of sixty miles area between Maryland and Virginia, occupied by the city of Washington. The district is governed by three commissioners appointed by the president and approved by the senate. (See Washington.)

DISTRICTS, Congressional, the divisions in the U. States which each return a member to congress. Their number varies at different times, being fixed after each decennial census. At present (1907) they are 386.

DITCH, a trench in the earth made by digging, particularly a trench for draining wet land, or for making a fence to guard inclosures.

DITMARSHES, a district of Holstein, in Germany, between the mouths of the Elbe and the Eider, are so little raised above the sea as to require the protection of strong embankments. The area is 500 sq. miles. and the total pop. above 70,000.

DIURET'ICS, medicines intended to increase the secretion and discharge of urine. They either act directly on the kidneys, exciting these organs to increased action; or indirectly by influencing the circulation first. Of the first class are squill, broom, juniper, alcohol, potash, etc.; of the second, digitalis, elaterium, cream of tartar, etc.

DIVAN, a Persian word having several significations. It is used in Turkey for the highest council of state, the Turkish ministry; and for a large hall for the reception of visitors. Among several oriental nations this name is given to certain collections of lyric poems by one author. The divans of Hafiz and Saadi, the Persian poets, are among the most important. In Western Europe the term is applied to a café, and to a kind of cushion seat.

DIVERS, birds remarkable for the habit of diving. The divers are a family of swimming birds, characterized by a strong, straight, rather compressed pointed bill about as long as the head; a short and rounded tail; short wings; thin, compressed legs, placed very far back, and the toes completely webbed. They prey upon fish, which they pursue under water, making use partly of their wings, but chiefly of their legs and webbed feet in their subaqueous progression. These birds inhabit the Arctic seas of the New and Old Worlds; they are abundant in the Hebrides, Norway, Sweden, and Russia. The great northern diver, loon, or ember goose is about 2¾ feet long, and is of handsome plumage.

DIV'IDEND, lit. what is to be divided, a term used in arithmetic and in reference to stocks, etc. In the latter sense it is the interest or profit of stocks divided among, and paid to, the owners. It also signifies the payment made to creditors out of the estate of a bankrupt.

DIVIDERS, a pair of compasses or similar instrument.

DIVIDING ENGINE, a machine for marking the divisions on the scales of scientific, mathematical, or other instruments. Some of these perform work of extraordinary fineness and accuracy.

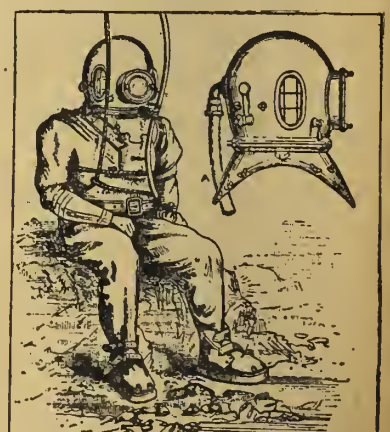
DIVINA COMMEDIA. See Dante.

DIVINATION, the act of divining; a foretelling future events, or discovering things secret or obscure, by the aid of superior beings, or by other than human means. In ancient times divination was divided into two kinds, natural and artificial. Natural divination was supposed to be effected by a kind of inspiration or divine afflatus; artificial divination was effected by certain rites, experiments, or observations, as by sacrifices, observation of entrails and flight of birds, lots, omens, position of the stars, etc.

DIVINE RIGHT, the claim set up by some sovereigns or their supporters to the absolute obedience of subjects as ruling by appointment of God, insomuch that, although they may themselves submit to restrictions on their authority, yet subjects endeavoring to enforce those restrictions by resistance to their sovereign's acts are considered guilty of a sin.

DIVING, the art or act of descending into water to considerable depths, and remaining there for a time. The uses of diving are important, particularly in fishing for pearls, corals, sponges, examining the foundations of bridges, recovering valuables from sunken ships, and the like. Without the aid of artificial appliances a skilful diver may remain under water for two, or even three minutes; accounts of longer periods are doubtful or absurd. Various methods have been proposed and engines contrived to render diving more safe and easy. The great object in all these is to furnish the diver with fresh air, without which he must either make but a short stay under water or perish,

DIVING-BELL, a contrivance for the purpose of enabling persons to descend and to remain below the surface of water



Diving-dress and diving-helmet.
a, Pipe by which air is supplied; *b*, valve by which it escapes.

for a length of time, to perform various operations, such as examining the foundations of bridges, blasting rocks, recovering treasure from sunken vessels, etc. Diving-bells have been made of

various forms, more especially in that of a bell or hollow truncated cone, with the smaller end close, and the larger one, which is placed lowermost, open. The air contained within these vessels prevents them from being filled with water on submersion, so that the diver may descend in them and breathe freely for a long time, provided he can be furnished with a new supply of fresh air when the contained air becomes vitiated by respiration. The diving-bell is generally made of cast-iron, and has several strong convex lenses set in the upper side or roof, to admit light to the persons within. It is suspended by chains from a barge or lighter, and can be raised or lowered at pleasure upon signals being given by the persons within, who are supplied with fresh air injected into a flexible pipe by means of forcing pumps placed in the lighter, while the heated air escapes by a cock in the upper part of the bell. A form, called the nautilus, has been invented which enables the occupants, and not the attendants above, to raise or sink the bell, move it about at pleasure, or raise great weights with it and deposit them in any desired spot.

DIVING-DRESS, a waterproof dress of india-rubber cloth used by professional divers, and covering the entire body except the head. The dress has a neck-piece or breastplate, fitted with a segmental screw bayonet joint, to which the head-piece or helmet, the neck of which has a corresponding screw, can be attached or removed. The helmet has usually three eyeholes, covered with strong glass, and protected by guards. Air is supplied by means of a flexible tube which enters the helmet and communicates with an air-pump above. To allow of the escape of the used air there is sometimes another flexible tube, which is led from the back part of the helmet to the surface of the water. But in the more improved forms of the dress, the breathed air escapes by a valve so constructed as to prevent water from getting in, though it lets the air out. Leaden weights are attached to the diver, and his shoes are weighted, that he may be able to descend a ladder, walk about below, etc. Communication can be carried on with those above by means of a cord running between the diver and the attendants; or he may converse with them through a speaking tube or a telephonic apparatus. One form of diving-dress makes the diver independent of any connection with persons above the water. It is elastic and hermetically closed. A reservoir containing highly compressed air is fixed on the diver's back, which supplies him with air by a self-regulating apparatus at a pressure corresponding to his depth. When he wishes to ascend he simply inflates his dress from the reservoir. Another form, known as the Fleuss dress, makes the diver also independent of exterior aid. The helmet contains a supply of compressed oxygen, and the exhaled breath is passed through a filter in the breast-piece which deprives it of its carbonic acid, while the nitrogen goes back into the helmet to be mixed with the oxygen, the supply of which is under the diver's own control, and to be breathed over again. A diver has remained an hour and a half under 35 feet of water in this dress. The safe limit of depth at which operations can be carried on with the diving-dress is 120 to 150 feet. Diving for pearls, sponges, or corals is now to a great extent carried on by means of diving-dresses.

DIVINING-ROD, a rod, usually of hazel, with two forked branches, used by persons who profess to discover minerals or water under ground. The rod, if carried slowly along by the forked ends, dips and points downward, it is affirmed, when brought over the spot where the concealed mineral or water is to be found. The use of the divining-rod is still common in many parts, and quite recently various wonderful instances of its efficacy in discovering water have been published in respectable prints.

DIVISIBIL'ITY, that general property of bodies by which their parts or component particles are capable of separation. Numerous examples of the division of matter to a degree almost exceeding belief, may be easily instanced. Thus glass test-plates for miscroscopes have been ruled so fine as to have 225,000 spaces to the inch. Cotton yarn has been spun so fine that one pound of it extended upward of 1000 miles, and a Manchester spinner is said to have attained such a marvelous fineness that one pound would extend 4770 miles. One grain of gold has been beaten out to a surface of 52 square inches, and leaves have been made 367,500 of which would go to the inch of thickness. Iron has been reduced to wonderfully thin sheets. Fine tissue paper is about the 1200th part of an inch in thickness, but sheets of iron have been rolled much thinner than this, and as fine as one 4800th part of an inch in thickness. Wires of platinum have been drawn out so fine as to be only the 30,000th part of an inch in diameter. Human hair varies in thickness from the 250th to the 600th part of an inch. The fiber of the coarsest wool is about the 500th part of an inch in diameter, and that of the finest only the 1500th part. The silk line, as spun by the worm, is about the 5000th part of an inch thick; but a spider's line is only the 30,000th part of an inch in diameter; insomuch that a single pound of this attenuated substance might be sufficient to encompass our globe. The trituration and levigation of powders, and the perennial abrasion and waste of the surface of solid bodies, occasion a disintegration of particles almost exceeding the powers of computation. The solutions of certain saline bodies, and of other colored substances, also exhibit a prodigious subdivision of matter. A single grain of the sulphate of copper or blue vitrol, will communicate a fine azure tint to five gallons of water. In this case the sulphate must he attenuated at least 10,000,000 times. Odors are capable of a much wider diffusion. A single grain of musk has been known to perfume a large room for the space of twenty years. At the lowest computation the musk had been subdivided into 320 quadrillions of particles, each of them capable of affecting the olfactory organs.

DIVISION, in arithmetic, the dividing of a number or quantity into any parts assigned; one of the four fundamental rules, the object of which is to find how often one number is contained in another. The number to be divided is the dividend, the number which divides is the divisor, and the result of the division is the quotient. Division is the converse of multiplication.

DIVISION, in military matters, a portion of an army consisting of two or more brigades, composed of the various arms of the service, and commanded by a general officer. In the navy, a select number of ships in a fleet or squadron of men-of-war. The term is now practically abolished since the introduction of gigantic heavily-armed iron-clad ships into the navy.

DIVISION OF LABOR, a principle employed in great industries for the simplification of the work to be done by each of the workmen engaged in it. The separation of complicated processes into a series of simple operations not only results in a great saving of time, but also demands much less ability on the part of the workman, in order that he may acquire the necessary skill in performing any particular operation. Owing to both of these causes, the saving of time, and the employment of cheaper labor, the cost of producing complicated articles is, by the application of this principle, immensely reduced. Division of labor tends to the invention of machinery, and to the effectual use of machinery when invented. It increases the skill and dexterity of the individual workman; it effects a great saving of time and capital, and it conduces to the more economical distribution of labor by classing work-people according to their capacity. It has, however, a deteriorating effect on the laborer's usefulness as an all-round workman.

DIVORCE is a separation, by law, of husband and wife, and is either, a complete dissolution of the marriage bonds, or a divorce, whereby the parties are legally separated, but not unmarried. The causes admitted by different codes of laws as grounds for the modification or entire dissolution of the marriage contract, as well as the description of tribunal which has jurisdiction of the proceedings, and the form of the proceedings, are various. Divorce was permitted by the law of Moses, but forbidden in the New Testament, except for unchastity. The early laws of Rome permitted the husband to divorce his wife for adultery and many other alleged offenses. The facility of divorce continued, without restriction, under the Roman emperors, but as the modern nations of Europe emerged from the ruins of the Roman Empire, they adopted the doctrine of the New Testament. Marriage, under the Roman Church, instead of a civil contract, came to be considered a sacrament of the church, which it was unlawful to dissolve. In the United States, marriage, though it may be celebrated before clergymen as well as civil magistrates, is considered to be a civil contract, and the laws as to divorce, and the facility or difficulty of obtaining it, differ greatly in the several states. In France divorce was legalized

in 1884, with conditions, after having been prohibited for many years.

DIXON, William Hepworth, miscellaneous writer, born at Manchester 1821, died in London 1879. He published several very popular works, including the Personal History of Lord Bacon, The Holy Land, and New America, the last being followed by Spiritual Wives; in the last ten years of his life, he gave to the world somewhere about twenty-five volumes of history, travel, and fiction, among others, Free Russia; Her Majesty's Tower; The Switzers; History of Two Queens, Catharine of Aragon and Anne Boleyn; Diana Lady Lyle, and Ruby Grey (both novels); and his last work, Royal Windsor.

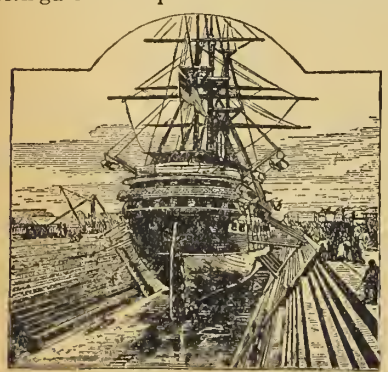
DJOKDJOKARTA, a Dutch residency in the island of Java, on the south coast, with a capital of the same name. Pop. 441,800. The town is large and regular, and contains the sultan's water-palace, and the seat of the Dutch resident, which is a fort commanding both the palace and the town. Pop. 45,000.

DNIEPER (nē'pĕr), a great river of Russia which rises in the government of Smolensk, flows first southwest, then southeast, and latterly again southwest to the Black Sea. It begins to be navigable a little above Smolensk, and has a total length, including windings, of 1230 miles. Since 1838 there have been steamboats on the river, and the trade carried by it is considerable.

DNIESTER (nēs'tèr), a large river of Europe, which has its source in the Carpathian Mountains, in Austrian Galicia, enters Russia at Chotin, and empties itself into the Black Sea, after a course of about 750 miles. Its navigation is difficult on account of frequent shallows and rapids.

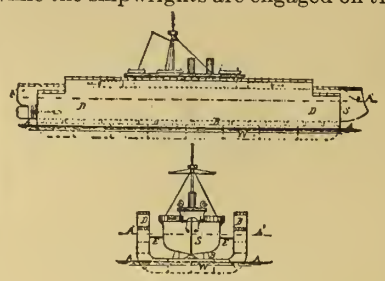
DOBRUD'SHA, The, a territory forming part of the kingdom of Roumania, included between the Danube, which forms its boundary on the west and north, the Black Sea on the east, and on the south by a line stretching from Silistria to a point a few miles south of Mangalia. Pop. about 100,000.

DOCKS are usually artificial inclosures for the reception of vessels, and provided with gates to keep in or shut out the tide.



Dry or graving dock.

They are called wet-docks when they are intended to receive vessels for loading and unloading, the gates being in this case constructed so as to keep in the tide, and thus preserve the water within the docks as nearly as possible at the uniform level of high water. They are called dry-docks, or graving-docks, when they are intended to admit vessels to be examined and repaired, the gates in this case being such as to keep out the tide while the shipwrights are engaged on the



Side and End Elevations of Floating Dock.
A, A, water-line; *A', A'*, immersed water-line for taking in ships; *B*, blocks for supporting ships; *D, D*, dock; *E, E*, shores for side support; *S*, ship raised on dock; *W*, water-tight compartments.

vessel. There is another kind of dry-docks called floating-docks, which float on the surface of the water, and may be sunk sufficiently to allow of a vessel being floated into them, and then raised again, by pumping the water out of the tanks round the sides. One of the chief uses of a wet-dock is to keep a uniform level of water, so that the business of loading and unloading ships can be carried on without any interruption and without danger of damage to the vessel from straining, low tides, storms, etc.

Graving-docks are built of strong masonry, and their entrance is closed either by swinging gates opening in the middle, and when shut presenting a salient angle to the water in the river or harbor from which the dock is entered, or by a framework called a caisson, built like the hull of a ship, with a keel and a stem at both ends. When the caisson is empty it floats, and may be removed to admit of a vessel being floated into the dock. The caisson being then placed at the entrance and filled with water, again sinks into the grooves intended for it and closes the graving-dock. The water is then pumped out, leaving the ship dry and supported by wooden blocks and props. With regard to floating-docks, a common type of construction is the iron floating-dock built in water-tight compartments, and not closed in at either end. It is sunk to the required depth by the admission of water into so many of the compartments, till the vessel to be docked can float easily above its bottom, and it is then raised by pumping out the water until the ship can be propped up as in a dry-dock.

A kind of dry-dock, called the hydraulic lift dock, consists of a double row of iron columns, each of which contains a hydraulic press. All these hydraulic presses can be worked simultaneously by a powerful steam-engine, and their combined action has the effect of raising a series of transverse iron girders stretching from the columns on one side to those of the other. An iron pontoon is first floated above these girders, and then sunk so as to rest on them, and the ship to be docked is floated above the pontoon and supported by blocks resting only upon the pontoon, so that the ship is in no way connected with the columns on each side. The hydraulic presses are then set to work, the girders with the pontoon and ship are raised high enough for the water to be run out of the pontoon, which is then sufficiently buoyant to float the ship. The pontoon may now be floated away clear of the dock, and another take its place. By this plan a number of vessels can be floated for overhauling and repairs in very shallow water at comparatively slight expense.

DOCTOR, a term literally signifying teacher. In the middle ages, from the 12th century, it came into use as a title of honor for men of great learning, such as Thomas Aquinas (Doctor Angelicus), Duns Scotus (Doctor Subtilis), etc. It was first made an academical title by the University of Bologna, and emperors and popes soon afterward assumed the right of granting universities the power of conferring the degree in law. The faculties of theology and medicine were soon included, but for a long time the faculty of arts retained the older title of Magister, till the German universities substituted that of Doctor. The title of Doctor is in some cases an honorary degree, and in other cases (as in medicine and science) conferred after examination. The title of D.C.L. (Doctor of Civil Law). for example, at the University of Oxford and at Trinity College, Dublin, is an honorary degree, and so also are those of D.D. (Doctor of Divinity) and LL.D. (Doctor of Laws) at various universities. The popes and the archbishops of Canterbury exercise the right of conferring the degree of Doctor both in law and divinity.

DODGE, Mary Abigail, an American writer, better known as Gail Hamilton, born at Hamilton, Mass., in 1830, died in 1896. Her work was ephemeral, chiefly on current topics, but possessed a crispness that made it in demand.

DODGE, Mary Elizabeth Mapes, an American poet, editor, and writer, born in New York in 1838. She was editor of St. Nicholas for many years. One of her best known works is Hans Brinker, or, The Silver Skates, which still retains its place, although published in 1865. This work was translated into several European languages and crowned by the French academy.

DODO, an extinct genus of birds once abundant on the island of Mauritius, and assigned by naturalists to the order Columbæ or pigeons, though an extreme modification of the type. It was a mas-

Dodo.

sive clumsy bird, larger than a swan, covered with down instead of feathers with short ill-shaped legs, a strong bulky hooked beak, and wings and tail so short as to be useless for flight.

DOE, John, and Richard Doe, two fictitious personages of the English law who formerly appeared in a suit of

ejectment. This fictitious form of procedure was abolished in 1852.

DOG, a well-known mammal, largely domesticated, carnivorous in the wild state, of very high intelligence, and of all the lower animals the most closely associated with man in sympathy and sociality. Wild dogs exist in Asia and Australia and all domesticated dogs are derived from some form of the wild animals, or from the mingling of various strains under domestication.

No one probably has ever attempted to make a complete catalogue of the varieties of domestic dogs known throughout the world, but Fitzinger estimated the number in 1876 at about 185. All these fall into certain groups, or types, as will presently be noted; and the study of their points of likeness and unlikeness has been made by several recent investigators of the law of variation.

Breeds of dogs have been variously classified. One Roman grouping mentioned by old writers was into fighters (pugnaces), wise dogs (sagaces), and swift-footed ones (celeres); the sagaces were said to have come from Greece, and the pugnaces from Asia. Another ancient grouping was into house-dogs, sheep-dogs, and sporting-dogs, the last embracing fighters, hounds hunting by scent, and hounds hunting by sight. Modern naturalists have substantially agreed upon six groups, with considerable differences in composition, however. Thus Col. Hamilton Smith, about 1830, arranged the list as follows: The wolf-dogs, including the Siberian dog, Eskimo dog, Iceland dog, Newfoundland dog, Nootka dog, sheep-dog, great wolf-dog, great Saint Bernard dog, Pomeranian dog, etc. The watch and cattle dogs, including the German boarhound, Danish dog, matin, dog of the North American Indians, etc. The greyhounds, including the Brinjaree dog, different kinds of greyhound, Irish hound, lurcher, Egyptian street dog, etc. The hounds, including the bloodhound, old southern hound, staghound, foxhound, harrier, beagle, pointer, setter, spaniel, springer, cocker, Blenheim dog, water-dog or poodle, etc. The cur dogs, including the terrier and its allies. The mastiffs, including different kinds of mastiff, the bulldog, pug dog, etc.

The latest arrangement is that by Windle, based upon the shape of the skull and other features, rather than upon form and function, yet not greatly different from its predecessors. It is as follows: Wolf-like Dogs. — Arctic sledge-dogs; shepherd dogs (collies); Newfoundland dog; Saint Bernard, rough and smooth, and Pomeranian or Spitz dog. Greyhound.—Old Irish wolf-dog; modern Irish wolf-dog; greyhound; Italian greyhound; West Indian naked dog. Spaniels. — All varieties. Hounds.—Bloodhound; foxhound; harrier; otter-hound, beagle, pointer, setter, etc., (hunting-dogs).

DOG-BANE, an American plant found from Canada to Carolina. The whole plant is milky; the root is intensely bitter and nauseous, and is employed in America instead of ipecacuanha.

DOG-CART, a sort of double-seated gig for four persons, those before and those behind sitting back to back; it is often furnished with a boot for holding dogs.

DOG-DAYS, the name applied by the ancients to a period of about forty days, the hottest season of the year, at the time of the heliacal rising of Sirius, the dog-star. The time of the rising is now, owing to the precession of the equinoxes, different from what it was to the ancients (1st July); and the dog-days are now counted from 3d July to Aug. 11, that is, twenty days before and twenty days after the heliacal rising.

DOG-FISH, a name given to several species of small shark, common around the British isles. The rough skin of one of the species, the lesser-spotted dog-fish, is used by joiners and other artificers in polishing various substances, particularly wood. This species is rarely 3 feet long. The greater dog-fish is in length from 3 to 5 feet. It is blackish-brown in color, marked with numerous small dark spots. Both species are very voracious and destructive. Their flesh is hard, dry, and unpalatable. The common or picked dog-fish is common in British and N. American seas, and is sometimes used as food. It is fierce and voracious.

DOGGER, a Dutch vessel equipped with two masts and somewhat resembling a ketch. It is used particularly in the German Ocean for the cod and herring fisheries.

Dutch dogger.

DOGMA, an article of religious belief, one of the doctrines of the Christian faith. The history of dogmas, as a branch of theology, exhibits in a historical way the origin and the changes of the various Christian systems of belief, showing what opinions were received by the various sects in different ages of Christianity, the sources of the different creeds, by what arguments they were attacked and supported, what degrees of importance were attached to them in different ages, the circumstances by which they were affected, and the mode in which the dogmas were combined into systems.

DOGMAT'ICS, a systematic arrangement of the articles of Christian faith (dogmas), or the branch of theology that deals with them. (See Dogma.) The first attempt to furnish a complete and coherent system of Christian dogmas was made by Origen in the 3d century.

DOG-STAR, a name for Sirius, the star that gives their name to the dog-days (which see).

DOILEY, a small ornamental napkin used at table to set glasses on at dessert.

DOL'DRUMS, among seamen, the parts of the ocean near the equator that abound in calms, squalls, and light baffling winds.

DOLE, Nathan Haskell, an American editor, born in Massachusetts in 1852. He has translated Daudet, Tolstoi, and other foreign authors with much success, and has published a number of original poems and essays.

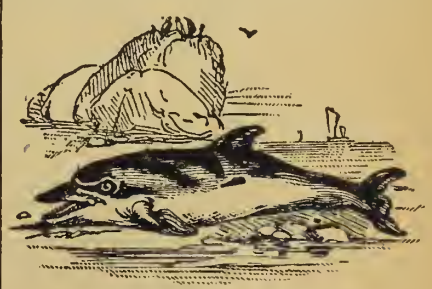
DOLE, Sanford Ballard, an Hawaiian agitator, revolutionist, and statesman, born in Honolulu in 1844. He was president of the provisional government in 1893, and in 1894 was elected president of the Hawaiian republic. He is a most capable jurist.

DOLLAR, the unit of money in the U. States and Canada. The American dollar was established by act of congress in 1792. The silver dollar consists of 412½ grains .900 fine, and the gold dollar of 25.8 grains .900 fine. The gold dollar was made the standard by the act of March 14, 1900, but no coin of that description has been made.

DOL'MAN, a long robe worn by the Turks as an upper garment. It is open in front, and has narrow sleeves. It has given its name to a kind of loose jacket worn by ladies.

DOL'OMITE, a mineral, also called magnesian limestone. It is composed of carbonate of calcium and carbonate of magnesium, and varies from gray or yellowish-white to yellowish-brown.

DOLPHIN, a cetaceous animal, which includes also the porpoises and narwhal. Dolphins are cosmopolite animals, inhabiting every sea from the equator to the poles; they are gregarious, and swim with extraordinary velocity. The common dolphin measures from 6 to 10 feet in length, has a long, sharp snout with numerous nearly conical teeth in both jaws; its flesh is coarse, rank, and disagreeable, but is used by the Laplanders as food. It lives on fish, mollusca, etc., and often may be seen in numbers round shoals of herring. The animal has to come to the surface at short intervals to breathe. The blow-hole is of a semilunar form, with a kind of valvular apparatus, and opens on the vertex, nearly over the eyes. The structure of the ear renders the sense of hearing very acute, and the animal is observed to be attracted by regular or harmonious sounds. One or two young are produced by the female, who



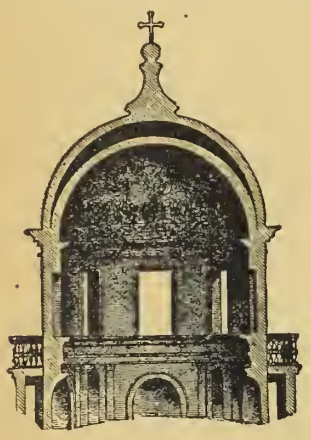
Common dolphin.

suckles and watches them with great care and anxiety, long after they have acquired considerable size.

DOM, a Portuguese title corresponding with the Spanish Don.

DOMAIN', same as Demesne (which see); also applied especially to crown lands or government lands.—Right of eminent domain, the dominion of the sovereign power over all the property within the state, by which it is entitled to appropriate any part necessary to the public good, compensation being given.

DOME, a vaulted roof of spherical or other curvature, covering a building or part of it, and forming a common feature in Byzantine and also in



Section of dome of San Pedro in Montorio, Rome, end of 15th century.

Renaissance architecture. Cupola also is used as a synonym, or is applied to the interior, dome being applied to the exterior. Most modern domes are semielliptical in vertical section, and are constructed of timber; but the ancient domes were nearly hemispherical, and constructed of stone. Of domes the finest, without any comparison, ancient or modern, is that of the Rotunda or Panthcon at Rome (142½ feet internal diameter and 143 feet internal height), erected under Augustus, and still perfect.

DOMESDAY (or Doomsday) **BOOK,** a book containing a survey of all the lands in England, compiled in the reign and by the order of William the Conqueror. The survey was made by commissioners, who collected the information in each district from a sworn jury consisting of sheriffs, lords of manors, presbyters, bailiffs, villeins—all the classes, in short, interested in the matter. The extent, tenure, value, and proprietorship of the land in each district, the state of culture, and in some cases the number of tenants, villeins, serfs, etc., were the matters chiefly recorded. The survey was completed within a year.

DOMESTIC ANIMALS, such as are reared and kept by man, and are to some extent in a tame state; as the dog, cat, ox, sheep, swine, horse, ass, elephant, camel, llama, reindeer, etc.

DOM'ICILE, in law, the place where a person has a home or established residence. Domicile is often an important question in determining the efficacy of legal citations, the validity of marriage, the right of succession to property, etc. For some purposes what is called a temporary domicile is sufficient, but in questions of marriage and succession it is the permanent domicile that determines the decision. A permanent domicile may be constituted by birth, by choice, or by operation of the law. To constitute a domicile by choice both actual residence and the intention to make it the permanent home are required. It is a legal principle that the wife takes the domicile of her husband. As a general rule the old domicile, and especially the domicile of origin, continues till a new one has been acquired.

DOMIN'GO, San, capital of the Dominican Republic (or San Domingo) in the island of Hayti. It lies on the southeast coast, at the mouth of the Ozama, and has a commodious port. It is the oldest European city in the New World, having been founded in 1494 by Bartholomew Columbus. Pop. about 16,000.

DOM'INIC, Saint, the founder of the order of the Dominicans, was born in 1170 at Calahorra, in Old Castile. He early distinguished himself by his zeal for the reform of canonical life and by his success as a missionary among the Mohammedans. Saint Dominic is usually considered the founder of the Inquisition, which is supposed to have originated with his mission to the Albigenses; but his claim is denied, on the ground that two Cistercian monks were appointed inquisitors in 1198.

DOMINICA (dom-i-nē'kȧ), a British West India island. It is about 29 miles in length, north to south, and 12 miles in breadth east to west; area, 186,436 acres. The principal exports consist of sugar, molasses, cocoa, and lime-juice. Dominica was ceded by France to Great Britain in 1763. Roseau is the capital. Pop. 26,841 (including about 300 aboriginal Caribs).

DOMINICAN REPUBLIC, or **SAN DOMINGO,** a republic occupying the eastern portion of the island of Hayti; area, 18,000 sq. miles. It is fertile and exports mahogany, sugar, tobacco, cocoa, etc., but its resources are as yet but little developed. It formerly belonged to Spain, and is the oldest colonial settlement in America. Its inhabitants are chiefly negroes and mulattoes. Capital, San Domingo. Pop. estimated at 504,000. See Hayti.

DOMIN'ICANS, called also predicants, or preaching friars (prædicatores), derived their name from their founder, St. Dominic. At their origin (1216, at Toulouse) they were governed by the rule of St. Augustine, perpetual silence, poverty, and fasting being enjoined upon them; and the principal object of their institution was to preach against heretics. Their distinctive dress consists of a white habit and scapular with a large black mantle, and hence they have been commonly known as Black Friars.

DOM'INO, formerly a dress worn by priests in the winter, which, reaching no lower than the shoulders, served to protect the face and head from the weather. At present it is a masquerade dress worn by gentlemen and ladies, consisting of a long silk mantle with wide sleeves and a masking hood. The name is also given to a half-mask formerly worn on the face by ladies when traveling or at masquerades.

Dominican or black friar.

DOM'INOES, a game played with small flat rectangular pieces of ivory, about twice as long as they are broad. They are marked with spots varying in number. When one player leads by laying down a domino, the next must follow by placing alongside of it another which has the same number of spots on one of its sides. Thus if the first player lays down 6–4, the second may reply with 4–8, or 6–7, etc.; in the former case he must turn in the 4, placing it beside the 4 of the first domino, so that the numbers remaining out will be 6–8; in the latter case he must turn in the 6 to the 6 in like manner, leaving 4–7, to which his opponent must now respond. The player who cannot follow suit loses his turn, and the object of the game is to get rid of all the dominoes in hand, or to hold fewer spots than your opponent when the game is exhausted by neither being able to play.

DOMITIAN, or in full Titus Flavius Domitianus Augustus, Roman emperor, son of Vespasian, and brother of Titus, was born A.D. 51, and in 81 succeeded to

the throne. At first he ruled with a show of moderation and justice, but soon returned to the cruelty and excesses for which his youth had been notorious. He established the most stringent laws against high treason, which enabled almost anything to be construed into this crime. At length a conspiracy, in which his wife, Domitia took part, was formed against him, and he was assassinated in his bed-room A.D. 96.

DOMREMY LA PUCELLE (don-rē-mi lȧ pu-sāl), the birth-place of Joan of Arc,

a small French village, department of the Vosges, 7 miles n. of Neufchâteau. The house is still shown here in which the heroine was born, and in the neighborhood is the monument erected to her memory.

DON, a Spanish title of honor, originally given only to the highest nobility, afterward to all the nobles, and finally used indiscriminately as a title of courtesy. It corresponds with the Portuguese Dom. During the Spanish occupation it was introduced and became naturalized in some parts of Italy, and was particularly applied to the priests.

DONA'TI'S COMET, so called from the Italian astronomer Donati, who first observed it in June, 1858. Next to the comet of 1811 it was the most brilliant that appeared last century. It was nearest the earth on the 10th October, 1858.

DON'EGAL, a maritime county, Ireland, province of Ulster, bounded n. and w. by the Atlantic Ocean; area, 1,197,154 acres, of which about a fifth is under crops. The manufactures are limited, and consist chiefly of linen cloth, woolen stockings, and worked muslin. The fisheries are extensive and valuable, and form the chief employment of the inhabitants of the coast and islands. Grain butter, and eggs are exported. The minerals include marble, lead, copper, etc., but are not wrought to advantage. Pop. 173,625. — Donegal, the county town, is a small seaport on the bay of the same name, at the mouth of the river Esk. Pop. 1323.

DONELSON, Andrew Jackson, an American diplomat, born in Tennessee in 1800, died 1871. He was private secretary to Jackson in 1829, and subsequently served as minister to Prussia and the federal German government. He took no part in the civil war.

DON'GOLA, a district of Upper Nubia, extending on both sides of the Nile from about lat. 18° to lat. 20° n. After having belonged to Egypt the rebellion under the Mahdi caused its evacuation by the Egyptian government, leaving it in an unsettled state; but under the Anglo-Egyptian authorities it has again been occupied. Its chief products are dates, cotton, indigo, and maize. The population is a mixture of Arabs and indigenous Nubians. Its chief town is New Dongola, on the Nile. Pop. 6000.

DONIZET'TI, Gaetano, Italian composer, born in 1798, at Bergamo. In 1830 appeared his Anna Bolena, which first, along with Lucrezia Borgia and Lucia di Lammermoor—the latter his masterpiece—acquired for him a European fame. Donizetti removed in 1840 to Paris, bringing with him three new operas, Les Martyrs, La Favorita, and La Fille du Régiment, of which the last two are among his most popular productions. He died 8th April, 1848. He had written as many as sixty-four operas

DON JUAN (*hu*-ân'), the hero of a Spanish legend which seems to have had some historical basis in the history of a member of the noble family of Tenorio at Seville. According to the legend Don Juan was a libertine of the most reckless character. An attempt to seduce the daughter of a governor of Seville brought the indignant father and the profligate don into deadly conflict, in which the former was slain. Don Juan afterward, in a spirit of wild mockery, goes to the grave of the murdered man and invites the statue of him erected there to a revel. To the terror of Don Juan the "stony guest" actually appears at the table to bear him away to the infernal world. The legend has furnished the subject for many dramas and operas. The most famous of the latter is Mozart's Don Giovanni, which has made the story familiar to everybody. The Don Juan of Byron bears no relation to the old story but in name and in the libertine character of the hero.

DONKEY-ENGINE, a small engine used in various operations where no great power is required. Thus a donkey-engine is often stationed on the deck of a ship to work a crane for loading and unloading.

DONNYBROOK, a village, Ireland, now mostly in the parliamentary borough of Dublin. Its famous fair, which seldom passed off without riot and bloodshed, was abolished in 1855.

DON QUIXOTE (kē-*hō*'tā), the title of a famous romance by Cervantes. The name of the hero, Don Quixote, is used as a synonym for foolish knight-errantry or extravagant generosity.

DOOMSDAY BOOK. See Domesday Book.

DORCAS SOCIETY (from Dorcas mentioned in Acts ix.), an association generally composed of ladies for supplying clothes to the poor. Frequently the members of the society meet at stated times and work in common.

DORDOGNE (dor-dony), a department of France, which includes the greater part of the ancient province of Périgord, and small portions of Limousin, Angoumois, and Saintonge. Area, 3544 sq. miles, of which about a third is fit for the plow. The climate is mild but somewhat changeable. Pop. 492,205.

DORE (dō-rā), Paul Gustave, a prolific French draftsman and painter, born at Strasbourg Jan. 6, 1833. He studied at Paris, contributing, when only sixteen years of age, comic sketches to the Journal Pour Rire. He distinguished himself greatly as an illustrator of books. His illustrations of Rabelais, of Perrault's Tales, Sue's Wandering Jew, Dante's Divina Commedia, and Cervantes' Don Quixote, displayed great fertility of invention, and the fine fantasy of his landscapes and the dramatic effectiveness of his groups acquired for him a European reputation. His illustrations of the Bible, of Ariosto's Orlando Furioso, and Milton's Paradise Lost, are also of high excellence. As a painter he has grandeur of conception and a bold expressive style. Among his chief works are Christ leaving the Prætorium, Paolo and Francesca di Rimini, The Flight into Egypt, Mont Blanc, etc. In later years Doré also won fame as a sculptor. He died 23d June, 1883.

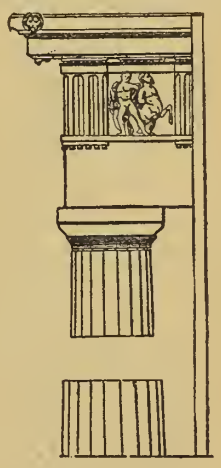
DORIANS, one of the four great branches of the Greek nation who migrated from Thessaly southward, settling for a time in the mountainous district of Doris in Northern Greece and finally in Peloponnesus. Their migration to the latter was said to have taken place in B.C. 1104; and as among their leaders were certain descendants of Hercules (or Herakles), it was known as the return of the Heraclidæ. The Dorians ruled in Sparta with great renown as a strong and warlike people, though less cultivated than the other Greeks in arts and letters. Their laws were severe and rigid, as typified in the codes of the great Doric legislators Minos and Lycurgus. (See Sparta.)—The Doric dialect was characterized by its broadness and hardness, yet on account of its venerable and antique style was often used in solemn odes and choruses.

DORIC ORDER, in architecture, is the oldest, strongest, and simplest of the three Grecian orders, and the one that is best represented among the remains of ancient Greek architecture. The Doric

Doric entablature.

e, entablature; *a*, epistyle or architrave; *b*, frieze; *c*, cornice. (From Archæol. Inst. Report on Assos Expedition.

column is distinguished by its want of a base (in the more ancient examples, at least), by the small number of its flutings



Grecian Doric order.

and by its massive proportions, the true Grecian Doric having the height of its pillars six times that of the diameter. The capital was small and simple, and the architrave, frieze, and cornice were rather plain and massive.

DORMANT STATE, a state of torpidity in which certain animals pass a portion of the year. In cold and temperate climates this period of long sleep takes place during the winter months, and is properly called hibernation. It commences when the food of the animals begins to get scarce, continues for a longer or shorter period, and is deeper or lighter according to the habits and constitution of the animal. Bats, bears, some animals of the rodent order, such

as the porcupine, the dormouse, the squirrel, etc., all the animals belonging to the classes of Amphibia and Reptilia, such as tortoises, lizards, snakes, frogs, etc., and many species of molluscs and insects, hibernate more or less completely, retiring to suitable places of concealment—the bat to dark caves, the hedgehog to fern-brakes, snakes to holes in trees, etc. During hibernation there is a great decrease of heat in the bodies of the animals, the temperature sometimes sinking to 40° or even 20° Fahr., or in general to a point a little above that of the surrounding atmosphere. The respiration as well as the pulsation of the heart is exceedingly slow, and the irritability of the animal often so low that in some cases it can be awakened only by strong electric shocks. With frogs and amphibious reptiles the dormant state is very common, and if the temperature is kept low by artificial means they may remain dormant for years. The term æstivation has been used to describe a similar condition into which certain animals, such as serpents and crocodiles, in tropical countries pass during the hottest months of the year

DORMER WINDOWS are windows inserted in the inclined plane of a sloping roof, on a frame rising vertically above the rafters.

DORMOUSE, a genus of mammiferous quadrupeds, of the order Rodentia. These little animals, which appear to be intermediate between the squirrels and the mice, inhabit temperate and warm countries, and subsist entirely on vegetable food. Their pace is a kind of leap, but they have not the activity of squirrels. Whilst feeding they sit upright and carry the food to their mouth with their paws. The dormice pass the winter in a lethargic or torpid state, reviving only for a short time on a warm sunny day, when they take a little of their hoarded stores and then relapse into the dormant state.

D'ORSAY, Alfred, Count, a dilettante artist and man of fashion, born at Paris 1798, died 1852. When a young man he visited England, and became acquainted with Byron and other literary and fashionable celebrities. He married a daughter of the Earl of Blessington, but after the earl's death a separation took place, and D'Orsay became an inmate of Gore House, which the Countess of Blessington had made the center of a famous literary coterie A zealous Bonapartist, he followed Prince Louis Napoleon to Paris in 1849, whose favor he enjoyed till his death.

DORSET, Dorsetshire, a maritime county in the south of England, having on the south the English Channel; area, 627,265 acres, over 490,000 being under crop. The general surface of the county is undulating; its principal elevations being chalk hills known as the North and South Downs, upon which immense flocks of sheep are pastured. The principal manufactures are those of flax, canvas, duck, etc., also silk and woolens. The principal rivers are the Stour, the Frome, and the Piddle. Dorchester is the county town. Other towns are Bridport, Poole, and Weymouth. Pop. 202,962.

DORSET, Earls of. See Sackville.

DORT'MUND, a city of Prussia, province of Westphalia, on the Emscher, 47 miles n.n.e. of Cologne, starting-point of an important canal to the lower Ems. It was once a free imperial Hanseatic town, and the seat of the chief tribunal of the Vehme. Pop. 142,733.

DORY, a fish belonging to the mackerel family, celebrated for the delicacy of its flesh. It seldom exceeds 18 inches in length, and is yellowish-green in color with a blackish spot on each side, which,

Dory.

according to an old superstition, is the mark of St. Peter's fore-finger and thumb. The dory is found on the Atlantic shores of Europe and in the Mediterranean.

DOUAI (dö-ā), or **DOUAY,** a town, France, department Nord, on the Scarpe, 18 miles south of Lille. It is one of the oldest towns in France, of which it became part by the Treaty of Utrecht. It is strongly fortified, has a fine townhouse, several handsome churches, an academy of arts and law, a lyceum, museum and public library, Benedictine college, hospital, etc.; a cannon foundry, linen manufactories, machine-works, tanneries, etc. There was long here a college for British Roman Catholic priests, the most celebrated of its kind. Pop. 30,030.

DOUAI BIBLE, the English translation of the Bible used among English-speaking R. Catholics, and executed by divines connected with the English College at Douai. The New Testament was published in 1582 at Rheims, the Old in 1609—10 at Douai, the translation being based on the vulgate. Various revisions have since materially altered it.

DOUBLE CONSCIOUSNESS, an alleged morbid "state of mind," in which the same person at different times appears to have a different personality. It is seriously discussed by psychologists, who compare it with hypnosis, and it is probably due to incomplete coordination in the associational region of the cerebral cortex.

DOUBLE-EAGLE, an American gold coin of the value of twenty dollars, so called because double the value of the coin called the eagle.

DOUBLE-ENTRY. See Book-keeping.

DOUBLE-INSURANCE, the effecting of two insurances upon the same goods. In marine insurance it is lawful for a shipper to insure his goods twice, but only to give an additional security in the event of the failure of the first underwriters. In the event of a loss it is ultimately divided among the underwriters in the ratio of the risks they have taken.

DOUBLE-STANDARD OF MONETARY VALUE. See Currency, Bimetallism.

DOUBLE-STARS, or **BINARY STARS,** stars which are so close together that they appear as one to the naked eye, but are seen to be double when viewed through a telescope. One of these stars may revolve about the other, or both may revolve round a common center. See Stars.

DOUBLET, a close-fitting garment, covering the body from the neck to a little below the waist. It was introduced from France into England in the

1, Doublet, time of Edward IV. 2, 3, Doublets, time of Elizabeth. 4, Doublet, time of Charles I.

14th century, and was worn by both sexes and all ranks until the time of Charles II., when it was superseded by the vest and waistcoat. The garment got its name from being originally lined or wadded for defense.

DOUBS (dö), a department of France, having Switzerland on its eastern frontier. Its surface is traversed by four chains of the Jura. The temperature is variable, and the climate somewhat rigorous. About a third of the land is arable, but much the greater part is covered with forests. Maize, potatoes, hemp, flax, are the principal crops Much dairy produce is made into Gruyère cheese. The minerals include iron, lead, and marble. Pop. 310,963.

DOUCHE (dösh), a jet or current of water or vapor directed upon some part of the body; employed in bathing establishments. When water is applied it is called the liquid douche, and when a current of vapor the vapor douche.

DOUGHFACE, a name applied, before and during the civil war, to any resident of the North who favored the slave owners of the South. The application of the name is not clear.

DOUGLAS (dug'las), a family distinguished in the annals of Scotland. Their origin is unknown. They were already territorial magnates at the time when Bruce and Baliol were competitors for the crown. As their estates lay on the borders they early became guardians of the kingdom against the encroachments of the English, and acquired in this way power, habits, and experience

which frequently made them formidable to the crown.

DOUGLAS, Stephen Arnold, American statesman, born in Vermont 1813, died 1861. Having gone to Jacksonville, Ill., he became an attorney, was appointed attorney-general for the state, and in 1843 was elected a member of the U.

Stephen A. Douglas.

States house of representatives. In 1847 he was elected to the senate, and by re-election was a member of this body till his death. He was especially prominent in connection with the question at to the extension of slavery into new states and territories, which he maintained was a matter to be settled by the people of the respective states or territories, and not by congress. He was a presidential candidate in 1860, when Lincoln was elected.

DOUGLASS, Frederick, American lecturer and journalist, was the son of a negro slave, and was born at Tuckahoe in Maryland, about 1817. Although his father was a white man, he was, according to the law, reared as a slave. In 1832 he was purchased by a Baltimore ship-builder, but made his escape in 1838. As he had taught himself to read and write, and showed talent as an orator, he was employed by the anti-slavery society as one of their lecturers. In 1845 he published his autobiography, and afterward made a successful lecturing tour in England. In 1870 he started a journal entitled the The New National Era; in 1871 he was appointed secretary of the commission to Santo Domingo; in 1872, presidential elector; in 1877 marshal for the district of Columbia, then commissioner of deeds for that district, and in 1889 United States minister to Hayti. He died in 1895.

DOUM PALM (dōm), a palm-tree. It is remarkable, like the other species of the genus, for having a repeatedly-branched stem. Each branch terminates in a tuft of large fan-shaped leaves. The fruit is about the size of an apple; it has a fibrous mealy rind, which tastes like gingerbread (whence the name gingerbread tree sometimes applied to this palm), and is eaten by the poorer inhabitants of Upper Egypt, where it grows. An infusion of the rind is also used as a cooling beverage in fevers. The seed is horny, and is made into small ornaments. Ropes are made of the fibers of the leaf-stalks.

DOVE. See Turtle-dove and Pigeon.

DOVER, a city in New Hampshire. It is situated on both sides of the Cocheco, which has here a fall of over 30 feet, affording abundant water-power for the large iron and cotton manufactories. Pop. 13,214.

DO'VER, a mun. and parl. borough of England, county Kent, 67 miles south-east of London. It is an important railway terminus, and as a port for mail and packet service with the Continent has a large passenger traffic. Pop. 41,782.

Doum palm.

DOVER, Straits of, the narrow channel between Dover and Calais which separates Great Britain from the French coast. At the narrowest part it is only 21 miles wide. The depth of the channel at a medium in the highest spring-tides is about 25 fathoms. On both the French and English sides the chalky cliffs show a correspondency of strata which leaves no room for doubt that they were once united, although this is known otherwise.

DOVER'S POWDER, a preparation frequently used in medical practice to produce perspiration. It consists of 1 grain of opium, 1 of ipecacuanha, and 8 of sulphate of potash in every 10 grains, which constitute a full dose. In preparing it the ingredients must be thoroughly mixed.

DOVE-TAILING, in carpentry, is the fastening boards together by letting one piece in the form of a dove-tail into a corresponding cavity in another. The dove-tail is the strongest kind of jointing.

DOW, Neal, an American temperance advocate, born in Maine in 1804, died in 1897. He fought in the civil war on the Union side, rose to be brigadier-general, was a prisoner in Libby prison and in 1880 was prohibition candidate for president of the United States. His whole life long he consistently worked for total abstinence.

DOWER, in English law, is the right which a wife (not being an alien) has in the lands and tenements of which her husband dies possessed. By common law this right amounts to one-third of his estate during her life; by local custom it is frequently greater.

DOWN, a county of Ireland, in Ulster, bounded on the north by Belfast Lough and on the east by the Irish Sea; area, 610,730 acres, of which over five-sixths are productive. The principal manufactures are linen and muslin. The fisheries on the coast, principally cod, haddock, and herring, are considerable. the county town is Downpatrick. Pop. 289,335.

DOWNING, Andrew Jackson, an American horticulturist, born in New York in 1815, died in 1852. He introduced into this country the English method of landscape gardening, designed the garden of the capitol at Washington, and other government garden works.

DOXOL'OGY, a set form of words giving glory to God, and especially a name given to two short hymns distinguished by the title of greater (Glory be to God on high, etc.) and lesser (Glory be to the Father, etc.). Both the doxologies have a place in the Church of England liturgy, the latter being repeated after every psalm, and the former used in the communion service.

DOYLE, Sir Arthur Conan, English novelist, born at Edinburgh, 1859, studied medicine, and for some years practiced, but gave up the profession for that of literature. Among his books are Micah Clarke; The Sign of Four; The White Company; The Adventures of Sherlock Holmes, etc.

DRACHMA (drak'ma), the unit of weight and of money among the ancient Greeks. It was the principal Greek coin, was made of silver and was worth (the Attic drachma) about 20 cents. As a weight among the Greeks it was about 2 dwt. 7 grains troy.

DRACO, a legislator of Athens, about 620 B.C., whose name has become proverbial as an inexorable and bloodthirsty lawgiver, and whose laws were said to have been written in blood, not ink.

DRACO, the Dragon, a constellation of the northern hemisphere, containing, according to Flamsteed, eighty stars. The star Draconis is celebrated as the one used in determining the coefficient of aberration of the fixed stars.

DRAFT, or **DRAUGHT,** a bill drawn by one person on another. Also a rough copy of any document intended to be afterward transcribed.

DRAG, (1) a long coach or carriage, generally uncovered and seated round the sides. (2) An apparatus for retarding or stopping the rotation of one wheel or of several wheels, in carriages especially. (3) An apparatus, consisting of a frame of iron with a bag-net attached, used to recover articles lost in the water.

DRAG-NET, a net drawn along the bottom of a river or pond to catch fish. The use of drag-nets is usually prohibited in rivers where fish breed, as it takes all indiscriminately.

DRAGO DOCTRINE, so called from Argentine, minister of foreign affairs of that name, who in 1906 declared the debts of one nation should not be forcibly collected by army and navy of another nation, but left to the courts.

DRAG'ON, a fabulous monster, the stories regarding which reach back almost as far as history. His form is described as generally resembling that of a winged and two-legged serpent, the body covered with scales, the head crested, and the mouth spouting fire. The immediate source of the mediæval conception is probably the Scriptures, modi-

fied by accounts brought home by the crusaders of the crocodiles in Egypt.

DRAGON, or **DRAGON-LIZARD,** a name for several species of lizards inhabiting Asia, Africa, and South America. The common flying lizard, the best

The dragon of fable.

type of the genus, is about 10 or 12 inches in length, the tail being extremely long in proportion to the body. The sides are furnished with peculiar extensions of the skin, forming a kind of wings, which help to support it in the air when it springs from branch to branch. Its food consists almost exclusively of insects.

DRAGON-FLY, a family of neuropterous insects. They have a large head, large eyes, and strong horny mandibles. They are beautiful in form and color, and are of very powerful flight. They live on

Dragon-fly.

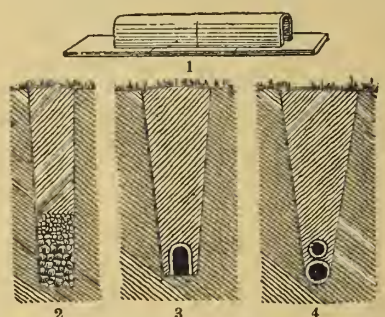
insects, and are remarkable for their voracity. The dragon-fly deposits its eggs in the water, where the larvæ and pupæ live on aquatic insects. The larval stage lasts for a year. The family is of very wide distribution.

DRAGON'S BLOOD, a resinous juice, usually obtained by incision from various tropical plants. It differs in composition, and is often much adulterated. It is opaque, of a reddish-brown color, brittle, and has a smooth shining conchoidal fracture. It is soluble in alcohol and oil, but scarcely so in water. It is used for coloring varnishes, staining marble, leather, and wood, for tooth tinctures, etc.

DRAGON-TREE, a tree-like lilaceous plant, with a stem simple or divided at top, and in old age often much branched. It is a native of the Canaries, and yields the resin known as dragon's blood. It is often grown in stoves and greenhouses.

DRAGOON', a kind of mounted soldier, so called originally from his musket (dragon) having on the muzzle of it the head of a dragon. At one time dragoons served both as mounted and foot soldiers, but now only as the former.

DRAINAGE, in agriculture, a method of improving the soil by withdrawing the water from it by means of channels that are generally covered over. The successful practice of draining in a great measure depends on a proper knowledge of the superficial strata, of their situation, relative degrees of porosity, etc. Some strata allow water to pass through them, while others more impervious force it to run or filtrate along their surfaces till it reaches more level ground below. In general where the grounds are in a great measure flat and the soils of materials which retain the excess of

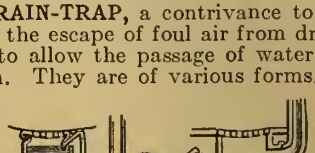


1, Horse-shoe tile with sole. Sections of drain —2, Stone drain. 3, Drain with horse-shoe tiles. 4, Drain with pipe-tiles.

moisture, they require artificial means of drainage to render them capable of yielding good crops whether of grain or grass. The wetness of land which makes it inferior for agricultural purposes, may appear not only as surface-water but as water which flows through the lower strata, and to draw off these there are the two distinct operations of surface-draining and under-draining. The rudest form of open drains are the deep furrows lying between high-backed ridges, and meant to carry off the surplus water after the soil is completely saturated, but in doing so they generally carry off also much of the best of the soil and of the manure which has been spread upon it. The ordinary ditch is a common form of water-course useful in certain cases, as in hill pastures. But covered drains at a depth of 4 feet or so are the common forms in draining agricultural lands. They are generally either stone-drains or tile-drains. Stone-drains are either formed on the plan of open culverts of various forms, or of small stones in sufficient quantity to permit a free and speedy filtration of the water through them. The box-drain, for instance, is formed of flat stones neatly arranged in the bottom of the trench, the whole forming an open tube. In tile-drains, tiles or pipes of burnt clay are used for forming the conduits. They possess all the qualities which are required in the formation of drains, affording a free ingress to water, while they effectually exclude vermin, earth, and other injurious substances. Drainage tiles and pipes have been made in a great variety of forms, the earliest of which, since the introduction of thorough draining, was the horse-shoe tile, so called from its shape. These should always rest on soles, or flats of burned clay. Pipe tiles, which combine the sole and cover in one piece, have been made of various shapes, but the best form appears to be the cylinder. An important department of draining is the draining off of the waters which are the sources of springs. Sometimes the judicious application of a few simple drains, made to communicate with the watery layers, will often dry swamps of great extent, where large sums of money, expended in forming open drains in the swamp itself, would leave it but little improved. In the laying out of drains the first point to be determined is the place of outfall, which should always afford a free and clear outlet to the drains, and must necessarily be at the lowest point of the land to be drained. The next point to be determined is the position of the minor drains; in the laying out of which the surface of each field must be regarded as being made up of one or more planes, as the case may be, for each of which the drains should be laid out separately. Level lines are to be set out a little below the upper edge of each of these planes, and the drains must then be made to cross these lines at right angles. By this means the drains will run in the line of the greatest slope, no matter how distorted the surface of the field may be. All the minor drains should be made to discharge into mains or submains, and not directly into an open ditch or water-course. As a general rule there should be a main to receive the waters of the minor drains from every 5 acres. The advantages of drainage are obvious. In the first place it allows the soil to be brought into a more suitable condition for the growth of plants, aiding in producing the finely-divided and porous state by which the roots and rootlets can spread themselves at will in order to obtain the needed supplies of food, air, and moisture. It also allows the sun's rays to produce their full effect on the soil and plants without being robbed of great part of it by the stagnant water.

DRAINAGE TUBES are used in surgery to effect a discharge of matter from an abscess or other collection of matter when a free incision cannot be safely or conveniently made. They are usually made of india-rubber or caoutchouc, and are introduced into the abscess or wound so that one end is in contact with the seat of discharge, while the other reaches to the surface of the skin.

DRAIN-TRAP, a contrivance to prevent the escape of foul air from drains, but to allow the passage of water into them. They are of various forms. In



Drain-trap.

the traps represented above it will be seen that there must always be certain quantity of water maintained to bar the way against the escape of the gas from

the drain or sewer. When additional liquid is conveyed to the trap there is of course an overflow into the drain. In the left-hand figure the gas is prevented from escaping by a metal plate thrown obliquely over the drain mouth and dipping into the water in the vessel beyond it.

DRAKE, Sir Francis, an English navigator, born at Tavistock, in Devonshire, in 1539. He joined Sir John Hawkins in his last expedition against the Spaniards (1567). Having gathered a number of adventurers round him he contrived to fit out a vessel in which he made two successful cruises to the West Indies in 1570 and 1571. Next year, with two small ships, he again sailed for the Spanish Main, captured the cities of Nombre de Dios and Vera Cruz, and took a rich booty which he brought safely home. In 1577 Drake made another expedition to the Spanish Main, having this time command of five ships. On this the most famous of his voyages Drake passed the Straits of Magellan, plundered all along the coast of Chili and Peru, sacked several ports, and captured a galleon laden with silver, gold, jewels, etc., to the value of perhaps $1,000,000. He then ran north as far as 48° n. lat., seeking a passage to the Atlantic, but was compelled to return to Port San Francisco on account of the cold. He then steered for the Moluccas, and holding straight across the Indian Ocean doubled the Cape of Good Hope, and arrived at Plymouth 3d Nov., 1580, being thus the first of the English circumnavigators. In 1593 he represented Plymouth in parliament. His later expeditions, that in 1595 against the Spanish West Indies and that to Panama, were not so successful, and his death, which took place in 1596 at sea off Porto Bello, was hastened by disappointment.

Sir Francis Drake.

DRAMA, a class of writings which almost entirely consist of dialogue, persons being represented as acting and speaking, and the pieces being usually intended to be acted on a stage by parties assuming the characters of the respective persons. Its two great branches are tragedy and comedy, the former, roughly speaking, melancholy in character, the latter cheerful. The origin of the drama must be sought for in the love of imitation, and dramatic performances of some kind are to be met with probably among all nations. Dramatic compositions are found in the Old Testament, for example, in Job and the Song of Solomon; and ancient India and China both developed a dramatic literature of their own. The European drama had its origin in Greece. Both forms, tragic and comic, took their rise in the celebrations of the Greek festivals of Dionysius (Bacchus), at which hymns and chants were sung by choruses in honor of the god, and the chorus continued to be a prominent feature of the old Greek drama. Greek comedy commenced about 580–560 B.C., with Susarion, but it was long in attaining regular form. Of the old Greek comedy the chief representatives were Cratinus, Eupolis, Pherecrates, and Aristophanes—the last the greatest. The invention of tragedy is generally ascribed to Thespis about 530 B.C., who was followed by Phrynichus. But the true creator of tragedy was Æschylus, in whose works and those of Sophocles and Euripides it found its most perfect expression.

In most modern European countries the regular drama took its rise in the mysteries, miracle-plays, and moralities of the middle ages. In Italy, however, it began with a reproduction in Latin of classical models. The earliest tragedy in Italian is Trissino's Sofonisba (1502). Regular comedies in Italian were written by Ariosto, Aretino, Macchiavelli, and others; and to the same period (15th and 16th centuries) belongs the Italian Pastoral Drama, which sprung from the ancient idylls, and aimed at a fanciful delineation of Arcadian and mythological scenes. Among the pastoral dramatists of this period are Poliziano, Tasso and Guarini. The pastorals gave birth to the opera, early masters of which, so far as it may be included in the poetic drama, are Zeno and Metastasio. The Italian drama waned in the 17th century, but in the 18th genuine comedy and classic tragedy were restored, the former by Goldoni, the latter by Alfieri. Monti, Manzoni, and Niccolini are among the later writers of tragedy.

The other European nations cultivated the dramatic art much later than the Italians. The English and Spaniards devoted their attention to it almost at the same time; the former reaching their acme in Shakespeare, the latter in Lope de Vega and Calderon. The history of the English theater and the drama is naturally divided into two parts, the first of which begins with the reign of Elizabeth and ends with the reign of Charles I. With Charles II. the drama reappeared, and exhibited a licentiousness hardly equalled by that of any other Christian nation. During the 19th century many writers have been conspicuous by their dramas. Among the chief of these may be noted Byron, Coleridge, Landor, Shelley, Maturin, Talfourd, Milman, Sir Henry Taylor, the first Lord Lytton, Knowles, R. H. Horne, Arnold, Browning, Swinburne, and Tennyson. Among other 19th century writers for the stage, who, however, may be called playwrights rather than dramatists, may be named, Douglas Jerrold, Tom Taylor, Charles Reade, Thomas Robertson, W. G. Wills, Henry Byron, Robert Buchanan, Dion Boucicault, W. S. Gilbert, etc.

The French drama was in a miserable state before Corneille (1606–84), who indeed is looked on as the founder of the drama in France. Racine, Molière, Voltaire, and in later times Hugo, are some of the other distinguished French dramatists. Since about 1820 a new dramatic school has been formed in France, which, departing from the ancient strictness of what is called the classic, approaches more and more to the German or British, or what is called the romantic school.

The German drama is of later birth than any we have mentioned, and for a long time the Germans contented themselves with translations and adaptations from the French. Lessing was the first who, by word and deed, broke the French sway (1755), and he was succeeded by Schiller and Goethe, who rank as the greatest of the more modern dramatists. Prominent names in the German drama are Kotzebue, Körner, Schlegel, Tieck, Brentano, Grillparzer, Hebbel, Ludwig, Gutzkow, Freytag, Laube, Von Moser, etc. The Dutch drama begins with the classical tragedies of Koster in the beginning of the 17th century, and reached its highest in Vondel (1587–1659). Holberg, Heiberg, Oehlenschläger, Ibsen, and Björnson are the chief names connected with the Scandinavian drama.

The American drama is on the same order as the English, and although no great dramatists have been developed in the U. States many plays of power have been written by American authors. Among them may be mentioned The Contrast, by Royall Tyler; The Prince of Parthia, by Godfrey; Brutus, or the Fall of Tarquin, by John Howard Payne; Metamora, by John A. Stone; and The Gladiator, by R. N. Bird. More recently a number of fairly good plays have been written, but the U. States has not produced a classic play since those above mentioned.

DRAPER, John William, an American historian, chemist, and philosopher, born in England in 1811, died in 1882. He came to the U. States as a boy and was early a teacher in Sidney College, Va. He made important contributions to the science of physical chemistry, but is popularly known for his two works The History of the Intellectual Development of Europe (1863) and The History of the Conflict Between Religion and Science (1874).

DRAPERY, the clothes or hangings with which any object is draped or hung; specifically in sculpture and painting, the representation of the clothing or dress of human figures.

DRAUGHT, the depth of a body of water necessary to float a ship; or the depth a ship sinks in water, especially when laden.

DRAUGHTS, a game resembling chess played on a board divided into sixty-four checkered squares. Each of the two players is provided with twelve pieces or "men" placed on every alternate square at each end of the board. The men are moved forward diagonally to the right or left one square at a time, the object of each player being to capture all his opponent's men, or to hem them in so that they cannot move. A piece can be captured only when the square on the diagonal line behind it is unoccupied. When a player succeeds in

moving a piece to the further end of the board (the crown-head), that piece becomes a king, and has the power of moving or capturing diagonally backward or forward. When it so happens that neither of the players has sufficient advantage in force or position to enable him to win, the game is drawn. Checkers is the common American name of the game.

DRAWBACK, usually a certain amount of duties or customs dues paid back or remitted to an importer when he exports goods that he has previously imported and paid duty on, as, for instance, tobacco, etc.; or a certain amount of excise paid back or allowed on the exportation of home manufactures.

DRAWBRIDGE, a bridge with a lifting floor, such as were formerly used for crossing the ditches of fortresses, or any movable bridge over a navigable channel where the height of the roadway is insufficient to allow vessels to pass underneath. Modern drawbridges across rivers, canals, the entrances of docks, etc., are generally made to open horizontally, and the movable portion is called a bascule, balance, or lifting bridge, a turning, swivel, or swing bridge, or a rolling bridge, in accordance with the mode in which it is made to open. Swing-bridges are usually divided into two parts meeting in the middle, and each moved on pivots on the opposite sides of the channel, or they may move as a whole on a pivot in the middle of the channel. Rolling bridges are suspended from a structure high above the water, and are propelled backward and forward by means of rollers.

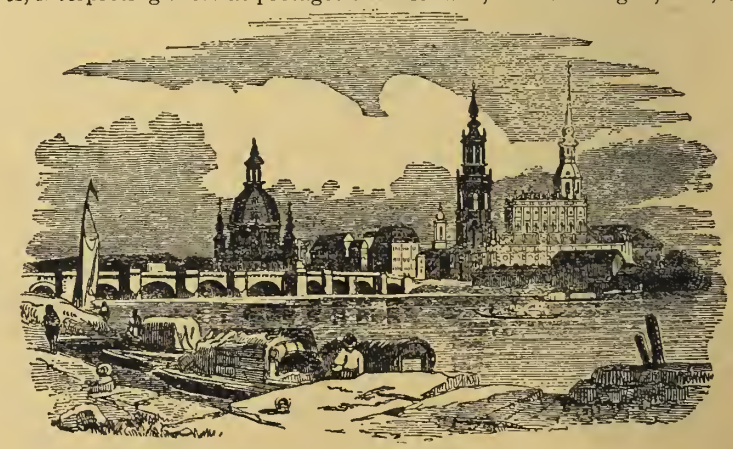
DRAWING is the art of representing upon a flat surface the forms of objects, and their positions and relations to each other. The idea of nearness or distance is given by the aid of perspective, foreshortening, and gradation. The term drawing, in its strict sense, is only applicable to the representing of the forms of objects in outline, with the shading necessary to develop roundness or modeling. In art, however, the term has a wider significance. Highly-finished paintings in water-color are called drawings, as are also sketches or studies in oils. Drawing, in its restricted sense, may be divided into these kinds: (1) pen drawing; (2) chalk drawing, which may include lead-pencil drawings; (3) crayon drawing; (4) drawing shaded with the brush or hair-pencil; (5) architectural or mechanical drawing. Pen drawings are often confined to pure outlines; an appearance of relief or projection being given by thickening or doubling the lines on the shadow side. Finished pen drawings have all the shading produced by combinations of lines. Chalk drawings (including lead-pencil drawings) are most suited for beginners, as errors can be easily corrected. Black, red and white chalks are used. When the chalk is powdered and rubbed in with a stump, large masses and broad effects can be produced with much rapidity. A combination of hatching and stumping is generally preferable to adhering exclusively to either mode. Crayon drawings are those in which the true colors of the objects represented are more or less completely wrought out with different colored crayons. Drawings shaded with the brush are outlined with the pencil or pen, the shading being laid on or washed in with the brush in tints of India ink, sepia, or color. Architectural and mechanical drawings are those in which the proportions of a building, machine, etc., are accurately set out for the guidance of the constructor: objects are in general delineated by geometric or orthographic projection.

DREAMS, trains of ideas which present themselves to the mind during sleep. The principal feature of the state of dreaming is the absence of voluntary control over the current of thought, so that the principle of suggestion has unlimited sway. There is usually an utter want of coherency in the images that appear before the mental eye, but this want excites no surprise in the dreamer. Occasionally, however, intellectual efforts are made during sleep which would be difficult to surpass in the waking state. It is said that Condillac often brought to a conclusion in his dreams reasonings on which he had been employed during the day; and that Franklin believed that he had been often instructed in his dreams concerning the issue of events which at that time occupied his mind. Coleridge composed from 200 to 300 lines during a dream; the beautiful fragment of Kubla Khan, which was all he got committed to paper when he awoke, remains a specimen of that dream-poem. Dreams are subjective phenomena dependent on natural causes. They generally take their rise and character from external bodily impressions, or from something in the preceding state of body or mind. They are, therefore, retrospective and resultant instead of being prospective or prophetic. The latter opinion has, however, prevailed in all ages and among all nations; and hence the common practice of divination or prophesying by dreams, that is, interpreting them as presages of coming events. Some authorities declare that all our dreams take place when we are in process of going to sleep or becoming awake, and that during deep sleep the mind is totally inactive. This is denied by the majority of philosophers, and with apparent reason.

DREDGING, a term applied to the operation of removing mud, silt, and other deposits from the bottom of harbors, canals, rivers, docks, etc. The steam dredging-machine now in common use has a succession of strong iron buckets on an endless chain, which traverses on a frame whose lower end is vertically adjustable so as to regulate the depth at which it works. It is worked by steam, and the buckets tear up the matter at the bottom, raise it, and discharge it into punts or hoppers stationed close to the dredging vessel. Dredging is also the operation of dragging the bottom of the sea in order to bring up oysters, or to procure shells, plants, and other objects for scientific observation. The oyster dredge is a light iron frame with a scraper like a narrow hoe on one side, and a suspending apparatus on the other. To the frame is attached a bag made of some kind of netting to receive the oysters. The dredges used by naturalists are mostly modifications of or somewhat similar to the oyster dredge. Scientific dredging has of late assumed a high importance as making us acquainted with the life of deep-sea areas.

DRED SCOTT CASE, a celebrated case decided by the United States Supreme Court in 1857. Scott was the slave of a Missouri owner who brought him into Illinois and later into Minnesota. There he was permitted to marry and raise a family On his return to Missouri he sued for freedom on the ground that his residence in Illinois and Minnesota (which were free soil) had enfranchised him. All the lower courts decided against him and so did the supreme court which held that negroes descended from negro slaves had no standing in the courts. In his decision Justice Taney used the oft-quoted words, "the negroes had no rights which the white man was bound to respect."

DRENTHE (dren'te), a province, Holland, bounded by Hanover, Overijssel, Friesland, and Groningen; area, 948 sq miles. Drenthe is remarkable for the great number of so-called "giants" graves' or barrows scattered over the country. Its capital is Assen. Pop. 125,792.



Dresden—The old bridge, Court church, and church of Our Lady.

DRES'DEN, the capital of the kingdom of Saxony, is situated in a beautiful valley on both sides of the river Elbe, which is here spanned by three stone

bridges. It is first mentioned in history in 1206, and has been the residence of the sovereigns since 1485; was greatly extended and embellished by Augustus the Strong (1694–1736), and rapidly increasd duing the 19th century. Among the chief edifices besides several of the churches are the Museum (joined on to an older range of buildings called the Zwinger), a beautiful building containing a famous picture-gallery and other treasures; the Japanese Palace (Augusteum), containing the royal library of from 300,000 to 400,000 volumes, beside a rich collection of manuscripts; the Johanneum, containing the collection of porcelain and the historical museum, a valuable collection of arms, armor, domestic utensils, etc., belonging to the middle ages. The city is distinguished for its excellent educational, literary, and artistic institutions, among which are the Polytechnic School, much on the plan and scale of a university; the Conservatory and School of Music; the Academy of Fine Arts, etc. The chief glory of Dresden is the gallery of pictures, one of the finest in the world, which first became of importance under Augustus II., king of Poland and elector of Saxony, but owes its most valuable treasures to Augustus III., who purchased the greater portion of the gallery of the Duke of Modena. The pictures number about 25,000, and in particular comprise many fine specimens of the Italian, Dutch, and Flemish schools. Besides this fine collection the museum contains also engravings and drawings amounting to upward of 350,000. There is here also a rich collection of casts exemplifying the progress of sculpture from the earliest times, and including copies of all the most important antiques . Pop. (1900), 395,349.

DRESDEN CHINA, a delicate, semi-transparent, highly-finished china made at Meissen, near Dresden. The manufacture resulted from an accidental discovery made by Böttger, a young chemist, in 1710, and the vases, statuettes, groups of figures, candelabra, clocks, etc., manufactured during the 18th century are highly prized. They are more remarkable for excellence of execution than for purity of design.

DREW, Daniel, an American capitalist, born in New York in 1788, died in 1879. He was one of the most important of the earlier railroad builders and developers and was at one time associated with Cornelius Vanderbilt.

DREW, John, an American actor, born in Dublin, Ireland, in 1825, died in 1862. He was well known in his day as a clever comedian.

DREW, John, an American actor, son of John Drew, born in 1853. About 1879 he became the leading man with Daly's company, and in 1892 he appeared as a star. Drew has a wide range of comedy power from Petruchio, in the Taming of the Shrew, to Richard Carvel. He is one of the most popular of American actors.

DREW THEOLOGICAL SEMINARY, a Methodist Episcopal theological school founded in 1866 at Madison, N. J., by donations from Daniel Drew. The property of the seminary amounts to $1,170,000, and the library contains 73,000 volumes. No tuition fees are charged.

DREXEL INSTITUTE of Art, Science, and Industry, an institution founded by Anthony Drexel at Philadelphia in 1891. The buildings and endowments aggregate $6,000,000, technical courses are given, and there is a registration of perhaps 5,000 students. The library contains 30,000 volumes, and the institute conducts extension lectures and courses of great utility.

DREYFUS, Alfred, a French officer of artillery, who was convicted of treason in 1894, stripped of his uniform and banished to the Ile du Diable off the coast of Guiana. During his imprisonment his friends unearthed the conspiracy which caused his conviction, and Dreyfus was recalled, re-tried and fully acquitted. His rank and uniform were returned to him; he was made an officer of the Legion of Honor and other honors were done him, one especially being worthy of mention, that of placing the body of Emile Zola in the Pantheon because he had defended the honor of Dreyfus. Although the case made a great stir its chief interest (aside from the sufferings of the victim) hinges on the stupidity of the French courts and the hatred of the French for Jews.

DRIFT, in geology, a term applied to earth and rocks which have been conveyed by icebergs or glaciers and deposited over the surface of a country; variously called Diluvium, Diluvial, Glacial, or Northern Drift, Boulder Formation, etc. Geologists now often use instead of Drift the terms stratified or unstratified Boulder Clay, which were not formerly recognized as distinct formations.

DRIFT, in mining, the course or direction of a tunnel or gallery; or a passage between two mine shafts.

DRIFT SAND, sand thrown up by the waves of the sea, and blown when dry some distance inland until arrested by large stones, tree roots, or other obstacles, round which it gradually accumulates until the heaps attain considerable dimensions, often forming dunes or sand-hills.

DRILL, a tool used for boring holes in wood, metal, stone, ivory, etc. It consists of a sharp chisel to which a circular motion is communicated by various contrivances. For drilling iron, steel, etc., a lathe driven by steam is generally used, the drill being fixed into a chuck and the work pressed against it as it revolves. For rock-boring the diamond rock-drill, an instrument with cutting edges made of boart or black diamond, is now generally adopted. See Boring.

DRILL, a fine linen texture of a satiny finish, used for gentlemen's summer dresses. Plain drills are worked with five shafts, fancy patterns with eight.

DRILL, the course of instruction in which a soldier or sailor is taught the use of arms and the practice of military and naval evolutions.

DRILL, a species of baboon, of a smaller size and less fierce disposition than the mandrill, and like it a native of the coast of Guinea. The face and ears are bare and of a glossy black color, the palms of the hands and soles of the feet are also naked and of a deep copper color.

DRILLING, the plan of sowing in parallel rows as distinguished from sowing broadcast. The crops which are now generally drilled are turnips, potatoes, beans, pease, carrots, clover, cereals, flax, etc. The first form of drill was of very simple construction, and was only adapted for sowing one row at a time, but now a great variety of improved implements are in use.

DRINK. See Dietetics.

DRINKING FOUNTAIN, an erection, often ornate and artistic, on or near a public thoroughfare or place of resort, for supplying people, and sometimes also horses, dogs, etc., with water to quench their thirst,

DRIPSTONE, a projecting tablet or molding over the head of a doorway, window, archway, or niche to throw off the rain. It is also called a weather

Dripstone, Westminster Abbey.

molding, and label when it is turned square. It is of various forms; sometimes a head is used as a termination or support, at others an ornament or simple molding is adopted.

DRIVING-WHEEL, in machinery, a wheel that communicates motion to another or others; in railway locomotives the large wheel which is fixed upon the crank-axle or main shaft.

DROME, a southeast department of France, covered almost throughout by ramifications of the Alps, the average height of which, however, does not exceed 4000 feet; area, 2508 sq. miles. Valence is the capital. Pop. 314,615

DROMEDARY, the Arabian and African camel, difierent from the Bactrian camel in having only one hump on the back. It has also more slenderness and symmetry of form. Its usnal pace is a

Dromedary, or Arabian camel.

trot, which it often maintains for many hours together at the rate of 9 miles an hour. The dromedary surpasses other camels in speed, and can travel several several days without drink. It is extensively used as a beast of burden in Africa and Arabia.

DROPSY, a disease which consists in the collection of serous or watery fluid in the cellular tissue, or in different cavities of the body. It receives different appellations according to the particular situation of the fluid. When it is diffused through the cellular tissue, either generally or partially, it is called anasarca; when it is deposited in the cavity of the cranium it is called hydrocephalus; when in the chest, hydrothorax, or hydrops pectoris; when in the abdomen, ascites; in the uterus, hydrometra; within the scrotum, hydrocele; and within the ovary, ovarian dropsy. Obstructive organic disease of the heart and degenerative diseases of the kidneys are the most common causes of general dropsy. The treatment often includes removal of the fluid from the cavities containing it by tapping or puncturing; otherwise drugs which stimulate excretion by the skin, bowels, and kidneys are employed, but all remedies frequently prove ineffectual.

DROSKY, a kind of light, four-wheeled carriage used by the Russians. It is not covered, and in the middle there rises a sort of bench placed lengthwise on which the passengers ride as on a saddle; but the name is now applied to various kinds of vehicles, as to the common cabs plying in the streets of German cities, etc.

DROWNING means death by the air being prevented entering the lungs owing to the mouth and nostrils being immersed in a liquid, the liquid being commonly water. Death may, therefore, occur by drowning in a small quantity of water. Thus a child may fall head downwards into a tub and be drowned, though the tub is not half full of water, sufficient to cover the mouth and nostrils being all that is necessary and a man overcome by a fit or by drunkenness may fall on a road with his head in a ditch or pool of water, and thus meet death. Death is thus due to suffocation, to the stoppage of breathing and to the entrance of water into the lungs. When death has been caused by drowning, the skin presents the appearance called goose-skin (cutis anserina), the face and surface of the body generally are usually pale, a frothy liquid is found in the lungs and air-passages, and about the lips and nostrils; water may be found in the stomach and clenched fingers, holding substances grasped at, may serve to show that a struggle had taken place in the water and that the body was alive at the time of immersion. Complete insensibility arises, it is probable, in from one to two minutes after submersion, recovery, however, being still possible, and death occurs in from two to five minutes. So long as the heart continues to beat, recovery is possible; after it has ceased it is impossible. Newly born children and young puppies stand submersion longer than the fully grown.

Remedies: Pull the body up on to dry ground. Send immediately for medical assistance, warm blankets, dry clothing, brandy and hot water, if any one is at hand to send. No delay must be permitted, however, in treating the person, so that if only one person is on the spot, he must begin to treat the person instantly, without seeking assistance. Remove all clothing from the neck and chest. Fold the article of dress removed so as to make a firm pillow, which is to be placed under the shoulders, so that the upper part of the body is slightly raised and the head slightly thrown back. Cleanse the mouth and nostrils, open the mouth and pull forward the tongue. If natural efforts to breathe are made, try to stimulate them by brisk rubbing of the sides of the chest and of the face. If no effort to breathe is made, proceed to produce the entrance and outflow of air from the lungs by Sylvester's or Howard's method.

Sylvester's method: Stand or kneel behind the person's head, grasp each arm at the elbow, draw both arms simultaneously upward till they are extended in line with the body, as a man places them when he stretches himself. Let this movement occupy about 2 seconds. This enlarges the chest and causes the entrance of air to the lungs. Without a pause carry the arms down to the sides, making them overlap the chest a little, and firmly press them on the chest. This movement should occupy another 2 seconds. It expels air from the lungs. Repeat the movements, and maintain them steadily and patiently at the rate of 15 times a minute, until breathing has been fully restored, or until medical aid arives, or until death is certain. An hour is not too long a time to persist, and so long as there seems at least effort to breathe the efforts must be persevered in.

Howard's method: Place the body on its face, with the roll of clothing under the stomach; the head being supported on the hand as shown in Figure 1. Pull the body over the roll of clothing to expel water from the chest. Then turn the body on the back, the shoulders being supported as shown in Fig. 2. Kneel over the body. Place both hands on the lower part of the chest, so that the thumbs hook in under the lowest ribs and the fingers are spread out on the chest. Steadily press forward, raising the ribs, your own body being thus thrown leaning forward. This enlarges the cavity of the chest and causes air to enter. When the ribs have been raised to the utmost extent, with a slight effort push yourself back to the more erect position, allowing the ribs to recoil to their former position. This expels the air. Repeat the process 15 times a minute. One person will find it more easy to maintain this method for a prolonged period than Sylvester's, especially if the patient be big and heavy.

Meanwhile, if other persons are present they should be occupied rubbing the body and limbs (always upward) with hands or warm flannel, applying hot flannels, bottles, etc., to the limbs, feet, arm-pits, etc. As soon as the person is sufficiently restored to be able to swallow, give small quantities of hot brandy and water, hot wine and water, hot coffee, etc., and use every effort to restore and maintain warmth.

Drowning was formerly a mode of capital punishment in Europe. The last person executed by drowning in Scotland suffered death in 1611. In Ireland there was an execution by drowning as late as 1777.

Fig. 1.

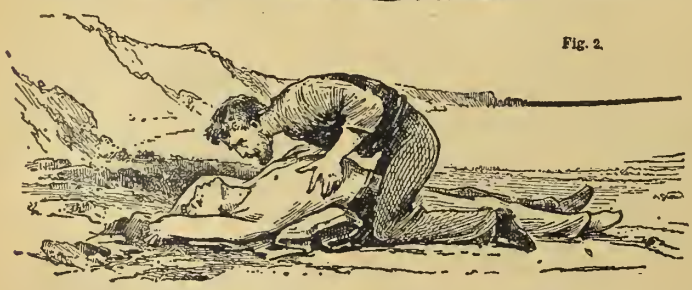


Fig. 2.

Howard's method for restoring the apparently drowned.

DRUGGET, a coarse kind of woolen felt or cloth, formerly used by the lower classes for purposes of clothing, but now chiefly used as a covering for carpets.

DRUGS, a general name for any substances, vegetable, animal or mineral, used in the composition or preparation of medicines; also applied to ingredients used in chemical preparations employed in the arts.

DRUIDS, the priests of the Celts of Gaul and Britain. According to Julius Cæsar they possessed the greatest authority among the Celtic nations. They had some knowledge of geometry, natural philosophy, etc., superintended the affairs of religion and morality, and performed the office of judges.

DRUM, a musical instrument of percussion, of Eastern origin, either cylin-

drical or hemispherical in shape, with the end or ends covered with tightened parchment, which is stretched or slackened at pleasure by means of cords with sliding knots or screws. Drums are of three kinds: (1) the long or bass drum played with stuffed-nob drum-sticks, and used only in large orchestras or military bands; (2) the side-drum, having two heads, the upper one only being played upon by two sticks of wood; (3) the kettle-drum, a hemisphere of brass or copper, the end of which is covered with parchment, always used in pairs, one drum being tuned to the key-note, and the other to the fifth of the key, the compass of the two together being an octave.

DRUM-FISH, and other species of the same genus, fishes found on the Atlantic coasts of N. America, and so named from the deep drumming sound they make. They often weigh about 20 lbs.

DRUM-MAJOR, or **SERGEANT-DRUMMER,** a non-commissioned officer whose duty it is to teach and direct the drummers. He marches at the head of the band carrying the regimental baton.

DRUMMOND, Prof. Henry, was born at Stirling in 1851, and educated at the universities of Edinburgh and Tübingen. He died in 1897. He traveled much, and wrote a popular book on Tropical Africa (1888). His most remarkable work is Natural Law in the Spiritual World (1883), which has passed through many editions and been translated into various languages. He is author also of Travel Sketches in Our New Protectorate; The Greatest Thing in the World; The Ascent of Man (1894), etc.

DRUMMOND, Thomas, the inventor of the lime-ball light known by his name, was born in Edinburgh in October, 1797, and died at Dublin, April 15, 1840. He invented a heliostat, and first used the light which bears his name about 1825 during the survey of Ireland. He subsequently entered political life, and became in 1835 under-secretary for Ireland, a country which he practically ruled with the utmost success for five years.

DRUMMOND LIGHT, a very intense light produced by turning two streams of gas, one of oxygen and the other of hydrogen, in a state of ignition upon a ball of lime. This light was proposed by Capt. Drummond to be employed in light-houses. See Lime-light.

DRUNKENNESS, the state of being drunk or overpowered by alcoholic liquor, or the habit of indulging in intoxication. A similar condition may be produced by numerous agents, but the term is always applied to the act or habit of drinking alcoholics to excess. Drunkenness is no excuse for any crime, but it renders a contract invalid if either of the parties was in a state of complete drunkenness when the contract was signed.

DRUSUS, the name of several distinguished Romans, among whom were: —Marcus Livius, orator and politician; became tribune of the people in 122 B.C. He opposed the policy of Caius Gracchus, and became popular by planting colonies.—Marcus Livius, son of the above, was early a strong champion of the senate or aristocratic party, but showed great skill in manipulating the mob. He rose to be tribune of the people, and was assassinated B.C. 91.—Nero Claudius, brother of the Emperor Tiberius, born B.C. 38. By a series of brilliant campaigns he extended the Roman empire to the German Ocean and the river Elbe, and was hence called Germanicus. By his wife Antonia, daughter of Mark Antony, he had a daughter, Livia, and two sons, Germanicus and Claudius, the latter of whom afterward became emperor. He died in B.C. 9.

DRY'ADS, wood nymphs, in the Greek mythology; supposed to be the tutelar deities of trees. Each particular tree or wood was the habitation of its own special dryad.

DRY'DEN, John, English poet, was born near Aldwinkle, Northamptonshire, in 1631, and went to Trinity College, Cambridge, being here elected to a scholarship. After leaving the university he went to London, and on the death of

John Dryden.

the Protector he wrote his Heroic Stanzas on that event. In 1661 he produced his first play, The Duke of Guise. This was followed by The Indian Queen, a tragedy, and The Indian Emperor, which at once raised Dryden to the highest pitch of public estimation, an elevation which he retained till his death. He published a translation of Juvenal, and one of Persius. About a third part of Juvenal was translated by Dryden, who wrote an essay on satire which was prefixed to the whole. His poetic translation of Virgil appeared in 1697, and, soon after, that masterpiece of lyric poetry, Alexander's Feast, his Fables, etc. He died May 1st, 1700, in the sixty-ninth year of his age, and was buried in Westminster Abbey. Dryden is unequalled as a satirist among English poets, and the best of his tragedies are unsurpassed by any since written. His poetry as a whole is more remarkable for vigor and energy than beauty, but he did much to improve English verse. He was also an admirable prose writer. Personally he was modest and kindly.

DRYING-MACHINE, a machine used in bleaching, dyeing, and laundry establishments, consisting of two concentric drums or cylinders, one within the other, open at the top, and having the inner cylinder perforated at its side with numerous small holes. The goods to be dried are placed within the inner cylinder, and the machine is then made to rotate with great velocity, when, by the action of centrifugal force, the water escapes through the holes in the side. The action of the drying-machine is the same in principle as that witnessed when a person trundles a mop to dry it.

DRYING-OIL, the name given to linseed and other oils which have been heated with oxide of lead; they are the bases of many paints and varnishes. When exposed to the air they absorb oxygen, and are converted into a transparent, tough, dry mass or varnish.

DRY-POINT, a sharp-pointed instrument used by engravers to incise fine lines in copper without the plate being covered with etching-ground or the lines bit in by acid. This tool is much employed in working the more delicate portions of plates produced as etchings.

DRY-ROT, a well-known disease affecting timber, occasioned by various species of fungi, the mycelium of which penetrates the timber, destroying it.

DUAL, in grammar, that number which is used, in some languages, to designate two things, whilst another number (the plural) exists to express many. The Greek, Sanskrit, and Gothic of ancient languages, and the Lithuanian and Arabic of modern, possess forms of the verb and noun in which two persons or things are denoted, called the dual numbers.

DUBAR'RY, Marie Jeanne, Comtesse, mistress of Louis XV., was born at Vaucouleurs 1746. She came young to Paris, entered on an immoral course, and was presented to the king in 1769, who had her married for form's sake to the Count du Barry. She exercised a powerful influence at court, and with some of her confidants completely ruled the king. Important offices and privileges were in her gift, and the courtiers abased themselves before her. After the death of Louis she was dismissed from court and sent to live in a convent near Meaux. She received a pension from Louis XVI. During the reign of terror she was arrested as a royalist and executed, Nov. 1793.

DUB'LIN, the metropolis of Ireland, is situated in co. Dublin, on the east coast of the island, at the mouth of the Liffey, the banks of which for more than two miles from the sea are lined with quays. The river, which divides the city into two unequal parts, is crossed by numerous bridges. The principal public secular buildings are the Castle, the official residence of the viceroy; the Bank of Ireland, formerly the Irish parliament house; Trinity College; the courts of justice; the custom-house; the King's Inns; the post-office; rotunda; corn exchange; commercial buildings; the mansion house; city hall or corporation buildings; etc. The most important literary and scientific institutions are Trinity College (Dublin University); the Royal University; the Royal College of Science; the Roman Catholic University; the College of Surgeons; the Royal Dublin Society; the Royal Hibernian Academy of Painting, Sculpture and Architecture; the Royal Irish Academy for Promoting the Study of Science, Literature, and Antiquities; the Archæological Society; the Royal Zoological Society; etc. Dublin contains two Protestant Episcopal cathe-

drals—St. Patrick's Cathedral, erected in 1190, and thoroughly restored between 1860 and 1865; and Christ's Church, built in 1038 and also recently restored, both restorations being carried on by private munificence. The Roman Catholic Cathedral is a very large edifice. A little northwest of the city, up the Liffey, is the Phœnix Park, with an area of 1759 acres. In it are the Viceregal Lodge, the residence of the Lord Lieu-

Sackville street, Dublin, showing the O'Connell monument, the post office, and the Nelson monument.

tenant; the chief secretary's and under secretary's official residences; the Royal Hibernian Military School, and the depot of the Royal Irish Constabulary; as also the gardens of the Royal Zoological Society. The manufactures carried on are of little note: poplins, for which Dublin has been long celebrated, are still in some request, and brewing and distilling are largely carried on. Pop. 289,108.—The county, which is in the province of Leinster, on the east coast of the island, has an area of 226,895 acres, or 354 square miles, about a third of it under crops of various kinds, chiefly grass and clover. Pop. 447,266.

DUBLIN, University of, an institution founded in 1591, when a charter, or letters-patent, was grantd by Queen Elizabeth for the incorporation of the "College of the Holy and Undivided Trinity," the University and Trinity College being practically the same. The corporation now consists of a provost, seven senior fellows, twenty-six junior fellows, and seventy foundation scholars. The senate of the university consists of "the chancellor of the university, or, in his absence, of the vice-chancellor, and such doctors or masters of the university as shall have and keep their names on the books of Trinity College." The senate possesses the right of electing the chancellor of the university; it is also the body which grants degrees. The fellows are appointed for life, after an examination. The scholars are chosen from among the under-graduates, after an examination in mathematics and logic, or in Greek, Latin, and logic. The scholarships are tenable for five years, or till the degree of M.A. is attained. The course of general instruction extends over four years. The college possesses a library of about 200,000 printed volumes and 1700 manuscripts. It has also a botanic garden and museum.

DUBUQUE (du-buk'), a city in Iowa, on the right bank of the Mississippi. It occupies an important commerical position as a railway center and entrepôt for the agricultural and mineral products of the northern half of Iowa, and the timber of Wisconsin, and also from the valuable lead-mines in its vicinity. Pop. 1909, 50,000.

DU CHAILLU (du-shā-yü), Paul Belloni, traveler, born in Paris, 1835. He spent his youth in the French settlement at the Gaboon, on the west coast of Africa, where his father was a merchant. In 1852 he came to the U. States, of which he afterward became a naturalized citizen. In 1855 he began his first journey through western Africa, and spent till 1859 alone among the different tribes, traveling on foot upward of 8000 miles. He collected several gorillas never before hunted, and rarely, if ever, before seen by any European. The result of this journey was published in 1861. A second expedition was made in 1863, an account of which, under the title A Journey to Ashango Land, appeared in 1867. The Land of the Midnight Sun, an account of a tour in northern Europe (1881), had a considerable success. He died in 1903.

DUCK, the name common to all the web-footed birds constituting the land-ducks and sea-ducks. The ducks are very numerous as species, and are met with all over the world. They are often migratory, going northward in summer to their breeding-places. Their food is partly vegetable, partly animal. The common mallard or wild-duck is the original of the domestic duck. In its wild state the male is characterized by the deep green of the plumage of the head and neck, by a white collar separating the green from the dark chestnut of the lower part of the neck, and by having the four middle feathers of the tail recurved. The wild-duck is taken in large quantities by decoys and other means. Some tame ducks have nearly the same plumage as the wild ones; others vary greatly, being generally duller or pure white, but all the males have the four recurved tail-feathers. There are several favorite varieties of the domestic duck, those of Normandy and Picardy in France, and the Aylesbury ducks in England, being remarkable for their great size and delicacy of flesh. The musk-duck, erroneously called Muscovy duck, a native of south America, is the largest of the duck kind, and approaches nearly to the size of a goose. The canvas-back duck is peculiar to America, and is celebrated for the excellence of its flesh. Other species of ducks are the shoveler, remarkable for the strange form of its bill; the gadwall, which is more rare in America than in Europe; the pintail or sprigtail, remarkable for the form of its tail, abundant in both hemispheres; the black or dusky duck, peculiar to America, and very abundant; the summer or wood duck, remarkable for its great beauty, and for its migrations being directly opposed to those of the other species; the teal; the eider-duck, so well known for its valuable down; the scoter; the pochard or red-head; the scaup-duck or blue-bill; the long-tailed duck; the harlequin-duck all found on both continents.

DUCK, a species of coarse cloth made of flax, lighter and finer than canvas.

DUCKING-STOOL, a stool or chair in which common scolds were formerly tied and plunged into water. They were of different forms, but that most commonly in use consisted of an upright post and a transverse movable beam on which the seat was fitted or from which it was suspended by a chain. The ducking-stool is mentioned in the Doomsday survey: it was extensively in use throughout the country from the 15th till the beginning of the 18th century, and in one rare case at least—at Leominster—was used as recently as 1809.

DUCKWEED, the popular name of several species of plants growing in ditches and shallow water, floating on the surface, and serving for food for ducks and geese. Five species are known in Britain, and others are common in America. They consist of small fronds bearing naked unisexual flowers.

DUCTIL'ITY, the property of solid bodies, particularly metals, which renders them capable of being extended by drawing, while their thickness or diameter is diminished, without any actual fraction or separation of their parts. On this property the wire-drawing of metals depends. The following is nearly the order of ductility of the metals which possess the property in the highest degree, that of the first mentioned being the greatest: gold, silver, platinum, iron, copper, zinc, tin, lead, nickel, palladium, cadmium. Dr. Wallaston succeeded in obtaining a wire of platinum only $\frac{1}{5000}$th of an inch in diameter. The ductility of glass at high temperatures seems to be unlimited, while its flexibility increases

in proportion to the fineness to which its threads are drawn.

DUDEVANT (düd-väṅ), Armantine-Lucile-Aurore Dupin, Madame, better known by the non de plume of George Sand, one of the greatest of French novelists, born 1804, died 1876. In 1822 she married Baron Dudevant, to whom she bore a son and a daughter; but in 1831 separated from him, and took up her residence in Paris. In conjunction with Jules Sandeau, a young lawyer, she wrote Rose et Blanche, which was published in 1831, with the pseudonym Jules Sand. The reception it met with afforded her an opportunity of publishing a novel solely by herself—Indiana, under the name of George Sand, which she ever after retained. Indiana had a brilliant success, but excited much criticism by its extreme views on social questions. This was also the case with many others of her works. She visited Italy with Alfred de Musset; and lived eight years with Frédéric-François Chopin, the composer. These relations also influenced or occasioned some of her works (as Elle et Lui, 1858). In 1836 she obtained a judicial separation from her husband, with the care of her children. She took an active interest in the revolution of 1848, and contributed considerably to newspaper and other political literature. In 1854 she published Histoire de Ma Vie, a psychological autobiography. Her published works consist of upward of sixty separate novels, a large number of plays, and numerous articles in literary journals.

DUE BILL, a brief acknowledgment of indebtedness, generally taking the form of the familiar "I. O. U" (I owe you). It is not a negotiable instrument, it does not promise to pay, but it is legally assignable by the payee.

DUEL, a premeditated and prearranged combat between two persons with deadly weapons, for the purpose of deciding some private difference or quarrel. The combat generally takes place in the presence of witnesses called seconds, who make arrangements as to the mode of fighting, place the weapons in the hands of the combatants, and see that the laws they have laid down are carried out. Upon every insult or injury which seemed to touch his honor, a gentleman thought himself entitled to draw his sword, and to call on his adversary to give him satisfaction, and it is calculated that 6000 persons fell in duels during ten years of the reign of Henry IV. His minister, Sully, remonstrated against the practice; but the king connived at it, supposing that it tended to maintain a military spirit among his people. In 1602, however, he issued a decree against it, and declared it to be punishable with death. Many subsequent prohibitions were issued, but they were all powerless to stop the practice. During the minority of Louis XIV. more than 4000 nobles are said to have lost their lives in duels. The practice of duelling was introduced into England from France in the reign of James I.; but it was never so common as in the latter country. Cromwell was an enemy of the duel, and during the protectorate there was a cessation of the practice. It came again into vogue, however, after the restoration, thanks chiefly to the French ideas that then inundated the court. As society became more polished duels became more frequent, and they were never more numerous than in the reign of George III. In France duelling still prevails to a certain extent; but the combats are usually very bloodless and ridiculous affairs. In the German army it is common, and is recognized by law. The duels of German students, so often spoken of, seldom cause serious bloodshed. In the United States duels are now uncommon. In some of the states the killing of a man in a duel is punishable by death or by forfeiture of political rights, and in a large number the sending of a challenge is a felony. In the army and navy it is forbidden. Among the celebrated duels fought in the U. States were those between Charles Lee and John Laurens, McIntosh and Gwinnett, Cadwallader and Conway, Hamilton and Burr, Dickinson and Jackson, Benton and Lucas, Clinton and Swartout, Randolph and Clay, and Graves and Cilley.

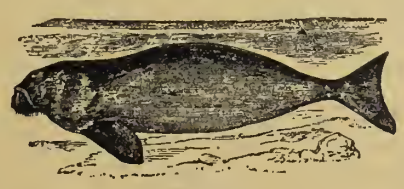
DUEN'NA, the chief lady-in-waiting on the Queen of Spain. In a more general sense, an elderly female holding a middle station between a governess and companion, appointed to take charge of the younger female members of Spanish and Portuguese families.

DUE PROCESS OF LAW, a term used to designate the regular procedure in litigation, prosecution, etc. It is very ancient, having been used in magna charta and also in the constitution of the U. States.

DUET, a musical composition for two voices or instruments.

DUFF'ERIN, Frederick Temple Hamilton-Blackwood, Marquis of, British statesman, born at Florence 1826. He began his public services in 1855, when he was attached to Earl Russell's mission to Vienna. Subsequently he was governor general of Canada and viceroy of India. He died in 1902. Beside being a noted diplomatist he was also a popular author. In 1847 he published Narrative of a Journey from Oxford to Skibbereen during the year of the Irish Famine; in 1860, Letters from High Latitudes; also various pamphlets on Irish questions. In 1888 he was made Marquis of Dufferin and Ava.

DU'GONG, a herbivorous mammal, belonging to the order Sirenia, which includes the manatees. It is a native of the Indian seas; possesses a tapering



Dugong.

body ending in a crescent-shaped fin, and is said sometimes to attain a length of 20 feet, though generally it is about 7 or 8 feet in length. The skin is thick and smooth, with a few scattered bristles; the color bluish above and white beneath. In its osteology it exhibits some points of correspondence with the Pachydermata. Its food consists of marine plants; it yields little or no oil, but is hunted by the Malays for its flesh, which resembles young beef, and is tender and palatable.

DU GUECSLIN (dü-gā-klāṅ), Bertrand, Constable of France, born about 1314, died 1380. Mainly to him must be attributed the expulsion of the English from Normandy, Guienne, and Poitou. He was captured by Chandos at the battle of Auray in 1364, and ransomed for 100,000 francs. While serving in Spain against Peter the Cruel he was made prisoner by the English Black Prince, but was soon liberated. For his services in Spain he was made Constable of Castile, Count of Trastamare, and Duke of Molinas; and in 1370 he was made constable of France.

DUKE, a title belonging originally to a military leader. In Britain it is the highest rank in the peerage, the corresponding female title being duchess. Royal Dukes have a special status and precedence. The first hereditary duke in England was the Black Prince, created by his father, Edward III., in 1336. The duchy of Cornwall was bestowed upon him, and was henceforward attached to the eldest son of the king, who is considered a duke by birth. The duchy of Lancaster was soon after conferred on Edward's third son, John of Gaunt, and hence arose the special privileges which these two duchies still in part retain. A duke in the British peerage, not of royal rank, is styled "your grace," and is "most noble;" his wife is a duchess. The coronet consists of a richly-chased gold circle, having on its upper edge eight golden leaves of a conventional type called strawberry leaves; the cap of crimson velvet is closed at the top with a gold tassel, lined with sarcenet, and turned up with ermine. (See Coronet.) At various periods and in different continental countries the title duke (Herzog in Germany) has been given to the actual sovereigns of small states. The titles "grand-duke" and "grand-duchess," "archduke" and "archduchess," are in use also on the European continent, the latter to distinguish the princes and princesses of the Austrian imperial family. In the Bible the word dukes is used, Gen. xxxvi., for the duces of the vulgate

DUL'CIMER, one of the most ancient musical instruments, used in almost all parts of the world. The modern instrument consists of a shallow trapezium-shaped box without a top, across which

Italian dulcimer.

runs a series of wires, tuned by pegs at the sides, and played on by being struck by two cork-headed hammers. It is in much less common use in Europe now than it was a century or two ago, and is interesting chiefly as being the prototype of the piano. It is still, however, occasionally to be met with on the Con-

tinent at rustic rejoicings, and in England in the hands of street musicians. The Hebrew psaltery is supposed to have been a variety of the dulcimer.

DULUTH (du-lüth'), capital of St. Louis co., Minnesota, at the s.w. extremity of Lake Superior. The Northern Pacific and Lake Superior. and Mississippi railways terminate here; and extensive docks and other works have been constructed affording a convenient outlet for the surrounding wheat region. 1909, 88,000.

DUMA, name of the Russian consultative national assembly granted to Russia by Czar Nicholas II. Aug. 19, 1905. The first and second duma were dismissed for advocating policies opposed by the government, and in 1908 a third was assembled that was subservient to the bureaucracy.

DUMAS (dü-mä), Alexander, French novelist and dramatist, born at Villers-Cotterets 1803. In 1823 he went to Paris, and obtained an assistant-secretaryship from the Duke of Orleans, afterward Louis Philippe. He soon began to write for the stage, and in 1829 scored his first success with his drama Henry III. It was produced when the battle between the Romanticists and the Classicists was at its height, and hailed as a triumph by the former school The same year appeared his Christine, and in quick succession Antony, Richard d'Arlington, Térésa, Le Tour de Nesle, Catharine Howard, Mlle. de Belle-Isle, etc. Dumas had now become a noted Parisian character. The critics fought over the merits of his pieces, and the scandal-mongers over his prodigality and galanteries. Turning his attention to romance, he produced a series of historical romances, among which may be mentioned, Les Deux Dianes; La Reine Margot; Les Trois Mousquetaires, with its continuations Vingt Ans Après, and Vicomte de Bragelonne. His Monte Cristo and several others are also well known to English readers through translations. Several historical works were also written by him. The works which bear his name amount to some 1200 volumes, including about 60 dramas; but the only claim he could lay to a great number of the productions issued under his name, was that he either sketched the plot or revised them before going to press. He earned vast sums of money, but his recklessness and extravagance latterly reduced him to the adoption of a shifty, scheming mode of living. In 1860 he accompanied Garibaldi in the expedition which freed Naples from the Bourbons. He died at the residence of his son, at Puys, near Dieppe, in 1870.

Alexander Dumas.

DUMAS, Alexander, son of the above, born 1824; novelist and dramatist. His works treat mostly of the relations between vice and morals. His first novels, La Dame aux Camélias and Diane de Lys, were very successful, as were also the plays which were founded on them. His dramas, which are much superior to his novels, deal satirically with the characters, follies, and manners of French society. He died in 1895.

DU MAURIER (dü-mō'ri-ā), George Louis Palmella Busson, artist and writer, was born in Paris 1834. After studying in Belgium and France he returned to London, and soon began to contribute drawings to Punch, Once a Week, Cornhill Magazine, etc. He succeeded Leech on Punch, and became famous chiefly through his drawings for that publication. He also illustrated various books, and wrote Trilby and two other tales. He died in 1896

DUMB. See Deaf and Dumb.

DUMBAR'TON, a royal and parliamentary burgh and seaport, Scotland, chief town of Dumbarton co., stands on the Leven near its junction with the Clyde, 16 miles w.n.w. Glasgow. Shipbuilding is carried on to a great extent, etc. Pop. 113,870.

DUMB-BELLS, weights usually in the form of two iron balls connected by a straight piece for holding, used in gymnastic exercises for strengthening the muscles of the arms and chest.

DUMBNESS. See Deaf and Dumb,

DUMFRIES (dum-frēs'), a river port, railway center, and parliamentary burgh, Scotland, capital of the county of same name, and the chief place in the south of Scotland. There are iron-foundries, hosiery and tweed factories, tanneries, coach-building works, etc. Dumfries is a place of great antiquity. The church of the Minorites which once stood here was the scene of the murder of the Red Comyn by Bruce in 1306. Burns spent his closing years here, and the street in which he lived now bears his name. His remains rest under a handsome mausoleum, and a statue of him was erected in 1882. Pop. 20,240.—The county abuts on the Solway Firth, having on its borders the counties of Lanark, Peebles, Selkirk, Roxburgh, Ayr, and Kirkcudbright; area, about 1100 sq. miles or 702,946 acres, of which about a third are under cultivation. The minerals most abundant are coal, lead, iron, antimony, and gypsum. Coal and lead are worked to a small extent. Limestone and freestone abound in various parts. Its principal towns are Dumfries, Annan, Sanquhar, Lockerbie, Moffat, and Lochmaben. Pop. 72,569.

DUMOURIEZ (dü-mö-ri-ā), Charles François Duperrier, a French general of great military talent, was born at Cambrai in 1739, died near Henley-on-Thames 1823. He served as an officer in the Seven Years' war. In 1778 he was appointed governor of Cherbourg; in 1792 he was minister of foreign affairs. War breaking out between France and Austria he resigned in order to take command of the army; invaded Flanders, and defeated the Austrians at Jemappes and conquered Belgium. Instead of prosecuting the war vigorously he now entered upon measures for the overthrow of the revolutionary government, issued a proclamation, in which he promised the restoration of the constitutional monarchy in the person of the heir to the crown, but was attacked by the Versailles volunteers, and compelled to flee (April 4, 1793). The convention set a price of 300,000 livres upon his head. At first he retired to Brussels, and after various wanderings found a final refuge in England, where he died in 1823.

General Dumouriez.

DUNABURG (dü'na-bürg), or Dvinaburg, a fortified town, Russia, government of Vitebsk, on the right bank of the Düna, or Dvina, 112 miles southeast from Riga. It carries on various industries, a considerable trade, and has three yearly fairs. The official name is Dvinsk. Pop. 72,518.

DUNBAR, Paul Laurence, an American negro poet, born in Ohio in 1872 died 1906. He published several volumes of poetry of considerable merit, among them being Oak and Ivy, Lyrics of Lowly Life, Poems of Cabin and Field, and Lyrics of the Hearth Side, When Melandy Sings, Howdy, Honey, Howdy, etc. Dunbar's verses were commended by William Dean Howells, to whose encouragement the poet owed much of his perseverance.

DUNBAR', William, the most eminent of all the old Scottish poets, was born, probably in East Lothian, about 1460–65. On the marriage of James IV. to Margaret of England Dunbar celebrated the event in a poem of great beauty, entitled, The Thistle and the Rose. He died about 1520.

DUN'CIAD, THE, a celebrated satirical poem by Pope, in which he gibbets his critics and foes. The first three books were published in 1728; the fourth book, or New Dunciad, appeared in 1742, with illustrations by Scriblerus and notes variorum. Cibber was latterly substituted for Theobald as the hero; and among others who figured in the satire were Ambrose Philips, Blackmore, Bentley, Defoe, Dennis, Shadwell, Settle, etc.

DUNDEE', a city, royal and parliamentary burgh, and seaport, Scotland, in the county of Forfar, on the north shore of the Firth of Tay, about 8 miles from the open sea, 37 miles n.n.e. of

Edinburgh. The most conspicuous building is St. Mary's Tower, or the Old Steeple as it is popularly called, 156 feet high, erected in the middle of the 14th century, and to which three modern parochial churches have been built in form of a cathedral, the nave, choir, and transept respectively forming a separate church. Among public buildings are: the town-hall, several public halls, the high school, exchange, infirmary, lunatic asylum, Albert Institute and free library, etc. The chief educational institution is the University College, for males and females, whose first session opened in 1883. The town has long been celebrated for its textile manufactures, particularly those of the coarser descriptions of linen, and it is now the chief seat of the linen trade in Scotland and of the jute trade in Great Britain, there being a great number of mills and factories engaged in the spinning and weaving of flax, jute, and hemp. Ship-building is extensively carried on, and there are large engineering establishments, etc. Population 160,871.

DUNDON'ALD, Thomas Cochrane, Tenth Earl of, British admiral, was born in Lanarkshire 1775, died 1860. In 1800 he was appointed to the Speedy sloop-of-war of fourten guns, and in the course of thirteen months captured over fifty vessels. In 1805, while in command of the Pallas frigate, he took some rich prizes, and for the next four years in the Impérieuse performed remarkable exploits in cutting out vessels, storming batteries, destroying signals, etc. On his return to England he entered parliament, and by his attacks on the abuses of the naval administration made himself obnoxious to the authorities. In 1818 he took service in the Chilian navy, his exploits greatly aiding the national independence of that country, as well as soon after of Brazil. He did much to promote the adoption of steam and the screw propeller in war ships.

DUNEDIN (dun-ē'din), capital of the provincial district of Otago, New Zealand, and the most important commercial town in the colony, stands at the upper extremity of an arm of the sea,

about 9 miles from its port, Port Chalmers, with which it is connected by railway. Though founded in 1848, its more rapid progress dates only from 1861, when extensive gold-fields discovered in Otago attracted a large influx of population. Wood is the staple export. There is a regular line of steamers between this port and Melbourne and communication is frequent with all ports of New Zealand. Population 52,390.

DUNES, low hills of sand accumulated on the sea-coasts of Holland, Britain, Spain, and other countries, in some places encroaching on and covering what once was cultivated land, but in others serving as a natural barrier to protect the country from the destructive encroachments of the sea.

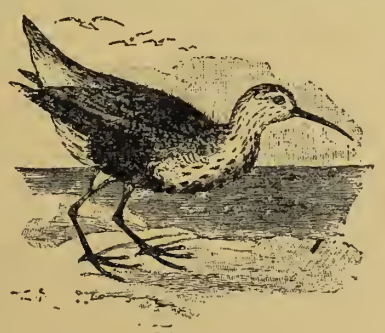
DUNGARPUR (dön-gar-pör'), an Indian native state in Rajputana; area, 1000 sq. miles; pop. 153,381.—Dungarpur is also the name of the chief town and residence of the Maharawal of the state.

DUNG BEETLE, a name applied to a large number of coleopterous insects from their habit of burying their eggs in dung.

DUNKERS, or TUNKERS, a religious sect in America, founded by Conrad Peysel, a German, in 1724, and which takes its name from the Ger. tunken, to dip, from their mode of baptizing converts. They reject infant baptism; use great plainness of dress and language; refuse to take oaths or to fight; and anoint the sick with oil in order to their recovery, depending on this unction and prayer, and rejecting the use of medicine. Every brother is allowed to speak in the congregation, and their best speaker is usually set apart as their minister. Called also Dippers, but by themselves Brethren.

DUNKIRK, a city, port of entry, and railway center in Chautauqua co., N. Y.; situated on Lake Erie, 40 miles s.w. of Buffalo. It is the western terminus of the Erie R. R., which connects it with New York city, 459 miles distant, and has a good harbor and an advantageous position for trade. Pop. 13,726.

DUN'LIN, a British bird, a species of sandpiper, occurring in vast flocks along sandy shores. It is about 8 inches in length from the point of the bill to the extremity of the tail, and its plumage



Dipper.

undergoes marked variations in summer and winter, the back passing from black with reddish edges to each feather, to an ashen gray, and the breast from mottled black to pure white. The American red-backed sandpiper is a different variety of dunlin, larger and with a longer or more decurved bill.

DUNLOP', a parish of Ayrshire, Scotland, which has given its name to an esteemed variety of cheese.

DUN'NAGE, faggots, boughs, or loose wood laid in the hold of a ship to raise heavy goods above the bottom to prevent injury from water; also loose articles of lading wedged between parts of the cargo to hold them steady.

DUNNE, Finley Peter, an American humorist, born at Chicago in 1867, and from 1885 to 1891 engaged as reporter, and later as editor and editorial writer for Chicago newspapers. In 1898 he published his first book of humor, "Mr. Dooley in Peace and War." Since that time he has published several other volumes, all devoted to the sayings of "Mr. Dooley," a convenient medium for the propagation of Mr. Dunne's deep and searching satire on human society and its shams. Mr. Dunne is probably the foremost of American humorists.

DUNOIS (du-nwä), Jean, Count of Orleans and of Longueville; a French hero, natural son of Louis, duke of Orleans, born 1402, died 1468. Dunois made the name "Bastard of Orleans" illustrious by his military exploits. He began his career with the defeat of Warwick and Suffolk, whom he pursued to Paris. Being besieged by the English he defended Orleans until relieved by the Maid of Orleans. In 1450 he had completely freed France from the English, and was rewarded by the title of "deliverer of his country," the county of Longueville, and the dignity of high chamberlain of France.

DUNS, John, commonly called Duns Scotus, an eminent scholastic divine, born 1265 or 1275, but whether in England, Scotland, or Ireland is uncertain. In 1304 he went to Paris, and was appointed professor and regent in the theological schools, in which situation he acquired the title of "the subtle doctor." Duns opposed Thomas Aquinas on the subject of grace and free-will; and hence the Scotists are opposed to the Thomists. Duns was the apostle of realism, which was opposed to the systems of nominalism and conceptualism promulgated by the other sections into which the schoolmen were divided. He died, it is said, at Cologne in 1308, leaving behind him numerous works.

DUNWOODY, Henry Harrison Chase, an American meteorologist, born in Ohio in 1842. Educated at West Point, he served for a time in the army, especially with the signal service and organized a large number of the weather stations in the U. States. He has published a number of important papers on meteorological subjects.

DUODECIMAL SYSTEM, in numeration, a system of numbers the scale of which is twelve. Duodecimals is a term applied to an arithmetical method of ascertaining the number of square feet, etc., in a rectangular area or surface whose sides are given in feet, inches and lines.

DUODEC'IMO (often contracted 12mo.) is that form of volume in which each leaf forms a twelfth part of the sheet.

DUODE'NUM, the commencement of the intestinal canal, the first of the smaller intestines, so called because its length is about twelve fingers' breadth (Lat. duodeni, by twelves).

DUQUESNE (dōō-kān'), a town in Allegheny County, Pa., one mile from McKeesport; on the Monongahela River, and on the Pennsylvania railroad. Its steelworks and blast-furnaces are extensive. Pop. 10,416.

DURAN'GO, a town in Mexico, capital of the state of Durango, about 500 miles n. w. Mexico, on an elevation 6845 feet above the sea. It is well built, has a cathedral, a mint, manufactures of cotton and woolen goods, leather, etc. Pop. 20,000.—The state (area, 42,530 sq. miles) is partly mountainous and unproductive, but has valuable gold, silver, and iron mines, and also fertile tracts. Pop. 196,852.

DUR'BAN, the chief port of the colony of Natal, S. Africa, on a landlocked bay (Port Natal). Pop. 57,000.

DURER (dū'rĕr), Albert, German painter, designer, sculptor, and engraver on wood and metal, born at Nürnberg 1471, died there 1528. In 1505 he went to Venice to improve himself in his art.

Albert Dürer.

His abilities excited envy and admiration. He painted the Martyrdom of Bartholomew for St. Mark's church, which painting was purchased by the Emperor Rudolph and removed to Prague. He also traveled to Bologna, to improve his knowledge of perspective. On his return to Nürnberg his fame spread far and wide. Maximilian I. appointed him his court-painter, and Charles V. confirmed him in this office. All the artists and learned men of his time honored and loved him, and for many years he was one of the chief burghers of his native town. Profound application and great facility in the mechanical part of his art were the characteristics of Durer, and enabled him to exert a great influence on German art. He was the first in Germany who taught the rules of perspective, and of the proportions of the human figure. He not only made use of the burin, like his predecessors, but was also among the first to practice etching. He invented the method of printing woodcuts with two colors.

DU'RESS, in law, restraint or compulsion, is of two kinds: duress of imprisonment, which is imprisonment or restraint of personal liberty; and duress by menaces or threats (per minas), when a person is threatened with loss of life, or with some kind of injury. An act done under duress is voidable or excusable.

DURGA (dur'gä), a Hindu divinity, one of the names given to the consort of Siva. She is generally represented with ten arms. In one hand she holds a spear, with which she is piercing Mahisha, the chief of the demons, the killing of whom was her most famous exploit; in another

Durga.

a sword; in a third the hair of the demon chief; and in others, the trident, discus, ax, club, and shield. A great festival in her honor, the Durga puja, is celebrated annually, lasting for ten days.

DURHAM (du'ram), an ancient city and parliamentary borough in England, capital of the county of the same name, on the river Wear, which is crossed here by four bridges, 14 miles s. of Newcastle. The principal public buildings are the ancient castle—now appropriated to the uses of the university—the cathedral, and other churches, the town-hall, county prison, grammar-school, etc. The educational institutions comprise the university, the grammar-school, a training-school for schoolmistresses, and other schools. There are manufactures of carpeting and mustard. The cathedral occupies a height overlooking the Wear. The larger portion of it is Norman in style, with insertions in all the English syles. Three magnificent and elaborately ornamented towers spring up from the body of the building, one from the center 212 feet high, and two together from the west end each 143 feet high; the entire length is 420 feet. It was founded by William de Carilepho, assisted by Malcolm, king of Scotland, in 1093. Pop. 14,641.—Durham University was founded in 1832, opened in 1833, incorporated by royal charter in 1837. It is in some relations connected with the bishopric of Durham, the office of warden being annexed to the deanery of Durham, and a canonry in the cathedral being annexed to each of the professors of divinity and classical literature. There are also professors of mathematics, Hebrew, medicine, etc. There are a college of physical science and a college of medicine at Newcastle-on-Tyne in connection with the university.—The county is on the n.e. coast of England, having on the e. the German Ocean, on the n. Northumberland, from which it is divided by the rivers Tyne and Derwent, Cumberland on the w., and Yorkshire on the s., the river Tees parting the two counties. Its area is 647,592 acres, of which two-thirds are under cultivation. The chief towns besides Durham are Sunderland, Gateshead, S. Shields, Stockton, Darlington, and Hartlepool. Pop. 1,187,324.

DUROC (dū-rok), Michel Gérard Christophe, Duke of Friuli, a distinguished general under Bonaparte, was born at Pont-à-Mousson in 1772; killed, 1813, at the battle of Bautzen. He served as aide-de-camp to Napoleon in the Italian and Egyptian campaigns. In 1805 he was made grand-marshal of the palace, and was frequently employed in diplomatic missions, though he still took his full share in the wars of France till the time of his death. He was a great favorite of Napoleon, and was killed by his side.

DURUY (dū-rū-ē), Victor, French historian and educationalist, born at Paris 1811. He is author of History of France, History of Greece, History of the Romans, History of Ancient Greece, and History of the World. He died in 1894.

DUSE (doo'zay), Eleonora, an Italian actress born in 1859 in Piedmont. Her first great success was at Milan in 1885. In 1892 she appeared at Vienna and in 1893 she made her American debut in New York as Camille. Duse has played with great success as Juliet, Magda, Francesca da Rimini and other noted parts.

DUSSELDORF (dus'sel-dorf), a town of Prussia, in the Rhenish province, beautifully situated among villas and gardens on the right bank of the Rhine, 22 miles n.n.w. Cologne, one of the handsomest towns in the valley of the Rhine. It is a great focus of railway and steamboat communication, and has a number of handsome public buildings, and several remarkable churches. Among the public institutions particular notice is due to the Academy of Art, founded, 1767, by the Elector Theodore. The industries embrace iron, cotton, leather, tobacco, carpets, chemicals, objects of art, etc., and the trade is large. Pop. 213,767.

DUST, very small particles of various kinds of matter, vegetable, animal, and mineral, which fills the atmosphere of the earth, at least near the surface of the earth, and which may be seen in the beams of the sun when passed through a mass of air, as in a room. No localities are free from dust. It is found over the surface of the ocean, on the tops of mountains, and in the most secluded places. It consists of the pollen of plants, vegetable fibers of many kinds, hairs, and fragments of various kinds, such as metallic salts, iron, etc. There are living organisms in dust which are not revealed by the microscope except by special tests, such as their power to propogate. In this way disease germs and moulds of various kinds are scattered about, find lodging places in favorable media, and in the bodies of man and animals produce what is called disease. Dust is largely made up of volcanic matter, finely ground, and of the comminuted meteroites oxized in their swift passage through the air. It is known that dust produces rain and causes moulds.

DUST-BRAND. See Smut.

DUST COUNTER, an instrument for counting the particles of dust in the air.

A small volume of air is forced into a receptacle with a glass bottom ruled into very small squares. The air is suddenly expanded and a fog is formed which, when it settles, carries down the dust. The number of particles per square are counted and a calculation is made by which the number of particles in a cubic centimeter of air can be estimated. The instrument was invented by John Aitken.

DUST STORMS, extraordinary whirlwinds caused by the rapid rise of the air from the surface of the earth in very hot climates. They are seen in India, the Sahara Desert, and in the western part of the U. States. The vertical motion of the air sucks in the dust from the earth, dead leaves, sticks, and other objects, and carries them sometimes up to the clouds, but ordinarily only 1000 feet above the earth. In hot desert regions several of these whirls are often seen together whirling about a center like dancing pillars of sand.

DUTCH, the people and language of Holland or the Netherlands. See Netherlands.

DUTCH EAST INDIA COMPANY, a company founded in 1602, which was given a trade monopoly of the Dutch colonies in Java, and the East. It went out of existence in 1795.

DUTCH EAST INDIES, a term applied to the possessions of Holland in the Malay Peninsula. They include Java, Madura, Sumatra, part of Borneo, and other islands, the total area of which is 736,400 miles and the population 34,090,000. The total European population, numbering not more than 75,000, consists chiefly of Dutch.

DUTCH GOLD, an alloy of eleven parts of copper and two of zinc. Called also pinchbeck. See also Dutch Metal.

DUTCH METAL, an alloy containing 84·5–84·7 per cent of copper and 15·5–15·3 per cent of zinc, with a fine golden-yellow color, ductile, malleable, and tenacious. When beaten out by a process analogous to that for gold-leaf, until the sheets are less than $\frac{1}{50000}$th part of an inch thick, it constitutes Dutch leaf or Dutch foil, and is used instead of gold-leaf for ornamental purposes.

DVORAK (dvor-sh'k'), Anton, a Bohemian musical composer, born in 1841. He studied at the Prague Conservatoire and at Vienna. He has composed several operas on national Bohemian subjects, a number of songs, orchestral arrangements of Bohemian dances, several symphonies, a Stabat Mater, a cantata The Specter Bride, an oratorio St. Ludmilla. Died 1904.

DWARF, a term applied to any animal or plant greatly below the usual size of its kind, particularly to a human being of small dimensions. Accounts of dwarf tribes have been common from early times, such tribes being located especially in Africa; and it would appear from the accounts of Du Chaillu, Schweinfurth, and other travelers that there are several dwarfish tribes through out this continent. The Obongo, a race of dwarfs, are described as living in woods near the Okanda river, in wretched huts made of branches. Other races are the Mabongo, and the Akka dwarfs of Central Africa; and a race is said to exist in the Congo State, not as a distinct community, however, but mixed with other tribes. Individual dwarfs occur in all races, and were formerly a fashionable appendage to the courts of princes and the families of nobles.

DWARFING, the process of training up trees or shrubs for ornament in houses so as to cause them never to reach more than a very small size, by keeping them in poor soil, giving them little water, pinching off strong shoots, etc. Practiced among the Chinese and Japanese.

DWIGHT (dwit), Timothy, American divine, born in Massachusetts 1752, died 1817. His father was Colonel Timothy Dwight, and his mother was a daughter of Jonathan Edwards. He served as chaplain in the revoluntionary army, and ultimately became president of Yale College. His Theology (1818) was for long a standard both in Britain and in America. He was also the author of two poems, the Conquest of Canaan and Greenfield Hill, besides numerous unimportant works, consisting of dissertations, occasional sermons, etc.

DWIGHT, Timothy, an American educator and clergyman, born in Connecticut in 1828. In 1886 he was elected president of Yale, and resigned in 1899. He has written a number of valuable commentaries on biblical literature.

DWIGHT, William Buck, an American geologist, born in 1833 at Constantinople, where his father was a missionary. He has been professor at Vassar College since 1878 and curator of the museum. He has published several papers on geological subjects.

DY'AKS, the aborigines of Borneo, chiefly inhabiting the interior of the island. They are a finely-formed race, of a yellow complexion, and are described as docile, industrious, and superior to the Malays. The more advanced of them practice agriculture and dwell in neatly-constructed and tolerably comfortable houses. In Sarawak they have made considerable advances in civilization. They are mostly heathen. The practice of head-hunting (hunting their enemies to make trophies of their heads) is practiced among them, but has been abolished where European influence prevails. See Borneo.

DYAS, in geology, a name for the Permian system.

DYCK, Sir Anthony Van. See Vandyck.

DYEING is the art of fixing a new and permanent color on textile substances, usually cotton, linen, silk, and wool. Some preliminary operations are necessary in order to cleanse the stuff from any foreign matters which would prevent the dye having free access to it, as well as to remove any natural coloring which would interfere with the production of bright clear tints. Cotton and linen fabrics go through a prolonged series of operations in bleaching (which see). Silk is boiled in a solution of fine soap, to remove the fatty matter; and wool is cleansed by scouring in weak soap or soda-lye or weak ammonia.

The process of dyeing varies much according to the stuff and the coloring matters used. In general animal fibers, like silk and wool, combine more easily with most colors than vegetable fibers such as linen and cotton. In the case of the former, for example, a simple immersion in aniline dyes is sufficient to produce a fixed color. Such colors are said to be substantive, in relation to the stuffs with which they thus combine. Dyes which will not unite directly with the fibers so as to produce a good and permanent color, are termed adjective. These dyes require the intervention of another agent to fix them on the different stuffs, and the name of mordant is applied to those substances which are employed to make the stuff to be dyed and the dyeing color combine. Alum, acetate of alumina, chloride of tin, salts of iron, albumen, gluten, tannin, etc., are common mordants. The mordant is generally dissolved in water into which the stuffs to be dyed are plunged. In some cases it is mixed with the color and both are simultaneously applied to the stuff. An important characteristic of mordants is their power of affecting the natural tint of the dye and thus enabling a variety of shades to be produced at small expense. Thus nitrates tend to give a yellow tinge to the colors, alumina deepens and oxide of tin brightens the natural tints. A process of dyeing to which the name of Aero-hydraulic dyeing has been given, consists in forcing the color through the material by hydraulic pressure. The advantages of the process are that the color is forced equally through any thickness of the stuff, which thus remains bright till completely worn out.

The dye-stuffs in use at the present day are derived alike from the animal, mineral, and vegetable kingdoms. Among the most notable additions to the list of coloring stuffs within recent years are the aniline dyes of coal-tar origin (see Aniline), which yield a great variety of brilliant colors, such as magenta, mauve, aniline, purple, roseine, violine, etc. From coal-tar also the two coloring principles of madder (alizarine and purpurine) have been artificially produced. There are few organic substances which under proper treatment will not yield coloring matter, and of late new coloring matters have been obtained from wood-sawdust, lichens, mosses, paper and cotton waste, bran, starch, sugar, soot, etc.

DYE-STUFFS. See Dyeing.

DYING DECLARATION. (See Declaration, Dying.)

DYKE. See Dike.

DYNAM'ETER, an instrument used for measuring the magnifying power of telescopes. It consists of a small compound microscope, with a transparent plate, exactly divided, which is fixed to the tube of a telescope, in order to measure exactly the diameter of the distinct image of the eye-glass. Also same as Dynamometer.

DYNAM'ICS is the science which deals with the laws of force in their relation to matter at rest or in motion, and as such it is differentiated from kinematics, which considers motion mathematically, and apart from the forces producing it. It is to Newton that we owe the clear statement of the three primary laws of force. These are: (1) that every body remains in a state of rest, or of uniform motion along a straight line, unless it is

compelled by force to change that state. (2) That change of motion is in proportion to the force employed, and occurs along the straight line in which the force acts. This change of motion includes both change of rate and of direction. (3) That, as the result of every action, there is also and always an equal reaction. These laws, which were formulated from experiment, involve the conception of force as a primary influence or action expressed in terms of space, time, and matter. Now, in dealing with the laws of force, a standard of measurement is required which shall be applicable to all forces at all times, and we therefore require to begin by establishing units of space, time, and mass. There are two systems of units in use, the one British, the other French. In the British system the foot is taken as the unit of length, and the second as the unit of time. In the French the centimetre is the unit of length, the second the unit of time; the unit velocity in the one case being that of one foot per second, in the other one centimetre per second. The British unit of mass is the pound (the mass of a certain lump of platinum deposited in the exchequer office, London); the French the gramme; and accordingly the French units of space, mass, and time are commonly known as the C.G.S. (centimetre, gramme, second) units. As the weight of a pound (or a gramme) is not the same at all parts of the earth's surface it cannot give us of itself an absolute or dynamical unit of force, that is, an invariable unit; but taking it in conjunction with unit time and unit velocity, we do obtain such a unit. Two absolute units of force are in common use in dynamics, the poundal and the dyne; the latter being the absolute unit in the C.G.S. system. The former is that force which, acting on the mass of one pound for one second, generates in that mass a velocity of one foot per second. The latter is that force which, acting on the mass of one gramme for one second, generates in that mass a velocity of one centimetre per second. It is important in dynamics to distinguish between mass and weight. The mass of one pound is the quantity of matter equal to a certain standard quantity (a certain lump of metal) and is quite independent of force. The weight of one pound is the force with which the mass of one pound is attracted to the earth's surface by the force of gravity. Another important term is momentum; the momentum of a body in motion at any instant is the product of the mass of the body and the velocity at that instant. Dynamics is divided into two great branches: statics, which treats of solid bodies at rest under the action of forces; and kinetics, which treats of the action of forces in producing motion in solid bodies. Formerly the latter alone was called dynamics, and to this, in conjunction with statics, the general name mechanics was given. In the wide sense dynamics includes also hydrostatics.

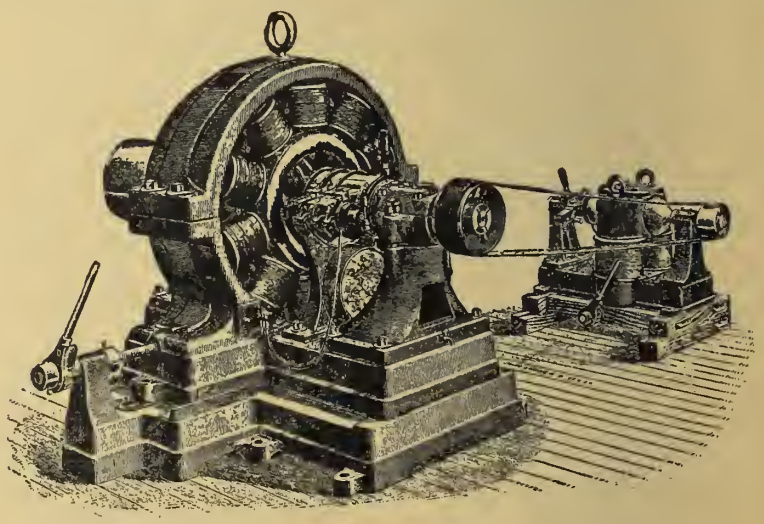
DYNAMIC THEORY, a theory explanatory of the essential constitution of matter. In the dynamic theory every body is considered as a space filled with continuous matter; porosity then becomes an accidental quality, but compressibility and dilatability essential properties. The state of a body depends entirely on certain attracting and repelling forces; and its volume must change with every change in the relative proportions of these forces. It is opposed to the atomic theory, which supposes every body to be composed of indivisible and impenetrable particles termed atoms. These are almost infinitely small, with void spaces between them, so that this theory makes porosity essential to matter.

DY'NAMITE, an explosive substance patented by A. Nobel in 1867. As originally made it consists of a siliceous earth obtained at Oberlohe in Hanover and known as kieselguhr, impregnated with 75 per cent of nitro-glycerine (see Nitro-glycerine), the object of the mixture being to facilitate the carriage and use of the substance by diminishing its susceptibility to explode by shock while not destroying its explosive force. The siliceous matter is of diatomaceous origin; it is extremely friable and porous, and has a considerable absorbent power. Dynamite thus prepared has the appearance of raw sugar. Diatomite, a substance superior to kieselguhr, is now also employed, and various other substances have been used to mix with the nitro-glycerine, such as charcoal, sand, saw-dust, etc. The mixture remains without change for any length of time, unless exposed to water. It burns away quietly if a light is applied to it, but explodes if heated to a high temperature. Usually it is exploded by a specially arranged fulminating cap. Its explosive force is several times that of gunpowder, which it has largely superseded for blasting.

DYNAMO, an electro-magnetic device for the production of electricity, which serves either as a generator or a motor. For example, the motor of a trolley car is a dynamo in all essentials the same as the dynamo at the power house which generates the current.

In an electric generator mechanical energy is converted into electrical energy by means of continuous relative motion between electrical conductors and a magnetic field, or fields, such motion causing the conductors to cut or traverse the lines of force of the fields. In an electric motor electrical energy is transformed into mechanical energy by means of continuously supplying a system of electrical conductors with an electric current, which causes a magnetic force to act between the conductors carrying it and the magnetic field, or fields, thereby producing continuous relative motion between the conductors and the magnetic fields.

The preceding definitions are general and necessarily technical. To comprehend them fully a knowledge of the fundamental principles involved in the operation of dynamo-electric machines is necessary. They may, however, be in a measure elucidated by a descriptive definition as follows: All generators consist essentially of one or more electro-magnets between the poles of which an armature, consisting of a soft iron core wound with coils of insulated copper wire, is made to revolve very rapidly by means of a steam-engine, a water-wheel, or other prime mover. In the transmission of energy by electricity the current produced by the generator is made to pass through another machine, similar and often identical in construction, and there causes the armature to revolve, and this revolution may be employed to do any kind of mechanical work. This second machine, working in reverse order from the first, is an electric motor. This description makes it clear, as do the preceding definitions, that to understand thoroughly the dynamo-electric machine requires a knowledge of three great branches of science—magnetism, electricity, and mechanics. The necessity for this special knowledge makes the subject of dynamo-electric machines a difficult one to discuss in familiar terms.

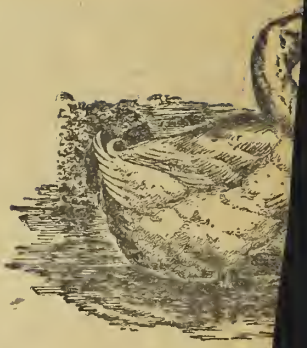


Dynamo.

DYNAMOM'ETER, any instrument for measuring the relative strength of men or animals, or the force of machinery. Commonly it consists of a

THE HAPPY HENS OF HENVILLE.

We are the hens from henville way,
And hens are happy, proud, and gay;
For hens that roost in Henville town
Have long been held in great renown.
We're famed for health and strength and
beauty;
Are mothers fond and do our duty;
And, like other matrons brave and true,
We "rule the roost," and the roosters, too.
We're active birds and cackleate
To furnish chicks of standard weight,
For 'tis their weight that pays our way
And makes our owners' poultry pay,
And, then, not to eggsagerate,
Our eggs are rated full first-rate;
We lay lots of them, rich and fat;
One hen will weekly fill a hat.
It would be hard such eggs to match,
Eggs in a hat ought sure to hatch.
Don't get eggcited. We'll end this lay
By telling you the Henville way
Of keeping chickens well and strong
And bright and busy all year long.
We keep at work; we love our home;
We're sound and clean, from toe to com[illegible]



TOULOUSE

ation of the hen's feathers are all
hat she carries about on her body.
he larger proportion of them will
ude the eye even when the exami-
ation is conducted with the most
xtreme care.

A short time ago a poultry keeper
our acquaintance was treating
s hens to a dose of liquid lice-
ller. This person is regular in
s attentions to the poultry house,
moving the droppings twice a
ek and whitewashing twice a

spiral spring suitably applied. When the pull upon a draft implement, as a plow for instance, is the point to be determined, the dynamometer is made a link in the draft-chain, and the amount of extension or collapse which it suffers indicates the intensity of the strain.

DYS'ENTERY, a dangerous disorder of the intestines, known by fever; frequent griping stools; tenesmus; stools chiefly mucous, sometimes mixed with blood, the natural feces being retained, or voided in small, compact, hard masses; loss of appetite and nausea. It may be occasioned by a sudden check in the perspiration, or the use of unwholesome and putrid food, or by noxious exhalations and vapors, and it is often the result of a specific contagion. When the symptoms run high, produce great loss of strength, and are accompanied with a putrid tendency and a fetid and involuntary discharge, the disease often terminates fatally in a few days. In some cases the febrile state wholly disappears after a time, while the proper dysenteric symptoms may be of long continuance. Hence the distinction into acute and chronic dysentery. Saline purgatives, and for severe cases laudanum (20 or 30 drops) or Dover's powder, are useful. The endemic dysentery of Egypt is a distinct disease caused by the presence of a worm in the intestines.

DYSMENORRHŒ'A, a disease of women, consisting in painful or difficult menstruation, which may be caused in various ways.

DYSPEP'SIA, difficulty of digestion. The action of the stomach on the food is that usually designated as digestion, and it is the derangement of this process that is usually expressed by the term dyspepsia. This derangement may be caused by disorders of a very various and even opposite character. The subacute and chronic forms of gastric irritation and inflammation are the most common forms of dyspepsia, and are often caused by too highly-seasoned or too abundant food and stimulant drinks, or by the improper use of emetics, tonics, or stimulants. Another class of dyspeptic diseases is connected with irritation of the mucous membrane of the duodenum, causing perversion of secretions and disorder of functions. A third class of dyspeptic diseases depends on the nerves connected with the digestive viscera. Hence arises an order of dyspeptic symptoms independent of any immediate affection of the stomach.

Dyspepsia is therefore not a disease of a uniform character, but is rather attached as a symptom to a variety of diseases. The most common cause of dyspepsia are excesses of various kinds, especially in the quantity of food eaten. Persons of a sedentary life require less nutriment than those of active habits. Exercise and the quantity of food to be digested must be proportioned to each other. The quality of food as well as its quantity has to be considered. Good cookery, which renders the food tender and pulpy, is one preservative against dyspepsia. Tough and badly-dressed meats, crude vegetables, hot bread and cakes, and the daily use of hot tea or coffee for breakfast, are among the numerous causes of this ailment.

DZOUNGARIA, a Chinese territory in Central Asia, stretching from about 43° to 48° n. lat. and from about 82° to 86° e. lon. It has an area of 147,950 sq. miles, and pop. 600,000. It is administratively connected with Kuldja, and since the surrender of Kuldja by the Russians in 1880 is again under Chinese rule. Dzoungaria, once the center of an independent empire, was first conquered by the Chinese in 1757.

E

E, the second vowel and the fifth letter of the English alphabet. It occurs more frequently in English words than any other letter of the alphabet. Its long or natural sound in English coincides with the sound of i in the Italian and French languages, as in here, mere, me. It has also another principal sound, a short one, heard in met, men. It has besides a sound like a in bare, as in there, where, etc., and the obscure sound which is heard in her. As a final letter in English it is generally silent, but it serves to indicate that the preceding vowel is to have its long sound, as in mane, cane, plume. When two e's come together the sound is generally the same as that of the single e long, as in deem, esteem, need (comp. however pre-exist, etc.).

E, in music, is the third note or degree of the diatonic scale, answering to the mi of the Italians and French.

EADS, James Buchanan, an American civil engineer and inventor, born in Indiana in 1820, died 1887. He removed to St. Louis in 1833 and figured in the civil war as an adviser of Lincoln in the matter of ironclads. In 1867 he began his famous work on the great Eads bridge at St. Louis, and 1874 undertook the construction of the jetties at New Orleans, by which the channel of the Mississippi river was deepened. The latter years of his life were spent in engineering works abroad.

EAGLE, the general name of raptorial birds that form a group of the great family Falconidæ, which includes the eagles, falcons, and hawks. The eagle is popularly regarded as the noblest and most courageous of the rapacious birds. It soars to a greater height than any other bird, from which circumstance the ancients considered it as the bird or

Bald eagle.

messenger of Jove. The genus Aquila

Golden eagle.

which includes the most typical eagles, is distinguished by its long and powerful bill, the curve commencing at the cere, by its wings reaching to the tip of the tail, and by its tarsi being feathered to the toes. The imperial eagle of Centra Europe is probably the species to which the popular belief in the courage, strength, and nobleness of eagles is to be traced. The golden eagle, is the chief British species. It measures over 6 feet from tip to tip of the expanded wings,

Imperial eagle.

and 3 feet from the beak to the end of the tail. The adults have the body brownish, becoming darker with age; the feathers of the head and neck pointed and of a golden-red hue. This species is found all over the northern hemisphere. The bald eagle, found in N. America and northeast Asia, is the symbol of the U. States. Like all members of the genus his diet is less restricted than that of the true eagles; and he even takes carrion. Another eagle, the serpent eagle, or short-toed eagle, ranges through south-

ern Europe, Asia, and especially North Africa. In structure and habits this bird approaches the buzzards.

EAGLE, as a symbol. The eagle first appears as a war standard among the Persians, through whom it reached the Egyptians. As the standard of the Roman armies it was first used by Marius, and latterly took the place of all the

Roman eagles.

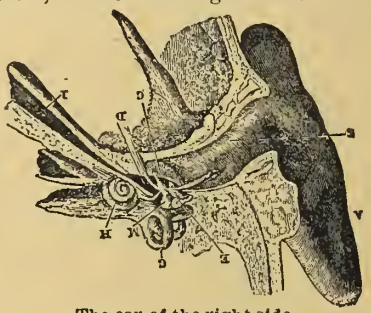
other emblems at the head of the legions. In the mediæval ages the eagle became the heraldic emblem of the old German Empire, and was made double-headed in the 14th century. When the old German Empire ceased the double-headed eagle was retained by Austria. A double-headed eagle is also the national military symbol of Russia, as a single-headed eagle is that of Prussia and the United States of America; the latter stands with outspread wings guarding a shield, with the motto E Pluribus Unum. The eagle is also the badge of several orders, the chief of which are the order of the Black Eagle, founded in 1701, and the highest order in Prussia; the order of the Red Eagle, also a Prussian order and founded in 1705; the Russian order of the White Eagle, originally Polish, and instituted in 1325.

EAGLE, a gold coin in the U. States of the value of ten dollars, first coined in 1795. There are also half-eagles, quarter-eagles, and double-eagles.

EAGLE-OWL, a name for several large horned owls, little inferior in size to the golden eagle, found in many parts of Europe and sometimes in Britain. An allied species, the Virginian horned owl is common in the U. States.

EAMES, Emma (Mrs. Julian Story), an American opera singer, born in 1867 in China, where her father was engaged in law. Her studies were made in Boston and in Paris (under Marchesi). In 1889 she made her first appearance in Faust and at once took her place among the great soprano singers of the time. Madame Eames has sung in Europe and the U. States in all the most difficult grand operas.

EAR, the organ of hearing. It is situated at the side of the head, and in the higher vertebrates is divided into the outer, middle and inner ear. The external ear, which is a cartilaginous funnel for collecting the sound waves and directing them inward, is composed of the pavilion, or projecting part, and of the auditory canal, which extends from the concha, or central hollow of the pavilion, to the membrane of the tympanum or drum. This membrane is a partition stretched obliquely across the bottom of the auditory canal, which it separates from the middle ear or drum; it is semi-transparent and very delicate. It vibrates with the waves of sound which strike against it, and transmits the vibrations to certain little bones of the cavity of the tympanum. These bones, which have been named respectively the hammer (malleus), the anvil (incus), and the stirrup (stapes), transmit the vibrations to the internal ear, forming a chain communicating at one end with the membrane just mentioned, and at the other with the inner ear. The internal ear consists of a bony cavity called the vestibule, three semicircular canals, and a bony structure in the form of a spiral shell, called the cochlea. The vestibule communicates with the tympanum, the cochlea, and the semicircular canals, and is entered by branches of the nerve of hearing. The various parts of the internal ear, which together form the osseous labyrinth, are lodged in the hardest part of the temporal bone; they are lined throughout with a very thin membrane, and are full of a very thin and limpid fluid. They contain a structure of corresponding form called the membranous labyrinth, consisting of sacs and canals, also containing a fluid. With-



The ear of the right side.

in the membranous canal of the cochlea is lodged the complicated apparatus which is believed to be the chief agent in the perception of sound. The middle ear communicates with the throat and pharynx by the Eustachian tube, through which air from the mouth may be pressed against the membrane of the drum. In the external auditory canal of the ear is produced the cerumen or ear-wax, which if allowed to accumulate may cause deafness. The cut shows a the pavilion, b the external canal, c the drum membrane partly removed, d cavity of middle ear, e anvil and m hammer, the small bones communicating with the drum and vestibule, h cochlea, g semi-circular canals, i Eustachian tube.

EARL, a degree of the British nobility between marquis and viscount, the title of highest antiquity in England. The title was made hereditary by William the Conqueror, and for a time was used interchangeably with that of count, the corresponding title on the Continent. The wife of an earl is still called a countess. An earl's coronet is composed of eight pearls raised upon points, with small leaves between, above the rim. See Coronet.

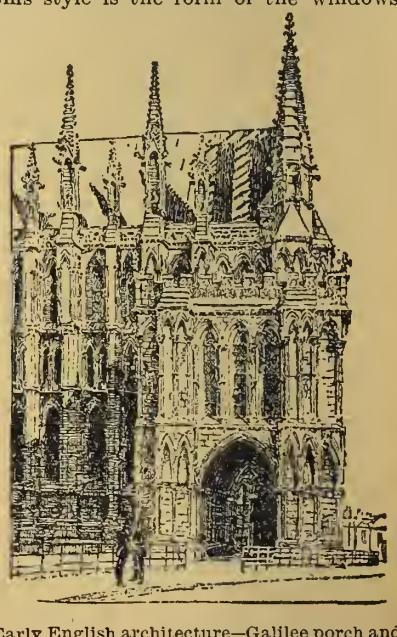
EARLSTON, a village of Scotland in Berwickshire. Near it are the ruins of the ancient tower, which belonged to the famous Thomas the Rhymer. Pop. 1060.

EARLY, Jubal Anderson, an American confederate general, born in Virginia in 1816, died in 1894. He graduated at West Point fought in the Mexican War, joined the confederate forces in 1861, fought at Bull Run, Williamsburg, Antietam, and other important battles of the civil war. Subsequently to the war general Early practiced law and was distinguished for being the most prominent of the "unreconstructed rebels." He never took the oath of allegiance to the U. States and died a confederate. He published several interesting memoirs.

EARLY ENGLISH ARCHITECTURE, the first of the Pointed or Gothic styles of architecture that prevailed in England. It succeeded the Norman in the reign of Richard I. (1189), and continued to the end of the reign of Henry II. in

Early English capital, Salisbury.

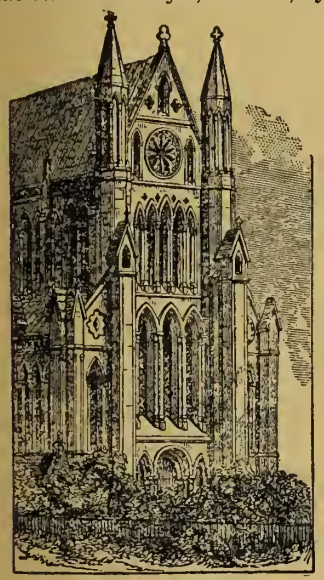
1272, a period of 123 years, when it gradually merged into the Decorated style. One of the leading peculiarities in this style is the form of the windows,



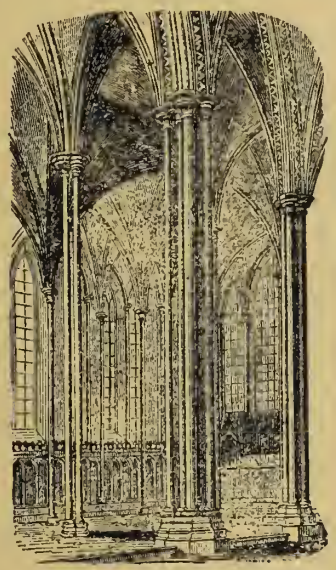
Early English architecture—Galilee porch and south transept of Lincoln cathedral.

which are narrow in proportion to their height, and terminate in a pointed arch, resembling the blade of a lancet. Throughout the early period of the style they are very plain, particularly in small churches; but in cathedrals and other large buildings the windows, frequently combined two or more together, are car-

ried to a great height, are richly and deeply molded, and the jambs ornamented with slender shafts. Though separated on the outside, these lancets are in the interior combined into one design, thus giving the first idea of a compound window. The doorways are in general pointed, and in rich buildings sometimes double; they are usually molded, and enriched with the tooth-ornament. The buttresses are often very bold and prominent, and are frequently carried up to the top of the building with but little diminution, and terminate in acutely-pointed pediments, which, when raised above the parapet, produce in some degree the effect of pinnacles. In this style, likewise, flying-buttresses were first introduced, and the buttresses themselves much increased in projection owing to the comparative lightness of the walls, which required some counter-support to resist the outward pressure of the vaulting. The roof in the Early English style appears always to have been high pitched, and the towers surmounted by lofty pointed spires, as at Salisbury cathedral. In the interior the arches are usually lancet-shaped, and the pillars often reduced to very slender proportions. As if to give still greater lightness of appearance, they are frequently made up of a center pillar, surrounded by slight detached shafts, only connected with the pillar by their capitals and bases, and bands of metal placed at intervals. The architects of this style carried their ideas of lightness to the utmost limits of prudence, and their successors have been afraid to imitate their example. The abacus of the capitals is generally made up of two bold round moldings, with a deep hollow between. The foliage is peculiar, generally very gracefully drawn, and thrown into elegant curves; it is usually termed stiff-leaved, from the circumstances of its rising with a stiff stem from the neck-mold of the capital. The trefoil is commonly imitated, and is very characteristic of the style. The moldings of this style have great boldness, and produce a striking effect of light and shade. They consist chiefly of rounds separated by deep hollows, in which a peculiar ornament, called the dog's-tooth, is used, whenever ornament can be introduced. This ornament is as characteristic of the Early English as the zig-zag is of the Norman.



Early English style—North-west transept of Beverly minster.



Early English style—Detached shaft in Lady Chapel, Salisbury cathedral.

EAR-RING, an ornament for the ear, consisting of a ring or hook passing through the lobe, with a pendant of diamonds, pearls, or other jewels frequently attached. Ear-rings were commonly worn among the Oriental nations, and by both sexes, from the earliest times. Among the Greeks and Romans they were not so commonly worn by men as by women. In England the Romanized Britons and the Anglo-Saxons wore them, but the fashion declined in the 10th century, and was again introduced in the 16th century, in Queen Elizabeth's time.

EARTH, the planet which we inhabit, a nearly spherical body which every twenty-four hours rotates from west to east round an imaginary line called its axis—this axis having as its extremities the north and south poles respectively—while in the course of a year it completes a revolution round the sun. To an observer whose view is not obstructed any part of the earth presents itself as a circular and horizontal expanse, on the circumference of which the heavens appear to rest. Accordingly, in remote antiquity, the earth was regarded as a flat, circular body, floating on the water. But even in antiquity the spherical form of the earth began to be suspected. It is only on this supposition that we can explain how the horizon of vision grows wider and wider the higher the position we choose, how the tops of towers and mountains at a distance become visible before the bases, how the hull of a ship first disappears as she sails away, and how, as we go from the poles toward the equator, new stars become visible Besides these proofs there are many others, such as the circular shadow of the earth seen on the moon during an eclipse, the gradual appearance and disappearance of the sun, and, lastly, the fact that since 1519 it has been regularly circumnavigated.

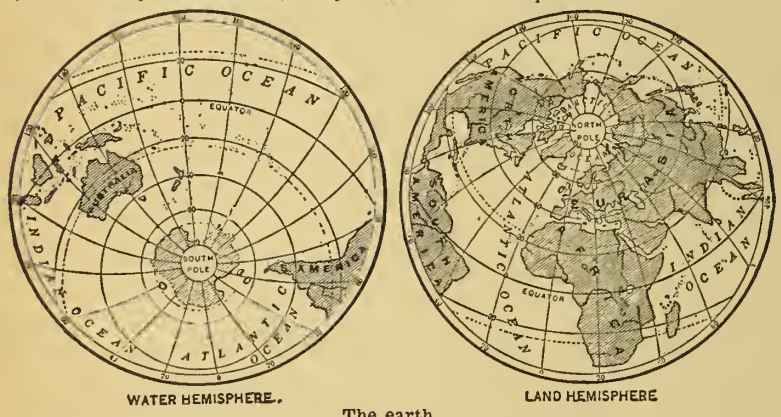
The earth is not, however, an exact sphere, but is very slightly flattened at the poles, so as to have the form known as an oblate spheroid. In this way the polar diameter, or diameter from pole to pole, is shorter than the diameter at right angles to this—the equatorial diameter. The most accurate measurements make the polar diameter about 27 miles less than the equatorial, the equatorial diameter being found to be 7925·6 miles, and the polar 7899·14 The earth is regarded as divided into two halves—the northern and the southern hemisphere—by the equator, an imaginary line going right round it midway between the poles. In order to indicate with precision the position of places on the earth additional circles are imagined to intersect one another on the surface in such a manner that those of the one set all pass through both poles, while those of the other are drawn parallel to the equator. The former are called meridians, the latter parallels of latitude and by them we can tell the latitude and longitude, and thus the exact position of any place.

Many experiments by various methods have been made in order to determine the average density of the earth, that is, the quantity of matter it contains. Among these methods may be mentioned: (1) that of determining the attraction of a mountain on the direction of a plumb-line and calculating from thence the density of the earth; (2) that founded on the difference of oscillation in a pendulum when placed at the summit of a mountain and when at the sea-level; (3) the converse of the preceding method, by the determination of the difference of gravity at the top and the bottom of a deep mine, by pendulum experiments; (4) Cavendish's experiment with the torsion balance, which attempts to compare the attractive force of two large lead balls over other two small lead balls with that exercised by the earth. From these and other experiments it has been calculated, taking the mean of all results, that the density of the earth is to that of water as 5·639 to 1.

The earth, in common with the other planets, moves round the sun, completing its revolution in about 365 days and six hours, and thus forming our common year. The orbit of the earth is an ellipse, with the sun in one of its foci. Hence the earth is not equally distant from the sun in all parts of the year; being about 3,000,000 miles nearer at one time than another, its least distance (perihelion distance) according to recent calculations being 89,897,000 miles, its greatest (aphelion distance) 92,963,000, and the the mean distance, or half the length of the long axis of the orbit, 91,430,000 miles. From this it may be calculated that the velocity of the earth in its orbit is about 17 miles a second. In winter (speaking of the northern hemisphere) the earth is nearest the sun and in summer farthest from it; for the difference

in the summer and winter temperature is not occasioned by the greater or less distance of the earth from the sun, but by the more or less oblique direction of the sun's rays. The passage of the earth round its orbit causes the sun to appear as if it described a similar orbit in the heavens; and hence it is that at one time of the year one group of stars is seen in the neighborhood of the sun at sunrise and sunset and at another time another group. This apparent path of the sun is the ecliptic, and corresponds with what would be the path of the earth as seen from the sun; and the groups of stars through which the sun successively passes form the zodiac.

The earth's daily motion about its own axis takes place, according to mean time, in twenty-three hours, fifty-six



The earth.

minutes, and four seconds. This diurnal revolution is the occasion of the alternation of day and night. As the axis on which the earth performs its diurnal rotation forms with the plane of its path about the sun an angle of 23½° (which angle also represents that between the plane of the ecliptic and the plane of the earth's equator), the sun ascends in the heavens, from March 21 to June 21 (the summer solstice), about 23½° above the equator toward the north pole, and descends again toward the equator from June 21 to September 23; it then sinks till December 21 (the winter solstice), about 23½° below the equator, toward the south pole, and returns again to the equator by March 21. This arrangement is the cause of the seasons, and the inequality of day and night attending them. For all countries lying beyond the equator, day and night are equal only twice in the year (at the equinoxes). At the summer solstice the north pole of the earth is turned toward the sun, and the south pole away from it, and for 23½° round the former there is a period of longer or shorter duration during which the sun is continually above the horizon for more than 24 hours, while round the latter there is an equal extent of surface within which the sun for similar periods is below the horizon. (See Day.) The reverse state of matters occurs at the winter solstice. The circles bounding these regions are called respectively the arctic and the antarctic circle, and the regions themselves the polar or frigid zones. Throughout a region extending to 23½° on each side of the equator the sun is directly overhead at every point in succession twice in the year. The circles which bound this region are called the tropics, that in the northern hemisphere being the tropic of Cancer, that in the southern the tropic of Capricorn, while the region between is the torrid zone. The regions between the tropics and the polar circles are respectively the north and south temperate zones.

From the evidence furnished by volcanoes, hot springs, sinking of mines, etc., it is known that the earth has a high internal temperature of its own. Taking the average of the various observed rates of increase this temperature seems to increase 1° Fahr. for every 60 feet of descent. Assuming this to continue, the rocks at a depth of 2 miles would be as hot as boiling water, and at a depth of 50 miles the heat would be such as at the surface would melt every known solid. This being so, various theories as to the internal condition of the earth have been proposed: (1) That a thin envelope or crust surrounds a molten interior. It can be shown, however, that as tides must be produced in such a molten mass the cool outer crust would be unable to withstand the enormous force of these unless it were about 2000 miles thick. (2) That the interior is solid, with spaces here and there filled with liquid or gaseous material. This theory assumes that there are within the earth enormous cavities filled with molten rock, which escapes when local pressure is removed in the form of volcanic outbursts. (3) That the earth consists of a thin crust, a large solid nucleus, and a liquid film between the nucleus and the crust; the temperature at the center being not much greater than comparatively near the surface. (4) That the earth is solid to the center, but any part may become liquid if local pressure is removed. We know that if the pressure on a solid be increased the melting point is correspondingly raised; now the pressure at the center of the earth, or even at the depth of 50 or 100 miles, must be something enormous, and probably is so great as to keep the rocks there permanently in a solid condition, notwithstanding the heat. This last theory is considered the most probable. On the supposition of its correctness volcanoes might be explained by supposing that at certain points here and there pressure is removed by the elevations of portions of the earth's surface which are constantly taking place, and that this allows the rocks to liquefy. Water may then soak down to these liquid rocks, and being converted into steam produce the various volcanic phenomena.

The earth (like the other planets) is believed to have condensed and solidified from a gaseous or nebular condition, and to have once had a far higher temperature than now. If such were the case the outer surface, losing heat by radiation, would be the first part to cool quickly; while the interior, losing its heat by conduction, would not cool so rapidly, and therefore would naturally have a higher temperature than the portion at the surface. This is what all observations indicate the condition of the earth to be, and the shape of the earth also indicates that it must once have been in a fluid state. Even the time at which it was in the fluid state has been roughly calculated by Sir W. Thomson (Lord Kelvin), whose estimate makes it about 200 millions of years ago. See Nebular Hypothesis.

Another feature that the earth as a whole presents is its magnetism. When a magnetic needle is balanced on a point it remains at rest in one position only, pointing then nearly due north and south. This can be explained only on the supposition that the earth acts as a great magnet. It has in fact two poles—a north and a south magnetic pole—which are not very far from, but by no means coincident with, the geographical poles. There is also a neutral line or magnetic equator, which does not greatly diverge from the geographical equator. The earth acts upon all magnets as they act upon each other, and it is for this reason that they point north and south.

The surface of the earth contains over 196,000,000 square miles, of which scarcely a third-part is dry land, the remaining two-thirds being water. The land is arranged into masses of irregular shape and size, the greatest connected mass being in the eastern hemisphere. The chief masses receive the name of continents, detached masses of smaller size forming islands. The surface of the land is variously diversified, exhibiting mountains, valleys, plains, plateaux, deserts, etc. The water area of the earth is divided into oceans, seas, bays, gulfs, etc., while rivers and lakes may be regarded as features of the land surface. The great phenomena of the oceans are currents and tides. The population of the whole earth is estimated at from 1350 to 1450 millions. The earth is attended by the moon as a subordinate or subsidiary planet. See also such articles as Climate, Currents, Ocean, Earthquake, Seasons, etc.

EARTH-CURRENTS, violent electrical disturbances of the nature of transient currents, which rush in one direction or the other, and by which telegraph lines, and particularly long submarine lines, are constantly troubled. Their origin and nature are not thoroughly understood, but they are found to be very intimately connected with the perturbations of terrestrial magnetism called magnetic storms, and

these, it is well known, are closely connected both with the appearance of the aurora borealis and with the occurrence of the sun's spots.

EARTHENWARE, a name applied to the more common sorts of pottery-ware. The older kinds of earthenware, such as Majolica, Delft-ware, Faience, and Palissy-ware are not only glazed, but are besides elaborately colored and enameled and ornamented with raised figures of various kinds.

EARTHQUAKE, a shaking of certain parts of the earth's surface, produced by causes not perceivable by our senses. This motion occurs in very different ways, having sometimes a perpendicular, sometimes a horizontal undulating, and sometimes a whirling motion. It also varies much in degrees of violence, from a shock which is hardly perceptible to one which bursts open chasms and changes the appearance of the ground itself. During these shocks sometimes smoke and flames, but more frequently stones and torrents of water are discharged. There is little doubt that earthquakes and volcanic eruptions are kindred phenomena, the latter differing from the former principally in proceeding from a permanent crater. All observations go to prove that both are due to disruptions produced by internal heat at a great depth beneath the surface of the earth. Of the particular way in which this force works, however, there are various theories. It has been thought by some that the center of earthquakes and volcanic disturbances is always near the sea or other large supplies of water, and that the disturbances are directly caused by the filtration of the water down to igneous matter, and the consequent generation of vast quantities of steam which frees itself by explosion. Others have sought to explain earthquakes as part of the phenomena of a planet cooling at the surface. The steady contraction of matter caused by the decay of heat would be likely to produce large cavities with an increasing tension of the neighboring strata till a tremendous subsidence involving convulsions reaching to the earth's surface removed the strain. The most remarkable earthquakes of modern times are those which destroyed Lima, in 1746, and Lisbon in 1755; still more recent are the earthquakes that visited Calabria in 1857, Peru and Ecuador in 1868, the island of Ischia in 1884, Charleston and that district of the United States in 1886, Mentone and the Riviera of Italy in 1887.

The great earthquake which destroyed San Francisco (see San Francisco) was connected, it is believed, with the recent disastrous eruption of Vesuvius (see Vesuvius) and with the earthquake all along the coast of South America on August 5, 1906, and following, in which 200 people were killed, and Valparaiso, Chile, was almost destroyed, with a loss of $2,000,000 of property, none of which was insured.

Measured by the immediate destruction of human life and of property and the resultant misery and suffering to human beings yet alive, the earthquake of December 28, 1908, in Sicily and Calabria was the most direful calamity in the world's history. Two hundred thousand lives and more than $1,000,000,000 worth of property—these figures tell the terrible story of Italy's misfortune and grief. The cities of Messina and Reggio, the former in Sicily and the latter on the mainland almost opposite, with their combined population of 170,000 were almost entirely destroyed. These cities and a number of smaller towns in the immediate vicinity were, in less than five minutes, crushed to heaps of smoking ruins.

Sicily and Calabria have always been known to be in the so-called earthquake belt. This region has been much studied by seismologists, and this latest convulsion has revived the speculation as to the cause of earthquakes. Volcanic activity on the part of Etna, Vesuvius and Stromboli was looked for at the time of the shock, but no serious eruption actually occurred. All of the seriously entertained theories of earthquake causes have been advanced to explain the shocks in southern Italy, for there were many minor shocks after the first great one, not only in Italy, but in Austria and Turkey as well. The most generally accepted theory is that an earthquake is the result of a "fault" in the geological formation under the affected region, in this case the fault constituting a line of contact between the volcanic strata underlying Mt. Etna and Mt. Vesuvius. It is believed that the strata underlying the Strait of Messina slipped along the line of this fault, and that the so-called tidal wave resulted from this rapid and radical altering of the sea's bed. In support of the theory now widely held that earthquakes are generally caused by the seeping of vast quantities of water into the earth's hot interior, resulting in the formation of gas and steam, it has been pointed out by Professor Milne, perhaps the greatest living authority on seismology, that an analysis of more than 10,000 observations in Japan shows that by far the greater number of earthquakes originated beneath the ocean or along the seaboard, "and as they radiated inland they became more and more feeble until on reaching the backbone of the country, which is drilled by numerous volcanic vents, they were almost imperceptible." Another idea is that the quiet, ceaseless work of the world's great rivers in carrying to the ocean sand and mud in immense quantities gradually alters the center of gravity of the globe and causes a shift in the direction of the axis. Many physicists agree with Prof. Percival Lowell, the eminent astronomer, in the contention that the earth is rapidly aging and that it is the wrinkling and consequent shrinking of the "skin" of the planet which is really the primary cause of earthquakes.

EARTHS, a term applied to certain tasteless, inodorous, dry, uninflammable substances of a moderate specific gravity, which constitute by far the greatest part of the gravel and soil that go to make up the mountains, valleys, and plains of our globe. They include lime, baryta, strontia, magnesia, alumina, etc. The earths were regarded as simple bodies until Sir H. Davy proved them to be compounds of oxygen with metals.

EARTH-SHINE, in astron. a name given to the faint light visible on the part of the moon not illuminated by the sun, due to the illumination of that portion by the light which the earth reflects on her. It is most conspicuous when the illuminated part of the disc is at its smallest, as soon after new moon. This phenomenon is popularly described as "the old moon in the new moon's arms."

EARTHWORM, a genus of common worms. They have a long, cylindrical body, divided by transverse furrows into numerous rings. The mouth is destitute of teeth, and they have no eyes, tentacles, or cirrhi. They are hermaphrodite. The common earthworm attains nearly a foot in length. It subsists on roots, woody fibers, animal matter, etc. It moves by the contractions of successive parts of the body aided by a double row of bristles. They are of great service to the agriculturist by loosening the soil and increasing its depth. This is chiefly the result of their mode of nourishment, since they deposit the soil they have swallowed, after digestion, in heaps called worm castings which bring up rich fine soil to the surface, gradually covering the upper layer sometimes to the extent of several inches.

EAR-TRUMPET, an artificial instrument for aiding the collection of the vibrations or waves of sound, and carrying them in an intensified form to the internal parts of the ear.

EARWIG, a common orthopterous insect whose name is derived from its supposed habit of insinuating itself into the ears of persons. This is practically impossible, yet the notion is widely spread. Much damage is sustained by gardeners from the depredations of these insects among fruit and tender vegetables, which constitute their proper food. The earwig is about three-quarters of an inch in length, having the wings folded under very short and truncate elytra or wing-cases, and the extremity of the abdomen armed with a horny forceps.

EASEL (ē'zel), the frame on which an artist supports his canvas. It is usually made to fold up after use.

EASEMENT, in law, a right or privilege which one proprietor may have to use the land of another in connection with the needs of his own land, as the use of a way, a water-course, etc. The right to an easement may be acquired either by grant or by uninterrupted enjoyment for a period of years.

EAST, one of the four cardinal points, being the point in the heavens where the sun is seen to rise at the equinox, or the corresponding point on the earth; that point of the horizon lying on the right hand when one's face is turned toward the north pole.

EASTER, the festival commemorating the resurrection of Christ, observed in the Roman Catholic, the Greek, Anglican, Lutheran, and other branches of the Christian church. By the first Christians it was considered to continue

the feast of the passover, at which the paschal lamb, a type of Christ, was sacrificed. Hence its name in Greek (pascha), French (pâques), and other Romance languages is taken from the Hebrew pesach, passover. The English name comes from the Anglo-Saxon Eostre, a goddess of light or spring, whose festival was celebrated in April. There was a long dispute in the Christian church as to the proper time for holding Easter, the Christians of the East celebrating it on the same day as that on which the Jewish passover fell, that is, the 14th of Nisan (hence they were called quarto decimani), while the majority of the church celebrated it on the Sunday next after this day. The controversy was decided by the Council of Nice (Nicæa) in 325, which settled that it was to be reckoned as at present, namely, that Easter is the first Sunday after the full moon which happens upon or next after the 21st of March, and if the full moon happens on a Sunday, Easter-day is the Sunday after, but, properly speaking, for the "full moon" in the above the "fourteenth day of the moon" should be substituted.

EASTERN ARCHIPELAGO. See Malay Archipelago.

EASTERN CHURCHES, a collective term for the Greek, Armenian, Coptic, Abyssinian, Syrian, and other kindred churches.

EASTERN EMPIRE. See Byzantine Empire.

EASTERN QUESTION, the name given to the diplomatic and national interests affected by the gradual retrocession of the Turkish Empire in Europe, and the problem of disposing of the territory thus left, or presumably to be left. Bulgaria, Roumania, Servia, and Greece are the new states which have naturally arisen on the withdrawal of the Turkish power, and their history in connection with the respective policies of England, France, Austria, and Russia toward them is the history of the phases of the "Eastern Question" so far. The Crimean war of 1854–56 with the Treaty of Paris which followed, the Russo-Turkish war of 1877–78 with the Treaty of Berlin, and the Greco-Turkish war of 1897, are among the notable events connected with this subject.

EASTERN ROUMELIA, a portion of the Turkish dominions in Europe lying on the south of Bulgaria from which it is separated by the Balkan Mountains; area, 13,500 sq. miles. The country is fertile, but agriculture is backward; wheat, wine, tobacco, etc., are produced; timber is abundant. The chief town is Philippopolis. East Roumelia was constituted an autonomous province of Turkey by the Treaty of Berlin in 1878, but has since attached itself to Bulgaria. (See Bulgaria.) Pop. 975,000.

EAST INDIA COMPANY, a great English company, originally simply a trading association, which played an important part in the history of Hindustan. It was formed in 1599 in London, with a subscribed capital of about $150,000, for the purpose of trade with the East Indies. A charter was granted to it by Queen Elizabeth on 31st December, 1600, for fifteen years, renewable for a similar period. In this charter the company is styled, "The Governor and Company of the Merchants of London trading into the East Indies." In 1617–18 the company was so enlarged as to include 954 proprietors, while a new joint-stock of $8,000,000 was subscribed. A new charter, granted by Charles II. in 1660, enlarged the powers of the company, giving it political and judicial authority in the factories and colonies established by it, with the right to appoint governors. On the revolution of 1688 the company was involved in new difficulties, and in 1692 the commons presented an address to the crown praying for their dissolution. A resolution in favor of the formation of a new company passed the House of Commons on 4th May, 1698, and this company was actually constituted by Act 9, William III. This act provided for the extinction of the old company, but an amalgamation was eventually arranged in 1708. The renewal of the company's charter in 1834 took place amid continued opposition to their mercantile, and even to their legislative privileges. It continued them in all their possessions except the island of St. Helena, put an end to the exclusive right of trade with China, and enacted that the company should with all convenient speed close their commercial business, and make sale of all their property not retained for government purposes; all their other property was to be held in trust for the crown, which was to take over their debts and guarantee their dividend out of the revenues of India. Henceforth the company existed only for the purpose of receiving payment of its capital, and of the dividends due upon capital until its repayment.

EAST INDIES, the name loosely applied to Hindustan, the Indo-Chinese peninsula, and a portion of the Eastern Archipelago, but excluding the Philippine Islands, New Guinea, and Australia.

EASTLAKE, Sir Charles Lock, English painter, president of the Royal Academy, born at Plymouth 17th November, 1793. He studied at the Royal Academy, London, and at Paris. In 1830 he was elected member of the Royal Academy, and in 1850 became its president, receiving at the same time the honor of knighthood. He died at Pisa 23d December, 1865.

EAST LIVERPOOL, a city in Columbiana co., Ohio, on the Ohio river; 44 miles w.n.w. of Pittsburg and 44 miles e. of Wheeling; has excellent educational advantages; is one of the most important pottery-ware manufacturing centers in the U. States, having thirty potteries. Pop. 69,285.

EASTON, a city and railway center, the capital of Northampton co., Pa., situated at the confluence of the Delaware and Lehigh rivers; 75 miles from New York and 60 miles fom Philadelphia. The famous treaty with the Five Nations is recorded as having taken place at the forks of the Delaware. Pop. 29,848.

EAST ORANGE, a town in Essex co., N. J., situated on the D., L. and W. railroad and the Wachung branch of the N. Y. and Greenwood Lake railway; 12 miles from New York and adjoining Newark on the west. It is a place of suburban residences for New York business men. Pop. 25,170.

EAST RIVER, a strait in New York state, separating New York from Brooklyn and connecting Long Island Sound with New York Bay, about 20 miles long. A great supension-bridge crosses between New York and Brooklyn.

EAST SAGINAW, the eastern portion of Saginaw city, Michigan, on the navigable river Saginaw, about 17 miles from its mouth in Saginaw Bay (Lake Huron). It has a large trade and important manufactures. See Saginaw.

EAST SAINT LOUIS, a city of Illinois, in St. Clair county, opposite Saint Louis, Mo. It is an important manufacturing and railroad center and contains many large buildings and several miles of paved streets. It has a population of 30,000.

EAU (ō), a French word signifying water, and used in English with some other words for several spirituous waters, particularly perfumes, as eau de Cologne, eau de Luce, etc.—Eau de Cologne is a fragrant water, made originally and in most perfection in Cologne. It consists of spirits of wine flavored by different essential oils blended so as to yield a fine fragrant scent.—Eau Créole, a highly-esteemed liqueur made in Martinique by distilling the flowers of the mammee apple with spirit of wine.—Eau de Luce ("water of Luce"), is made by dissolving white soap in spirit of wine, and adding oil of amber and sal ammoniac. It is a milky fluid, antispasmodic and stimulant.—Eau de Vie ("water of life"), a term used by the French for the coarser kinds of brandy, cognac being the name of the best.

EAU CLAIRE (ō klār), the county seat of Eau Claire county, Wis., 85 miles from Saint Paul, Minn. It has considerable manufacturing interests. Pop. 21,517.

EBERS (ā'bèrz), Georg Moritz, German Egyptologist and novelist, born 1st March 1837 at Berlin. His most important works have been translated into English, such as Egypt, Descriptive, Historical, and Picturesque, and the novels, An Egyptian Princess, Uarda, Homo Sum, The Emperor, The Sisters, all dealing with old Egyptian life; The Burgomaster's Wife, Only a Word, etc. He died in 1898

EB'ONY, the popular name of various plants of different genera, agreeing in having wood of a dark color. The most

Ebony.

valuable is the heart-wood, which grows in great abundance in the flat parts of Ceylon, and is of such size that logs of its heart-wood 2 feet in diameter and from 10 to 15 feet long are easily pro-

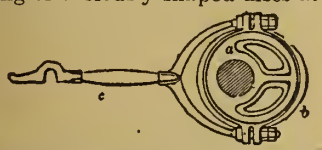
cured. Ebony is hard, heavy, and durable, and admits of a fine polish or gloss. The most usual color is black, red, or green. The best is jet black, free from veins, very heavy, astringent, and of an acrid pungent taste. On burning coals it yields an agreeable perfume, and when green it readily takes fire from its abundance of fat. It is wrought into toys, and used for mosaic and inlaid work.

EBULLITION, the boiling of a fluid. See Boil.

ECARTE (ā-kär'tā), a game at cards for two persons played with thirty-two cards, the small cards from two to six being excluded. In the English mode of playing the game the players cut for the deal, which is decided by the lowest card. The dealer gives five cards to either player, three and two at a time, and turns up the eleventh card for trump. If he turns up a king he scores one, and if a king occurs in the hand of either player he may score one by announcing it before the first trick. The cards rank as follows: king (highest), queen, knave, ace, ten, etc. The non-dealer leads; trumps take all other suits, but the players must follow suit if they can. Three tricks count one point, five tricks two points; five points make game. Before play begins the non-dealer may claim to discard (écarter) any of the cards in his hand, and have them replaced with fresh ones from the pack. This claim the dealer may or may not allow. Should he allow he can discard as many as he pleases. Sometimes only one discard is allowed, sometimes more.

ECCE HOMO (ek'sē-), a name often given to crucifixes and pictures which represent Christ bound and crowned with thorns.

ECCEN'TRIC, a term in mechanics applied to contrivances for converting circular into reciprocating (backward and forward) rectilinear motion, consisting of variously-shaped discs attach-

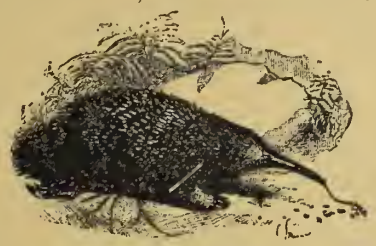


Eccentric of steam-engine—*a*, Eccentric wheel; *b*, Eccentric-strap; *c*, Eccentric-rod.

ed to a revolving shaft not in their center. An eccentric wheel is a wheel fixed on an axis that does not pass through the center. Its action is that of a crank of the same length as the eccentricity.

ECCLESIAS'TES (-tēz), the title by which the Septuagint translators rendered the Hebrew Coheleth ("the gatherer of the people"), a symbolic name explained by the design of the book and the dramatic position occupied by Solomon in it, one of the canonical books of the Old Testament. According to Jewish tradition it was written by Solomon; but the best modern criticism has decided that its style and language, no less than its thought, belong to a much later date.

ECHIDNA (ē-kid'na), a genus of Australian monotrematous, toothless mammals, in size and general appearance resembling a large hedgehog, excepting that the spines are longer, and the muzzle is protracted and slender, with a small aperture at the extremity for the protraction of a long flexible tongue. The habits of the Echidna are nocturnal; it burrows, having short strong legs with five toes, and feeds on insects,



Porcupine ant eater.

which it catches by protruding its long sticky tongue. It is nearly allied to the Ornithorhynchus, the two forming a peculiar class of animals, having in their structure some peculiarities at once of mammals, birds, and reptiles. In 1884 it was found, that, as Geoffroy St. Hilaire had suspected, the echidna and ornithorhynchus, although essentially mammals, were yet oviparous, producing their young from eggs. One species from its appearance, is popularly known as the porcupine ant-eater.

ECHO (ek'ō), the repetition of a sound caused by the reflection of sound-waves at some moderately even surface, as the wall of a building. The waves of sound on meeting the surface are turned back in their course according to the same laws that hold for reflection of light. In order that the echo may return to the place from which the sound proceeds the reflection must be direct, and not at an angle to the line of transmission, otherwise the echo may be heard by others but not by the transmitter of the sound. This may be effected either by a reflecting surface at right angles to the line of transmission, or by several reflecting surfaces which end in bringing the sound back to the point of issue. Sound travels about 1125 feet in a second; consequently, an observer standing at half that distance from the reflecting object would hear the echo a second later than the sound. Such an echo would repeat as many words and syllables as could be heard in a second. As the distance decreases the echo repeats fewer syllables till it becomes monosyllabic. The most practiced ear cannot distinguish in a second more than from nine to twelve successive sounds, so that a distance of not less than 60 feet is needed to enable a common ear to distinguish between the echo and the original sounds. At a near distance the echo only clouds the original sounds, and this often interferes with the hearing in churches and other large buildings. Woods, rocks, and mountains produce natural echoes in every variety, for which particular localities have become famous.—In Greek mythol. Echo was a nymph (one of the Oreads) who fell in love with Narcissus, and because he did not reciprocate her affection she pined away until nothing was left but her voice.

ECKELS, James Herron, an American financier, born in Princeton, Ill., 1858. He was comptroller of the currency from 1893 to 1898, since which time he has been president of the Commercial National Bank of Chicago.

ECKFORD, Henry, an American ship designer, born in Scotland in 1775, died in 1832. In 1796 he removed to the United States, established a ship yard, and built the Robert Fulton, the first successful ocean-going steamship.

ECLEC'TICS is a name given to all those philosophers who do not follow one system entirely, but select what they think the best parts of all systems. In this century the eclectic method found a notable supporter in the French philosopher Victor Cousin.

ECLECTIC SCHOOL OF MEDICINE, a school of medicine, founded in the United States in 1826 and represented today by 22 colleges and a considerable number of practitioners. The eclectic school teaches that the best practice of medicine is found in choosing remedies regardless of the "isms" of the discoverers.

ECLIPSE (ek-lips'), an interception or obscuration of the light of the sun moon or other heavenly body by the intervention of another and nonluminous heavenly body. Stars and planets may suffer eclipse, but the principal eclipses are those of the sun and the moon.

An eclipse of the moon is an obscuration of the light of the moon occasioned by an interposition of the earth between the sun and the moon; consequently, all eclipses of the moon happen at full moon; for it is only when the moon is on that side of the earth which is turned away from the sun, and directly opposite, that it can come within the earth's shadow. Further, the moon must at

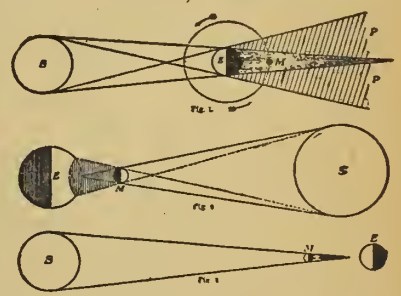


Diagram illustrating the theory of eclipses.

that time be in the same plane as the earth's shadow; that is, the plane of the ecliptic in which the latter always moves. But as the moon's orbit makes an angle of more than 5° with the plane of the ecliptic, it frequently happens that though the moon is in opposition it does not come within the shadow of the earth. The theory of lunar eclipses will be understood from Fig. 1, where s represents the sun, e the earth, and m the moon. If the sun were a point of light there would be a sharp outlined shadow or umbra only, but since the luminous surface is so large there is always a region in which the light of the sun is only partially cut off by the earth, which region is known as the penumbra (p p). Hence during a lunar eclipse the moon first enters the penumbra, then is

totally eclipsed by the umbra, then emerges through the penumbra again.

An eclipse of the sun is an occultation of the whole or part of the face of the sun occasioned by an interposition of the moon between the earth and the sun; thus all eclipses of the sun happen at the time of new moon. Fig. 2 is a diagram showing the principle of a solar eclipse. The dark or central part of the moon's shadow, where the sun's rays are wholly intercepted, is here the umbra, and the light part, where only a part of them are intercepted, is the penumbra; and it is evident that if a spectator be situated on that part of the earth where the umbra falls there will be a total eclipse of the sun at that place; in the penumbra there will be a partial eclipse, and beyond the penumbra there will be no eclipse. As the earth is not always at the same distance from the moon, and as the moon is a comparatively small body, if an eclipse should happen when the earth is so far from the moon that the moon's shadow falls short of the earth, a spectator situated on the earth in a direct line between the centers of the sun and moon, would see a ring of light round the dark body of the moon; such an eclipse is called annular, as shown in Fig. 3; when this happens there can be no total eclipse anywhere, because the moon's umbra does not reach the earth. An eclipse can never be annular longer than 12 minutes 24 seconds, nor total longer than 7 minutes 58 seconds; nor can the entire duration of an eclipse of the sun ever exceed 2 hours.

An eclipse of the sun begins on the western side of his disc and ends on the eastern; and an eclipse of the moon begins on the eastern side of her disc and ends on the western. The average number of eclipses in a year is four, two of the sun and two of the moon; and as the sun and moon are as long below the horizon of any particular place as they are above it, the average number of visible eclipses in a year is two, one of the sun and one of the moon.

ECLIP'TIC, the sun's path, the great circle of the celestial sphere, in which the sun appears to describe his annual course from west to east—really corresponding to the path which the earth describes. (See Earth.) The Greeks observed that eclipses of the sun and moon took place near this circle; whence they called it the ecliptic. The ecliptic has been divided tnto twelve equal parts, each of which contains 30 degrees, and which are occupied by the twelve celestial signs or constellations, viz.·

♈ = Aries (the Ram), March 20.
♉ = Taurus (the Bull), April 20.
♊ = Gemini (the Twins), May 21.
♋ = Cancer (the Crab), June 21.
♌ = Leo (the Lion), July 22.
♍ = Virgo (the Virgin), August 23.
♎ = Libra (the Balance), September 23.
♏ = Scorpio (the Scorpion), October 23.
♐ = Sagittarius (the Archer), Nov. 22.
♑ = Capricornus (the Goat), Dec. 21.
♒ = Aquarius (the Water-carrier), Jan. 19.
♓ = Pisces (the Fishes), February 18.

These are also called signs of the zodiac, the zodiac being a belt of the heavens extending 9 degrees on each side of the ecliptic. The days of the month annexed show when the sun, in its annual revolution, enters each of the signs of the zodiac. From the first point of Aries, or the place of the sun at the vernal equinox, the degrees of the ecliptic are counted from west to east. The plane of the ecliptic is that by which the position of the planets and the latitude and longitude of the stars are reckoned. The points at which the equator and ecliptic intersect are subject to a continual variation, receding westward at the rate of about 50 seconds a year. The angle at which the ecliptic stands to the equator is also variable, and has been diminishing for about 4000 years at the rate of about 50 seconds in a century. Laplace showed, however, that this variation has certain fixed limits, and that after a certain time the angle will begin to increase again. The combined result of these two changes is to cause the pole of the earth not to point constantly to the same spot in the heavens, but to describe an undulating circle round a certain point; but this movement is so slow that it takes many thousand years to complete it. See Nutation and Precession.

ECLOGUE (ek'log), a term usually applied to what Theocritus called idyls —short, highly-finished poems, principally of a descriptive or pastoral kind.

ECOLE POLYTECHNIQUE, a school in Paris established with the purpose of giving instruction in matters connected with the various branches of the public service, such as mines, roads and bridges, engineering, the army and the navy, government manufactures, etc. It was founded in 1794, and is under the direction of the minister of war. Candidates are admitted only by competitive examination, and have to pay for their board 1000 francs (about $200) a year. The pupils who pass satisfactory examinations at the end of their course are admitted to that branch of public service which they select.

ECUADOR (ek-wȧ-dōr'), a republic of S. America, situated under the equator, whence it takes its name, between Peru and Colombia. Area, about 248,386 sq. miles, or including the Galapagos Islands, 251,337 sq. miles. The mountain region is formed by a double range of snow-clad mountains—several of them active volcanoes—which inclose a longitudinal valley or table-land, with a breadth of 20 to 40 miles, and varying in elevation from 8500 to 13,900 feet. The most elevated of these mountains are, in the western range, Chimborazo, Pichincha, and Cotacachi, Chimborazo being 20,703 feet high. The chief towns here are Quito, the capital, with a pop. of 80,000; Riobamba, and Cuenca, all situated at a height of 9000 feet or more above the sea. The chief ports of Ecuador are Guayaquil and Esmeraldas. The most considerable rivers, the Tigre, Napo, Pastaza, etc., belong to the basin of the Amazon. Ecuador is comparatively poor in mammalia; although various kinds of deer as well as tapirs and peccaries are found in the forests. Parrots and humming-birds are also numerous, but perhaps the most remarkable of the birds in Ecuador is the condor, which dwells on the slopes of the Andes. Reptiles, including serpents, are numerous. The forests yield cinchona bark, caoutchouc, sarsaparilla, vegetable ivory, etc. The climate on the plains, both in the east and the west, is moist, hot, and unhealthy. In the higher regions the climate is rough and cold, but in great part the elevated valleys, as that of Quito, enjoy a delightful climate. Here the chief productions are potatoes, barley, wheat, and European fruits. In the lower regions are grown all the food-products of tropical climates, cacao, coffee, sugar, etc. Cacao forms three-fourths (or more) of the whole export; the remainder is made up of coffee, hides, vegetable ivory, caoutchouc, etc. The people are poorly educated. The religion is exclusively Roman Catholic. The executive government is vested in a president elected for four years, who is assisted by a council of state. The congress is the legislative body, and consists of two houses, one formed of senators, two for each province, the other of deputies, one for every 30,000 inhabitants, both elected by universal suffrage. The money unit is the sucre, equivalent to a 5-franc piece, but the coins of the U. States, France, and Britain circulate. Railways and telegraphs have made little progress.—Ecuador at the time of the conquest of Peru by the Spaniards formed part of the great empire of the Incas. Of the present population, the aboriginal red race form more than half; the rest are negroes, mulattoes, mestizos, a degenerate breed of mixed negro and Indian blood, and Spanish Creoles or whites. The latter are the chief possessors of the land, but are deficient in energy. Pop. estimated, 1,275,000.

ECUMENICAL COUNCIL, a general ecclesiastical council regarded as representing the whole Roman Catholic Church. The last was held at Rome in 1870. There were present 803, including cardinals, archbishops, bishops, abbots, and generals of orders. After much discussion, and the withdrawal of a numher of bishops, the infallibility of the pope as head of the church was affirmed and promulgated.

EC'ZĒMA, a disease of the skin, marked by an eruption of small vesicles, preceded by redness, heat, and itching of the part. In course of time the minute vesicles burst, and discharge a thin acrid fluid, which often gives rise to excoriation. The most severe form of this disease arises from constitutional conditions, but purely local attacks are likewise caused by exposure of the skin to irritating substances.

EDDA, the name given to two ancient Icelandic works, the one consisting of mythological poems, the other being mainly in prose. The first of these collections, called the Older or Poetic Edda, was compiled in the 13th century. For a long time an earlier date was given, the compiler being erroneously believed to have been Sæmund Sigfusson, a learned Icelandic clergyman, who lived from about 1056 to 1133. It consists of thirty-three pieces, written in alliterative verse, and comprising epic tales of the Scandinavian gods and goddesses, and narratives dealing with the Scandinavian heroes. These poems are now

assigned to a period extending from the 9th to the 11th century. The prose Edda, or Younger Edda, presents a kind of prose synopsis of the Northern mythology; a treatise on the Scaldic poetry and versification, with rules and examples; and lastly a poem (with a commentary) in honor of Haco of Norway (died 1263). In its earliest form this collection is ascribed to Snorri Sturluson, who was born in Iceland in 1178, and was assassinated there in 1241 on his return from Norway, where he had been scald or court poet.

EDDY, Clarence, an American organist, born in Massachusetts in 1851. In 1894 he became organist of the First Congregational Church in Chicago. He has composed a considerable quantity of organ music and has translated important text-books from the German.

EDDY, Mary Baker Glover, the founder of Christian Science, born in New Hampshire in 1822. She discovered Christian Science in 1866, founded the first Christian Science Church in 1879 at Boston, and the Massachusetts Metaphysical College in 1881. Her principal work is Science and Health, with Key to the Scriptures, in which the doctrines of Christian Science are set forth. (See Christian Science.)

EDDYSTONE LIGHTHOUSE, a lighthouse in the English Channel, erected to mark a group of rocks lying in the fair way from the Start to the Lizard. The rocks are covered only at the flood.

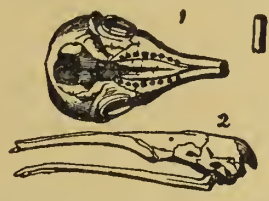
EDELWEISS (ā'dėl-vīs), a composite plant inhabiting the Alps, and often growing in the most inaccessible places. Its flower-heads are surrounded by a

Edelweiss.

spreading foliaceous wooly involucre, and its foliage is also of the same woolly character. It is not difficult to cultivate, but is apt to lose its peculiar woolly appearance.

E'DEN, the original residence of the first human pair. It is said to have had a garden in the eastern part of it, and we are told that a river went out of Eden to water this garden, and from thence it was parted into four heads, which were called respectively Pison, Gihon, Hiddekel, and Euphrates (Phrat), but this does not enable us to identify the locality. It was not the whole of Eden that was assigned to man for his first habitation, but the part toward the east, to which the translators of the Authorized Version have given the name of the Garden of Eden, and which Milton, in Paradise Lost, calls Paradise, that word (originally Persian) having in its Greek form (paradeisos) been applied to the Garden of Eden by the translators of the Septuagint.

EDENTA'TA (ē-), or toothless animals, the name of an order of Mammalia, though only two genera of the order want teeth, the ant-eaters, and the pangolins. The remainder are merely



1, Skull and (3) tooth of a small species of armadillo. 2, Skull of Great ant-eater.

destitute of teeth in the front of the jaws. The teeth they possess, however, are destitute of enamel, do not have complete roots, and are not replaced by a second set. This order is also characterized by the presence of great claws surrounding the ends of the toes, and more or less approximating to the nature of hoofs. It is divided into two sections, the first comprehending the sloths, which subsist on vegetable food, and the gigantic fossil animals the Megatherium and the Megalonyx; and the second including the armadillos and the ant-eaters, which live mainly on insects, though some of the armadillos eat other sorts of animal food, and also vegetables.

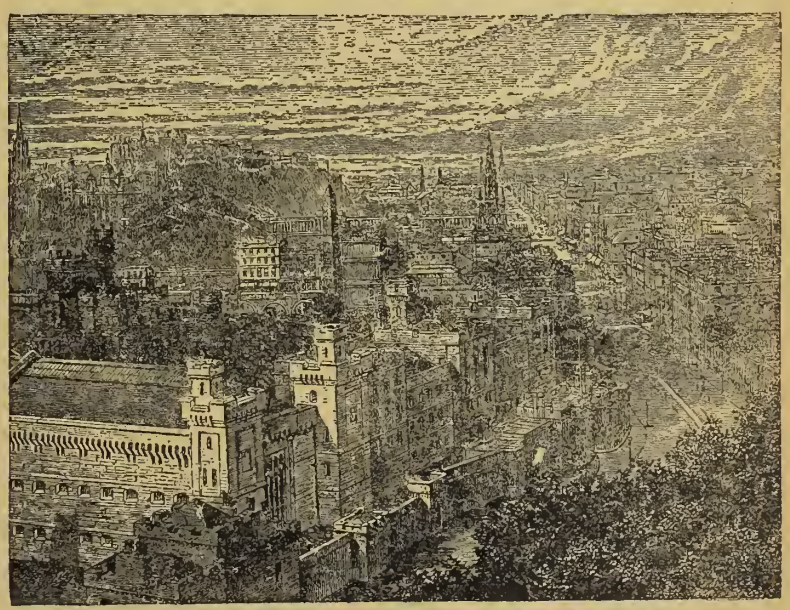
EDGAR ATHELING, grandson of Edmund Ironside and son of Edward the Outlaw, was born in Hungary, where his father had been conveyed in infancy to escape the designs of Canute. After the battle of Hastings, Edgar (who had been brought to England in 1057) was proclaimed king of England by the Saxons, but made peace with William and accepted the Earldom of Oxford.

EDIBLE BIRDS' NESTS. See Birds'-nests, Edible.

EDICT, a public proclamation by a sovereign, a governor, or other competent official.

EDICT OF NANTES. See Nantes.

ED'INBURGH, the metropolis of Scotland, and one of the finest as well as most ancient cities in the British empire, lies within 2 miles of the south shore of the Firth of Forth. It is picturesquely situated, being built on three eminences which run in a direction from east to west, and surrounded on all sides by lofty hills except on the north, where the ground slopes gently toward the Firth of Forth. The central ridge, which constituted the site of the ancient city, is terminated by the castle on the west, situated on a high rock, and by Holyrood House on the east, not far from which rise the lofty elevations of Salisbury Crags, Arthur's Seat (822 feet high), and the Calton Hill overlooking the city. Among the notable buildings are the ancient Parliament House, now the seat of the supreme courts of Scotland; St. Giles's Church or Cathedral, an imposing edifice in the later Gothic style, recently carefully restored; the Tron Church; Victoria Hall (where the General Assembly of the Established Church meets), with a fine spire; the Bank of Scotland; etc., besides some of the old family houses of the Scottish nobility and other buildings of antiquarian interest. In the old town the most remarkable public building is the castle. This fortress contains accommodation for 2000 soldiers, and the armory space for 30,000 stand of arms. In an apartment here are kept the ancient regalia of Scotland. The palace of Holyrood, or Holyrood House, as it is more generally called, stands at the lower or eastern extremity of the street leading to the castle. In the northwest angle of the building are



Edinburgh, showing the prison, the castle, Scott monument, Princess street, etc.

the apartments which were occupied by Queen Mary, nearly in the same state in which they were left by that unfortunate princess. Adjoining the palace are the ruins of the chapel belonging to the Abbey of Holyrood, founded in 1128 by David I. On the south side of the Old Town, and separated from it also by a hollow crossed by two bridges (the South Bridge and George IV. Bridge), stands the remaining portion of the city, which, with the exception of a few unimportant streets, is mostly modern. Besides the buildings already noticed Edinburgh possesses a large number of important edifices and institutions, chief among which are the Royal Institution (accommodating the Royal Society and other bodies), the National (Picture) Gallery, the National Portrait Gallery, the Museum of Science and Art, the Episcopal Cathedral of St. Mary's, the High-school register office, etc. Among the more prominent educational institutions are the University, the High-school, the Academy, the Free Church Theological College, the United Presbyterian Theological Hall, the Edinburgh School of Medicine, the Veterinary College, the Fettes College, on the model of the great English public schools, the Heriot-Watt College, technical, commercial, and literary, several endowed secondary schools. The Advocates' Library, the largest in Scotland, contains upward of 300,000 printed volumes and 3000 MSS.; the University Library, 200,000; the Library of Writers to the Signet, 90,000. There is also a rate-supported public library. The town was made a royal burgh in the time of David I.; but it was not till the 15th century that it became the recognized capital of Scotland. Pop. 316,479.—The county of Edinburgh or Midlothian is bounded n. by the Firth of Forth, along which it extends 11 or 12 miles; and by the counties of Linlithgow, Haddington, Berwick, Lanark, Peebles, Selkirk, and Roxburgh; area, 234,926 acres, over half of which is arable or under permanent pasture. The principal rivers are the North and South Esks and the Water of Leith, all running into the Forth. The chief crops are oats, barley, turnips, and potatoes. The manufactures are comparatively limited, but include ale, whisky, gunpowder, paper, tiles, etc. The fisheries are valuable. The chief towns are: Edinburgh, Leith, Dalkeith, Musselburgh, and Portobello. Pop. 488.647.

EDINBURGH, Duke of, H.R.H., Prince Alfred Ernest Albert, K.G., K.T., K.P., etc., late Duke of Saxe-Coburg-Gotha, the second son of Queen Victoria, was born at Windsor Castle, Aug. 6, 1844. In 1862 he declined the offer of the throne of Greece. In 1874 he married the Grand-duchess Marie, only daughter of the Emperor of Russia. In 1893 he succeeded his uncle as ruler of Saxe-Coburg-Gotha, He had one son (who predeceased him) and four daughters. He died in 1900.

EDINBURGH UNIVERSITY, the latest of the Scottish universities, was founded in 1582 by a charter granted by James VI. The number of chairs is now over forty, besides assistants. The university is a corporation consisting of a chancellor, rector, principal, professors, registered graduates and alumni, and matriculated students. Its government is administered by the University Court, the Senatus Academicus, and the General Council, as in the other Scottish universities, in all of which new ordinances have been introduced under the Universities (Scotland) Act of 1889. The University Court, which is the supreme governing body of the university, consists of the rector, who is president, the principal, the Lord-provost of Edinburgh, and eleven assessors. The Senatus superintends the teaching and discipline of the university, and consists of the principal and professors. The General Council consists of the chancellor, who is president, the members of the University Court and Senatus, and the graduates of the university. It takes cognizance of matters generally affecting the well-being of the university. The chancellor is the official head of the university, and it is through him or his deputy, the vice-chancellor, that degrees are conferred. He is elected for life by the general council. The principal is the resident head of the university and president of the Senatus, and is appointed for life (at Edinburgh by a body called the "Curators," elsewhere by the crown). The rector is elected for three years by the matriculated students. There are six faculties in the university, viz. arts, science, divinity, law, medicine, and music. The library contains 200,000 volumes. There are bursaries, scholarships, and fellowships, amounting annually to about $60,000.

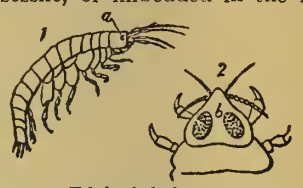
EDISON, Thomas Alva, a noted American inventor, born in Ohio in 1847. He began his career as a newsboy on the Grand Trunk Railway, and early began to experiment with mechanical and electrical devices. He learned the art of telegraphy at Mount Clemens, Mich., and soon afterward invented his automatic repeater. Going to Boston he secured work as an operator and was meanwhile busy with new inventions, among them a vote recorder, and the so-called "ticker" for the printing of market quotations. His greatest invention was that of the quadruplex telegraph system which revolutionized the art of telegraphy. He improved the telephone, invented the phonograph, and perfected the incandescent electric light. Edison has taken out hundreds of patents many of which have proved to be failures. He may be truly said, however, to be the greatest inventor of history.

ED'MONTON, a town in England, county of Middlesex, 7½ miles north of London, with an extensive trade in timber, carried on by the Lea River navigation. The "Bell at Edmonton" has become famous by association with the adventures of Cowper's John Gilpin. Pop. 46,899.

EDMUND I., King of England, an able and spirited prince, succeeded his brother Athelstan in 940. He conquered Cumbria, which he bestowed on Malcolm, king of Scotland, on condition of doing homage for it to himself. He was slain at a banquet May 26, 946.

EDMUND II., surnamed Ironside, King of England, was the eldest son of Ethelred II., and was born in 989. He was chosen king in 1016, Canute having been already elected king by another party. He won several victories over Canute, but was defeated at Assandun in Essex, and forced to surrender the midland and northern counties to Canute. He died after a reign of only seven months.

EDRIOPHTHAL'MATA, one of the great divisions of the Crustacea, including all those genera which have their eyes sessile, or imbedded in the head,



Edriophthalmata.

1, Fresh-water shrimp. *a*, single eye. 2, Head of cymothoa. *b*, clusters of simple eyes.

and not fixed on a peduncle or stalk as in the crabs, lobsters, etc. It includes slaters, sandhoppers, woodlice, etc. Some are parasitic on fishes, and of the others some live in the sea and some on land, as the common and the sea woodlouse.

EDSON, Cyrus, an American physician born in New York in 1857. He has been active in the sanitation affairs of New York City and is the inventor of several important surgical instruments.

EDUCATION, in the widest sense, all that course of instruction and discipline which is intended to enlighten the understanding, correct the temper, cultivate the taste, and form the manners and habits of youth, and fit them for usefulness in their future stations. Or it may be defined as the art or scientifically-matured system of developing and cultivating the various physical, intellectual, æsthetic, and moral faculties; and may thence be divided into four branches—physical, intellectual, æsthetic, and moral education. Under physical education is included all that relates to the healthy development of the organs of sensation and the muscular and nervous system. Intellectual education comprehends the means by which the powers of the understanding are to be developed and improved, and the imparting of instruction in the various branches of knowledge. Æsthetic education comprehends the agencies which purify and refine the mind by training it to perceive and take delight in what is beautiful, true, and pure in nature, literature, and art. Moral education (in which may or may not be included religious education) embraces the various methods of cultivating and regulating the affections of the heart. In the popular view education is much the same as instruction, and is regarded as consisting simply in the lessons and discipline learned in connection with attendance at school. So far as governments or other public bodies have interested themselves in the education of youth this view is tolerably correct; but probably the most perfect system of education would be one in which schools formed no part whatever. Schools, however, seem to have been

established at a very early period in the history of all civilized communities, though not neccssarily in connection with any system of national education. Indeed a thoroughly-organized system of national education exists in but few states, Germany being the most conspicuous example of such. In England no national system existed till the passing of the education act of 1870, and in Britain it is only elementary education that can be said to be established on a satisfactory footing. A complete system of national education ought to make satisfactory provision for primary or elementary education, secondary education, and higher or university education, besides providing for the due education of teachers, and for technical education, commercial education, artistic education, etc.; but how far education in any department should be free (or at the expense of the state) is a question on which authorities are not agreed. Elementary education is practically free in Britain, France, Italy, Germany, the United States, Canada. several of the Australian colonies, and elsewhere. In a properly-organized system the three great classes of educational institutions would be interdependent, the primary schools supplying pupils satisfactorily equipped for passing into the secondary schools, and these again passing on a certain number of their pupils to the university sufficiently equipped for entering on their more advanced studies. It is generally agreed that elementary education should be compulsory, and this is now the law in Britain, Germany, France, Italy, Denmark, many of the United States, etc.; but the law may exist with more or less laxity in the enforcement of it. The elementary schools have, at their special province, the teaching of those branches of education that everyone ought to be instructed in, such as reading, writing, arithmetic, grammar, geography, etc.; but they usually teach also a number of other subjects. The secondary schools include institutions known as high schools, academies, grammar-schools, colleges, etc. The subjects taught in them are such as ancient and modern languages, mathematics, science, history, geography, etc., and they may either prepare pupils who intend to engage in commerce or other business, or who intend to proceed to the university. Thus in some secondary schools there is a modern side and a classical side (or similar divisions); while in Germany there are the two distinct classes of schools, the "real-schools,") for modern subjects), and the gymnasia. The universities provide an education for the so-called "learned profession," as well as for all who appreciate the advantages of a university training. Their most characteristic feature is the privilege of granting degrees. Since 1900, English education, primary, secondary, and technical, has been under the control of the board of education, consisting of a president, the lord-president of the council, the principal secretaries of state, the first commissioner of the treasury, and the chancellor of the exchequer. There are separate education departments for Scotland and Ireland.

EDUCATION, COMMERCIAL, in the United States the teaching of account keeping, and other arts used in the conduct of business generally. Commercial education differs from technical education in that the American business or commercial college does not include the sciences in its curriculum. Of recent years institutions of higher education have taken up technical and commercial education on a scale much larger than before, and the importance of this branch of learning is a constantly growing quantity in American educational systems. The number of students in independent business colleges agregates hundreds of thousands.

EDUCATION, COMMISSIONER OF, the title of the chief of the United States Bureau of Education at Washington, D.C. He is appointed by the president and has charge of all educational statistics.

EDUCATIONAL ASSOCIATION, the National, an association of American teachers, organized in 1857 and incorporated in 1886. Annual meetings of the association are held in various parts of the country and the members read papers upon and discuss all aspects of their profession. The annual reports of the society are the most important educational documents published in the United States.

EDWARD, known as the Elder, King of England, son of Alfred the Great, born about 870, succeeded his father in 901. His reign was distinguished by successes over the Danes. He died in 925.

EDWARD, surnamed the Martyr, King of England, succeeded his father, Edgar, at the age of fifteen, in 975. He was treacherously slain in 979 by a servant of his step-mother, at her residence, Corfe Castle. The pity caused by his innocence and misfortune induced the people to regard him as a martyr.

EDWARD, King of England, surnamed the Confessor. On the death of his maternal brother, Hardicanute the Dane, in 1041, he was called to the throne, and thus renewed the Saxon line. His queen was the daughter of Godwin, earl of Kent. He died in 1066, and was succeeded by Harold, the son of Godwin. He caused a body of laws to be compiled from those of Ethelbert, Ina, and Alfred, to which the nation was long fondly attached. He was canonized by Pope Alexander III. in 1166.

EDWARD, Prince of Wales, surnamed the Black Prince, born June 15, 1330, the eldest son of Edward III. and Philippa of Hainault. In 1346 he commanded part of the forces at the battle of Crécy, and earned the praise of his warlike father. It was on this occasion hat he adopted the motto Ich dien (I serve), used by all succeeding princes of Wales. He died in 1376.

EDWARD I. (of the Norman line), King of England, son of Henry III., was born at Winchester in 1239. The contests between his father and the barons called him early into active life, and he finally quelled all resistance to the royal authority by the decisive defeat of Leicester at the battle of Evesham, in 1265. During his reign great progess was made in the establishment of law and order throughout the land. He died in 1307.

EDWARD II., King of England, born at Caernarvon Castle in 1284, and the first English Prince of Wales, succeeded his father, Edward I., in 1307. The king's fondness for a favorite, Hugh le Despenser, had made a number of malcontents, and Queen Isabella, making a visit to France, entered into a correspondence with the exiles there, and formed an association of all hostile to the king. Aided with a force from the Count of Hainault she landed in Suffolk in 1326. Her army was completely successful. The Despensers were captured and executed, and the king was taken prisoner and confined in Kenilworth, and ultimately in Berkeley Castle, where he was murdered 21st Sept. 1327.

EDWARD III., King of England, son of Edward II. by Isabella of France, was born in 1313. On his father's deposition in 1327 he was proclaimed king under a council of regency. Collecting an army and accompanied by the Black Prince, he crossed over to France. The memorable battle of Crécy followed, August 25, 1346, which was succeeded by the siege of Calais. In the meantime David II., having recovered the throne of Scotland invaded England with a large army, but was defeated and taken prisoner by a much inferior force under Lord Percy. In 1348 a truce was concluded with France; but on the death of King Philip, in 1350, Edward again invaded France, plundering and devastating. Recalled home by a Scottish inroad he retaliated by carrying fire and sword from Berwick to Edinburgh. In the meantime the Black Prince had penetrated from Guienne to the heart of France, fought the famous battle of Poictiers, and taken King John prisoner. A truce was then

Edward the Black Prince—Effigy at Canterbury.

made at the expiration of which (1359) Edward again crossed over to France and laid waste the provinces of Picardy and Champagne, but at length consented to a peace. This confirmed him in the possession of several provinces and districts of France which were intrusted to the Prince of Wales (the Black Prince), but gradually all the English possessions in France, with the exception of Bordeaux, Bayonne, and Calais, were lost. King Edward died a year after his heroic son. June 21, 1377.

EDWARD IV., King of England, was born in 1441. His father, Richard, Duke

of York, was grandson of Edmund, Earl of Cambridge and Duke of York, fourth son of Edward III., while the rival line of Lancaster descended from John of Gaunt, the third son. The victory of Towton, soon after his accession, confirmed his title, and three years after, on May 4, 1464, the battle of Hexham completely overthrew the party of Henry VI. The king now made an imprudent marriage with Elizabeth, widow of Sir John Grey, at the very time when he had despatched the Earl of Warwick to negotiate a marriage for him with the sister of the French king. He thus alienated powerful friends, and Warwick, passing over to the Lancastrian cause, gathered a large army, and compelled Edward to flee the country. Henry's title was once more recognized by parliament. But in 1471 Edward, at the head of a small force given him by the Duke of Burgundy, landed at Ravenspur in Yorkshire, and his army, being quickly increased by partisans, marched swiftly on London and took the unfortunate Henry prisoner. Warwick now advanced with an army to Barnet, where a battle was fought, 4th April, 1471, which ended in the death of Warwick and a decisive victory for Edward. The king was preparing for an expedition against France when he died, in April, 1483.

EDWARD V., King of England, the eldest son of Edward IV., was in his thirteenth year when he succeeded his father in 1483. His uncle, the Duke of Gloucester, soon made himself king as Richard III., and caused the young king and his brother to be sent to the Tower, where, it is said, he had them smothered by ruffians.

EDWARD VI., King of England, son of Henry VIII. by Jane Seymour, was born in 1537. His reign was uneventful. Edward died of a pulmonary complaint in July, 1553.

EDWARD VII., King of Great Britain and Ireland and Emperor of India, eldest son of Queen Victoria and the Prince Consort, was born at Buckingham Palace on Nov. 9, 1841. In December he was created Prince of Wales. He was educated under private tutors and at Edinburgh, Oxford, and Cambridge; visited Canada and the U. States in 1860; and underwent military training at the Curragh camp in 1861. He was promoted to the rank of general in 1862, and in that year visited Palestine and the East. Next year he took his seat in the House of Lords. On March 10, 1863, he was married in St. George's Chapel, Windsor Castle, to Princess Alexandra, eldest daughter of the King of Denmark, and from this time onward he discharged many public ceremonial functions. Attacked by typhoid fever in the winter of 1871, his life was for a time despaired of, but he recovered early in 1872, his recovery being made the occasion of a thanksgiving service in St. Paul's Cathedral. He visited India in 1875–76. He was a member of the poor law commission of 1893. He promoted the establishment of the Imperial Institute as a memorial of Queen Victoria's jubilee (1887), and he commemorated her diamond jubilee (1897) by founding the Prince of Wales's hospital fund for the better financial support of the London hospitals. On the death of Queen Victoria on Jan. 22, 1901, he succeeded to the throne. To him and Queen Alexandra have been born: Albert Victor Christian Edward, Duke of Clarence and Avondale, born 1864, died 1892; George Frederick Ernest Albert, now Prince of Wales and heir-apparent, born 1865, married 1893, to Princess Victoria Mary of Teck; Princess Louise, born 1867, married 1889, to the Duke of Fife; Princess Victoria, born 1868; and Princess Maud, born 1869, married 1896, to a son of the Crown Prince of Denmark.

EDWARDS, Jonathan, a celebrated American theologian and metaphysician, born at East Windsor, Connecticut, October 5, 1703. He entered Yale College in 1716, and studied till 1722, when

Jonathan Edwards

he received a license as preacher. In 1723 he was elected a tutor in Yale College, but resigned in 1726 to be ordained as minister at Northampton, Mass. After more than twenty-three years of zealous service here he was dismissed by the congregation owing to the severity with which he sought to exercise church discipline. He then went as a missionary among the Indians at Stockbridge, in Massachusetts. Here he composed his famous work on the Freedom of the Will, a masterpiece of metaphysical argument. It appeared in 1754, and was completed within four months and a half. In 1757 he was chosen president of the college at Princeton, New Jersey, but died shortly afterward, March 22, 1758.

EDWY, King of England, son of Edmund I., succeeded his uncle Edred in 955. He died in 959, being probably not more than eighteen or nineteen years old.

EEL, the general name of a family of fishes. The eel is characterized by its serpent-like elongated body, by the absence of ventral fins, and the continuity of the dorsal and anal fins round the extremity of the tail. The dorsal fin commences half-way between the head and the anal fin, and the lower jaw projects beyond the upper. The conger eel which is exclusively marine, the dorsal fin commences above the pectoral, and the upper jaw is the longer. The smoothness of the body—the scales being inconspicuous—and the serpentine movements of eels are proverbial.

EFFEN'DI, a Turkish title which signifies lord or master. It is particularly applied to the civil, as aga is to the military officers of the sultan. Thus the sultan's first physician is called Hakim effendi, the priest in the seraglio Iman effendi, etc.

EFFERVES'CENCE, the rapid escape of a gas from a liquid, producing a turbulent motion in it, and causing it to boil up. It is produced by the actual formation of a gas in the liquid, as in fermentation, or by the liberation of a gas which has been forced into it, as in aërated beverages.

EF'FIGY, an image or portrait, most frequently applied to the figures on sepulchral monuments.—To burn or hang in effigy, is to burn or hang an image or picture of a person, a mode in which the populace sometimes expresses its feelings respecting an obnoxious personage.

EFFLORES'CENCE, the fine white, feathery crystallization of sulphate and carbonate of sodium which appears on walls, or similar crystallizations on the surface of the earth, in decomposing rocks, etc. In medicine the term is applied to an eruption or rash, as in measles, etc.

EFFLUVIUM (pl. Effluvia), a noxious or disagreeable exhalation.

EGAN, Patrick, an Irish-American politician, born in Ireland in 1841. Until 1883 he was active in the home rule movement in Ireland, but in that year settled in the U. States at Lincoln, Neb. He was appointed minister to Chile by President Harrison in 1888. Egan for some time was the leader of the Irish revolutionists in America.

EGBERT, considered the first king of all England, was of the royal family of Wessex. He succeeded Brihtric in 802 as King of Wessex. He reduced the other kingdoms and rendered them dependent on him in 829, thus becoming their overlord. He died in 839.

EGG, a body specially developed in the females of animals, and in which, by impregnation, the development of the young animal takes place. Birds, reptiles, fishes, insects, and worms are oviparous, i. e. bring forth eggs or ova, as do also, among mammalia, the ornithorhynchus and echidna. The egg contains the germ of the young animal, as well as the substance which serves for its nourishment. All it needs for its development is external heat. The eggs of animals lower than the birds have usually only three parts, viz. the germinal spot or dot, the germinal vesicle, and the vitellus or yolk; the first being contained in the vesicle, and that again in the yolk. Besides these parts the eggs of birds have the white or albumen, and the shell, which consists of a membrane coated with carbonate of lime. The eggs of birds, especially of fowls, are a pleasant and nutritive food. The common domestic fowl, the turkey, the peahen, and the common duck produce the the eggs which are commonest in the market. Among reptiles, turtle produce eggs which are good for eating. The eggs of fishes are their roe or spawn.

EGGLESTON, Edward, an American novelist, born in Indiana in 1837, died in 1902. In 1870 he was made literary editor of the New York Independent, and was later editor of the Hearth and Home. Eggleston's works, such as the Hoosier Schoolmaster, The Mystery of

Metropolisville, The Circuit Rider, and other tales, are full of originality and power and occupy an unique place in literature.

EGGLESTON, George Cary, an American writer and editor, born in Indiana in 1839. He has served as the editor of numerous newspapers since 1870 and has published several volumes of historical memoirs and a number of novels.

EGG-NOG, a drink consisting of the yolk of eggs beaten up with sugar, and the white of eggs whipped, with the addition of wine or spirits.

EGG-PLANT, an herbaceous plant, from 1 foot to 18 inches high, with large white or purplish flowers The fruit is

Egg-plant.

about the size of a goose's egg, and generally yellow, white, or violet, and when boiled or stewed is used as an article of food.

EG'LANTINE, one of the names of the sweet-briar, a kind of wild rose. The name has sometimes been erroneously used for other species of the rose and for the honeysuckle.

E'GOTISM, as a philosophical doctrine, the view that the elements of all knowledge and the reality of the things known are dependent on the personal existence of the knower. Hence the logical position of the egotist is to doubt the substantial reality of everything except his own existence.

EG'RET, a name given to those species of white herons which have the feathers of the lower part of the back

American great white egret.

elongated and their webs disunited, reaching to the tail or beyond it at certain seasons of the year. Their forms are more graceful than those of common herons. The American egret is about 37 inches long to the end of the tail; plumage soft and blended; head not crested; wings moderate; the tail short, of twelve weak feathers. The European egret is about 40 inches long, of a pure white plumage; the bill is black or dark brown, yellow at the base and about the nostrils, and the legs are almost black. The little egret is about 22 inches long from bill to end of tail, the plumage is white.

EGYPT (ē'jipt), a country in the northeastern part of Africa, governed by a ruler (the khedive or viceroy) who pays tribute to the sultan of Turkey, but is virtually independent. Egypt is bounded on the n. by the Mediterranean Sea, on the e. by Arabia and the Red Sea, and on the w. by the Libyan Desert. Its natural southern frontier may be placed about Assouan (about 500 miles south of the Mediterranean), near which cultivated land almost disappears and the country begins to assume the features of the Nubian Desert. Another point at which the southern boundary has been placed is the second cataract of the Nile at Wady Halfa (about 670 miles south of the Mediterranean), which is the limit of free navigation for larger vessels. Farther south lies the extensive region known as the Egyptian Soudan. This territory was acquired by conquest and occupied for many years previous to the Mahdist revolt of 1883, but the success of the rebels led to its evacuation. Lord Kitchener's expedition in 1897–98, however, regained the country for Egypt. On the Red Sea littoral the farthest point south under the Egyptian flag is Suakin. A small strip of n. w. Arabia on the east of the Red Sea belongs to Egypt, as also the Sinaitic peninsula and the Isthmus of Suez. The area is about 394,000 sq. miles (only some 13,000 being inhabited), with a population of 9,734,405. The capital and largest town is Cairo, the next largest and chief seaport is Alexandria.

The inhabited portion of Egypt is mainly confined to the valley of the Nile, which, where widest (at the Delta), does not exceed 80 miles, and narrows steadily as we ascend its stream till, at the southern frontier, it is only 2 miles wide. The Nile has no tides, but runs constantly toward the sea at the rate of 2½ to 3 miles an hour. After it enters Egypt it flows in a northward direction but with considerable bends till it reaches lat. 30° 15′, a little beyond Cairo, where it divides into two main streams, the Rosetta and Damietta branches, which inclose that portion of land known as the Delta and formed by deposits of alluvial matter. Bordering on the Mediterranean are several salt lakes or lagoons, Menzaleh being the largest, through which is carried the Suez Canal, connecting the Mediterranean and the Red Sea; and also passing through other salt lakes; about 150 miles south of the Mediterranean is the lake Birket-el-Kurun, fed by the Nile. As very little rain falls in Egypt, the prosperity of the country entirely depends upon the Nile, and especially upon the yearly overflow of the river, which so fertilizes the soil with a brown slimy deposit that it produces two crops a year. Beyond the limits of the inundation and of irrigation there is no cultivation whatsoever. The Nile begins to rise in June, and continues to increase until September, overflowing the low lands along its course, the waters being conveyed by canals where natural channels fail. The Delta then looks like an immense marsh interspersed with islands, villages, towns, and plantations, just above the level of the water. After a few days the water begins to subside, and leaves the land again dry about the end of October. The seed is then sown, and artificial irrigation is maintained by water raised from the river, and distributed by means of channels throughout the fields. The appliances for raising water are simple and primitive; chiefly the shadoof worked by two men, and the sakieh driven by a donkey or an ox. The land is soon covered with green crops, and the first harvest is in March.

Chandler's shops, Lower Egypt.

The atmosphere in Egypt is extremely clear and dry, the temperature regular and exceedingly hot. The winter months are the most delightful part of the year.

later, the ground becomes parched and dry, and in May the suffocating khamseen, or simoom, begins to blow from the desert plains. Rain is scanty except near the sea-shore; but at night the dews are heavy in lower Egypt, and the air cool and refreshing. Egypt is not remarkably healthy, as, in addition to visitations of plague and cholera, opthalmia, diarrhœa, dysentery, and boils are very prevalent.

Now as formerly there is little timber, the principal trees, besides the date-palm and tamarisk, being the sycamore fig, and acacia or gum-arabic tree. The papyrus plant, once so important, is now to be found only in one or two spots. Of it was manufactured a paper which was supplied to all the ancient world. Beside the lotus or water-lily of the Nile, Egypt has always been celebrated for its production of corn, barley, a great variety of the bean class, leeks, garlic, onions, flax, and for plants of the cucumber tribe. To the products of ancient times have been added the sugar-cane, cotton plant, indigo, and tobacco.

In spite of the fact that at least two and sometimes three successive crops may be gathered in a year, agriculture in Egypt is still in a very low state; and the extreme poverty and generally wretched condition of the cultivators render improvement difficult. There are few trades which have attained a development of any importance.

Of the inhabitants of Egypt those of the peasant class, or fellahs as they are called, appear to be descendants of the ancient Egyptians mixed with Arab blood. Having embraced Mohammedanism, they are often denominated Arabs, though regarded by the true Arab with contempt. The Copts are the descendants of the ancient Egyptians who embrace and still cling to the Christian religion. With those aboriginal inhabitants are mingled, in various proportions, Turks, Arabs (chiefly Bedouins), Armenians, Berbers, negroes, and a considerable number of Europeans, especially Greeks and Levantines.

The government of Egypt is in the hands of the khedive or viceroy, who is assisted by a ministry formed on the model of those of Western Europe. The title and government are hereditary, but the khedive, as a Turkish vassal, has to pay an annual tribute to the sultan of about $3,500,000.

The Egyptians are the earliest people known to us as a nation. When Abraham entered the Delta from Canaan they had been long enjoying the advantages of a settled government. They had built cities, invented hieroglyphic signs, and improved them into syllabic writing, and almost into an alphabet. They had invented records, and wrote their kings' names and actions on the massive temples which they raised. The arrangement of Egyptian chronology is still a much-disputed point among scholars. A list of the kings of Egypt, arranged in 30 dynasties was given by the priest Manetho about 250 B.C., and this division is still used. Egyptologists go back as far as 5,702 years before Christ, and trace the founding of Egypt by Mena, about that date, with the building of its capital, Memphis. The chronology carries down with more or less breaks through the various dynasties until the conquest of Egypt in 332 B.C. by Alexander the Great. Egypt became a Greek state, subsequently a Roman province, and finally in 640 A.D., a mere territory of the Mohammedan power which it remains to the present day. Its glories are all in its ancient civilization. This cilivization of the Egyptian had reached a high pitch from the earliest period to which we can trace their history. The masonry of the passages in the great pyramid has not been surpassed at any age. More than 2000 B.C. the Egyptians had duodecimal as well as decimal numbers; weights and measures adjusted to a pound of 1400 grains. In mechanical arts the carpenter, boat-builder, potter, leather-cutter, glass-blower, and others are frequently represented on their ancient monuments, and we see the blow-pipe, bellows, and siphons; the press, balance, lever; the saw, the adze, the chisel, the forceps, the syringe, harpoon, razors; we have also glazed pottery, the potter's wheel, and the kiln; and dated specimens of glass of the time of Thothmes III., 1445 B.C. Gold-beating, damascening, engraving, casting, inlaying, wire-drawing, and other processes, were practiced. The processes of growing and preparing flax, as well as the looms employed, are all depicted. The social and domestic life of the ancient Egyptians is pictured for us on the walls of their temples and tombs. The rich spent much of their time in hospitality and entertainments, especially of a musical kind. In the country districts the superintendence of the agricultural works or the fisheries on their estates was varied by the sports and pleasures of a country life. The lower orders were poor and uneducated, scantily fed and clothed, and held in contempt by the higher classes. But there was no strict separation into caste; and although the priests form a ruling bureaucracy, the highest posts were open to the successful scholar Next to the priesthood in importance was the military class or order, who were all landholders and bound to serve in time of war. Below these were the husbandmen, who paid a small rent to the king. Egyptian custom seems to have allowed but one wife, who occupied an honorable and well-established position as the "lady of the house"

The two main principles on which the religion of Egypt was based appear to have been the existence of an omnipotent Being, whose various attributes being deified, formed a series of divinities; and the deification of the sun and moon. Each group of divinities formed a triad composed of a chief male deity, with a wife or sister and a son, as Osiris, Isis, and Horus, or Amun, Maut, and Khonso. Among the other gods of the Egyptian Pantheon are Ra, the sun, usually represented as a hawk-headed man. Mentu and Atmu are merely two phases of Ra, the rising and the setting sun. The worship of the bull Apis is connected with Osiris. Serapis is the defunct Apis, who has become Osiris. Seth or Set represents the power of evil. Ammon (Egyptian Amen), originally a local god, owed his importance to the greatness of his city, Thebes. Thoth is the chief moon-god, and is generally represented as ibis-headed. Anubis, the jackal-headed, belonged to the family of Osiris, and presided over mummification. Besides these deities the Egyptians worshiped beasts, reptiles, and even vegetables, probably as symbols. The Egyptians believed in the transmigration of souls and in the existence of a future state, in which mankind would be rewarded or punished according to their actions while on earth.

The monuments we have left to us in Egypt are of two main periods—those

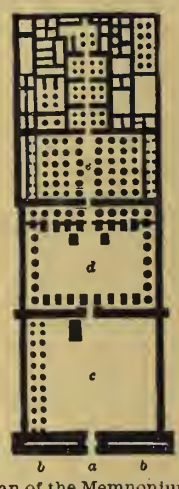


Fig. 1 Plan of the Memnonium, Thebes.

built in the times of the Paraohs or native kings, and those built during the rule of the Greeks and Romans (subsequently to 330 B.C.). The former

Fig. 2. Types of Egyptian columns.

period was by far the longer and more important, and to it belong the most characteristic examples of Egyptian architecture and sculpture, such as pyramids, vast temples, some of them cut in the solid rock (as at Ipsambul), rock-cut tombs, gigantic monolithic obelisks, and colossal statues. The characteristic features of the style are solidity, boldness, and originality. Among its peculiar characteristics may be noted—symmetry of structure; the gradual converging of the walls of some of its edifices, especially of the propylæa or tower gateways of its temples; roofs and covered ways being flat, and composed of immense blocks of stone reaching from one wall or column to another, the arch not being employed nor yet

EGYPT

timber; columns numerous, close, and massive, generally without bases, and exhibiting great variety in their capitals, from a simple square block to an elaborate composition of palm-leaves or other forms suggested by vegetation Fig. 2);

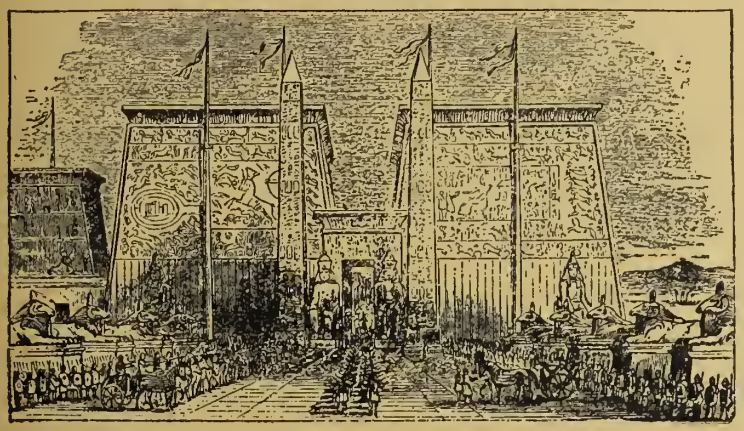


Fig. 3. Restoration of the prodylon or gate of the Temple of Luxor.

the employment of a large concave molding in the entablature, decorated with vertical flutings or leaves; walls and columns decorated with a profusion of

Fig. 4. Hall of columns in the Memnonium—Time of the Pharaohs.

sculptures in outline or low relief representing divinities, men, and animals, with innumerable hieroglyphics, brilliant coloring being often superadded. One remarkable feature associated with

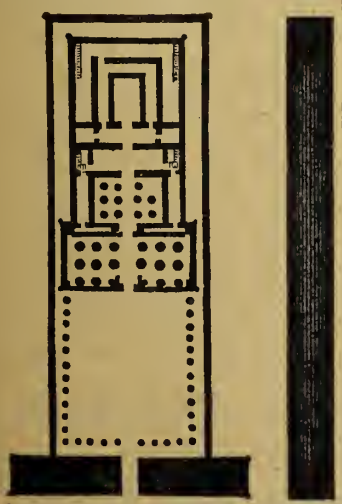
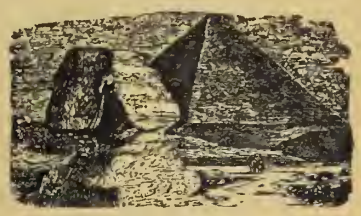


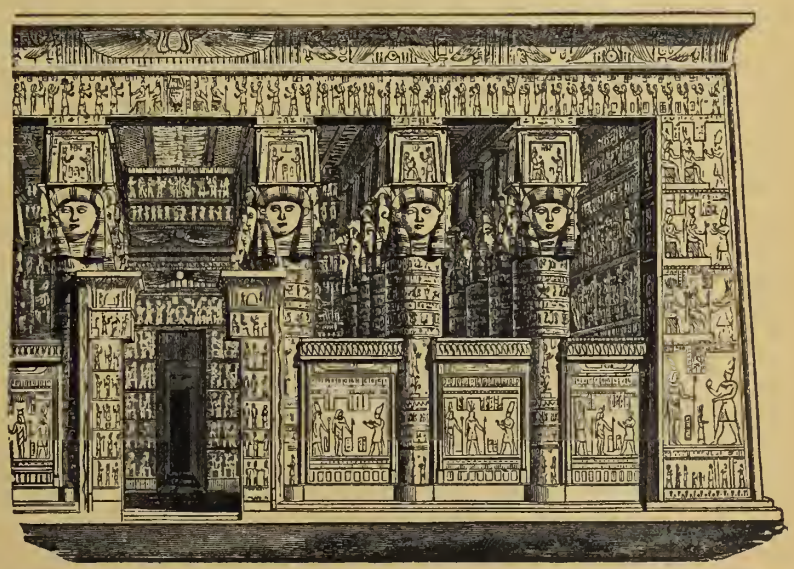
Fig. 6. Plan of Ptolemaic temple at Edfou.

this style is the grandeur of its mechanical operations in cutting, polishing, sculpturing, and transporting vast blocks of limestone and of granite. The pyramid is one of the best-known forms of Egyptian art, and there is little doubt that these structures were intended as the tombs of kings. The leading features of the Egyptian temples were these: a gateway flanked by two lofty pylons (Fig. 3) formed the entrance to a square court (see Fig. 1, a entrance, b b pylons, c court). From this court the way leads through a second gateway to an inner court (d), surrounded by a colonnade. Beyond this is the chamber of the temple known as the Hall of Columns (Fig. 1 e, and Fig. 4), the center avenue of which was higher than the rest of the hall, and consisted usually of twelve columns, which supported a flat roof formed of massive stones, light being admitted at the sides of this elevated portion. To the Hall of Columns succeeded a series of smaller chambers, the roofs of which were generally supported by six or four columns. These apartments frequently surrounded a dark chamber—the most sacred in the temple—the holy of holies. The surface of each architectural feature was engraved with its particular ornament appropriately colored. In the cavetto, or hollow molding of the cornice, it was customary to place the name and titles of the Pharaoh or king; the architrave stone was symbolically ornamented with the names of the divinities to whom the temple was dedicated, and of the sovereign in whose time it was built. The abacus of the column was invariably decorated with the royal titles. The capitals were painted in accordance with the intention of the form; if, for instance, the expanded papyrus was shown, the leaves of the calyx would be yellow and the filaments green. Beneath were horizontal bands of blue and white, and then a representation of the king offering gifts to the gods of the temple; and lastly, the yellow and red lines at the base of the shaft signified the brown leaves that envelop the base of the stalk of the natural plant, The Egyptian temple was invariably rectangular, with its walls inclining inward, and never more than one story high, and the approach to it was frequently



Sphinx and pyramid.

through an avenue of sphinxes Fig. 3). The temples built during the sway of the Greeks and Romans, though having a general resemblance to the earlier ones, differed in some respects, as in the use of more elaborate capitals, more salient forms in the architectural and sculptural decorations, etc. (The Ptolemaic temple is shown in Fig. 6.) A peculiar kind of mural sculpture was practiced among the Egyptians, the outline of the object to be represented being cut into the surface, while the minor forms and rotundity are shown



Temple of Denderah.

within this incised outline, thus forming a kind of "hollow relief." For further illustrations of Egyptian architecture, see Architecture, Esneh, Karnak; and for an account of the hieroglyphics of ancient Egypt see Hieroglyphics.

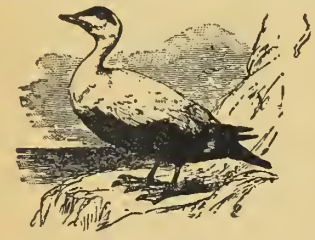
EGYPTIAN BEAN, a name sometimes given to the bean-like fruits of the Nelumbium speciosum, or sacred lotus, found in China, India, Australia, but no longer on the Nile.

EGYPTIAN BLUE, a brilliant pigment consisting of the hydrated protoxide of copper mixed with a minute quantity of iron.

EGYPTIAN VULTURE, a bird that frequents both shores of the Mediterranean, but rarely passes farther north, though it has been found in the British islands. It is one of the smaller vultures, about the size of a raven. The general color is white, the quill feathers of the wing being dark brown. It frequents the streets of eastern towns, where it is protected on account of its services as a scavenger.

EGYPTOLOGY, the science of Egyptian antiquities, or that branch of knowledge which deals with the language, history, etc., of ancient Egypt.

EIDER DUCK, a species of duck found from 45° north to the highest latitudes yet visited, both in Europe and America. Its favorite haunts are solitary rocky shores and islands. In Green-



Eider duck.

land and Iceland they occur in great numbers, and also breed on the western islands of Scotland. The eider duck is about twice the size of the common duck, being about 2 ft. 3 in. in length, 3 feet in breadth of wing, and from 6 to 7 lbs. in weight. The male is black, head and back white, with a black crown. The female is reddish drab spotted with black, and with two white bands on the wings. They feed largely on shellfish, crustaceans, etc. Their nests are usually formed of drift grass, dry seaweed, etc., lined with a large quantity of down, which the female plucks from her own breast. In this soft bed she lays five eggs, which she covers over with a layer of down. If this, with the eggs, is removed the bird repeats the process. One female generally furnishes about ½ lb. of down, but the quantity is reduced by cleaning. This down, from its superior warmth, lightness, and elasticity, is in great demand for beds and coverlets; and the districts in Norway and Iceland where these birds abound are guarded with the greatest vigilance as a most valuable property. As found in commerce this down is in balls of the size of a man's fist, and weighing from 3 to 4 lbs. It is so fine and elastic that 5 lbs. of the best quality is sufficient for a whole bed. The down from the dead birds is little esteemed, having lost its elasticity. The king eider duck is another species resembling the preceding and inhabiting the same coasts.

EIFFEL, Alexandre Gustave, a French engineer, designer of the Eiffel Tower at Paris. He was born in France in 1832, and was the designer of several important bridges. The frame work of Bartholdi's statue of Liberty at New York, was planned by M, Eiffel. (See Eiffel Tower).

EIFFEL TOWER, a gigantic steel tower at Paris, the tallest building of any kind in the world. It was erected as a special "wonder" for the Paris Exposition of 1889 by Alexandre Gustave Eiffel (which see). Its total height is 984 feet. It is built of four great piers, merging into one at a height of 620 feet from the ground. On various levels are great floor areas for entertainment, observation, and refreshment the first of these having an area of 38,000 square feet. Seven thousand tons of steel were used in the construction of the tower, at a cost of upwards of $1,000,000. From the top of the tower a view to a distance of 85 miles can be had.

EIGHT-HOUR DAY, a term applied to the ideal working day of the labor unions. It had its origin in England and its greatest growth in the United States, where numerous trades unions have established it as part of their bargain-contracts with employers. The eight-hour working day is established by law for all kinds of government work. Several states and cities have adopted it for their employes, but it is as yet by no means universal in the United States. In Australia the movement has succeeded better than in any other part of the world.

EJECT'MENT, in law, an action wherein the title to lands and tenements may be tried and the possession recovered. It is commenced by a writ addressed to the tenant in possession and all entitled to defend the possession, bearing that the plaintiff lays claim to the property in question, and calling upon all interested to appear within a certain time to defend their right, failing which the tenant in possession will be ejected. In its older form the action was

Flowering branch of oleaster. *a*, Fruit. *b*, Section of same.

remarkable for certain curious legal fictions on which procedure was based; and the name of John Doe, an imaginary plaintiff, and of Richard Roe, an equally imaginary defendant, were long familiar in cases of this kind in the courts.

EKAT'ERINOSLAV, a town of southern Russia, capital of a government of the same name, on the right bank of the Dnieper, 250 miles n. e. of Odessa. It was founded in 1787 by Prince Potemkin, and consists of a number of long, broad, and dirty streets. Pop. 46,876.—The government, which is intersected by the Dneiper and at one point reaches the Sea of Azow, mostly consists of steppes; area, 26,140 sq. miles; pop. 1,792,831.

ELÆAGNA'CEÆ, the oleaster family of plants, a small natural order of opetalous oxogens scattered over the northern regions. Several species are cultivated for their silvery scurfy foliage. The silver-berry is a native of northern America.

E'LAND, a species of antelope inhabiting Africa, the largest of all the antelopes being about the size of an ox. Its flesh, especially that of the thighs, which are dried and used in this state, is highly prized, and consequently the animal is

Eland.

now nearly exterminated in the neighborhood of Cape Colony, where it was once common. The color is a light or grayish brown, and it possesses a short mane. The horns, which are about 18 inches long and nearly straight, are spirally keeled.

ELASMOBRANCHII (-brang'ki-ī), an order of fishes, including the sharks, skates, and chimæra, in which the skull is not composed of distinct bones, but simply forms a kind of cartilaginous box, the vertebral column sometimes cartilaginous, sometimes consisting of distinct vertebræ, the integumentary skeleton in the form of placoid scales, the intestines being very short, and provided with a spiral valve. They have two pairs of fins (pectorals and ventrals), two responding to the fore and hind limbs, and the ventral fins are close to the anus. The heart consists of an auricle, a ventricle, and a muscular arterial bulb. The gills are fixed, and form a number of pouches, which open internally into the pharynx, communicating outwardly by a series of apertures placed on the side of the neck.

ELAS'MODON, a sub-genus of the genus Elephant, under which are included the mammoth and Asiatic species, the African elephant belonging to the sub-genus Loxodon.

ELASTIC'ITY is the property in virtue of which bodies resist change of volume and change of shape, and recover their former figure or state after external pressure, tension, or distortion. The former is called elasticity of volume, the

latter elasticity of shape. The name compressibility is also used in connection with the elasticity of volume; and rigidity, or resistance to change of shape in connection with the latter. Fluids possess no rigidity whatever; they offer no permanent resistance to change of shape; while a solid body, unless it is distorted beyond certain limits, called the limits of elasticity, tends to return to its original form. Both fluid and solids possess elasticity of volume, and tend to resume their original volume after compression. The elasticity of volume of the former is perfect; whatever compression they have been subjected to, they return under the same conditions of temperature to precisely their original volumes when the forces of compression are removed. In the case of solids there are limits to their elasticity of volume as well as to their elasticity of form; thus gold may be made permanently denser by hammering.

ELBA, a small island in the Mediterranean, in the province of Livorno (Leghorn), Italy, separated from the mainland by the Strait of Piombino, about 6 miles wide. The island is 18 miles long and from 2½ to 10½ miles broad, and is traversed by mountains rising to a height of over 3000 feet. It is rich in iron, marble, granite, salt, etc.; and iron ore is exported. Excellent wine and fruits are produced. It has two seaports—Porto-Ferrajo (the capital) and Porto-Longone. The Treaty of Paris in 1814 erected Elba into a sovereignty for Napoleon, who resided in it from May 4, 1814, to February 26, 1815. Pop. 24,000

ELBE, river of Germany, one of the largest in Europe. It rises on the s.w. slopes of the Schneekoppe or snowcap, one of the Riesengebirge, between Bohemia and Silesia. From this point it flows nearly due s. into Bohemia for about 50 miles, when it turns to the w., and after about 40 miles takes a general n.n.w. direction till it falls into the North Sea, intersecting Saxony, a considerable portion of Prussia, and in the latter part of its course separating Holstein on its right from Hanover on the left. The length, including windings, is upward of 780 miles. It is more or less navigable for about 470 miles, but its estuary at Cuxhaven is much encumbered with sand-banks. In 1870 its navigation was declared free from Hamburg to Melnik in Bohemia. The North Sea and Baltic ship canal now connects its estuary with Kiel Bay. The Elbe is well stocked with fish.

ELBERFELD (el'bĕr-felt), a town of Rhenish Prussia, in the government of and 15 miles e. of Düsseldorf, on both sides of the Wupper, inclosed by lofty hills. Taken with Barmen it stretches along the Wupper valley for about 6 miles. Linen, woollen, silk, and mixed goods, ribbons, and velvet are extensively made and exported. There are numerous mills for spinning cotton twist, linen yarn, and worsted, and numerous dye-works, and miscellaneous industrial establishments. The environs are almost entirely taken up with bleach-fields. Pop. 156,937; with Barmen, 298,884.

ELDER, a name given to different species of small trees or shrubs, with opposite and pinnated leaves, bearing small white flowers in large and conspicuous corymbs, small berries of a black or red color, and bitter and nauseous leaves possessing purgative and emetic properties. The wood of the young shoots contains a very large proportion of pith. The common elder is a wild shrub or small tree, distinguishable by its winged leaves; its clusters of small, cream-white flowers, and the small black berries by which these are succeeded, and from which a kind of wine is sometimes made. Two species inhabit N. America: a common plant from the 49th to the 30th parallel of latitude, the berries of which are black and have a sweet taste; and one which bears red berries, and inhabits Canada, the northern parts of New England, and the Alleghany Mountains. Elder wood is yellow, and in old trees becomes so hard that it is often substituted for box-wood. Its toughness also is such that it is made into skewers, tops for fishing-rods, etc. The light pith is utilized for balls for electric experiments, and various ointments, drinks, and medicinal decoctions are made from the bark, leaves, flowers, and berries.

ELDERS, persons who, on account of their age, experience, and wisdom, are selected for office, as, among the Jews, the seventy men associated with Moses in the government of the people. In the modern Presbyterian churches elders are officers who, with the pastors or ministers, compose the consistories or kirk-sessions, with authority to inspect and regulate matters of religion and discipline in the congregation.

EL DORA'DO, a country that Orellana, the lieutenant of Pizarro, pretended he had discovered in South America; and between the Orinoco and Amazon rivers; and which he named thus on account of the immense quantities of gold and precious metals which, he asserted, he had seen in Manoa, the capital of the country.

ELECTION, in politics the choosing of public officials by the vote of the electors (persons having the suffrage right). In the U. States elections may be direct, as in the case of congressmen, legislators, judges, etc., or indirect, as in the case of U. States senators and the president, the former being chosen by the state legislatures and the latter by an electoral college (which see). Candidates are named in various ways, or may be self-constituted, and the law in many instances recognizes the machinery by which candidates are chosen. The various states have various laws regulating elections and contests of elections. All contested elections, however, are always decided by party considerations and not by justice—unless party considerations be considered as being sufficiently just.

ELECTION, in theology, the doctrine that God has from the beginning elected a portion of mankind to eternal life, passing by the remainder. It is founded on the literal sense of certain passages of Scripture, and has been amplified by the labors of systematic theologians into a complete and logical system. It dates in ecclesiastical history from the time of Augustine; but Calvin has stated it so strongly and clearly in his Institutes, that it is generally associated with his name.

ELECTIVE STUDIES, studies which are optional with the student in an educational institution. In American universities a certain number of specific studies are "required" for a degree. Thus for the A.B. degree the candidate is required to do a definite amount of work in the languages, history, etc., but he is given a choice as to the kind of work he will do within certain limits. Elective studies have been found to be very efficient in stimulating interest, as they enable a candidate for a degree to select the branches in which he is most interested. The system, however, has many eminent opponents.

ELECTOR, the title of certain princes of the old German Empire who had the right of electing the emperors.

ELECTORAL COLLEGE, in the U. States the body of the electors chosen by the people to vote for the president. The people vote not for their favorite candidate for president but for the candidate for elector who invariably votes for the head of the party ticket. This fact shows how really little force the American constitution has upon the will of the people. In effect it is the popular vote that elects the president, not the vote of the electors. The electors of each state meet, vote by ballot for the president and vice-president, and after being signed by the governor the vote is sent to the president of the U. States senate and counted in the presence of both houses of congress. All this work, however, is merely formal, the result of the election being known as soon as the popular vote is known.

ELECTORAL COMMISSION, a body of men empowered by congress in 1877 to settle the electoral votes of Florida, Louisiana, Oregon, and South Carolina, in the presidential election of 1876. These four states presented conflicting certificates and congress could not agree. The commission consisted of five senators, five representatives, and five members of the supreme court. The commission found that Hayes and Wheeler had been elected over Tilden and Hendricks by a majority of one electoral vote.

ELECTRICAL FISHES, a name given to fishes possessing the property of communicating an electric shock when touched with the hand or any electric conductor. One of the best known is the electric eel, a native of South America. It is of nearly equal thickness throughout; head and tail obtuse; ordinary length, 3½ to 4 feet. The seat of the four electrical organs is along the under side of the tail, and they are said to possess the power of knocking down a man, and of painfully numbing the affected limb for several hours after the shock. After a few discharges, however, the faculty of producing a shock is impaired, and an interval of rest is required for a new storage of force.

ELECTRIC BATTERY, the original name of what is now more commonly called a battery of Leyden-jars, the old name having been given before galvanic

batteries were invented. See Leyden-jar.

ELECTRIC CLOCK, a clock driven or controlled by electrictity, the latter being the ordinary meaning of the term. One clock driven in the ordinary way can be made to control by electric currents another clock (or clocks) also driven in the ordinary way so as to make it keep accurate time. By means of it one high-class clock (usually in an astronomical observatory) compels a number of other clocks at considerable distances to keep time with it. The clocks thus controlled ought to be so regulated that if left to themselves they would always gain a little, but not more than a few minutes per day. The pendulum of the controlling clock, in swinging to either side, makes a brief contact, which completes the circuit of a galvanic battery, and thus sends a current to the controlled clock. The currents pass through a coil in the bob of the pendulum of the controlled clock, and the action between these currents and a pair of fixed magnets urges the pendulum to one side and to the other alternately. The effect is that, though the controlled clock may permanently continue to be a fraction of a second in advance of the controlling clock, it can never be so much as half a second in advance. An electrically-controlled clock usually has close beside it a small magnetic needle, which moves to the one side or the other according to the direction of the current, and thus shows whether the currents are coming. The arrangements are usually such that at every sixieth second (that is at every exact minute) no current is sent, and the needle stands still. Any small error is thus at once detected.

ELECTRIC HEATER, a device used to convert an electric current into heat for the purpose of heating a house, an apartment, or an interior. The heater consists of coils of metal, placed in a box containing air which, on the passage of the current through the coils, thus heating the coils, becomes itself hot and heats the air surrounding the box. Numerous variations of this idea have been patented, nearly all of which are satisfactory. Electric heating is the ideal system for warming houses of any kind, but its expense prevents its general adoption.

ELECTRIC'ITY, the name given to the unknown cause of certain effects of very various kinds which are found to be closely connected one with another. They include two distinct kinds of attraction and repulsion (electrostatic and electrodynamic), the magnetization of iron, the deflection of magnetic needles, the production of heat and light in certain circumstances, the separation of certain chemical compounds into their constituents, and spasmodic actions on the nervous and muscular systems of animals. The name is derived from the Greek ēlectron, amber, the fact that amber when rubbed attracts light particles, such as small pieces of paper, having been known to the ancient Greeks. Friction was the only artificial source of electricity employed until Galvani, near the close of last century, accidentally obtained it by the contact of two metals with the limbs of a frog; and Volta, developing Galvani's discovery, invented the first galvanic or voltaic battery. Electricity produced by friction is called frictional electricity; that produced by chemical action on metals, voltaic electricity.

All substances which, like amber, could be made to show elcctrical attraction by rubbing them, were called electrics by early writers on electricity. They included glass, amber, sulphur, shellac, rosin, silk, flannel, etc. The name non-electrics was given to other bodies which were supposed not to be susceptible of excitation by friction. The bodies called non-electrics were also called conductors, from the power which they exhibited of allowing electricity to pass through them. Electrics were also called non-conductors. The names conductor and non-conductor are still retained, but the names elcctric and non-electric are discarded as being founded on a mistake. Electricity can be excited by the friction of a conductor against a non-conductor, and is, in fact, so excited in the ordinary electrical machine, in which glass rubs against an amalgam spread on a cushion. A metallic rod furnished with a glass handle can be electrified by rubbing it with flannel, the glass preventing the electricity from being conducted away through the hand. Substances thus electrified exhibit two opposite kinds of electricity, known respectively as positive and negative. Bodies charged with the same kind of electricity repel each other; those charged with opposite kind attract each other. An instrument for indicating the presence of electricity is called an electroscope.

All solid and liquid substances allow electricity to pass through them to some extent, but the differences of degree are enormous. The best conductors are the metals, cspecially gold, silver, and copper. Perfectly pure copper conducts about seven times as well as iron. Substances which have excessively small conducting power are not called conductors, but insulators, so that a good insulator is another name for an excessively bad conductor. Among the best insulators may be mentioned glass, paraffin (the wax, not the oil), ebonite, shellac, mica, india-rubber, and gutta percha. The ratio of the conducting power of a metal to that of one of these substances is about a thousand million billions to one. Water occupies an intermediate position between these two extremes. In experiments with frictional or influence machines it behaves as a conductor, but in experiments with galvanic batteries it behaves as an insulator. The word resistance is used in the opposite sense to conducting power; a good insulator is said to have high resistance, and a good conductor to have low resistance.

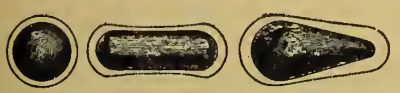
Electrostatics is that branch of the general science of electricity which treats of the repulsions between like and the attractions between unlike kinds of electricity. The fundamental law of electrostatics is that if e and é denote two quantities of electricity collected in two spaces very small in comparison with the distance between them, the mutual force which they exert upon each other is directly as the product eé, and inversely as the square of the distance. If the two quantities eé are both positive, or both negative, the force is a repulsion; but if one is positive and the other negative, it is an attraction. Electrostatic attractions and repulsions manifest themselves in two distinct ways, namely, (1) as attractions and repulsions between electrified bodies; (2) as producing changes in the distribution of electricity on conductors. This second effect is called electrostatic induction. The different portions of the charge of one and the same conductor act upon one another according to the general law of repulsion, and thus produce the actual distribution, which is entirely on the surface, all electricity being repelled from the interior. The interposition of an insulating substance between two quantitities of electricity alters the amount of the forces which they exert upon each other. In a broad sense electrostatics may be held to include within its range all the phenomena of frictional electricity and of the electricity produced by influence machines, such as those of Holtz, Voss, and Wimshurst.

The rapid escape of electricity from a charge body is an electric discharge. When the discharge takes place through a conductor it is called continuous, and when it takes place through a non-conductor (for example through air) it is called a disruptive discharge. The name "electric discharge" is especially applied to cases in which the escaping electricity produces luminosity. Three kinds of such discharge have been distinguished—the spark, the brush, and the glow. The spark is accompanied by a sound which varies from a faint crack to a loud bang. In nature it is seen on the largest scale in the case of lightning, which is a discharge of atmospheric electricity. In many cases the electric spark presents no definite shape, but looks like a mere point of fire, or, if very bright, is enlarged by its dazzling effect on the retina; but when it leaps across a space of several inches of air it assumes a crooked shape bearing a remarkable resemblance to a flash of lightning. The brush discharge is only faintly luminous. It occurs especially at sharp points and edges of highly-charged bodies. It is barely visible by daylight, and its appearance in the dark is that of a luminous halo. It projects only a small distance into the air surrounding the body from which the charge is escaping. The glow discharge simply renders the surface of the body luminous, and does not extend into the air at all. In some modern electric apparatus beautiful effects of elcctric discharge are shown. Thus by causing a discharge to take place in highly-rarefied air or gas it is made to jump across a considerable interval, and the whole intervening space is filled with a beautiful nebulous luminosity, the color of which depends on the nature of the gas. If the vacuum is sufficiently good the luminosity is seen to be disposed in transverse stripes, tchnically called strie.

An electrified body left to itself gradually loses its electricity. This effect

is due to more causes than one. If the body is a conductor and has any sharp points or edges, these afford a ready channel for the escape of the charge into the air. Some loss occurs by particles of dust in the air being attracted to the body and then repelled after coming in contact with it. But the chief loss in the case of a smooth conductor on insulating supports usually occurs by leakage over the surface of the supports, owing to a thin film of moisture from which it is difficult to keep them free. This is especially the case with glass supports. Dissipation can be almost completely prevented by surrounding the electrified body with an artificially dried atmosphere. The most usual means of doing this is to place a shallow dish of sulphuric acid in the closed vessel in which the body is contained. The loss by dissipation can thus be reduced to one or two per cent of the entire charge per diem.

When a conductor has a permanent charge, there is no electricity in its interior. The charge resides entirely at the surface, and is not distributed equally over the whole surface but is thickest (so to speak) at those parts which project most. The dotted lines in



Distribution of electricity—Relative amounts on curved surfaces.

figures above illustrate by their distances from the conductor, the thickness (technically called density) of the electricity at the different parts of the surface. At sharp edges, and still more at sharp points, the density is exceedingly great and hence the electricity has a strong tendency to leak away.

What is known as an electric current is a peculiar condition of a wire or other conductor of electricity, in virtue of which it deflects magnetic needles in its neighborhood, magnetizes a piece of soft iron round which is it coiled, has its own temperature raised, and exhibits various other effects. This condition of a wire occurs both in connection with frictional and voltaic electricity, and can be produced by attaching its ends to the two terminals of a galvanic battery, or to the two terminals of a magneto-electric machine, and in various other ways. An electric current may be regarded at pleasure as consisting in the flow of positive electricity in one direction through the wire in question, or of negative electricity in the opposite direction, or of both electricities simultaneously one in each direction. What is conventially called the direction of the current is the direction in which the positive electricity may be regarded as flowing. The "strength" of a current denotes the quantity of electricity that passes through the wire in the unit of time. The deflecting force which a current exerts on a magnetic needle—other things being equal—is proportional to the strength of a current; but the quantity of heat which it generates in a given time is proportional to the square of its strength. One effect of currents is the decomposition of certain chemical compounds, and this effect, like that first mentioned, is simply proportional to the strength of the current. Instruments for measuring the strengths of currents by chemical decomposition are called voltameters, and instruments for measuring them by the deflection of magnetic needles are called galvanometers. The current by which telegraphs are worked are usually obtained from galvanic batteries; but the far stronger currents required for electric lighting are usually produced by machines called dynamos driven by steam or water power. The currents in such machines are due to magneto-electric induction.

Electro-dynamics is that branch of electrical science which treats of the attractions and repulsions exhibited between wires or other conductors through which currents are passing. If two wires are paralled, they will attract each other when currents are passing the same way through them both, and will repel each other when the currents are opposite. If the wires are inclined to each other at any angle there is not only an attraction or repulsion, but a still more marked tendency to rotation, which is not satisfied till the wires have become parallel and the currents flow in the same direction through them both. When there are only two straight wires these forces are feeble and require delicate apparatus for their exhibition; but by employing coils of wire the forces are multiplied, and an instrument constructed on this principle called the electro-dynamometer has been much employed for the measurement of currents. The whole science of electro-dynamics is due to Ampère, who discovered its main facts, and reduced them by ingenious experiments, combined with very abstruse reasoning, to a single mathematical formula which includes them all.

Daily experience with the electric telegraph shows that electrical action is propagated with great rapidity. The time that intervenes between the sending of a signal from one station and its visible effect at another, depends on a variety of circumstances The time is notably longer for underground or submarine wires than for wires suspended in the air on poles When one end of a long submarine or subterranean telegraph wire is suddenly put in connection with a galvanic battery or other source of electricity, the current which flows out of the other end into the earth does not begin sharply but gradually, and takes a measurable time to attain its full strength. Hence an instrument which is delicate enough to show a very feeble current, will show the effect earlier than one which requires a strong current to move it. An instrument in which the moving parts are small and light has also an advantage over one in which they are large and heavy. Something, too, depends on the nature of the source of electricity employed. A source which acts with sudden violence, like the discharge of a Leyden-jar or an induction-coil, will make the effect appear earlier than a comparatively gentle source, such as an ordinary galvanic battery. Electrictiy has not a definite velocity like light or sound. It is rather comparable to waves on water, which travel with very various speeds according to their length and the depth of the water. The highest speed ever observed in the transmission of electric effects was that obtained by Wheatstone in his celebrated experiment with a rotating mirror. In this experiment a Leyden-jar was discharged through half a mile of wire with three interruptions in it, at each of which a spark was formed by the electricity leaping across. One interruption was in the middle, and the other two were at the ends, one end being close to the knob of the jar, and the other end close to its outer coating. The wire was so arranged that all three interruptions were near together; and by observing the reflections of the three sparks in a rotating mirror, he was able to discover that the middle spark occurred sensibly later than those at the two ends, these latter being simultaneous. The lagging of the middle spark behind the other two was regarded as the time that electricity took to travel through a quarter of a mile of wire, and the velocity thus found for electricity was 230,000 miles per second, a velocity greater than that of light, which is between 185,000 and 186,000 miles per second. Observations made in connection with the use of the electric telegraph for determining longitudes, have shown that the time which intervenes between the sending and receiving of a signal was about four-tenths of a second between Aden and Bombay, two-tenths of a second between Alexandria and Malta, two-tenths between Malta and Berlin, and about one-eighth of a second between Greenwich and Valentia.

If we endeavor to explain electrical phenomena by regarding electricity as a substance, we are met by two difficulties: one is that electricity adds nothing to the weight of a body; the other is that electrical phenomena are dual, as if there were two opposite kinds of electricity which destroy each other when they unite, Du Faye maintained the existence of two electrical fluids endowed with opposite qualities, and called them the vitreous and the resinous fluid. Franklin endeavored to account for the same phenomena by assuming the existence of a single electric fluid, and supposing an electrified body to be a body which possesses either more or less than the normal quantity of this fluid. If more, it was said to be positively, and if less, negatively electrified. Franklin's positive and negative corresponded with Du Faye's vitreous and resinous. Whenever electricity is generated the two opposite kinds are always produced, and produced in exactly equal quantity. Modern theories favor the idea that electricity is not a substance or a pair of substances, but a special kind of motion, and that the two opposite electricities are two opposite states of motion of the particles of a medium which is believed to pervade all bodies and all space: the same medium whose vibrations constitute light.

The employment of electricity commercially and industrially is daily increasing in importance. The electric

telegraph has long been familiar, and the telephone is now almost equally so. Electric lighting is rapidly extending, and electric railways or tramways are increasing in number. The operations of electro-metallurgy are also of great importance.

The electric transmission of power is the transmission of power to a distance by electricity, effected by employing the source of power to drive a machine called a dynamo which generates an electric current. This current is conveyed by a copper conductor insulated from the earth to the distant station, where it passes through a machine called an electro-motor (see that article), one part of which (called the armature) is thereby made to revolve, and imparts its motion to the machinery which is to be driven.

This is the simplest arrangement, and is that which is commonly employed when the original currents are not of such high tension as to be dangerous to life in the case of accidental shocks. There is, however, a great waste of power in employing low-tension currents when the distance is great; hence it is becoming a common practice to employ high-tension currents for transmission through the long conductor which connects the two stations, and to convert these into low-tension currents before they reach the houses or workshops where they are to be used. This is done sometimes by employing the high-tension currents to drive a local dynamo which generates low-tension currents, sometimes by employing them to charge storage cells arranged in long series, and afterward connecting these cells in shorter series. When the original currents are alternating they are made to generate induced currents by means of an instrument called a transformer, which is similar in principle to an ordinary Ruhmkorff coil, with the important difference that the primary wire is long and thin, and the secondary wire short and thick. These methods of transmission and transformation are employed not only for giving out mechanical power, but also for electric lighting. In the gigantic installation which has been recently erected for supplying a large district in London with electricity sent from Deptford, the currents are alternating, and the conductors consist not of copper wires, but of two copper tubes one within the other, insulated from one another, the outer one being connected with the earth. It is believed that the time is not far distant when electricity will be generally laid on to houses in large towns as gas and water are now, and will be available both for electric lighting and for mechanical work such as driving lathes and sewing-machines, raising lifts, etc.

The phrase, "distribution of electricity," has been used during the last few years to denote the supplying of strong currents of electricity from central stations where they are generated, to houses, street lamps, etc., in their vicinity. The central station contains a few powerful dynamo machines, driven usually by steam-power. The positive and negative terminals of the dynamo are put in connection with the positive and negative main conductors which are to supply the district, and from these mains smaller conductors branch off to the houses or lamps. All these conductors are of copper, that metal when pure having seven times the conductivity of iron. Different methods are in use for keeping the supply of electricity steady in spite of the varying demands made upon it. In some systems of distribution, instead of the two main conductors being one positive and the other negative, each is positive and negative alternately, the reversals taking place some hundreds of times per second. The currents are then said to be alternating. When such reversals do not take place, the currents are said to be direct.

ELECTRIC LIGHT, a light obtained through heating a suitable body to incandescence by causing a current of electricity to pass through the body. The substance usually employed for this purpose in carbon, which has two recommendations: first, its power of bearing a very high temperature without melting; and secondly, its high emissive power, which is the source of most of the light in the flame of a candle, an oil lamp, or a jet of gas.

Fig. 1. Arc light carbons.

Until quite recent years the only kind of electric light in practical use was what is now called the arc light. The arc light is obtained by causing two sticks of carbon, one of them in connection with the positive and the other with the negative terminal of a battery or dynamo, to touch each other for an instant so as to complete the circuit, and then separating them and keeping them steadily at a small distance apart. Before the carbons have touched, the cold air between them prevents the current from passing, but as soon as they touch they become intensely heated, and if they are not separated too far the air between them is hot enough to serve as a conductor. The light is emitted partly by the ends of the carbons, especially of the positive carbon, and partly by the gaseous matter (containing also fine particles of solid carbon) which occupies the intervening space and forms the arc or streak of light joining the two carbon points. When the source of electricity is an alternating-current machine each carbon is alternately positive and negative several times in a second, and the two points behave alike. When the source is a direct-current machine or a galvanic battery the positive carbon wears away about twice as fast as the negative, and the positive carbon becomes hollow at the end, while the negative remains pointed. The hollow in the positive carbon is the brightest part of the whole arrangement; and when a beam of light is to be thrown in some definite direction, care should be taken that this hollow is exposed to view in that direction.

Fig. 1 contains a representation of the two carbons of the arc light as they appear when cold, the positive carbon being marked + and the negative −. Also a magnified representation such as can be obtained by throwing an image of the burning carbons on a screen by means of a lens.

To keep the carbons at the proper distance apart a special contrivance called a "regulator" is employed. There are many varieties of regulator, but they all depend on the principle that increase of distance between the carbons causes increase of resistance. They usually contain an electro-magnet through which either the whole or a portion of the current passes, and the variations in the strength of this magnet arising from change of resistance are taken advantage of to cause the motion, in one direction or the opposite, of a piece of iron which locks and unlocks the mechanism.

As regards the material of the carbon sticks, Sir Humphry Davy used pieces of wood-charcoal, and the substance deposited in the interior of gas retorts has sometimes been employed, but it is now usual to employ a mixture of powdered carbon (from gas retorts), lamp-black, syrup, and gum, with a very little water. The sticks are obtained by forcing this pasty mixture through a draw-plate; they are then baked, and after being again impregnated with syrup are heated to a high temperature.

Arc lights give the largest amount of light for a given amount of horse-power expended in driving the dynamo; but incandescent lights, which have been introduced by Edison, Swan, and other inventors of late years, possess several advantages. Fig. 2 represents Swan's incandescent lamp. a is a glass vessel of globular form exhausted very perfectly of air; b b is a fine elastic filament of carbon, prepared from parchment paper, and becoming incandescent when the current is sent through it. Its two ends are attached to two platinum wires which, where they pass out of the bulb, are hermetically sealed into its wall by

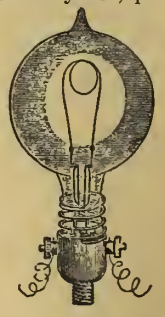


Fig. 2. The Swan lamp.

ELECTRIC MACHINES

fusion of the glass around the wires. These two wires are in connection with the two binding-screws. c c when the lamp is upon the stand, where it is held in its place by the spiral wire d.

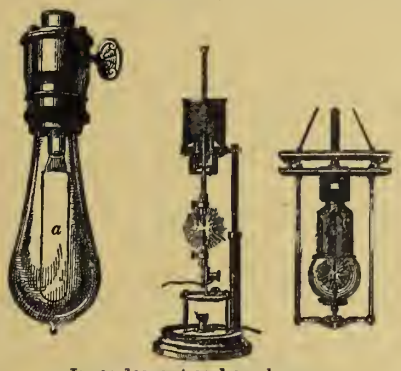
Owing to the absence of oxygen, there is no combustion in an incandescent lamp, and hence the carbon does not waste away. The want of means to obtain a sufficiently good vacuum was the chief cause which prevented the earlier introduction of such lamps. Sprengel's murcurial pump, with Crookes's improvements, has supplied this want. All the incandescent lamps agree in having a carbon filament suspended in vacuo, but they differ in the mode of preparation of the carbons and in other details.

The light of an incandescent lamp is extremely steady, affording a great contrast to the flickering which is never altogether absent from arc lights. Its temperature is lower, and hence its color is not blue or violet, like that of most arc lights, but slightly yellow, though whiter than gas. It is superior both to gas and to the arc light in giving off no products of combustion to vitiate the air of an apartment

The Jablochkoff light, which is represented in Fig. 3, occupies an intermediate place, but more nearly resembles the arc lamps. The two sticks of carbon (a a) are side by side at the distance of ¼ inch or ½ inch according to the power of the lamp, and this intervening space is occupied either with plaster of paris or china-clay (b). The lower ends of the carbon are inserted in copper or brass tubes (c c) separated by asbestos. The lamp is lighted by temporarily inserting a piece of carbon to connect the ends of the two sticks; and after a fair start has once been obtained, the top of the plaster of paris is hot enough to act as a conductor. Its incandescence contributes a portion of the light of the lamp, and it gradually burns away so as never to project quite so far as the carbons. Alternating currents are now always used with it, as the two carbons may then be exactly alike and will wear away equally.

Jablochkoff lamp.

The introduction of electric lights for commercial uses may be said to date from the lighting of the Avenue de l'Opéra at Paris by Jablochkoff lamps, a few years previous to the Paris Electrical Exhibition of 1881. The electric light, as previously known, was considered too dazzling for street purposes, but the Jablochkoff "candles," which even when naked are far less dazzling than "arc" lights, were concealed from direct view by opal globes, and instead of single points of dazzling brightness, presented an appearance like a row of full moons. The application of electricity to street lighting having thus been proved to be feasible, the attention of



Incandescent and arc lamps.

inventors was directed to the subject, and rapid improvements followed. The subsequent invention of "incandescent" or "glow" lamps rendered electricity applicable as an illuminant for domestic purposes. The electric lights now used for street lighting are sometimes Jablochkoff candles, but more frequently arc lights in opal globes. For the lighting of harbors and open spaces, naked arc lights are preferred, as they give more light in proportion to the expense than any other arrangement. For hotels, shops, dwelling-houses, and steamboats, incandescent lamps are almost evclusively employed. The currents necessary for producing the light are always obtained either directly or indirectly from dynamo or magneto machines driven by steam-engines or other prime movers. When we say "indirectly," we allude to the fact that galvanic batteries of the kind called storage batteries or accumulators are sometimes employed to give the currents; but these accumulators must first be charged by sending currents through them from dynamos, and can produce no current on their own account. For the methods of conveying currents from a central station to different parts of a district, see Electricity. For an explanation of the action of dynamos, see Magneto-electric Machines.

ELECTRIC MACHINES, any machine for producing powerful electrical

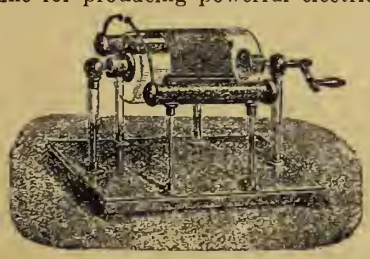


Fig. 1. Cylinder electric machine.

effects. The name is, however, seldom applied to machines depending on magneto-electric principles, and is practically confined to two classes of machines—those which act by friction, and those which act by electro-static induction. The former are called friction machines, and the latter influcnce machines. For many years the former were the only kind known, but they have now been almost superseded by the latter. In friction machines the electricity is generated by the friction of either a glass cylinder or a circular glass plate against cushions covered with an amalgam of zinc and tin. The positive electricity which is thus developed on the surface of the glass is given off to an insulated brass conductor furnished with teeth like those of a comb, the sharp points of which are nearly in contact with the glass. The negative electricity which is at the same time generated on the cushion must be provided with some means of escaping, or the action of the

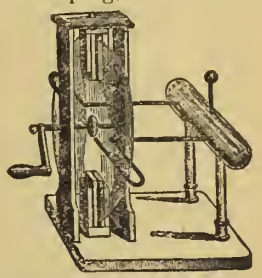


Fig. 2. Plate electric machine.

machine would soon stop. It is usually allowed to escape to the earth by a brass chain connected with the cushions; but in some machines a negative conductor connected with the cushions is insulated like the positive conductor by a glass support. Negative sparks can then be drawn from this conductor at the same time that positive sparks are drawn from the other. A cylinder machine having both a positive and a negative conductor is shown in Fig. 1, and a plate machine in Fig. 2.

An influence machine (that of Voss) is exhibited in Fig. 3. Of the two glass plates which it contains the larger is stationary, and has two patches of tin-

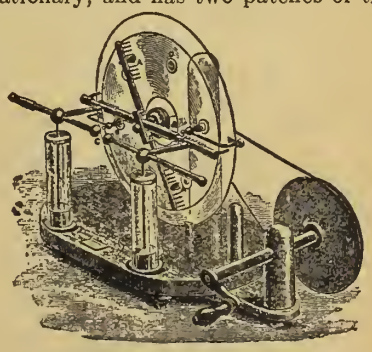


Fig. 3. Voss's influence machine.

foil on its back, one of which has a positive and the other a negative charge. One of them covers the left-hand and upper portion of the back, and the other the right-hand and lower portion. The revolving plate has six metallic studs like that seen at d set in it at equal distances. The sloping bar seen in front of it is of brass and carries two little brushes

a a of thin brass wire, against which the studs rub as they pass by, and this happens at the same moment for both brushes. When the studs have advanced about a quarter of a revolution, they come in contact with another pair of brushes b b which are in connection with the two patches of tinfoil, and serve to replenish their charges.

There are also two brass combs fixed opposite the two horizontal radii of the plate, one row collecting positive and the other negative electricity. They are in connection with the two knobs c which are seen in front of the machine, and a brilliant discharge of electricity takes place between these knobs. The first influence machine that came into extensive use was that of Holtz, and the latest (and probably the best) is that of Wimshurst, in which both the plates revolve, their directions of rotation being opposite. The machine of Holtz is started by holding a flat piece of vulcanite, which has been excited by friction, at the back of the fixed plate. The machines of Voss and Wimshurst, if kept dry, will usually work without such assistance, their action being such as to rapidly increase any casual charge possessed by the plates. For other kinds of machine by which electric shocks can be obtained, see Electro-medical Machines.

ELECTRIC RAILWAY, a railway in which the propulsion is effected by means of an electro-motor, that is, a machine one part of which can be made to revolve by sending a current through it. This revolving part, called the armature, is geared to the driving-wheels and forces them to revolve whenever the current passes. The current is supplied in some cases by storage cells carried in the car, these cells having themselves been first charged by a dynamo-machine. More usually the current is conveyed direct from a dynamo to the electro-motor, by means of a long conductor insulated from the ground, which is fixed either beside or between the rails, and is rubbed by a metallic brush attached to the car, this brush being in connection with the electro-motor. The current, after passing through the electro-motor, escapes to the axles of the driving-wheels, and so through the driving-wheels themselves to the rails, which need not be insulated. In many electric railways (or tramways) the conductor is an overhead wire from which the current is obtained to drive the cars. The first permanent electric railway was laid down at Berlin in 1881.

ELECTRIC TELEGRAPH. See Telegraph, Electric.

ELECTROCUTION, execution by electricity; that is, the killing of a man by an electric shock. This method of killing condemned criminals was adopted by New York in 1888 and by Ohio in 1896. It is supposed that the method is more humane than that of hanging. The condemned is led to a chair, an electrode is placed upon his bared leg, and enough current is sent into him to kill him. Many people think that electrocution is even more horrible than hanging. The courts, however, have decided that it is less so.

ELEC'TRODE, a term introduced by Faraday to denote the wires or other terminals by which electricity either enters or leaves a body which is undergoing electrolytic decomposition, in order to avoid an implied theory connected with the use of the older terms pole, positive pole, negative pole. He called the electrode at which the current enters the anode (ana, upward), and the elcctrode at which the current leaves the electrolyte the cathode (kata, downward). (See Electro-metallurgy.) The two latter terms have now been introduced in metallurgic practice; and the term electrode has become common in the extended sense of the way by which electricity enters or leaves an instrument. For instance, we speak of the electrodes of an electrometer or a galvanometer, or of a battery.

ELECTRO-DYNAMOMETER, an instrument used for the measurement of electric currents by means of the mechanical forces which they exert upon each other. It contains two coils of wire, one fixed and the other movable; the latter being either larger or smaller than the other so as to be able to pass either outside it or through it. Both coils are in vertical planes and have the same vertical diameter, round which the movable one can revolve so as to set its own plane at any angle with the plane of the other. The terminals of the movable coil dip in cups of mercury, one of which is in connection with one end of the fixed coil, and the other with one of the binding-screws of the instrument. The other binding-screw is in connection with the other end of the fixed coil. Hence when the two binding-screws are connected with a battery or other source of electricity, the current has to pass through both coils. Its effect is exhibited by a tendency in the movable coil to set its plane in coincidence with that of the fixed coil, and in such a manner that the current will circulate the same way round both coils. This tendency is resisted by mechanical means provided for the purpose—usually by the torsion of a wire from the end of which the movable coil hangs; and the measurement is usually made by applying torsion until the planes of the two coils are at right angles. The amount of torsion thus applied is proportional to the mutual force exerted by the two coils, and this is proportional to the square of the current, since when we double the current through one we also double the current through the other.

ELECTROL'YSIS is the chemical decomposition of certain compound bodies under the action of a current of electricity. The following are the main facts to be mentioned. When an electrolyte (as a body capable of electrolytic decomposition is called) is subjected to a current of electricity of sufficient intensity, it is broken up into two elements, which appear, one of them at one electrode and the other at the other electrode; thus, if two platinum plates connected with the first and last plates of a battery be plunged in a trough containing a solution of chloride of silver, the chlorine is given off at the plate by which positive electricity enters, that is, at the plate which is connected with the copper plate of the battery, and the silver is deposited at the plate connected with the zinc plate of the battery. The two elements are liberated at these places in quantities chemically equivalent. Thus for every 108 grammes of silver deposited at one side of the vessel 35·5 grammes of chlorine are given off at the other side. When a compound consisting of a metallic and a non-metallic part is decomposed, the non-metallic part is set free at the electrode at which the current enters and the metallic part at the opposite electrode. Hydrogen acts as a metal. Electrolysis takes place only when the electrolyte is in a liquid state, and involves a transfer of the materials of which the compound is composed from one part of the vessel to another.

The electrolytic action of the current is the same at all parts of the circuit. If the current is made to traverse several vessels, each containing the same substance, all in series (that is, the current that leaves the first entering the second, and so on), it will be found that in each of the cells precisely the same amount of decomposition goes on. There will be the same weight of silver deposited at one side, and the same weight of chlorine set free at the other.

The same quantity of electricity decomposes chemically equivalent quantities of different electrolytes. If we pass the current through a series of cells containing different electrolytes, for example, water, chloride of silver, sulphate of soda, and collect the products of decomposition, we find that the quantities of hydrogen, silver, and sodium set free are strictly proportional to the chemical equivalents of these bodies. Further, in the battery which gives rise to the electric current, if precautions are taken to avoid disturbance by local action on the plates, it is found that the action which goes on in each of its cells is chemically equivalent to that in each of the decomposing cells.

The quantity of the electrolyte decomposed in a given time is proportional to the strength of the current. Currents are often measured in practice by observing the weight of copper deposited in a given time from a solution of sulphate of copper.

ELECTROLYTE. See previous article

ELECTRO-MAGNET, a piece of iron temporarily converted into a magnet by means of a current of electricity sent through a wire which is coiled round it. The wire is usually covered with silk, cotton, gutta percha, or some other insulator, to prevent the current from leaping across, and compel it to travel through the whole length of the wire. The more pure and soft the iron is, the stronger will its magnetism be while it lasts, and the more completely will it disappear when the current stops. Steel is less affected than soft iron for the time, but remains permanently magnetized after the current ceases. Electro-magnets are usually much more powerful than other magnets of the same size. The iron which is magnetized by the current passing round it is called the core. It is frequently straight, the wire being wound upon it like thread upon a reel; but very frequently it has the shape of a **U**, or horse-shoe, the wire being coiled round the two ends and the bend of the **U** left uncovered.

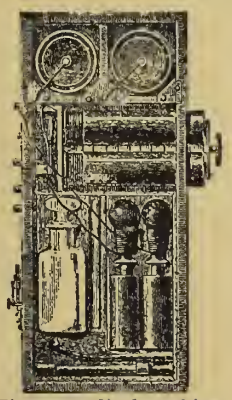
To predict which end will be the north pole, the following rule may be employed: Let the core be a straight bar of iron held in front of you pointing left and right, then if the current ascends on the side next you, and descends on the further side, the north pole is to your left hand and the south pole to your right. If the straight bar is then bent into horse-shoe shape, its poles will not be changed. There is no necessity to inquire whether the wire forms a right-handed or a left-handed helix, this circumstance having no influence on the question of poles. Indeed, in most cases (just as in the case of thread on a reel) the helices are some right-handed and some left-handed.

An electro-magnet is said to be made when the current is sent through its coil, and unmade when the current is stopped. In some applications of electro-magnets it is necessary to make and unmake them in rapid succession. It is then preferable for the core to consist of a bundle of iron wires rather than of a solid bar.

ELECTRO-MAGNETISM, a term that in its broadest sense denotes the science which treats of the relations between magnetism and electricity. In a narrower sense a magnetic effect produced by electricity is said to be electro-magnetic, while an electrical effect produced by the agency of magnets is called magneto-electric. In the preceding article we have described one electro-magnetic effect—the making of an electro-magnet by means of a current. Another important electro-magnetic effect is the deflection of a magnetic needle by a current of electricity passing near it. The simplest experiment to illustrate this action is to take an ordinary mariner's compass, hold just above it a copper wire parallel to the needle of the compass, and then, while the wire is in this position, let its two ends be connected with the two poles of a galvanic battery. The needle will instantly turn away from its north-and-south position, and will remain deflected as long as the current continues to pass over it. If the current flows from south to north, the north end of the needle is turned to the west; and if the current is in the opposite direction, the needle turns the other way. This is the easiest test for determining the direction in which a current is flowing through a wire; and it is the basis of the construction of galvanometers, which are the instruments chiefly employed for the measurement of currents. The current tends to make the needle take a position at right angles to the direction of the current; but as the earth tends to make the needle point north and south, the position actually taken is between the two. The fact that a current deflects a needle was discovered by Œrsted of Copenhagen, and the general rule for the direction of the deflection was thrown into the following form by Ampère: Imagine the current to enter at your feet and come out at your head, then the north pole of a needle in front of you will be deflected to your left. This rule holds good whether the current is above the needle, below it, or in any other position. The rule may also be put in the following form: Imagine an ordinary screw placed so that the current is in its axis; the north pole of the needle will turn to the same side to which that part of the circumference which is next it turns when the screw advances in the direction of the current.

The leading fact of magneto-electricity is that when a magnet is moved in the neighborhood of a wire or other conductor, the motion causes a current of electricity in the conductor; and a similar effect occurs if the wire is moved while the magnet remains at rest. In the experiment, above described, of making a magnetic needle turn on its pivot by sending a current through a wire held above it, the motion of the needle produces for the time being a weakening of the current. If the needle were made by mechanical means to turn the contrary way, it would strengthen the current for the time being. If there were no original current, the turning of the needle to either side by mechanical means would produce a current in the wire. The current thus produced is always opposite in direction to that which would aid the motion.

ELECTRO-MEDICAL MACHINES, machines intended for giving shocks for medical purposes. They are of various kinds, but they all produce their effects by a rapid succession of either interruptions or reversals of an electric current. Such interruptions or reversals are always accompanied by the action called self-induction, especially when the original current flows through a coil of many convolutions, and still more if these convolutions encircle an iron core. Self-induction in such cases shows itself as a sudden and violent action, having the same sort of relation to a steady current that a blow has to a steady pressure. One form of electro-medical machine is shown above. At the top of the figure are shown two small galvanic cells, in which for greater portability materials of pasty consistency are used instead of liquids. The bottle shown below is for replenishing them. In the center of the figure are seen two cylindrical coils, through which the current from the two cells passes. They have cores of soft iron to strengthen their action, and they have also sliding covers of copper for mitigating their action. These are shown in the figure as pulled out a short distance, so as to uncover a small portion of the coils. The shocks become stronger as these covers are drawn further out. The action of the covers may be described as a muffling or cushioning of the sudden violence of self-induction. Some of the commonest forms of electro-medical machine are magneto-electric, their currents being produced by making a coil of copper wire rotate rapidly between the poles of a strong magnet. The employment of such a machine for administering shocks to patients is called faradisation, from Faraday, the discoverer of magneto-electricity.



Electro-medical machine.

ELECTRO-METAL'LURGY, the art of depositing metals from solutions of their salts upon metallic or other conducting surfaces by the agency of an electric current. Its operations may be classified under three heads: the making of facsimilies, the formation of permanent coatings, and the obtaining of a pure metal from an impure. In every instance the current enters the solution by a plate of the metal in question, which is immersed in it, and leaves the solution by the conducting surface on which the deposit is formed. The plate at which the current enters (called the anode) is gradually dissolved, and an equal quantity of the metal is at the same time deposited on the surface by which the current leaves the solution (called the cathode). The source employed for giving the current was formerly a galvanic battery, but is now more frequently a dynamo machine, in which the armature is constructed of much stouter wire than is used in dynamos intended for other purposes. Copper lends itself with special readiness to electrical deposition, and the solution employed for the purpose is usually a saturated solution of sulphate of copper; but if the surface to be coated is of iron, steel, or zinc, it is necessary to employ an alkaline solution, in which cyanide of potassium and carbonate of soda are usually the chief ingredients, a salt of copper being present in comparatively small quantity. For electro-gilding, a solution containing cyanide of potassium and cyanide of gold is employed; and for electro-plating, a solution of cyanide of potassium and cyanide of silver. It so happens that the impurities which usually occur in copper roughly smelted from the ore consist of substances which either cannot be dissolved in a solution of sulphate of copper, or cannot be deposited on a copper surface from such a solution. Hence when a plate of crude copper is used as the anode, pure copper is deposited on the cathode, and most of the impurities fall to the bottom of the vessel. Pure copper is now produced in enormons quantities by this method, purity being an essential requisite in copper wire for electrical purposes.

The most important instance of the position of a permanent coating is electro-plating. To ensure good adhesion it is necessary to remove every particle of grease and oxide from the surface (usually German silver) on which the silver is to be deposited. With this view the article to be plated, after being well scoured, is boiled in a strong lye of caustic potash or soda, and dipped in dilute acid, technically called pickle;

after which it is washed in distilled water, and then quickly dipped in a solution of nitrate of mercury until it appears white on the surface. Finally it is suspended in the silver solution, when it is immediately coated with a thin film of silver. This operation is called striking. After a few seconds it is taken out and well brushed, generally with bundles of brass wire attached to a lathe; it is then washed and replaced in the plating solution, where it is allowed to remain for a longer or shorter period according to the thickness of deposit required. An immersion of a few hours is generally sufficient. To ascertain the amount of metal deposited it is only necessary to weigh the articles from time to time. One and a quarter or one and a half ounce of silver to the square foot gives an excellent plate about the thickness of common writing-paper. In ordinary circumstances the coating of deposited silver is chalk-white, and has a dead or matted appearance, which is much esteemed for medals. Sometimes the operator is desirous of having his object bright, either entirely or partially. In this case the object is brushed over with old beer or dipped into a solution of soft soap, and is then submitted to the burnisher. Certain chemicals added to the solution will cause the original deposit to have a metallic luster

The production of copper facsimiles by the electric current is called electrotype, and is the oldest branch of electrometallurgy. One of its most important applications is the copying of type set up for printing, and of wood blocks for wood-cuts. A mould is first obtained in gutta percha or some similar material. This, being a non-conductor, is brushed over with plumbago in its interior, so as to give it a conducting surface to receive the deposit. After several hours the deposit is detached from the mould and backed by pouring in melted solder, the surface being first moistened with chloride of zinc to make the solder adhere. In the copying of steel engravings the mould is obtained by electro-deposition of copper on the steel, the surface of which must first be specially prepared to prevent adhesion; and a second electro-deposition of copper, on the mould thus obtained, gives the required copy, from which impressions can be printed.

ELECTROM'ETER, an instrument intended for accurate electro-statical measurements. Stated in precise technical language, its purpose is to measure the difference of potential between two conductors. Most of the electromcters in actual use are inventions of Sir William Thomson, who was the first to give accuracy to this branch of electrical measurement. His quadrant-electrometer is the instrument chiefly used, and its indications are usually given by means of a small movable mirror which reflects a spot of light from a lamp on to a paper scale. When the two conductors which are tested have the same potential the spot of light stands in the middle of the scale, and its movement to either side indicates the difference of their potentials. The instrument is sufficiently delicate to give a sensible displacement when the two conductors are the two plates of a single galvanic cell; and a displacement twice as great will be obtained by combining two such cells.

ELECTRO-MOTIVE FORCE, a phrase (commonly abbreviated into the three initial letters e.m.f.) which is of very frequent use in modern electrical literature, especially in connection with electric currents. The e.m.f in a wire through which a current is flowing may be compared to the difference of pressures in a long, narrow, horizontal pipe, through which water is flowing. As the difference of the pressure at the two ends of the pipe forces the water through in spite of frictional resistance, so the difference of the potentials at the two ends of the wire forces the current through in spite of the electrical resistance of the wire. This difference of potentials is another name for electro-motive force. Each cell of a battery is a source of e.m.f. and when the cells are connected in the usual way (technically called in series) their e.m.f.'s are added together, so that, for example, the e.m.f. of a battery of ten cells is ten times the e.m.f. of one cell. E.m.f. can also be produced in a wire by moving a magnet in its neighborhood, and this e.m.f. will be exactly proportional (other things being equal) to the velocity of the motion. The commercial unit of e.m.f. is the volt. Its magnitude may be inferred from the statement that the e.m.f. of a single cell is usually more than one volt, and less than 2½ volts. The highest e.m.f. permitted by the board of trade in wires which are liable to be touched by the public is about 200 volts. It is no unusual thing for a dynamo to give an e.m.f. of 1000 or 2000 volts. Currents produced by a source of high e.m.f. are often called currents of high tension. They are necessary when several arc lamps are to be supplied in series, and they are also necessary (on the score of economy) when power is to be transmitted by electricity to great distances.

ELECTRO-MOTORS, or **ELECTRO-MAGNETIC ENGINES,** are contrivances for making a current produce continuous rotatory motion, the force producing the motion being sufficient to overcome a considerable amount of mechanical resistance, and so do useful work. Until quite recent years this object was effected by the alternate making and unmaking of electro-magnets, which attracted pieces of iron provided for the purpose, and caused them to move in the directions required for producing continuous rotation. In modern electro-motors the action is greatly intensified by employing, instead of the above-mentioned pieces of iron, electro-magnets whose poles are alternately attracted and repelled by those of the fixed electro-magnets. In order to produce these alternate attractions and repulsions the currents in the moving electro-magnets are continually reversed, while the currents in the fixed magnets are always in the same direction. The revolving electro-magnet or group of electro-magnets is called the armature. It revolves with great rapidity, and its movement is transmitted by a belt or otherwise to the machinery which is to be driven. The construction of an electro-motor is almost precisely similar to that of a direct-current dynamo. Indeed the same machines have often been used interchangeably for both purposes. See Electric Railway, Electricity.

ELECTROPH'ORUS, an electrical instrument consisting of two plates, the lower of vulcanite or shellac, with tinfoil or other metal at the bottom, and the upper of brass, with a glass handle The operator begins by applying friction

Electrophorus.

with a catskin or flannel to the upper surface of the lower plate, which thus acquires a negative charge. The upper plate is then placed upon it and pressed closely down. In this process the upper plate, being in connection with the earth through the body of the operator, acquires a positive charge by induction; and if the upper plate be now lifted off by its glass handle, a good spark can be obtained from it. It may then be pressed down again, removed again, and another spark obtained, and so on, time after time. If the insulation is thoroughly good, hundreds of sparks can be drawn in this way without the necessity of renewing the charge on the surface of the lower plate. It might have been expected that the upper plate would require a coating of insulating varnish to prevent it from touching the lower one; but experience shows that this precaution is unnecessary. A smooth plate of metal does not easily receive electricity from an insulating substance with which it is brought in contact. The electrophorus is often so constructed that when the two plates are in contact, the upper plate is in conducting communication with the metal base of the lower plate. This arrangement saves time, as it is then unnecessary to touch the upper plate with the hand.

ELECTROPLATE. See Electro-metallurgy.

ELEC'TROSCOPE, any apparatus for showing the presence of electricity without giving quantitative measurements. One form consists of two stiff straws loosely tied together at the top, so that

Gold leaf electroscope.

they are free to open out at the bottom whenever they repel each other. If they are placed in conducting communication with an electrified body they will open out. A more sensitive instrument is the

gold-leaf electroscope, which is represented in the adjoining figure. Here the two gold leaves are shown diverging under the influence of an electrified body held over the instrument. The gold leaves are attached to the lower end of a short rod of brass, whose upper end carries the brass knob which forms the top of the instrument. These metal parts are supported by the glass shade which insulates them from the earth, and the upper part of which is represented in the figure as coated with varnish, but this is not essential. The two gold leaves originally hang down parallel and nearly touching each other. When an electrified body is slowly brought down over the knob from a good height above it, the unlike electricity is attracted to the knob, and the like electricity is repelled into the gold leaves, which, in consequence of being thus electrified, repel each other. The two little brass columns standing up from the base are in connection with the earth, and their presence increases the divergence of the leaves. As soon as the electrified body above is removed, the leaves come together again. If, however, while the leaves are standing apart under the influence of the body overhead, the knob is touched with the finger the leaves will instantly come together. It will then be found that either lowering or raising the influencing body causes them to open out again; and if the influencing body is removed they will open out to the same width at which they stood just before the knob was touched. The leaves and knob have now a charge opposite to that of the influencing body, and the electroscope can now be used to show whether the charge of a second influencing body is positive or negative. If the second body has the same kind of electricity as the first, it will diminish the repulsion; if it has the opposite kind, it will increase the repulsion.

ELEC'TROTYPE, that branch of electro-metallurgy which deals with the production of facsimiles. See Electro-metallurgy.

EL'EGY, a mournful and plaintive poem or funeral song, or any serious poem of a melancholy contemplative kind. In classic poetry what is known as elegiac verse is composed of couplets consisting of alternate hexameter and pentameter lines.

ELEMEN'TAL SPIRITS, according to a belief common in the middle ages, spirits proper to and partaking of the four so-called elements, viz. salamanders or fire spirits, sylphs or aerial spirits, gnomes or earth spirits, and undines or water spirits.

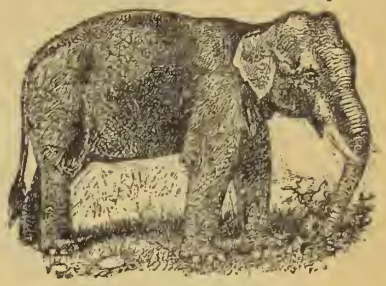
ELEMENTARY EDUCATION. See Education.

EL'EMENTS, the simplest constituent principles or parts of anything; in a special sense, the ultimate indecomposible constituents of any kind of matter. In ancient philosophies the term was applied to fire, air, earth, and water. The mediæval chemists, however, obsorbed in the study of metals and mineral substances, supposed that the metals consisted of an elemental sulphur and an an elemental mercury mixed together more or less perfectly and in different proportions. To these were subsequently added salt and some others, so that about the middle of the 17th century the first principles amounted to five, divided into two classes: the active, consisting of mercury or spirit, sulphur or oil, and salt; and the passive, consisting of water or phlegm, and earth or the terrestrial part. The names remained, not so much as denoting substances or ultimate principles as gradually coming to denote functions; the first great modification being the expansion of the idea of elemental sulphur into phlogiston by Stahl, as the result of which the adherents of the phlogistic theory applied the term to phlogiston, to the gases then discovered, the mineral, vegetable, and animal acids, the alkalies, earths, and metallic calces, oil, alcohol, and water. The substances considered as simple naturally changed with the change of theory introduced by Lavoisier, who considered as elements, oxygen, nitrogen, hydrogen, sulphur, phosphorus, and carbon, the metals and the earths, and, as Boyle had already suggested, practically defined an element as a body not yet decomposed, the definition now commonly adopted. For list of known elements see Chemistry.

EL'EPHANT, the popular name of a genus or sub-family of five-toed proboscidian mammals, usually regarded as comprehending two species, the Asiatic and the African. From a difference in the teeth, however, the African species is sometimes treated as a distinct genus, and some authors divide the Asiatic elephants into several species, such as the Indian elephant, the Ceylon elephant and the Sumatra elephant. The so-called white elephants are merely albinos. The African elephant is distinguished from the Asiatic species by its greater height, its larger ears, its less elevated head and bulging or convex forehead, the closer approximation of the roots of the tusks, and the greater density of the bone. It has also only three external hoofs on the hind-feet, while the Asiatic has four. All elephants are remarkable for their large, heavy, short bodies supported on columnar limbs, a very short neck, a skull with lofty crown and short face-bones, with the exception of the premaxillaries, which are enlarged to form tusk-sockets. To compensate for the short neck, they have the long proboscis, often 4 or 5 feet in length, produced by the union and development of the nose and upper lip. It is made up of muscular and membraneous tissue, the only cartilages being the valves at the entrance of the nares. The trunk is of great strength and sensibility, and serves alike for respiration, smell, taste, suction, touch, and prehension. The tusks, which are enormously developed upper incisor teeth, are not visible in young animals, but in a state of maturity they project, in some instances 7 or 8 feet. The largest on record (possibly that of an extinct species) weighed 350 lbs. Elephants sometimes attain the height of 15 feet, but their general height is about 9 or 10. Their weight ranges from 4000 to 9000 lbs. The female is gravid twenty months, and seldom produces more than one at a birth: this, when first born, is about 3 feet high, and continues to grow till it is sixteen or eighteen years of age. It is said they live to the age of 100 years and upward. They feed on vegetables, the young shoots of trees, grain,

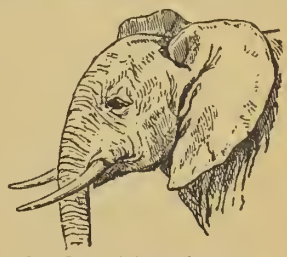
African elephant.

Asiatic elephant.



Indian elephant.

Head of Indian elephant.



Head of African elephant.

and fruit. They are polygamous, associating in herds of a considerable size under the guidance of a single leader. The domesticated elephant requires much care, and a plentiful supply of food, being liable to many ailments. The daily consumption of a working elephant is, 2 cwts. of green food, about half a bushel of grain, and about 40 gallons of water. Their enormous strength, docility, and sagacity make them of great value in the East for road-making, building and transport. They are used on occasions of pomp and show, being often richly caparisoned, and bearing on their back a howdah containing one or more riders, besides the mahout or driver sitting on the animal's neck. Tiger-shooting is often practiced from an elephant's back. The fossil remains of the genus Elephas indicate the former existence of at least fourteen species; and a still larger number of species belong to the allied genus Mastodon.

ELEPHANTI'ASIS, a disease chiefly occurring in tropical climates, characterized by a peculiar overgrowth of the skin and subjacent textures, and attacking especially the legs, which become enlarged and elephantine. It appears to arise from repeated inflammation of the skin and a concurrent obstruction of the veins and lymphatic glands of the inflamed part. The disease occasionally affects the scrotum, enlarging it to enormous dimensions. In general it is attended with little pain, and the health may remain otherwise unaffected for many years. In the early stages wet bandaging or ligature of the main artery has been found serviceable, but amputation may be necessary.

ELEPHANT-SEAL, the proboscis seal, or sea-elephant, the largest of the seal family. There are probably two species, one found only on the coast of California and Western Mexico, the other found in Patagonia, Kerguelen Island, Heard's Island, and other parts of the southern seas. They vary in length from 12 to 30 feet, and in girth at the chest from 8 to 18 feet. The proboscis of the male is about 15 inches long when the creature is at rest, but elongates under excitement. The females have no proboscis, and are considerably smaller than the male. Both species are becoming rare from their continual slaughter.

ELEPHANT'S-EAR, a name sometimes given to plants of the genus Begonia.

ELEVATION, in architecture, a geometrical delineation of the front or any face of a building in which all the parts are drawn according to scale, and not shown as they would appear in perspective.—In astronomy, it is the height of a celestial object above the horizon.

ELEVATION OF THE HOST, in the ritual of the Mass, is the lifting up of the elements immediately after consecration, to be worshiped by the people. It was introduced into the Latin Church in the 11th century.

EL'EVATOR, a mechanical contrivance consisting of a series of boxes or buckets attached to a belt traveling round two drums, one above and one below, for hoisting grain, meal, etc., into a mill or storehouse from a ship's hold, etc. In the U. States large buildings containing such contrivances, and in which grain is stored, receive the same name.—(2) An apparatus for raising or lowering persons or goods to or from different levels in warehouses, hotels, etc., consisting usually of a cage or movable platform worked by hydraulic, steam, or electric power.

ELF. See Fairy.

ELGIN, a royal and parliament burgh of Scotland, capital of Elgin county, finely situated on the Lossie, about 5 miles from its influx into the Moray Firth, 70 miles n.w. of Aberdeen. Pop. 8260.—The county of Elgin, also called Morayshire, is a maritime county, bounded by the Moray Firth, Banffshire, Inverness-shire, and Nairnshire; area, 340,000 acres. Pop. 44,808.

ELGIN, a town on the Fox river in Kane co., Ill., noted for its important manufacturing and agricultural industries. It is charmingly situated on a number of pretty hills and is the centre of one of the prettiest districts in America. Here is situated the Elgin watch works the products of which have a world-wide reputation. Elgin is also the center of one of the finest dairy farming districts in the world. The Illinois State Hospital for the Insane is the largest public institution. Pop. 25,000.

ELGIN, James Bruce, Eighth Earl of, and twelfth Earl of Kincardine, Governor-general of India, born in 1811. He died in 1863.

EL HASA, a fertile district of Eastern Arabia, on the Persian Gulf. It produces dates, wheat, millet, rice, etc. Pop. estimated at 160,000.

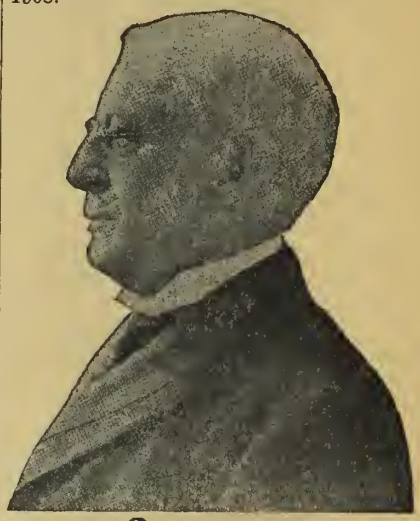
ELI, one of the Hebrew judges, the predecessor of Samuel. He was high-priest and judge for forty years, but was less successful as head of his own household. His two sons having been slain and the ark taken in battle by the Philistines, the news proved so severe a shock that he fell and broke his neck, at the age of ninety-eight. Little is really known of the history of Eli, since he is only shown to us in the weakness of old age, unable to control his sons Hophni and Phinehas, whose wickedness disgusted and alienated the people.

ELI'AS, the New Testament form of Elijah.

ELIAS, Mount St. See Saint Elias, Mount.

ELI'JAH, the most distinguished of the prophets of Irsael, flourished in the 9th century B.C., during the reigns of Ahab and Ahaziah, and until the beginning of the reign of Jehoram, his special function being to denounce vengeance on the kings of Israel for their apostasy. He incurred the anger of Jezebel, wife of Ahab, for slaying the prophets of Baal, but escaped to Horeb, afterward returning to Samaria to denounce Ahab for the murder of Naboth. Elijah at length ascended to heaven in a chariot of fire, Elisha, his successor, being witness. See 1 Kings xvii. to xxi. and 2 Kings i. and ii.

ELIOT, Charles William, a noted American educator, born in Boston in 1834. He was educated at Harvard and held several chairs in the university until 1869, when he became its president. Under his administration the university had its greatest growth. He remodeled the curriculum, devised the elective system of studies and soon became the acknowledged authority in America on higher education. He has published several text-books and a number of essays and addresses. He resigned the presidency of Harvard in 1908.



Charles W. Eliot

EL'IOT, George, the assumed literary name of Mary Ann, or, as she preferred to write the name in later years, Marian Evans, English novelist. Born at Griff, near Nuneaton, on 22d November, 1820. She received at Coventry an excellent education, comprising the classical and modern languages, and shortly after her twenty-first year became a convert to rationalism. It was not, however, until January, 1857, that she came prominentnently into public notice, with the first of a series of tales entitled Scenes from Clerical Life. The series came to an end in November, 1857, and in the following year the publication of Adam Bede placed her in the first rank of writers of fiction. It was succeeded by the Mill on the Floss (1860), Silas Marner (1861), Romola (1863), Felix Holt (1866), Middlemarch (1872), and Daniel Deronda (1876). In addition to those prose works she published three volumes of poems, The Spanish Gypsy (1868), Agatha (1869), and the Legend of Jubal (1874). Her last work published during her life was the series of essays entitled The Impressions of Theophrastus Such (1879), but a volume of mixed essays was issued posthumously. For many years she was happily associated both in life and work with George Henry Lewes, though a legal union was impossible during the lifetime of Mrs. Lewes. In May, 1880, after Mr. Lewes' death, she married Mr. John Cross, but did not survive the marriage many months, dying rather suddenly at Chelsea on the 22d December of that year.

ELI'SHA, a Hebrew prophet, the disciple and successor of Elijah. Many miracles of prediction and cure, and even

of raising the dead, are ascribed to him, but his figure is less original and heroic than that of his master. He held the office of prophet for fully sixty-five years from the reign of Ahab to that of Joash (latter half of 9th century B.C.).

ELIX'IR, a word of Arabic origin, applied by the alchemists to a number of solutions employed in attempting the transmutation of metals into gold, and also to a potion, the elixir vitæ, or elixir of life, supposed to confer immortality. It is still used for various popular remedies, for the most part composed of various aromatic and stimulative substances held in solution by alcohol.

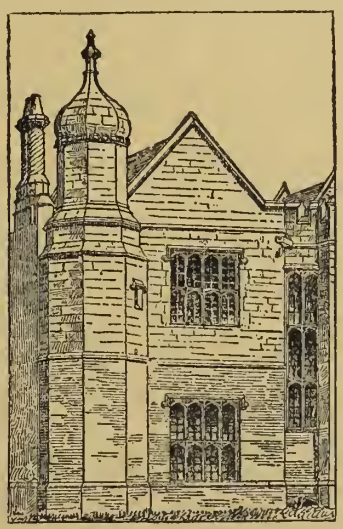
ELIZABETH, a city in New Jersey, 14 miles S.W. from New York, with which it has ample communication by railway and steamer. It is a favorite residence of New York business men. The Singer Sewing Machine Co. has a large factory here, and there are also foundries, oil-cloth factories, etc. Pop. 1909, 70,000.

ELIZABETH, Queen of England, daughter of Henry VIII. and of Anne Boleyn, was born at Greenwich September 7th, 1533, and almost immediately declared heiress to the crown. On the accession of Edward VI. Elizabeth was committed to the care of the

Queen Elizabeth.

queen-dowager Catherine. The first great object of her reign was the settlement of religion, to effect which a parliament was called on 25th January, and dissolved on the 8th May, its object having been accomplished. The nation was prepared for a return to the reformed faith, and the parliament was at the bidding of the court. The ecclesiastical system devised in her father's reign was re-established, the royal supremacy asserted, and the revised prayer-book enforced by the act of uniformity. While, however, the formal establishment of the reformed religion was easily completed, the security and defense of the settlement was the main object of the policy and the chief source of all the struggles and contentions of her reign. With the unfortunate Mary, Queen of Scots, were connected many of the political events of Elizabeth's reign. On her accession the country was at war with France. Peace was easily concluded (1559); but the assumption by Francis and Mary of the royal arms and titles of England led to an immediate interference on the part of Elizabeth in the affairs of Scotland. The detention of Mary in England (1568–87), whither she fled to the protection of Elizabeth, led to a series of conspiracies, beginning with that under the Earls of Northumberland and Westmoreland, and ending with the plot of Babington, which finally determined Elizabeth to make away with her captive. The execution of Queen Mary (1587), though it has stained her name to posterity, tended to confirm her power among her contemporaries, and caused Philip of Spain to send the Armada against England (see Armada). The war with Spain dragged on till the close of Elizabeth's long reign. During her reign the splendor of her government at home and abroad was sustained by such men as Burleigh, Bacon, Walsingham, and Throgmorton; but she had personal favorites of less merit who were often more brilliantly rewarded. Chief of these were Dudley, whom she created Earl of Leicester, and whom she was disposed to marry, and Essex, whose violent passions brought about his ruin. He was beheaded in 1601, but Elizabeth never forgave herself his death. Her own health soon after gave way, and she died on 24th March, 1603, naming James VI. of Scotland as her successor.

ELIZ'ABETHAN ARCHITECTURE, a style of architecture which prevailed in England during the reigns of Elizabeth and James I. It succeeded to the Tudor style, properly so called, with which it is sometimes confounded. The Elizabethan is a mixture of inferior Gothic and debased Italian, producing a singular heterogeneousness in detail, with, however, wonderful picturesqueness in general effect, and domestic accommodation more in accordance with the wants of an advancing civilization than was afforded by the styles which preceded it. The chief characteristics of Elizabethan architecture are: windows

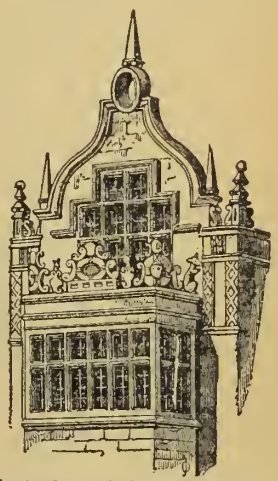


Elizabethan architecture—Hargrave hall, England.

of great size both in the plane of the wall and deeply embayed, ceilings very richly decorated in relief, galleries of great length, very tall and highly-decorated chimneys, as well as a profuse use of ornamental strap-work in the parapets, window-heads, etc. The Elizabethan style is the last stage of the Tudor or Perpendicular, and from its corresponding in point of period with the Renaissance of the Continent has sometimes been called the English Renaissance. The epithet Jacobean has sometimes

Drawing-room of Bramhall hall, Cheshire. Time of Elizabeth.

been given to the very latest stage of the Elizabethan, differing from the Elizabethan proper in showing a greater admixture of debased Italian forms. The



Elizabethan window, Rushton hall.

princely houses which arose during the reign of Elizabeth are numerous, and many even yet remain to attest the splendor of the time. Of these may be mentioned Burghley House, Hardwick Hall, and Bramhall Hall.

ELIZABETH FARNESE (fär-nā'zā), Queen of Spain, daughter of Edward II., prince of Parma, born 1692. On becoming the second wife of Philip V. she surprised those who had counseled the marriage by assuming the practical headship of the kingdom, and her ambition and that of her minister Alberoni disturbed the whole of Europe. The "termagant tenacious woman," as Carlyle called her, died in 1766.

ELIZABETH OF VALOIS, or **ISABELLA,** Queen of Spain, was born in 1545, daughter of Henry II. of France and Catherine de Medici. She was destined by the Treaty of Cateau-Cambrésis to be the wife of the infante, Don Carlos, but his father, Philip II., being left a widower, became fascinated and married her himself. She died in 1568.

ELIZABETH PETROWNA, Empress of Russia, daughter of Peter the Great and Catherine, born in 1709 or 1710, ascended the throne on 7th Dec. 1741, as the result of a conspiracy, in which

Ivan VI., a minor, was deposed. Elizabeth is said to have rivalled her mother in beauty, and to have surpassed her in her love of pleasure, and her government was largely conducted by favorites. She was a patron of literature, founded the University of Moscow, and corresponded with Voltaire. She died in 1762.

ELIZABETH STUART, Queen of Bohemia, daughter of James I. of England and VI. of Scotland, born in Falkland Palace, Fifeshire, 1596. Her marriage with the Palatine Frederick was celebrated at Whitehall in 1613. Her husband, then at the head of the Protestant interest in Germany, accepted in 1619 the crown of Bohemia offered to him by the revolted Protestants of that country; but after his defeat by the imperialists at the battle of Prague in 1620 he and his wife were obliged to flee, first to Breslau and Berlin, and then to the Hague. She returned to England at the Restoration with her nephew Charles II., and died at Leicester House, London on 13th Feb., 1662.

ELK, Moose, or Moose Deer, the largest of the deer family, a native of northern Europe, Asia, and America. The American form (to which the name moose is usually given) is sometimes separated from the European, but most naturalists find no specific difference between them. The elk or moose has a

Elk.

short compact body, standing about 6 feet in height at the shoulders, a thick neck, large clumsy head, and horns which flatten out almost from the base into a broad palmate form with numerous snags. In color the elk is grayish brown, the limbs, sides of head, and coarse mane being, however, of a lighter hue. Their flesh resembles beef rather than venison. For the most they are inoffensive, and so exceedingly wary that they are approached only with difficulty. In America the Indians and half-breeds are the most skilful moose-hunters. The moose has a wide range in Canada, extending from the Arctic Ocean and British Columbia to New Brunswick and Nova Scotia; and it is found also in Maine. It feeds largely on the shoots of trees or shrubs, such as the willow and maple, and on bark, etc. In Sweden its destruction is illegal, and in Norway, there are many restrictions.

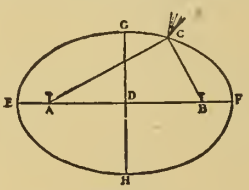
ELK'HART, a town of Indiana, on the Elkhart River, with railroad works, paper-mills, etc. Pop. 13,140.

ELKINS, Stephen Benton, an American politician, born in Ohio in 1841. He studied law, began practice in Missouri, removed to New Mexico in 1864 and was territorial delegate from 1873 to 1877. He removed to West Virginia, was secretary of war in President Harrison's cabinet and in 1894 was elected U. States senator from West Virginia.

ELKS, Benevolent and Protective Order of, a fraternal association organized in 1868 and consisting chiefly of theatrical people. It has lodges in numerous cities of the U. States and is very active in contributing to all kinds of charities through its great "benefit" performances. The membership is upward of 150,000.

ELLIOTT, Maxine, an American actress, born in Maine. She made her first important appearance in 1890 in The Middleman and subsequently joined Daly's company going to London, where she played in Shakespearean parts. In 1898 she was married to N. C. Goodwin, with whom she has appeared in various plays with great success.

ELLIPSE', a figure in geometry ranking next in importance to the circle, and produced when any cone is cut by a plane which passes through it not parallel to nor cutting the base. Kepler



Ellipse.

discovered that the paths described by the planets in their revolutions round the sun are ellipses, the sun being placed in one of the foci. To describe an ellipse:—At a given distance on the surface on which the ellipse is to be described fix two pins, a and b, and pass a looped string round them. Keep the string stretched by a pencil, c, and move the pencil round, keeping the string at the same tension, then the ellipse e g f h will be described; f and g are the foci, d the center, e f the major axis, and g h the minor axis, d a or d b is the eccentricity of the ellipse. A line drawn from any point in the curve perpendicularly to the axis is an ordinate to the axis. Any straight line drawn through the center and terminated both ways by the curve is called a diameter.

ELLIP'SIS, in grammar, the omission of one or more words, which may be easily supplied by the connection.

ELLIPTIC'ITY of the earth, the deviation of the form of the earth from that of a sphere. See Earth, Degree.

ELLSWORTH, Ephraim Elmer, an American soldier-hero, born in New York in 1837, died in 1861. In April, 1861 he organized a Zouave regiment in Chicago, went to the front, and was the first man killed in the north. On May 24 he was shot dead at Alexandria by an inn-keeper from whom he had just torn a confederate flag.

ELLSWORTH, Oliver, an American jurist, born in Connecticut in 1745, died in 1807. He took a leading part in the continental congress and in the early Connecticut legislature and from 1796 to 1800 was chief justice of the U. States Supreme Court.

ELM, a genus of trees, consisting of thirteen species, all natives of the northern temperate zone. They have biscxual flowers with a campanulate calyx, as many stamens as there are divisions in the limb of the calyx, and two styles.

Flowering branch and foliage of English elm with flower and fruit on larger scale.

The American or white elm is abundant in the Western States, attaining its loftiest stature between lat. 42° and 46°; here it reaches the height of 100 feet, with a trunk 4 or 5 feet in diameter, rising sometimes 60 or 70 feet before it separates into a few primary limbs. Its wood is not much esteemed. The red or slippery elm is found over a great extent of country in Canada, Missouri, and as far south as lat. 31°; it attains the height of 50 or 60 feet, with a trunk 15 or 20 inches in diameter; the wood is of better quality than that of the white elm. The leaves and bark yield an abundant mucilage. The wahoo, inhabiting from lat. 37° to Florida, Louisiana, and Arkansas, is a small tree, 30 feet high. The branches are furnished on two opposite sides with wings of cork 2 or 3 lines wide; the wood is fine-grained and heavy.

ELMI'RA, a town in New York, on the Chemung River; with a college for women, the state reformatory, fine court-house, etc. Its industrial establishments comprise rolling-mill, blast-furnace, foundries, machine-works, etc. Pop. 1909, 42,000.

ELMO'S FIRE, St., a meteoric appearance often seen playing about the masts and rigging of ships. If two flames are visible (Castor and Pollux) the sailors consider it a good omen; if only one (Helena), they regard it as a bad one.

ELOCUTION, the art by which, in delivering a discourse before an audience, the speaker is enabled, with greatest east and certainty, to render it effective and impressive. The value of an elocutionary training is very great, as well in sparing the voice as in overcoming natural defects in delivery, and in cultivating and developing the natural taste.

ELO'HIM, one of the Hebrew names for God, of frequent occurrence in the Bible. Elohim is used in speaking both of the true God and of false gods, while Jehovah is confined to the true God. The plural form of Elohim has caused a good deal of controversy, some considering it as containing an allusion to the doctrine of the trinity, others regarding it as the plural of excellence, others holding it as establishing the fact

of a primitive polytheism. The Elohistic passages in the Pentateuch, or, in other words, the passages in which the Almighty is always spoken of as Elohim, are supposed to have been written at an earlier period than those in which he is spoken of as Jehovah. The Elohistic passages are simpler and more primitive in character than the Jehovistic; thus Gen. i. 27 is Elohistic; Gen. ii. 21–24 is Jehovistic.

ELONGATION, Angle of, the angular distance of a planet from the sun, as it appears to the eye of a spectator on the earth.

ELOPEMENT, in law, the desertion of her husband by a woman and her cohabitation with another man. The term does not legally apply to unmarried persons who flee or abscond for the purpose of becoming married, although it is generally used in that way. The consequent of the act today is to free the husband from all responsibility for his wife's debts or her support.

EL PASO, the capital of El Paso co., Texas, a railway center and port of entry; situated on the Rio Grande. Near it the river passes through a mountain-gap called El Paso del Norte (North Pass), which is the chief thoroughfare between Mexico and New Mexico. On the opposite bank of the Rio Grande, in Chihuahua, Mexico, is Ciudad Jaurez, formerly called Paso del Norte, a village important as the starting-point of the Mexican Central Railroad, and having a custom-house, through which a large amount of goods pass in transit between the U. States and Mexico. Pop. 18,575.

ELPHINSTONE, Hon. Mountstuart, Indian administrator, born in Scotland in 1778. He joined the Bengal civil

Mountstuart Elphinstone.

service in 1795, was ambassador to the Afghan court in 1808, was resident at the court of Poonah from 1810 to 1817, and was British commissioner to that province from 1817 to 1819, when he became governor of Bombay. During a government of seven years he established a code of laws, lightened taxes, and paid great attention to schools and public institutions. He resigned in 1827. A college established by the natives was called after him Elphinstone College. He was offered the governor-generalship of India in 1835, and afterward that of Canada, both of which he declined. He died in 1859.

ELSSLER, Fanny, an Austrian dancer born in 1810, died in 1884. In 1841 she visited the U. States and was received with much enthusiasm by lovers of the ballet. Her sister Therese also became proficient as a dancer. She was created Baroness von Barnim by the King of Prussia.

ELVES. See Elf.

ELWELL, Frank Edwin, an American sculptor, born in Massachusetts in 1858. He has made a number of noted figures and groups including "Awakening of Egypt," "Death of Strength," "Intelligence," and several monumental groups.

ELWOOD, a town in Madison co., Ind., on the Pitts., Cin., Ch. and St. L. and Erie railways; 45 miles n.n.e. of Indianapolis. It is a shipping-point for grain and stock. Pop. 15,160.

ELY, Isle of, a portion of the county of Cambridge, separated by the Ouse from the rest of the county, and forming itself a sort of county. It is about 28 miles long by 25 miles broad; area, 239,259 acres. Pop. 63,861.

ELYRIA, the capital of Lorain co., Ohio, beautifully situated at the confluence of the eastern and western branches of Black river; 7 miles s. of Lake Erie and 25 miles w. of Cleveland. Sandstone is one of the chief exports. Pop. 10,391.

ELYSIUM, Elysian Fields, among the Greeks and Romans the regions inhabited by the blessed after death. They are placed by Homer at the extremities of the earth, by Plato at the antipodes, and by others in the Fortunate Islands (the Canaries). They were at last transferred to the interior of the earth, which is Virgil's notion.

EMANCIPATION, Liberation from slavery or subjection of some kind. See Catholic Emancipation, Slavery.

EMANCIPATION, PROCLAMATION OF, the paper issued by President Lincoln, Jan. 1, 1863, declaring the negro slaves free. It was issued as a war measure. The proclamation read as follows:

BY THE PRESIDENT OF THE UNITED STATES OF AMERICA.

A PROCLAMATION.

Whereas, on the 22d day of September, in the year of our Lord one thousand eight hundred sixty-two, a proclamation was issued by the President of the United States, containing among other things, the following, to wit:

"That on the 1st day of January, in the year of our Lord one thousand eight hundred sixty-three, all persons held as slaves within any state, or designated part of a state, the people whereof shall then be in rebellion against the United States, shall be then, thenceforward, and forever free; and the executive government of the United States, including the military and naval authority thereof, will recognize and maintain the freedom of such persons, and will do no act or acts to repress such persons, or any of them, in any efforts they may make for their actual freedom.

"That the executive will, on the first day of January, aforesaid, by proclamation, designate the states and parts of states, if any, in which the people thereof respectively shall then be in rebellion against the United States, and the fact that any state, or the people thereof, shall on that day be in good faith represented in the Congress of the United States by members chosen thereto at elections wherein a majority of the qualified voters of such state shall have participated, shall, in the absence of strong countervailing testimony, be deemed conclusive evidence that such state and the people thereof are not then in rebellion against the United States."

Now, therefore, I, Abraham Lincoln, President of the United States, by virtue of the power in me vested as commander-in-chief of the army and navy of the United States and as a fit and necessary war measure for repressing said rebellion, do, on this first day of January, in the year of our Lord one thousand eight hundred sixty-three, and in accordance with my purpose so to do, publicly proclaimed for the full period of 100 days from the day first above mentioned, order and designate as the states and parts of states wherein the people thereof, respectively, are this day in rebellion against the United States, the following, to wit:

Arkansas, Texas, Louisiana, (except the parishes of Saint Bernard, Plaquemines, Jefferson, Saint John, Saint Charles, Saint James, Ascension, Assumption, Terre Bonne, Lafourche, Saint Mary, Saint Martin, and Orleans, including the city of New Orleans), Mississippi, Alabama, Florida, Georgia, South Carolina, North Carolina, and Virginia (except the forty-eight counties designated as West Virginia, and also the counties of Berkeley, Accomac, Northampton, Elizabeth City, York, Princess Ann, and Norfolk, including the cities of Norfolk and Portsmouth), and which excepted parts are, for the present, left precisely as if this proclamation were not issued.

And by virtue of the power and for the purpose aforesaid, I do order and declare that all persons held as slaves within said designated states and parts of states are, and henceforward shall be free; and and that the executive government of the United States, including the military and naval authorities thereof, will recognize and maintain the freedom of said persons.

And I hereby enjoin upon the people so declared to be free, to abstain from all violence, unless in necessary self-defense; and I recommend to them that in all cases, when allowed, they labor faithfully for reasonable wages.

And I further declare and make known that such persons of suitable condition will be received into the armed service of the United States to garrison forts, positions, stations, and other places, and to man vessels of all sorts in said service.

And upon this act, sincerely believed to be an act of justice, warranted by the constitution, upon military necessity, I invoke the considerate judgment of mankind and the gracious favor of Almighty God.

In witness whereof, I have hereunto set my hand, and caused the seal of the United States to be affixed.

Done at the city of Washington, this first day of January, in the year of our

Lord one thousand eight hundred sixty-three, and of the independence of the United States of America the eighty-seventh.

[L.S.] By the President:

ABRAHAM LINCOLN.

WILLIAM H. SEWARD, Secretary of State.

EMAN'UEL THE GREAT, King of Portugal, ascended the throne in 1495. During his reign were performed the voyages of discovery of Vasco da Gama, of Cabral, of Americus Vespucius, and the heroic exploits of Albuquerque, by whose exertions a passage was found to the East Indies, the Portuguese dominion in Goa was established, the Brazils, the Moluccas, etc., were discovered. The commerce of Portugal, under Emanuel was more prosperous than at any former period. The treasures of America flowed into Lisbon, and the reign of Emanuel was justly called "the golden age of Portugal." He died in 1521, aged fifty-two.

EMBALMING (em-bäm'ing), the process of filling and surrounding with aromatic and antiseptic substances any bodies, particularly corpses, in order to preserve them from corruption. The ancient Egyptians employed the art on a great scale, and other peoples, for example the Assyrians and Persians, followed them, but by no means equalled them in it. The ancient Peruvians appear to have injected and washed the corpses with the fluid that flows from imperfectly burned wood, which would of course contain pyroligneous acid, creosote, and other antiseptics. Pliny alludes to the use of a similar fluid by the Egyptians for embalming. In later times bodies have been preserved a long time by embalming, especially when they have remained at a low and uniform temperature, and have been protected from the air. The body of Edward I. was buried in Westminster Abbey in 1307, and in 1770 was found entire. Canute died in 1036; his body was found very fresh in 1776 in Winchester Cathedral. The bodies of William the Conqueror and of Matilda, his wife, were found entire at Caen in the 16th century. Of the various modern artificial means of preserving bodies, impregnation with corrosive sublimate appears to be one of the most effective, next to immersion in spirits. An injection of sulphate of zinc into the blood-vessels is said to be very effective.

EMBANK'MENT, a mound of earth, etc., thrown up either for the purpose of forming a roadway at a level different from that of the natural surface of the ground, or for keeping a large body of water within certain limits.

EMBAR'GO, in commerce, an arrest on ships or merchandise by public authority; or a prohibition of state, commonly on foreign ships, in time of war, to prevent their going out of or coming into port. A breach of embargo, under knowledge of the insured, discharges the underwriters of all liability.

EM'BASSY, in its strict sense, signifies a mission presided over by an ambassador, as distinguished from a legation or mission intrusted to an envoy. An ambassador, as the representative of the person of his sovereign, can demand a private audience of the sovereign to whom he is accredited, while an envoy must communicate with the minister for foreign affairs.

EMBER-DAYS, in the Anglican and Roman Catholic Churches, fast-days occurring at the times in the year appointed for ordination. As now observed they are the Wednesday, Friday and Saturday after the first Sunday in Lent, after the feast of Pentecost or Whitsunday, after the festival of the Holy Cross (14th Sept.), and after the festival of St. Lucia (13th Dec.). The weeks in which these days fall are called Ember-weeks.

EMBER-GOOSE, a bird, known also as the great northern diver and loon. See Divers.

EMBERIZ'IDÆ, a family of small birds belonging to the order Insessōres and tribe Conirostres, typical genus Emberīza. It includes the buntings, the

Texas sparrow.

snow-flake, the yellow-hammer, and reed sparrow. The ortolan belongs to this family. By some naturalists they are classified as a sub-family of the finches. The Texas sparrow or green-finch is a common species in the lower Rio Grande valley.

EMBEZ'ZLEMENT is the appropriation, by a clerk or servant, to himself, of money or property put into his hands in trust. In English law it is a felony punishable by penal servitude for not more than fourteen years, or by imprisonment; and in the case of a male under the age of sixteen, by whipping in addition to the imprisonment.

EM'BLEM, specifically a picture representing one thing to the eye and another to the understanding. The most common emblems are such as a balance, which represents justice; a crown, an emblem of royalty; the serpent, of cunning; etc.

EM'BOLISM, the blocking up of a blood-vessel by a clot of blood that comes from some distance, till it reaches a vessel too small to permit its onward progress, often the cause of sudden paralysis and death, or of gangrene and pyæmia.

EMBOS'SING, the art of producing raised figures upon plane surfaces, such as on leather and cloth for bookbinding, etc.; on paper for envelopes, etc.; on wood or bronze, in architecture or sculpture.

EMBROI'DERY, figured work in gold, or silver, or silk thread, wrought by the needle, upon cloths, stuffs, or muslins. The art was common in the East in very ancient times. The Jews appear to have acquired it from the Egyptians; Homer makes frequent allusion to it; and Phrygia was celebrated for its embroidery, which was in great demand at Rome. Embroidery is commonly divided into two classes; white embroidery applied to dress and furniture, in which the French and the Swiss excel; and embroidery in silk, gold, and silver, chiefly in demand for ecclesiastical vestments, etc. The Chinese, Hindus, Persians, and Turks excel in work of this kind.

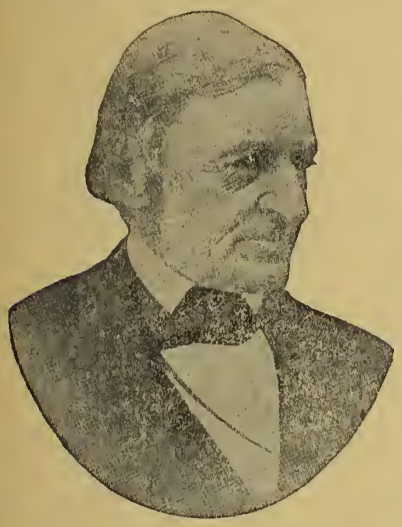
EM'BRYO, (1) in zoology, the earliest and rudimentary form in which any young animal appears; it may be the first rudiments of the animal in the womb, before the several members are distinctly formed, after which it is called the fetus. (2) In plants the embryo is the rudimentary organism contained in the seed.

EMBRYOL'OGY, the branch of biology comprising the history of animals from the first appearance of organization in the egg or ovum (the embryo stage) up to the attainment of the perfect form. The importance of the study partly depends upon the fact that the history of animals thus traced reveals the existence of structures which disappear at a later period, or become obscured by arrest of their development, or by union with other parts, and permits us to follow the steps by which complex organs arise by the combination of simpler parts. Thus points of affinity are detected between species and orders whose adult aspect is very unlike.

EM'ERALD, a well-known gem of pure green color, somewhat harder than quartz; it is a silicate of aluminium and the rare element glucinum or beryllium, which was detected in it by Vauquelin after it had been discovered by the same chemist in the beryl. Its color is due to the presence of chromium. Its natural form is either rounded or that of a short six-sided prism. It is one of the softest of the precious stones, but is not acted on by acids. Emeralds of large size and at the same time free from flaws are rare;

EM'ERSON, Ralph Waldo, an American poet and prose writer, born at Boston in 1803. He graduated at Harvard in 1821, for five years taught in a school, and in 1829 became minister to a Unitarian church in Boston, but in 1832 resigned his charge. He spent greater part of 1833 in Europe, and on his return began his career as a lecturer on various subjects, in which capacity he acted for a long series of years. In 1835 he took up his permanent residence at Concord, Mass., and in 1836 published a small volume called Nature. He was one of the original editors of the Dial, a transcendental magazine begun in 1840. Two volumes of his essays were published in 1841 and 1844, and his poems in 1846. His miscellaneous addresses had been published in England in 1844, and on visiting Great Britain in 1847 he was welcomed by a large circle of admirers. In 1850 he published Representative Men; in 1856, English Traits; in 1860, The Conduct of Life; in 1869, May Day and Other Poems, and Society and Solitude; in 1871, Parnassus, a collection of poems; in 1876, Letters and

Social Aims. He died April 27, 1882. Emerson showed certain similarities with Carlyle, of whom he was a friend and correspondent. Their correspondence appeared in 1883. He was one of the most original and influential writers that the U. States have produced.



R. Waldo Emerson

EM'ERY, an impure variety of corundum, of blackish or bluish-gray color, chiefly found in shapeless masses and mixed with other minerals. It contains about 82 per cent of alumina and a small portion of iron; is very hard; is infusible, and is not attacked by acids. The best emery is brought from the Levant, chiefly from Cape Emeri in Naxos. It also occurs in Spain, and in a few iron-mines in Great Britain. It is employed in cutting and polishing precious stones; in smoothing the surface of the finer kinds of lenses preparatory to their being polished; in the polishing of marble; by cutlers, locksmiths, glaziers, and other artisans. For all these purposes it is pulverized in large iron mortars or in steel mills, and the powder, which is rough and sharp, is carefully washed and sifted into eight or ten different degrees of fineness. Emery-paper and emery-cloth are made by laying a thin coat of glue upon the fabric, and dusting the emery from a sieve of the required size.

EMET'IC, any substance administered to induce vomiting. Emetics are most commonly administered to remove poisonous or indigestible substances from the stomach, or to clear the air-passages of obstructive morbid material in cases of bronchitis, croup, etc. Ipecacuanha and sulphate of zinc are frequently given for these purposes, or, as a readily obtainable substitute, mustard stirred into water. They should, however, always be administered with caution, or serious injury to the system may result.

EMEU, EMU (ē'mū), a large cursorial bird, formerly dispersed over the whole Australian continent, but now almost extirpated in many districts. It is allied to the cassowary, but is distinguished by the absence of a "helmet" on the top of the head. It nearly equals the ostrich in bulk, being thicker in the body, though its legs and neck are shorter. Its feet are three-toed (the ostrich has two toes), and its feathers, which are double, are of a dull sooty-brown color, those about the neck and

Emu.

head being of a hairy texture. The wings are small and useless for flight, but the bird can run with great speed, and emeu coursing as a sport is said to surpass that of the hare. The flesh of the young emeu is by some considered a delicacy. The emeu is a bird of the plain, the cassowary of the forest. It is easily tamed, and may be kept out of doors in temperate climates. It feeds on vegetable matter, fruits, roots, etc.

EMIGRATION. See Immigration.

EMIGRES (ā-mi-grās), a name given more particularly to those persons who left France at the commencement of the French revolution.

EMINENT DOMAIN, the right of a state or sovereign, to appropriate property for the use of the state, or public use. In the U. States the right imbues in the general government and in all of the several states, either by right of their sovereignty or by vestment from the constitution. The right, however, has its restrictions. Property cannot be taken by eminent domain except "by due process of law," and just compensation given to the person or persons from whom the property has been taken. The usual procedure is to condemn the property and then to pay to the owner the compensation fixed by a court or other body, this compensation being full value for present or future interests in the property.

EM'MET, Robert, an Irish patriot, born at Cork in 1780. He was expelled from Trinity College, Dublin, in 1798, on the ground of exciting disaffection and rebellion, and having become an object of suspicion to the government, quitted Ireland. He returned there on the repeal of the suspension of the habeas corpus act, and became a member of the Society of United Irishmen for the establishment of the independence of Ireland. In July, 1803, he was the leader in the rebellion in which Lord Kilwarden and others perished. He was arrested a few days afterward, tried, and executed. His fate excited special interest from his attachment to Miss Sarah Curran, daughter of the celebrated barrister. Emmet's speech before his execution is one of the most stirring and eloquent masterpieces of the world's oratory. His remains are buried in Trinity churchyard, New York.

EMMETT, Daniel Decatur, an American writer of songs and singer, born in Ohio in 1815, died in 1902. He was the author of the song "Dixie" which, carried south during the civil war by Union soldiers, became the war song of the south. Among his other famous songs were "Old Dan Tucker" and "Walk Along John."

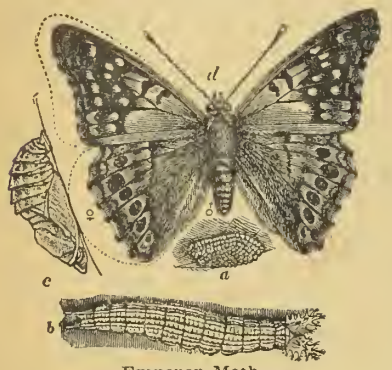
EMOTION, a term variously used by psychologists; sometimes as one of the divisions of feeling the other being sensation; sometimes as opposed to feeling when the latter is identified with sensation, and sometimes as distinct from both sensation and feeling, when the last term is rigidly confined to the sense of pleasure or pain. In any one of these uses, however, emotions are distinguished from sensations in that sensations are primary forms of consciousness arising by external excitation, are comparatively simple and immediately presentative phenomena, and are definite in character and capable of localization; while emotions are secondary or derived forms of consciousness, are complex and representative, and are vague and diffused. Sensations are said to be "peripherally initiated," while emotions are centrally initiated. When, in addition to its being distinguished from sensation, it is also distinguished from feeling, emotion is applied to the whole physical condition accompanying the sense of pleasure or pain (feeling). The muscles of the body and the organic functions of the system are often considerably influenced by emotion, which naturally seeks an outward expression unless held in check by what Darwin has called serviceable associated habits.

EM'PEROR, the title of the highest rank of sovereigns. The word imperātor from imperāre, to command, in its most general sense signified the commander of an army. After the overthrow of the Roman republic imperator became the title of the rulers or emperors, and indicated their supreme power. Charlemagne was crowned, by Leo III., as "Carolus Augustus, the God-sent pious and great emperor of Rome." Napoleon I. adopted the old idea of an empire as a general union of states under the protection, or at least political preponderance, of one powerful state; and he was followed in this by his nephew, Napoleon III. In 1806 the first German Empire, 1000 years old, became extinct, and the German Emperor, Francis II., adopted the title of Francis I., emperor of Austria. In December, 1870, the second German Empire was formed, King William of Prussia having accepted the imperial office and title offered him at Versailles while engaged in the siege of Paris. Britain is considered as an empire, the crown as imperial, and the paliament is styled the Imperial Parliament of Great Britain and Ireland; but the sovereign has not the imperial title in reference to the home dominions, though the king bears the title of Emperor of India.

EMPEROR MOTH, a British moth of the silk-worm family. The color is grayish-brown, with a faint purple tinge. The wings are about 3 inches in expanse, and in the center of each is a large eye-like spot. The larva is of a

green color, with a black band on each segment.

EM'PHASIS, in rhetoric, a special stress or force given to some syllable, word, or words in speaking, in order to impress the hearers in some desired manner, thus differing from accent, the position of which is fixed.



Emperor Moth.
a, eggs; *b*, larva, dorsal view; *c*, pupa, lateral view; *d*, male butterfly, with partial outline of female. (All natural size.)

EMPIRE, the dominions of an emperor.—Empire State, a name given to New York State, New York being called the Empire City.

EMPIR'IC, in medical history an appellation assumed by a sect of physicians who contended that observation and experience alone were the foundation of the art of medicine. An empiric, in modern medicine, is a physician who has had no regular professional education, but who relies on what is frequently a very crude experience.

EMPLOYERS' LIABILITY, the liability of persons employing others for the injuries such employes sustain in the service of their employers. The liability, however, is limited. The servant entering the employ of another person is assumed to take the ordinary risks of the service or business, including the risks from the negligence of fellow employes. The employer is liable for injuries employes sustain when the injury is due to negligence on the part of the employer himself.

EMPLOYMENT BUREAU, an agency which secures positions for unemployed persons and secures helpers for those in want of help. In several foreign countries the government engages in this kind of intermediation. Also labor unions operate employment agencies. Several states of the U. States have tried the experiment and certain cities have employment bureaus in operation with some success. The great mass of this business is, however, undertaken by private enterprises which receive fees from both sides. Employment agencies, owing to fraudulent practices by disreputable concerns, are now generally regulated by law.

EMPORIA, city and railway center; capital of Lyon co., Kan., on the A., T. and S. F. and the M., K. and T. R. Rs; 6 miles above the junction of the Neosho and Cottonwood rivers, in a fine agricultural and stock-raising region. Pop. 10,120.

EMPO'RIUM, a center of extensive commerce, a trading town or city.

EMS, a beautiful watering-place in the Prussian province of Hesse-Nassau, on the river Lahn, not far from its confluence with the Rhine. Its mineral waters are warm—from 70° to 118° Fahr., contain large quantities of carbonic acid gas, and are used in chronic catarrhs, pulmonary complaints, diseases of the stomach, gout, and some diseases of the urinary vessels. There are about 8,000 visitors each season. Pop. 6,943.

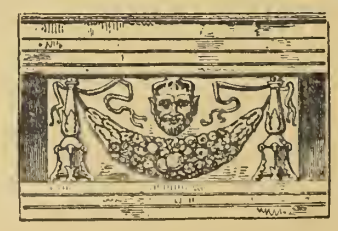
EMU. See Emeu.

EMUL'SION, a medical preparation, consisting of an oily or resinous substance made to combine with water by some substance that itself has the property of combining with both, such as gum arabic, the yolk of eggs, almonds, etc.

ENAM'EL, a vitreous glaze of various colors fused to the surface of gold, silver, copper, and other substances. The art of enameling, which is of great antiquity, was practiced by the Assyrians and by the Egyptians, from whom it may have passed into Greece, and thence into Rome and its provinces, including Great Britain, where various Roman antiquities with enameled ornamentation has been discovered. The basis of all kinds of enamel is a perfectly transparent and fusible glass, which is rendered either semi-transparent or opaque by the admixture of metallic oxides. White enamels are composed by melting the oxide of tin with glass, and adding a small quantity of manganese or phosphate of calcium to increase the brilliancy of the color. The addition of the oxide of lead, or antimony, or oxide of silver, produces a yellow enamel. Reds are formed by copper, and by an intermixture of the oxides of gold and iron. Greens, violets, and blues are formed from the oxides of copper, cobalt, and iron. In the middle of the 18th century enameling was largely applied to the decoration of snuff-boxes, tea-canisters, candlesticks, and other small articles. Of late years it has been extensively applied to the coating of iron vessels for domestic purposes, the protection of the insides of baths, cisterns, and boilers, and the like. Enameling in colors upon iron is now common, iron plates being thus treated by means of various mixtures, and words and designs of various kinds being permanently fixed upon them by stencilling, for advertising, sign-boards, etc.

ENCAMPMENT. See Camp.

ENCAR'PUS, in architecture, a sculptured ornament in imitation of a garland



Encarpus—From Palazzo Niccolini, Rome.

of fruits, leaves, or flowers, suspended between two points. The garland is of greatest size in the middle, and diminishes gradually to the points of suspension, from which the ends generally hang down. The encarpus is sometimes composed of an imitation of drapery similarly disposed, and sometimes of an assemblage of musical instruments, implements of war or of the chase.

ENCAUSTIC TILES, ornamental paving-tiles of baked pottery, much used during the middle ages in the pavements of churches and othes ecclesiastical edifices. The encaustic tile, strictly so-called, was decorated with patterns

Part of medieval pavement of encaustic tiles —Church of St. Pierre-sur-Dive, Normandy.

formed by different colored clays inlaid in the tile and fired with it. The art appears to have originated in the latter part of the 12th century, to have attained its highest perfection during the 13th, and to have sunk into disuse in the 15th. During the whole of this period it was principally carried on in England and Normandy. After a long lapse the art was revived in England in 1830 by Wright, a Shelton potter. In modern manufacture two methods are employed, the "plastic" and the "semi-dry" or "dust" method. The first is, in all essentials, that used in the middle ages, except, perhaps, in the perfection of modern molding appliances; the second consists in ramming pulverized clay with a minimum of moisture into metal dies, the subsequent firing of tiles thus consolidated being attended with less risk from shrinkage.

ENCEINTE (ân-sant'), in fortification, the continuous line of works which forms the main enclosure of a town or fortress. The term is also applied to the area within this line.

ENCKE (en'ke), Johann Franz, German astronomer, born at Hamburg in 1791. He calculated the orbit of the comet observed by Mechain, Miss Herschel, and Pons, predicted its return, and detected a gradual acceleration of movement, ascribed by him to the presence of a resisting medium. The comet is now known as Encke's comet. The fame of his works The Distance of the Sun, Transit of Venus of 1769 led to his appointment as director of the Berlin Observatory (1825), a position which he held till his death in 1865.

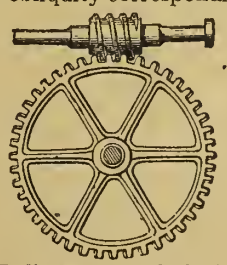
ENCYCLOPÆDIA, CYCLOPÆDIA, or **CYCLOPEDIA,** a systematic view of the whole extent of human knowledge or of particular departments of it, with the subjects arranged generally in alphabetic order. Varro and Pliny the elder, among the Romans, attempted works

of an encyclopædic nature, the latter in his well-known Historia Naturalis, or Natural History. Other ancient encyclopedic works were those of Stobæus and Suidas, and especially of Marcianus Capella. In the 13th century a work on a regular plan was compiled by the Dominican Vincent of Beauvais (d. 1264), in which was exhibited the whole sum of the knowledge of the middle ages. His work was entitled Speculum Historiale, Naturale, Doctrinale, to which an anonymous author added, some years later, a Speculum Morale. Roger Bacon's Opus Majus also belonged to the encyclopedic class. An exceedingly popular work was the De Proprietatibus Rerum of Bartholomeus de Glanvilla, an English Franciscan friar, which maintained its reputation from 1360 to the middle of the 16th century. In the 17th century various encyclopedic works were compiled, such as the Latin one of Johann Heinrich Alsted (in 7 vols., Herborn, 1620). In 1674 appeared the first edition of Moreri's Le Grand Dictionnaire Historique; in 1677 Johann Jacob Hoffmann published at Basel his Lexicon Universale; and in 1697 appeared Bayle's famous Dictionnaire Historique et Critique, which is still of great value. The first English alphabetical encyclopædia was the Lexicon Technicum, published in 1704. Among the chief English works of this kind are: 1. Ephriam Chambers's Cyclopædia, or a Universal Dictionary of Arts and Sciences, published in 1728 in 2 vols. folio. 2. The Encyclopædia Britannica, published in Edinburgh, in nine editions—the first in 1788, the last in 1875–88 (24 vols. 4to, with supplement, 11 vols., 1902–03). 3. Rees' Cyclopædia, 39 vols. 4to, illustrated, 1802–20. 4. Edinburgh Encyclopædia, 1810–30, 18 vols. 4to, conducted by Sir David (then Dr.) Brewster. 5. Encyclopædia Metropolitana, London, 29 vols. 4to, and containing some valuable complete treatises. 6. The London Encyclopædia, by Thomas Curtis, 22 vols. 4to; London, 1829. 7. The Penny Cyclopædia, in 28 vols. small folio, 1833–43; since recast under the name of the English Cyclopædia. 8. Chambers's Encyclopædia, in 10 vols. large 8vo, 1860–68; new edition in 1888–92. 9. The Popular Encyclopædia, in 7 vols. large 8vo, 1833–38; now issued in 14 vols. The chief American encyclopædias are the Encyclopædia Americana, in 13 vols., 1829–33; the New American Cyclopædia, in 16 vols., 1858–63 and 1881, Johnson's Universal Cyclopedia, 4 vols., 1874–77, and 8 vols., 1895, and the International Encyclopædia, 17 vols. 1904, 20 vols. 1906. Of the French cyclopædias the most famous is the great Dictionnaire Encyclopédique, by Diderot and D'Alembert (see next article); the Encyclopédie Méthodique, ou par Ordre des Matiéres, Paris, 1781–1832, in 201 vols. 4to, of which 47 are plates; the Encyclopédie Moderne, 1824–32, 26 vols.; the Encyclopédie des Gens du Monde, 1835–44, 22 vols.; the Dictionnaire de la Conversation et de la Lecture 1851–58; the excellent Grande Encyclopédie, 31 vols.; and the large and valuable Grand Dictionnaire Universel du XIX Siècle, edited by Larousse, 16 vols. folio (with supplementary vols.). Numerous works of this kind have been published in Germany, the most popular being the Conversations-Lexikon of Brockhaus, now in its fourteenth edition; Meyer's Konversations-Lexicon, in its fifth edition; Pierer's Konversations-Lexikon, in its seventh edition; and that issued by Spamer, now in its second edition. The most comprehensive is the Allgemeine Encyklopädie, originally edited by Professors Ersch and Gruber, begun in 1818, and not yet completed.

ENCYCLOPEDIE (äṇ-ṣik-lo-pā-dē), the French, the most important work of the 18th century after the works of Voltaire and Rousseau, originated in a French translation of Ephriam Chambers's Cylcopædia. Diderot was appointed to edit it, and enlisted the ablest men of the time as contributors. Diderot himself was a prolific contributor on a wide variety of topics.

ENDEM'IC, a name commonly applied to diseases which attack the inhabitants of a particular district or country, and have their origin in some local cause, as the physical character of the place where they prevail, or in the employment, habits, and mode of living of the people. Diseases which are endemic in one country may also appear in others, and become epidemic under influences resembling those which are the cause of the endemic in the former place.

ENDLESS SCREW, a mechanical contrivance, consisting of a screw, the thread of which gears into a wheel with skew teeth, the obliquity corresponding to the



Endless screw and wheel.

angle of pitch of the screw. It is generally employed as a means of producing slow motion in the adjustments of machines, rather than as transmitter of any great amount of power.

ENDOG'AMY, a custom among some savage peoples of marrying only within their own tribe: opposite to exogamy.

ENDOGENOUS PLANTS (en-doj'-e-nus), or **ENDOGENS,** one of the large primary classes into which the vegetable kingdom is divided, so named in consequence of the new woody bundles being developed in the interior of the stem, in which there is no distinction of pith and bark. In transverse section these bundles appear scattered through the cellular matter, being more compact toward the circumference. The other organs of the plants are also characteristic. The leaves are generally parallel-veined, the flowers usually with three organs in each whorl, the seed has an embryo with one cotyledon, and the radicle issues from a sheath and is never developed into a tap-root in germination. To this class belong palms, grasses, rushes, lilies. etc. Endogens increase in thickness only to a limited extent; hence they are not injured by twining plants as exogens are.

ENE'MA, any liquid or gaseous form of medicine for injection into the rectum. It is most commonly administered to induce peristaltic action of the bowels, but it is often the most desirable means of conveying into the system nourishment or stimulants.

EN'ERGY, in physics, the power that a body or system possesses of doing work. A body may possess energy in one of two forms, viz. as kinetic energy, that is the energy due to motion, and potential energy, that is energy due to what may be called a position of advantage. Thus a moving mass, a bullet for example, can do work in virtue of its motion, and the name kinetic energy is given to energy of this kind. Under this name is also included energy belonging to molecular motion, to electricity in motion, to heat and light, and to actual chemical action. Again, as examples of potential energy we may take the case of a mass raised up to a position in which it is capable of doing work by falling—the weight of a clock for instance; but the term also includes the energy due to electrical separation, to absorb heat, and to chemical separation, as in gunpowder, which is ready to do work by means of its explosion. From the investigations of Joule and others into the nature and phenomena of heat and the discovery of the equivalence of a definite quantity of mechanical energy to a definite quantity of heat, the grand principle of the conservation of energy was established. This asserts that the total amount of energy in the universe, or in any limited system which does not receive energy from without, or part with it to external matter, is invariable. If energy of any form seems to disappear in such a case it reappears in some other form. Thus, mechanical energy may be converted into heat. Heat again may be converted into the energy of electricity in motion, or into the potential energy of chemical separation. And electrical energy, whether potential or kinetic, and the energy of chemical separation, are also convertible into heat. (See also Correlation of Physical Forces.) Connected with this principle is another which states that no known natural process is exactly reversible, and that if we transform mechanical energy into heat, for example, we never can pass back and obtain from the heat produced precisely the amount of mechanical energy with which we commenced. Whatever attempt is made to transform and retransform energy by an imperfect process and no known process is perfect, part of the energy is necessarily transformed into heat, and is dissipated so as to be incapable of further useful transformation. It therefore follows, that as energy is in a constant state of transformation, there is a constant process of degradation of energy going on, a process by which energy constantly approaches the unavailable form of uniformly diffused heat; and this will go on till the whole of the energy of the universe has taken this final form.

EN'GINE, a mechanical contrivance in which one or other of the natural

forces is utilized for the performance of work of some kind; often distinctively a steam-engine.

ENGINEER CORPS, the name applied to the body of engineers of the U. States navy, established by the act of congress which was approved Aug. 31, 1842. The engineers came into the navy with the adoption of steam power, and their importance has steadily increased since that time. In 1866 the first cadet engineers were admitted to the naval academy and the number grew yearly until, in 1899, the engineer corps, as an acknowledged separate body was lost in the general plan of officers, thus putting an end to the ill feeling which had existed in the navy between the engineers and the line officers.

ENGINEERING INSTRUMENTS, instruments used by civil engineers in the various work attendant upon surveying. They are used generally for measuring levels or horizontal lines, measuring distances, measuring angles, and for other work. Distance is measured by the chain, the surveyor's compass is used for measuring direction, the level is used for determining horizontal lines, and the theodolite for measuring angles.

ENGINEERS in the United States Navy are commissioned officers having charge of the machinery of steam-vessels. A thorough practical education in the construction and management of steam machinery is required. In military law they are considered non-combatants.

ENGINEERS, CORPS OF, the body of engineers of the U. States army, the duties of which consist of all kinds of surveying, reconnoitering, constructino of fortifications, planning of all defensive works, laying out of routes, and constructing roads and bridges. The engineers are regarded as combatant and often take part in battle, although their proper work is often more important than mere fighting.

ENGLAND, including Wales, the southern and larger portion of the island of Great Britain, is situated between 50° and 55° 46′ n. lat., and 1° 46′ e. and 5° 42′ w. lon. On the n. it is bounded by Scotland; on all other sides it is washed by the sea; on the e. by the North Sea or German Ocean; on the s. by the English Channel; and on the w. by St George's Channel and the Irish Sea. The area is 37,319,221 acres or 58,311 square miles, of which 32,597,398 acres or 50,933 square miles are in England, and 4,721,-823 acres or 7378 square miiles in Wales. This is exclusive of the Channel Islands and the Isle of Man, which together would add 193,647 acres or 302 square miles more to the area. For population, etc., see Britain.

The capital of England and of the British Empire is London. The cities next in size (in order of population) are: Liverpool, Manchester and Salford, Birmingham, Leeds, Sheffield, Bristol, Nottingham, Bradford, and Hull.

The chief indentations are: on the east the Humber, the Wash, and the Thames estuary; on the west, the Solway Firth, Morecambe Bay, Cardigan Bay, and the Bristol Channel; those on the south are less prominent, though including some useful harbors. The chief islands are: Holy Island, the Farne Islands, Sheppy, and Thanet on the east coast; the Isle of Wight on the south; the Scilly Isles at the south-west extremity; and Lundy Island, Anglesey, Holyhead, and Walney on the west.

The lofticst heights of England and Wales are situated at no great distance from its western shores, and consist, not so much of a continuous chain as of a succession of mountains and hills, stretching, with some interruptions,from north to south, and throwing out numerous branchcs on both sides, but particularly to the west, where all the culminating summits are found. Amid these mountains lie the celebrated English lakes, of which the most important are Windermere, Derwent Water, Coniston Lake, and Ullswater. Here also is the highest summit of Northern England, Scawfell (3210 feet). A large part of the surface of England consists of wide valleys and plains. Beginning in the north the first valleys on the east side are those of the Coquet, Tyne, and Tees; on the west the beautiful valley of the Eden, gradually widens out into a plain of about 470 square miles, with the town of Carlisle in its center. The most important of the northern plains is the Vale of York, which has an area of nearly 1000 sq. miles. Properly speaking it is still the same plain which stretches, with scarcely a single interruption, across the counties of Lincoln, Suffolk, and Essex, to the mouth of the Thames, and to a considerable distance inland, comprising the Central Plain and the region of the Fens. On the west side of the island, in S. Lancashire and Cheshire, is the fertile Cheshire Plain.

England is well supplied with rivers, many of them of great importance to industry and commerce. Most of them carry their waters to the North Sea. If we consider the drainage as a whole, four principal river basins may be distinguished, those of the Thames, Wash, and Humber belonging to the German Ocean and the Severn belonging to the Atlantic. In regard to minerals, manufacturing, etc., see Britain.

The history of England proper begins when it ceased to be a Roman possession. On the withdrawal of the Roman forces, about the beginning of the 5th century A.D., the South Britons, or inhabitants of what is now called England, were no longer able to withstand the attacks of their ferocious northern neighbors, the Scots and Picts. In the middle of the 5th century the occasional Teutonic incursions gave place to persistent invasion with a view to settlement. These Teutonic invaders were Low German tribes from the country about the mouths of the Elbe and the Weser, the three most prominent being the Angles, the Saxons, and the Jutes. Of these the Jutes were the first to form a settlement, taking possession of part of Kent, the Isle of Wight, etc., but the larger conquests of the Saxons in the south and the Angles in the north gave to these tribes the leading place in the kingdom. The struggle continued 150 years, and at the end of that period the whole southern part of Britain, with the exception of Strathclyde, Wales, and West Wales (Cornwall) was in the hands of the Teutonic tribes. This conquered territory was divided among a number of small states or petty chieftaincies.

While this work of conquest and of inter-tribal strife had been in progress toward the establishment of a united kingdom, certain important changes had occurred. The conquest had been the slow expulsion of a Christian race by a purely heathen race, and the country had returned to something of its old isolation with regard to the restofEurope. But long before the close of the 6th century Christianity had secured a footing. The legal and political changes immediately consequent upon the adoption of Christianity were not great, but there resulted a more intimate relation with Europe and the older civilizations, the introduction of new learning and culture the formation of a written literature, and the fusion of the tribes and petty kingdoms into a closer and more lasting unity than that which could have been otherwise secured.

The kingdom, however, was still kept in a state of disturbance by the attacks of the Danes, who had made repeated incursions during the whole of the Saxon period, and about half a century after the unification of the kingdom became for the moment masters of nearly the whole of England. But the genius of Alfred the Great, who had ascended the throne in 871, speedily reversed matters by the defeat of the Danes at Ethandune (878). Guthrum, their king, embraced Christianity, became the vassal of the Saxon king, and retired to a strip of land on the east coast including Northumbria and called the Danelagh. During the 10th century many changes had taken place in the Teutonic constitution. Feudalism was already taking root; the king's authority had increased; the folkland was being taken over as the king's personal property; the nobles by birth, or ealdormen, were becoming of less importance in administration than the nobility of thegns, the officers of the king's court. Animosities between the English and the Danes who had settled among them bccame daily more violent, and a general massacre of the latter took place in 1002. The following year Sweyn invaded the kingdom with a powerful army and assumed the crown of England. Ethelred was compelled to take refuge in Normandy; and though he afterward returned, he found in Canute and adversary no less formidable than Sweyn. Ethelred left his kingdom in 1016 to his son Edmund, who displayed great valor, but was compelled to divide his kingdom with Canute; and when he was assassinated in 1017 the Danes succeeded to the sovereignty of the whole.

Canute (Knut), who espoused the widow of Ethelred, that he might reconcile his new subjects, obtained the name of Great, not only on account of his personal qualities, but from the extent of his dominions, being master of Denmark and Norway as well as England. In 1035 he died, and in England was followed by other two Danish kings, Harold and Hardicanute, whose joint reigns lasted till 1042, after which the English line was again restored in the person of Edward the Confessor. Ed-

ward was a weak prince, and in the latter years of his reign had far less real power than his brother-in-law Harold, son of the great earl Godwin. On Edward's death in 1066 Harold accordingly obtained the crown. He found, however, a formidable opponent in the second-cousin of Edward, William of Normandy who instigated the Danes to invade the northern counties, while he, with 60,000 men, landed in the south. Harold vanquished the Danes, and hastening southwards met the Normans near Hastings, at Senlac, afterwards called Battle. Harold and his two brothers fell (Oct. 14, 1066), and William (1066–87) immediately claimed the government as lawful king of England, being subsequently known as William I., the Conquerer.

At his death, in 1087, William II., commonly known by the name of Rufus, the conqueror's second son, obtained the crown, Robert, the eldest son, receiving the duchy of Normandy. In 1100, when William II. was accidently killed in the New Forest, Robert was again cheated of his throne by his younger brother Henry (Henry I.), who in 1106 even wrested from him the duchy of Normandy. He supported his quarrel with firmness, and brought it to a not unfavorable issue. His reign was also marked by the suppression of the greater Norman nobles in England, whose power threatened to overshadow that of the king, and by the substitution of a class of lesser nobles. In 1135 he died in Normandy, leaving behind him only a daughter, Matilda.

By the will of Henry I. his daughter Maud or Matilda, wife of Godfrey Plantagenet, Count of Anjou, and frequently styled the Empress Matilda, because she had first been married to Henry V., emperor of Germany, was declared his successor. But Stephen, son of the Count of Blois, and of Adela, daughter of William the Conqueror, raised an army in Normandy, landed in England, and declared himself king. After years of civil war and bloodshed an amicable arrangement was brought about, by which it was agreed that Stephen should continue to reign during the remainder of his life, but that he should be succeeded by Henry, son of Matilda and the Count of Anjou. Stephen died in 1154, and Henry Plantagenet ascended the throne with the title of Henry II., being the first of the Plantagenet or Angevin kings. A larger dominion was united under his sway than had been held by any previous sovereign of England, for at the time when he became King of England he was already in the possession of Anjou, Normandy, and Aquitaine.

Henry II. found far less difficulty in restraining the license of his barons than in abridging the exorbitant privileges of the clergy, who claimed exemption not only from the taxes of the state, but also from its penal enactments, and who were supported in their demands by the primate Becket. Henry was the first who placed the common people of England in a situation which led to their having a share in the government. The system of frank-pledge was revived, trial by jury was instituted by the Assize of Clarendon, and the Eyre courts were made permanent by the Assize of Nottingham.

Richard I., called Cœur de Lion, who in 1189 succeeded to his father, Henry II., spent most of his reign away from England. Having gone to Palestine to join in the third crusade he proved himself an intrepid soldier. Returning homeward in disguise through Germany he was made prisoner by Leopold, duke of Austria, but was ransomed by his subjects. In the meantime John, his brother, had aspired to the crown, and hoped, by the assistance of the French, to exclude Richard from his right. Richard's presence for a time restored matters to some appearance of order; but having undertaken an expedition against France, he received a mortal wound at the siege of Chalons, in 1199.

John was at once recognized as King of England, and secured possession of Normandy; but Anjou, Maine, and Touraine acknowledged the claim of Arthur, son of Geoffrey, second son of Henry II. On the death of Arthur, while in John's power, these four French provinces were at once lost to England. John's exactions and misgovernment had equally embroiled him with the nobles. In 1213 they refused to follow him to France, and on his return defeated, they at once took measures to secure their own privileges and abridge the prerogatives of the crown. King and barons met at Runnymede, and on June 15, 1215, the Great Charter (Magna Charta) was signed. In 1216, however, John died, and his turbulent reign was succeeded by the almost equally turbulent reign of Henry III.

During the first years of the reign of Henry III. the abilities of the Earl of Pembroke, who was regent until 1219, retained the kingdom in tranquility; but when, in 1227, Henry assumed the reins of government he showed himself incapable of managing them.

On the death of Henry III., in 1272, Edward I. succeeded without opposition. From 1276 to 1284 he was largely occupied in the conquest and annexation of Wales. In 1292 Balliol, whom Edward had decided to be rightful heir to the Scottish throne, did homage for the fief to the English king; but when, in 1294, war broke out with France, Scotland also declared war. The Scots were defeated at Dunbar (1296), and the country placed under an English regent; but the revolt under Wallace (1297) was followed by that of Bruce (1306), and the Scots remained unsubdued. In 1295 the first perfect parliament was summoned, the clergy and barons by special writ, the commons by writ to the sheriffs directing the election of two knights from each shire, two citizens from each city, two burghers from each borough. The great aim of Edward, to include England, Scotland, and Wales in one kingdom proved a failure, and he died in 1307 marching against Robert Bruce.

The reign of his son Edward II. was unfortunate to himself and to his kingdom. He made a feeble attempt to carry out his father's last and earnest request to prosecute the war with Scotland, but the English were almost constantly unfortunate; and at length, at Bannockburn (1314), they received a defeat from Robert Bruce which insured the independence of Scotland. He died in 1327.

The reign of Edward III. was as brilliant as that of his father had been the reverse. The main projects of the third Edward were directed against France, the crown of which he claimed in 1328 in virtue of his mother, the daughter of King Philip. The victory won by the Black Prince at Crecy (1346), the capture of Calais (1347), and the victory of Poitiers (1356), ultimately led to the Peace of Brétigny in 1360, by which Edward III. received all the west of France on condition of renouncing his claim to the French throne. Before the close of his reign, however, these advantages were all lost again, save a few principal towns on the coast.

Edward III. was succeeded in 1377 by his grandson Richard II., son of Edward the Black Prince. The people of England now began to show, though in a turbulent manner, that they had acquired just notions of government. In 1380 an unjust and oppressive poll-tax brought their grievances to a head, and 100,000 men, under Wat Tyler, marched toward London (1381). Wat Tyler was killed while conferring with the king, and the prudence and courage of Richard appeased the insurgents. Despite his conduct on this occasion Richard was deficient in the vigor necessary to curb the lawlessness of the nobles. In 1398 he banished his cousin, Henry Bolingbroke and on the death of the latter's father, the Duke of Lancaster, unjustly appropriated his cousin's partimony. To avenge the injustice Bolingbroke landed in England during the king's absence in Ireland, and at the head of 60,000 malcontents compelled Richard to surrender. He was confined in the Tower, and despite the superior claims of Edmund Mortimer, Earl of March, Henry was appointed king (1399), the first of the House of Lancaster, Richard was, in all probability, murdered early in 1400.

The manner in which the Duke of Lancaster, now Henry IV., acquired the crown rendered his reign extremely turbulent, but the vigor of his administration quelled every insurrection. During the reign of Henry IV. the clergy of England first began the practice of burning heretics under the act de haeretico comburendo, passed in the second year of his reign. Henry died in 1413, leaving his crown to his son, Henry V., who revived the claim of Edward III. to the throne of France in 1415, and invaded that country at the head of 30,000 men. The disjointed councils of the French rendered their country an easy prey; the victory of Agincourt was gained in 1415; and after a second campaign a peace was concluded at Troyes in 1420, by which Henry received the hand of Katherine, daughter of Charles VI., was appointed regent of France during the reign of his father-in-law, and declared heir to the throne on his death. The two kings, however, died within a few weeks of each other in 1422, and the infant son of Henry thus became king of England (as Henry VI.) and France at the age of nine months.

England during the reign of Henry VI. was subjected, in the first place, to all the confusion incident to a long minority, and afterward to all the misery of a civil war. In France (1422–53) the English forces lost ground, and were finally expelled by the celebrated Joan of Arc, Calais alone being retained. The rebellion of Jack Cade in 1450 was suppressed only to be succeeded by more serious trouble. In that year Richard, duke of York, the father of Edward, afterward Edward IV., began to advance his pretensions to the throne, which had been so long usurped by the house of Lancaster. The wars which resulted, called the Wars of the Roses, from the fact that a red rose was the badge of the house of Lancaster and a white one that of the house of York, lasted for thirty years, from the first battle of St. Albans, May 22, 1455, to the battle of Bosworth, Aug. 22, 1485. Henry VI. was twice driven from the throne (in 1461 and 1471) by Edward of York, whose father had previously been killed in battle in 1460. Edward of York reigned as Edward IV. from 1461 till his death in 1483, with a brief interval in 1471; and was succeeded by two other sovereigns of the house of York, first his son Edward V., who reigned for eleven weeks in 1483; and then by his brother Richard III., who reigned from 1483 till 1485, when he was defeated and slain on Bosworth field by Henry Tudor, of the House of Lancaster, who then became Henry VII.

Henry VII. was at this time the representative of the house of Lancaster and in order at once to strengthen his own title, and to put to an end the rivalry between the houses of York and Lancaster, he married in 1486 Elizabeth, sister of Edward V. and heiress of the house of York. His administration throughout did much to increase the royal power and to establish order and prosperity. He died in 1509.

The authority of the English crown, which had been so much extended by Henry VII., was by his son Henry VIII. exerted in a tyrannical and capricious manner. The most important event of the reign was undoubtedly the Reformation; though it had its origin rather in Henry's caprice and in the casual situation of his private affairs than in his conviction of the necessity of a reformation in religion, or in the solidity of reasoning employed by the reformers. Henry had been espoused to Catherine of Spain, who was first married to his elder brother Arthur, a prince who died young. Henry became disgusted with his queen, and enamored of one of her maids of honor, Anne Boleyn. He had recourse, therefore, to the pope to dissolve a marriage which had at first been rendered legal only by a dispensation from the pontiff; but failing in his desires he broke away entirely from the Holy See, and in 1534 got himself recognized by act of parliament as the head of the English Church. He died in 1547. He was married six times, and left three children, each of whom reigned in turn. These were: Mary, by his first wife, Catherine of Aragon; Elizabeth, by his second wife, Anne Boleyn; and Edward, by his third wife, Jane Seymour.

Edward, who reigned first, with the title of Edward VI., was nine years of age at the time of his succession, and died in 1553, when he was only sixteen. His short reign, or rather the reign of the Earl of Hertford, afterward Duke of Somerset, who was appointed regent, was distinguished chiefly by the success which attended the measures of the reformers, who acquired great part of the power formerly engrossed by the Catholics. The intrigues of Dudley, duke of Northumberland, during the reign of Edward, caused Lady Jane Grey to be declared his successor; but her reign, if it could be called such, lasted only a few days. Mary, daughter of Henry VIII., was placed upon the throne, and Lady Jane Grey and her husband were both executed. Mary, a bigoted Catholic, seems to have wished for the crown only for the purpose of re-establishing the Roman Catholic faith. Political motives had induced Philip of Spain to accept of her a spouse; but she could never prevail on her subjects to allow him any share of power. She died in 1558.

Elizabeth, who succeeded her sister Mary, was attached to the Protestant faith, and found little difficulty in establishing it in England. Having concluded peace with France (1559), Elizabeth set herself to promote the confusion which prevailed in Scotland, to which her cousin Mary had returned from France as queen in 1561. In this she was so far successful that Mary placed herself in her power (1568), and after many years' imprisonment was sent to the scaffold. (1587). As the most powerful Protestant nation, and as a rival to Spain in the New World, it was natural that England should become involved in difficulties with that country. The dispersion of the Armada by the English fleet under Howard, Drake, and Hawkins was the most brilliant event of a struggle which abounded in minor feats of valor.

To Elizabeth succeeded (in 1603) James VI. of Scotland and I. of England, son of Mary Queen of Scots and Darnley. His accession to the crown of England in addition to that of Scotland did much to unite the two nations, though a certain smouldering animosity still lingered. His son Charles I., succeeded him in 1625, and his marriage with a Catholic, his arbitrary rule, and illegal methods of raising money, provoked bitter hostility. Under the guidance of Laud and Strafford things went from bad to worse. Civil war broke out in 1642 between the king's party and that of the parliament, and the latter proving victorious, in 1649 the king was beheaded.

A commonwealth or republican government was now established, in which the most prominent figure was Oliver Cromwell. Mutinies in the army among Fifth-monarchists and Levellers were subdued by Cromwell and Fairfax, and Cromwell in a series of masterly movements subjugated Ireland and gained the important battles of Dunbar and Worcester. At sea, Blake had destroyed the Royalist fleet under Rupert, and was engaged in an honorable struggle with the Dutch under Van Tromp. But within the governing body matters had come to a deadlock. A dissolution was necessary, yet parliament shrank from dissolving itself, and in the meantime the reform of the law, a settlement with regard to the church, and other important matters remained untouched. In April, 1653, Cromwell cut the knot by forcibly ejecting the members and putting the keys of the house in his pocket. From this time he was practically head of the government, which was vested in a council of thirteen. A parliament—the Little or Barebones Parliament—was summoned, and in the December of the same year Cromwell was installed Lord Protector of the Commonwealth of England, Scotland, and Ireland. With more than the power of a king, he succeeded in dominating the confusion at home and made the country feared throughout the whole of Europe. Cromwell died in 1658, and the brief and feeble protectorate of his son Richard followed.

There was now a wide-spread feeling that the country would be better under the old form of government, and Charles II., son of Charles I., was called to the throne by the Restoration of 1660. He took complete advantage of the popular reaction from the narrowness and intolerance of Puritanism, and even latterly endeavored to carry it to the extreme of establishing the Catholic religion.

As Charles II. left no legitimate issue, his brother the Duke of York succeeded him as James II. (1685–88). An invasion by an illegitimate son of Charles, the Duke of Monmouth, who claimed the throne, was suppressed, and the king's arbitrary rule was supported by the wholesale butcheries of such instruments as Kirke and Jeffreys. The king's zealous countenance of Roman Catholicism and his attempts to force the church and the universities to submission provoked a storm of opposition. The whole nation was prepared to welcome any deliverance, and in 1688 William of Orange, husband of James' daughter Mary, landed in Torbay. James fled to France, and a convention summoned by William settled the crown upon him, he thus becoming William III. Annexed to this settlement was a Declaration of Rights circumscribing the royal prerogative by depriving him of the right to exercise dispensing power, or to exact money, or maintain an army without the assent of parliament. This placed henceforward the right of the British sovereign to the throne upon a purely statutory basis. A bill for triennial parliaments was passed in 1694, the year in which Queen Mary died. For a moment after her death William's popularity was in danger, but his successes at Namur and elsewhere, and the obvious exhaustion of France, once more confirmed his power. The treaty of Ryswick followed in 1697, and the death of James II. in exile in 1701 removed a not unimportant source of danger. Early in the following year William also died, and by the act of settlement Anne succeeded him.

The closing act of William's reign had been the formation of the grand alliance between England, Holland, and the German Empire, and the new queen's rule opened with the brilliant successes of Marlborough at Blenheim (1704) and Ramilies (1706). Throughout the earlier part of her reign the Marlboroughs

practically ruled the kingdom, the duke's wife, Sarah Jennings, being the queen's most intimate friend and adviser. In 1707 the history of England becomes the history of Britain, the Act of Union passed in that year binding the parliaments and realms of England and Scotland into a single and more powerful whole. See art. Britain.

The first religion of the Celts of England was Druidism. It has been conjectured that Christianity may have reached Britain by way of France (Gaul) before the conclusion of the 1st, or not long after the commencement of the 2d century, but the period and manner of its introduction are uncertain. It had, however, made considerable progress in the island previous to the time of Constantine the Great (306–337).

A period of almost total eclipse followed the inroad of the pagan Saxons, and it was not until A.D. 570 that signs of change showed themselves in the new nationality. On the coming of Austin, or St. Augustine, sent over in 596 by Gregory, the Great, a residence at Canterbury was assigned to him, and Ethelbert, king of Kent, and most of his subjects, adopted Christianity.

The clergy in course of time attained, particularly after the Norman conquest, to such a height of domination as to form an imperium in imperio. Under Anselm (1093–1109) the church was practically emancipated from the control of the state, and the power of the pope became supreme. With the reign of Edward I. the new system of parliaments came as an effective rival of the church synods, and various acts restrained the power of the clergy. In the 14th century the teaching of Wickliffe promised to produce a thorough revolt from Rome; but the difficulties of the house of Lancaster which drove its members to propitiate the church, and the Wars of the Roses, prevented matters coming to a head.

A steady decay of vital power set in however, and when Henry VIII. resolved to recast the English church there was no effective protest. In 1534 the papal authority was set aside by act of parliament, and by another act of parliament, passed in 1535, Henry assumed the title of supreme head of the Church of England.

With the reign of Mary the old religion was re-established; and it was not till that of Elizabeth that the Church of England was finally instituted in its present form. The doctrines of the church were again modified, and the forty-two articles were reduced to thirty nine by the convocation of the clergy in 1563. As no change was made in the episcopal form of government, and some rites and ceremonies were retained which many of the reformed considered as superstitious, this circumstance gave rise to many future dissensions. In 1559 before the close of the first year of Elizabeth's reign, the Acts of Supremacy and Uniformity were passed with the object of bringing about the entire subjection of the church and the people in religious matters to the royal authority.

From James I. some relief was anticipated by Puritans and nonconformists, but they were disappointed. Under Charles I. the attempt was made, through the instrumentality of Laud, to reduce all the churches of Great Britain under the jurisdiction of bishops. But after the death of Laud the parliament abolished the episcopal government, and condemned everything contrary to the doctrine, worship, and discipline of the Church of Geneva. In the reign of William III., and particularly in 1689, the divisions among the friends of Episcopacy gave rise to the two parties called the high-churchmen or non-jurors, and low-churchmen. The former maintained the doctrine of passive obedience to the sovereign; that the hereditary succession to the throne is of divine institution; that the church is subject to the jurisdiction of God alone; etc. The gradual progress of civil and religious liberty since that time has settled practically many such controversies.

As at present constituted the established religion of England is Episcopacy. The sovereign is the supreme head. The church is governed by two archbishops and thirty-one bishops. The Archbishop of Canterbury is styled the primate of all England, and to him belongs the privilege of crowning the kings and queens of England. The province of Canterbury comprehends 24 bishoprics; in the province of the Archbishop of York, who is styled primate of England, there are 9 bishoprics, the province comprising Cheshire, Lancashire, Yorkshire, and the other northern counties. Archbishops and bishops are appointed by the sovereign by what is called a congé d'élire, or leave to elect, naming the person to be chosen and sent to the dean and chapter. The archbishops and bishops, to the number of 24, have seats in the House of Lords, and are styled spiritual lords. As regards architecture little can be said with regard to the style prevalent between the invasion of the Anglo-Saxons and the Norman Conquest, from the fact that the remains of buildings erected in England before the Conquest are few and insignificant. The Norman style was introduced in the reign of Edward the Confessor, though the workmen, both then and after the Conquest, being English, the earlier work preserved many native characteristics. The Norman period proper extends from about 1090 to 1150, some of the best examples being parts of the cathedrals of Rochester, Winchester, Durham, and Canterbury. In the brief period 1160 to 1195 a marked change took place in the adoption of the pointed arch and what is known as the Early English style. Improved methods of construction led to the use of lighter walls and pillars instead of the heavy masses employed in the Norman style. Narrow lancet-shaped windows took the place of the round arch; bold projecting buttresses were introduced; and the roofs and spires became more lofty and more pointed, while in the interiors pointed arches rested on lofty clustered pillars. The best Early English type is Salisbury Cathedral. The Early English style has been regarded as lasting from 1190 to 1270, when the Decorated style of Gothic began to prevail. The transition to the Decorated style was gradual, but it may be considered as lasting to 1377. Exeter Cathedral is an excellent example of the earliest Decorated style. Between 1360 and 1399 the Decorated style gave place to the Perpendicular, which prevailed from 1377 to 1547, and was an exclusively English style. Gothic architecture, though it lingered on in many districts, practically came to an end in England in the reign of Henry VIII. The Elizabethan and Jacobean styles which followed were transitions from the Gothic to the Italian, with which these styles were more or less freely mixed. About 1836 the Gothic revival commenced, and that style has been employed with considerable success in the churches erected in recent times. At the present day Gothic is much employed for ecclesiastical and collegiate buildings, and a mild type of Renaissance for civil buildings. Of late years a style that has received the name of "Queen Anne" is much in vogue for private residences. It is very mixed, but withal highly picturesque. The most striking novelties in the 19th century have been introduced by the extensive use of iron and glass, as exemplified in the Exhibition building of 1851, the Crystal Palace, Sydenham, and the great railway-stations.

Very little is known of the state of the art of painting among the Anglo-Saxons; but in the 9th century Alfred the Great caused numerous MSS. to be adorned with miniatures, and about the end of the 10th century Archbishop Dunstan won reputation as a miniature painter. Under William the Conqueror and his two sons the painting of large pictures began to be studied, and Lanfranc, archbishop of Canterbury, adorned the vault of his church with paintings. Numerous miniatures of the 13th and 14th centuries have come down to us, rude in execution, but not without originality. Of native artists few are of importance prior to that original genius William Hogarth (1697–1764). Throughout the 18th century English artists attained higher eminence in portrait painting than in other departments, and it culminated in Sir Joshua Reynolds (1723–92), Thomas Gainsborough (1727–88), and Romney (1734–1802). Landscape-painting was represented by Richard Wilson, 1714–82, who painted classical scenes with figures from heathen mythology, and by Gainsborough already mentioned, who painted scenes of English nature and humble life. The Royal Academy of Arts, of which Reynolds was the first president, was established in London in 1769. In landscape the reputation of Turner (1775–1857) "stands alone, solitary, colossal." In historical painting Hilton (1786–1839), Eastlake (1793–1865), Etty (1787–1849), E. M. Ward (1816–97), C. W. Cope (b. 1811), and D. Maclise (1811-70) attained celebrity. Landseer (1802-73) stands by himself as a painter of animals.

In 1824 the nucleus of the National Gallery was formed by the purchase of the Angerstein collection, and in 1832 the vote was passed for the erection of the National Gallery building.

The modern group of British painters may be held to date from about 1850. Prominent among these the following may be named: In historical painting

Leighton, Alma-Tadema, Watts, Poynter, Long, Goodall, Holman Hunt, Noel Paton, Burne-Jones, and Madox Brown, as also W. P. Frith, whose Derby Day and Railway Station, so descriptive of modern life, may well be classed as historical. In figure painting or genre T. Faed, Erskine Nicol, Fildes, Orchardson, Herkomer, and Pettie. In portraiture Millais, Frank Holl, Ouless, and Richmond. In landscape Linnell, Hook, Peter Graham, John Brett, Vicat Cole, H. Moore, and Keeley Halswelle. In water-colors the most eminent artists have been Girtin (1773–1802), Cotman (1782–1842), Liverseege (1803–32), Stothard (1755–1834), Turner, David Cox (1788–1859), De Wint (1784–1849), Copley Fielding (1787–1855), Barret (1774–1842), Samuel Prout (1783–1852), W. H. Hunt (1790–1864), Louis Haghe (1806–85), W. L. Leitch (1804–83, Sam Bough (1822–74), J. F. Lewis (1805–76).

The language spoken in England from the settlement of the Anglo-Saxons to the Norman Conquest (say 500–1066) is popularly known as Anglo-Saxon, though simply the earliest form of English. (See Anglo-Saxons.) It was a highly inflected and purely Teutonic tongue presenting several dialects. The Conquest introduced the Norman-French, and from 1066 to about 1250 two languages were spoken, the native English speaking their own language, the intruders speaking French. During this period the grammatical structure of the native language was greatly broken up, inflexions fell away, or were assimilated to each other; and towards the end of the period we find a few works written in a language resembling the English of our own day in grammar, but differing from it by being purely Saxon or Teutonic in vocabulary. Finally, the two languages began to mingle, and form one intelligible to the whole population, Normans as well as English, this change being marked by a great infusion of Norman-French words, and English proper, being the result. English is thus in its vocabulary, a composite language, deriving part of its stock of words from a Teutonic source and part from a Latin source, Norman-French being in the main merely a modified form of Latin. In its grammatical structure and general character, however, English is entirely Teutonic, and is classed with Dutch and Gothic among the Low German tongues. If we divide the history of the English language into periods we shall find three most distinctly marked: 1st, the Old English or Anglo-Saxon, extending down to about 1100; 2d, the Middle English, 1100–1400 (to this period belong Chaucer, Wickliffe, Langland); 3d, Modern English. A more detailed subdivision would give transition periods connecting the main ones. The chief change which the language has experienced during the modern period consists in its absorbing new words from all quarters in obedience to the requirements of advancing science, more complicated social relations, and increased subtlety of thought. At the present time the rapid growth of the sciences already existing, and the creation of new ones, have caused whole groups of words to be introduced, chiefly from the Greek.

Before any English literature, in the strict sense of the term, existed, four literatures had arisen in England—the Celtic, Latin, Anglo-Saxon, and Anglo-Norman. With the coming of the Normans, although the Anglo-Saxon chronicle was continued until 1154, the native language practically ceased for a time to be employed in literature, Latin being employed in law, history, and philosophy, French in the lighter forms of literature.

Apart from a few brief fragments, the first English writings after the Conquest are the Brut of Layamon (about 1200), based on the Brut of Wace; and the Ormulum, a collection of metrical homilies attributed to Orm or Ormin, an Augustine monk. Between the beginning and middle of the 14th century the English speech had entered upon a new phase of development in the absorption of Norman-French words. A rapid expansion of the literature followed, having as the foremost figure that of Chaucer (1340–1400), who, writing at first under French influences, and then under Italian, became in the end the most representative English writer of the time.

The period from the time of Chaucer to the appearance of Spenser, that is, from the end of the 14th to near the end of the 16th century, is a very barren one in English literature, in part probably owing to foreign and domestic wars, the struggle of the people toward political power, and the religious controversies preceding and attending the Reformation.

Several events of European importance combined to stimulate life and enlarge the mental horizon—the invention of printing, or rather of movable types, the promulgation of the Copernican system of astronomy, the discovery of America, the Renaissance, and the Reformation. The Renaissance spread from Florence to England by means of such men as Colet, Linacre, Erasmus, and Sir Thomas More (1480–1535), the last noteworthy as at the head of a new race of historians. Important contributions to the prose of the time were the Tyndale New Testament, printed in 1525, and the Coverdale Bible (1535). The first signs of an artistic advance in poetic literature are to be found in Wyatt (1503–42) and Surrey)1516–47), who nationalized the sonnet, and of whom the latter is regarded as the introducer of blank verse.

After the death of James I. the course of literature breaks up into three stages, the first from 1625 to 1640, in which the survivals from the Elizabethan age slowly die away. The second stage (1640–60) was almost wholly given up to controversial prose, the Puritan revolution checking the production of pure literature. In this controversial prose of the time Milton was easily chief. With the restoration a third stage was begun. Milton turned his new leisure to the composition of his great poems; the drama was revived, and Davenant and Dryden, with Otway, Wycherley, and Congreve in their first plays, and minor playwrights, are the most representative writers of the period. Butler established a genre in satire, and Marvell as a satirist in some respects anticipated Swift; Other features of the last part of the 17th century were the immense advance in physical science under Boyle, Isaac Newton, Harvey, and others, and the rise of the newspaper press.

Dryden's death in 1700 marks the commencement of the so-called Augustan age in English literature. During it, however, no greater poet appeared than Pope (1688–1744), in whom sagacity, wit, and fancy take the place of the highest poetic faculty, but who was a supreme artist within the formal limits of his conception of metrical art.

With the French Revolution, or a few years earlier, the modern movement in literature may be said to have commenced. The departure from the old traditions, traceable in Gray and Collins, was more clearly exhibited in the last years of the century in Cowper (1731–1800) and Burns (1759–96), and was developed and perfected in the hands of Blake (1757–1828), Bowles (1762–1850), and the "Lake poets" Wordsworth (1770–1850), Coleridge (1772–1834), and Southey (1774–1843). A more important group was that of Byron (1788–1824), Shelley (1792–1822), and Keats (1796–1821), with which may be associated the names of Leigh Hunt (1784–1859), Thomas Moore (1779–1852), and Landor (1775–1864). Among the earlier writers of fiction there were several women of note, such as Maria Edgeworth (1767–1849) and Jane Austen (1775–1817). The greatest name in fiction is unquestionably that of Scott. Other prose writers were Mackintosh, Malthus, Hallam, James Mill, Southey, Robert Hall, William Hazlitt, Sydney Smith, Francis Jeffrey, Lord Brougham. In the literature since 1830 poetry has included as its chief names those of Hood, Aytoun, Charles Mackay, Philip James Bailey, Elizabeth Barrett Browning, Coventry Patmore, Lord Lytton (Owen Meredith), Matthew Arnold, Dante G. Rossetti, Robert Buchanan, Wm. Morris, Lewis Morris, Jean Ingelow, Swinburne, and last and greatest, Tennyson and Browning. A brilliant list of novelists for the same period includes Marryat, Lord Lytton, Ainsworth Dickens, Thackeray, Charles Kingsley, Charlotte Brontë, Lover, Lever, Wilkie Collins, Mayne Reid, George Macdonald Charles Reade, George Eliot, Anthony Trollope, William Black, Thomas Hardy R. D. Blackmore, George Meredith, Thackeray, and others. To the historical and biographical list belong Alison, Macaulay, Buckle, Carlyle, Grote, Milman, Froude, Lecky, Kinglake, John Richard Green, E. A. Freeman, John Morley, Leslie Stephen. In science and philosophy among the chief writers have been Whewell, Sir W. Hamilton, Mansel, John Stuart Mill, Alexander Bain, Hugh Miller, Charles Darwin, Huxley, Tyndall Max Müller, Herbert Spencer, T. H. Green. Of the other prose writers of importance the chief are De Quincey, Harriet Martineau, Sir Arthur Helps, Ruskin, Matthew Arnold, W. E. Gladstone.

ENGLISH, Thomas Dunn: poet and physician; born in Philadelphia, 1819. Among his works are several successful dramas, numerous novels, among them Walter Woolfe, a volume of poems, and

American Ballads. The best known of his poems is the popular ballad, Ben Bolt. He died in 1902.

ENGLISH, William Hayden: lawyer and politician; born Lexington, Ind., 1822. Was elected to U. S. House of Representatives in 1852, and three times re-elected, retiring in 1860; was nominated for vice-president of the U. S. by the democratic convention at Cincinnati, Ohio, June 24, 1880. He was president of the Indiana Historical Society, and the author of works on the history and constitution of that state. Died in Indianapolis, 1896.

ENGLISH CHANNEL, the arm of sea which separates England from France, extending, on the English side, from Dover to the Land's End; and on the French, from Calais to the Island of Ushant. On the east it communicates with the German Ocean by the Strait of Dover, 21 miles wide; and on the west it opens into the Atlantic by an entrance about 100 miles wide. At its greatest breadth it is about 150 miles. The pilchard and mackeral fisheries are very important.

ENGRAVING, the art of representing objects and depicting characters on metal, wood, precious stones, etc., by means of incisions made with instruments variously adapted to the substances operated upon and the description of work intended. Impressions from metal plates are named engravings, prints, or plates; those printed from wood being called indifferently wood engravings and wood-cuts. While, however, these impressions are not altogether dissimilar in appearance, the processes are distinct. In plates the lines intended to print are incised, and in order to take an impression the plate is daubed over with a thick ink which fills all the lines. The surface is then wiped perfectly clean, leaving only the incised lines filled with ink. A piece of damp paper is now laid on the face of the plate, and both are passed through the press, which causes the ink to pass from the plate to the paper. This operation needs to be repeated for every impression. In the wood block, on the contrary, the spaces between the lines of the drawing are cut out, leaving the lines standing up like type, the printing being from the inked surface of the raised lines, and effected much more rapidly than plate printing.

Engraving on wood, intended for printing or impressing from, long preceded engraving on metals. The art is of eastern origin, and at least as early as the 10th century engraving and printing from wood blocks was common in China. We first hear of wood engraving being cultivated in Europe by the Italians and Germans in the 13th century. For a hundred and fifty years, however, there is small indication of the practice of the art, which was at first confined to the production of block-books, playing cards, and religious prints. In the 15th century the art of printing from engraved plates was discovered in Florence by Maso Finiguerra. Engraving had long been used as a means of decorating armor, metal vessels, etc., the engravers generally securing duplicates of their work before laying in the niello (a species of metallic enamel) by filling the lines with dark color, and taking casts of them in sulphur. The discovery of the practicability of taking impressions upon paper led to engraving upon copper plates for the purpose of printing from. The date of the earliest known niello proof upon paper is 1452. The substitution of steel for copper plates (1820–30) gave the power of producing a much larger number of fine impressions, and opened new possibilities for highly-finished work. During the closing years of the 18th century line engraving attained a depth of color and fulness of tone in which earlier works generally are deficient, and during the 19th century it reached a perfectness of finish which it had not previously attained. A picture, whether figure or landscape, may be translated by line engraving with all its depths of color, delicacy of tone, and effect of light, and shade; the various textures, whether of naked flesh, silk, satin, woolen, or velvet, all successfully rendered by ingenious modes of laying the lines and combination of lines of varying strength, width, and depth. In the period 1820–60 landscape engraving attained a perfection in Great Britain which it had not attained in any other country, or at any other time. Through lack of encouragement, change of fashion, and the adoption of other methods of reproduction, line engraving is rapidly becoming a lost art.

Line Engraving, as implied by the term, is executed entirely in lines. The tools are few and simple. They consist of the graver or burin, the point, the scraper, and the burnisher; and oil-stone or hone, dividers, a parallel square, a magnifying lens; a bridge on which to rest the hand; a blind or shade of tissue paper, to make the light fall equally on the plate, callipers for levelling important erasures, a small steel anvil, a small pointed hammer, and punches. In etching, the following articles are required: a resinous mixture called etching-ground, capable, when spread very thinly over the plate, of resisting the action of the acids used; a dauber for laying the ground equally; a hand-vise; some hair-pencils of different sizes, and bordering wax, made of burgundy-pitch, bees'-wax, and a little oil.

In engraving, the plate, which is highly polished and must be free from all scratches, is first prepared by spreading over it a thin layer of ground. The surface is then smoked, and the outline of the picture transferred to it by pressure from the paper on which it has been drawn in fine outlines by a black-lead pencil. The picture is then drawn on the ground with the etching-needle, which removes the ground in every form produced by it, and leaves the bright metal exposed. A bank of wax is then put round the plate and diluted acid poured on it, which eats out the metal from the lines from which the ground has been removed, but leaves the rest of the plate untouched. The plate is then gone over with the graver, the etched lines clearly defined, broken lines connected, new lines added, etc. Sometimes the plate is rebitten more than once, those parts which are sufficiently bitten in the first treatment being stopped with varnish, and only the selected parts exposed to after-biting. Finally the burnisher is brought into play alternately with the graver and point to give perfectness and finish. Such is the process for landscape engraving. In historical and portrait engraving of the highest class, the lines are first drawn on the metal with a fine point and then cut in by the graver, first making a fine line and afterward entering and re-entering till the desired width and depth of lines is attained. Much of the excellence of such engravings depends on the mode in which the lines are laid, their relative thickness, and the manner in which they cross each other. In historical engraving etching is but little used, and then only for accessories and the less important parts.

The wood best adapted for engraving is box. It is cut across the grain in thicknesses equal to the height of type, these slices being subjected to a lengthened process of seasoning, and then smoothed, for use. Every wood engraving is the representative of a finished drawing previously made on the block; the unshaded parts being cut away, and the lines giving form, shading, texture, etc., left standing in relief by excavations of varied size and character, made between them by gravers of different forms.

Drawings on wood are made either with black-lead pencil alone or with pencil and indian ink, the latter being employed for the broader and darker masses. It is now much the practice to photograph drawings made in black and white upon the wood instead of making the drawing on the wood block. When the drawing is put on the wood by washes or by photography instead of being entirely done by pencil lines, the engraver has to devise the width and style of lines to be employed instead of cutting in facsimile, as is the case when the drawing is made entirely in lines. The tools required for wood engraving are similar but more numerous than those of the engraver on copper or steel. See also Die-sinking, Gems, Half-tone and Zinc Engraving.

ENGROSSING, in law, denotes extending a deed, that is, rewriting it out fully in fair and legible characters.

ENLIST'MENT, the method by which an army is supplied with troops, as distinguished from conscription. Up to 1802 the enlistment of men for the British army was left in the hands of private undertakers, or middlemen, who received a commission on the recruits they procured; but the abuses of this system induced the government to take the matter into their own management. At an early period enlistment was for short periods, but this was soon changed to enlistment for life. The act of 1847 limited the term of enlistment to ten years for the infantry and twelve for the cavalry, artillery, and ordnance; re-enlistments for periods of eleven and twelve years might be made, after serving which retiring pensions were granted. By the acts of 1870 and 1881 the system of long and short service was introduced. By both acts the term of long service was fixed for twelve years, at the expiration of which period the soldier may re-enlist for other nine years, service for

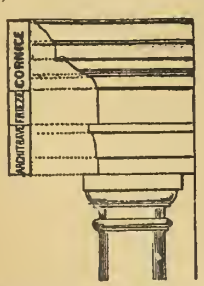
the two terms, or twenty-one years, entitling him to a pension. The short service of the first act extended over six years with the regular army and six years in the first-class reserve; the short service of the act of 1881 is seven years in the regular army and five in the reserve. In the navy a seaman may engage for five or ten years, for the period his ship is in commission, or for a longer period. He receives higher pay for longer service. In the U. States men are enlisted for five years' duty in every branch, and recruits are assigned to regiments by order of the war department.

ENOCH (ē'nok), (1) The eldest son of Cain, who called the city which he built after his name (Gen. IV. 17). (2) One of the patriarchs, the father of Methuselah. He "walked with God; and he was not; for God took him" (Gen. v. 24) at the age of 365 years. The words quoted are generally understood to mean that Enoch did not die a natural death, but was removed as Elijah was.

ENOCH, Book of, an apocryphal book of an assumedly prophetical character, to which considerable importance has been attached on account of its supposed quotation by St. Jude in the 14th and 15th verses of his epistle. It is referred to by many of the early fathers; is of unknown authorship, but was probably written by a Palestinian Hebrew. Its date is also uncertain, critical conjecture ranging from 144 B.C. to 132 A.D.

EN'SIGN, formerly, in the British army, the officer who carried the flag or colors of an infantry regiment; for this title, second lieutenant has been substituted. In naval language the ensign is the flag over the poop or stern which distinguishes the ships of different nations. In the royal navy of Britain it is a flag with a white field divided into quarters by the red cross of St. George, and having the union (or Union Jack as it is commonly called) in the upper corner next the staff. In the United States navy an ensign ranks next below lieutenant.

ENTAB'LATURE, in architecture, the horizontal, continuous work which rests



Entablature of Tuscan Column.

upon a row of columns, and belongs especially to classical architecture. It consists of three principal divisions—the architrave immediately above the abacus of the column, next the frieze, and then the cornice. In large buildings projections similar to and known also as entablatures are often carried round the whole edifice, or along one front of it.

ENTAIL', in law, the settlement of an estate by which a freehold is limited to a person and the heirs of his body, with such particular restrictions as the donor may specify. Entailed estates are divided into general and special, the former when the estate is given to the donee and his heirs without exception, the latter when the estate is limited to certain heirs to the exclusion of others.

ENTENTE CORDIALE (äṅ'tänt' kôr'-dyäl'). A term used specifically to signify a certain cordiality, based either on sentiment or on community of interests, between different countries and statesmen. It suggests a relation bordering on an alliance, though a formal alliance is by no means necessary to create it.

ENTER'IC FEVER. See Typhoid Fever.

ENTERI'TIS (Greek, enteron, intestine), inflammation of the intestines. There are several forms of the disease of great severity and very fatal. A common form, which is of the nature of an intestinal catarrh, generally yields to simple treatment; but other forms are of great danger, and demand skilled and attentive treatment.

ENTOMOL'OGY, the branch of zoology which treats of the insects. The true insects are those animals of the division Arthropoda or Articulata distinguished from the other classes of the division by the fact that the three divi-

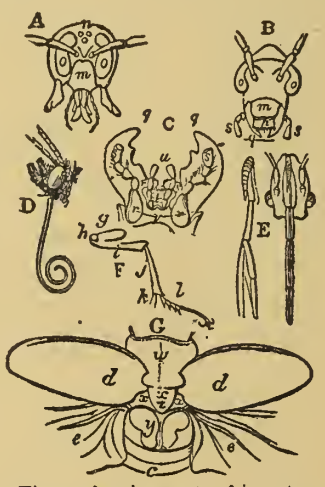


Figure showing parts of insects.

A, B, C, Mandibulate mouth. A, Head of Hornet, and upper side of mouth. *m*, Clypeus. *n*, Ocelli, stemmata, or simple eyes. *o*, Compound eyes. B, Head of beetle, and C, under side of mouth of beetle. *m*, Clydeus. *o*, Eyes. *p*, Labrum or upper lip. *q*, Mandibles or upper jaws. *r*, Maxillæ or lower jaws. *s*, Maxillary palpi. *t*, Labium or under lip. *u*, Labial palpi. *v*, Mentum or chin.—D and E, Haustellate mouths. D, Spiral sucker of a butterfly, called antlia. E, Straight sucker of a plant-bug (pentatoma) called haustellum.—F, Leg of stag-beetle. *g*, Coxa. *h*, Trochanter. *i*, Femur. *j*, Tibia *k*, Calcaria or spurs. *l*, Tarsus, which in this instance is pentamerous, or consisting of five pieces.—G, Thorax of stag-beetle. *c*, Abdomen. *d d*, Elytra. *e e*, Wings. *w*, Prothorax. *x*, Mesothorax. *y*, Metathorax. *z*, Scutellum.

sions of the body—the head, thorax, and abdomen—are always distinct from one another. There are never more than three pairs of legs in the perfect insect, and these are all borne upon the thorax. Each leg consists of from six to nine joints. The first of these is called the "coxa," and is succeeded by a short joint called the "trochanter." This is followed by a joint, often of large size, called the "femur," succeeded by the "tibia," and this has articulated to it the "tarsus," which may be composed of from one to five joints. Normally two pairs of wings are present, but one or other may be wanting. The wings are expansions of the sides of the second and third sections of the thorax, and are attached by slender tubes called "nervures." In the beetles the anterior pair of wings becomes hardened so as to form protective cases for the posterior membraneous wings, and are called in this condition "elytra" or "wing-cases." Respiration is effected by means of air-tubes or tracheæ, which commence at the surface of the body by lateral apertures called "stigmata" or "spiracles," and ramify through every part of the body. The head is composed of several segments amalgamated together, and carries a pair of feelers or "antennæ," a pair of eyes, usually compound, and the appendages of the mouth. The thorax is composed of three segments, also amalgamated, but generally pretty easily recognized. The abdominal segments are usually more or less freely movable upon one another, and never carry locomotive limbs; but the extremity is frequently furnished with appendages connected with generation, and which in some cases serve as offensive and defensive weapons (stings). The organs of the mouth take collectively two typical forms, the masticatory and the suctorial, the former exemplified by the beetles, the latter by the butterflies, in which the mouth is purely for suction. The alimentary canal consists of the œsophagus or gullet, a crop, a gizzard, a stomach, and an intestine, terminating in a cloaca. There is no regular system of blood-vessels; the most important organ of the circulation is a contractile vessel situated dorsally and called the "dorsal vessel." The nervous system is mainly composed of a series of ganglia placed along the ventral aspect of the body and connected by a set of double nerve-cords. The sexes are in different individuals, and most insects are oviparous. Reproduction is generally sexual, but non-sexual reproduction also occurs. Generally the young are very different from the full-grown insect, and pass through a "metamorphosis" before attaining the mature stage. When this metamorphosis is complete it exhibits three stages—that of the larva, caterpillar, or grub, that of the pupa or chrysalis, and that of the imago or perfect winged insect.

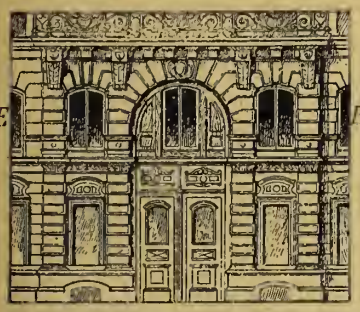
ENTOZO'A, a general name for those annulose parasitical animals, which infest the bodies of other animals. Some are found in the intestines, others in the liver, brain, muscles, and other tissues. They pass through different stages in their development, and at each stage occupy a different tissue and usually a different animal. Thus the cystic or bladder worm, whose presence in the brain of sheep causes staggers, is the immature form of the tapeworm of the dog, etc. The number of species is being reduced as the relations of the different forms are studied.

ENTREES (äṅ-trāz), in cookery, made-dishes comprising cutlets, fricassees, sweetbreads, and similar dishes, usually served hot before the joints at dinner.—

Entremets are similar dishes, but of a more delicate character, served between the main dishes of the second course at dinner.

ENTREPOT (äṇ-tr-pō; Fr.), a port where foreign merchandise which cannot enter the interior of a country is deposited in magazines under the surveillance of the custom-house officers till it is re-exported; also, any place where goods are sent to be distributed wherever customers are found.

ENTRE RIOS (en'trē rē'os; "between rivers"), a province of the Argentine Republic, lying between the Uruguay and the Paraná; area estimated at 45,000 sq. miles; pop. 300,000. The province is largely pastoral. Capital, Concepcion, with a pop. of 10,000.



Part of house on Boulevard Malesherbes, Paris. *E, E,* entresol.

ENTRESOL (en'tèr-sol;), a low story between two of greater height, generally the ground and first stories.

EN'TRY, in law, the act of taking possession of lands or tenements by entering or setting foot on the same.

EN'VELOPES, the paper covers that inclose letters or notes. They became common shortly after the introduction of the penny postal system; were at first made chiefly by hand, but are now not only shaped, but folded, gummed, etc., by machinery.

ENVIRONMENT, in zoölogy and botany, the sum of the conditions or surroundings of animal and plant life. Climate, the physical features of a country, absence or presence of enemies, and ease or difficulty of procuring food are among the more important factors of environment.

EN'VOY, a person deputed by a ruler or government to negotiate a treaty, or transact other business, with a foreign ruler or government. We usually apply the word to a public minister sent on a special occasion or for one particular purpose; hence an envoy is distinguished from an ambassador or permanent resident at a foreign court, and is of inferior rank.

E'OCENE, in geology, a term applied to the lower division of the Tertiary strata. The Eocene beds are arranged in two groups, termed the Lower and Upper Eocene; the strata formerly called Upper Eocene being now known as Oligocene. They consist of marls, limestones, clays, and sandstones, and are found in the Isle of Wight and in the southeast of England and northwest of France, in Central Europe, Western Asia, Northern Africa, and the Atlantic coast of North America.

EOLIAN HARP. See Æolian Harp.

EOLITH'IC PERIOD, in archæology, the early part of the palæolithic period of prehistoric time.

EOZO'IC ROCKS, the name given to the oldest fossiliferous rocks, such as the Laurentian and Huronian of Canada, from their being supposed to contain the first or earliest traces of life in the stratified systems.

EOZO'ON, a supposed gigantic fossil foraminifer found in the limestone of the Laurentian rocks of Canada, and in the Archæan rocks of Germany; so called as being the oldest form of life traceable in the past history of the globe. There is doubt, however, as to their being true fossils, many geologists now regarding them as of mineral origin.

EP'ACT, in chronology, the excess of the solar month above the lunar synodical month, and of the solar year above the lunar year of twelve synodical months. The epacts then are annual and menstrual or monthly. Suppose the new moon to be on the 1st of January: the month of January containing 31 days, and the lunar month only 29 days, 12 hours, 44 minutes, 3 seconds; the difference, 1 day, 11 hours, 15 minutes, 57 seconds, is the menstrual epact. The annual epact is nearly 11 days; the solar year being 365 days, and the lunar year 354. The epacts were once of some importance in ecclesiastical chronology, being used for finding when Easter would fall.

EPARCH (ep'ärk), in Greece, the governor or prefect of a provincial division called an eparchy, a subdivision of a nomarchy or province of the kingdom. In Russia an eparchy is the diocese or arch-diocese of a bishop or archbishop.

EPAULEMENT (e-pāl'ment), in fortification, a term for the mass of earth or other material which protects the guns in a battery in front and on either flank.

EP'AULET, EP'AULETTE, an ornamental shoulder-piece belonging to a military or other dress. Epaulettes were worn in the British army till 1855, and are still worn in the navy by all officers of and above the rank of lieutenant, and by some civil officers.

EPHEM'ERA, are known as may-flies or day-flies, and are characterized by the slenderness of their bodies; the delicacy of their wings, which are erect and unequal, the anterior being much the larger; the rudimentary condition of the mouth; and the termination of the abdomen in three filiform appendages. In the state of larvæ and pupæ they are equatic and exist for years. When ready for their final change they creep out of the water, generally toward sunset of a fine summer evening, beginning to be seen generally in May. They shed their whole skin shortly after leaving the water, propagate their species, and die, taking no food in the perfect state. The may-fly is well known to anglers, who imitate it for bait.

EPHE'SIANS, The Epistle to the, a canonical epistle addressed by the apostle Paul to the church which he had founded at Ephesus. It was written during his first captivity at Rome, immediately after he had written the Epistle to the Colossians (A.D. 62); and was sent by the hands of Tychicus, who also bore the message to the church at Colossæ.

EPH'ESUS, an ancient Greek city of Lydia, in Asia Minor, one of the twelve Ionian cities, on the south side of the Caystrus, near its mouth. It was at one time the grand emporium of Western Asia, having a convenient and spacious harbor. The apostle Paul visited Ephesus and established a Christian church there, to which he dedicated one of his epistles. It was famous for its temple of Artemis (Diana), called Artemision, the largest and most perfect model of Ionic architecture, and reckoned one of the seven wonders of the world. The first great temple, begun about B.C. 650 and finished after 120 years, was burnt by the notorious Herostratus in order to perpetuate his name B.C. 356 (the night of Alexander the Great's birth). A second and more magnificent was then erected, which was burned by the Goths in A.D. 262. Some interesting remains have recently been discovered by excavation. Several church councils were held here, especially the third ecumenical council of 431, at which Nestorius was condemned. The site of the city is now desolate; near it is a poor village, Aiasoluk.

EPH'OD, a species of vestment worn by the Jewish high-priest over the second tunic. It consisted of two main pieces, one covering the back, the other the breast and upper part of the body, fastened together on the shoulders by two onyx stones set in gold, on each of which were engraved the names of six tribes according to their order. A girdle or band, of one piece with the ephod, fastened it to the body. Just above the girdle, in the middle of the ephod, and joined to it by little gold chains, rested the square breastplate with the Urim and Thummim. The ephod was originally intended to be worn by the high-priest exclusively, but a similar vestment of an inferior material seems to have been in common use in later times among the ordinary priests.

E'PHRAIM, the younger son of Joseph, and the founder of one of the twelve tribes of Israel. When the Israelites left Egypt the Ephraimites numbered 40,500, and their possessions in the very center of Palestine included most of what was afterwards called Samaria.

EP'IC, a poem of the narrative kind. Some authorities restrict the term to narrative poems written in a lofty style and describing the exploits of heroes. Others widen the definition so as to include not only long narrative poems of romantic or supernatural adventure, but also those of a historical, legendary, mock-heroic, or humorous character. Epic is distinguished from drama in so far as the author frequently speaks in his own person as narrator; and from lyrical poetry by making the predominant feature the narration of action rather than the expression of emotion. Among the more famous epics of the world's literature may be noted: Homer's Iliad and Odyssey; Virgil's Æneid; the German Nibelungenlied; the Anglo-Saxon poem of Beowulf; the French

Song of Roland; Dante's Divina Commedia; Tasso's Gierusalemme Liberata; Arosto's Orlando Furioso; Milton's Paradise Lost; Spenser's Fairy Queen; Camoens' Lusiads (Portuguese); and Firdusi's Shah Nameh (Persian). Hesiod's Theogony; the poetic Edda; the Finnish Kalewala; the Indian Mahâbhârata may be described as collections of epic legends. The historical epic has an excellent representative in Barbour's Bruce; and specimens of the mock-heroic and humorous epic are found in The Battle of the Frogs and Mice; Reynard the Fox; Butler's Hudibras; and Pope's Rape of the Lock.

EPICTE'TUS, a Greek Stoic philosopher, born in Phrygia about A.D. 60. He lived long at Rome, where, in his youth, he was a slave. Though nominally a Stoic, he was not interested in Stoicism as an intellectual system; he adopted its terminology and its moral doctrines, but in his discourses he appeared rather as a moral and religious teacher than as a philosopher. His doctrines approach more nearly to Christianity than those of any of the earlier Stoics, and although there is no trace in what is recorded of them of his having been directly acquainted with Christianity, it is at least probable that the ideas diffused by Christian teachers may have indirectly influenced them. The excellence of his system was universally acknowledged. When Domitian banished the philosophers from Rome (A.D. 94) Epictetus retired to Epirus. There he is supposed to have died. His disciple Arrian collected his opinions, which are preserved in two treatises called the Discourses of Epictetus, and the Manual or Enchiridion.

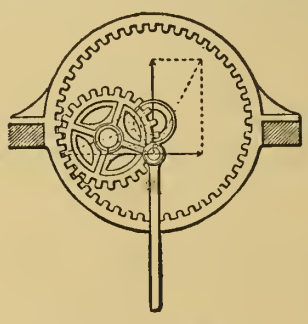
EPICURE'AN PHILOSOPHY. See Epicurus.

EPICU'RUS, a Greek philosopher, founder of the Epicurean school, was born in the island of Samos B.C. 342, died at Athens B.C. 270. He settled at Athens, B.C. 306, and purchased a garden in a favorable situation, where he established a philosophical school. Here he spent the remainder of his life, living in a simple manner and taking no part in public affairs. His pupils were numerous and enthusiastically devoted to him. His theory of the universe was based on the atomic theory of Democritus. The fundamental principle of his ethical system was that pleasure and pain are the chief good and evil, the attainment of the one and the avoidance of the other of which are to be regarded as the end of philosophy. He endeavored, however, to give a moral tendency to this doctrine. He exalted the pure and noble enjoyments derived from virtue, to which he attributed an imperishable existence, as incalculably superior to the passing pleasures which disturb the peace of mind, the highest good, and are therefore detrimental to happiness. Peace of mind, based on meditation, he considered as the origin of all good. The philosophy of Epicurus has been violently opposed and frequently misrepresented; but while it is not open to the charges of gross sensualism which have been brought against it, it cannot be considered as much better than a refinement of sensualism. In ancient times his philosophy appears to have been more popular in Greece than in Rome, although his disciples were numerous in both, and the Latin poem of Lucretius, De Rerum Natura, is a poetical exposition of his doctrines. Epicurus was a very voluminous writer, but few of his writings are extant, and what we possess comprising only some fragments of a Treatise on Nature, two letters, and detached passages. Lucretius, Cicero, Pliny, and Diogenes Laertius are our chief authorities for his doctrines.

EP'ICYCLE, in the ancient astronomy a small circle supposed to move round the circumference of a larger, a hypothetical mode of representing the apparent motion of the planets, which were supposed to have such a motion round the circumference of a large circle, called the deferent, having the earth in its center.

EPICY'CLOID, in geometry, a curve generated by the movement of a circle upon the convex side of another curve, that generated by the movement of a circle upon the concave side of a fixed curve being called a hypocycloid.

EPICYCLOI'DAL WHEEL, a wheel or ring fixed to a framework, toothed on its inner side, and having in gear with it another toothed wheel of half the diameter of the first, fitted so as to revolve



Epicycloidal wheel.

about the center of the latter. It is used for converting circular into alternate motion, or alternate into circular. While the revolution of the smaller wheel is taking place any point whatever on its circumference will describe a straight line, or will pass and repass through a diameter of the circle, once during each revolution. In practice, a piston-rod or other reciprocating part may be attached to any point on the circumference of the smaller wheel.

EPIDEM'IC, or EPIDEMIC DISEASE, signifies a disease which attacks a people, suddenly spreading from one to the other in all directions, prevailing a certain time and then dying away. It usually travels from place to place in the direction of the most-frequented lines of communication. The reason is that such diseases are commonly due to some infective material capable of being conveyed from one individual to another, and of being transported from place to place. In the U. S. small-pox and cholera are occasionally epidemic, while scarlet fever, measles, chicken-pox, diphtheria, typhoid fever, etc., are almost invariably so. Certain diseases which appear to be more mental than physical sometimes occur so numerously as to assume an epidemic form, such as St. Vitus' dance, convulsionary diseases, suicidal mania, etc. See Endemic.

EPIDER'MIS, in anatomy, the cuticle or scarf-skin of the body; a thin membrane covering the true skin of animals, consisting of two layers, an inner or mucous layer, called the rete mucosum, composed of active cells containing granules of coloring matter, and an outer or horny layer, consisting of flattened scale-like cells, dry, inactive, and effete which are constantly being shed in the form of dust. Both layers are destitute of feeling, and of vessels or nerves.—The term is also applied to the cellular layer which covers the surface of plants, usually formed of a layer or layers of more or less compressed and flattened cells. It may be thin and soft or dense and hard, and has often appendages in the form of hairs, glands, etc.

EPIGÆA (-jē'a), a genus of shrubs of the heath order, characterized by having three leaflets on the outside of the five-

Trailing arbutus.

parted calyx; and by the corolla being salver-shaped, five cleft, with its tube hairy on the inside. the trailing arbutus, is the May-flower of N. America.

EPIGASTRIUM, Epigastric Region, that part of the abodmen that lies over the stomach. See Abdomen.

EPIGLOTTIS, a cartilaginous plate behind the tongue, which covers the glottis like a lid during the act of swallowing, and thus prevents foreign bodies from entering the larynx. In its ordinary position during respiration it is pointed upwards, but in the act of swallowing it is pressed downwards and backward by the drawing up of the windpipe beneath the base of the tongue, and thus closes the entrance to the air-passages. See Larynx.

EP'IGRAM, in a restricted sense, a short poem or piece in verse, which has only one subject, and finishes by a witty or ingenious turn of thought; in a general sense, a pointed or witty and antithetical saying. The term was originally given by the Greeks to a poetical inscription placed upon a tomb or public monument, and was afterward extended to every little piece of verse expressing with precision a delicate or ingenious thought, as the pieces in the Greek anthology. In Roman classical poetry the term was somewhat indiscriminately used, but the epigrams of

Martial contain a great number with the modern epigrammatic character.

EP'ILEPSY, a nervous disease, the falling-sickness, so-called because the patient falls suddenly to the ground. It depends on various causes, often exceedingly complicated and incapable of being removed; hence it is often an incurable periodical disease, appearing in single paroxysms. In its fully-developed form, convulsions, attended by complete unconsciousness, are the prominent feature. Among the different causes may be mentioned hereditary tendency, gastric disturbances, or some irritation within the skull itself, such as tumors, etc. It is, for the most part, preceded by a tingling sensation, creeping up from the foot or hand to the breast and head, or some other premonitory symptom such as spectral illusions, headache, giddiness, confusion of thought, sense of fear, etc.; but sometimes there are no precursive symptoms. During the paroxysm all that is to be attended to is to prevent the patient from injuring himself; and this is to be accomplished by raising the head gently and loosening all tight parts of the dress. It is advisable to protect the tongue from being bitten by introducing a piece of india-rubber, cork, or soft wood between the teeth.

EP'ILOGUE, the closing speech or short poem addressed to the audience at the end of a play. The epilogue is the opposite of the prologue, or opening address.

EPINAY, Louise Florence Pétronille, Madame d', French authoress, born in 1725, died 1783. She became the wife of M. Delalive d'Epinay, who filled the office of farmer-general. In 1748 she became acquainted with Rousseau, and gave him a cottage in which he passed many of his days. She was the author of Les Conversations d'Emilie, Lettres à Mon Fils, and Mes Moments Heureux. She left interesting memoirs and correspondence.

EPIPH'ANY, a festival, otherwise called the manifestation of Christ to the Gentiles, observed on the 6th of January in honor of the adoration of our Savior by the three magi, or wise men, who came to adore him and bring him presents, led by the star. As a separate festival it dates from 813.

EPIS'COPACY, the system of church government in which bishops are established as distinct from and superior to priests or presbyters, there being in the church three distinct orders—deacons, priests, and bishops. See Bishop.

EPISCOPAL CHURCH, THE PROTESTANT, the religious body formerly known as "The Church of England in America," and generally styled the "American Episcopal Church." The full legal title of this communion is "The Protestant Episcopal Church in the United States of America," to distinguish it from those Christians, on the one hand, who acknowledge the papal supremacy, and from those, on the other who reject the authority of bishops. Whether this were really intended or not is perhaps doubtful; the name, however, describes with sufficient accuracy the relations of this church to the other religious bodies in the U. States.

The Episcopal Church is the descendant and representative of that branch of the Church of England which was established in the North American colonies in the 17th century. The English adventurers of that and the preceding age, like the Spaniards and Portuguese, carried their national religion with them, and introduced it wherever they gained a footing.

The first services of the Reformed Church of England within the territory now occupied by the U. States were held probably at Point Réyes, Drake's Bay, on the California coast, in June and July, 1579. Francis Fletcher, priest and preacher of the little company in the Golden Hind, in which Sir Francis Drake at this time circumnavigated the globe, records in the World Encompassed the use of the church's prayers on the eve, or on the festival, of St. John Baptist, June 24, at which service sailors and savages were the worshipers, and the crew of the Golden Hind besought their God in behalf of the natives attracted to these solemn rites that He would "open their blinded eyes to the knowledge of Him, and of Jesus Christ the salvation of the Gentiles."

EPISCOPAL SYSTEM, in the Roman Catholic Church, that theory according to which the highest clerical power is vested in the whole body of bishops. This theory was most prominently brought forward in the papal elections of the 14th century, and its followers declared the church, as represented in its general assemblies, to be above the pope. But the declaration of papal infallibility put an end to these differences, and made an impossibility of the episcopal system. In the German Protestant churches the episcopal system is that theory according to which the authority of the bishops, which had been suspended in the Protestant countries in consequence of the peace of 1555, was transferred to the ruler of the country.

EP'ISODE, an incidental narrative, or digression in a poem, which the poet has connected with the main plot, but which is not essential to it.

EP'ITAPH, an inscription upon a tomb or monument in honor or memory of the dead. Epitaphs were in use both among the Greeks and Romans. The Greeks distinguished by epitaphs only their illustrious men. Among the Romans they became a family institution and private names were regularly recorded upon tombstones. The same practice has generally prevailed in Christian countries. On Christian tombstone epitaphs usually give brief facts of the deceased's life, sometimes also the pious hopes of survivors in reference to the resurrection or other doctrines of the Christian faith, etc. Many so-called epitaphs are mere witty jeux d'esprit, which might be described as epigrams, and which were never intended seriously for monumental inscriptions. The literature of the subject is very large.

EPITHALAMIUM, a nuptial song or poem in praise of a bride and bridegroom. Among the Greeks and Romans it was sung by young men and maids at the door of the bridal chamber of a new-married couple.

EPITHE'LIUM, in anatomy, the cellular layer which lines the internal cavities and canals of the body, both closed and open, as the mouth, nose, respiratory organs, blood-vessels, etc., and which is analogous to the cuticle of the outer surface. There are several varieties of epithelium. The epithelium lining the blood-vessels is called sometimes endothelium.

EPIZOOT'IC, or **EPIZOOTIC DISEASE,** a disease that at some particular time and place attacks great numbers of the lower animals just as an epidemic attacks man. Pleuro-pneumonia is often an epizootic, as was also the rinderpest.

E PLU'RIBUS U'NUM. The national motto of the United States, proposed by the committee appointed by Congress on July 4, 1776, to prepare designs for a seal. The intended meaning was "One formed of many," in reference to the composition of the government.

EPOCH, or **ERA,** is a fixed point of time, commonly selected on account of some remarkable event by which it has been distinguished, and which is made the beginning or determining point of a particular year from which all other years, whether preceding or ensuing, are computed. The creation and the birth of Christ are the most important of the historical epochs. The creation has formed the foundation of various chronologies, the chief of which are: 1. The epoch adopted by Bessuet, Ussher, and other Catholic and Protestant divines, which places the creation in B.C. 4004. 2. The Era of Constantinople (adopted by Russia), which places it in B.C. 5508. 3. The Era of Antioch, used till A.D. 284, placed the creation B.C. 5502. 4. The Era of Alexandria, which made the creation B.C. 5492. This is also the Abyssinian Era. 5. The Jewish Era, which places the creation in B.C. 3760. The Greeks computed their time by periods of four years, called Olympiads, from the occurrence every fourth year of the Olympic games. The first Olympiad, being the year in which Corœbus was victor in the Olympic games, was in the year B.C. 776. The Romans dated from the supposed era of the foundation of their city (Ab Urbe Condita, A.U.C.), the 21st of April, in the third year of the sixth Olympiad, or B.C. 753 (according to some authorities B.C. 752). The Christian Era, or mode of computing from the birth of Christ as a starting-point, was first introduced in the 6th century, and was generally adopted by the year 1000. This event is believed to have taken place earlier, perhaps by four years, than the received date. The Julian epoch, based on the coincidence of the solar, lunar, and indictional periods, is fixed at 4713 B.C., and is the only epoch established on an astronomical basis. The Mohammedan Era, or Hejĭra, commences on 16th July, 622, and the years are computed by lunar months. The Chinese reckon their time by cycles of 60 years. Instead of numbering them as we do, they give a different name to every year in the cycle. See Chronology, Calendar.

EPSOM SALT, sulphate of magnesium a cathartic salt which appears in capillary fibers or acicular crystals. It is found covering crevices of rocks, in mineral springs, etc.; but is commonly prepared by artificial processes from

magnesian limestone by treating it with sulphuric acid, or by dissolving the mineral kieserite in boiling water, allowing the insoluble matter to settle, and crystallizing out the Epsom salt from the clear solution. It is employed in medicine as a purgative, and in the arts. The name is derived from its having been first procured from the mineral waters at Epsom.

EQUATION, in algebra, a proposition asserting the equality of two quantities, and expressed by the sign = between them; or an expression of the same quantity in two dissimilar terms, but of equal value; as, $3s. = 36d.$ or $x = b + m - r$. In the latter case x is equal to b added to m with r subtracted, and the quantities on the right hand of the sign of equation are said to be the value of x on the left hand. An equation is termed simple, quadratic, cubic, or biquadratic, or of the first, second, third, or fourth degree, according as the index of the highest power of the unknown quantity is one, two, three, or four.

EQUATION, in astronomy, the correction or quantity to be added to or subtracted from the mean position of a heavenly body to obtain the true position. The term personal equation is the quantity of time by which a person is in the habit of noting a phenomenon wrongly; it may be called positive or negative, according as he notes it after or before it really takes place.

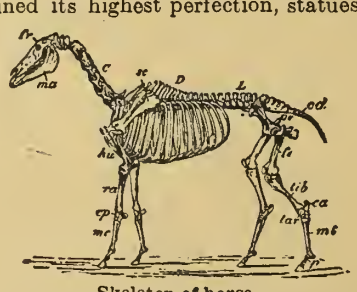
EQUATION OF TIME, the difference between mean and apparent time, or the difference of time as given by a clock and as given by a sun-dial, arising chiefly from the varying velocity of the earth in its orbit and the eccentricity of the orbit. The sun and the clock agree four times in the year; the greatest difference between them at the beginning of November is fully sixteen minutes. See Day.

EQUATION, PERSONAL, the constant which must be applied to every time observation recorded by an observer (as in astronomy) in order to make the mean of such observations agree with those of another observer. It is found by experience that different persons, in recording the results of observations will make various errors, some anticipating the event, but others failing to record it at the proper time. When it is found possible, by examining a long series of records made of the same event by two observers, to discover the average difference between their records of events, a very important correction of time-intervals may sometimes be introduced into a computation based upon such records. Such a correction is called the relative personal equation of the two astronomers. When it is found that an observer habitually makes, or is likely to make, a certain error in his time-records, such error (or absolute personal equation) can be readily allowed for.

EQUA'TOR, that great circle of our globe every point of which is 90° from the poles. All places which are on it have invariably equal days and nights. Our earth is divided by it into the northern and southern hemispheres. From this circle is reckoned the latitudes of places both north and south. There is also a corresponding celestial equator in the plane of the terrestrial, an imaginary great circle in the heavens the plane of which is perpendicular to the axis of the earth. It is everywhere 90° distant from the celestial poles, which coincide with the extremities of the earth's axis, supposed to be produced to meet the heavens. During his apparent yearly course the sun is twice in the celestial, and vertically over the terrestrial equator, at the beginning of spring and of autumn. Then the day and night are equal all over the earth, whence the name equinox.—The magnetic equator is a line which pretty nearly coincides with the geographical equator, and at every point of which the vertical component of the earth's magnetic attraction is zero; that is to say, a dipping needle carried along the magnetic equator remains horizontal. It is hence also called the aclinic line.

EQUATO'RIAL, an astronomical instrument contrived for the purpose of directing a telescope upon any celestial object, and of keeping the object in view for any length of time, notwithstanding the diurnal motion of the earth. For these purposes a principal axis resting on firm supports is mounted exactly parallel to the axis of the earth's rotation, and consequently pointing to the poles of the heavens, being fixed so as to turn on pivots at its extremities. To this there is attached a telescope moving on an axis of its own in such a way that it may either be exactly parallel to the other axis, or at any angle to it; when at right angles it points to the celestial equator. By this means a star can be followed by one motion from its rising to its setting. In some observatories the equatorials have the necessary motion given them by clock-work.

EQUESTRIAN STATUE, a complete figure of a person on horseback, executed generally in bronze or stone. In ancient Greece, where plastic art attained its highest perfection, statues of



Skeleton of horse.

fr, frontal bone; *C*, cervical vertebræ; *D*, dorsal vertebræ; *L*, lumbar vertebræ: *cd*, caudal vertebræ; *sc*, scapula; *pe*, pelvis; *ma*, mandible; *hu*, humerus; *ra*, radius; *cp*, carpus; *mc*, metacarpus: *fe*, femur; *tib*, tibia; *ca*, calcaneum; *tar*, tarsus; *mt*, metatarsus; *p*, phalanges.

men and horses were often of the first excellence, but horses were more commonly represented as attached to the chariot. In Rome, equestrian statues of the emperors mere common.

EQ'UIDÆ, the horse family, a family belonging to the order Ungulata, or hoofed mammals, and subdivision perissodactyla, characterized by an undivided hoof formed of the third toe and its enlarged horny nail, a simple stomach, a mane on the neck, and by six incisor teeth on each jaw, seven molars on either side of both jaws, and by two small canine teeth in the upper jaw of the males, and sometimes in both jaws. It is divided into two groups—one including the asses and zebras, the other comprising the true horses.

EQUILIB'RIUM, a state of equipoise; a state of rest produced by the mutual counteraction of two or more forces, as the state of the two ends of a lever or balance, when both are charged with equal weight. When a body, being slightly moved out of any position, always tends to return to its position, that position is said to be one of stable equilibrium; when the body will not thus return to its previous position, its position is said to be one of unstable equilibrium.

EQUINOC'TIAL, in astronomy, the circle in the heavens otherwise known as the celestial equator. When the sun is on the equator there is equal length of day and night over all the earth: hence the name equinoctial. — Equinoctial gales, storms which are observed generally to take place about the time of the sun's crossing the equator, that is, at the vernal and autumnal equinox, in March and September. (See Equinox.)— Equinoctial points are the two points wherein the celestial equator and ecliptic intersect each other; the one, being in the first point of Aries, is called the vernal point; and the other, in the first point of Libra, the autumnal point. These points are found to be moving backward or westward at the rate of 50″ of a degree in a year. This is called the precession of the equinoxes.

EQ'UINOX, the precise time when the sun enters one of the equinoctial points, or the first point of Aries about the 21st of March, and the first point of Libra about the 23d of September, making the day and night of equal length all over the world. At all other times the length of the day and of the night are unequal, their difference being the greater, the more we approach either pole, while in the same latitude it is everywhere the same.

EQ'UITY, in law, the system of supplemental law administered in certain courts, founded upon defined rules, recorded precedents, and established principles, the judges, however, liberally expounding and developing them to meet new exigencies. While it aims to assist the defects of the common law, by extending relief to those rights of property which the strict law does not recognize, and by giving more ample and distributive redress than the ordinary tribunals afford, equity by no means either controls, mitigates, or supercedes the common law, but rather guides itself by its analogies, and does not assume any power to subvert its doctrines. Courts of equity grant redress to all parties where they have right, and modify and fashion that redress according to circumstances. They bring before them all the parties interested in the subject-matter of the suit, and adjust the rights of all.

EQUITY OF REDEMPTION, in law, the advantage allowed to a mortgagor of a reasonable time to redeem an estate mortgaged, when it is of greater value than the sum for which it is mortgaged.

EQUIV'ALENTS, in chemistry, a term for the proportions in which the elements

combine with one another to form compounds. See Chemistry.

ERA. See Epoch.

ERAS'MUS, Desiderius, a Dutch scholar, born at Rotterdam in 1467. His original name was Gerard, but this he changed according to a fashion of the time. In 1492 he traveled to Paris to perfect himself in theology and polite literature. He went to England in 1497, where he was graciously received by the king. He returned soon after to the Continent, and took his doctor's degree. He returned to England in 1510; wrote his Praise of Folly and was appointed Margaret professor of divinity and Greek lecturer at Cambridge. In 1514 he returned to the Continent and lived chiefly at Basel, where he died in 1536. To extensive learning Erasmus joined a refined taste and a delicate wit. He rendered great and lasting service to the cause of reviving scholarship. Although he took no direct part in the Reformation, and was reproached by Luther for lukewarmness, he attacked the disorders of monasticism and superstition, and everywhere promoted the cause of truth.

Desiderius Erasmus.

He edited various classics, the first edition of the Greek Testament from MSS. (with Latin translation), etc., but his best-known books are the Encomium Moriæ, or Praise of Folly, and his Colloquies.

ER'EBUS, in the Greek mythology, the son of Chaos and Darkness. The name Erebus was also given to the infernal regions.

ER'FURT, an important town in the Prussian province of Saxony, on the river Gera, formerly a fortress with two citadels, now given up as such. Pop. 72,360.

ER'GOT, the altered seed of rye and other grasses caused by the attack of a fungus. The seed is replaced by a dense homogeneous tissue largely charged with an oily fluid. In its perfect state this germinates and produces the Claviceps. When diseased rye of this kind is eaten in food for some time it sometimes causes death by a kind of mortification called dry gangrene. Ergot is used in obstetric practice to promote the contraction of the uterus.

ERICA (e-rī'ka), the heath, a large genus of branched rigid shrubs, most of which are natives of South Africa, a few being found in Europe and Asia. The leaves are narrow and rigid, the flowers are globose or tubular, and four-lobed.

1, Heads of ergot (*aa*) produced on a grass. 2, Clavideps purpurea (*bb*) springing from the Ergot.

ER'ICSSON, John, engineer, born in Sweden, 1803. He served for a time in the Swedish army; removed to London in 1826, and to New York in 1839. He is identified with numerous inventions

John Ericsson.

and improvements on steam machinery and its applications. His chief inventions are his caloric engine, the screw propeller (1836), which has revolutionized navigation, and his turret-ships, the first of which, the Monitor, distinguished itself in the American civil war, and inaugurated a new era in naval warfare. He latterly devoted himself to studies of the earth's motion and the intensity of solar heat. He died in 1889.

ERIE (ē'ri), one of the great chain of North American lakes, between Lakes Huron and Ontario, about 265 miles long, 63½ miles broad at its center, from 40 to 60 fathoms deep at the deepest part; area 9600 square miles. The whole of its southern shore is within the territory of the U. States, and its northern within that of Canada. It receives the waters of the upper lakes by Detroit river at its southwestern extremity, and discharges its waters into Lake Ontario by the Niagara river at its northeast end. The Welland Canal enables vessels to pass from it to Lake Ontario. It is shallow compared with the other lakes of the series, and is subject to violent storms. The principal harbors are those on the U. States side—Buffalo, Erie, Cleveland, etc.

ERIE, a city in Pennsylvania; an important railway and commerical center on the southern shore of Lake Erie. There are numerous iron-works (including foundries, rolling-mills, blast-furnaces, etc.), petroleum refineries, breweries, tanneries, wood-working factories, etc. The harbor is one of the best on the lake. Population, 1909, 68,000.

ERIE CANAL, the largest in the U. States, serving to connect the great lakes with the sea. It begins at Buffalo on Lake Erie, and extends to the Hudson at Albany. It is 363 miles long; has in all 72 locks; a surface width 70 feet, bottom width 42 feet, and depth 7 feet It is carried over several large streams on stone aqueducts; cost nearly $10,000,000, and was opened in 1825. The navigation is free.

ERIODEN'DROL, the wool-tree. There are eight species natives of America, but one belongs to Asia and Africa. The species are noble plants,

Wool-tree.

growing from 50 to 100 feet high, having palmate leaves, and red or white flowers. The woolly coat of the seeds of some of the species is used in different countries for stuffing cushions and similar purposes.

ERIOM'ETER, an optical instrument for measuring the diameters of minute particles and fibers, from the size of the colored rings produced by the diffraction of the light in which the objects are viewed.

ER'IVAN, a Russian town, capital of government of the same name in the lieutenancy of the Caucasus, on the Sanga, north of Mount Ararat. It has a citadel, barracks, a cannon foundry, and some manufactures. Pop. 12,505. The government has an area of 10,705 sq. miles, and a pop. of 583,957.

ER'MINE, the stoat, a quadruped of the weasel tribe, found over temperate Europe, but common only in the north. In consequence of the change that occurs in the color of its fur at different seasons—by far most marked in the

Ermine.

Arctic regions—it is not generally known that the ermine and stoat are the same. In winter, in cold countries or severe seasons, the fur changes from a reddish-

Ermine.

brown to a yellowish-white, or almost pure white, under which shade the animal is recognized as the ermine. In both states the tip of the tail is black. Like many other species of this genus

the ermine has the faculty of ejecting a fluid of a musky odor. Its fur is short, soft, and silky. It was formerly one of the insignia of royalty, and is still used by judges. When used as linings of cloaks the black tuft from the tail is sewed to the skin at irregular distances.—In heraldry, ermine is one of the furs, represented with its peculiar spots black on a white ground.

E'ROS, the Greek name of Cupid and Amor.

EROSION THEORY, in geology, the theory, now held by all geologists, that valleys are due to the wearing influences of water and ice, the latter chiefly in the form of glaciers, as opposed to the theory which regards them as the result of fissures in the earth's crust produced by strains during its upheaval.

EROT'IC, relating to love.—Erotic Poetry, amatory poetry.—The name of erotic writers has been applied, in Greek literature, particularly to a class of romance writers, and to the writer of the Milesian Tales.

ERRA'TA, the list of errors and corrections placed at the end or at the beginning of a book.

ERRAT'ICS, or **ERRATIC BLOCKS,** in geology, boulders or large masses of angular rock which have been transported to a distance from their original mountains by the action of ice during the glacial period. Thus on the slopes of the Jura Mountains immense blocks of granite are found which have traveled 60 miles from their original situation. Similarly masses of Scotch and Lake-district granites and of Welsh rocks (some of which weigh several tons) occur not uncommonly in the surface soil of the Midland counties of England.

ERROR, WRIT OF, in law, a formal instrument, issued by or under authority of a court, commanding the person to whom it is addressed to do a certain act therein specified. It is written in the form of a mandate from the highest authority in the state—the king in Great Britain, the president, people, or commonwealth in the United States, attested by the chief judge of the court, sealed and signed by the clerk, and may be issued either at the commencement of an action or proceeding, or during its progress, to the sheriff or to some other person, for the purpose of procuring various acts to be done in connection with such action or proceeding.

ERSKINE, Thomas, Lord Erskine, Scottish lawyer, the youngest son of the tenth earl of Buchan, was born in 1750, and died in 1823. After serving four years in the navy and seven in the army he commenced the study of law, and in 1778 took his degree at Cambridge and was called to the bar. His success was immediate. In May, 1783, he was elected a member of parliament for Portsmouth, a seat he held till 1806, when he was raised to the peerage. The rights of juries he firmly maintained on all occasions. In 1792, being employed to defend Thomas Paine, when prosecuted for the second part of his Rights of Man, he declared that, waiving all personal convictions, he deemed it right, as an English advocate, to obey the call; by the maintenance of which principle he lost his office of attorney-general to the Prince of Wales. In the trials of Hardy, Tooke, and others for high treason in 1794, the ability displayed by Erskine was acknowledped by all parties. He was a wa m partisan of Fox, and a strenuous opposer of the war with France. On the death of Pitt, in 1806, Erskine was created a peer, and raised to the dignity of lord-chancellor. During his short tenure of office the bill for the abolition of slavery was passed.

ERUPTIVE ROCKS, in geology, those which, like lava, basalt, granite, etc., have broken through other rocks while in a molten state.

ERYSIP'ELAS, the rose, or St. Anthony's fire, a disease characterized by diffused inflammation of the skin or some part of the body, but chiefly of the face or head, and attended by fever. It is, generally, an acute affection, its medium duration being from ten to fourteen days. It should be treated by nourishing food and iron tonics, the parts being protected from cold.

ERYTHE'MA, a mild form of inflammation of the skin somewhat resembling erysipelas. Some forms are connected with constitutional diseases, as rheumatism, gout, etc.

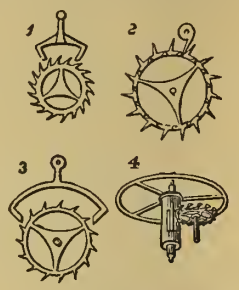
ERZERUM, ERZEROUM, or **ERZEROOM** (er'ze-röm), a city of Turkish Armenia, capital of a vilayet with an area of 27,000 sq. miles, and a pop. of 582,745. The town is about 6000 feet above sea-level, forms an important strategical center, and has become a principal frontier fortress. The Moslem element prevails largely over the Christian, although it is the metropolis of the Armenian church in union with Rome. In addition to important manufactures, especially in copper and iron, it carries on an extensive trade, and is a chief halting-place for Persian pilgrims on their way to Mecca. Pop. 38,894.

ESARHAD'DON, the son of Sennacherib, and one of the most powerful of all the Assyrian monarchs. He extended the empire on all sides, and is the only Assyrian monarch who actually reigned at Babylon. He died about 667 B.C.

E'SAU, the eldest son of Isaac, and twin-brother of Jacob. His name (which signifies rough, hairy) was due to his singular appearance at birth, being "red, and all over like an hairy garment." The story of his marriage, of his loss of birthright through the craft of Rebekah and Jacob, and of his quarrel and reconciliation with Jacob, are told in the book of Genesis. He was the progenitor of the Edomites, who dwelt on Mount Seir.

ESCANABA, the capital of Delta co., Mich., situated on the C. and N. W. Railway and on Green Bay, 360 miles north of Chicago. It ships annually over 4,000,000 tons of iron ore and large quantities of coal, lumber, and fish. Pop. 10,760.

ESCAPE'MENT, the general contrivance in a time-piece by which the pressure of the wheels (which move always in one direction) and the vibratory motion of the pendulum or balance-wheel are accommodated the one to the other. By this contrivance the wheel-work is made to communicate an impulse to the regulating power (which in a clock is the pendulum and in a watch the balance-wheel), so as to restore to it the small portion of force which it loses in every vibration, in consequence of friction and the resistance of the air. The leading requisite of a good escapement is that the impulse communicated to the



Watch and clock escapements.

1, Anchor escapement of a common clock. 2, Duplex escapement. 3, Lever escapement. 4, Horizontal or cylinder escapement.

pendulum or balance-wheel shall be invariable, notwithstanding any irregularity of foulness in the train of wheels. Various kinds of escapements have been contrived, some of which are shown in the accompanying figure. See also Clock, Watch.

ESCHATOL'OGY (es-ka-), in theol. the "doctrine respecting the last things," which treats of the millennium, the second advent of Christ, the resurrection, judgment, conflagration of the world, and the final state of the dead.

ESCHEAT (es-chēt'), in law, a species of reversion arising from default of heirs or by forfeiture. That which falls or lapses to the original proprietor, or to the state, as lands or other property. By modern legislation there can be no escheat on failure of the whole blood wherever there are persons of the half-blood capable of inheriting.

ESCROW', a legal writing delivered to a third person to be delivered by him to the person whom it purports to benefit, when some condition is performed. Upon the performance of this condition it becomes an absolute deed, but if the condition be not performed it remains an escrow or scroll.

ESCU'RIAL, a remarkable building in Spain, comprising at once a palace, a convent, a church, and a mausoleum. It is distant from Madrid about 24 miles in a northwesterly direction, and situated on the acclivity of the Sierra Guadarrama, the range of mountains which divides New from Old Castile. It was built by Philip II., and dedicated to St. Lawrence, in commemoration of the victory of St. Quentin, fought on the festival of the saint in 1557. It is popularly considered to be built on the plan of a gridiron, from the fact that St. Lawrence is said to have been broiled alive on a sort of large gridiron. The building is a rectangular parallelogram measuring 744 feet in length by 580 in breadth. The interior is divided into courts, formerly inhabited by monks and ecclesiastics, while a projection 460 feet in length (the handle of the gridiron) contains the royal palace. It was begun in 1563 and finished in 1584. It is of moderate height, and its innumerable windows (said to be 11,000) give it (apart from the church) somewhat the

aspect of a large mill or barracks. The church is the finest portion of the whole building. The dome is 60 feet in diameter, and its height at the center is about 320 feet. Under it is the Pantheon or family vault of the Spanish sovereigns. The library contains a valuable collection, including a rich store of Arabic MSS. The Escurial was partly burned in 1671, when many MSS. were destroyed, and was pillaged by the French in 1808 and 1813. It was restored by Ferdinand VII., but the monks, with their revenues which supported it, have long since disappeared. In 1872 it was fired by lighting, and suffered serious damage.

ESCUTCHEON, in heraldry, the shield whereon coats of arms are represented. See Heraldry.

ESDRAE'LON, Plain of, a plain extending across Palestine from the Mediterranean to the Jordan, and drained by the river Kishon. Among its subsidiary valleys are those of Engannin, Taanach, and Megiddo. This plain is celebrated for many important events in Old Testament history.

ESDRAS, Books of, two apocryphal books, which, in the Vulgate and other editions, are incorporated with the canonical books of Scripture. In the Vulgate the canonical books of Ezra and Nehemiah are called the first and second and the apocryphal books the third and fourth books of Esdras. The Geneva Bible (1560) first adopted the present nomenclature, calling the two apocryphal books first and second Esdras The subject of the first book of Esdras is the same as that of Ezra and Nehemiah, and in general it appears to be copied from the canonical Scriptures. The second book of Esdras is supposed to have been either of much later date, or to have been interpolated by Christian writers.

ES'KIMOS. See Esquimaux.

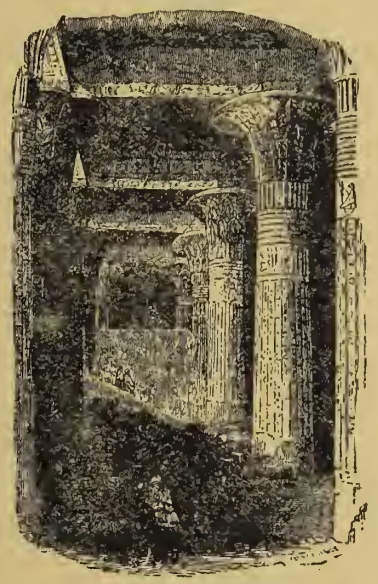
ESMARCH (es'märh), Johannes Friedrich August, German surgeon; born 1823. He held high official positions during the Schleswig-Holstein and Franco-German wars; is a great authority on gun-shot wounds; has originated valuable improvements in barrack-hospitals, ambulances, etc.; and is the author of several surgical works.

ES'NEH, a town of Upper Egypt, on the left bank of the Nile, 28 miles s.s.w. of Thebes, capital of a province of same name, on the site of the ancient Latopolis. Among the ruins there is a beautiful portico of twenty-four lofty and massive columns, belonging to a temple of Kneph (the only portion of the temple cleared out), and erected in the Ptolemaic and Roman period, with a zodiac on the ceiling. Esneh is the entrepôt of the Senaar caravans; has manufactures of cottons, pottery, etc.; and is reckoned the healthiest place in Egypt. Pop. 7000.

ESOP. See Æsop.

ESPERANTO LANGUAGE. An effort to establish an international language. In 1887 Dr. Zamenhof, a Russian physician, issued a pamphlet suggesting a new international language, to be called Esperanto. Only trifling progress was made in the first ten years of the movement. The famous French linguist, M. de Beaufort threw his own scheme aside and accepted that of Dr. Zamenhof as better suited for the purpose intended. From France the movement extended to Germany, Austria, Switzerland, Italy, and England. During the last few years active work has been undertaken in the U. States. Books on the Esperanto language are now printed in more than twenty languages and the number of periodicals is estimated at 30. At the Bologne congress, delegates from 22 countries spoke the language freely.

The Esperanto vocabulary is much smaller than any other language, having only about 2,000 words as compared to 32,000 in the French and 100,000 words in the English languages.



Interior of temple, Esneh.

ESPIR'ITO-SANTO ("Holy Spirit"), a maritime province, Brazil, bounded north by Bahia, south by Rio-de-Janeiro, length, about 260 miles; breadth, about 120 miles; area, 43,290 sq. miles. Pop. 121,560.

ESPLANADE', in fortification, the wide open space left between a citadel and the nearest houses of the city. The term is also frequently applied to a kind of terrace, especially along the sea-side, for public walks or drives.

ESPOU'SAL or BETROTHAL, consists of a deliberate mutual promise of marriage, expressed by outward signs, between two persons, both of whom may lawfully and validly enter into such an engagement. When such promise is made and accepted on both sides, neither party can lawfully withdraw from it without the other's consent or unless something comes to light, which, had it been known in time, would have prevented the engagement.

ESQUIMAULT (es-kē'mâlt), a harbor and naval station on the southeast coast of Vancouver Island, about 3 miles from Victoria, the capital of British Columbia. The harbor is almost landlocked, and with the "Royal Roads" outside, is capable of giving safe anchorage to a fleet of vessels of the largest size. It is the station of H.M. ships on the Pacific coast, and is being fortified and provided with all the necessaries of a first-class naval arsenal.

ESQUIMAUX (es'ki-mōz), or **ESKIMOS,** a race inhabiting the Arctic coasts of North America, from Greenland to Bering's Strait, and extending into Asia. They call themselves Inu-it, the people; their other name is from an Algonquin word signifying eaters of raw flesh. They consist of three principal stocks—the Greenlanders; the Esquimaux proper, in Labrador; and the western Esquimaux, found along Hudson's Bay, the west side of Baffin's Bay, the polar shores as far as the mouths of the Coppermine and Mackenzie rivers, and both on the American and Asiatic sides of Bering's Strait. Their leading physical peculiarities are a stunted stature, flattened nose, projecting cheek-bones, eyes often oblique, and yellow and brownish skin. Seal-skins, reindeer and other furs are used as materials for dress, according to the season, as well as skins of otters, foxes, martins, etc. In summer they live in tents, covered with skins; in winter they may be said to burrow beneath the snow. In Greenland houses built of stone and cemented with turf are used as permanent habitations. Vegetation being extremely stunted within the limits of their territories, their food consists of the flesh of whales, seals, walrus, etc., often eaten raw; and they show remarkable skill in fishing and hunting. Their weapons are bows and arrows, spears or lances, generally pointed with bone, but sometimes with metal. Their only domestic animal is the Esquimaux dog (which see). In intellect they are by no means deficient; in manners they are kind and hospitable. Their religious ideas appear scanty, but success has attended the labors of the Danish missionaries in teaching them the Christian religion.

ESQUIMAUX DOG, or **ESKIMO DOG,** a breed of dogs extensively spread over the northern regions of America and of eastern Asia. It is rather larger than the English pointer, but appears less on account of the shortness of its legs. It has oblique eyes, an elongated muzzle, and a bushy tail, which give it a wolfish appearance. The color is generally a deep dun, obscurely barred and patched with darker color. It is the only beast of burden in these latitudes, and with a team of such dogs attached to his sledge the Eskimo will cover 60 miles a day for several successive days.

ES'SAY, a composition in which something is attempted to be proved or illustrated, usually shorter and less methodical and finished than a systematic or formal treatise; so that it may be a short disquisition on a subject of taste, philosophy, or common life. Caution or modesty has induced many writers of note to give the title of essay to their most elaborate productions; thus we have Locke's Essay on the Human Understanding.

ESSEN, a town of Rhenish Prussia, 18 miles northeast of Düsseldorf, founded in the 9th century, and adorned with a fine church dating from 873. It has recently increased with great rapidity and is celebrated for the steel and iron works of Krupp, the most extensive in Europe, employing about 20,000 workmen. Pop. 78,706.

ESSENCES, solutions of the volatile or essential oils in spirits.

ESSENES (es-sēnz'), or **ESSÆANS,** a sect among the Jews, the origin of which is unknown, as well as the etymology of their name. It appears to have sprung up in the course of the century preceding the Christian era, and disappeared on the dispersion of the Jews after the siege of Jerusalem. The sect appears to have been an outcome of Jewish mysticism, which gradually assumed the form of a distinct organization. They were remarkable for their strictness and abstinence, and had a rule of life analogous to that of a monastic order.

ESSENTIAL OILS, volatile oils usually drawn from aromatic plants by subjecting them to distillation with water, such as the oils of lavender, cloves, peppermint, etc.

ESSEX, a maritime county in the s.e. of England, bounded by Suffolk, the Thames, Hertford, and Middlesex; area is 987,032 acres. The surface is generally level, except in the n.w., where it is undulating and sometimes hilly. The soil is in general extremely fertile. The principal productions are potatoes, barley, wheat, oats, mangolds, turnips, tares, rape, mustard, and trefoil. The raising of caraway, coriander, and teaze, is almost peculiar to this county. The chief towns are Chelmsford, the county town; West Ham, Colchester, Maldon, and Harwich. The county has eight parliamentary divisions, each returning one member Pop. 785,399.

ESSEX, Robert Devereux, Second Earl of, was born in 1567. Having appeared at court, he soon became a favorite of Queen Elizabeth, by whom he was kept in attendance against his will during the danger of the Armada. He served with more or less distinction in expeditions to Portugal and France, the latter on behalf of Henry of Navarre. In 1596 he was commander of the troops in an expedition against Spain, and distinguished himself by the capture of Cadiz. In an expedition next year he was less fortunate, and the queen, with whom he was always quarreling, received him coldly. Presuming on the favor of Elizabeth he behaved with rudeness to her at a privy-council and received a box on the ear, and was told to "go and be hanged." After some months a reconciliation took place, and he was appointed Lord-lieutenant of Ireland (1599), which was then in a state of rebellion. He returned to England in September, having been entirely unsuccessful in his government. He was made a prisoner in his own house, and foolishly tried to excite an insurrection in London. After a skirmish with a party of soldiers he was compelled to surrender, and sent to the Tower. He was tried for treason on 19th February, and executed on 26th February, 1601.

ESTABLISHED CHURCH, a church having a form of doctrine and government established by law in any country for the teaching of Christianity within its boundaries, and usually endowed by the state. The upholders of the establishment theory maintain that it is the duty of a state to provide for the religious instruction of the people. On the other hand, it is argued that the state has no right to endow or support any particular sect or denomination, unless they assume that that denomination alone is possessed of religious truth and worth.

ESTATE, the interest or quantity of interest a man has in lands, tenements, or other effects. Estates are real or personal. Real estate comprises lands, tenements, and hereditaments, held in freehold. Personal estate comprises interests for term sofy ears in lands, tenements and hereditaments, and property of every other description. Real estate descends to heirs; personal to executors or administrators. In ordinary language, an estate is a piece of landed property; a definite portion of land in the ownership of some one.

ESTHER, a Jewess, who became the queen of Ahasuerus, King of Persia, and whose story is told in the book of the Old Testament called by her name. This book is supposed by some to be the composition of Mordecai himself, the uncle of the heroine. Various opinions are held regarding the time and truth of the story; but the feast of Purim which commemorates the events narrated is still observed by the Jews during the month Adar.

ESTHONIA, a maritime government of Russia, bounded by the gulf of Finland, the Baltic, and the governments of Livonia and St. Petersburg. It includes several islands, of which the most important are Dagoe and Oesel; area, about 7610 sq. miles. The peasantry are almost all of Finnish origin, and speak a Finnish dialect. In the 10th and 12th centuries it belonged to Denmark, it was afterward annexed by Sweden, and in 1710 was seized by Russia. Revel is the capital. Pop. 392,738.

ESTOP'PEL, in law, anything done by a party himself, which puts a period to an action by closing the ground of controversy.

ESTREMADU'RA, a western division of Spain, consisting of the provinces of Badajoz and Caceres. The area is about 16,700 sq. miles, and the pop. 818,211.

ESTREMADURA, a maritime province of Portugal. The principal city is Lisbon. Area, 6876 sq. miles. Pop. 946,472.

ES'TUARY, the wide mouth of a river opening out so as to form an arm of the sea.

ETA'WAH, a town, Hindustan, N. W. Provinces, capital of the district of same name, on left bank of the Jumna, picturesqnely situated among ravines, and richly planted with trees. Pop. 34,721. The district has an area of 1694 sq. miles, and a pop. of 722,371.

ETCHING, the art of producing designs upon a plate of steel or copper by means of lines drawn with an etching-needle (a fine-pointed steel tool), the lines being drawn through a coating or varnish (the ground), and bitten in by some strong acid which can only affect the plate where the varnish has been removed.

ETHELBERT, King of England, son of Ethelwulf, succeeded to the government of the eastern side of the kingdom in 857, and in 860, on the death of his brother Ethelbald, became sole king. He died in 866.

ETH'ELBERT, King of Kent, born about 560, died 616. He succeeded his father, Hermenric, and reduced all the Anglo-Saxon states, except Northumberland, to the condition of his dependants. Ethelbert was the first Anglo-Saxon king to draw up a code of laws.

ETH'ELRED I., King of England, son of Ethelwulf, succeeded his brother Ethelbert in 866. Ethelred died in consequence of a wound received in an action with the Danes in 871, and was succeeded by his brother Alfred.

ETHELRED II., King of England, son of Edgar, born 968, succeeded his brother, Edward the Martyr, in 978, and, for his want of vigor and capacity, was surnamed the Unready. He died at London in the midst of his struggle with Canute (1016).

ETH'ELWULF, King of England, succeeded his father, Egbert, about 837; died 857. He is best remembered for his donation to the clergy, which is often quoted as the origin of the system of tithes.

E'THER, a hypothetical medium of extreme tenuity and elasticity supposed to be diffused throughout all space (as well as among the molecules of which solid bodies are composed), and to be the medium of the transmission of light and heat.

ETHER, in chem. a very light, volatile and inflammable fluid, produced by the distillation of alcohol with sulphuric acid. It is lighter than alcohol, of a strong, sweet smell, susceptible of great expansion, and has a pungent taste. A mixture of vapor of ether with atmospheric air is extremely explosive. Ether produces an intoxication of short duration, and is sometimes used as an anæsthetic.

ETH'ICS, otherwise called Moral Philosophy or Morals, is the science which treats of the nature and laws of the actions of intelligent beings, considered as to whether they are right or wrong, good or bad. The science is more or less closely connected with theology, psychology, politics, political economy, and jurisprudence, but what most strictly belongs to it is the investigation of the principles and basis of duty or the moral law, and an inquiry into the nature and origin of the faculty by which duty is recognized. Various answers have been given to the question why we call an action good or bad, such as that it is consistent or not with the will of God, or with the nature of things, or with the greatest happiness of the greatest number, or that an inward faculty decides it to be such or such; and a great variety of ethical systems have been proposed. The foundations of the leading systems were laid in antiquity, the names of Socrates, Plato, Aristotle, Epicurus, the Cynics and the Stoics being especially prominent. The introduction of Christianity brought a new element into ethical speculation, and among Christians ethics were intimately associated with theology, and morality was regarded as based on and regulated by a definite code contained in the sacred writings. The speculations of the Greeks were not, however, disregarded, and some of the ablest Christian moralists (as Augustine, Peter Lombard, Erigena, Anselm, Aquinas, etc.) endeavored to harmonize the Greek theories with the Christian dogmatics.

Most modern ethical systems consider the subject as apart from theology and as based on independent philosophical principles, and they fall into one of two great classes—the utilitarian systems, which recognize as the chief good, happiness, or the greatest possible satisfaction of the tendencies of our nature; and the rationalistic systems, which recognize that ideas of law and obligation can have their source only in reason. The first of the modern school in England was Hobbes (1588–1679). Among subsequent names are those of Cudworth, Locke, Clarke, Shaftesbury, Butler, Hutchison, Hume, Adam Smith, Reid, Paley, Whewell, Bentham, J. S. Mill, etc. Among those who maintain the utilitarian theory of morals is Paley, who holds that men ought to act so as to further the greatest possible happiness of the race, because God wills the happiness of men, and rewards and punishes them according to their actions, the divine commands being ascertained from Scripture and the light of nature. Bentham's utilitarianism is considerably different from Paley's. It was entirely dissociated from theology or Scripture, and maintained that increase of happiness ought to be the sole object of the moralist and legislator, pleasure and pain being the sole test of actions. To utilitarianism as a special development belong the later "evolution ethics" represented by Mr. Herbert Spencer, in which biological conceptions, such as "the preservation of the human race," take the place of the Benthamite criterion for determining what is good and bad in actions. Another theory of ethics places the moral principal in the sentimental part of our nature, that is, in the direct sympathetic pleasure or sympathetic indignation we have with the impulses which prompt to action or expression. By means of this theory, which he treats as an original and inexplicable fact in human nature, Adam Smith explains all the phenomena of the moral consciousness. In considering the systems which recognize that the ideas of law and obligation can have their source only in reason, the question, what is the source of the laws by which reason governs, gives rise to a number of psychological theories among which we may notice Clarke's view of the moral principles as rational intuitions or axioms analogous to those of mathematics; Butler's theory of the natural authority of conscience; the position of Reid, Stewart, and other members of the later intuitional school, who conceive a moral faculty implanted in man which not only perceives the "rightness" or "moral obligation" of actions, but also impels the will to perform what is seen to be right. Very similar as far as classification goes, is the position of Kant, who holds that reason recognizes the immediate obligation of certain kinds of conduct, and that an action is only good when done from a good motive, and that this motive must be essentially different from a natural inclination of any kind.

ETHIOPIA, or **ÆTHIOPIA** (Hebrew, Cush), in ancient geography, the country lying to the south of Egypt, and comprehending the modern Nubia, Kordofan, Abyssinia, and other adjacent districts; but its limits were not clearly defined. In ancient times its history was closely connected with that of Egypt, and about the 8th century B.C. it imposed a dynasty on Lower Egypt, and acquired a predominant influence in the valley of the Nile. In sacred history Ethiopia is repeatedly mentioned as a powerful military kingdom (see particularly Isaiah xx. 5). In the 6th century B.C. the Persian Cambyses invaded Ethiopia; but the country maintained its independence till it became tributary to the Romans in the reign of Augustus. Subsequently Ethiopia came to be the designation of the country now known as Abyssinia, and the Abyssinian monarchs still call themselves rulers of Ethiopia.

ETHNOL'OGY AND ETHNOG'RAPHY, sciences treating of man, the former analyzing the social phenomena of mankind as shown in their customs, languages, institution, etc.; the latter being more concerned with descriptive details and the orderly collection of facts relating to particular tribes and localities. Besides these terms there is the term Anthropology, used by some to indicate the general science or natural history of mankind, of which the other two are parts. Here we can only give a few particulars bearing on the strictly ethnological and ethnographic divisions of the subject. (As to the place of man in the animal kingdom see Man.) The unity or plurality of species of the human race is a question which has given rise to much discussion. The most common view has probably been that which regards all mankind as descended from Adam and Eve, attributing the great differences exhibited by different races to climate and other causes acting for a long period of time. Many have held that such differences were not to be so accounted for and that the various typical races of the earth were not descended from a single pair, but were separately created in separate localities. The belief that man may have originated from a single pair is supported by the researches of Darwin, who has shown how an accumulation of differences amounting to the appearance of a distinct species may arise from continual modifications of a single primordial form. Certainly among men the variability of the same race under different climatic conditions is very striking. Even within a comparatively small period of time physical surroundings have induced typical differences between the lithe, sparsely-fleshed Yankee of New England and the plump, rosy-cheeked Englishman; and the Boer of South Africa, with its dry climate, has developed a type as decidedly different from his original stock in moist Holland. The theory of the development of the human race from a single species demands a vast duration of time; and the flint implements discovered intermingled with remains of the mammoth and other extinct animals have proved that man was a contemporary of the mammoth, the cave bear, and other mammalia of the geological period antecedent to our own, though how distant that period was as measured by thousands of years it is difficult to say. Another interesting point is in regard to the first home of the human race. This of course is quite uncertain, but probably it was either in western Asia or in Africa, and we may naturally conclude that where the mammalia of the highest characteristics appear there was the possible birthplace and center of distribution of mankind.

When we attempt to classify mankind we can scarcely find any one physical characteristic belonging exclusively to a single race. At most we can only say that certain characteristics are the preponderant ones in certain races. In seeking racial characteristics ethnologists make use of various principles of classification. Some give the first place to the shape of the head. Camper, the Dutch anatomist, was the first who attempted to make a scientific distinction of races on this principle, taking as the basis of measurement the amount of the facial angle. But Camper's method, though it illustrates excellently the great differences which exist, between, say, the anthropoid apes with an angle of 42°, the African negro with an angle of 70°, and the European with an angle of 80°, is without certainty, it being possible to find in the population of a single large town as wide variations of the facial angle as exist between distinct races. Camper's method was therefore superseded by the method of Blumenbach, which is based on consideration of all the chief distinctions in shape of the head according to which he classified the human family into five varieties: the Caucasian, Mongolian, Ethiopian, Malay and American. These five varieties were cut down to three by Cuvier, who treated the Malay and American as subdivisions of the Mongolian; and extended by Dr. Prichard, who divided the Caucasian class into a Semitic and an Aryan or Indo-European class. Latham's classification was into 1. Mongolidæ (Chinese, Turks, Malays, American races etc.); 2. Atlantidæ (African races, Jew and Arabs); 3. Japetidæ (Indo-Europeans). Among the later attempts made to find a new principle of classification we may mention that of Retzius, based on the relative length and breadth of the skull, according to which mankind are divided into Dolichocephalic or long-skulled and Brachycephalic or short, broad-skulled races. Later developments of craniology have introduced a third class, the Mesocephailic, representing a mean between the other two. The general rule for measurement is that the longitudinal diameter being rated as 100, the lateral diameter is expressed in a percentage of these units. If the index of breadth is from 74 to 78 the skull is termed mesocephalous; if below 74 it is dolichocephalous, a narrow or long skull; if it reaches 79 it is brachycephalous, a broad or short skull. The capacity of the brain cavity is also a favorite method with some ethnologists. Here the European stands highest with 92·1 cubic inches; the Australian lowest with 81·7. The character of hair and color of skin has always been used by Huxley as the basis of his classifications, which divides mankind into 1. Ulotrichi, crisp or woolly haired people with yellow or black skin, comprising Negroes, Bushmen, and Malays; 2. Leiotrichi, smooth-haired people, subdivided into Australioid, Mongoloid, Xanthochroic (fair

whites) and Melanochroic (dark whites) groups. But many ethnologists hesitate to accept a classification which brings together nations apparently unrelated, such as the Australians, the ancient Egyptians, and the tribes of southern India. On the other hand, the character of the hair is found to be one of the surest tests in separating neighboring races, such as the Papuan, and the Malayan and Australian tribes. Oscar Peschel's classification, based on a number of different particulars, such as the shape of the skull, the color of the skin, the nature and color of the hair, the shape of the features, etc., is as follows:

1. The Australians.—Characters: skull of the dolichocephalic type, the jaws being also prognathous or protruded. The nose is narrow at the root, widening greatly below. The mouth is wide and unshapely. The body is thickly covered with hair; the hair is black, elliptical in section, that on the head being frizzly, and standing out so as to form a shaggy crown. The color of the skin is dark as a rule, sometimes black, though a light copper-red also occurs.

2. The Papuans.—This race, which is the one most closely allied to the Australians, occupies New Guinea, New Caledonia, the Solomon Islands, New Hebrides, the Fiji Islands, etc. The most distinctive mark is their peculiarly flattened and abundant hair, growing in tufts, and forming a spreading crown round the head. The skin is always dark, the skull high and narrow (dolichocephalic); the jaws prognathous; the lips fleshy and somewhat swollen; the nose hooked somewhat after the Jewish type.

3. The Mongoloid Nations.—To this race belong the Polynesian and Asiatic Malays, the people of southeastern and eastern Asia, the Tibetese, all the Northern Asiatics, with their kinsmen in northern Europe, and lastly the aboriginal population of America. The common characteristics are: long straight hair, circular in section; almost complete absence of beard and body hair; skin dark-colored, varying from leather-yellow to deep brown, sometimes inclining to red; prominent cheek-bones, and eyes in general set obliquely. The various members of the Mongoloid race may be classed under the following subdivisions: (a) The Malay race, comprising the Malays of Malacca, Sumatra, Java, etc., the inhabitants of Madagascar, the New Zealanders, the natives of the Sandwich Islands, etc. (b) Southern Asiatics with monosyllabic languages, comprising the Chinese, Indo-Chinese (Burmese, Siamese, Anames, etc.), Tibetese, etc. (c) Coreans and Japanese. (d) Northern Mongoloids of the Old World, comprising the true Mongols, Turks, Finns, Lapps, Magyars, Bulgarians, etc., all much resembling the Chinese and Indo-Chinese group in physical characters. (e) Northern Nations of doubtful position.—The Yenisei Ostiakas, the Ainos of Yesso, the inhabitants of Saghalien, etc. (f) The Behring's Nations, of which the Esquimaux or Eskimo, are the most important. (g) The American Aborigines or Red Indian.

4. The Dravidians or Aborigines of India.—These tribes have the skin generally very dark, frequently quite black; their hair is long and black, not straight but crimped or curly; the hair of beard and body grows profusely; the lips are thick and fleshy, somewhat like those of the negroes, but the jaws are never prominent. The Dravidians comprise the Tamuls, Telugus, Gonds, Santals or Sonthals, etc.

5. The Hottentots and Bushmen.—These are tribes of little importance inhabiting South Africa. They have the hair tufted and matted, the beard scanty, the body almost hairless; the lips are full but not so much so as with the negroes; the nose is of the snub shape; the opening of the eyes is narrow but not oblique. They are slimly built, and the Bushmen are particularly low in stature; their color is yellowish or yellowish-brown.

6. The Negroes.—The negroes inhabit Africa from the southern margin of the Sahara to the territory of the Hottentots and Bushmen, and from the Atlantic to the Indian Ocean. They display great variety in external characteristics, and what is popularly considered the typical negro is rarely met with. The color of the skin passes through every graduation, from ebony-black to dark brown, copper-red, olive, or yellow. In some tribes the nose is straight, in others hooked, though often broad and flat. The hair of the head is generally short, elliptic in section, and much crimped; that on the body is not plentiful; whiskers are comparatively rare. The negroes may be divided into the Bantu negroes (including the Kaffirs, Bechuanas, etc.) and the Soudan negroes, these divisions being based on differences in language. It is in the Soudan region that the most typical members of the negro race are found.

7. The Mediterranean Nations.—These include all Europeans who are not Mongoloids, the north Africans, all western Asiatics, and the Hindus. Among them are the highest members of the human race. The northern nations have the skin quite fair; the southern have it darker; in North Africa and eastern Asia it becomes yellow, red, or brown. The nose has always a high bridge; prognathism and prominence of the jaws and cheek-bones are rare; the lips are never intumescent, and in no other race are refined and noble features so frequent. Subdivisions are: (a) The Hamites, comprising the ancient Egyptians, the Copts of Egypt and the Nubians, the Berbers and Gallas. (b) The Semites.—These comprise the Jews, Arabs, and Abyssinians, and the ancient Canaanites, Assyrians, Babylonians, and Phœnicians. (c) The Indo-European or Aryan family.—This family is divided into two branches, a European and an Asiatic. The European comprises the Germanic or Teutonic nations (English, Germans, Dutch, Danes, Norwegians, Swedes, etc.), the Romance nations (French, Italians, Spaniards, Portuguese), the Slavonians (Russians, Bohemians, Servians, etc.), the Greeks, and lastly the Celts. The Asiatic comprises the Hindus, Afghans, Persians, Armenians, and Kurds. (d) Europeans of doubtful position.—These include the Basques of the northeast of Spain and southwest of France and various tribes in the Caucasus.

ETH'YL, is the name given to the radicle which is contained in ether and alcohol. It is a colorless gas, which is liquefied by moderate cold and pressure, and which burns with a brilliant white flame.

ETH'YLAMINE, an organic base formed by the substitution of ethyl for all or part of the hydrogen of ammonia. It has the odor and many of the reactions of ammonia.

ETIENNE (ā-ti-ān), St., a town of southern France, dep. Loire, on the Furens, 32 miles s.w. of Lyons. The town stands in the center of one of the most valuable mineral fields of France; and in addition to the extensive collieries, blast-furnaces, and other ironworks in the vicinity, has manufactures of ribbons, silks, cutlery, firearms, etc. The collieries alone employ about 16,000 men. Pop. 1891, 133,443.

ETIQUETTE (et'i-ket), a collective term for the established ceremonies and usages of society, from the forms which are to be observed in particular places such as courts, levees, and public occasions, to the general forms of polite society. Among courts the Byzantine and Spanish courts, and the French court under Louis XIV. and XV., have been noted for the strictness of their etiquette. Social etiquette consists in so many minute observances that a tolerable familiarity with it can be acquired only by a considerable intercourse with polite society. It is often said that all that is necessary to constitute good social manners is common sense and good feeling; but not to mention those formal rules of society which, though intrinsically worthless, demand a certain amount of respect, there are also many difficulties and emergencies in social intercourse which require peculiar tact and delicacy of judgment. Hence quickness of sympathy and a certain fineness of observation are more needed for proficiency in this sphere than pure power of intellect.

ETNA, or Ætna Mount, the greatest volcano in Europe, a mountain in the province of Catania in Sicily; height 10,374 feet. It rises immediately from the sea, has a circumference of more

Etna.

than 100 miles, and dominates the whole northeast part of Sicily, having a number of towns and villages on its lower slopes. The top is covered with perpetual snow, midway down is the woody or forest region; at the foot is a region of orchards, vineyards, olive groves, etc. Etna thus presents the variety of cli-

mates common to high mountains in lower latitudes, oranges and lemons and other fruits growing at the foot, the vine rather higher up, then oaks, chestnuts, beeches, and pines, while on the loftiest or desert region vegetation is of quite a stunted character. A more or less distinct margin of cliff separates the mountain proper from the surrounding plain; and the whole mass seems formed of a series of superimposed mountains, the terminal volcano being surrounded by a number of cones, all of volcanic origin, and nearly 100 of which are of considerable size. The different aspects of the mountain present an astonishing variety of features—woods, forests, pastures, cultivated fields, bare rocky precipices, streams of lava, masses of ashes and scoriæ, as also picturesque towns and villages. From the summit the view presents a splendid panorama, embracing the whole of Sicily, the Lipari Islands, Malta, and Calabria. The eruptions of Etna have been numerous, and many of them destructive. That of 1169 overwhelmed Catania and buried 15,000 persons in the ruins. In 1669 the lava spread over the country for forty days, and 10,000 persons are estimated to have perished. In 1693 there was an earthquake during the eruption, when over 60,000 lives were lost. One eruption was in 1755, the year of the Lisbon earthquake. Among more recent eruptions are those of 1832, 1865, 1874, 1879. An eruption is ordinarily preceded by premonitory symptoms of longer or shorter duration.

ETRU'RIA, the name anciently given to that part of Italy which corresponded partly with the modern Tuscany, and was bounded by the Mediterranean, the Apennines, the river Magra, and the Tiber. The name of Tusci or Etrusci was used by the Romans to designate the race of people anciently inhabiting this country, but the name by which they called themselves was Rasena (or perhaps more correctly Ta-rasena). These Rasena entered Italy at a very early period from the north, and besides occupying Etruria proper, extended their influence to Campania, Elba, and Corsica. Etruria proper was in a flourishing condition before the foundation of Rome, 753 B.C. It was known very early as a confederation of twelve great cities, each of which formed a republic of itself. Among the chief were Veii, Clusium, Volsinii, Arretium, Cortona, Falerii, and Faesulae; but the list may have varied at different epochs. The chiefs of these republics were styled lucumones, and united the office of priest and general. They were elected for life. After a long struggle with Rome the Etruscan power was completely broken by the Romans in a series of victories, from the fall of Veii in 376 B.C. to the battle at the Vadimonian Lake (283 B.C.). The Etruscans had attained a high state of civilization. They carried on a flourishing commerce, and at one time were powerful at sea. They were less warlike than most of the nations around them, and had the custom of hiring mercenaries for their armies. Of the Etruscan language little is known, although more than 3000 inscriptions have been preserved. It was written in characters essentially the same as the ancient Greek; but philologists have not as yet been able to decide with what language it is connected, nor to agree in the decipherment of almost any inscription. The Etruscans were specially distinguished by their religious institutions and ceremonies, which reveal tendencies gloomy and mystical. Their gods were of two orders, the first nameless, mysterious deities, exercising a controlling influence in the background on the lower order of gods, who manage the affairs of the world. At the head of these is a diety resembling the Roman Jupiter (in Etruscan Tinia). But it is characteristic of the Etruscan religion that there is also a Vejovis or evil Jupiter. The Etruscan name of Venus was Turan, of Vulcan Sethlans, of Bacchus Phuphluns, of Mercury Turms. Etruscan art was in the main borrowed from Greece. For articles in terra-cotta, a material which they used mainly for ornamental tiles, sarcophagi, and statues Etruscans were especially celebrated. In the manufacture of pottery they had made great advances; but most of the painted vases popularly known as Etruscan are undoubtedly productions of Greek workmen. The skill of the Etruscans in works of metal is attested by ancient writers, and also by numerous extant specimens, such as necklaces, ear-rings, bracelets, etc. The bronze candelabra, of which many examples have been preserved, were eagerly sought after both in Greece and Rome. A peculiar manufacture was that of engraved

Etruscan sarcophagus in terra-cotta, from Chiusi; period of full development.—Museo Egizio, Florence.

bronze mirrors. These were polished on one side, and have on the other an engraved design, taken in most cases from Greek legend or mythology. The Etruscans showed great constructive and engineering skill. They were acquainted with the principle of the arch, and the massive ruins of the walls of their ancient cities still testify to the solidity of their constructions. Various arts and inventions were derived by the Romans from the Etruscans.

ETRUSCAN LANGUAGE. See Etruria.

ETRUSCAN VASES, a class of beautiful ancient painted vases made in Etruria, but not strictly speaking a product of Etruscan art, since they were really the productions of a ripe age of Greek art, the workmanship, subjects, style, and inscriptions being all Greek. They are elegant in form and enriched with bands of beautiful foliage and other ornaments, figures and similar subjects of a highly artistic character. One class has black figures and ornaments on a red ground—the natural color of the clay; another has the figures left of the natural color and the ground painted black. The former class belong to a date about 600 B.C., the latter date about a century

Etruscan vases.

later, and extend over a period of about 300 or 350 years, when the manufacture seems to have ceased. During this period there was much variety in the form and ornamentation, gold and other colors besides the primitive ones of black and red being frequently made use of. The subjects represented upon these vases frequently relate to heroic personages of the Greek mythology, but many scenes of an ordinary and even of a domestic character are depicted. The figures are usually in profile; temples are occasionally introduced; and many curious particulars may be learned from these vase pictures regarding the Hellenic ritual, games, festivities, and domestic life.

ETYMOL'OGY, a term applied (1) to that part of grammar which treats of the various inflections and modifications of words and shows how they are formed from simple roots; (2) to that branch of philology which traces the history of words from their origin to their latest form and meaning. Etymology in this latter sense, or the investigation of the origin and growth of words, is among the oldest of studies. Plato and other Greek philosophers, the Alexandrian grammarians, the scholiasts, the Roman Varro, and others wrote much on this subject. But their work is made up of conjectures at best ingenious rather than sound, and very often wild and fantastic. It was not till recent times, and particularly since the study of Sanskrit, that etymology has been scientifically studied. Languages then began to be properly classed in groups and families, and words were studied by a comparison of their growth and relationship in different languages. It was recognized that the development of language is not an arbitrary or accidental matter, but proceeds according to general laws. The result was a great advance in etymological knowledge and the formation of a new science of philology.

EUBŒ'A, formerly called Negropont, a Greek island, the second largest island of the Ægean Sea. It is 90 miles in length; 30 in greatest breadth, reduced at one point to 4 miles. The island was anciently divided among seven independent cities, the most important of which were Chalcis and Eretria, and its history is for the most part identical with that of those two cities. With some small islands it forms a modern nomarchy, with a pop. of 95,136.

EUCALYP'TUS, a genus of trees, mostly natives of Australia, and remarkable for their gigantic size, some of

them attaining the height of 480 or 500 feet. In the Australian colonies they are known by the name of gum-trees, from the gum which exudes from their trunks; and some of them have also such names as "stringy bark," "iron bark," etc. The wood is excellent for ship-

Blue gum-tree.

building and such purposes. The blue gum yields an essential oil which is valuable as a febrifuge, antiasthmatic, and antispasmodic; the medicinal properties of this tree also make it useful as a disinfectant, and as an astringent in affections of the respiratory passages, being employed in the form of an infusion, a decoction, or an extract, and cigarettes made of the leaves being also smoked. Two species have an excellent sanitary effect when planted in malarious districts such as the Roman Campagna, parts of which have already been reclaimed by their use. This result is partly brought about by the drainage of the soil (the trees absorbing great quantities of moisture), partly perhaps by the balsamic odor given out. The Eucalyptus has been introduced with success into India, Algiers, southern France, etc.

EUCHARIST (ū'ka-rist), a name for the sacrament of the Lord's supper, in reference to the blessing and thanksgiving which accompany it. See Lord's Supper.

EUCHRE (ū'kėr), a game of cards, played mostly by two of four persons. After cutting for the deal, five cards are dealt (either by twos and threes or by threes and twos) to each player. The uppermost card of those undealt is turned for trump. The first player has the option either to "order up" (i.e. to make this card trump) or "pass." In the latter case it is left to the next player to decide if he will play first or pass, and so on till the turn of the dealer comes, who must either play on this trump or turn it down, when all the players have again their choice in turn of making a new trump or passing. If a trump is "ordered up" or taken in the first round, the dealer may take it into his cards, discarding instead his poorest card. If the player who elects to play wins five tricks, he counts two; if he wins three tricks he counts one; if he wins fewer than three tricks he is euchred, and each independent opponent counts two. The cards rank as at whist, except that the knave of the trump suit, called the right bower (from Ger. bauer, a peasant), is the highest card, and the knave of the other suit of the same color the second highest.

EUCLID, of Alexandria, a distinguished Greek mathematician, who flourished about 300 B.C. His Elements of Geometry in thirteen books, are still extant, and form the most usual introduction to the study of geometry. The severity and accuracy of his methods of demonstration have as a whole never been surpassed. Besides the Elements, some other works are attributed to Euclid.

EUGENE (ū-jēn'), or **FRANCOIS EUGENE,** Prince of Savoy, fifth son of Eugéne Maurice, duke of Savoy-Carignan, and Olympia Mancini, a niece of Cardinal Mazarin, was born at Paris, Oct. 18, 1663. He entered the Austrian service in 1683, serving his first campaign as a volunteer against the Turks. On the outbreak of war between France and Austria he received the command of the imperial forces sent to Piedmont to act in conjunction with the troops of the Duke of Savoy. At the end of the war he was sent as commander-in-chief to Hungary, where he defeated the Turks at the battle of Zenta (Sept. 11, 1697).

Prince Eugene.

The Spanish war of succession brought Eugene again into the field. In northern Italy he outmaneuvered Catinat and Villeroi, defeating the latter at Cremona (1702). In 1703 he commanded the imperial army in Germany, and in cooperation with Marlborough frustrated the plans of France and her allies. In the battle of Höchstadt or Blenheim, Eugene and Marlborough defeated the French and Bavarians under Marshal Tallard, Aug. 13, 1704. Next year Eugene, returning to Italy, forced the French to raise the siege of Turin, and in one month drove them out of Italy. During the following years he fought on the Rhine, took Lille, and, in conjunction with Marlborough, defeated the French at Oudenarde (1708), and Malplaquet (1709), where he himself was dangerously wounded. In the war with Turkey, in 1716, Eugene defeated two superior armies at Peterwaradin and Temesvar, and, in 1717, took Belgrade, after having gained a decisive victory over a third army that came to its relief. He died in Vienna April 21, 1736. He was one of the great generals of modern times.

EUGENIE (eu-zhā-nē), Marie de Guzman, Ex-empress of the French, born at Granada in Spain in 1826. On Jan. 29, 1853, she became the wife of Napoleon III. and empress of the French. On March 16, 1856, a son was born of the marriage. When the war broke out with Germany she was appointed regent (July 27, 1870) during the absence of the emperor, but on the 4th Sept. the revolution forced her to flee from France. She went to England, where she was joined by the prince imperial and afterward by the emperor. On Jan. 9, 1873, the emperor died, and six years later the prince imperial was slain while with the English army in the Zulu war. In 1881 the empress transferred her residence to Farnborough in Hampshire.

EU'NUCH, a male of the human species emasculated by castration. The term is of Greek origin; but eunuchs became known to the Greeks no doubt from the practice among Eastern nations of having them as guardians of their women's apartments. Eunuchs were employed in somewhat similar duties among the Romans in the luxurious times of the empire, and under the Byzantine monarchs they were common. The Mohammedans still have them about their harems. Emasculation, when effected in early life, produces singular changes in males and assimilates them in some respects to women, causing them in particular to have the voice of a female. Hence, not so long ago, it was not uncommon in Italy to castrate boys in order to fit them for soprano singers when grown to manhood.

EUPHRA'TES, or **EL FRAT,** a celebrated river of western Asia, in Asiatic Turkey, having a double source in two streams rising in the Anti-Taurus range. Its total length is about 1750 miles, and the area of its basin 260,000 sq. miles. It flows mainly in a southeasterly course through the great alluvial plains of Babylonia and Chaldæa till it falls into the Persian Gulf by several mouths, of which only one in Persian territory is navigable. About 100 miles from its mouth it is joined by the Tigris, when the united streams take the name of Shatt-el-Arab. It is navigable for about 1200 miles, but navigation is somewhat impeded by rapids and shallows. The melting of snow in the Taurus and Anti-Taurus causes a flooding in spring. The water is highest in May and June, when the current, which rarely exceeds 3 miles an hour, rises to 5.

EURA'SIANS, a name sometimes given to the "half-castes" of India, the offspring of European fathers and Indian mothers. They are particularly common in the three presidential capitals—Calcutta, Madras, and Bombay. They generally receive a European education, and the young men are often engaged in government or mercantile offices. The girls in spite of their dark tint are generally very pretty and often marry Europeans.

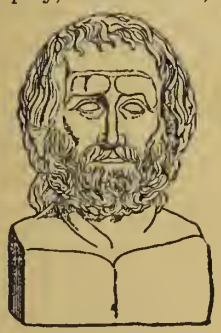
EURE (eur), a river of n.w. France, which rises in the department of the Orne, and falls into the Seine after a course of 124 miles, being navigable for about half the distance. It gives its name to a department in the n.w. of France, forming part of Normandy; area, 2300 sq. miles. Evreux is the capital. Pop. 349,471.

EURE-ET-LOIR (eur-ė-lwär), a department in the n.w. of France, forming part of the old provinces of Orléannais

and Ile-de-France; area, 2267 sq. miles. The department is essentially agricultural, and has few manufactures. The capital is Chartres. Pop. 284,683.

EURE'KA, (I have found it), the exclamation of Archimedes when, after long study, he discovered a method of detecting the amount of alloy in King Hiero's crown. Hence the word is used as an expression of triumph, as a discovery.

EURIP'IDES (-dēz), a celebrated Athenian tragedian, born B.C. 480, or, according to the Arundel marbles, 485, at Salamis. He began to write tragedies at the age of eighteen, although his first published play, the Peliades, appeared



Euripides.

only in 455 B.C. He was not successful in gaining the first prize till the year 441 B.C., and he continued to exhibit till 408 B.C., when he exhibited the Orestes. The violence of unscrupulous enemies, who accused him of impiety and unbelief in the gods, drove Euripides to take refuge at the court of Archelaus, king of Macedonia, where he was held in the highest honor. According to a tradition he was killed by hounds in 406 B.C. Euripides is a master of tragic situations and pathos, and shows much knowledge of human nature and skill in grouping characters, but his works lack the artistic completeness and the sublime earnestness that characterize Æschylus and Sophocles. Euripides is said to have composed seventy-five, or according to another authority ninety-two tragedies. Of these eighteen (or nineteen, including the Rhesus) are extant, viz.: Alcestis, Medea, Hippolytus, Hecuba, Heracleidæ Supplices, Ion, Hercules, Furens, Andromache, Troades, Electra, Helena, Iphigenia in Tauris, Orestes, Phœnissæ, Bacchæ, Iphigenia in Aulis, and Cyclops.

EURIPUS (ū-rī'pus), in ancient geography, the strait between the island of Eubœa and Bœotia in Greece.

EURO'PA, in Greek mythology, the daughter of Agēnor, king of the Phœnicians, and the sister of Cadmus. The fable relates that she was abducted by Jupiter, who for that occasion had assumed the form of a bull, and swam with his prize to the island of Crete. Here Europa bore to him Minos, Sarpēdon, and Rhadamanthus.

EUROPE, the smallest of the great continents, but the most important in the history of civilization for the last two thousand years. It forms a huge peninsula projecting from Asia, and is bounded on the n. by the Arctic Ocean; on the w. by the Atlantic Ocean; on the s. by the Mediterranean, the Black Sea, and the Caucasus range; on the east by the Caspian Sea, the Ural river, and the Ural mountains. The most northerly point on the mainland is Cape Nordkyn, in Lapland, in lat. 71° 6′; the most southerly points are Punta da Tarifa, lat. 36° n., in the Strait of Gibraltar, and Cape Matapan, lat. 36° 17′, which terminates Greece. The most westerly point is Cape Roca in Portugal, in lon. 9° 28′, w., while Ekaterinburg is in lon. 60° 36′ e. From Cape Matapan to North Cape is a direct distance of 2400 miles, from Cape St. Vincent to Ekaterinburg, northeast by east, 3400 miles; area of the continent, about 3,800,000 sq. miles. Great Britain and Ireland, Iceland, Nova Zembla, Corsica, Sardinia, Sicily, Malta, Crete, the Ionian and the Balearic islands are the chief islands of Europe. The shores are very much indented, giving Europe an immense length of coast-line (estimated at nearly 50,000 miles). The chief seas or arms of the sea are: the White Sea on the north; the North Sea or German Ocean on the west, from which branches off the great gulf or inland sea known as the Baltic; the English Channel, between England and France; the Mediterranean communicating with the Atlantic by the Strait of Gibraltar (at one point only 19 miles wide); the Adriatic and Archipelago, branching off from the Mediterranean; and the Black Sea, connected with the Archipelago through the Hellespont, Sea of Marmora, and Bosphorus.

The mountains form several distinct groups or systems of very different geological dates, the loftiest mountain masses being in the south central region. The Scandinavian mountains in the northwest, to which the great northern peninsula owes its form, extend above 900 miles from the Polar Sea to the south point of Norway. The highest summits are about 8000 feet. The Alps, the highest mountains in Europe (unless Mount Elbruz in the Caucasus is claimed as European), extend from the Mediterranean first in a northerly and then in an easterly direction, and attain their greatest elevation in Mont Blanc (15,781 feet), Monte Rosa, and other summits. Branching off from the Alps, though not geologically connected with them, are the Apennines, which run southeast through Italy, constituting the central ridge of the peninsula. The highest summit is Monte Corno (9541 feet). Mount Vesuvius, the celebrated volcano in the south of the peninsula, is quite distinct from the Apennines. By southeastern extensions the Alps are connected with the Balkan and the Despoto-Dagh of the southeastern peninsula of Europe. Among the mountains of southwestern Europe are several massive chains, the loftiest summits being in the Pyrenees, and in the Sierra Nevada in the south of the Iberian Peninsula. The highest point in the former, La Maladetta or Mont Maudit, has an elevation of 11,065 feet; Mulahacen, in the latter, is 11,703 feet, and capped by perpetual snow. West and northwest of the Alps are the Cevennes, Jura, and Vosges; north and northeast, the Harz, the Thüringerwald, Mountains, the Fichtelgebirge, the Erzgebirge and Böhmerwaldgebirge. Further to the east the Carpathian chain incloses the great plain of Hungary, attaining an elevation of 8000 or 8500 feet. The Ural Mountains between Europe and Asia reach the height of 5540 feet. Besides Vesuvius other two volcanoes are Etna in Sicily, and Hecla in Iceland. A great part of northern and eastern Europe is level. The great plain of north Europe occupies part of France, western and northern Belgium, Holland, the northern provinces of Germany, and the greater part of Russia. A large portion of this plain, extending through Holland and North Germany, is a low sandy level not unfrequently protected from inroads of the sea only by means of strong dykes. The other great plains of Europe are the plain of Lombardy (the most fertile district in Europe) and the plain of Hungary. Part of southern and southeastern Russia consists of steppes.

The main European watershed runs in a winding direction from southwest to northeast, at its northeastern extremity being of very slight elevation. From the Alps descend some of the largest of the European rivers, the Rhine, the Rhone, and the Po, while the Danube, a still greater stream, rises in the Black Forest north of the Alps. The Volga, which enters the Caspian Sea, an inland sheet without outlet, is the longest of European rivers, having a direct length of nearly 1700 miles, including windings 2400 miles. Into the Mediterranean flow the Ebro, the Rhone, and the Po; into the Black Sea, the Danube, Dnieper, Dniester, and Don (through the Sea of Azov); into the Atlantic, the Gaudalquiver, the Guadiana, the Tagus, and the Loire; into the English Channel, the Seine; into the North Sea, the Rhine, the Elbe; into the Baltic, the Oder, the Vistula, and the Duna; into the Arctic Ocean, the Dwina. The lakes of Europe may be divided into two groups, the southern and the northern. The former run along both sides of the Alps, and among them, on the north side, are the lakes of Geneva, Neuchâtel, Thun, Lucerne, Zürich, and Constance; on the south side, Lago Maggiore, and the lakes of Como, Lugano, Iseo, and Garda. The northern lakes extend across Sweden from west to east, and on the east side of the Baltic a number of lakes, stretching in the same direction across Finland on the borders of Russia, mark the continuation of the line of depression. It is in Russia that the largest European lakes are found—Lakes Lagoda and Onega.

The geological features of Europe are exceedingly varied. The older formations prevail in the northern part as compared with the southern half and the middle region. North of the latitude of Edinburgh and Moscow there is very little of the surface of more recent origin than the strata of the Upper Jura belonging to the mesozoic period, and there are vast tracts occupied either by eruptive rocks or one or other of the older sedimentary formations. Denmark and the portions of Germany adjoining belong to the Cretaceous period, as does also a large part of Russia between the Volga and the basin of the Dnieper. Middle and eastern Germany with Poland and the valley of the Dnieper present on the surface Eocene for-

mations of the tertiary period. The remainder of Europe is remarkable for the great diversity of its superficial structure rocks and deposits belonging to all periods being found within it, and having for the most part no great superficial extent. Europe possesses abundant stores of those minerals which are of most importance to man, such as coal and iron, Britain being particularly favored in this respect. Coal and iron are also obtained in France, Belgium, and Germany. Gold is found to an unimportant extent, and silver is widely spread in small quantities. The richest silver ores are in Norway, Spain, the Erzgebirge, and the Harz Mountains. Spain is also rich in quicksilver. Copper ores are abundant in the Ural Mountains, Thuringia, Cornwall, and Spain. Tin ores are found in Cornwall, the Erzgebirge, and Brittany.

Several circumstances concur to give Europe a climate peculiarly genial, such as its position almost wholly within the temperate zone, and the great extent of its maritime boundaries. Much benefit is also derived from the fact that its shores are exposed to the warm marine currents and warm winds from the southwest, which prevent the formation of ice on most of its northern shores. The eastern portion has a less favorable climate than the western. The extremes of temperature are greater, the summer being hotter and the winter colder, while the line of equal mean temperature decline south as we go east. The same advantages of mild and genial temperature which western has over eastern Europe, the continent collectively has over the rest of the Old World. The diminution of mean temperature, as well as the intensity of the opposite seasons, increases as we go east. Peking, in lat. 40° n., has as severe a winter as St. Petersburg in lat. 60°.

With respect to the vegetable kingdom Europe may be divided into four zones. The first, or most northern, is that of fir and birch. The birch reaches almost to North Cape; the fir ceases a degree further south. The cultivation of grain extends further north than might be supposed. Barley ripens even under the seventieth parallel of north latitude; wheat ceases at 64° in Norway, 62° in Sweden. Within this zone, the southern limit of which extends from lat. 64° n. Norway to lat. 62° in Russia, agriculture has little importance, its inhabitants being chiefly occupied with the care of reindeer or cattle, and in fishing. The next zone, which may be called that of the oak and beech, and cereal produce, extends from the limit above mentioned to the 48th parallel. The Alps, though beyond the limit, by reason of their elevation belong to this zone, in the moister parts of which cattle husbandry has been brought to perfection. Next we find the zone of the chestnut and vine, occupying the space between the 48th parallel and the mountain chains of southern Europe. Here the oak still flourishes, but the pine species become rarer. Rye, which characterizes the preceding zone on the continent, gives way to wheat, and in the southern portions of it to maize also. The fourth zone, comprehending the southern peninsulas, is that of the olive and evergreen woods. The orange flourishes in the southern portion of it, and rice is cultivated in a few spots in Italy and Spain.

As regards animals the reindeer and polar-bears are peculiar to the north. In the forest of Poland and Lithuania the urus, a species of wild ox, is still occasionally met with. Bears and wolves still inhabit the forests and mountains; but, in general, cultivation and population have expelled wild animals. The domesticated animals are nearly the same throughout. The ass and mule lose their size and beauty north of the Pyrenees and Alps. The Mediterranean Sea has many species of fish, but no great fishery; the northern seas, on the other hand, are annually filled with countless shoals of a few species, chiefly the herring, mackerel, cod, and salmon.

Europe is occupied by several different peoples or races, in many parts now greatly intermingled. The Celts once possessed the west of Europe from the Alps to the British Islands. But the Celtic nationalities were broken by the wave of Roman conquest, and the succeeding invasions of the Germanic tribes completed their political ruin. At the present day the Celtic language is spoken only in the Scotch Highlands (Gaelic), in some parts of Ireland (Irish), in Wales (Cymric), and in Brittany (Armorican). Next to the Celtic comes the Teutonic race, comprehending the Germanic and Scandinavian branches. The former includes the Germans, the Dutch, and the English. The Scandinavians are divided into Danes, Swedes, and Norwegians. To the east, in general, of the Teutonic race, though sometimes mixed with it, come the Slavonians, that is, the Russians, the Poles, the Czechs or Bohemians, the Servians, Croatians, etc. In the south and southeast of Europe are the Greek and Latin peoples, the latter comprising the Italians, French, Spanish, and Portuguese. All the above peoples are regarded as belonging to the Indo-European or Aryan stock. To the Mongolian stock belong the Turks, Finns, Lapps, and Magyars or Hungarians, all immigrants into Europe in comparatively recent times. The Basques at the western extremity of the Pyrenees are a people whose affinities have not yet been determined. The total population of Europe is about 330,000,000; nine-tenths speak the languages of the Indo-European family, the Teutonic group numbering about 108,000,000, the Slavonic and Latin over 95,000,000 each. The prevailing religion is the Christian, embracing the Roman Catholic, various sects of Protestants (Lutheran, Calvinistic, Anglican, Baptists, Methodists, etc.), and the Greek Church. A part of the inhabitants profess the Jewish, a part the Mohammedan religion

The states of Europe, with their respective areas and populations, are as shown below. In addition to those given in the table, there are also the insignificant states of Andorra, Monaco, and San Marino, which still maintain a kind of precarious independence.

States.	Area in Eng. Sq. Miles.	Population.	Designation.
Austria-Hungary	240,942	46,973,359	Empire.
Liechtenstein	62	9,124	Principality.
Bosnia, Herzegovina, etc	23,262	1,504,091	Annexed by Austria.
Belgium	11,373	7,074,910	Kingdom.
Denmark	14,789	2,484,770	Kingdom.
Faroe and Iceland	40,266	83,665	
France	204,090	39.118,995	Republic.
Germany	211,149	60,600,183	Empire.
Britain	120,832	41,606,177	Kingdom.
European Possessions	145	175,186	
Greece	25,014	2,433,806	Kingdom.
Netherlands	12,648	5,347,182	Kingdom.
Luxemburg	999	213,283	Grand-duchy.
Italy	114,410	32,475,253	Kingdom.
Montenegro	3,658	236,000	Principality.
Portugal	36,028	5,423,132	Kingdom.
Roumania	48.307	5,500,000	Kingdom
Russia	2,095,504	143,364,649	Empire.
Servia	18,800	2,493,691	Kingdom.
Spain	191,100	18,891,674	Kingdom.
Sweden	170,979	5,136,441	Kingdom.
Norway	122,869	2,240,032	Kingdom.
Switzerland	15,992	3,315,443	Confederative Republic.
Turkey	63,850	6,130,200	Empire.
Bulgaria	24,650	3,744,360	Principality.
Eastern Roumelia	13.500	.....	Joined to Bulgaria.

Europe was probably first peopled from Asia, but at what date we know not. The first authentic history begins in Greece at about 776 B.C. Greek civilization was at its most flourishing period about 430 B.C. After Greece came Rome which, by the early part of the Christian era, had conquered Spain, Greece, Gaul, Helvetia, Germany, between the Danube and the Alps, Illyria, Dacia, etc. Improved laws and superior arts of life spread with the Roman empire throughout Europe, and the unity of government was also extremely favorable to the extension of Christianity. With the decline of the Roman Empire a great change in the political constitution of Europe was produced by the universal migration of the northern nations. The Ostrogoths and Lombards settled in Italy, the Franks in France, the Visigoths in Spain, and the Anglo-Saxons in South Britain, reducing the inhabitants to subjection, or becoming incorporated with them. Under Charlemagne (771–814) a great Germanic empire was established, so extensively that the kingdom of France, Germany, Italy, Burgundy, Lorraine, and Navarre were afterward formed out of it. About this time the

northern and eastern nations of Europe began to exert an influence in the affairs of Europe. The Slavs, or Slavonians, founded kingdoms in Bohemia, Poland, Russia, and the north of Germany; the Magyars appeared in Hungary, and the Normans agitated all Europe, founding kingdoms and principalities in England, France, Sicily, and the East. The Crusades and the growth of the Ottoman power are among the principal events which influenced Europe from the 12th to 15th century. The conquest of Constantinople by the Turks (1453), by driving the learned Greeks from this city, gave a new impulse to letters in western Europe, which was carried onward by the invention of printing, and the Reformation. The discovery of America was followed by the temporary preponderance of Spain in Europe, and next of France. Subsequently Prussia and Russia gradually increased in territory and strength. The French revolution (1789) and the Napoleonic wars had a profound effect on Europe, the dissolution of the old German Empire being one of the results. Since then the most important events in European history have been the establishment of the independence of Greece; the disappearance of Poland as a separate state; the unification of Italy under Victor Emmanuel; the Franco-German war, resulting in the consolidation of Germany into an empire under the leadership of Prussia; and the partial dismemberment of the Turkish Empire.

EURYDICE (ū-rid'i-sē), in Greek mythology, the wife of Orpheus. See Orpheus.

EUSE'BIUS, the father of ecclesiastical history, a Greek writer, born in Palestine about 265 A.D., died about 340. About 315 he was appointed Bishop of Cæsarea. He became an advocate of the Arians and condemned the doctrines of Anthanasius. His ecclesiastical history extends from the birth of Christ to 324. Among his other extant works is a life of Constantine the Great.

EUS'TIS, James Biddle, an American lawyer, was born in New Orleans in 1834. During the civil war he served in the Confederate army as judge-advocate on the staffs of Generals Magruder and Johnston, and afterward was one of the commissioners sent by Louisiana to confer with President Johnson with regard to the "reconstruction" of that state. He served for several terms in the state legislature, and was afterward twice sent to the U. States senate, serving from 1877 to 1879, and again from 1885 to 1891. From 1879 to 1884 he was professor of civil law in the University of Louisiana, and from 1893 to 1899, after his second term in the senate, was U. States minister and first U. States ambassador to France. He died in 1899.

EUTHANASIA, (ū'thâ-nā'zhĭ-â), the use of narcotics or other means for shortening life, in disease, has become a subject of discussion in civilized countries; and it is often a very practical question as to how far such means are admissible for soothing the last hours of life, when the approach of death does not of itself dull the consciousness and the sensibility to pain. It must be decided according to all the surrounding circumstances, medical and otherwise, in each individual case.

EUXANTHINE, a substance supposed to be derived from the bile or urine of the buffalo,camel, or elephant. It comes from India under the name of purree or Indian yellow, and is used as a pigment.

EUX'INE, the ancient name for the Black Sea.

EVANGEL'ICAL, a term often used to qualify certain theological views, especially strict views on the question of the atonement, justification by faith, the inspiration and authority of the Scriptures and allied doctrines. In a more general sense the word implies a peculiar fervency and earnestness in insisting on such doctrines as regeneration, redemption, etc.

EVANGELICAL ALLIANCE, an association of members of different sections of the Christian church, organized in London in 1846, to lend its influence in favor of evangelical doctrines, religious union and liberty, and against superstition and unbelief. The alliance has branches throughout the world, the American branch being especially strong and has held meetings at Paris, Berlin, Amsterdam, Geneva, New York, etc.

EVAN'GELISTS, the writers of the history or doctrines, precepts, actions, life, and death of Christ; in particular, the four evangelists, Matthew, Mark, Luke, and John. The ancient symbols of the four evangelists are: for Matthew, a man's face; for Mark, a lion; for Luke, an ox; and for John, a flying eagle.

EVANS, Marian. See Eliot, George.

EV'ANS, Oliver, born at Newport, Del., in 1755, was the inventor of the automatic flour-mill and the high-pressure steam-engine. He died in New York, 21st April, 1819.

EVANS, Robley Dunglison, naval officer, born in Virginia in 1846. In the civil war he took part in both attacks on Fort Fisher, and was so seriously wounded that he was retired from active service. After his recovery he was restored to the service at his own request. During the Chilian imbroglio of 1891 he commanded the Yorktown; in 1896 he was put in command of the Indiana, and in 1898 was put in command of the Iowa, which was assigned to blockade duty off the coast of Cuba during the war with Spain, and which took a prominent part in the battle of July 3 near Santiago. In Oct., 1898, he was appointed a member of the board of inspection and survey. He published A Sailor's Log in 1901.

EV'ANSTON, a town in Illinois, on Lake Michigan, 12 miles n. of Chicago. It has a university with museum and extensive library. Pop. 25,620.

EV'ANSVILLE, a city in Indiana, pleasantly situated on a height above the Ohio. It contains some handsome buildings, including custom-house and post-office, etc. Coal and iron abound in the vicinity, and there are numerous factories, flour-mills, iron-foundries, etc., and a large shipping trade. Pop. 69,140.

EVAPORATION, the conversion of a liquid or solid by heat into vapor or steam, which becomes dissipated in the atmosphere in the manner of an elastic fluid. The process of evaporation is constantly going on at the surface of the earth, but principally at the surface of the sea, of lakes, rivers, and pools. The vapor thus formed, being specifically lighter than atmospheric air, rises to considerable heights above the earth's surface; and afterward, by a partial condensation, forms clouds, and finally descends in rain.

EVARTS, Wm. M., was born in Boston, in 1818. In 1868 was counsel for President Johnson in the impeachment trial. In 1872 was counsel for the U. States in the Alabama claims. His fees have amounted to $50,000 for a single opinion. He was secretary of state under President Hayes, and U. States senator from 1885 to 1891. He died 1901.

EVENING-STAR, or Hesperus, the name given to the planet Venus when visible in the evening. See Venus.

EVERETT, Edward, an American statesman and author, born at Dorchester, Massachusetts, April 11, 1794. After traveling for some years in Germany and England he returned to America in

Edward Everett.

1819 to occupy the chair of Greek literature at Harvard. He became editor of the North American Review, and entering the political world became successively member of Congress, governor of Massachusetts, and minister plenipotentiary in England (1840). In 1845 he was appointed president of Harvard College, and in 1852 secretary of state. Shortly after he retired into private life. He died at Boston, January 15, 1865.

EVERETT, a city in Middlesex co., Mass., adjoining Boston, Chelsea, and Malden, of which last it formed part until incorporated as a town in 1870. Pop. 29,625.

EVERGLADES, a low marshy tract of country in Southern Florida, inundated with water and interspersed with patches or portions covered with high grass and trees. They are 160 miles long and 60 broad.

EVERGREEN, a plant that retains its verdure through all the seasons, as the fir, the holly, the laurel, the cedar, the cypress, the juniper, the holm-oak, and many others. Evergreens shed their old leaves in the spring or summer, after the new foliage has been formed, and consequently are verdant through all the winter season. They form a considerable part of the shrubs commonly cultivated in gardens, and are beautiful at all seasons of the year.

EVERLASTING-FLOWERS, a name applied to certain plants which, when

dried, suffer little change in their appearance.

EV'EREST, MOUNT, the highest mountain of the earth; in the eastern range of the Himalayas, in Northern Nepaul; lat. 27° 59′ 12″ n., lon. 86° 58′ 6″ e. According to the measurement of Waugh in 1856, the altitude is 29,002 feet.

EVERSION OF THE EYELIDS, ectropium, a disease in which the eyelids are turned outward, so as to expose the red internal tunic. It occurs most frequently in the lower eyelid.

EVICTION, the dispossession of a person from the occupancy of lands or tenements. The term occurs most commonly in connection with the proceedings by which a landlord ejects his tenant for non-payment of rent or on determination of the tenancy. In the case of evictions of tenants in Ireland, generally for non-payment of rent, the tenants are frequently readmitted as caretakers, or under some other title.

EVIDENCE is that which makes evident, which enables the mind to see truth. It may be (a) intuitive, i. e. resting on the direct testimony of consciousness, of perception or memory, or on fundamental principles of the human intellect; or it may be (b) demonstrative i.e. in a strict sense, proofs which establish with certainty as in mathematical science certain conclusions; or it may be (c) probable, under which class are ranked moral evidence, legal evidence, and generally every kind of evidence which, though it may be sufficient to satisfy the mind, is not an absolutely certain and incontrovertible demonstration.

EVIDENCES OF CHRISTIANITY, these may be divided broadly into two great classes, viz. external evidences, or the body of historical testimonies to the Christian relation; and internal evidences, or arguments drawn from the nature of Christianity itself as exhibited in its teachings and effects, in favor of its divine origin. The first Christian apologies—those of Justin Martyr, Minucius Felix, and Tertullian, written in the 2d century—were mainly intended as justifications of the Christian religion against the charges of atheism, immorality, etc., commonly made at that time. Of a more philosophical kind and dealing more comprehensively with the principles of religion and belief in general, are the works of Origen, Arnobius, and Augustine in the centuries immediately succeeding. During the middle ages, the scientific representation of Christianity is mostly the work of the schoolmen occupied in welding Aristotelian or Platonic philosophy with the fabric of Christian dogmatics, or writing attacks on the Jewish and Mahommedan faiths.

EVIL EYE, a power which, according to an old and wide-spread superstition, resides in some people of doing injury to others by a mere look, or a look accompanied by certain words or charms. This belief, common among the ancients, is still prevalent among the more ignorant classes in Italy, Russia, Andalusia, Turkey, Egypt, the Highlands of Scotland, and other places.

EVOLUTION, a term used to denote (usually) the theory that all forms of life are derived from one or a few forms which, by gradual change, have been transmitted into the millions of forms we now see. The general idea of evolution was familiar to the ancients, but it was not until Goethe, Lamarck, and Kant suggested the cousinship of all living things that the idea of modern evolution arose.

The chief interest attaching to evolution in the popular mind dates from Darwin's work, "The Origin of Species," because it was seen that if Darwin's theory was true, man was not specially created by a deity but was descended in a straight line from an ape-like animal, and more remotely from still lower forms.

Darwin's theory is important not because it holds that man is thus descended, but because it was the first rational attempt to establish the doctrine of evolution on a scientific basis. The heart of Darwinism is the process he calls "natural selection." Organisms inherit their traits from their parents. But as a new generation is slightly different from the preceding generation, the individuals having favorable traits survive, while those who have not, perish. Thus the "unfit" are eliminated before they can propagate; and this process, going on for centuries or ages, produces the most divergent types. In this way millions of species have disappeared and the millions that survive are still changing their forms. It has been well said that before Darwin the living beings of the earth were as wax-figures in a museum. Darwin's suggestion imbued them with life and they began to move.

Since Darwin's time natural selection has been applied to the entire universe; to the survival of chemical elements, which, among themselves, are in a "struggle for existence"; to the evolution of star-clusters and planet-systems; to disease, to society, in a word to all the phenomena of being.

The doctrine of evolution as applied to man is of special interest. Man is the most highly organized member of the animal world. The endeavor has often been made in classification to separate man from the brute creation. One system, expressing a vast gap between the Quadrumana and man, classifies man in the order Bimana ("two-handed"), the highest division of the Mammalian class; and relegates the monkeys and apes to the lower and distinct order—that of the Quadrumana ("four-handed"). The more recent arrangements, however, classify man and the monkeys in one order, making man the highest family or group of this order. From the purely anatomical point of view the differences which separate the anthropoid apes from man are in some respects less than those which separate these higher apes from apes lower in the scale. But the mental or psychical endowments of man oblige us to remove him far above the highest Quadrumana; and even the characters by which he is anatomically separated from the highest apes form a very distinct and appreciable series. The first grand characteristic of man is his erect position and bipedal progression. The lower limbs, with the feet broad and plantigrade and the well-developed heel, are devoted exclusively to progression and supporting the weight of the body; while the upper limbs have nothing to do with progression, but subserve prehension entirely. The bones of the face in man do not project forward, while they are elongated in a downward direction; and the face and forehead are in the more civilized races situated nearly in the same plane, so that the face immediately underlies the brain. Similarly the development of a distinct chin is also a peculiarly human feature, and one which in the highest varieties of mankind becomes most marked. The great cranial capacity of man, or the greater size of the cranial or brain portion as compared with the facial portion of the skull, forms another noteworthy and distinctive character of the human form. The brain convolutions also are more numerous and complex than is the case with any other mammal. The teeth of man are arranged in a continuous series, and without any diastema or interval. The development of hair too is very partial. The gorilla presents of all the apes the nearest approach to the human type taken in its entirety; but it differs in the relative number of vertebræ (13 dorsal

Skeletons of the

GIBBON. ORANG. CHIMPANZEE. GORILLA. MAN.

Photographically reduced from Diagrams of the natural size (except that of the Gibbon, which was twice as large as nature), drawn by Mr Waterhouse Hawkins from specimens in the Museum of the Royal College of Surgeons.

and 4 lumbar, to 12 and 5 respectively in man), in the order of dental succession and in the presence of the interval or diastema, in the less prominent muscular development of the buttocks and calves, and in other minor differences. The orangs most closely approach man's structure in the number of ribs and in the form of the cerebrum, while they exhibit the greatest differences from him in the relative length of the limbs. The chimpanzees are most anthropoid in the shape of the cranium, in the arrangement and succession of the teeth, and in the length of the arms as compared with that of the legs. Of the higher apes the gibbons are those furthest removed from the human type of structure. Chief among the psychical features, or rather among the results of the operation of the principle of mind, we note the possession of the moral sense of right and wrong. The possession of an articulate language, by which he can communicate his thoughts, is also the exclusive possession of man, and draws a sharp line of separation between him and all other animals. With regard to the geological history of man, the earliest traces yet discovered belong to the Post-pliocene deposits in conjunction with existing species of shells and some extinct species of mammals. Man's advent upon the earth is consequently referred to a period much anterior to that which former limits and theological ideas prescribed. Among the modern theories regarding the origin of man may be noted those of (1) Darwin; that man is directly descended from an extinct form of anthropoid ape, with a tail and pointed ears, arboreal in its habits and an inhabitant of the Old World; further, that man has diverged into different races or subspecies, but that all the races agree in so many unimportant details of structure, and in so many mental peculiarities, that they can be accounted for only through inheritance from a common progenitor. (2) Wallace also affirms the original unity of man, and places him apart as not only the head and culminating point of the grand series of organic nature, but as, in some degree, a new and distinct order of being; maintaining that a superior intelligence has guided the development of man in a definite direction and for a special purpose, just as man guides the development of many animal and vegetable forms. (3) Carl Vogt holds a plurality of the race; adopts Darwin's idea of natural selection accounting for the origin and endowments of man, but rejects Wallace's idea of the higher controlling intelligence. (4) Mivart propounds a theory of a natural evolution of man as to his body, combined with a supernatural creation as to his soul.

EWALD (ā'vält), Johannes, Danish poet, born at Copenhagen in 1743. After studying theology at Copenhagen University he ran away and enlisted in the Prussian service, which he soon deserted for the Austrian. Having returned to Copenhagen an elegy which he wrote on the death of Frederick V., of Denmark was received with general admiration, and awoke in himself the consciousness of poetic talent. His reputation rapidly increased with the publication of his tragedies, The Death of Balder, Adam and Eve, Rolfkrage, etc.; and his odes and songs.

EWELL, Benjamin Stoddert, American educator, born in Washington, D. C., in 1810. He was professor of mathematics at Hampden-Sidney College in 1839–1846 and filled a similar chair at Washington University in 1854, and William and Mary College of which he became president in 1854. He was in command of the 32nd regiment Virginia Volunteers from 1861–2 and adjutant-general of the confederate army on the staff of Gen. Joseph E. Johnston when he was commander of the department of Tennessee and Mississippi. He died in 1883.

EWELL, Richard Stoddert, American soldier, born in Georgetown, D. C., in 1817. He served during the Mexican war with Scott from Vera Cruz to the City of Mexico. He was actively engaged on the side of the confederacy during the civil war and attained the rank of lieutenant-general. He was placed in command of the second corps of Gen. Lee's army upon the death of "Stonewall" Jackson. He led the charge of the corps at the capture of Winchester, at Gettysburg, the Wilderness and, Spottsylvania Court House. He died in 1872.

EWING, Thos., statesman, was born in Ohio co., Va., in 1789. In 1831 and 1850 was elected to the U. States senate. In 1841 appointed Secretary of the Treasury. In 1849 was made the first secretary of the interior. He died in 1871.

EX'CELLENCY, a title given to ambassadors and plenipotentiaries, governors of colonies, the president of the United States, etc.

EXCELSIOR, a material widely used for packing and as stuffing in mattresses and upholstery. It is made from logs of wood that have been divided into 18 inch blocks. The fibers are separated from the blocks by knife-points and packed in bales of 250 pounds weight. About 45,000 tons are manufactured annually in the U. States of which large quantities are exported.

EXCHANGE, a place in large commercial towns where merchants, agents, bankers, brokers, and others concerned in commercial affairs meet at certain times for the transaction of business. The institution of exchanges dates from the 16th century. They originated in the important trading cities of Italy, Germany, and the Netherlands, from which last-named country they were introduced into England. In some exchanges only a special class of business is transacted. Thus there are stock exchanges, corn exchanges, coal exchanges, cotton exchanges, etc.

EXCHANGE, in commerce, that species of transactions by which the debts of individuals residing at a distance are canceled by order, draft, or bill of exchange, without the transmission of specie. The process of liquidating obligations between different nations is carried on in the same way by an exchange of foreign bills. When all the accounts of one country correspond in value with those of another, so that there is an even balance, the exchange between the countries will be at par, that is, the sum for which the bill is drawn in the one country will be the exact value of it in the other. Exchange is said to be at par when, for instance, a bill drawn in New York for the payment of $500 in London can be purchased there for $500. If it can be purchased for less, exchange is under par and is against London. If the purchaser is obliged to give more, exchange is above par and in favor of London. Although the thousand circumstances which incessantly affect the state of debt and credit prevent the ordinary course of exchange from being almost ever precisely at par, its fluctuations are confined within narrow limits, and if direct exchange is unfavorable between two countries this can often be obviated by the interposition of bills drawn on other countries where an opposite state of matters prevails. See also Bill of Exchange.

EXCHEQ'UER, in Britain, the department which deals with the moneys received and paid on behalf of the public services of the country. The public revenues are paid into the Bank of England (or of Ireland) to account of the exchequer, and these receipts as well as the necessary payments for the public service are under the supervision of an important official called the controller and auditor general, the payments being granted by him on receipt of the proper orders proceeding through the treasury. The public accounts are also audited in his department.

EXCISE', an inland duty or impost laid on commodities produced and consumed within a country, and also on licenses to manufacture and deal in certain commodities.

EXCOMMUNICATION, the exclusion of a Christian from the communion and spiritual privileges of the church. Excommunication was practiced early by the Christian church. A distinction gradually arose between a lesser and a greater excommunication, the former being a suspension from church privileges, the latter a formal expulsion excluding from all communion with the faithful. In the middle ages the pope often excommunicated whole cities and kingdoms. In such a case all religious services ceased and the grave inconveniences thus caused made excommunication a formidable weapon in the hands of the pope, till with frequent abuse it lost its force. Besides excommunication an extreme degree of denunciation called anathema, and cutting the offender off from all the hopes and consolations of the Christian faith, is used in the Roman Catholic Church. In the Church of England both the less and the greater excommunication are recognized.

EXCRE'TION, in physiology, the separation and carrying off of waste matter from an animal body, a function performed by the lungs, kidneys, bladder, and the skin, besides the action of the intestinal canal.

EXECUTION, in law, is a judicial writ grounded on a judgment of the court by which the writ is issued, and is granted for the purpose of carrying the judgment into effect, by having it executed. Exe-

cution is granted by a court only upon the judgments given by the same court, not upon those pronounced by another.

EXECUTIONER, the official who carries into effect a sentence of death, or inflicts capital punishment in pursuance of a legal warrant. In England the duty of executing the extreme sentence of the law devolves upon the sheriff, and in Scotland on the civic magistracy, but in practice the duty is performed by another in their presence. In the U. States the duty devolves upon the sheriff.

EXEC'UTIVE, that branch of the government of a country by which the laws are carried into effect or the enforcement of them superintended. The term is used in distinction from the legislative and the judicial departments, and includes, the supreme magistrate whether emperor, king, president, or governor, his cabinet or ministers, and a host of minor officials.

EXEC'UTOR, in law, is one appointed by a man's last will to carry its provisions into execution after the testator's death. The testator may, by the common law, appoint any person of sound mind and discretion, though otherwise under some legal disabilities as to contracting and transacting business in general, such as a married woman, or a minor. The duties of executors and of administrators are, in general, the same, the difference of the two depending mostly on the mode of appointment, the executor being nominated by the testator, the administrator being appointed by the judge of probate. An executor is liable for any loss occurring to the estate through negligence; for paying legatees before all debts are discharged.

EXEGESIS (-jē'sis), the exposition or interpretation of the Scriptures. The science which lays down the principles of the art of sacred interpretation is called exegetics or hermeneutics.

EX'ETER, a city, river-port, and parliamentary and municipal borough of England, in the county of Devon, on the left bank of the Exe, 10 miles northwest from its outlet in the English Channel. By means of a canal vessels of 300 tons can reach the city. The largest vessels remain at Exmouth. Exeter is a place of remote antiquity, having been a British settlement long prior to the invasion of the Romans, Pop. 37,580.

EXHIBITION, Industrial, an exhibition of works of industry and art for the purpose of exciting public interest and promoting trade and manufactures. In 1798 an industrial exhibition of the products of French industry was held at Paris, and proved so successful that in 1802, during the consulate of Napoleon, another was held. The beneficial effects of these exhibitions were so obvious that a series of them was held at intervals, the eleventh and last being held at Paris in 1849. In Britain exhibitions of a more or less local nature had been held in Dublin (1829), Manchester, Liverpool, and Birmingham, and annually in London in the premises of the Society of Arts. All these had been generally successful, but the necessity of holding one on an international scale was first brought fairly before the public in 1848 by Prince Albert. A vast structure of iron and glass, the design of Joseph Paxton, was erected in Hyde Park, London, and was opened by Queen Victoria on the 1st of May, 1851. The entire area was about 19 acres; the number of exhibitors reached 15,000. In 1855 the first French Exposition Universelle was opened in Paris. The buildings were erected in the Champs Elysées, and covered about 24 acres. There were in all about 24,000 exhibitors. This was followed by the national exhibitions of the Dutch at Haarlem and the Belgians at Brussels, both in 1861, and the following year by the second great international exhibition held in London. The second French International Exhibition was opened on the 1st April, 1867, and closed on the 3d November. It was erected on the Champ de Mars, and covered about 37 acres. The exhibitors numbered nearly 50,000, the visitors about 10,000,000. In 1873 the first Austrian international exhibition was held in Vienna. A great exhibition was held at Philadelphia in 1876 upon the occasion of the centennial festival of the American declaration of independence. It occupied 60 acres, and had nearly 10,000,000 visitors. A third French International Exhibition was held at Paris in 1878, the area occupied amounting in all to 140 acres, the visitors numbering about 17,000,000. A fourth was held in 1889, the latter being partly intended to commemorate the centenary of the French Revolution. One of the features in connection with it is the famous Eiffel Tower of iron, 984 feet high, and thus more than 400 feet higher than any other structure. In 1883 a series of exhibitions began at South Kensington, London, where the exhibits were confined to articles having relation to a special department. To this series belonged The Fisheries Exhibition of 1883, the Health Exhibition of 1884, the Exhibitions of Inventions in 1885 and the Exhibition of Colonial and Indian Products in 1886. This latter was visited by 5,550,749 persons. Besides these Edinburgh had an International Exhibition of Industry, Science, and Arts in 1886, visited by 2,769,632 persons. In 1887 a Royal Jubilee Exhibition of Arts and Manufactures was opened at Manchester, and was visited by 4,765,000 persons In the following year a great International Exhibition of Industry, Science, and Art was held at Glasgow, and attracted during the season 5,748,379 visitors. In 1892–93 an International Exhibition of majestic proportions was held in Chicago, Illinois, to commemorate the 400th anniversary of the discovery of America. The total number of visitors was 27,539,521. This exhibition presented the finest examples of architectural beauty and grandeur ever seen on earth. Other notable exhibitions in the U. S. were the California Mid-Winter Exhibition in San Francisco in 1894; The Cotton States and Industrial Exposition in Atlanta, Ga., in 1895; the Tennessee Centennial Exposition in Nashville in 1897. In 1898 the Trans-Mississippi Exposition at Omaha, Neb., was unqualifiedly successful. In 1899 a National Export Exposition was held in Philadelphia, which resulted in a great increase of foreign trade. The Pan-American Exposition in Buffalo to celebrate the achievements of the Western Hemisphere during one hundred years, and to promote commerce among the Pan-American countries, was opened May 1 and closed Nov. 1, 1901. The site occupied 350 acres. The South Carolina Inter-State and West Indian Exposition in Charleston in 1901-02, the World's Fair in St. Louis in 1904 in celebration of the Louisiana purchase. The French held a great International Exposition at Paris, 1900, which, in the number of admissions, was far in excess of any similar affair. This was opened by President Loubet, April 14, and closed Nov. 12.

EXILE, the condition of a person who either voluntarily or by penal sentence absents himself from his own country in order to escape the consequences to life, liberty, or property that residence at home would bring with it; also, the person who so absents himself. Exile is as a punishment unknown to English law, unless it be in the form of transportation by act of Parliament, or as a condition of release by the executive from a capital or other severe punishment.

Free countries, unless overawed by superior power, have generally given refuge to political exiles, and seldom have they delivered them up on demand from the exile's country. This was the boast of Athens, which Demosthenes calls the common place of refuge for Greece; he also pronounces it to be the common usage of all men to give shelter to an exile. The connection of the exile with his native land of course ceases. The jurisdiction over him depends on the laws of the land where he is domiciled. If, as sometimes happens, he engages in plots with accomplices in his native country, he is amenable to the law of his domicile for any criminal acts he may commit within its jurisdiction. Such a person is sometimes demanded by the authorities of his original home, in order to be proceeded against by its laws and modes of trial. But a free country will refuse to surrender its territorial rights in such cases.

EXMOUTH, Edward Pellew, Viscount, a British naval officer, born in 1757. He went to sea at the age of thirteen, served as midshipman in the Blond frigate during the American war, and greatly distinguished himself at Lake Champlain. In 1804 we was sent to take the chief command on the East Indian

Viscount Exmouth.

station, in the Culloden, of seventy-four guns; and here he remained till 1809, when he had attained the rank of vice-admiral. In 1816 he proceeded to Algiers in command of a combined fleet of twenty-five English and Dutch ships to enforce the terms of a treaty regarding the abolition of Christian slavery which the dey had isolated. He bombarded the city for seven hours, and inflicted such immense damage that the dey consented to every demand. Twelve hundred Christian slaves were by this exploit restored to liberty. Lord Exmouth was raised to the dignity of a viscount for this service. He died in 1833.

EX'ODUS, the name given in the Septuagint to the second book of the Pentateuch, because it describes the departure of the Israelites from Egypt. The contents of the book are partly historical describing the departure of the Israelites from Egypt, and partly legislative, describing the promulgation of the Sinaiti law. One of the difficulties connected with this book is that, according to Scriptural chronology, the residence of the Israelites in Egypt was only 215 years, and it seems incredible that in this time "the threescore and ten souls" who accompanied Jacob to Egypt could have become the two and a half millions who left with Moses.

EXOGENOUS PLANTS (eks-oj'e-nus), or **EXOGENS,** those plants whose stems are formed by successive additions to the outside. The exogens are the largest primary class of plants in the vegetable kingdom, and their increase by annual additions of new layers to the outside of

Exogenous plants.

1, Section of a branch of three years' growth. *a*, Medulla or pith. *b*, Medullary sheath. *e e*, Medullary rays. *c c*, Circles of annual growth. *d*, Bark. 2, Netted veined leaf of exogen (Oak). 3, Dicotyledonous seed of exogen. *a a*, Cotyledons. 4, Germination of dicotyledonous seed. *a a*, Seed-leaves of cotyledons. *o*, Plumula. 5, Exogenous flower (crowfoot).

their stems, formed in the cambium between the wood and the bark, is a feature in which they differ essentially from endogens, whose wood is formed by successive augmentations from the inside. The concentric circles thus annually formed, distinguishable even in the oldest trees, aid in computing the age of the tree. The stem and branches also exhibit a central pith and medullary rays extending outwards to the bark. All the trees of cold climates, and the principal part of those in hot, are exogenous, and are readily distinguished from those that are endogenous by the reticulated venation of their leaves, and by their seeds having two cotyledons (dicotyledonous). The parts of the flower are generally in fours or fives.

EX'ORCISM, the casting out of evil spirits by certain forms of words or ceremonies. An opinion prevailed in the ancient church that certain persons, those particularly who were afflicted with certain diseases, especially madness and epilepsy, were possessed by evil spirits. Over such persons forms of conjuration were pronounced, and this act was called exorcism. There were even certain men who made this a regular profession, and were called exorcists. Exorcism still makes a part of the beliefs of some churches. In the Roman Catholic Church exorcist is one of the inferior orders of the clergy.

EXOT'IC, belonging to foreign countries; a term used especially of plants. Exotic plants are such as belong to a soil and climate entirely different from the place where they are raised. They are nearly always greenhouse or hothouse plants.

EXPANSION, in physics, is the enlargement or increase in the bulk of bodies, in consequence of a change in their temperature. This is one of the most general effects of heat, being common to all bodies whatever, whether solid or fluid. The expansion of fluids varies considerably, but, in general, the denser the fluid, the less the expansion; thus water expands more than mercury, and spirits of wine more than water; and, commonly, the greater the heat, the greater the expansion; but this is not universal, for there are cases in which expansion is produced, not by an increase, but by a diminution of temperature. Water, in cooling, ceases to contract at 42° F.; and at about 39°, just before it reaches the freezing point (32°), it begins to expand again, and more and more rapidly as the freezing point is reached. This expansion is about one-eleventh of its bulk, and accounts for the bursting of pipes, etc., when water is freezing in them.

EX PARTE, a title frequently used in legal proceedings. If Black is adjudged bankrupt the title of the bankruptcy proceedings is In re Black; and if a creditor named Smith makes an application in the cause for an order or determination in his behalf, his proceeding is entitled, Ex parte Smith in re Black. So if Jones applied for leave to sue on official bond this preliminary proceeding is entitled Ex parte Jones. The term is also used to describe the application or proceeding itself: Statements made in a judicial proceeding under such circumstances that the opposite party has no opportunity to challenge their accuracy are often spoken of as ex parte.

EXPATRIATION, the voluntary abandonment of one's native country with the intention of becoming a citizen of another state. The right of a person to throw off the obligation of allegiance has been denied by eminent writers and some governments. The true view would seem to be that the power to determine when the allegiance of the citizen may cease belongs to the state of which he is a member, rather than to himself. At the same time the freedom of intercourse between nations in modern times and the interests of civilization require that the various nations should provide liberal rules by which at proper times the relation of the citizen to the state may cease, and the individual, freed from the ties of burdensome allegiance, may assume another citizenship if he so desire.

EXPECTATION, in the doctrine of chances, the value of any prospect of prize or property depending upon the happening of some uncertain event. A sum of money in expectation upon a certain event has a determinate value before that event happens. If the chances of receiving or not receiving a hundred pounds, when an event arrives, are equal; then, before the arrival of the event the expectation is worth half the money.—Expectation of life, the probable duration of the life of individuals of any given age. A rough estimate of anyone's expectation of life is made by calculating two-thirds of the difference between his or her present age and eighty.

EXPEC'TORANTS, in pharmacy, medicines which favor the discharge of mucus from the windpipe and air-passages of the lungs. Such are the stimulating gums and resins, squills, ipecacuanha, etc.

EXPER'IMENT, an operation designed to discover some unknown truth, principle, of effect, or to establish it when discovered. It differs from observation in the fact that the phenomena observed are, to a greater or less extent, controlled by human agency. Experiment distinguishes the modern method of investigating nature, and to it we owe the rapid strides made in chemistry, physics, etc.

EXPERT, a person eminently skilled in any particular branch or profession; specifically a scientific or professional witness who gives evidence on matters connected with his profession, as an analytical chemist or a person skilled in handwriting.

EXPERT TESTIMONY, in law, the testimony of expert witnesses, or, as they are commonly called, experts. The function of an expert witness is to examine a real or supposed case of facts and interpret them. They are called to give their testimony because, by reason of their special knowledge or skill in the matter in question, they are able to interpret or give accurate opinions concerning them where other men would not be qualified so to do. Their function is to give their opinions or judgments merely as witnesses of a matter of fact, actual or supposititious, presented to them, to aid the final judges of fact (the court or jury, as the case may be), but not to bind them. Notwithstanding the opinion either one way or the other of the expert witness employed to testify in any matter or proceeding at law, the final judgment as to the actual facts of the case, which shall be binding upon the parties to the litigation or proceeding, if for the jury, judge, or referee, as the case may be. The expert witness judges of the relation of the phenomena which he sees or perceives by his senses to the general rules of the science or art in which he is skilled or learned; but he has no part in the judgment as to the relation of the facts involved in the case to legal rules. He usually states what in his opinion would be a fact upon the supposition that certain other facts are true.

EXPLO'SION, a sudden bursting, generally due to the rapid production of

gaseous matter from solids to liquids. Thus the explosion of gunpowder is due to the sudden formation and expansion of gases into which the powder is converted by chemical agency. Explosions are often caused by the elastic force of steam confined in boilers, etc.

EXPLO'SIVES, are compounds practically available in war, in mining, and in general use for the sudden development of immense force. They comprise gunpowder, gun-cotton, nitro-glycerine with its compounds dynamite, litho-fracteur, etc.

EX POST FACTO, in law, by something done after and bearing upon something previously done; thus a law is said to be ex post facto, or retrospective, when it is exacted to punish an offense committed before the passing of the law.

EXPRESS', a special message, messenger, or conveyance, sent on a particular occasion. The name is given to any regular provision made for the speedy transmission of messages, parcels, commissions, and the like; and particularly to a railway train which travels at specially high rate of speed, stopping only at the principal stations.

EXPRESS, (1) Fast passenger service. The minimum standard of express trains in the U. States is about 40 miles an hour. An express on the New York Central road, running from New York to Buffalo, makes 440 miles in 6 hours and forty-seven minutes. On the Lake Shore and Michigan Southern, Buffalo to Chicago, 525 miles in seven hours and fifty minutes.

(2) Arrangements for fast conveyance of parcels. In continental Europe this service is performed by the post-office; in the United Kingdom mainly by the railways themselves, though the parcels-post is also well developed; in North America by companies specially organized for the purpose. The parcels express business was started by W. F. Harnden between Boston and New York in 1839, this forming the beginning out of which the Adams Express Company ultimately grew. The Wells-Fargo Express was started in 1845, and the American Express some five years later. Besides these the most important companies are the United States and the Southern.

EXPRESSED OILS, in chemistry, are those which are obtainable from bodies only by pressing, to distinguish them from mineral and essential oils, which last are, for the most part, obtained by distillation.

EX'TRACT, a term to denote all that can be dissolved out of a substance by a specified menstruum, such as water, alcohol, ether, etc. In modern pharmacy the term is applied to two kinds of preparation from vegetables. One is got by digesting the plant in water or other solvent, and evaporating or distilling away the excess of solvent until the extracted matter is sufficiently inspissated. The other is got by bruising the plant in a mortar, separating the juice, warming it until the green coloring matter separates, and filtering it off. The juice is next heated until the albumen coagulates, and again filtered. The juice is now evaporated to a syrup, the green coloring matter added and well mixed, and the evaporation is thereafter continued until the required concentration is attained. Extracts must be capable of being redissolved, so as to form a solution like that from which they were derived. Extracts are used in cookery, medicine, and the manufacture of perfumery.

EXTRACT OF MEAT, a preparation of beef, and sometimes of mutton, or of both combined, in which the muscular fiber, fat, and gelatin are removed, and the highly nitrogenous elements preserved and condensed into a semi-solid mass of about the consistence of ordinary butter. Most of what is sold in Europe and the U. States comes from Buenos Ayres, where its manufacture was first established under the supervision of the chemist Liebig.

Extract of meat is of variable quality and composition, and at the best but imperfectly represents the beef it was made from; some forms of it are stimulants merely. Nevertheless, it is useful in preparing soups, and especially in nourishing those who are sick of low fevers, pyæmia, and other like diseases.

EXTRADI'TION, the act by which a person accused of a crime is given up by the government in whose territories he has taken refuge to the government of which he is a subject. Treaties have been entered into by the U. States with almost all civilized countries for the apprehension and extradition of persons charged with particular offenses, such as murder, robbery, embezzlement by public officers, arson, rape, piracy, etc. The constitution of the U. States provides that "a person charged in any state with treason, felony, or other crime, who shall flee from justice and be found in another state, shall, on demand of the executive authority of the state from which he fled, be delivered up to be removed to the state having jurisdiction of the crime."

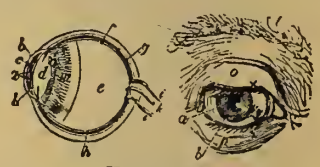
EXTRAVAGAN'ZA, in music, the drama, etc., a species of composition designed to produce effect by its wild irregularity and incoherence; differing from a burlesque in being an original composition and not a mere travesty.

EXTREME UNCTION has been, since the 12th century, one of the seven sacraments of the Catholic Church. It is performed in cases of mortal disease by anointing in the form of a cross, the eyes, ears, nose, mouth, hands, feet, and reins (in the case of males). It is administered after confession and the eucharist, and is believed to remove the last stains of sin. It can only be administered by a bishop or priest, and is not applied in the case of young children or excommunicated persons.

EXTREMITIES, the limbs, as distinguishing them from the other divisions of the animal, the head and trunk. The extremities are four in number, in man named upper and lower; in other animals anterior and posterior.

EYCK (īk), Hubert and Jan van, brothers, famous painters of the old Flemish school, born at Maaseyck, Hubert in 1366, Jan probably about 1390. They lived first at Bruges, whence the younger brother is called John of Bruges, and afterwards at Ghent, to which they removed about 1420. Here they executed the celebrated Adoration of the Lamb for the cathedral of Ghent; a painting which, in its different parts, contains above three hundred figures, and is a masterpiece. It was in two horizontal divisions, comprising ten panels, of which only the two central ones remain at Ghent, the others being at Berlin. Hubert did not live to see it completed. He died at Ghent (1426), as did also his sister Margaret, who was likewise a painter (1431). Jan finished the work in 1432, and returned to Bruges, where he remained till his death, which took place in 1441, and executed several excellent pieces. His reputation became very great even during his lifetime, by his share in the introduction of oil-painting, the original invention of which has been incorrectly ascribed to him by many. Jan van Eyck also introduced improvements in linear and aerial perspective, and in painting upon glass.

EYE, the visual apparatus of animals, consisting in man of the globe of the eye, the muscles which move it, and of its appendages, which are the eyelids and eyebrows, and the lachrymal apparatus. The walls of the globe of the eye are formed principally of two fibrous membranes; one white and opaque—the sclerotic (Gr. skleros, hard)—which envelops two-thirds of the globe posteriorly; and the other transparent, and resembling a horny plate, whence its name, cornea (Lat. corneus, horny). The sclerotic is a tough fibrous coat, and is the part to which the phrase "white of



Human eye.

Interior. *a*, Pupil. *b*, Iris. *c*, Cornea. *d*, Crystalline lens. *e*, Vitreous humor. *f*, Retina. *g*, Choroid coat. *h*, Sclerotic coat. *i i*, Central vein of the retina. *k*, Optic nerve. *m*, Ciliary processes. *n*, Ciliary ligament or circle.
Exterior. *l*, Eyebrow. *o p*, Upper and lower eyelid. *x x*, Eyelashes. The pupil and iris are also shown at *a* and *b* respectively.

the eye" is applied. In the front of the globe the sclerotic is abruptly transformed into the transparent portion (the cornea), which is circular and which forms a window through which one can see into the interior. A mucous membrane, the conjunctiva, so named because it unites the eye to the lid, spreads over the anterior portion of the globe, and then folds back on itself and lines the internal surface of the eyelids. On the internal surface of the sclerotic is a vascular membrane called the choroid. This is essentially the blood-vessel coat of the eyeball. The front part of the choroid terminates about the place where the sclerotic passes into the cornea in a series of ridges, the ciliary processes. The circular space thus left in front by the termination of the choroid is occupied by the iris, a round curtain, the structure seen through the cornea, differently colored in different individuals. In its center is a round hole, the pupil, which appears as if it were a black spot. The iris forms a sort of transverse partition dividing the cavity of the eyeball into two chambers, a small anterior

chamber filled with the aqueous humor, and a large posterior chamber filled with vitreous humor. The iris consists of a framework of connective tissue, and its posterior surface is lined by cells containing pigment which gives the color to the eye. In its substance are bundles of involuntary muscular fibres, one set being arranged in a ring round the margin of the pupil, the other set radiating from the pupil like the spokes of a wheel. In a bright light the circular fibres contract and the pupil is made smaller; but in the dark these fibres relax and cause the pupil to dilate more or less widely, thus allowing only that quantity of luminous rays to enter the eye which is necessary to vision. Just behind the pupil is the crystalline lens, resembling a small, very strongly magnifying glass, convex on each side, though more so behind. The greater or less convexity of the surfaces of the lens determines whether the vision is long or short. The internal surface of the choroid, or rather the pigmentary layer which covers it is lined by the retina or nervous tunic upon which the objects are depicted that we see. It appears to be formed by the expansion of the optic nerve, which enters the eye at its posterior part about one-tenth of an inch to the inner side of the axis of the eyeball, and forms at the bottom of the globe an enlargement, which is called the papilla of the optic nerve. Microscopists describe the retina as being composed of five, or even eight layers, of which the internal one is vascular and in contact with the vitreous; the external one, very important in a physiological point of view, is the membrane of Jacob. It is composed of cones and cylinders or rods, joined together like the stakes of a palisade, perpendicular to the plane of the membrane, and forming by their free extremities a mosaic, each microscopic division of which is about 0·001 of a line in diameter according to Robin, and 0·0008 of a line according to Helmholtz; and represents a section of a rod. These rods and cones are believed to be the agents by whose aid the waves of light become transformed into the stimulus of a sensation. The ocular globe is put in motion in the orbit by six muscles, grouped two by two, which raise or lower the eye, turn it inward or outward, or on its antero-posterior axis. In these movements the center of the globe is immovable, and the eye moves round its transverse and vertical diameters. These three orders of movements are independent of each other, and may be made singly or in combination, in such a manner as to direct the pupil toward all points of the circumference of the orbit. Each eye is furnished with two eyelids, moved by muscles, which shield it from too much light and keep it from being injured. They are fringed with short fine hairs called eyelashes; and along the edge of the lids is a row of glands similar to the sebaceous glands of the skin. The eyebrows, ridges of thickened integument and muscle, situated on the upper circumference of the orbit and covered with short hairs, also regulate to some extent the admission of light by muscular contraction. In reptiles, some fishes (sharks, etc.), in birds and in some mammals a third eyelid or nictitating member is present, and can be drawn over the surface of the eye so as to clear it of foreign matters, and also to modify the light. The lachrymal apparatus is composed of, firstly, the lachrymal gland, which lies in a depression of the orbital arch; secondly, of the lachrymal canals, by which the tears are poured out upon the conjunctiva a little above the border of the upper lid; thirdly, the lachrymal ducts, which are destined to receive the tears after they have bathed the eye, and of which the orifices or lachrymal points are seen near the internal commissure of the lids; fourthly, the lachrymal sac, in which the lachrymal ducts terminate, and which empties the tears into the nasal canal. The tears, by running over the surface of the conjunctiva, render it supple and facilitate the movements of the globe and eyelids by lessening the friction. The influence of moral or physical causes increases their secretion, and when the lachrymal ducts do not suffice to carry them off they run over the lids.

Vision.—The retina renders the eye sensible of light, and we may therefore consider it as the essential organ of vision. The function of the other portions is to converge the luminous rays to a focus on the surface of the retina, a condition necessary for distinct vision and the clear perception of objects. The visual impressions are transmitted from the retina to the brain by means of the optic nerve, of which that membrane appears to be the expansion. The two optic nerves converge from the base of the orbit toward the center of the base of the skull, where there is an interlacement of their fibres in such a manner that a portion of the right nerve goes to the left side of the brain, and a part of the left nerve to the right side; this is called the chiasma or commissure of the optic nerves. The principal advantage of having two eyes is in the estimation of distance and the perception of relief. In order to see a point as single by two eyes we must make its two images fall on corresponding points of the retinas; and this implies a greater or less convergence of the optic axes according as the object is nearer or more remote. To accommodate the eye to different distances the lens is capable of altering itself with great precision and rapidity. When we look at a near object the anterior surface of the lens bulges forward becoming more convex the nearer the object; the more distant the object the more the lens is flattened. When the transparency of the cornea, the crystal line lens, or any of the humors, is destroyed, either partially or entirely, then will partial or total blindness follow, since no image can be formed upon the retina; but although all the humors and the cornea be perfectly transparent, and retain their proper forms, which is likewise necessary to distinct vision, yet, from weakness or inactivity of the optic nerve, or injury of the central ganglia with which it is connected, weakness of sight or total blindness may ensue. Defective vision may also arise from the crystalline lens being so convex as to form an image before the rays reach the retina (a defect known as short sight or myopia), in which case distinct vision will be procured by interposing a concave lens between the eye and the object of such a curvature as shall cause the rays that pass through the crystalline lens to meet on the retina; or the lens may be too flat, as in the case in old age, a defect which is corrected by convex lenses. In the lower forms of life the organs of sight appear as mere pigment spots. Ascending higher, simple lenses or refracting bodies occur. Insects, crustaceans, etc., have large masses of simple eyes or ocelli aggregated together to form compound eyes—the separate facets or lenses being optically distinct, and sometimes numbering many thousands. In the molluscs well-developed eyes approaching in structure those of the highest animals are found; and in all vertebrate animals the organ of vision corresponds generally to what has been described, though they vary much in structure and adaptation to the surroundings of the animal.

EYE-PIECE, in a telescope, microscope, or other optical instrument, the lens, or combination of lenses to which the eye is applied.

EZE'KIEL ("God shall strengthen"), the third of the great prophets, a priest, and the son of Buzi. He was carried away when young (about 599 B.C.) into the Babylonish captivity. His prophetic career extended over a period of 22 years, from the 5th to the 27th year of the captivity. The Book of Ezekiel contains predictions made before the fall of Jerusalem, 586 B.C. (chaps. I.-xxiv.); prophecies against some of the neighboring tribes (chaps. xxv.-xxxii.); prophecies concerning the future of Israel (xxxiii.-xxxix.); and a series of visions relating to the circumstances of the people after the restoration.

EZRA, a celebrated Jewish scribe and priest. Under his guidance the second expedition of the Jews set out from Babylon to Palestine under the reign of Artaxerxes I., about 458 B.C. The important services rendered by Ezra to his countrymen on that occasion, and also in arranging, and in some measure, it is believed, settling the canon of Scripture, are especially acknowledged by the Jews, and he has even been regarded as the second founder of the nation. Josephus states that he died in Jerusalem; others assert that he returned to Babylon, and died there at the age of 120 years. The Book of Ezra contains an account of the favors bestowed upon the Jews by the Persian monarchs, the rebuilding of the temple, Ezra's mission to Jerusalem, and the various regulations and forms introduced by him. It is written partly in Hebrew and partly in Chaldee, which have led some to conclude that it is the work of different hands.

F

F, the sixth letter of the English alphabet, is a labio-dental articulation, formed by the passage of breath between the lower lip and the upper front teeth. It is classed as a surd spirant, its corresponding sonant spirant being v, which is distinguished from f by being pronounced with voice instead of breath, as may be perceived by pronouncing ef, ev. (In if, of, however, f is = v.) The figure of the letter F is the same as that of the ancient Greek digamma, which it also closely resembles in power.

F, in music, is the fourth note of the diatonic scale.

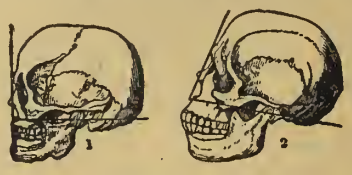
FA, the name given by Guido to the fourth note of the natural diatonic scale of C.

FABLE, in literature, a term applied originally to every imaginative tale, but confined in modern use to short stories, either in prose or verse, in which animals and sometimes inanimate things are feigned to act and speak with human interests and passions for the purpose of inculcating a moral lesson in a pleasant and pointed manner. The fable consists properly of two parts—the symbolical representation and the application, or the instruction intended to be deduced from it, which latter is called the moral of the tale, and must be apparent in the fable itself. The oldest fables are supposed to be the oriental; among these the Indian fables of Pilpay or Bidpai, and the fables of the Arabian Lokman, are celebrated. ((See Bidpai and Lokman.) Among the Greeks, Æsop is the master of a simple but very effective style of fable. The fables of Phædrus are a second-rate Latin version of those of Æsop. In modern times Gellert and Lessing among the Germans, Gay among the English, the Spanish Yriarte, and the Russian Ivan Kriloff, are celebrated. The first place, however, among modern fabulists belongs to the French writer La Fontaine.

FACADE (fa-sȧd′ or fa-sȧd′), the face, front view, or principal elevation of a building. It usually contains the principal entrance.

FACE, the front part of the head, the seat of most of the senses. The bony basis of the face, exclusive of the thirty-two teeth (these not being in the strict sense bones), is composed of fourteen bones, called, in anatomy, the bones of the face. The anterior part of the skull also forms an important feature of the face. Of all these bones the lower jaw only is movable, being articulated with the base of the skull. The other bones are firmly joined together and incapable of motion. In brutes the jaws project much more than in men, and form the prominent feature of the face, while the forehead recedes. The face of birds comprehends the ophthalmic regions, cheeks, temples, forehead and vertex; the face of insects includes all between the proboscis and the prothorax.

FACIAL ANGLE, an angle of importance in the method of skull measurement introduced by Camper, the Dutch anatomist, who sought to establish a connection between the magnitude of this angle and the intelligence of different animals and men, maintaining that it is always greater as the intellectual powers are greater. Suppose a straight line drawn at the base of the skull, from the great occipita cavity, across the external orifice of the ear to the bottom of the nose, and another straight line from the bottom of the nose, or from the roots of the upper incisors, to the most prominent part of the forehead, then both



Facial angle.
1, European. 2, Negro.

lines will form an angle which will be more or less acute. In apes this angle is only from 45° to 60°; in the skull of a negro, about 70°; in a European, from 75° to 85°. In another mode of drawing the lines the angle included between them varies in man from 90° to 120°, and is more capable of comparison among vertebrate animals than the angle of Camper. This angle though of some importance in the comparison of races, is fallacious as a test of individual capacity.

FACIAL NERVE, a nerve of the seventh pair of cranial nerves, a motor nerve which supplies the muscles of expression on either side of the face. Paralysis of this nerve produces facial paralysis, the result of which is that the affected side is smooth, unwrinkled, and motionless, the eyelids are wide open and cannot be closed, and the muscles of the sound side having it all their own way drag the mouth to that side.

FACTOR, in arithmetic, the multiplier and multiplicand, from the multiplication of which proceeds the product; thus 7 and 4 are the factors of 28. In algebra any expression which is considered as part of a product is considered a factor.

FAC′TORY (from factor), a name which appears originally to have been given to establishments of merchants and factors resident in foreign countries; it now more commonly signifies a place in which the various processes of a particular manufacture are carried on simultaneously. The rapid growth of factories in this sense is a comparatively recent development of industry, resulting from the free use of machinery and the consequent subdivision of labor. Among the advantages of the factory system are generally counted: 1st, increased productiveness arising from the minute division of labor; 2d, the mechanical accuracy and the cheapness of the product turned out by machinery; 3d, the facilities for union and co-operation for common improvement afforded by bringing large masses of workmen together. But this last consideration is probably more than counterbalanced by the smaller amount of independent intelligence called forth in the individual worker, through the monotony of the minutely subdivided operations. Decided disadvantages of the factory system are the unhealthiness of the crowded rooms, where the air is full of deleterious elements; and the increasing demand on the labor of women and children, interfering as it does with the economy of domestic life.

FACTORY ACTS, acts passed for the regulation of factories and similar establishments. Considering that women and children were not qualified fully to protect themselves against the strain of competition, the British legislature has passed a series of acts to regulate the conditions of their employment in factories. Various acts were passed up to 1878, when what is known as the Factory and Workshop Act was passed. It consolidates the previous series of statutes, and may be said to contain practically all the law dealing with the subject. It has general provisions regarding drainage, ventilation, and fencing of dangerous machinery, etc. In textile factories the hours of labor for women are restricted to ten, with Saturday for a half-holiday. The hours for children (those under fourteen years of age) are fixed at half of those allowed to women and young persons ("young persons" being defined as those between fourteen and eighteen). Provision is made for holidays and for attendance at school of children employed in factories. Special provisions for particular kinds of factories are made by separate acts, and under these the employment of females and young persons is regulated in bleaching and dyeing works, lace-factories, manufactories of earthenware, lucifer matches, percussion caps, cartridges, blast-furnaces, copper-mills, forges, foundries, manufactories of machinery, metal, india-rubber, gutta-percha, paper, glass, tobacco, letterpress printing, bookbinding, etc. In all the states of the American Union in which the factory is an industrial feature there is some legislation relative to the employment of women and children. Attention is given to the age of children employed, and attendance at public schools for a certain period each year is obligatory. The daily hours of labor are regulated. In some states the belting, shafting, etc., employed must be securely guarded. Penalties for violation of these provisions are designated.

FACULTY, the members taken collectively of the medical or legal professions; thus we speak of the medical faculty, etc. The term is also used for the professors and teachers collectively of the several departments in a university; as, the faculty of arts, of theology, of medicine, or of law.

FACULTY, in law, is a power to do something, the right to do which the law admits, or a special privilege granted by law to do something which would otherwise be forbidden.

FÆCES, the excrementitious part evacuated by animals. It varies of course with different species of animals,

according to their diet. The main constituents are unassimilable parts of the food, on which the digestive process has no effect, ahd other portions, quite nutritious, but which have escaped digestion, also certain waste matters, etc. In disease the composition varies extremely.

FAHRENHEIT, (fä'rèn-hīt), Gabriel Daniel, German physicist, known for his arrangement of the thermometer, was born at Dantzig in 1686. Abandoning the commercial profession for which he had been designed, he settled in Holland to study natural philosophy. In 1720 he effected a great improvement by the use of quicksilver instead of spirits of wine in thermometers. He invented the Fahrenheit scale (see Thermometer), and made several valuable discoveries in physics. He died in 1736.

FAIENCE (fā-yens'), imitation porcelain, a kind of fine pottery, superior to the common pottery, in its glazing, beauty of form, and richness of painting, and of which several kinds are distinguished by critics. It derived its name from the town of Faenza, in Italy, where a fine sort of pottery called majolica was manufactured as early as the 14th century. The majolica reached its greatest perfection between 1530 and 1560. In the Louvre, at Berlin, and at Dresden are rich collections of it. The modern faience appears to have been invented about the middle of the 16th century, at Faenza as an imitation of majolica, and obtained its name in France, where a man from Faenza, having discovered a similar kind of clay at Nevers, had introduced the manufacture of it. True faience is made of a yellowish or ruddy earth, covered with an enamel which is usually white, but may be colored. This enamel is a glass rendered opaque by oxide of tin or other suitable material, and is intended not only to glaze the body, but to conceal it entirely. See Pottery.

FAINTING, or syncope, a sudden suspension of the heart's action, of sensation, and the power of motion. It may be produced by loss of blood, pain, emotional disturbance, or organic or other diseases of the heart. It is to be treated by placing the patient on his back in a recumbent position or even with his head slightly depressed, sprinkling cold water on his face, applying stimulant scent to the nostrils, or anything which tends to bring back the blood to the brain. The admission of fresh cool air and the loosening of any tight article of dress are important.

FAIRBAIRN, Sir William, British civil engineer, born at Kelso, Roxburghshire in 1789. About 1831, his attention having been attracted to the use of iron as a material for ship-building, he built the first iron ship. He shares with Mr. Stephenson the merit of constructing the great tubular bridge across the Menai Strait. Fairbairn was one of the earliest members of the British association for the advancement of science, of which he was president in 1861–62. He was created a baronet in 1869. He died 18th August, 1874.

FAIRBANKS, Charles Warren, American statesman, was born in Union co., Ohio, in 1852. In 1874 he was admitted to the bar of the supreme court of Ohio at Columbus, and in the same year he removed to Indianapolis, Ind. In 1893 he was delegate at large to the Republican National Convention at St. Louis, in 1896, and was temporary chairman of the convention. He was appointed a member of the United States and British Joint High Commission which met in Quebec in 1898 for the adjustment of Canadian questions, especially referring to the seal fisheries of Alaska. He was elected to the U. States senate in 1897. In 1904 he was elected vice-president on the republican ticket.

FAIRBANKS, Thaddeus, American inventor, born in Brimfield, Mass., in 1796. In June, 1831, he patented the platform scales being his name. Afterward about fifty different improvements were made on these scales which have been sold in all parts of the world. He died in 1886.

FAIRCHILD, Charles Stebbins, American financier, born in Cazendria, N. Y., in 1842. He was admitted to the bar in 1865 and became deputy-attorney-general of New York in 1874, and attorney-general in 1876. He was assistant secretary of the treasury in 1857 to 1887, and secretary in 1887–9.

FAIRCHILD, Lucius, American soldier, born in Kent, Ohio, in 1831. At the beginning of the civil war he enlisted as a private in the federal army and in 1861 was appointed a captain in the regular army and major in the volunteer army. He took part in the battles of Bull Run and Antietam, and led the charge up Seminary Hill at Gettysburg. He was promoted brigadier-general in 1863 but resigned to become secretary of state of Wisconsin. He was afterward elected governor and served six consecutive terms. In 1886 he was chosen commander in chief of the Grand Army of the Republic. He died in 1896.

FAIRFAX, Thomas, Lord, a distinguished commander and leading character in the civil wars which distracted England in the 17th century. He was born in 1611, at Denton, in Yorkshire, being son and heir of Ferdinando, Lord Fairfax, to whose title and estates he succeeded in 1648. After serving in the Netherlands with some reputation he returned to England, and on the rupture between Charles I. and the parliament joined the forces of the latter. In 1642 he was appointed general of the horse, and two years later held a chief command in the army sent to co-operate with the Scots. In 1645, on the resignation of the Earl of Essex, Fairfax became general-in-chief of the parliamentary army. After the victory at Naseby he marched into the western countries, quelling all opposition, put down the insurgents in Kent and Essex in 1647, and captured Colchester. In April, 1649, he was occupied along with Cromwell in suppressing revolt in the army; but positively declined to march against the Scottish Presbyterians. He was a member of Cromwell's first parliament. He co-operated in the restoration of Charles II., being one of the committee charged to secure his return. He died at Nun Appleton, Yorkshire, 12th November, 1671.

FAIRIES, Elves, etc., imaginary supernatural beings or spirits supposed to have considerable influence for good or evil in the affairs of men. In the 12th century the poem of Lancelot of the Lake introduced the poetical treatment of the fairy world into France; and the fairies played at important part in the romantic works of the time. In the last part of the 17th century the true fairy tales first became popular, the Italians taking the lead in the Pentameron of Basilio. The fashion passed to France, where Perrault in 1697 published Contes de ma Mère l'Oye. Numerous imitations soon appeared. The best collections of later times have been those of the Brothers Grimm in German, and in English those of Keightley and Croker. As an original writer of fairy tales, Hans Christian Andersen, the celebrated Dane deserves particular mention.

FAIRS, periodical meetings of persons having goods or wares for sale in an open market held at a particular place, and generally for the transaction of a particular class of business. The origin of fairs is obviously to be traced to the convenience of bringing together at stated times the buyers and sellers of the stock-produce of a district. In Europe the numerous festivals of the church afforded the most favorable opportunity for the establishment of these markets. This association is indicated in the German name of a fair, which is identical with that used for the ceremony of the mass. In the middle ages fairs were of great importance, and were specially privileged and chartered by princes and magistrates, public proclamation being made of their commencement and duration. But modern facilities of communication have much diminished the necessity for periodical markets, and it is now chiefly among agriculturists that they are of much importance, large agricultural meetings being held in various districts for the sale of cattle and horses, and for the exhibition of agricultural implements. There are also, especially in Scotland, a considerable number of hiring fairs for farm-servants. In the less developed commerce of the east, however, they still retain much of their ancient importance and magnitude. In Europe the most important fairs of the present day are those at Leipzig, and Frankfort-on-the Main in Germany, at Lyons in France, and at Nijni-Novgorod in Russia. The latter is, indeed, the largest fair in the world. The fairs of Great Britain now mostly consist of the weekly market-days of country towns and the agricultural meetings already mentioned. In many places the old fair-days are still kept, but are now merely an assemblage of penny-theaters, peep-shows, and such amusements. In the U. States there are no fairs of the kind so common in the old world; the term is applied so a variety of exhibitions, especially of cattle and agricultural products. It also includes exhibitions and sales for religious and charitable purposes.

FAIRWEATHER, Mount, on the west coast of North America, in Alaska territory. It rises to the height of 14,900 feet, and is covered with perpetual snow.

FAITH, the assent of the mind to the truth of what is declared by another, resting on his authority and veracity, either without other evidence or on probable evidence of any kind. In a special sense the term faith is used for the assent of the mind to what is given forth as a revelation of man's relation to God and the infinite, i. e. a religious faith; and in Christian theology we have (1st) historical or speculative faith, or belief in the historic truthfulness of the Scripture narrative and the claims of Scripture to an inspired and supernatural origin: (2d) Evangelical or saving faith, that emotion of the mind (as Dwight defines it) which is called trust, or confidence exercised toward the moral character of God, and particularly of the Savior.

FAITH, Confession of. See Confession of Faith.

FAITH CURE, the curing or attempting to cure disease by appealing to the patient's faith. Also any cure supposed to have been effected by such means. The legal status of practitioners of faith cure—divine healing, faith healing, mental science, prayer cure, etc.—have in recent years arisen in different states but thus far no final determination of them has been reached.

FAKIRS (fā-kērz'), a kind of fanatics met with chiefly in India and the neighboring countries, who retire from the world and give themselves up to contemplation. They are properly of the Mohammedan religion, but the term is often used for a medicant of any faith. They are found both living in communities and solitary. The wandering fakirs gain the veneration of the lower classes by absurd penances and self mutilations.

FALCON (fa'kn), a name of various birds of prey. The falcons proper for strength, symmetry, and powers of flight are the most perfectly developed of the feathered race. They are distinguished

Peregrine falcon.

by having the beak curved from the base, hooked at the point, the upper mandible with a notch or tooth on its cutting edge on either side, wings long and powerful, the second feather rather the longest, legs short and strong. The largest European falcons are the jerfalcon or gyrfalcon proper, a native of the Scandinavian Peninsula, and the Iceland falcon, to which may be also added the Greenland falcon. Between these three species much confusion at one time prevailed, but they are now distinctly defined and described. In the Greenland falcon the prevailing color at all ages is white, in the Iceland falcon dark. The latter more nearly resembles the true gyrfalcon of Norway, which, however, is generally darker, rather smaller, but with a longer tail. The average length of any of these falcons is about 2 feet. The Greenland species used to be the most highly prized by falconers. Its food consists chiefly of ptarmigans, hares, and water-fowl. It is found over a wide range of northern territory. The peregrine falcon is not so large as the jerfalcon, but more elegant in shape. It chiefly inhabits wild districts, and nestles among rocks. It preys on grouse, partridges, ptarmigans, pigeons, rabbits, etc. Its flight is exceedingly swift, said to be as much as 150 miles an hour. The peregrine falcon was one of those most frequently used in falconry. Other British falcons are the hobby, formerly a great favorite for the chase of small game when falconry was in fashion; the merlin, small but swift and spirited; the kestrel, one of the most common British falcons. The term falcon is by sportsmen restricted to the female, the male,

Gerfalcon.

which is smaller and less courageous, being called tiercel, tersel, tercelet, or falconet.

FALCON'IDÆ, a family of birds of prey, in which the destructive powers are most perfectly developed. The family includes the different species of eagles as well as the hawks and falcons properly so-called, comprising the sub-families, buzzards, eagles, falcons, kites, hawks, and harriers.

FALCONRY (fä'kn-ri), the pursuit of game by means of trained falcons or hawks; also called hawking. Falconry is a very old amusement in Europe and Asia. In the middle ages it was the favorite sport of princes and nobles; and, as ladies could engage in it, it became very prevalent. Charlemagne passed laws in regard to falconry. In Germany Henry the Fowler and the Emperor Frederick the Second were much addicted to this sport, the latter having written a work on falconry. In France it reached its height under Francis I., whose grand falconer had under him an establishment of 15 nobles and 50 falconers. In Britain it was practiced among the Anglo-Saxons, but grew still more in favor after the Norman Conquest. In England the Duke of St. Albans is still hereditary grand falconer, and presents the king with a cast (or pair) of falcons on the day of his coronation. Falconry continued in favor till the 17th century; but the invention of fire-arms gradually superseded it, though in isolated instances gentlemen may be still be found who pursue the sport to some little extent. In Persia and other eastern countries hawking is still in great favor. The training of a hawk is a matter requiring great pains and pro-

Goshawk hooded for falconry.

tracted attention, the natural wildness and intractableness of the birds being difficult to overcome. When a hawk suffers itself to be hooded and unhooded quietly and will leap on the hand of the trainer to receive food, its education is considered far advanced, and the trainer now endeavors to accustom it to the lure. This may be a piece of leather or wood covered with the wings and feathers of a bird and attached to a cord. The falcon is fed from it, and is recalled by the falconer swinging the lure round his head with an accompanying cry. When it has been taught to obey the lure it is then practiced in the mode of seizing its game, which is first done with tame game attached to a peg. It is then made to fly at free game, and when it is fully trained it is used for sport. It is always kept hooded during excursions, until it is wanted to fly.

FAL'KIRK, a parliamentary burgh of Scotland, in Stirlingshire, 2½ miles west by north of Edinburgh. Falkirk is of great antiquity, and is associated with many remarkable historical events. In the neighborhood was fought the Battle of Falkirk in 1297 between Sir William Wallace and Edward I., the Scots, who were much inferior in numbers, being defeated. About 1 mile southwest from the town the Highlanders under Prince Charles defeated the royal forces under General Hawley, Jan. 17, 1746. Pop. 16,615.

FALKLAND, (fak'land), an ancient royal burgh of Scotland, county of Fife, 21 miles north of Edinburgh. It was once the residence of the Scottish kings, and possesses remains of an ancient palace and some curious old houses. There was formerly a castle here, in which David, eldest son of Robert III., was starved to death by order of his uncle the Duke of Albany, but no trace of it now remains. Pop. 972.

FALKLAND ISLANDS, an island group belonging to Great Britain, in the South Atlantic Ocean, about 300 miles east of the Straits of Magellan. They consist of two larger islands, East Falkland and West Falkland, containing respectively about 3000 and 2300 sq. miles, with a great number of smaller ones surrounding them; total area, 6500

sq. miles. They are hilly and boggy, entirely destitute of trees, but covered with a variety of grasses very nutritive for the sheep and cattle, the rearing of which is the principal industry. Fish and sea-fowl abound. The climate is equable and very healthy. The Falkland Islands were discovered by Davis on the 14th August, 1592. In 1710 a French vessel from St. Malo touched at them, and named them Isles Malouines. Settlements were afterwards formed on them by the French, Spaniards, and English alternately, but the latter have ultimately retained possession of them. The colony has a governor and other officers appointed by the crown. Port Stanley, in East Falkland, is a thriving settlement. Pop. of the group, 1800.

FAL'LACY, in logic, is when an argument is used as decisive of a particular issue, which in reality it does not decide. Properly a fallacy is a fault in the form of reasoning but the term is applied also to faults in the substance of the argument or proving one proposition by assuming another which is identical with it; or mistaking the point at issue; or arguing as if sequence were the same thing as cause and effect.

FALLING SICKNESS. See Epilepsy.

FALLING STARS. See Meteors.

FALL OF BODIES, all bodies on the earth, by virtue of the attraction of gravitation, tend to the center of the earth. A ball held in the hand presses downward; if dropped, it descends perpendicularly; if placed on an inclined plane, it rolls down, in doing which it presses the plane with a part of its weight. In the air bodies fall with unequal velocities, a piece of paper, for instance, more slowly than a ball of lead; and it was formerly thought that the velocity of the fall of bodies was in proportion to their weight. This error was attacked by Galileo, who, experimenting with balls of different substances which he dropped from the tower of Pisa, was led to the conclusion that the resistance of the air acting on different extents of surface was the cause of the unequal velocities, and that in a vacuum all bodies would fall with the same velocity. The truth of this last proposition was first demonstrated by Newton in his celebrated "guinea-and-feather" experiment, where a guinea-and feather are shown to fall side by side in the vacuum of the air-pump. This experiment proves that the force of gravitation in bodies is proportional to their inertia, that is to their mass. The laws of falling bodies, that is of bodies falling freely in a straight line and through a distance short in comparison with the earth's center, are the following:

1. When a body falls from rest it acquires velocity at the rate of about 32·2 feet per second. This number, which represents the acceleration due to the force of gravity, varies slightly with the locality, increasing from the equator to the poles, and diminishing as we recede from the center of the earth. At the end of five seconds therefore, the body would be found to be moving at the rate of 5 x 32·2, that is 161 feet per second.

2. The space fallen through in the first second is half of 32·2, that is 16·1 feet; and the space fallen through in any given time is found by multiplying the square of the number of seconds by 16·1. Thus, in three seconds a body falls 9 x 16·1 feet, or 144·9 feet.

3. The square of the velocity acquired by falling through any number of feet is found by multiplying twice that number by 32·2. Thus if a body falls 9 feet, the square of the velocity acquired is 2 x 32 x 9, or 576 feet per second, 32 being used instead of 32·2 and taking the square root of 576, we find that a velocity of 24 feet is acquired in a fall of 9 feet.

4. When a body is projected vertically upward with a given velocity, it continues to rise during a number of seconds found by dividing the number that expresses the velocity of projection by 32·2; and it rises to a height found by dividing the square of that number by 2 x 32·2, or 64·4.

FALL OF MAN, a commonly received doctrine of Christianity, founded upon the historical narrative contained in the third chapter of the book of Genesis, together with the allusions to the same matter in other parts of Scripture. Adam, having eaten of the forbidden fruit, is said to have fallen; and the relation of mankind in general to this fall is stated by St. Paul in the words: "By one man's disobedience many were made sinners" (Rom. v. 19). Thus, in the fall of Adam, all men are held to have fallen and to have contracted "original sin," alienating them from God and rendering them morally inadequate. The doctrine of the fall does not stand alone in Scripture. It is universally agreed by interpreters that in the original sentence pronounced on the transgressors there is contained the promise of a redemption, and that the whole scope of Scripture is directed to the development of this promise, and of the divine scheme of providence associated with it.

FALLOPIAN TUBES, in anatomy, are two ducts which open by one extremity into the womb, one at either angle of the fundus, and terminate at the other end in an open trumpet-shaped mouth, which at certain times grasps the ovary and receives the ovum. They are named after Fallopius or Falloppio, an Italian anatomist of the 16th century, who first recognized their functions.

FALLOW DEER, a European and Western Asiatic deer. It is smaller than the stag, of a brownish-bay color, whitish beneath, on the insides of the limbs, and beneath the tail. The horns, which are peculiar to the male, are very different from those of the stag; they are not properly branched, but are broader toward the upper part, and divided into processes down the outside. A simple snag arises from the base of each, and a similar one at some distance from the first. It was introduced at an early period into Britain.

FALLOWS, Samuel, clergyman, born at Pendleton, near Manchester, England 1835; removed with his parents to Wisconsin 1845; became a minister of the Methodist Episcopal Church; entered the army as chaplain 1861; afterward engaged in active military service; reached the rank of colonel and brevet brigadier-general; became rector of St. Paul's Reformed Episcopal Church, Chicago, 1875; editor-in-chief of the Appeal, the organ of the Reformed Episcopal Church, 1876; and was chosen a bishop of the Reformed Episcopal Church 1876, He has published a Supplemental Dictionary and Past Noon, and has edited many well-known books.

FALL RIVER, a city and port, Bristol co., Massachusetts, on an arm of Narraganset Bay and Taunton river, 53 miles s.s.w. of Boston. It is at the head of deep-water navigation, and the terminus of a line of steamers from New York. It contains several handsome streets, and has extensive cotton, woolen and calico-printing factories, iron-works, etc. Pop. 1909, 115,000.

FALSE IMPRISONMENT, the unlawful imprisonment or detention of any person. Every confinement of the person is imprisonment, whether in a common prison or a private house, or even by forcibly detaining one in the streets or highways. The law punishes false imprisonment as a crime, besides giving reparation to the party injured, through an action of trespass.

FALSE PERSONATION, all forms of false personation, for the purpose of obtaining the property of others, are punishable by the criminal law; as instances, the personation of the owner of any share, stock, or annuity, etc.; the false personation of voters at an election is a misdemeanor, the punishment of which is determined by state statute, involving fine, imprisonment, and deprivation of the rights of citizenship for a certain period.

FALSE PRETENSES, false representations and statements, made with a fraudulent design to otbtain "money, goods, wares, and merchandise," with intent to cheat. At common law a misdemeanor, punishable by statute.

FALSET'TO, applies in singing, to the notes above the natural compass of the voice. It is also called the head or throat voice, in contradistinction to the chest voice, which is the natural one. The falsetto voice is produced by tightening the ligaments of the glottis.

FAMILIAR SPIRITS, demons or evil spirits supposed to be continually within call and at the service of their masters, sometimes under an assumed shape, sometimes attached to a magical ring, or the like, sometimes compelled by magic skill, and sometimes doing voluntary service. We find traces of this belief in ages and countries, under various forms.

FAMILY, in zoological classifications, a group of individuals more comprehensive than a genus and less so than an order, a family usually containing a number of genera, while an order contains so many families. Family names usually terminnte in -idæ (after Latin patronymics, such as Æacidæ, sons or descendants of Æacus). In botany it is sometimes used as a synonym of order.

FAMINE, a dire want of food affecting considerable numbers of people at the same time. Irregular rainfalls in tropical climates, imperfect methods of irrigation, or, as in Ireland, the too exclusive dependence of the mass of people on a single article of food which happens to fail, are among the commonest causes of famines. In the early and mediæval ages they were frequent; but the rapidity of

modern communication and transport has made the rigor of famine almost impossible in Europe. In Ireland the years 1814, 1816, 1822, 1831, 1846, were marked by failure of the potato crop, and in the last-mentioned year the dearth was so great that ten millions were voted by parliament for relief of the sufferers. India has long been the seat of terrific famines; but of late the British officials have been very successful in organizing relief measures. Among the more recent are that in Northwest India (1899–00), in which above 800,000 perished; that in Bengal and Orissa (1865–66), when about a million perished; that in Bengal (1874), which was very successfully treated; that in Bombay, Madras, Mysore (1877), in which about half a million died. In China, a great famine took place in 1877–78, in which over nine millions are said to have perished; another took place in 1888–89 owing to the overflow of the Yellow river.

FAN, the name of various instruments for exciting a current of air by the agitation of a broad surface. (1) An instrument made of wood or ivory, feathers, thin skin, paper, variously constructed and mounted, and used by ladies to agitate the air and cool the face. As an article of luxury the fan was well known to the Greeks and Romans, They are said to have been introduced into England from Italy in the reign of Henry VIII. (2) Any contrivance of vanes or flat discs revolving by the air of machinery, as for winnowing grain, for cooling fluids, urging combustion, assisting ventilation, etc., is also so-called.

FANAT'ICISM is the term applied more particularly to the extravagance manifested in religious matters by those who allow themselves to be hurried away by their fancy and feelings, to the adoption not only of wild enthusiasitc views, but also of inordinate and not unfrequently persecuting measures, By an extension of the term it is also sometimes applied to other forms of extravagance.

FANCY, a term approaching imagination in meaning. In its general acceptation it refers both to the forms of the imagination and to the mental faculty which produces them; but it is used frequently for the lighter or more fantastic forms of the imagination, and for the active play of that faculty which produces them.

FANDAN'GO, an old Spanish dance, which originated most probably with the Moors in Andalusia. It is seldom danced but at the theater, and in the parties of the lower classes. It is danced by two persons only, who never touch so much as each other's hands; their reciprocal allurements, retreats, approaches, and varied movements, by turns pursuing and pursued, their looks, attitudes, and whole expression, are grossly indicative of voluptuousness.

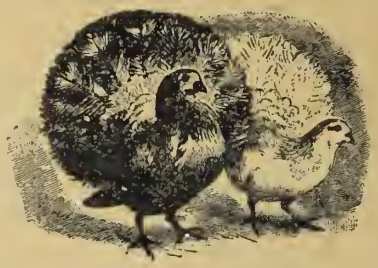
FANEUIL HALL (fan'ū-il), a public building in Boston, famous as the place where stirring speeches were made at the outbreak of the war for American independence. It obtained the name "The cradle of American liberty." It was enlarged in 1805.

FANFARE, a short, lively, loud, and warlike, piece of music, composed for trumpets and kettle-droms. Also small, lively pieces performed on hunting-horns, in the chase.

FANNING ISLANDS, a group of coral islands in Central Polynesia between 1° 57′ and 5° 49′ n. lat., and between 157° and 162° w. lon.

FAN-PALM, a name sometimes given to the taliput palm, a native of Ceylon and Malabar It is also applied to the Mauritia palm, a tree which grows in great abundance on the banks of the Orinoco river in South America, and which yields the natives of these regions food, wine (made from its sap), and cordage, besides serving them for housing during the inundations to which the country is subject.

FAN-TAIL, a variety of the domestic pigeon, so called from the fan-like shape



Fantails.

of their tails. Also a name applied to certain Australian birds of the fly-catcher family.

FAN'TAN, In the American game a pack of 52 cards is used. The deal starts by cutting the cards. Ace high deals. The cards are then dealt to the left, one at a time. As many as eight persons may play. The cards remaining at the finish of the deal are dealt face down to the center of the table. The first player at the left of the dealer must have an ace to play, in which event he plays the ace to the center of the table. Having no ace, he must ante the amount agreed upon (usually 5 cents or less) to the center of the table, and draw one of the remaining cards. Thus the game proceeds until an ace can be played, after which the different stacks of cards are built up consecutively to the king. The first player ridding himself of his cards wins the pot. Failure to play a card in turn is punished by a fine equal to the amount of the ante for every card remaining in all of the player's hands.

FANTA'SIA, in music, a species of composition in which the author ties himself to no particular theme, ranging as his fancy leads him amid various airs and movements.

FAN-TRACERY, in architecture, elaborate geometrical carved work, which spreads over the surface of a vaulting, rising from a corbel and diverging like the folds of a fan. Fan-tracery vaulting is much used in the Perpendicular style, in which the vault is covered by ribs and veins of tracery, of which all the principal lines diverge from a point, as in Henry VII.'s chapel, Westminster.

FAR'ADAY, Michael, one of the greatest of English chemists and physicists, was born in humble circumstances at Newington Butts, near London, on the 22d September, 1791. Early in life he was apprenticed to a bookbinder in London, but occupied himself at his leisure hours with electrical and other scientific experiments. Having been taken by a friend to Sir Humphrey Davy's lectures he attended the course, and conceived such an ardent desire for study that he resolved to quit trade. With this end he sent his notes of the lectures to Sir Humphrey Davy, who was so struck with the great ability they showed that

Fan-tracery vaulting, Beauchamp chapel, Warwick.

he appointed him his assistant at th Royal Institution. In 1829 he became lecturer at the Royal Military Academy at Woolwich, and in 1833 he was appointed to the newly-established chair of chemistry at the Royal Institution. It was while in this office that he made most of his great electrical discoveries. His communications to the Philosophical Transactions have been published separately in three vols. (1839, 1844, 1855). In 1832 he received the honorary

Fan-tracery, Cloisters of Gloucester cathedral, England.

degree of D.C.L. from Oxford, was made an honorary member of the Academy at Berlin, with many other honors too numerous to mention. He died Aug. 25, 1867. As an experimentalist Faraday was considered the very first of his time. As a popular lecturer he was equally distinguished, and even used to draw crowds to the Friday evening lecture at the Royal Institution. Among his published works we may mention the fol-

lowing: Researches in Electricity (1831–55), Lectures on Non-metallic Elements (1853), Lectures on the Forces of Matter (1860), Lectures on the Chemical History of a Candle (1861).

FARALLO'NES, a group of small islands in the Pacific, about 30 miles from the entrance to the Bay of San Francisco.

FARCE, a dramatic piece of low comic character. It is grotesque and extravagant rather than artistically humorous.

FARCY, a disease to which horses are liable, intimately connected with glanders, the two diseases generally running into each other. It is supposed to be a disease of the absorbents of the skin, and its first indication is generally the appearance of little tumors called farcy buds on the face, neck, or inside of the thigh.

FARDEL-BOUND, a term applied to cattle and sheep affected with a disease caused by the retention of food in the maniplies or third stomach, between the numerous plaits of which it is firmly impacted. Over-ripe clover, vetches, or rye-grass are liable to produce the disease.

FARGO, a city and railway center, the capital of Cass co., N. Dak., situated on the Gt. Northern, C., M. and St. P., and Northern Pacific railways, and on the west bank of the Red river of the North; at the head of navigation, opposite Moorehead, Minn. It is one of the most important markets for wheat and farm machinery in the Northwest. Pop. 11,362.

FARIBAULT (fār-i-bō'), a city and railway center, the capital of Rice co., Minn., situated at the confluence of Straight and Cannon rivers; 53 miles s. of St.-Paul. Pop. 10,160.

FARIDPUR (fa-rēd-pör'), a district of India, in the Dacca Division of Bengal; area, 2276 sq. miles; pop. 1,631,734 Chief town, Faridpur, on the Marā Padmā. Pop. 10,263.

FARI'NA, a term given to a soft, tasteless, and commonly white powder, obtained by trituration of the seeds of cereal and leguminous plants, and of some roots, as the potato. It consists of gluten, starch and mucilage.

FARI'NI, Luigi Carlo, an Italian statesman and author, born in 1812. He became known as a nationalist and patriot in the political movements of 1841, had to leave the country for a time, but returned and was made a member of the reform ministry at Rome during the disturbances of 1848. After the peace of Villafranca he was chosen dictator of the duchies of Parma and Modena, and was mainly instrumental in inducing them to unite with the Piedmontese monarchy. His History of the Papal States from 1814 to 1850 is well known. In 1862 he became president of the ministry, lost his reason in 1863, and died 1st August, 1866.

FARMERS-GENERAL, private contractors, to whom under the old French monarchy was let out the collection of various branches of the revenue, poll-tax, duties on salt and tobacco, customs, etc. These contractors made enormous profits on the farming of the public revenues. A revenue collected in this way not only imposed a much heavier burden on the people but the merciless rigor of irresponsible and uncontrolled exactors subjected them to hardships and indignities to which they could not submit without degradation. In 1790 the system was suppressed by the constituent assembly.

FARMERS' INSTITUTES, gatherings of farmers held annually in the various states. The object of these institutes is the bringing together the workers in agricultural science and the practical farmers for the discussion of questions of mutual interest. The growth of farmers' institutes has been largely owing to the impetus given to the agricultural interests by the Morrill Land Grant Act of 1862. Gatherings are held in over 40 states, generally in the winter when the farmers are free to attend them.

FARMING. See Agriculture.

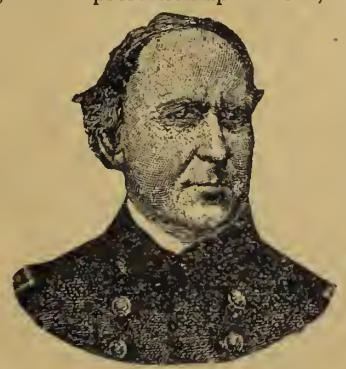
FARNE (or Ferne) **ISLANDS,** a group of islets, England, in the German Ocean off the north coast of Northumberland, 2 miles e. by s. of Bamborough Castle, and separated from the mainland by a channel of about 1¾ mile. They have been the scene of several disastrous shipwrecks.

FARO, or **PHARO,** a game of hazard at cards, played chiefly in gambling establishments, and in which the player plays against the bank, represented by a professional faro-banker.

FARO, a promontory forming the northeast point of Sicily at the entrance to the Strait of Messina. The point is strongly fortified, and on it there is a lighthouse 200 years old.

FAROE ISLANDS (fā'rō), a group of islands in the North Atlantic, lying between Iceland and Shetland. They belong to Denmark, and are twenty-five in number, of which seventeen are inhabited. The inhabitants are chiefly engaged in fishing and the rearing of sheep. Thorshavn, in Strömö, the largest island, is the seat of government. Pop. 12,965.

FAR'RAGUT, David Glasgow, admiral of the U. States, was born in 1801, and entered the navy as midshipman at the age of 9½. In 1821 he was promoted to a lieutenancy, and was actively engaged in his profession up till 1851, when



David G. Farragut.

he was oppointed assistant inspector of ordnance. In 1855 he received a commission as captain. In 1861 he was assigned to go with the expedition against New Orleans, undertaken on the formation of the confederacy, and sailed in February of the following year. New Orleans surrendered to the combined attack of the land and naval forces on 25th April, and Farragut proceeded to Vicksburg, running past successfully. In consequence of his success at New Orleans he was promoted to the rank of rear-admiral. In 1863 Farragut attempted to pass the batteries of Port Hudson, but was unsuccessful. In August, 1864, he attacked the confederate fleet in the bay of Mobile, and forced it to surrender, thus making the fall of Mobile merely a question of time. July 25, 1866, he was made admiral, a grade which had not hitherto existed in the U. States navy. He died 14th August, 1870.

FARRAR, Frederic William, The Ven., D.D., F.R.S., born in Bombay, Aug. 7, 1831. He has published several popular theological works and works of fiction, and is known as a popular lecturer. He was Bampton Lecturer in 1885. Among his principal works are: The Life of Christ, Life of St. Paul, The Early Days of Christianity, Lives of the Fathers. He died in 1903.

FARRIERY. See Veterinary Art.

FARS, or **FARSISTAN,** a maritime province in the southwest of Persia, abutting on the Persian Gulf. The manufactures include woolen, silk, and cotton goods; and in these and other articles an active trade is carried on, chiefly with Hindustan. Pop. estimated at 1,700,000.

FARTHING, the fourth part of a penny; the modern form of the Anglo-Saxon feorthung, the fourth part of anything.

FARTHINGALE, or **FARDINGALE,** an article of ladies' attire worn in the days of Queen Elizabeth, and closely resembling the modern crinoline. It was formed of circles of whalebone hoops, and protruded more at the waist than the modern crinoline.

FARUKHABAD, or **FARRAKHABAD** (far-ak-ä-bad'), a city in the northwest Provinces of British India, 2 or 3 miles from the Ganges, a handsome well-built town, with avenues of trees in many of its streets. Pop. 78,032.

FASCES (fas'sēz), among the ancient Romans, a bundle of polished rods, in the middle of which was an axe, carried by lictors before the superior magistrates. The number of fasces and lictors varied with the dignity of the magistrate. In the city the axe was laid aside.

FASCINATION, the exercise of an overpowering and paralyzing influence upon some animals attributed to certain snakes corresponding somewhat to the so-called evil-eye among human beings. Squirrels, mice, and the smaller birds are said to be the most subject to this power; but the fact is far from clearly explained, and is not perhaps even sufficiently demonstrated. Most of the accounts agree in describing the animal fascinated as having a painful consciousness of its danger, and the power exercised over it, but to be unable to resist the desire to approach the fascinator. Some have endeavored to explain this power as the effect of narcotic emanations from the serpent which stupefy the weaker animal. Others regard it as bearing as striking analogy to the mesmeric influence which one human being sometimes has over another.

FASCINES, (fa-sēnz'), in the miliatry art, bundles of boughs or rods from 6 to 18 feet in length and usually 1 foot in diameter, used in raising batteries, strengthening parapets, revetting slopes etc. The twigs are drawn tightly together by a cord, and bands are passed round them at the distance of 2 feet from each other. Very long thin ones are called saucissons or battery-sausages.

FASHODA, a large town built by the Egyptians in 1867 on the banks of the Nile in the Soudan, n. lat. 10°. It gives its name to that portion of the district. Since 1884 it has been in ruins, the Mahdi overthrowing Egyptian rule in that year. In 1898 Marchand, a French adventurer, hoisted the French flag there, but was ousted by the Anglo-Egyptian Sirdar, General Herbert Kitchener.

FASTING, the partial or total abstinence of mankind and animals from the ordinary requisite supply of aliment, by which it is to be understood that quantity which is adapted to preserve them in a healthy and vigorous condition. It would appear that various warm blooded animals are capable of sustaining total abstinence much longer than human beings. Cats and dogs have survived for several weeks without nourishment of any kind, but it is probable that few human beings could survive such deprivation for more than a week. The use of water without solid food enables life to be sustained much longer than it could otherwise be.

FASTS, temporary abstentions from food, especially on religious grounds. Abstinence from food, accompanied with signs of humiliation and repentance or grief, is to be found more or less in almost all religions. Among the Jews fasts were numerous, and we find many instances of occasional fasting in the Old Testament. Herodotus says that the Egyptians prepared themselves by fasting for the celebration of the great festival of Isis. So in the Thesmophoria at Athens, and in the rites of Ceres at Rome, it was practiced. The Church of Rome, distinguishes between days of fasting and of abstinence. The former are: 1, the forty days of Lent; 2, the Ember days, being the Wednesday, Friday, and Saturday of the first week in Lent, of Whitsun week, of the third week in September, and of the third week in Advent; 3, the Wednesdays and Thursdays of the four weeks in Advent; 4, the vigils or eves of Whitsuntide, of the feasts of St. Peter and St. Paul, of the Assumption of the Virgin, of All Saints, and of Christmas Day. When any fasting days fall upon Sunday it is observed on the Saturday before. The Greek Church observes four principal fasts: that of Lent, one beginning in the week after Whitsuntide, one for a fortnight before Assumption, one forty days before Christmas. In the East, however, the strict idea of a fast is more preserved than in the West.

FAT, an oily concrete substance, a compound of carbon, hydrogen, and oxygen, deposited in the cells of the adipose or cellular membrane of animal bodies. In most parts of the body the fat lies immediately under the skin. Fat is of various degrees of consistence, as in tallow, lard and oil. It is generally white or yellowish, with little smell or taste. It consists of two substances, stearine and elaine or oleine, the former of which is solid, the latter liquid. These elements are separated by pressing the fat between folds of bibulous paper, which absorbs the liquid or oil. By after-treatment with water the oil is separated from the paper. Fats are insoluble in water. When boiled with caustic alkalies they are decomposed (saponification yielding an alkaline salt of the fatty acid (soap) and glycerine. Human fat appears to contain no stearine, but margarine and oleine. It is an excellent packing material in the body, and gives the human frame its smooth rounded contour. Being a bad conductor of heat, it is useful in retaining warmth, but its chief function is that of nutrition.

FA'TALISM, the belief in fate, or an unchangeable destiny, to which everything is subject, uninfluenced by reason, and pre-established either by chance or the Creator. Among notable historical examples of the belief in fate may be mentioned the old Greek conception of a fate which stood behind the gods themselves as a controlling power; the Mohammedan fatalism, which regards all things great and small as inexorably predetermined, so that no accident is possible; the theological doctrine of predestination among Calvinists. See Predestination.

FATEHPUR (fat-e-pör'), Indian town in district of the same name, Allahabad division, Northwest Provinces, 50 miles s.e. of Cawnpore. Pop. 21,328. The district was an area of 1639 sq. miles, and a pop. of 683,745.

FATES, in Greek and Latin mythology, the inexorable sisters who spin the thread of human life. The appellation Clotho (the spinner) was probably at first common to them all among the Greeks. As they were three in number, and poetry endeavored to designate them more precisely, Clotho became a proper name, as did also Atropos and Lachesis. Clotho means she who spins (the thread of life); Atropos signifies unalterable fate; Lachesis, lot or chance; so that all three refer to the same subject under different points of view. They know and predict what is yet to happen. Lachesis is represented with a spindle, Clotho with the thread, and Atropos with scissors, with which she cuts it off. We find also in the northern mythology three beautiful virgins, the Nornen, who determine the fate of men. Their names are Urd (the past), Varande (the present) and Skuld (the future).

FATHERS OF THE CHURCH, or **CHRISTIAN FATHERS.** See Church, Fathers of the.

FATHOM, a unit of length equal to 6 feet. It is chiefly used by sailors, who measure soundings, etc., in fathoms.

FAT'IMITE DYNASTY, a line of caliphs claiming descent from Fatima, the favorite daughter of Mohammed, and of Ali her cousin, to whom she was married. In the year 909 Abu-Mohammed Obeidalla, giving himself out as the grandson of Fatima, endeavored to pass himself off as the Mahdi or Messiah predicted by the Kora. Denounced as an imposter by the reigning caliph of Bagdad he fled into Egypt, became caliph of Tunis, and soon conquered all Northern Africa from the Straits of Gibraltar to the borders of Egypt. His son wrested Egypt from the Abbasides in 970 and founded Cairo. The Fatimite dynasty was extinguished on the death of Adhed, the fourteenth cailph, and a new line began with Saladin.

FATTY ACIDS, a name given to such acids as have been separated from fats. Fats and fixed oils are composed of one or more acids combined with the radical glycyl. By boiling with potash or soda the fat is decomposed, glycerin and a soap being the products. By treating this soap with hydro-chloric or sulphuric acid the base is removed and the fatty acid obtained free. These acids are such as butyric, caproic, steraic, margaric, palmitic, pelargonic, valerianic, acteic, etc. Formic acid has also been included, in the fatty series of acids, as it belongs to the same order as those named.

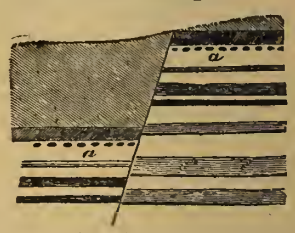
FATTY DEGENERATION, an abnormal condition found in the tissues of the animal body, in which the healthy protoplasm is replaced by fatty granules. It is a sign of defective nutrition, and is common in old age, affecting the muscles the heart, the arteries, kidneys, etc. It is accompanied by great muscular flabbiness and want of energy, the sufferer looking at the same time fat and comparatively well.

FATTY TISSUE, in anatomy, the adipose tissue, a tissue composed of minute cells or vesicles, having no communication with each other, but lying side by side in the meshes of the cellular tissue, which serves to hold them together, and through which also the blood-vessels find their way to them. In the cells of this tissue the animal matter called fat is deposited.

FAUBOURG (fō-bör), a suburb of French cities; the name is also given to districts now within the city, but which were formerly suburbs without it. Thus the Faubourg St. Germain is a fashionable quarter of Paris in which the ancient nobility resided.

FAU'CET, a form of valve or cock in which a spigot or plug opens or closes a part of a pipe for the passage of liquid.

FAULT, in geology, a fracture of strata, accompanied by a sliding down or an upheaval of the deposits on the one side of the fracture to a greater distance



Section showing displacement of strata by a fault. *a* and *a* were once a continuous mass of rock.

than the other. Faults are frequently met with in coal-beds, the miner coming unexpectedly upon an abrupt wall of other strata. The angle this makes with the plane of the bed he is working indicates whether he must look up or down for its continuation on the other side of the fracture. In mines these faults often

serve for natural drains. The cut shows at a a the change of position in strata caused by a fault.

FAUNA, a collective word signifying all the animals of a certain region, and also the description of them, corresponding to the word flora in respect to plants.

FAURE, François Felix, (fräṅ-swa-fā-lēks fŏr) French president, born in Paris in 1841. During the Franco-Prussian war he commanded a body of volunteers and gained the ribbon of the Legion of Honor. He entered the assembly in 1881, served as colonial and commerical minister in the cabinets of Gambetta, Jules Favre, and Tirad, and as minister of marine in that of Dupuy. He was elected president of the republic in 1895 He died in 1899.

FAUST, Doctor John, a celebrated dealer in the black art, who lived in Germany, early in the 16th century. According to some accounts he was born in Suabia, others make him a native of Anhalt, others of Branndenburg. In his sixteenth year he went to Ingolstadt and studied theology, became in three years a magister, but abandoned theology, and began the study of medicine, astrology, and magic, in which he likewise instructed his familiar Johann Wagner, the son of a clergyman at Wasserburg. After Dr. Faust had spent a rich inheritance, he, according to tradition, made use of his power to conjure up spirits, and entered into a contract with the devil for twenty-four years. A spirit called Mephistophles was given as a servant, with whom he traveled about, enjoying life in all its forms, but the evil spirit finally carried him off. Even yet Dr. Faustus and his familiar Wagner play a conspicuous part in the puppet-shows of Germany, and the legend forms the subject of Goethe's great drama Faust, and furnishes the libretto for Gounod's famous opera of the same name. As early as 1590 the legend was dramatically treated in England by Christopher Marlowe.

FAVART (fä-vär), Charles Simon, creator of the serio-comic opera in France, born 1710, was the son of a pastry-cook. His poetical reputation rests principally on his numerous productions for the opera aux Italiens, and the comic opera. He was the director of a company of itinerant actors which followed Marshal Saxe into Flanders. His wife, Madame Favart, was a famous singer, comic actress, and dancer, and participated in the composition of her husband's plays. Favart died in 1792.

FAVRE (fävr), Jules, a French politician, born 21st March, 1809, at Lyons. He was a leader of the party of opposition to the President Louis Napoleon; and after the coup d'état (1851) he retired from political life for six years, till in 1858 his defense of Orsini for the attempt on the life of the emperor again brought him forward. From this time he again became an active leader of the republican opposition to the emperor. On the fall of the empire he became vice-president of the government of national defense and minister of foreign affairs. As such he conducted the negotiations for peace with Prince Bismarck. But though he showed great energy and was very eloquent, his operations both in the matter of the armistice and the peace showed a lack of skill and judgment. He died in 1880.

FAWKES, Guy. See Gunpowder Plot.

FAYAL (fī-äl′), an island belonging to Portugal, one of the Azores. It is of a circular form, about 10 miles in diameter The climate is good, and the air always mild and pure. The soil is very fertile, producing in abundance wheat, maize, flax, and almost all the fruits of Europe. It exports a great quantity of oranges and lemons. The chief place is Villa Horta or Orta. Pop. 31,000.

FAYENCE. See Faience.

FAYETTE, General La. See Lafayette.

FAYOUM (fä-yŏm′), a province of Middle Egypt, a little to the west of the Nile, surrounded by the Libyan desert; area about 800 sq. miles. On the west lies Lake Birket-el-Kurun. The chief town, Medinet-el-Fayoum, is connected with Cairo by a railway. Pop. of province, 228,709.

FEASTS. See Festivals.

FEATHER-GRASS, the popular name of a plant, a native of dry places in the south of Europe. The leaves are rigid, setaceous, grooved; the awns exceedingly long, feathering to the point. It is a great ornament to gardens in summer, and to rooms in winter. The rush-leaved Feather-grass is found in the prairies of the Western States.

FEATHERS, the form which the dermal appendages assume in birds, agreeing in mode of development, but differing in form from hair and scales. The leather consists of a stem, horny, round strong, and hollow in the lower part, called the quill, and in the upper part, called the shaft, filled with pith. On each side of the shaft is a web composed of a series of regularly-arranged fibres called barbs. The barbs and shaft constitute the vane. On the edges of the barbs are set the barbules, which interlock with those of adjacent barbs, and thus give strength at the vane. Feathers are generally divided into two kinds, quill feathers in the wing or tail, and plumes or clothing feathers generally diffused. The feathers of birds are periodically changed, generally once, but in some species twice a year. This is called moulting. When feathers have reached their full growth they become dry, and only the tube, or the vascular substance which it contains, continues to absorb moisture or fat. When, therefore, part of a feather is cut off, it does not grow out again; and a bird whose wings have been clipped remains in that situation till the next moulting season, when the old stumps are shed and new feathers grow out. If, however, the stumps are pulled out sooner (by which operation the bird suffers nothing), the feathers will be renewed in a few weeks or even days. The feather is a very strong formation, not readily damaged the arch of the shaft resisting pressure, while the web and fine fibers yield without suffering. Being a bad conductor of heat it preserves the high temperature of the bird, while it is so light as to be easily carried in flight. It is rendered almost impervious to wet by the oily fluid which most birds secrete at the base of the tail. Feathers form a considerable article of commerce, particularly those of the ostrich, heron, swan, peacock, goose, etc., for plumes, ornaments, filling of beds, pens, etc.

FEATHER-STAR, a beautiful crinoid star-fish occurring on the British coasts, consisting of a central body or disc, from which proceed five radiating arms, each dividing into two secondary branches, so that ultimately there are ten slender rays. Each arm is furnished on both sides with lateral processes so as to assume a feather-like appearance. It is fixed when young by a short stalk, but exists in a free condition in its adult state.

FEB′RIFUGE, a medicine employed to drive off or diminish fever, such as quinine.

FEB′RUARY (from the Roman Februa, a festival of expiation or purification), the second month in the year, having twenty-eight days, except in leap-year, when it has twenty-nine. This latter number of days it had originally among the Romans, until the senate decreed that the seventh month should bear the name of Augustus, when a day was taken from February and added to August to make it equal to July in number of days.

FEDERAL GOVERNMENT, government by the confederation of several united states, self-governing in local matters, but subject in matters of general polity to a central authority, as, for instance, the Swiss Republic, the U. States of North America, Mexico, etc. The degree to which such states give up their individual rights as sovereign bodies may be very different.

FEDERAL PARTY, a name assumed by that portion of the people of the U. States who favored the adoption of the federal constitution, organized the government and administered it for twelve years. They advocated a government having attributes of sovereignty, operating upon the people directly, and having all necessary powers for effective action; their opponents favored a simple compact of confederation.

FEE, or FIEF, in law, primarily meant a loan of land, an estate held in trust on condition of the grantee giving personal or other service to the prince or lord who granted it. Feudal estates, however, soon came to be regarded as inalienable heritages held on various tenures; hence the term fee came to be equivalent to an estate of inheritance, that is an interest in land which passes to heirs if the owner die intestate. The amplest estate or interest in land is that of a fee-simple, which is also called an absolute fee, in contradistinction to a fee limited or clogged with certain conditions. A fee-simple means the entire and absolute possession of land, with full power to alienate it by deed, gift, or will. It is the estate out of which other lesser estates are said to be carved; such as fee-tail, which is limited to particular heirs, and subject to certain restrictions of use; and a base fee, which ceases with the existence of certain conditions.

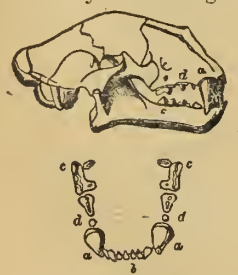
FEEHAN, Patrick Augustine, American Roman Catholic prelate, born in Tipperary, Ireland, in 1829. He came to the U. States in 1852, when he was ordained. He was installed as first Arch-

bishop of Chicago in 1880. During his administration he founded several new parishes, a college of the Christian Brothers and other institutions. He died in 1902.

FEEJEE. See Fiji.

FEELING, is properly a synonym for sensation, or that state of consciousness which results from the application of a stimulus to the extremity of some sensory nerve. It is the most universal of the senses, existing wherever there are nerves; and they are distributed over all parts of the body, though most numerous on such parts as the fingertips and the lines where skin and mucous membrane pass into each other. This universal distribution of feeling is necessary, otherwise parts of the body might be destroyed without our knowledge. The structures which thus apprehend the impressions of contact are papillæ or conical elevations of the skin in which the nerves end, and which are richly supplied with blood-vessels. The term feeling is also used for a general sense of comfort or discomfort which cannot be localized, and it is thus that the disturbances of internal organs often manifest themselves. In a figurative sense the term is also applied to a mental emotion, or even to a moral conception; thus we may speak of a friendly feeling, a feeling of freedom.

FE'LIDÆ, animals of the cat kind, a family of Carnivora in which the predaceous instincts reach their highest development. They are among the quad-



Teeth of felidæ.

Skull and teeth of the tiger. *a*, Canines or tearing teeth. *b*, Incisors or cutting teeth. *c*, True molars or grinding teeth. *d*, Carnassial or sectorial teeth.

rupeds what the Falconidæ are among the birds. The teeth and claws are the principal instruments of the destructive energy in these animals. The incisor teeth are equal; the third tooth behind the large canine in either jaw is narrow and sharp; and these, the carnissial or sectorial teeth, work against each other like scissors in cutting flesh; the claws are sheathed and retractile. They all approach their prey stealthily, seize it with a spring, and devour it fresh. The species are numerous in Europe, Asia, Africa, and America, but none are found in Australia. The family comprehends the lion, tiger, leopard, lynx, jaguar, panther, chetah, ounce, serval, ocelot, cat, etc.

FELLAH, an Arabian word meaning "peasant," and used for the laboring class in Egypt. The fellahs or fellaheen constitute about three-fourths of the population of Egypt, and are mostly the direct descendants of the old Egyptians, although both their language and religion are now that of their Arabian conquerors. They live in rude huts by the banks of the Nile, and have suffered much from over-taxation and oppressive rule. See Egypt.

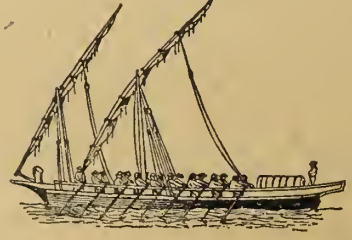
FELO DE SE (Latin, "a felon in regard to himself"), in law, a person that, being of sound mind and of the age of discretion, deliberately causes his own death. Formerly, in England, the goods of such a person were forfeited to the crown, and his body interred in an ignominious manner; that is, unless the coroner's jury gave a verdict of unsound mind; but these penalties have been abolished.

FEL'ONY, in law, includes generally all crimes below treason and of greater gravity than misdemeanors. Formerly it was applied to those crimes which entailed forfeiture of lands or goods as part of the punishment.

FEL'SPAR or **FELDSPAR,** a mineral widely distributed, and usually of a foliated structure, consisting of silica and alumina, with potash, soda, or lime. It is a principal constituent in all igenous and metamorphic rocks, as granite, gneiss, porphyry, greenstone, trachyte, felstone, etc. When in crystals or crystalline masses it is very susceptible of mechanical division at natural joints. Its hardness is a little inferior to that of quartz. There are several varieties, as common felspar or orthoclase, the type of an acid group containing from 7 to 16 per cent of potash; albite and oligoclase, soda felspars, the quantity of soda exceeding that of lime; labradorite and anorthite, lime felspars, the quantity of lime in the latter amounting to 20 per cent.

FELT, a kind of cloth made of wool, or of wool and cotton united by rolling, beating and pressure. The materials to be felted are carded and placed in a machine, where they are kept wet and intimately mixed together by a process of beating. Pressure then unites the whole into a compact mass. The use of felt as a material for hats, tents, cloaks etc., is very ancient. For hat-making the fur of rabbits, beavers, raccoons, and the wool of sheep is generally used. Felt being a good non-conductor of heat is much used for roofing, sheathing boilers, hot-water reservoirs, etc. The felt for such purposes is made from the coarsest woolen refuse from paper-mills.

FELUC'CA, a long narrow vessel, generally undecked, of light draught, and



Felucca.

rigged with large lateen sails. They also carry from eight to twelve large oars. They are common in the Mediterranean.

FE'MUR, in vertebrate animals, the first bone of the leg, situated next the trunk of the body, and in man popularly called the thigh-bone.

FENCES, continuous lines of obstacles artificially interposed between one portion of the surface of the land and another for the purpose of separation or exclusion. Live fences are made of hawthorn, holly, box, beech, etc.; dead fences of stone, wood, and in recent times of iron or wire. In agriculture fences are necessary both for restricting the tenant's own animals to their pasture, and for protecting his land from straying animals. The general erection of fences on farms is one of the improvements of modern agriculture.

FENCING, the art of attack and defense with sword or rapier, no shield being used. It was in Italy in the 16th century that the skilful use of the small sword first became common. The art spread to Spain and then to France, where, on account of the prevalence of duelling, it was brought to a high degree of development. The small sword or rapier (which was adopted for duelling) has a point, but no edge, and therefore demands the highest degree of adroitness in its use. In the fencing schools the instrument adopted for exercise is called a foil; it has a guard of metal or leather between the handle and blade, which is made of pliant steel and has a button at the end in place of a point. The parries are made with the weapon itself by opposing the forte of the foil (i.e. the strong part from the handle to the center) to the feeble of the adversary's foil (i.e. to the part from center to point); the upper part of the body to the right is defended by the parry called tierce, the upper part to the left by the carte, and the lower part by the seconde. In all parrying care must be taken that in covering the side attacked the other side is not too carelessly exposed to the enemy. After every parry a return should be made with rapidity and decision. The fencer should rely more upon his sword hand for protection than upon his agility of leg; yet he must be active on his legs so as to advance, retreat, or lunge with effect. The knee should therefore be somewhat bent when the fencer is on guard, that he may be light and elastic in his movements. An attack may be made by the mere extension of the arm, or accompanied by a lunge, that is, by advancing the body, stepping forward with the right foot, without moving the left. An engagement means the crossing of the blades; a disengagement, slipping your foil under the opponent's and then pressing in the opposite direction; riposte, the attack without pause by a fencer who has parried. Fencing with the broadsword differs essentially from that with the foil, as the former has an edge as well as a point, and is therefore meant to cut as well as thrust. According to the instructions of drill-masters there are seven cuts, with corresponding guards, and three thrusts. Cut one is a diagonal, downward cut at the left cheek of the adversary; cut three is delivered with an upward slope at the left leg, and cut five horizontally at the right side; cuts two, four, and six attack the right cheek, right side, and right leg respectively; and cut seven is directed vertically at

the head. Guards one and two defend the upper portion of the body, the sword sloping upwards in an opposite direction to the opponent's; guards three and four protect the legs, the sword sloping downward; guards five and six defend the sides, when the sword is held vertically, point downward; and guard seven protects the head, the blade meeting the enemy's almost at a right angle. Since the introduction of the bayonet, bayonet exercise has become an important department of fencing in the army. In handling the bayonet defensively the right foot is thrown back and receives most of the weight of the body, the knees are bent, the bayonet brought to a horizontal position level with the waist. This is the "guard," and according to the parry to be made the weapon is carried either to the "high" position, pointing upward from the breast, or to the "low" position, pointing downward from the breast. In taking the offensive the right leg is straightened, and the left bent forward, without moving the fect from their place. The butt of the rifle is pressed firmly to the shoulder and points straight forward. In "shortening arms" the butt is carried back to the full extent of the right arm, while the barrel (turned downward) rests upon the left arm. The body rests upon the right leg, which is slightly bent, while the left is somewhat advanced.

FENELON (fān-lōn), François de Salignac de la Mothe, born in 1651 at the Château Fénelon, in Périgord, of a family illustrious in church and state. He took orders at the age of twenty-four, and distinguished himself in the work of converting Protestants. In 1681 his uncle conferred on him the priory of Carennac. Soon after he wrote his first work, Traité de l'Education des Filles, which was the basis of his future reputation. In 1689 Louis XIV. intrusted to him the education of his grandsons, the Dukes of Burgundy, Anjou, and Berri. In 1694 he was created Archbishop of Cambray. A theological dispute with Bossuet, the virtual head of the French Church, terminated in his condemnation by Pope Innocent XII., and his banishment to his diocese by Louis XIV. Fénelon submitted without the least hesitation, and thenceforward lived contentedly in his diocese, sustaining the venerable character of a Christian philosopher, and scrupulously performing his sacred duties. He died in 1715. He left numerous works in philosophy, theology, and belles-lettres. The most celebrated is Les Adventures de Télémaque, in which he endeavored to exhibit a model for the education of a prince. It was commonly taken for a satire on the reign of Louis XIV., though nothing probably, was further from the mind of Fénelon.

FE'NIANS, a name usually derived from Fionn or Finn, the name given to a semi-mythical class of Irish warriors famous for their prowess. The name has been assumed in recent years by those Irish who formed a brotherhood in their own country and in America, with the intention of delivering Ireland from the sovereignty of England, and establishing an Irish republic. About the end of 1861 the Fenian Brotherhood was regularly organized in America; The close of the civil war, when large numbers of Irish soldiers were released from service, was thought to be a convenient time for taking decisive steps. Two risings were planned in Ireland, but they were both frustrated by the energetic measures of the British government. An invasion of Canada, failed as miserably as the attempt in Ireland, and convinced the Irish that they could not expect the aid from the U. States on which they had hitherto counted. At last, on 5th March, 1867, the long-prepared insurrection broke out almost simultaneously in the districts of Dublin, Drogheda, and Kerry. The number of insurgents in the field, however, did not exceed 3000, and though they burned some police stations, they nowhere faced the troops sent after them. About the same time some forty or fifty Irish-Americans landed in a steamer near Waterford, but soon after fell into the hands of the police. In 1870 and 1871 two raids were again made on Canada, but both were ridiculous failures, the first being repulsed by the Canadian Volunteers, and the second suppressed by the United States government. At present the brotherhood seems to have suspended active operations.

FENNEC, a small animal allied to the dog and fox, and sometimes called the Sahara fox, being a native of that region.

Fennec.

It lives on birds, jerboas, lizards, dates, etc., burrows with great facility, and is easily tamed. It is fox-like in appearance, and is remarkable for the great size of its ears.

FENNEL, a fragrant plant, cultivated in gardens. It bears umbels of small yellow flowers, and has finely divided leaves. The fruit, or in common language the seeds, are carminative, and frequently employed in medicine.

FER'DINAND, German emperors:—1. Ferdinand I., brother of Charles V., born at Alcala, in Spain, 10th March, 1503. On the abdication of Charles he succeeded to the imperial title. He died 25th July, 1564.—2. Ferdinand II. was born in 1578, and succeeded his uncle Matthias as Emperor of Germany in 1619. He was of a dark and reserved character, and had been brought up by his mother and the Jesuits in fierce hate of Protestantism. The result was a quarrel with his Bohemian subjects, who openly revolted and offered the Bohemian crown to the Elector Palatine, a step which led to the outbreak of the Thirty Years' war (1619). He died Feb. 15, 1637.—3. Ferdinand III., son of the preceding, was born in 1608, and succeeded his father in 1637. He had served in the Thirty Years' war and had seen the miseries which it occasioned and was reluctant to continue it. There were eleven years more of it, however, before the Peace of Westphalia was concluded in 1648. Ferdinand died in 1657.

FERDINAND I. of Bourbon, King of the Two Sicilies (previously Ferdinand IV. of Naples), born January 12, 1751, was the third son of Charles III., King of Spain, whom he succeeded in 1759, on the throne of Naples, on the accession of the latter to that of Spain. In 1768 he married Maria Caroline Louisa, daughter of the Empress Maria Theresa, who soon acquired a decided influence over him. He died in January, 1825, and was succeeded by his son, Francis I.

FERDINAND II., King of the Two Sicilies, born in 1810, succeeded his father Francis I. on the 8th of November, 1830. The revolution of France in this year had unsettled the minds of men throughout the continent, and Ferdinand was forced to make concessions to his subjects, but soon recalled them, determining thenceforward to make his will the only law. He died in 1859 and was succeeded by his son, Francis II., who lost his crown when Italy was united in 1860 under Victor Emmanuel.

FERDINAND V., King of Aragon, who received from the pope the title of the Catholic, on account of the expulsion of the Moors from Spain, was the son of King John II., and was born March 10, 1453. On the 18th of October, 1469, he married Isabella of Castile, and thus brought about that close connection between Aragon and Castile which became the basis of a united Spanish monarchy and raised Spain to preeminence among European states. After a bloody war of ten years they conquered Granada from the Moors (1491); but the most brilliant event of their reign was the discovery of America, which made them sovereigns of a new world. (See Columbus.) This politic prince laid the foundation of the Spanish ascendency in Europe by the acquisition of Naples (1503), and by the conquest of Navarre (1512); but his policy was deceitful and despotic. He instituted the court of the Inquisition at Seville in 1480, and, to the great injury of Spanish commerce, expelled the Jews (1492) and Moors (1501). He died in 1516.

FERDINAND VII., King of Spain, eldest son of Charles IV., and of Maria Louisa of Parma, born in 1784; ascended the throne in March, 1808, when a popular rising forced his father to abdicate in his favor. A month later he himself abdicated in favor of Napoleon, who conferred the crown on his brother Joseph. Ferdinand returned to Spain in March, 1814. His arbitrary conduct caused an insurrection in 1820, which was at first successful, but Louis XVIII. of France having sent an army to his aid, his authority was once more made absolute in Spain. Having no sons he abolished the act of 1713 by which Philip V. had excluded women from the throne of Spain, and then left his crown to his daughter Isabella to the exclusion of his brother Don Carlos. It was during the reign of this king that the Spanish colonies in America broke away from the mother country.

FER'ETORY, a kind of box made of gold or other metal, or of wood variously adorned, and usually in the shape of a

Feretory.
English medieval silverwork.

ridged chest, with a roof-like top, for containing the relics of saints. It is borne in processions.

FERGHANA', a province of Asiatic Russia in Turkestan, formed in 1876 out of the conquered khanate of Khokand. Area, 36,000 sq. miles. The climate is warm, and the soil in part fertile, but a considerable portion of the country is desert. Pop. about 716,000. Khokand is the capital.

FERGUSON, James, an eminent experimental philosopher, mechanist, and astronomer, was born of poor parents at Keith, in Banffshire, in 1710. While a boy tending sheep he acquired a knowledge of the stars, and constructed a celestial globe. He died in 1776. His principal works are: Astronomy Explained upon Sir Isaac Newton's Principles (1756); Lectures on Mechanics, Hydrostatics, etc. (1760); Select Mechanical Exercises (1773).

FERMANAGH (fer-mä'na), an inland county in Ireland, in the province of Ulster; area, 714 sq. miles, or 457,369 acres. The soil is variable, and not remarkably fertile. The manufactures are unimportant. Politically it is divided into North Fermanagh and South Fermanagh, each sending one member to parliament. Pop. 74,037.

FERMENTATION, the spontaneous conversion of an organic substance into new compounds by the influence of a ferment, these ferments being apparently vegetable organisms of extremely simple type, which by their life, growth, and increase set up fermentation. There are several kinds of fermentation: 1st, the vinous or alcoholic fermentation—the most important from an economic and industrial point of view—in which the sugar contained in liquids is converted into alcohol, carbonic acid, and glycerin; 2d, the acid fermentation, in which spirituous liquors become acid, producing acetic acid; 3d, the putrid fermentation, by which organic substances undergo various alterations according to the nature of the substance, and generally set free poisonous gases. Fermentation is also described as lactic, butyric, etc., according to the nature of the results. The general course of alcoholic fermentation, as seen in brewing and wine making, is as follows:—After a lapse of time, which may vary much according to the temperature and other conditions, the liquid acquires a turbid appearance, there is a slight disengagement of gas, which increases till the liquid begins to effervesce, its temperature rises to a higher point than that of the surrounding air, and its surface becomes covered with a frothy matter known as yeast. The effervescence becomes more and more violent till a climax is reached, when its intensity gradually diminishes, and the disengagement of gas ceases. The yeast then settles down at the bottom of the liquor, which is now entirely deprived of its sugar, and has the characteristic taste and effects of "fermented liquors." The rationale of this process has long been the subject of much discussion, but there can be little doubt that it is due to microscopic organisms (the yeast fungus) which live and multiply in the liquid in which they cause fermentation. And the fermentation may be checked or altogether prevented by anything which prevents the growth of the fungus, for example by the presence of any antiseptic substance such as sulphuric acid, carbolic acid, etc., which acts as a poison on the fungus; or by the liquid being either too hot or too cold (below 50° or above 86° Fahr.). Fermentation differs in kind according to the nature of the substance which produces it, and each kind is the special production of a certain species of organism, no two of which will ever pass into each other. Lactic fermentation, such as occurs in milk, that has been allowed to stand, is caused, according to Pasteur, by the development in the mass of a microscopic fungus, Penicillium glaucum, the sugar of the milk being converted into lactic acid. The acid or acetous fermentation occurs in liquids which have already undergone vinous fermentation. When exposed to the atmosphere such liquids become sour, and vinegar is produced. This change is probably due to the growth of a fungus, Mycoderma aceti (the vinegar plant). Viscous fermentation often accompanies vinous fermentation, making the wine thick and viscous so that it runs out in threads when poured. It occurs at temperatures ranging from 68° to 104° Fahr. Butyric fermentation follows on lactic fermentation when the latter is allowed to proceed after lactate of lime has been formed. It is believed that putrefaction is only a species of fermentation, determined by ferment of the bacteria class. As it is commonly maintained that fermentation may be set up by the necessary germs entering the liquors from the air in which they float, the theory of fermentation has a close connection with that of the germ theory of disease. See Germ Theory.

FERMENT'ED LIQUORS, alcoholic beverages obtained by the fermentation and clarification of saccharine fluids. These have been in use from the earliest times. Among the commonest kinds are wine made from the juice of the grape; ale or beer made from an infusion of malt; cider, from apples; mead, from honey; kumiss made by the Kirghiz from mares' milk; chica from maize by the South American Indians, etc. From all fermented liquors a spirit may be extracted by distillation.

FERNS, a natural order of cryptogamous or flowerless plants, forming the highest group of the acrogens or summit-growers. They are leafy plants, the leaves, or more properly fronds, arising from a rhizome or root-stock, or from a hollow arborescent trunk, and being circinate in vernation, a term descriptive of the manner in which the fronds are rolled up before they are developed in spring, having then the appearance of a bishop's crosier. On the veins of their lower surface, or their margins, the fronds bear small vessels named sporangia, containing spores. These spore-cases are arranged in clusters, named sori, which are either naked or covered with a layer of the epidermis, which forms an involucre or indusium. When the spores germinate they produce a

Male-fern.

cellular structure of a leafy description, called the pro-embryo, or prothallus, upon which are developed organs which have received the names of antheridia and archegonia. When produced upon the prothallus these organs do not immediately give origin to a germinating spore, but from their mutual action proceeds a distinct cellular body, destined at a later period to develop into a fruit-bearing frond. Ferns have a wide geographical range, but are most abundant in humid, temperate, and tropical regions. In the tropical forests the tree ferns rival the palms, rising sometimes to a height of 50 or 60 feet. Ferns are very abundant as fossil plants. The earliest known forms occur in Devonian rocks. Various systems of classification for ferns have been proposed. At present the order is usually divided into six or eight sub-orders or tribes distinguished by differences in the structure of the sporangium. The generic characters are founded on the position and direction of the sori and on the venation. A few of the ferns are used medicinally mostly as demulcents and astringents.

FERRA'RA, a city of N. Italy, capital of the province of same name, 26 miles n.n.e. Bologna, in a fertile but unhealthy plain. Pop. 28,814.—The province was formerly a duchy of Italy held by the House of Este as a papal fief from 1471 till 1597, when it fell to the pope. At the unification of Italy under Victor Emmanuel in 1860 it gave its name to a province bounded on the n. by the Po, e. by the Adriatic, s. and w. by Ravenna, Bologna, and Modena; area, 1100 sq. miles; pop. 247,788.

FER'RET, a carnivorous animal closely allied to the polecat, about 14 inches in length, of a pale-yellow color, with red eyes. It is a native of Africa.

Ferrets are used, in catching rabbits, rats, etc., to drive them out of their holes.

Ferret.

FERRIS WHEEL, The, exhibited at the Chicago World's Fair, was a remarkable engineering feature. Its diameter was 270 feet; its circumference 825 feet. Its highest point was 280 feet. The axle was a steel bar, 45 feet long, 32 inches thick. Fastened to each of the twin wheels was a steel hub 16 feet in diameter. The 36 cars on the wheel each comfortably seated 40 persons, wheel and passengers weighing 1200 tons. The two towers at the axis supporting the wheel were 140 feet high. The motive power was a 1000-horse-power-steam-engine under the wheel. By the Ferris wheel the almost indefinite application of the tension spoke to wheels of large dimensions has been vindicated, the expense being far smaller than that of the stiff spoke.

FERROL, a fortified seaport of Northern Spain, in the province and about 12 miles n.e. of the town of Coruña, on a fine island bay, connected with the sea by a channel so narrow as to admit only one ship-of-the-line at a time. The chief naval arsenal of Spain, established on a magnificent scale, is here. The manufactures consist chiefly of swords, cutlery, and military and naval equipments. Pop. 23,811.

FERRY, a particular part of a river, lake, arm of the sea, etc., where a boat or other conveyance plies to carry passengers or goods from one side to the other. The right of establishing a public ferry is usually the prerogative of a government or legislature. The person who has a right of ferry is required to keep a boat or boats suitable for the conveyance of passengers, to charge a reasonable fare, and to provide the requisite landing-places on either bank of the river. No one will be allowed to establish a rival ferry so near the original one as to destroy its custom. Common rowing-boats, sailing-boats, large flat-bottomed barges pulled along a rope stretched from bank to bank for horses and carriages, and steam ferry-boats are among the conveyances.

FERRY, Jules François Camille, French statesman and writer, born at St. Dié in the Vosges, April 5, 1832. He became a barrister at Paris, but devoted himself almost entirely to journalism. In 1869 he was returned as deputy for the sixth arrondissement of Paris and took his seat among the members of the "Left." After the fall of Sedan he became a member of the Government of the National Defense. In 1872 Thiers appointed him minister resident at Athens. In 1879 he became minister of public instruction, and as such introduced an education bill, which among other things forbade unauthorized communities, such as Jesuits, to teach in schools. In 1880, Ferry, having become premier, entered upon a vigorous and somewhat hazardous foreign policy. His seizure of Tunis, in 1881, was so far successful, though it led to his resignation; again premier in 1883 his unfortunate expedition to Tonquin forced him to retire from office. Feb. 24, 1893, he was elected president of the senate, but died March 17 of the same year.

FER'ULA, a genus of umbelliferous plants, whose species often yield a powerful stimulating gum resin, employed in medicine. The species are natives of the shores of the Mediterranean and Persia, and are characterized by tall-growing pithy stems, and deeply-divided leaves, the segments of which are frequently linear.

FESSE (fes), in heraldry, a band or girdle comprising the center third part of the shield, and formed by two horizontal lines drawn across it; it is one of the nine honorable ordinaries. The fesse-point is the exact center of the escutcheon.

FESSENDEN, William Pitt, statesman, born at Boscawen, N. H., 1806. He was elected in 1841 to the congress of the United States, and in 1853, he was elected to the United States senate. In 1864, on the retirement of Mr. Chase from the secretaryship of the treasury, he accepted that portfolio, and discharged the duties of the office during a most critical period of the nation's finances until March, 1865, when he resigned and resumed his seat in the senate, to which he had been re-elected. He died in 1869.

FES'TIVALS, or FEASTS, certain days or longer periods consecrated to particular celebrations either in honor of some god, or in commemoration of some important event. Such festivals have prevailed among nearly all nations, both ancient and modern. Among the Jews there are six festivals prescribed in the Scriptures (Lev. xxiii.), and thence called sacred feasts. These are the weekly feasts of the Sabbath; the Passover, or Feast of Unleavened Bread; Pentecost, or the Feast of Weeks; the Feast of Trumpets, or New Moon; the Feast of the Atonement; and the Feast of Tabernacles. Afterward the Feast of Purim (to commemorate the failure of Haman's machinations), and the Dedication of the Temple (after its profanation by Antiochus Epiphanes), were added. Among the ancient Greeks were celebrated the Dionysia; the Eleusiania; the four great national games, the Olympic, the Isthmian, Nemean, and Pythian games. But each community and city had its own local festivals in addition, such as the Panathenæa, held by the tribes of Attica, whose union it was intended to celebrate. Among Roman festivals were the Saturnalia, Cerealia, Lupercali, and others.

The festivals of the Christian church owe their origin partly to those of the Jewish religion, such as Easter, which corresponds to the Passover of the Jews and Whitsuntide, which corresponds to Pentecost; partly also to pagan festivals, which the Christian hierarchy, finding it impossible to abolish them, applied to Christian uses by converting them in festivals of the church. These festivals are divided into movable and immovable; the former those which in different years fall on different days, the latter those which always fall upon the same day. The chief of the movable feasts is Easter, the one on which the position of all the others, except that of Advent Sunday, depends. Septuagesima Sunday falls nine weeks before Easter, Sexagesima Sunday eight weeks, Quinquagesima Sunday seven weeks, the first Sunday in Lent six weeks, and Palm Sunday, one week before Easter. Rogation Sunday falls five weeks, Ascension day forty days, Whitsunday seven weeks, and Trinity Sunday eight weeks after Easter. Ash Wednesday is the Wednesday before the first Sunday in Lent, Maundy Thursday the Thursday, and Good Friday the Friday before Easter, and Corpus Christi is the Thursday after Trinity Sunday. Advent Sunday is the nearest Sunday to the feast of St. Andrew, November 30, whether before or after. The chief immovable feasts are the feast of the Circumcision on the 1st of January, Epiphany on the 6th of January, the Annunciation of the Blessed Virgin on the 25th of March, the Transfiguration of Christ on the 6th of August; the feast of St. Michael (Michaelmas) and All the Angels on the 29th of September, the feast of All-Saints on the 1st of November, the festival of All-Souls on the 2d of November, and Christmas Day or the Feast of the Nativity of our Lord on the 25th of December. The festivals relating to the Virgin Mary in the Roman Catholic Church include: the feast of the Annunciation; the Purification of the Virgin, or Candlemas; the feast of the Visitation of Our Lady; the feast of the Immaculate Conception; the Nativity of the Virgin; the Martyrdom of the Virgin Mary; the Assumption of the Virgin (Aug. 6); and several smaller ones. The worship of the cross introduced two festivals; that of the Invention of the Holy Cross (May 3), and that of the Exaltation of the Cross (September 1). The saints' days that are still held as festivals and have religious services connected with them in the Church of Englnad, are called red-letter days, because they used to be printed with red letters in the church calendar; while the saints' days which were still retained in the calendar at the Reformation, but had no services connected with them, are called black-letter days, because they were printed in black letters.

FESTUS, Sextus Pompeius, a Roman grammarian belonging to the 2d or 3d century of our era, author of an abridgment of a work by Verrius Flaccus called De Verborum Significatione, a kind of dictionary, which is very valuable for the information it contains about the Latin language. The work of Festus was still further abridged in the 8th century by Paulus Diaconus. The one MS. of the original work of Festus is now at Naples.

FE'TISH, or FETICH, a word first brought into use by De Brosses, in his work Du Culte des Dieux Fétiches (1760), and derived from the Portuguese feitiço, magic, a word which expressed the Portuguese opinion of the religion of the natives of the west coast of Africa. The Portuguese gave this name to the

idols of the negroes of the Senegal, and afterward the word received a more extensive meaning. A fetish is any object which is regarded with a feeling of awe, as having mysterious powers residing in it, but without any consciousness in

Fetishes of Dahomey, Africa.

the exercise of them. The fetish may be animate, as a cock, a serpent, etc.; or inanimate, as a river, a tooth, a shell. Fetish worship prevails in Guinea and other parts of the west coast of Africa. In addition to the common fetish of the tribe every individual may have one of his own. To this he offers up prayers, and if they are not heard he punishes it, or perhaps throws it away, or breaks it in pieces.

FETUS, FŒTUS, the young of viviparous animals in the womb, and of oviparous animals in the egg, after it is perfectly formed; before which time it is called embryo.

FEUDAL SYSTEM, that system by which land (a fief) is held by a vassal on condition of fidelity, that is, in consideration of services to be rendered to his superior or feudal lord. The nature of the feudal system is to be explained by its origin among the Germanic tribes. In the earliest times the relation of superior and vassal did not exist in connection with the ownership of land. Each freeman had his share of the tribe lands, which were held simply on condition of his fulfilling his public duties of attendance at the councils of the mark or township and performing his share of military service in the wars or musters decreed at such councils. The noble had, of course, more land and more influence than the simple freeman, but there need be no tie of vassalage between them. This seems to have been the primitive social organization of the Anglo-Saxons and other German tribes. The lands held by all freemen, whether noble or ordinary freemen, under this system, are said to be allodial as distinguished from feudal lands, which imply service to a superior lord. By the close of the 10th century, however, this system had undergone considerable modifications. The masses of Teutonic invaders who overran Gaul and England had necessarily to confer exceptional powers on their leaders; and as they were for long very much in the position of military in an enemy's country, these powers were naturally continued. Thus it was that kings, before unknown to the Anglo-Saxons, made their appearance immediately after their descent upon Britain. It was common for a chief or great man to have a retinue or bodyguard composed of valiant youths, who were furnished by the chief with arms and provisions, and who in return devoted themselves to his service. These companions originally received no pay except their arms, horses, and provisions and the portion of the spoils which remained after the chieftain had taken his own share. But when conquered lands came to be apportioned and large districts fell into the hands of kings or dukes and their subordinates, they gave certain portions of the territory to their attendants to enjoy for life. These estates were called beneficia or fiefs, because they were only lent to their possessors, to revert after their death to the grantor, who immediately gave them to another of his servants on the same terms. As the son commonly esteemed it his duty, or was forced by necessity, to devote his arm to the lord in whose service his father had lived, he also received his father's fief; or rather, he was invested with it anew. By the usage of centuries this custom became a right and the fief became hereditary. A fief rendered vacant by the death of the holder was at once taken possession of by his son, on the sole condition of paying homage to the feudal superior. Thus a feudal nobility and a feudal system arose and for a time existed alongside of the old allodial system. But gradually the greater security to be got by putting one's self under the protection of some powerful ruler or leader gave the feudal system the predominance. The free proprietor of landed property, oppressed by powerful neighbors, sought refuge in submitting to some more powerful nobleman, to whom he surrendered his land, receiving it back as a vassal. Even the inferior nobility found it to be to their advantage to have themselves recognized as feudatories of the nearest duke or earl; and as the royal power steadily advanced, the offices of duke, ealdorman, gerefa, etc., were always bestowed by the king. Thus the crown became the source of all authority and possession in the country. The land which had once been "folcland," or the land of the people, became the land of the king, from whom all titles to it were held to be derived. Such at least was the development of feudalism in England, where its centralizing tendencies, especially in the matter of holding lands from the crown, were strongly reinforced by the circumstances of the conquest under William the Norman. Under him and his immediate successors there was a struggle between royalty and the nobility, which ended in the power of the latter sinking before that of the kings. On the other hand, in Germany, France, and elsewhere on the continent, the disintegrating tendencies of feudalism as a system of government had full play. In these countries the weakening of the kingly authority encouraged the great feudal dukes and counts to set up in an almost absolute independence, which in France was afterwards gradually lost as the monarchy grew stronger, but in Germany continued to divide the land down almost to our own times into a number of petty principalities.

Among the chief agencies that overthrew the feudal system were the rise of cities, the change in modes of warfare, and the spread of knowledge and civilization. The spirit of the feudal system, grounded on the prevalence of landed property, was necessarily foreign to cities which owed their origin to industry and personal property, and founded thereon a new sort of power. The growth of this new class, with its wealth and industrial importance, has contributed more than anything else to a social and political development before which the old feudal relations of society have almost totally disappeared. Even yet, however, the laws relating to land still bear the stamp of feudalism in various countries. In England, for instance, all land-owners are theoretically regarded as tenants holding from some superior or lord, though the lord may be quite unknown. See also Middle Ages.

FEUILLANTS (feu-yän), a religious order which arose as a reform of the order of Bernardins, and took origin in the abbey of Feuillants, near Toulouse, established in 1577. There were also convents of nuns who followed the same reform, called Feuillantines. They were suppressed by the revolution of 1789, and their convent in Paris taken possession of by a political club named the Feuillants, of which Mirabeau was a member.

FEUILLET (feu-yā), Octave, a French novelist and dramatist, born at Saint Lô, department of Manché, 1812; came into notice about 1846 with his novels of Le Fruit Défendu, Le Conte de Polichinelle, and a series of comedies and tales. In 1857 the appearance of Le Roman d'un Jeune Homme Pauvre raised Feuillet to the first rank of the novelists of the day. Among his other numerous novels are Monsieur de Camors, Julia de Trécœur, Le Sphinx, Histoire d'une Parisienne, etc. His works have a refined humor, and are free, in great part, from the realistic coarseness of the later French school. He died in 1890.

FEUILLETON (feu-i-ton), that part of a French newspaper devoted to light literature or criticism, and generally marked off from the rest of the page by a line. The feuilleton very commonly contains a tale.

FEVER, a diseased condition of the body characterized by an accelerated pulse, with increase of heat, deranged functions, diminished strength, and often with excessive thirst. Fevers usually commence with chills or rigors, known as the cold stage of the disease, although the temperature of the body is really increased. There are also a feeling of lassitude, pains in the back and limbs, loss of appetite, and nausea. This soon develops into the hot stage, in which the pulse quickens and the skin becomes hot and dry. These phenomena are accompanied by thirst, headache, a furred tongue, a constipated state of the bowels and a deficiency in the urinary secretion. The symptoms are generally aggravated at night, and may even be accompanied by slight delirium. After a time the crisis is reached, when the patient either dies from gradual exhaustion or from

hyperpyrexia, or he begins to recover, the febrile symptoms disappearing sometimes quite suddenly, sometimes very slowly. The loss of strength in fever due to the waste of tissue (caused by the abnormal temperature) being greatly in excess of the nutritive supply, together with the general disturbance of functions often brings about fatal results. In many cases fever is only an accompanying symptom of some specific disorder, but in others it is the primary and predominant element, apparently due to some poison operating in the blood. (See Germ Theory of Disease.) These primary or specific fevers may be classified as follows:—

1. Continued Fever, in which there is no intermission of the febrile symptoms till the crisis is reached. Simple fever or febricula, typhus, typhoid (enteric or gastric) fever are examples. Relapsing fever also comes under this head; its chief feature is the recurrence of fever about a week after the subsidence of the symptoms.

2. Intermittent Fever or Ague, in which there is a periodic cessation of the symptoms. The varieties are the quotidian, occurring every day; the tertian, recurring in 48 hours; quartan, recurring in 72 hours or every three days.

3. Remittent Fever, in which there is a short daily diminution of the symptoms. The condition known as hectic fever and yellow fever belong to this class.

4. Eruptive Fevers—(1) Small-pox. (2) Cow-pox. (3) Chicken-pox. (4) Measles. (5) Scarlet-fever. (6) Erysipelas. (7) Plague. (8) Dengue fever. See the separate articles.

FEZ, one of the two capitals of Morocco, 100 miles east of the Atlantic and 85 miles south of the Mediterranean. It is finely situated on the hilly slopes of a valley, on the river Fez, which divide Old Fez from New Fez. There are many mosques, one of them the largest in N. Africa. The sultan's palace is a large but somewhat ruinous structure. Fez was at one time famous as a seat of Arabian learning. It is considered a holy town by the Western Arabs, and was resorted to by them as a place of pilgrimage when the way to Mecca was obstructed. Fez was founded in 793, and was the capital of an independent state from 1202 to 1548, attaining a high state of prosperity. The population is variously estimated from 50,000 to 150,000.

FEZ (from Fez, the above town), a red cap of fine cloth, with a tassel of blue silk or wool at the crown, much worn in Turkey, on the shores of the Levant, in Egypt, and North Africa generally. The core or central part of a turban usually consists of a fez.

FEZZAN', a state of North Africa, in the Sahara, forming a depression surrounded by mountain chains and consisting of a great number of small oases. There are no rivers or brooks, and few natural springs; but water is found in abundance at various depths, generally from 10 to 20 feet. Rain seldom falls; in some districts it does not rain for years together, and but little at a time. The natives are a mixed race of Arabs, Berbers, negroes, etc. Fezzan is governed by a lieutenant-governor under the governor of Tripoli, and dependent therefore on Turkey. Pop., variously estimated, does not probably exceed 50,000.

FIACRE (fē-ä-kr), in France, a small four-wheeled carriage or hackney-coach, so called from the Hotel St. Fiacre, where Sauvage, the inventor of these carriages, established in 1640 an office for the hire of them.

FI'AT (Lat. "let it be done"), in English law, a short order or warrant from a judge for making out and allowing certain processes.

FIBERS, these may be of mineral, animal, or vegetable origin. In the mineral kingdom a fiber which may be so used has been found in asbestos. Among animal fibers the silk obtained from the cocoons of the silk-worm and the wool of the sheep represent two great classes. Of the latter the wool of the sheep is by far the most important on account of its length, its fineness, and the comparative ease with which it can be produced in large quantities for the market. Among other animals whose wool or hair is also used to some extent are the goat, especially of the Angora species, the llamä or alpaca, the vicuña, the rabbit, the yak, the chinchilla, etc. But the vegetable kingdom furnishes by far the greatest number and variety of fibers for manufacturing purposes. These fibers are obtained either, as in inexogenous plants, from the sheath of the bark or bast; or, as in endogenous plants, from the cellular tissues and pulp of their roots, stems, and leaves; or, in a few plants, from a hairy covering which grows upon the seeds within the pod. Of the first class are flax, hemp, and China grass. To the second class belong New Zealand flax, Manila hemp, coir of cocoa-nut fiber, and Pita-flax. To the third class belong cotton, vegetable silk. For details see Cotton, Flax, Hemp, Jute, Silk, Wool, etc.

FI'BRIN, a peculiar organic compound substance found in animals and vegetables. Animal fibrin constitutes the solid matter which deposits when blood coagulates, but it is also furnished by the chyle, lymph, saliva, and by pus and other pathological fluids. Fibrin is composed of carbon, nitrogen, hydrogen, and oxygen, and is closely allied to albumen and caseine. It is a very important element of nutrition. In healthy venous blood there is about 2·3 present, but its percentage is slightly more in arterial blood. It is best obtained by switching newly-drawn blood with a glass rod or bundle of twigs, when the fibrin adheres to the rod or twigs in threads, and is purified from coloring matter by prolonged washing and kneading with water, and then by treatment with alcohol and ether to remove fat and other substances.

FIBROUS TISSUE, an animal tissue with a shining silvery luster used to connect or support other parts. It is of two kinds, white, and yellow (elastic). It forms the ligaments, tendons of muscles, etc.

FIB'ULA, in anat. the outer and smaller bone of the leg below the knee, much smaller than the tibia. See Leg.

FICHTE (fih'tē), Johann Gottlieb, German philosopher, born in 1762. After studying at Jena, Leipzig, and Wittenberg he passed several years as a private tutor in Switzerland and in Prussia Proper, and in Königsberg made the acquaintance of the great Kant, who showed some appreciation of his talents. His Versuch einer Kritik aller Offenbarung (Essay towards a Criticism of all Revelation, 1792) attracted general attention, and procured him the professorship of philosophy in Jena in 1793. In 1800 he was one of the most prominent professors of that university during its most brilliant period. Here he published, under the name of Wissenschaftslehre (Theory of Science), a philosophical system, which, though founded on Kant's system, gives the latter a highly idealistic development which was strongly repudiated by the Königsberg philosopher. On account of an article he had written to the Philosophical Journal (on the grounds of our belief in the divine government of the world) he fell under the suspicion of atheistical views. This gave rise to an inquiry, which ended in Fichte losing his chair. He then went to Prussia, where he was appointed in 1805 professor of philosophy at Erlangen. During the war between Prussia and France he went to Königsberg, where he delivered lectures for a short time, returned to Berlin after the Peace of Tilsit, and in 1810, on the establishment of the university in that city, was appointed rector and professor of philosophy. Fichet's philosophy, though there are two distinct periods to be distinguished in it, is a consistent idealism, representing all that the individual perceives as distinct from himself, the ego, as a creation of this I or ego. This ego, however, is not the consciousness of the individual so much as the divine or universal consciousness of which the other is but a part. His philosophy thus came to assume a strongly moral and religious character. He died on Jan. 27, 1814.

FICTION. See Novel and Romance.

FICTION, in law, is an assumption made for the purposes of justice, though the same fact could not be proved, and may be literally untrue. Thus an heir is held to be the same person as the ancestor to the effect of making the heir liable for the debts of the ancestor. The rules by which the existence of legal fictions are limited have been stated as follows: (1) The fiction must have the semblance of truth (2) It shall not be used to work a wrong. (3) It shall only be employed for the end for which it was introduced.

FIDDLE. See Violin.

FIDDLE-FISH. See Angel-fish.

FIDDLE-WOOD, the common name of a genus of trees or shrubs with some twenty species, natives of tropical America. Some of the species are ornamental timber trees; several yield a hard wood valuable for carpenter work.

FIEF (fēf). See Fee, Feudalism.

FIELD, in heraldry, the whole surface of the shield on which the charges are depicted, or of each separate coat when the sheld contains quarterings.

FIELD-ALLOWANCE, an extra payment made to officers of the British army on active service in the field, to compensate partly the enhanced price of all necessaries. These allowances are not made in India.

FIELD-ARTILLERY, light ordnance easy of draught, and hence fitted for rapid movements in the field.

FIELD-CRICKET, campestris, one of the most noisy of all the crickets larger, but rarer than the house-cricket. It frequents hot, sandy districts, in which it burrows to the depth of 6 to 12 inches, and sits at the mouth of the hole watching for prey, which consists of insects.

FIELD, Cyrus West, best known as projector and promoter of first submarine telegraph between Europe and America, was born in 1819. Engaged in business in New York until 1853, when, at age of 33, became interested in submarine cable project. Organized the New York and London Telegraph Company in 1854; induced American government to make ocean surveys; made first attempt to lay cable in 1857. After several failures cables was completed and first message sent by Queen Victoria to President Buchanan on August 16, 1858. This first cables broke almost immediately, and after seven years of effort, Mr. Field, with aid of American and British capital, laid another cable, which was successfully completed July 27, 1866. Mr. Field also originated the elevated railroad project in New York City, and was in railroad business until his death in 1892.

FIELD, David Dudley, American clergyman and historical writer, was born in 1781; father of Cyrus W., David Dudley and Stephen Johnson Field. He died in 1867.

FIELD, David Dudley, a distinguished American lawyer, who devoted his life to the reform of the laws. Was born in 1805. His code of civil procedure was adopted by practically every state in the Union and by Great Britain. Eighteen states adopted his code of criminal procedure and his Outlines of International Law form the basis of the code of nations. He died in 1894.

FIELD DOG, distinct breed of dog with natural instinct for locating game birds and retrieving them after they are killed. Are of keen, alert intelligence, noted for docile disposition, and capable of receiving close training. Field dogs are of various species, the general classes being pointers, setters and retrievers. Pointers locate game birds by sense of smell and indicate their location to the hunter by stopping short and "pointing" with nose directed to the spot. The setter works in a similar manner, but crouches on its haunches when it desires to indicate the presence of the game. The retriever is trained to go into cover or into the water for birds after they have been shot and bring them to its master without mangling them.

Field dogs must be carefully trained from puppyhood. The most important and therefore the first requisite is obedience. The dog after being accustomed to collar and leash, is taught to keep close to its master's heel until it is sent forward. The next step in the training of a dog is to prevent him from flushing the game. Then the animal is taught to range for game and to "down" or return promptly at the proper signal. Retrievers of water birds, of course, receive special training, as their duties differ from the setter or pointer. The setter and pointer are easily taught to retrieve on land. (See Setter, Pointer, Retriever.)

FIELD, Eugene, American poet, journalist and story writer, noted for the touching pathos of his poems on childhood and the eccentricity of his humor, was born in 1850. Began newspaper

Eugene Field.

career on Kansas City Times, later on the Denver Tribune. At age of 33 began department of "Sharps and Flats" in Chicago Daily News, which he kept up until his death, twelve years later. In those twelve years be became recognized as one of America's most versatile humorists. His writings covered a wide gamut, from the quaint and whimsical to the pathetic, grotesque and farcical. Best known poem of childhood, "Little Boy Blue;" writings included "Echoes from a Sabine Farm," "With Trumpet and Drum," and "Love Affairs of a Billionaire." He died in 1895.

FIELDFARE, a song bird of the thrush family, easily tamed and sing well in captivity. Found principally in

Fieldfare.

Norway, but winters in England and along the Mediterranean. General color is gray, throat of reddish yellow streaked with black, back and wings brown, tail nearly black.

FIELD-FORTIFICATION, Field-works, temporary works, such as trenches, rifle-pits, etc., thrown up to strengthen the position of an army operating in the field. See Fortification.

FIELD GAMES, open air athletics consisiting of running, hurdle racing, broad and high jump, pole vaulting, throwing the hammer and putting the shot. Marathon race (25 miles) recently added to interstate and international meets.

FIELD GLASS, a binocular telescope of great magnifying power used principally by army officers in following military maneuvers. For use in trenches from behind breastworks field glasses are constructed with reflecting prisms which enable one to see without exposing any part of his body. Technically a field glass is a double telescope with chromatic eyeglass.

FIELDING, Henry, one of the greatest of English novelists, was born in Somersetshire, April 22, 1707. He was educated at Eton, whence he removed to Leyden; but the straitened circumstances of his father shortened his academical studies, and turned his attention to the stage. His first dramatic piece was entitled Love in Several Masks, was produced at Drury Lane in 1728, and met with a favorable reception. The Temple Beau, The Author's Farce, The Modern Husband, Don Quixote in England, and many others quickly followed, a number of them being little more than free translations from the French. In 1740 he was called to the bar, and went on circuit, but with so little success that he was compelled to return to literature. In 1742 the first of his great novels, Joseph Andrews, appeared, which he had at first conceived as a burlesque of Richardson's Pamela. It was a great success, and was followed by A Journey From this World to the Next, and the History of Jonathan Wild. In 1749 his masterpiece, The History of Tom Jones, appeared, and was followed two years afterward by Amelia. At length, however, his constitution, exhausted both by hard work and reckless living, gave way, and in June of 1754 he had to seek the milder climate of Lisbon, where he died 8th October of the same year. The chief merits of Fielding as a novelist are wit, humor, correct delineation of character, and knowledge of the human heart. He drew from a varied experience of life, which he reproduced with an artistic realism entitling him to be considered, far more than Richardson, as the creator of the English novel.

FIELD, Kate, American actress, lecturer and journalist; was born in 1840; stage success inconspicuous; best known as editor of "Kate Field's Washington," weekly periodical published at National Capital. She died in 1896.

FIELD, Marshall, American merchant and financier; was born in 1835; clerked in Pittsfield, Mass., store until 1856; then went to Chicago. In 1860 became junior partner in wholesale dry goods establishment. In 1865 headed firm of Field, Palmer & Leiter; in 1881 Marshall Field & Co., built up largest wholesale and retail dry goods business in the world, with branches in England, France and Germany. Invested largely in Chicago real estate before fire of 1871, and became millionaire; largely identified in banking and railroad investments; founded Field Columbian Museum in 1894 with initial gift of $1,000,000, to which his will added $8,000,000. Left fortune variously estimated from $100,000,000 to $150,000,000 to two grandsons, in trust, making them 50 years hence richest heirs in the world. He died in 1906.

FIELD-MARSHAL, the highest military dignity in Britain, Germany, and other countries. In Britain the dignity is conferred by selection and enjoyed by but a very few officers, and chiefly for distinguished services or on the ground of royal descent. It was introduced into Britain by George II. in 1736.

Marshall Field.

FIELD-MOUSE. See Mouse.

FIELD-OFFICERS, in the army, those competent to command whole battalions —majors, lieutenant-colonels, as distinguished from those intrusted with company duties, as captains and lieutenants.

FIELD OF THE CLOTH OF GOLD, a spot in the valley of Andren, between the English castle of Guisnes and the French castle of Ardres, celebrated for the meeting (7th June, 1520) between Henry VIII. of England and Francis I. of France, attended by the flower of nobility of both nations. The diplomatic results were little or nothing, and the event is now memorable only as a grand historical-parade.

FIELD-PIECES, small cannons, from three to twelve-pounders, carried with an army.

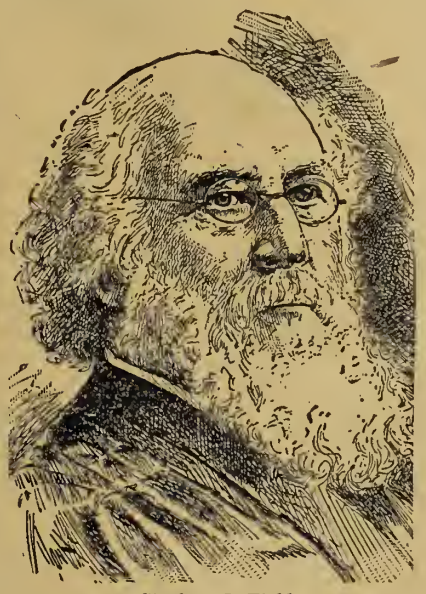
FIELD, Stephen Johnson, was born in 1816; graduate of Williams college 1837; practiced law in New York; went to California as a 49er; on California supreme bench 1857 until 1863. He was appointed to the United States supreme court in 1863. During career as justice of United States supreme court he made many notable dissenting opinions, chief being in legal tender case. As member of electoral commission of 1876-7, which decided Hayes-Tilden controversy, he voted with minority against seating of Hayes. He died in 1899.

FIELD-WORKS. See Fortification.

FIFE, a small instrument of the flute kind, pierced with six finger-holes, and usually having one key. Its ordinary compass is two octaves from d on the fourth line of the treble staff upwards. A combination of fifes and drums is the officially recognized music in the British army and navy.

FIFE, or **FIFESHIRE,** a maritime county, Scotland, forming the peninsula between the Firths of Forth and Tay; extreme length, 43 miles; extreme breadth, 17 miles; area, 316,089 acres. Fife is the third largest coal-producing county in Scotland. Iron, limestone, and freestone abound. There are salmon and other fisheries. The principal towns are Dunfermline, Kirkcaldy, St. Andrews, and Cupar, the county town. Pop. 187,320.

FIFTH, in music, an interval consisting of three tones and a semitone. Except the octave it is the most perfect of concords. Its ratio is 3:2. It is called the fifth as it comes, by diatonic ascent, in the fifth place from the fundamental or tonic. See Music.



Stephen J. Field.

FIG, a deciduous tree belonging to the order Moraceæ (mulberry). It is indigenous to Asia Minor, but has been naturalized in all the countries round the Mediterranean. It grows from 15 to 20 or even 30 feet high. In congenial climates it bears two crops in a season, one in the early summer from the buds of the last year; and other (which is the chief harvest) in the autumn, from those on the spring growth. The fruit is a

Common fig.

hollow receptacle produced in the axils of the leaves on small round peduncles, and containing a great multitude of minute flowers, the ripe carpels of which are embedded in the pulp. The flowers are male and female, the former situated near the orifice at the top, the latter in that part of the concavity next the stalk. Figs, particularly dried figs, form an important article of food in the countries of the Levant. The best come from Turkey.

FIG'ARO, a dramatic character first introduced on the French stage by Beaumarchais in his comedies, the Barber of Seville and the Marriage of Figaro. Figaro is a barber remarkable for his shrewdness and dexterity in intrigue. The plays were adapted for Mozart's Marriage of Figaro and Rossini's Barber of Seville. The name is also well known as that of satirical journals published in Paris and London.

FIGULINE, a name given by mineralogists to potter's clay.

FIG'URAL (or Figurate) **NUMBERS,** numbers formed by the terms of arithmetical series of all sorts, in which the first number is always unity. For example:

I.—	1,	2,	3,	4,	5,	6, etc.
II.—	1,	3,	6,	10,	15,	21, etc.
III.—	1,	4,	9,	16,	25,	36, etc.
IV.—	1,	5,	12,	22,	35,	51, etc.

Those in the second row are called triangular numbers, because their units may be arranged in equilateral triangles; the members of the third row are called square numbers: those of the fourth pentagonal, etc.; and so there are also hexagonal, heptagonal, and, in general, polygonal numbers.

FIGURE-HEAD, the ornamental figure or bust on the projecting part of a

Figure-head.

ship's stem, over the cutwater and immediately under the bowsprit.

FIJI, FEEJEE, or **VITI ISLANDS,** an island group, South Pacific Ocean, east of the New Hebrides, between lat. 15° 30′ and 19° 30′ s.; and lon. 177° e. and 178° w. The entire group, which was discovered by Tasman in 1643, comprises altogether 254 islands and islets, eight of which are inhabited; total area about 8000 sq. miles. Two of the islands only are of large size, namely, Viti Levu, 90 miles long by 60 wide; and Vanua Levu, rather longer but much narrower and more irregular. Next to these come Taviuni and Kandavu. The islands are of volcanic origin, extremely fertile, and covered with a luxuriant foliage, especially on the east side. The Fijians are dark-colored, frizzly-haired, bearded race of Melanesia extraction although intermixed with the Polynesians of Tonga and Samoa. They are cleanly in their habits, and are generally regarded

as superior to the Polynesians in intelligence. Their early character, however, was bad. Cannibalism was reduced to a system, and wives, children, and friends were often sacrificed to the fondness for human flesh. Cannibalism seems now to be abolished. This result has been due to the Christian missions, mostly Wesleyan, which have been very successful, most of the native population having become professed Christians. From 1866 onward the influx of European settlers from New Zealand and the Australian colonies gradually brought the trade of Fiji into importance and repeated applications were made to the British government both by the settlers and the king, Thakombau, to annex the islands. At length in 1874 this was done, and the Fiji Islands were made a crown colony, under a governor, assisted by an executive council and legislative assembly, both, either officials or nominated by the governor. Native chiefs take part in the administration, the old customary law being still largely adhered to. Since the annexation the prosperity of the colony has been remarkable. The population is about 132,000. The Europeans number about 2,000. The capital is Suva, on the south coast of Viti Levu. The island of Rotumah, to the north, was annexed to Fiji in 1881.

FILE, a bar of cast-steel with small sharp-edged elevations on its surface called teeth, the use of which is to cut into or abrade metals, wood, ivory, horn, etc. Files are of various shapes, as flat, half-round, three-sided, square, or round and are generally thickest in the middle, while their teeth are of various degrees of fineness and of different forms. A file whose teeth are in parallel ridges only is called single-cut or float-cut. Such are mostly used for brass and copper. When there are two series of ridges crossing each other the file is double-cut, which is the file best suited for iron and steel. Rasps are files which have isolated sharp teeth separated by comparatively wide spaces, and are used chiefly for soft materials such as wood and horn. Each of these three classes of files is made in six different degrees of fineness, the coarsest being called rough, the next middle, followed by bastard, second-cut, smooth, and superfine or deadsmooth, each a degree finer than that which precedes it. Files are usually made with the hand, file-cutting machines not having been as yet perfectly successful on account of the delicacy of touch required in the work. The blanks, as the steel before it has teeth is called, are laid on the anvil and struck with the chisel, which rests obliquely on the blank, each blow raising a ridge or tooth. The strength of the blow depends on the hardness of the metal, and when one part is harder than another the workman alters his blows accordingly. When one side is covered with single cuts, if the file is to be double cut he adds in the same manner a second series, crossing the others at a certain angle. In making fine files a good file-cutter will cut upwards of two hundred teeth within the space of an inch. The files, except those that are used for soft substances, are then hardened by heating them to a cherry-red color and then dipping them in water. They are then finished by scouring and rubbing over with olive-oil and turpentine.

FILE, a row of soldiers ranged one behind another from front to rear. When a column is arranged two deep, a file is thus two men.

FILE-FISH, a name given to certain fishes from their skins being granulated like a file; one species, a common inhabitant of the Mediterranean, has the power

File-fish.

of inflating the sides of the abdomen at pleasure, and grows to the size of two feet. Another species is a native of the Indian and American seas.

FIL'IBUSTERS, a name given to those adventurers, chiefly from the U. States, who endeavored to effect settlements on the Spanish islands and colonies in Central America. The term is of Spanish origin, but is ultimately from the English fly-boat, referring to the small fast sailing vessels used by the buccaneers in the 17th century. Among the most noted of the filibusters was William Walker who made three expeditions to Nicaragua (1855, 1857, 1860).

FILIGREE', a kind of ornamental open work in gold or silver, wrought delicately in the manner of little threads or grains, or of both intermixed. The art was practiced by the Etruscans and the Greeks of the Byzantine empire. In the 17th century it was carried to great perfection in Italy, and silver filigree work is still largely manufactured in the south of Europe. Some of the eastern nations, especially the Chinese and Malays, show great skill in the manufacture of silver filigree.

FILLMORE, Millard, the thirteenth president of the United States, born at

Millard Fillmore.

Sumner Hill, Cayuga co., N. Y., in 1800. In 1822 he removed to Buffalo, N. Y., was admitted to the bar in 1823, and sent to the New York Assembly 1829–32; was in congress 1833–35 and 1837–41, where he was an active and useful member, favoring J. Q. Adams' views upon slavery, and in other public questions acting mainly with the Whigs. In 1844 he was the Whig candidate for governor of New York; in 1847 was chosen comptroller of the state and resigned in 1849; in 1848 was chosen vice-president of the United States on the ticket with Gen. Taylor. On the death of the latter, July 9, 1850, Mr. Fillmore became president. The great events of his administration were the passage of the Compromise acts of 1850 and the Japan expedition of 1852. He died in 1874.

FILTH DISEASES, discoveries in bacteriology and the application of exact methods of research have shown that the importance of filth as a casual factor in the production of disease consists mainly in two facts—first, that it furnishes a good medium for the growth and multiplication of certain forms of pathogenic bacteria when these gain access to it; and, second, that sooner or later such bacteria are very likely to find their way into it.

Of the micro-organisms which produce disease, some, such as the bacillus of typhoid, can grow and multiply in dead organic matter at ordinary temperatures, and a few of them may thus in the course of a few days make all parts of a foul solution dangerous, while others, such as the bacillus of tubercle, require temperatures near that of the living body for development, and hence under ordinary circumstances do not make accumulations of filth infectious. Although small-pox, scarlet fever, diphtheria, measles, and typhus may be conveyed by foul clothing or bedding, yet their spread is usually in no way connected with accumulations of filth, nor are they generated de novo by such accumulations. Typhoid fever is the typical filth disease, in the sense that it is mainly transmitted through human excretia, yet there is no evidence that cesspool or water-supply can become the cause of this disease in any other way than by having the specific bacillus of typhoid added to it. It is possible that a common and under ordinary circumstances harmless form of bacillus may, in the course of time and under special conditions of food and temperature, be so changed in nature and functions as to be capable of producing a transmissible disease, but it is very improbable that such a change gives rise to the ordinary forms of specific disease as seen in practice.

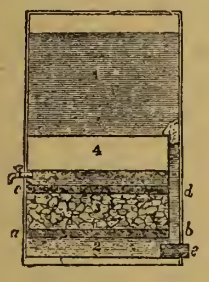
The idea that specific disease of any kind is produced by gases or volatile products of any kind given off by decomposing filth is now generally abandoned, and it is known that the micro-organisms which cause such diseases do not pass into the air from the surface of fluids or from moist surfaces by simple evaporation. They are carried into the air by spray or dust, but not otherwise. Whether yellow fever is a filth disease, in the proper sense of the term, is as yet uncertain, but it is prudent to act on the supposition that its specific germ may be preserved in, and have its powers for evil intensified by, accumulations of hu-

man excreta and by water polluted with such excreta.

The various forms of septic disease, including puerperal fever and those produced by pyogenic organisms, are often due to want of cleanliness of the person, of clothing, of instruments, etc., and such want of cleanliness is apt to occur in connection with or to be produced by the presence of accumulations of filth, and in this sense they may perhaps be called filth diseases. The name "finger-nail fever," which has been applied to puerperal fever, is a very suggestive one.

Filth diseases are to be prevented, by preventing accumulations of filth rather than by trying to disinfect such accumulations, and one of the most important means of doing this for a city is a proper system of sewerage, which involves a good general water-supply and the regulation of the drainage systems in individual houses to insure proper connections and prompt disposal of liquid wastes.

FILTRA'TION, the process of freeing a liquid from solid matter suspended in it by causing it to pass through some pervious substance or substances which catch and retain the solid matter. The materials of which a filter is composed must have pores or interstices sufficiently coarse to allow the passage of the liquid, and yet sufficiently fine to prevent the passage of any solid particles. On a small scale unsized paper is generally used; but on a large scale various kinds of stone, sand, gravel, powdered glass, clay, porous sulphur, preparations of iron, charcoal, cloth, felt, horse-hair, skins, silicated carbon, sponge, wood, wool, cane, capillary threads, etc., are all employed. In domestic filters the simplest forms are those in which the water passes down by its own gravitation through the filtering medium to a reservoir below. Lateral and ascending filtration are not uncommon. One of the most successful forms of ascending filter is divided into four compartments, as seen in the figure. The uppermost part, containing the water to be filtered, communicates with the lowest by a tube having a loose sponge at its mouth to stop some of the impurities. The top of the lowest compartment is composed of a porous slab, through which the water passes into the third part, which is filled with charcoal. The water is lastly forced through the charcoal and another slab into the remaining compartment, which is furnished with a tap to draw off the filtered water. The filters at water-works are large tanks or beds, made of good clay and filled with layers of large stones, pebbles, and coarse gravel, fine gravel, coarse sand and fine sand—the fine sand being at the top. Other materials are sometimes utilized, such as furnace cinders or clinkers, shells or shell-sand, and so forth. The water in the reservoir, collected from springs, surface drainage, and rain, is allowed to deposit its suspended matter in settling-tanks, and then it is run into the filters. By percolation the rest of the mineral matter is removed, and the water then flows into the mains which are to convey it to the locality where it is to be used. Filtration can only remove substances mechanically suspended in the liquid. In order to remove dissolved substances distillation is necessary.



Water filter.

1 2 3 4, The compartments; *a b*, porous top of 2d compartment; *c d*, filtering top of 3d compartment; *e*, movable plug.

FINALE (fi-nä'le), the concluding part of a musical composition, for instance, of a quartette, of a symphony, of any act of an opera, of a ballet, etc. It consists of compositions of various characters.

FINANCE', the system or science of public revenue and expenditure. In the plural the term is applied to the income or revenue of a state, to the funds in the public treasury, and also to private incomes or resources. See such articles as Exchequer, National Debt, Taxation, Bank, etc.

FIN-BACK, or **FINNER,** a name given the species of a genus of whales (Physalus), so called for their possessing a dorsal hump or fin. The name is also sometimes given to the members of the genus Balænoptera or rorquals.

FINCH, one of the Fringillidæ, a large family of small seed-eating birds, inhabiting all parts of the globe, and belonging to the order Insessores, section Conirostres. They are distinguished by having a sharply-pointed, conical, and in most cases a strongly-formed bill, suitable for crushing seeds and other hard objects. The species have been divided among several sub-families, as the haw-finches, the true finches, the buntings, the larks, the bull-finches, etc.

FIN DE SIECLE, a French phrase meaning end of the century, and used adjectively in the sense of peculiar to, or characteristic of, the close of the century or of the epoch; of such character as might be thought fitting to the end of the epoch—overwrought, overestimated, artificial, and sophisticated.

FINDING. In law this term has the same meaning as in popular language. The finder of lost property upon land who takes it into his possession becomes invested with a special property therein, which is superior to the claims of all persons except that of the true owner. He is under no legal obligation to take into his custody any articles he may thus discover, but if he does, certain important rights and obligations immediately attach to his possession. His primary duty is to preserve the property intact, and in as excellent condition as its natural state at the time of finding will permit, in anticipation of the owner's appearing to reassert his title. A finder thus becomes a kind of bailee, and, like other bailees, he may defend his possession and interest by bringing action against any third person who injures the property, or asserts dominion over it, or interferes with his immediate ownership. If the absolute owner ever appears, restoration must be made to him, and the finder will be entitled to no reward if none had been previously offered, and can only claim to be remunerated for the actual and necessary expenses incurred in the proper care of the goods. But if a specific reward had been promised, of which the finder had knowledge, he would be authorized in demanding it and would have a lien upon the property until such charges were satisfied. If at the time of making the discovery the finder knew, or had means of readily ascertaining to whom the property belonged, it would be his duty to seek out the owner and return whatever he had thus acquired; and if he failed to do this his retention of the goods would be a fraudulent appropriation of them which would constitute larceny. But in cases where knowledge of ownership could not be acquired no larceny could be committed. Retaining the chattels would then not be wrongful, but reasonable and obligatory. If the former owner can never be discovered or never asserts any claim to the property, it vests obsolutely in the finder. The place where the finding occurred is immaterial as regards his rights. If an article which was lost in a store was picked up by any stranger, he would have the first claim to it, and if the owner never reappeared might enforce his title even against the storekeeper. This would not be the case, however, if the article was only left by accident, for it would then be regarded as confided to the keeping of the proprietor of the store, who might demand it from any one by whom it was discovered.

FINDLAY, a city and railway center, the capital of Hancock co., Ohio; 90 miles n.w. of Columbus. It is the center of a natural gas-field, and since 1885 has become an important manufacturing center for glass-works, rolling-mills, nail-factories, etc. Pop. 20,162.

FINE, in English law, formerly signified a sum of money paid at the entrance of a tenant into his land and on other occasions, but now generally has the signification of a pecuniary penalty exacted either in punishment of, or in compensation for, an offense, whether committed against an individual, in contravention of the laws of the community, or against the community itself.

FINE ARTS, the arts whose object is the production of pleasure by their immediate impression on the mind, as poetry, music, painting, and sculpture. In modern usage the term is often restricted to the imitative arts which appeal to us through the eye, namely painting, sculpture, engraving, architecture, and is sometimes even restricted to the two first as more essentially imitative and imaginative.

FIN'GAL, a hero of Gaelic romance, celebrated as a great warrior and a generous man in many old ballads belonging alike to Ireland and Scotland; but more especially the hero of an epic poem attributed to Fingal's son Ossian, first published by James Macpherson in 1672. See Ossian.

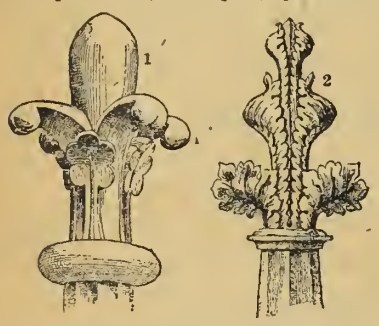
FINGAL'S CAVE, a famous natural cavern in the island of Staffa, one of the western islands of Scotland. It extends 227 feet from its mouth inward, is composed of lofty basaltic columns, beautifully jointed, and of most symmetrical, though somewhat varied forms. The height from the top of the arched roof to the mean level of the sea is 66 feet; the breadth at the entrance 42 feet, at the end of the cave 22 feet.

FINGER-BOARD, the part of a stringed instrument, as the neck of a violin, guitar, etc., to which the fingers (of the left hand) are applied in playing to stop the strings. The finger-board of a keyed instrument (played with both hands) is commonly called a key-board.

FINGERING, in music, (a) the art of dexterously applying the fingers to a musical instrument in playing. (b) The marking of the notes of a piece of music, as for the piano, organ, harmonium, concertina, etc., so as to guide the fingers in playing.

FINGERS. See Hand.

FINIAL, in architecture, an ornamental bunch of foliage which terminates pinnacles, canopies, pediments,



1, Finial, A.D. 1230, Cathedral of Amiens, France.
2, Finial, 15th century.

etc., or any ornament of like kind. By older writers the term is used to denote not only the leafy termination but the whole pyramidal mass.

FI'NING, a substance used to clarify liquors, usually such as are out of condition or are of inferior quality. A solution of isinglass is generally used for beer, and alum, carbonate of soda, salt of tartar, etc., for spirits. Finings always destroy some of the real virtue of the liquor.

FINISTERE (fi-nis-tār; "Land's End"), a department of France, so named from occupying its westernmost extremity; area, 2,595 sq. miles. The soil is generally fertile and well cultivated; fishing is extensively carried on; and the minerals are of considerable importance, including iron, zinc, bismuth, and lead. The manufactures consist chiefly of sail-cloth, linen, soap, oil, candles, ropes, leather, paper, and tobacco. Ship-building also is carried on, and the general trade is extensive. Quimper is the capital; other towns are Brest, Châteaulin, and Morlaix. Pop. 707,820.

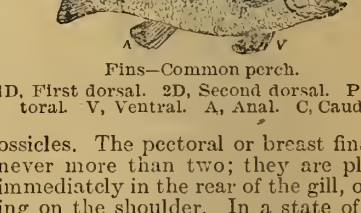
FINISTERRE, Cape, the most western cape of Spain, on the coast of Galicia.

FIN'LAND, a Russian grand-duchy, containing 134,829 sq. miles, bounded n. by Norway, e. by the governments of Olonetz and Archangel s. by the Gulf of Finland, w. by Sweden and the Gulf of Bothnia. The capital is Helsingfors. The country, in some parts, is hilly, being traversed by the continuations of the Scandinavian Mountains, and, is sandy, marshy, and abounding in lakes, which furnish one of the most characteristic features of the scenery. Tillage and cattle-breeding are carried on to some extent; but the most valuable exports are the products of the forests, timber, pitch, tar, and rosin. The forests occupy 60 per cent of the surface. The climate is severe, but healthy; the mean yearly temperature in the north is 27·5° F., at Helsingfors 38·7°. The principal minerals are iron and copper; granite is extensively quarried. The inhabitants are mostly Finns (see Finns) and Swedes, with a few Lapps, Russians, and Germans. Up to the 12th century the Finns lived under their own chiefs and were pagans. Their conversion to Christianity took place about the middle of that century after their conquest by the Swedes. In 1721 the part of Finland which formed the province of Wiborg was secured to Peter the Great by treaty. The remainder was conquered from the Swedes in 1809. The religion, laws, and liberties of the country have, however, been preserved, and Finland is perhaps the freest part of the Russian empire. The established religion is Lutheran; but there is complete religious freedom for other bodies. The national parliament consists of four estates, the nobles, the clergy, the burgesses, and the peasants, convoked by the grand-duke, the Emperor of Russia. The superior administrative power is in the hands of the senate, which is nominated by the crown, and sits at Helsingfors under the presidency of a governor-general representing the emperor. The governor-general is usually a Russian and is appointed by the emperor. All other officials, as well as the officers of the army, must be Finnish subjects. In 1899 the Czar af Russia made Finland an integral portion of the empire. In 1908 the Czar dissolved the Finnish Diet. Pop. 2,250,000.

FINLAND, Gulf of, a great arm of the Baltic, 250 or 260 miles long and from 10 to 70 miles wide, stretching from w. to e. between Finland on the n. and the Russian governments of Esthonia and St. Petersburg on the s. Its waters are only slightly salt. It contains numerous islands, several excellent harbors and strong fortresses.

FINNS, are a race of people inhabiting the northwest of European Russia (governments of Archangel and Olonetz), but especially the grand-duchy of Finland. In a wider sense the term Finns, with its adjective Finnic, is applied to one of the chief branches of the northern or Uralo-Altaic division of the Turanian family of peoples and languages. The Uralo-Finnic family has been divided into four groups or branches: 1, Ugric, to which the Ostiaks, Voguls, and Magyars belong; 2, the Bulgaric or Volgaic, consisting of the Tcheremisses and the Mordvins; 3, the Permic, composed of the Permians, Sirianes, and Votiaks; and 4, the Chudic or Baltic group. To the last belong, besides the Finns proper, the Esths of Esthonia and the Lives or Livonians, the Chudes, in the governments of Novgorod and Olonetz, and the Lapps in Archangel and the northern parts of Finland, Sweden, and Norway. The typical Finns are physically of low stature but of strong build; with round head, forehead low and arched, features flat with prominent cheek-bones, and obliquc eyes. Their language belongs to the northern division of the Turanian or Uralo-Altaic family of languages, and is most nearly allied to the languages of the Esths, Lapps, Mordvins, Voguls, and Hungarians. It is agreeable to the ear, rich in vowels and diphthongs, copious, and uncommonly flexible. The language is remarkably rich in declensional forms, there being as many as fifteen different cases, expressing such relations as are expressed in English by near, to, by, on, in, with, without, along, etc. There is no distinction of gender in nouns. The verb resembles the noun in its capability for expressing shades of meaning by corresponding inflections. A great impulse has been given to the cultivation of the language in modern times. It is now recognized as an official language side by side with Swedish, and is becoming more and more the vehicle for imparting instruction. In many of the higher educational institutions for both sexes in Finland the Finnish language is used. Works on science and history as well as poetry have been written in Finnish in recent years; a great Finnish-Swedish dictionary has been published, and there are now a considerable number of newspapers. The center of this literary life is Helsingfors.

FINS, the projecting wing-like organs which enable fishes to balance themselves and assist in regulating their movements in the water. The fin consists of a thin elastic membrane supported by rays or little bony or cartilaginous



Fins—Common perch.
1D, First dorsal. 2D, Second dorsal. P, Pectoral. V, Ventral. A, Anal. C, Caudal.

ossicles. The pectoral or breast fins are never more than two; they are placed immediately in the rear of the gill, opening on the shoulder. In a state of rest these fins are parallel with the body, and have the apex toward the tail. The ventrals, or abdominal fins, are placed under the throat or belly, and point downward and backward. They are smaller, in general, than the pectorals, and have sometimes long appendages. Those of the back, or the dorsal fins, point upward and backward, and vary in number from one to four, to which sometimes are added several finlets or pinnulæ—small appendages which are seen in the mackerel. The anal fins are situated behind the vent, varying in number from one to three, placed vertically, and, like the dorsal, generally deeper on the anterior margin. The caudal, or tail fin, terminates the body, and both propel the fish and serves as

the rudder by which it steers itself. The pectoral and ventral are known as paired fins, and represent the fore and hind limbs of other vertebrates; the dorsal, anal, and caudal are median, vertical, or unpaired fins, and are organs peculiar to fishes.

FINSBURY, a parliamentary borough of England, forming part of London, bounded by the parliamentary boroughs of St. Pancras, Islington, Shoreditch, London City, and Westminster. Pop. 182,109.

FION, FIONN (fē'on), a name given in the Ossianic poetry to a semi-mythical class of warriors of superhuman size, strength, speed, and prowess. Generally they are supposed to have been a sort of Irish militia, and to have had their name from Fion MacCumhal (the Finn MacCoul of Dunbar, and Fingal of Macpherson), their most distinguished leader; but Mr. Skene believes them to have been of the race that inhabited Germany before the Germans, and Scotland and Ireland before the Scots.

FIORD, a geographical term (of Scandinavian origin) applied to long, narrow, and very irregularly-shaped inlets of the sea, such as diversify the coast of Norway. Similar inlets of the sea are presented in the sea-lochs of the west coast of Scotland, as also in the fiords on the southwest coast of the South Island of New Zealand, where the scenery is singularly imposing. Fiords often seem to owe their origin to the action of glaciers in remote epochs of the earth's history.

FIR, a name sometimes used as coextensive with the term pine, and including the whole genus Pinus; sometimes restricted to trees of the genus Abies, which differ from the pines in their leaves growing singly, and the scales of the cones being smooth, round and thin. The term fir, thus limited, is applied to the different varieties of the silver fir and the spruce fir, the common silver fir being the Abies picea of botanists, while the common or Norway spruce is the Abies excelsa. Other species are the great Californian fir, the balm of Gilead fir, the large-bracted fir, the hemlock spruce fir, oriental fir, white spruce fir, Douglas fir, etc. The firs, even in the widest sense of the term, are almost all remarkable for the regularity of their growth, their tapering forms and the great altitude of their stems. Their timber is often highly valuable, being almost solely used in the construction of houses, and for the spars and masts of vessels of all kinds. Some of them are planted mainly as ornamental trees. By some botanists the larch and cedar are included with the firs in the genus Abies. See Spruce, Silver Fir, Hemlock, etc.

FIRE, the simultaneous and vividly perceptible evolution of heat and light during the process of combustion. The uses and dangers of fire, and to some extent the means of controlling it, have been generally understood from a very early period. The symbolic and superstitious uses of fire are numerous, and have been, or are, common to all races. Anciently fire was regarded as one of the four elements of which all things are composed, the other three being air, earth, and water.

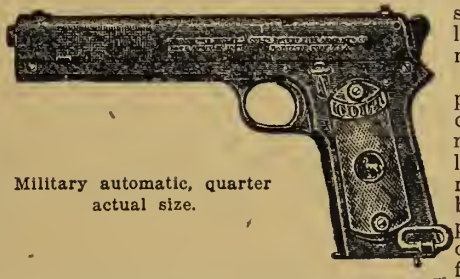
FIRE-ALARM, an apparatus, mechanical, electric, and telegraphic, used for detecting fires, and for giving instantaneous notice of an outbreak. Detectors are often placed in the different apartments of a building, which ring an alarm when the temperature reaches a certain height. In large towns a series of signal-boxes is distributed in different quarters from which an alarm can be immediately telegraphed to the fire department.

FIREARMS, in no other field of the mechanical arts has a greater inventiveness and skill in workmanship been shown than in the evolution of the firearm. From the old horse pistol to the modern self-acting revolver and automatic pistol—from the old muzzle-loading, bell-muzzled fowling piece to

Hammerless.

the modern breech-loading, double-barreled, hammerless shotgun—one may trace the hall marks of mechanical perfection as attained by the artisan of the age.

The old horse pistol was a cylinder of wrought steel, having a breech pin, a pistol stock and nipple for a percussion cap exploding the charge of black gunpowder beneath it. The fowling piece was of a far longer cylinder of steel, with



Military automatic, quarter actual size.

the same general breech lock, cap nipple and fitted with a shoulder stock instead of the pistol butt. Along these same general lines the older flint-lock weapons had been made and down to the present these lines have been preserved to artistic and ultilitarian perfections of the modern firearm.

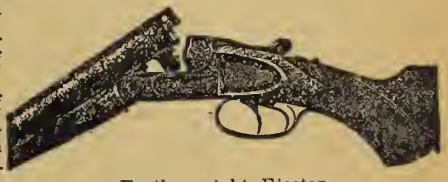
To-day the American products in defensive and hunting arms take an unquestioned lead in the civilized world. The finish of the watchmaker's art is on them. Utility and beauty of workmanship are balanced in them.

Consider the revolver of modern times. Samuel Colt was its inventor and exploiter before 1840. In that time black powder and the percussion cap were the explosive combination, each of the five or six chambers of the revolver loading from the chamber muzzles and backed by the nipple and the percussion caps. These chambers, rotating within the cylinder, brought the caps under the striking hammer, one after the other.

When a Yankee inventor evolved the metallic cartridge, with its fulminating substance held inside the rim of the copper shell and allowing the shell to be loaded as the cylinder bore itself previously had been loaded, the nipple for the percussion cap was done away with and the breech-loading revolver cylinder was made standard. According to this design the revolver went on to its present perfection, the rim fire cartridge giving way to the surer central fire cartridge and adapting itself to the terrible energy of the smokeless powders.

The term "revolver" comes from the revolving cylinder, though it is often misapplied in speaking of a pistol.

The first hammerless revolver was of American origin and of recent date. The two chief ends of this weapon were the elimination of danger from an explosion caused by striking the hammer, as from a fall, and in taking the projecting thumb piece away it might not become caught in the withdrawal of the weapon from the pocket. A still later device has made it impossible to explode the hammerless revolver unless it shall be clasped by the hand at the moment the trigger is pulled for firing. The mere "breaking" of one of these modern



Featherweight Ejector.

weapons, as necessary for loading, insures through the shell injector the absolute safety that comes of certain emptiness of the cylinder.

The first "automatic" weapon for pocket or holster use was of German origin. It was a heavy, cumbersome mechanism and devoid of all artistic lines. Even at the present time it carries many imperfections of line and balance. But in the smaller sizes for pocket use the doing away with the obtruding cylinder has made it compact for the purpose of concealment. Also it has added three more cartridges to the chamber than is possible for the pocket size, five-shot revolver. The chamber of this automatic pistol is inserted with its eight cartridges into the lower end of the butt. A sliding, forced movement of the barrel mechanism gives the user a full notice that it is loaded. A safety catch makes it safe until the catch is released by thumb pressure. Thereafter from the first shot it becomes the most dangerous weapon ever made.

Using the high explosive cartridge, the recoil from the shot is taken up in cocking the weapon automatically, ejecting the empty shell and forcing the next cartridge into place, ready for the next pull on the trigger. There is no

sense of recoil to the hand holding the gun. A light revolver may "jump" three to six inches from a shot; the automatic pistol holds it quite level, shot after shot until the magazine is empty.

To the untutored or careless user this automatic weapon is one of the most dangerous of arms to himself or to the bystander, in that unless a careful examination be made, the user never knows for a certainty if it be empty. To the weapon-trained man this fact in itself makes always for its safety, in that its terrible muzzle never is pointed in any other than a safe direction. Like the hammerless revolver it cannot be fired save when clasped in the hand and the trigger pulled.

The old Kentucky squirrel rifle was the forerunner of the magazine rifle. No weapon within its range ever exceeded this weapon in accuracy. But modern methods have shortened its long barrel, while modern "rifling" and the gradual constriction toward the muzzle made possible by breech loading has given terrible energy to the conical, jacketed bullet, lead filled into its cone of copper or nickel.

Spencer's carbine of 1860 was the first American adaptation of the breech-loading magazine rifle, carrying a lead missile nearly half an inch in diameter. At close range this soft missile would go through an animal and at the point of egress would leave a wound into which a hand might be thrust. To-day the thin cone of the modern jacketed steel bullet from the modern rifle may pass through the same animal at 3,000 yards and the wound scarcely be found, though a soft-nosed bullet is often used in hunting large game. In the civil war men advanced against the carbine in quadruple lines with success, where to-day against the modern army rifle the same movement would mean the annihilation of a regiment.

Thirty years ago the hunter using the double-barreled muzzle-loading shotgun in a duck blind had no trust in a gun that was not at least 10-gauge with barrels of thirty-two to thirty-six inches. To-day the modern hammerless shotgun of 12-gauge and having twenty-eight-inch barrels is all sufficient, its average of seven pounds, beautifully balanced, contrasting with the over-balanced twelve to fourteen pounds of the old muzzle-loading "duck" gun. Nitro powders, chilled shot and the "choke" boring of the shorter barrels have effected the revolution of the clumsy muzzle-loader.

Of necessity the old muzzle-loading shotgun contained perfect cylinders in its two bores. In the making of such a gun no master of gun making could tell if the gun turned out to the best of his art; one day would throw a shot pattern half equal in efficiency to the pattern of the gun finished the day after. By the laws of choke boring to-day, however, the master of choke boring virtually may make this shot pattern to the order of the sportsman. At forty yards he may cause this pattern to spread 250 pellets within the rim of a Derby hat, or may spread the 250 shot through a thirty-inch circle.

There are several methods of "choking" a gun. The most accepted method, however, is to bore the cylinder in such a way that the barrel's least diameter is from two to three inches from the muzzle. A constriction of five 1,000ths of an inch in the right hand barrel represents a "modified" choke; thirty to forty 1,000ths of an inch in the left hand barrel is the full choke. Ordinarily the two barrels of the gun are not choked in the same degree and the right barrel is less choked in order that in firing the right barrel first by the front trigger, the shooter gets from the full choke of the left barrel a second later the same relative chance at a moving bird.

Once the iron wire twist in a gun barrel stood for the strongest and most ornate possibility for the gun barrel. Steel wire followed iron, until at the present time in the alternating of iron and steel and the manipulation of these metals in the welding, the "chain," "diamond" and other fanciful twists of the Damascus barrels are suggestive of the jeweler's art, while of strength to withstand the wedging charge of chilled shot in front of a dynamite force of the terrible nitro powders.

Twelve years ago the magazine rifle suggested the magazine, or "pump" shotgun. No sportsman handling the finest of Damascus double barrels casts doubt upon the efficiency of the pump gun. At the same time some sportsmen do not take the pump gun afield and on many game preserves it is a discredited arm which would blackball the shooter from club membership. The pump gun carries an average of six shells in its magazine. But its rapidity of action prompts firing at birds in flock until after the murderous possibilities of its killing range are exhausted, countless cripples are made in every killing season to the destruction of fair sport.

This pump gun has its successor in the automatic hammerless shot gun that is in a state of evolution. The magazine just above the trigger is especially cumbersome and heavy, but in use the natural recoil is taken up in the ejection of the shell, and sliding a loaded shell into the barrel, and re-cocking the gun. It works practically upon the same principle as the automatic pistol and its magazine holds five loaded shells.

FIRE-BALL, (1) a ball filled with powder or other combustibles, intended to be thrown among enemies, and to injure by explosion, or to set fire to their works. (2) a popular name applied to a certain class of meteors which exhibit themselves as globular masses of light moving with great velocity, and not unfrequently passing unbroken across the sky until lost in the horizon. They differ from ordinary meteors, probably, more in volume and brilliancy than in any other distinctive characteristic. They are not to be confounded with another class of meteors that explode in their passage, and appear to let fall a dull red body (meteorlite) to the earth.

FIRE-BOX, the box (generally made of copper) in which the fire in a locomotive engine is placed. See Boiler.

FIRE-CLAY, a compact kind of clay, consisting chiefly of silica and alumina, capable of sustaining intense heat, and used in making fire-bricks, gas-retorts, crucibles, etc. The most highly esteemed fire-clay is that of Stourbridge, which is used wherever high temperatures have to be resisted. Fire-clay belongs to the coal formation, and always forms a stratum immediately below each seam of coal.

FIRE-DAMP, light carburetted hydrogen gas or marsh-gas. It is sometimes very abundantly evolved in coal-mines, and is productive of the most dreadful results when it explodes, occasioning the death of nearly all then at work in the mine. It appears to be generated by the decomposition of partially carbonized coal, and when it constitutes more than $\frac{1}{18}$th of the volume of the atmosphere of mines the whole becomes highly explosive when fire is brought in contact with it. The safety-lamp affords the chief protection against the fatal effects of this gas.

FIRE-ENGINE, a machine for throwing water for the purpose of extinguishing fire. Machines for the extinguishing of fires have been used from a very early date.

So far as known, the first steam fire-engine was developed by Brathwaite in 1829 or 1830. In 1850 A. B. Latta, in Cincinnati, produced the first machine

Fire-engine.

which was practically useful. Cincinnati was the first city in the U. States to organize a steam fire department, but other large cities and towns rapidly followed the example.

The main parts of the steam fire-engine are the boiler, engine, pumps, and the vehicle on which these are mounted. Boilers are generally of the vertical water-tube type. The engines and pumps are also generally vertical, double-acting, and in duplicate. To facilitate the preparation of fire-engines for service, heaters are maintained in the engine-house to give a constant supply of hot water to the engines. When the alarm strikes the fire is kindled beneath the boiler, and steam is soon available. The rated capacity of steam fire-engines ranges from about 400 to 1300 gallons per minute, and their weights from 5000 to 9500 pounds. The first, and probably the only thorough test of steam fire-engines, was that made in 1876 at the Centennial Exhibition at Philadelphia. A more recent series of tests was made at Boston in 1893. The engines tested were those in regular service by the fire department, some practically new and others fifteen years old. In all cases the engines drew water from a hydrant under pressures of from 30 to 40 pounds. The largest average quantity of water pumped per minute during the whole of one test was 910 gallons, the pumps having been run two hours and twenty-three minutes and throwing

a total of 130,121 gallons of water. The average steam-pressure was 101.3 pounds, and the average water-pressure at the pumps was 112.8 pounds. For shorter periods during this test better results were obtained: thus, for about twelve minutes there was a discharge of 1022 gallons per minute. To enable the engines to be drawn by horses at a high rate of speed, lightness is essential. Fire-engines mounted on fire-boats, like those used by New York, Chicago, Detroit, and other cities, may be designed with less regard for weight and with more consideration for fuel economy; but here, also, quickness and effectiveness of service ranks first, so the chief advantage of such fire-engines is that they may be made practically as capacious and powerful as is desired, and may approach fires closely from the water-front side, where the ordinary steam fire-engine cannot be driven.

Chemical fire-engines and extinguishers range all the way from apparatus mounted on wheels and propelled by horses or men to small tanks carried on a fireman's back, or small hand force-pumps. The aim of all such devices is to smother the fire by means of some gas, such as carbonic-acid gas. The larger and more effective apparatus include a generating tank or tanks, in which water and soda are placed, with an agitator to aid in dissolving the soda, an acid-feeding chamber, and the necessary hose. If the generating apparatus is in duplicate, with proper hose connections, continuous streams may be thrown; otherwise the stream will cease while recharging is in progress. The water serves as a medium to carry the gas, and the gas is the motive force for the water.

FIRE-ESCAPES, a stationary or portable device to escape from burning buildings when ordinary means of egress to the ground are destroyed or cut off by flames. The fire-escape required by most city building laws, consists of balconies attached to the outside of the building, connected by iron ladders with each other, and opening onto each floor at a door or window. Portable fire-escapes may be operated from the interior of the building or from the outside according to their character. Interior fire-escapes of this class vary in character from a simple knotted rope placed in each room, and down which persons seeking escape slide, to more elaborate devices. Portable fire-escapes operated from the outside consist of ladders, telescopic tubes carrying slings, cables which may be thrown up into open windows, etc. One of the most effective of all of these devices is a simple ladder of sufficient length to reach from one story to the next, and provided with large hooks at one end which may be inserted over the window-sill. The first ladder is placed from the ground, the second from the top of the first, and so on until a line of ladders extends from the ground to the top floor, down which the occupants of the building may descend alone or be carried by the firemen.

FIRE-EXTINGUISHER, an apparatus by which fire may be extinguished, by pouring on it water charged with some gas that is incapable of supporting combustion, especially carbonic-acid gas. The Babcock extinguisher consists of a cylindrical vessel which may be carried on the back, filled with a solution of sodium bicarbonate, over which is suspended a vessel containing sulphuric acid, which is made to tilt over and discharge its contents into the solution when brought into use, thus liberating the carbon dioxide. Large cylinders containing chemical salts, have been mounted on wheels, known as "chemical fire-engines," and are used in many of the larger cities.

Hand grenades, or bombs filled with fire-extinguishing solutions of chlorine or ammonium chloride, borax, carbonic-acid gas under preat pressure, mixtures of calcium chloride, magnesium sulphate, sodium carbonate, sodium chloride, and sodium silicate are in common use; but they are of value only in the first stages of a fire.

FIREFLY, a name indefinitely given to any winged insect which possesses much luminosity. Except the lantern-fly, the fireflies are all coleopterous, and are members of two nearly allied families the Elateridæ or skip-jacks, and Lampyridæ, to which the glow-worm belongs

FIRE INSURANCE, just when a scientific system of insurance against loss by fire was first introduced it is impossible to say. In the ordinances of the guilds of the Middle Ages, we find regulations for the payment of indemnity to any member who suffered loss of property by fire.

The earliest recorded proposal for the establishment of a scientific fire-insurance company in England was made in 1635. The first office was opened by N. Barbon, in London, in 1667, the year after the great fire. It is highly probable that the business had already been introduced on the continent.

The first fire-insurance company in the U. States was opened at Philadelphia in 1752, and incorporated in 1768. The development of the fire-insurance business was slow at first, but before the end of the eighteenth century, at least thirty charters had been granted to companies for carrying on the business. The most trying time in the history of fire insurance in the U. States during the last fifty years came in the early seventies. In October, 1871, as a result of the Chicago fire, insurance companies became liable for indemnities amounting to more than $96,500,000. In November of the following year occurred the great Boston fire, which brought a loss of more than $52,600,000 upon the companies. These two great losses, coming in quick succession, subjected all fire-insurance companies to great strain. More than a hundred of them were forced to suspend operations, while many others found their surplus wiped out and their capital seriously impaired.

The year 1906 tested the financial strength of the fire insurance companies to the limit. The earthquake in San Francisco on April 18 was followed by a fire which raged for three days before it was under control. The estimated net losses to the insurance companies was $113,441,595, divided as follows: American companies, $63,771,499; foreign companies, $49,670,096.

On Jan. 1, 1907, there were doing business in the United States 374 joint stock fire insurance companies, and 257 mutual companies. Their combined capital was $84,290,590; their combined assets, $554,331,115; their combined net surplus, $176,942,570. During the year they wrote risks aggregating $30,000,000,000. The figures do not include the operation of some 500 town and county mutual companies, whose transactions are purely local.

Some indication of the increase in the use of fire insurance by property-owners may be gained from a comparison of the total fire loss for different periods with the losses sustained by the insurance companies during the same periods. The figures given in the Spectator year book for 1902 indicate that in the decade 1881–1890, 57.4 per cent of the total fire loss was covered by insurance, while in the decade 1891–1900, 60.9 per cent of the total loss was thus covered. The relation of insurance to the amount of fire loss demands careful consideration. Against the great gain which the system of fire insurance confers upon society must be set a direct loss due to the increase in the amount of property destroyed by fire as a result of the insurance itself. A part of this increased loss is due to the greater carelessness of the owners because of the insurance; a larger part is due to the deliberate destruction of insured property by the owners for the sake of securing the insurance. What proportion of fires is due to incendiarism it is impossible to determine with accuracy. Various estimates, ranging from 20 to 40 per cent, have been made by different investigators. The value of the property deliberately destroyed in order to obtain insurance constitutes one element in the cost of insurance. The insurance companies themselves are indirectly responsible for a part of this loss. It is a matter of common knowledge that agents and brokers show too great laxity in granting insurance on property up to, and sometimes far beyond, its full value. Every instance of over-insurance is a standing invitation to incendiarism.

While a part of the annual loss by fire must be charged against the system of insurance, insurance companies must, on the other hand, be credited with a large share of the responsibility for the discovery and application of methods for preventing such loss. Not only have they always been active, both in the adoption of preventive measures and in compelling or inducing the insured to adopt such measures, but it is also to their initiative that a large part of the progress in state and municipal activity along the same lines have been due.

FIRE ISLAND, or **GREAT SOUTH BEACH,** a low spit of sand, about 50 miles long but broken by inlets, almost 40 miles southeast of New York City. It separates the Great South Bay from the Atlantic Ocean. On its western end is a lighthouse of the first order; also a station from which transatlantic steamers bound for New York are first sighted. The beach is a popular summer resort.

FIRELOCK, a musket or other gun, with a lock furnished with a flint and steel, by means of which fire is produced in order to discharge it; distinguished

from the old matchlock, which was fired with a match.

FIRE OF LONDON, The Great, broke out in a house near London Bridge 2d Sept. 1666, and raged for several days. Two-thirds of London was destroyed—eighty-nine churches and more than 13,000 dwelling-houses. The monument erected by Wren at Fish Street Hill commemorates the great fire, and at one time bore an inscription attributing the fire to Popish faction.

FIRE-PROOFING, various plans have been adopted for rendering houses, or an apartment in a house, fireproof, as by constructing them entirely of brick or stone, and employing iron doors, ties, and lintels, stone staircases and landings. In the case of textile fabrics, as cotton, linen, etc., saturation with various salts, as borax, which leaves their crystals in the substance of the fabrics, is the means adopted for rendering them incombustible. Wood is best protected by silicate of soda, which, on the application of strong heat, fuses into a glass, and this, enveloping not only the outside but also the internal fibers of the wood, shields it from contact with the oxygen of the air. Fireproof safes are generally constructed with double walls and stout iron, having a space between the walls filled with some substance which is a very bad conductor of heat.

FIRE-SHIPS, are generally old vessels filled with combustibles, and fitted with grappling-irons, to hook enemies' ships and set them on fire. This ancient device has been frequently tried in modern warfare, though it can never be of much effect when employed against modern ships.

FIRE-WORSHIP, the worship of fire, the highest type of which worship is seen in the adoration of the sun, not only as the most glorious visible object in the universe, but also as the source of light and heat. In the East the worship of the element of fire was practiced by the ancient Persians or Magians, and is continued by the modern Parsees. The establishment of this species of idolatry among the Persians is ascribed to Zoroaster, who taught his disciples that in the sun and in the sacred fires of their temples God more especially dwelt, and that therefore divine homage was to be paid to these.

FIRKIN, a British measure of capacity, being the fourth part of a barrel, or equal to 7½ imperial gallons, or 2,538 cubic inches. It is now legally abolished.

FIR'LOT, a dry measure used in Scotland, but now legally abolished; the fourth part of a boll.

FIRM. a partnership or association of two or more persons for carrying on a business; a commercial house; or the name or title under which a company transact business.

FIR'MAMENT, the vault of heaven. The Hebrew word rakia, which is so rendered in Scripture, conveys chiefly the idea of expansion, although that of solidity is also suggested, inasmuch as the root signification of the word is that which is expanded by beating out. The English firmament is adopted from the Latin firmamentum, which is the equivalent of the Greek stereoma (stereos, firm, solid), by which the writers of the Septuagint rendered rakia.

FIR'MAN, a decree, order, or grant of an Oriental sovereign, as of Turkey, issued for various special purposes, for instance to ensure a traveler protection and assistance.

FIROZABAD', town and municipality in Agra district, in the United Provinces of India, pop. 16,023. Pop. of tahsil or revenue district, 108,521.

FIROZPUR', a thriving commercial town, Punjab, India, capital of a district of the same name. Pop. 50,437. The district forms the southwestern portion of the Jalandhar division. Area, 4,302 sq. miles; pop. 886,676.—Firozpur is also the name of a town in Gurgaon district, Punjab. Pop. 6,878.

FIRTH, Frith, an estuary, a term applied in Scotland to arms of the sea, such as the Firth of Clyde, of Tay, and of Forth, etc. It is the same word as the Norwegian fjord.

FISH. See Ichthyology.

FISH CULTURE, the breeding, rearing, transplanting, and protection of aquatic animals in order to maintain or increase their abundance.

The maintenance of ponds for the rearing of fresh-water fishes for food or ornamental purposes is a very ancient one. In recent years fish culture has become almost synonymous with the harvesting of eggs, their artificial fecundation, and the rearing of the young up to varying stages in hatcheries established for that purpose. The U. States far surpasses all other countries in the extent of this work under Government patronage. The Federal government supports twenty-eight hatcheries at various favorable places, and one steamer, the Fishhawk, a sort of floating hatchery, exclusively used in the actual culture of fishes or in the investigation of problems pertaining thereto. The purpose of the governmental hatcheries is either to stock new waters with desirable species or to maintain by planting the supply in waters already tenanted.

It is now established that waters thus stocked or replenished have not only been able to maintain their supply of fishes, but have greatly increased it. Pacific waters have been successfully stocked with Atlantic species, and almost exhausted streams in various parts of the U. States have been successfully restored. In some species the eggs are not handled, but the spawning fishes are provided with favorable ponds for spawning purposes, where their eggs are protected from enemies, given suitable temperature, etc. This is the case with members of the Centrarchidæ, such as the black bass, which build a nest and guard the eggs during incubation. The young when hatched are either taken from the ponds and fed in suitable troughs until better able to shift for themselves, or are supplied with food in the ponds themselves. In most species, however, the eggs are artificially expelled from the body into suitable receptacles, in which they are fertilized by the addition of milt similarly obtained from the males. After a few moments the eggs are transferred to running water where they are kept and taken care of until the embryos emerge. The exact method employed in fertilization, but especially the subsequent handling of the eggs during incubation, varies considerably with the character of the eggs See Pisciculture.

FISHERIES, a term which includes all the industries concerned in the capture of the inhabitants of fresh and salt water for food and other economic purposes. It is thus applied to the procuring not only of fish proper, but also of other animals and products found in the sea, such as sponges, corals, pearls, shell-fish, turtles, whales, seals, etc. The most important of fresh-water fisheries is that of salmon, which is prosecuted with draw-nets, stake-nets, and by sportsmen with fly-hooks. Trout, eel, pike, and perch are among the other important fresh-water fishes. Sea-fisheries, including the herring, cod, haddock, and other fishes, are prosecuted in a variety of ways. Hand-line and long-line fishing are worked more or less. Of nets the chief varieties are trawls, drift-nets, seines, bag nets, and trammel or set nets. Fisheries have generally been considered so important an object of national wealth that governments have been careful to protect and encourage them in various ways. The right to various fisheries has often been a matter of international disputes, negotiations, and treaties. (See Canada.) Fisheries belonging to particular governments, especially inland fisheries in lakes and rivers, are also frequently protected by laws relating to the mode of capture, etc., which vary with the particular circumstances. The countries whose fishing industries produce the most valuable returns are Great Britain, British North America, and the U. States. The banks of Newfoundland are one of the richest fishing grounds in the world, and are largely frequented by French fishermen. The German Ocean also yields a very rich harvest to the fishermen of all the surrounding coasts, especially in herring, cod, haddock, flat-fish, etc.

FISH, Hamilton, American statesman, born in 1805 in New York City; in 1842 he was elected to congress as a Whig. In 1848 he was elected governor In 1851 he was elected U. States senator. In March, 1869, Fish was appointed secretary of state, and served through both of Grant's administrations, retiring in 1877. In 1871 he was one of the commissioners who negotiated and signed the Treaty of Washington with Great Britain. During the "Alabama Claims" arbitration he was successful in securing the adoption by the tribunal of a provision which relieved the U. States from responsibility for indirect damages arising out of the Fenian raids and Cuban filibustering expeditions. He also brought about the settlement of the long-standing Northwestern boundary dispute with Great Britain, which resulted in the cession to the U. States of the island of San Juan (see San Juan boundary), and the satisfactory settlement of the complications growing out of the Virginius affair. He died in 1895.

FISHES. See Ichthyology.

FISH-GLUE, a coarse species of isinglass.

FISH-HAWK, a name given in America to the osprey or fishing-eagle. See Osprey.

FISH-HOOK, a curved, barbed, and pointed steel wire used for catching fish. Hook-making machines are now common, especially in the U. States, where the wire is run into the machine, and on the other side the hook drops out completed, with the exception that it must be tempered and colored.

FISHING BIRDS, the fishing birds proper include the larger sea-birds, such as the loons, penguins, auks, puffins, tropic-birds, frigate-birds, cormorants and gannets; and certain fresh-water families of higher organization, such as the pelicans, darters, most herons, and some ducks. All are either powerful swimmers and divers, or else are skillful in lying in wait and snatching or piercing any fish that comes sufficiently close to their motionless forms. The instrument (except in the Raptores, which use their talons) is the beak, which is long, straight, sharply pointed, and sharp-edged, so that a firm grip may be had of the slippery bodies of their prey. Many of these birds have a special provision for bringing home a part of their catch to their young, either by swallowing it as far as the crop, whence it may be disgorged, or by storing it in a bag formed by the distensible membrane between the lower mandibles.

FISHING-ROD, a long slender rod, usually made in jointed sections, to which the line is fastened in angling. See Angling.

FISH-JOINT, a splice or joining, as in railways, where two rails end to end are fastened together by flat pieces of iron (fish-plates) placed on each side of the rails, and fastened by screw-nuts and bolts (fish-bolts).

FISH-LOUSE, a name for several crustaceans of the order Ichthyopthira, parasitic on fishes. Some are common on many of the British sea-fishes. Sickly fishes often become the victims of multitudes of these creatures, or the sickness is induced by the number which attacks them.

FISH PLATE, a flat plate or bar of iron employed in pairs to connect the ends of adjacent rails in railway track. The two plates are placed on opposite sides of the webs of the rails, and are held by bolts passing through the plates and the webs of the two rails. In order to increase the strength of the joint, the angle bar was devised, having a vertical web like the fish plate and an inclined flange extending over the rail-base. The angle-bar joint is now almost universally employed.

FISK, Clinton Bowen, American soldier and politician; was born in 1828 at Griggsville, N. Y. At the beginning of the civil war he entered the Union Army and in 1865 was brevetted major-general. Subsequently he devoted his life largely to the interests of the colored race; was assistant commissioner in the Freedman's Bureau, and was instrumental in founding Fisk University. He was prohibition candidate for governor of New Jersey in 1886, and for president of the U. States in 1888. He died in 1890

FISK, James, Jr. American stock speculator, born in Bennington, Vt., in 1834. In 1870 he opened a brokerage office in New York City. He picked up a precarious living for some time, until Daniel Drew made him one of his agents in his famous struggle with Cornelius Vanderbilt for the control of the Erie Railway. The Vanderbilt faction was forced out of the directorate, installing Fisk and Jay Gould in their stead. This was the beginning of the association of Jay Gould and James Fisk, which terminated only with the death of Fisk. Gould became president of the Erie Railroad, and Fisk the vice-president and comptroller. From their headquarters a campaign of bribery and corruption was carried on that brought under the power of these men city, state, and federal officials, judges, and legislatures, reaching its climax in the gold conspiracy in 1869 and "Black Friday," when an attempt was made to control President Grant himself. A quarrel with one of his partners, E. S. Stokes in 1872 culminated in his death at the hands of the latter.

FISKE, John, American philosopher and historian, was born at Hartford, Conn., in 1842. He graduated at Harvard College in 1863, and in 1869 began a career of distinguished success as a lecturer at Harvard on Philosophy in its Evolutionary Aspect. In 1884 he was made professor of American History in Washington University, St. Louis. He lectured on American History at University College, London, in 1879, and at the Royal Institution of Great Britain in 1880. He did much to popularize the philosophy of Evolution, and through outlines of Cosmic Philosophy won a national reputation. His contributions in book form to American History constitute practically a connected history of the U. States from the first discoveries to the establishment of federal government. He edited with Gen. James Grant Wilson Appleton's Cyclopedia of American Biography. He died in 1901.

FISKE, Minnie Maddern, American actress, born in New Orleans in 1865. Throughout her childhood she played at times with many well-known actors like Laura Keene, John McCullough, Barry Sullivan and E. L. Davenport. At sixteen she was brought out as a star in Fogg's Ferry and for several years made some success. She has appeared in Ibsen's A Doll's House, A Bit of Old Chelsea, etc. She made a sensation in Tess of the D'Urbervilles and in Becky Sharp.

FISK UNIVERSITY, an institution for the education of colored persons, founded in 1866, at Nashville, Tenn., by the American Missionary Association of New York and the Western Freedman's Aid Commission of Cincinnati. The university at present comprises theological, normal, college, preparatory, music, and industrial departments. The attendance in all departments is over 500.

FISSIROSTRES (-ros'trēz), a tribe of the Insessores or perching birds, distinguished by having a very wide gape extending beneath the eyes. It comprehends the night-jar or goatsuckers, whip-poor-will, swallows, swifts, martins, etc. But in modern classification this division is often disregarded.

FIS'TULA, in surg. a channel open at both ends excavated between an internal part and the skin-surface, showing no tendency to heal, and generally arising from abscesses. It occurs more frequently at some outlet of the body, as the urinary passages and anus.

Fissirostres.

1, Diurna. Head, foot, and bill of a swallow. 2, Nocturna. Head, foot, and bill of a goat sucker.

FIT, a sudden and violent attack of disorder, in which the body is often convulsed, and sometimes the person is unconscious; as, a fit of apoplexy or epilepsy.

FITCH, William Clyde, an American playwright, born in New York in 1865. His first play, Beau Brummel, was brought out by Richard Mansfield at the Madison Square Theater, New York, in 1890. Among his plays are: Betty's Finish; Frédéric Lemaître; A Modern Match; Pamela's Prodigy; April Weather; Mistress Betty; The Moth and the Flame; Nathan Hale, which has been his greatest success; The Cowboy and the Lady; Sapho; Barbara Frietchie; The Climbers; Captain Jinks of the Horse Marines; Lovers' Lane; The Way of the World; The Last of the Dandies; The Girl and the Judge; and The Stubbornness of Geraldine.

FITCH'BURG, a city (including the villages of West Fitchburg, South Fitchburg, Cleghorn, Crockerville, Rockville, and Traskville) and one of the county-seats of Worcester county, Mass., 25 miles north of Worcester and 50 miles northwest of Boston; on a branch of the Nashua river, and on the Fitchburg division of the Boston and Maine, and the New York, New Haven and Hartford railroads. Pop. 33,000.

FITZGERALD, Edward, English poet, was born near the market town of Woodbridge, in Suffolk, in 1809. In 1853, the first drama of his famous translations appeared: Six Dramas of Calderon. Fitzgerald's intimacy with Professor Cowell, the orientalist, culminated in their study of the Persian poets, and bore important fruit in Fitzgerald's translation of the Salaman and Absal, of Jami, in 1856, and the Rubaiyat three years later. The story of how the now famous quatrains first claimed public attention is well known. Fitzgerald offered some of "the less wicked" of them to Frazer's Magazine; but as they failed to appear, he made a present of them, two years later, to his publisher, Mr. Quaritch, who issued them in a brown-covered pamphlet, at five shillings. In course of time they found their way to a penny box outside the bookseller's door. It was there that Mr. Whiteley Stokes bought the copy which he gave to Dante Gabriel Rosetti, who in turn passed it onto Mr. Swinburne, and thus laid the foun-

dation of the Omar cult in England. It is only just beginning to be recognized that Fitzgerald's Rubaiyat is held in honor, not as Persian, but as English poetry, and that to the great majority the sources are as unimportant as the sources of a play of Shakespeare. He died in 1883.

FIVE FORKS, a locality in Dinwiddie county, Virginia; the scene of an important battle fought 1st April, 1865, one week before the close of the civil war. After heavy fighting the confederates were completely defeated.

FIXED ALKALIES, potash, soda, lithia, and oxides of the rare metals rubidium and cæsium, so named in contradistinction to ammonia, which is termed volatile alkali.

FIXED OILS. See Oils.

FIXED STARS, those stars which appear to remain always at the same distance from each other and in the same relative position. The name comprehends, therefore, all the heavenly bodies, with the exception of the planets, with their moons, and the comets. See Stars.

FIXTURES, in law, are accessories annexed to houses or lands, which by the fact of their being so annexed become a part of the real property and pass to the freeholder, not being removable at will by the tenant or occupier of the property. The general rule of law is that whatever has been affixed to the premises or put into the land by a tenant during his occupancy cannot be removed without the landlord's consent. Large exceptions are made to this rule in favor of the tenant, covering generally fixtures for trade, for agricultural purposes, and for ornament or convenience; but the removal must not injure the land or buildings of the landlord.

FLAG, a piece of cloth on which certain figures or devices are painted, impressed, or wrought, borne on a staff or pole, and usually employed to distinguish one company, party, or nationality from another. In the army a flag is a banner by which one regiment is distinguished from another. Flags borne on the masts of vessels not only designate the country to which they belong, but also are made to denote the quality of the officer by whom a ship is commanded.

FLAG, a popular name for many endogenous plants with sword-shaped leaves, mostly growing in moist situations. It has sword-shaped leaves and yellow flowers, grows in marshy places and by the sides of streams and lakes. The stout creeping root-stock has been recommended for alleviating the toothache, and is used for dyeing black in the Hebrides. The leaves make excellent thatch, and are also employed for making bottoms to chairs.

FLAGELLANTS, (flaj'el-ants), the name of a sect in the 13th century who maintained that flagellation was of equal virtue with baptism and other sacraments. They walked in procession with shoulders bare, and whipped themselves till the blood ran down their bodies, to obtain the mercy of God and appease his wrath against the vices of the age. Rainer, a hermit of Perugia, is said to have been its founder in 1260. He soon found followers in nearly all parts of Italy. Their number soon amounted to 10,000, who went about, led by priests bearing banners and crosses. They went in thousands from country to country, begging alms; and for centuries they formed a sort of intermittent order of fanatics, frequently reappearing here and there in times of extraordinary declension or distress.

FLAGEOLET (flaj'o-let), a small wind-instrument of music, played by means of a mouthpiece. The tone produced is similar to that of the piccolo, but is softer in quality, and the range is two octaves. The double flageolet consists of two instruments united by one mouthpiece, and producing double notes. The name flageolet tones is given to those harmonic tones on the violin, violoncello and other stringed instruments, produced by the finger lightly touching the string on the exact part which generates the harmony, and not by pressing the string down to the finger-board.

FLAG-OFFICER, an officer in the U. States navy entitled by his rank to carry at the masthead a flag instead of a pennant, indicative of his command. At present the flag-officers are admirals, who carry the flag at the main, vice-admirals, who carry it at the fore, and rear-admirals, who carry it at the mizzen. In case a ship has but two masts they are called the fore and main; the flag of a rear-admiral is then hoisted at the main. Previous to the abolition of the grade of commodore officers of this rank were included among the flag-officers.

FLAG OF TRUCE, a white flag shown by one of two forces, indicating a desire to communicate. The necessity of communicating with the enemy in time of war, and the fact that this can usually be best done by means of a flag of truce, has given to the latter a sort of sacred character, which is recognized by all civilized people. A flag of truce, must be sent by the senior officer present, and it can only be received at the will of the senior officer of the other side. In a naval battle the vessel bearing it should not attempt to proceed beyond a point at which her character can be easily ascertained; should she attempt to go farther she may be warned by a shot across her bow, and if she does not then stop she will be fired into. The detention of a flag of truce beyond the lines is a protection to the receiving side against espionage, torpedo attack, etc. Any attempt to obtain information of the enemy's position, condition, or force through a flag of truce may subject the bearer to trial as a spy. In dispatching a flag of truce, except during an engagement, the flagship of the senior officer should keep her colors flying and a white flag at the fore; and if the senior officer of the enemy receives the flag-bearer his ship should do likewise during the progress of the conference, and afterward until the flag-of-truce boat has reached its inner lines. The boat carrying the flag should be met at the proper point by one in charge of an officer of suitable rank from the other senior officer, which should fly a white flag while going and returning.

FLAG-SHIP, a ship in which an admiral, or the commander of a squadron, hoists his flag.

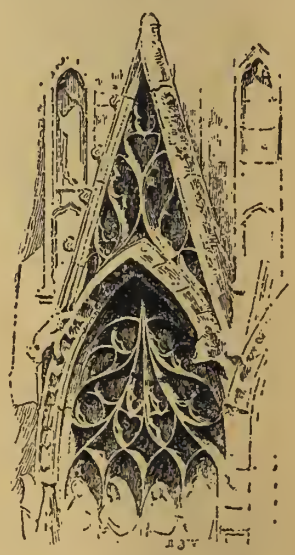
FLAGSTONE, any sandstone, limestone, etc., that is cut or split readily into thin layers, and may be used for pavements, floors, etc.

FLAMBEAU, a sort of torch or light made of some sort of thick wick covered with wax or other inflammable material, and used at night in illuminations, processions, etc.

FLAMBOY'ANT, a term designating a style of Gothic architecture in use in France from the 14th to the 16th century, having prevailed during the whole of the

Flamboyant tracery, St. Ouen, Rouen.

15th century. It was distinguished by the waving and somewhat flamelike tracery of the windows, panels, etc., (hence the name), and is usually regarded as a decadent variety of the decorated Gothic. The moldings in this style are often ill combined, some of the members being disproportionately large or small.



Flamboyant tracery, Rouen cathedral, Normandy.

The pillars are often cylindrical, either plain or with a few of the more prominent moldings of the arches continued down them, without any capital or impost intervening. This is so common that it may be regarded as a characteristic of the style. Moldings also sometimes meet and interpenetrate each other. The arches are usually two-centered, sometimes semi-circular, and, in later examples, elliptical. The foliage enrichments are usually well carved, but the effect is often lost from the minuteness and intricacy of the parts.

FLAME, a blaze rising from a burning body, or any inflammable gas in a state of visible combustion. Flame is attended with great heat, and sometimes with the evolution of much light; but the temperature may be intense when the light is feeble, as is the case with the flame of burning hydrogen gas. The flame of a a candle may be divided into three zones; an inner zone containing chiefly unburned gas, another zone containing partially-burned gas, and an outer zone where the gas is completely consumed by combination with the oxygen of the air. The luminosity of flame depends upon the presence of extremely small particles of solid matter (usually carbon) or of dense gaseous products of combustion. When the pressure of the gas producing the flame is so great that it is all but flaring, it is found that certain sounds will cause the flame to alter its shape, thus producing the phenomenon of sensitive flames.

FLAMIN'GO, a bird formerly placed in the order of wading birds, but now generally ranked among the Natatores or swimmers, and constituting a family Phœnicopteridæ, allied to the Anatidæ or ducks. Its body is rather smaller than that of the stork, but owing to the great length of the neck and legs it stands from

Red flamingo.

5 to 6 feet high. The beak is naked, lamellate at the edges, and bent as if broken; the feet are palmated and four-toed. The common flamingo occurs abundantly in various parts of Southern Europe, Northern Africa, etc. It is entirely scarlet, except the quill-feathers, which are jet-black. The tongue is fleshy, and one of the extravagances of the Romans during the later period of the empire was to have dishes composed solely of flamingoes' tongues. The flamingoes live and migrate in large flocks, frequenting desert sea-coasts and salt-marshes. They are extremely shy and watchful. While feeding they keep together, drawn up artificially in lines, which at a distance resemble those of an army; and, like many other gregarious birds, they employ some to act as sentinels, for the security of the rest. Their food appears to be mollusca, spawn, crustaceans, etc., which they fish up by means of their long neck, turning their head in such a manner as to take advantage of the crook in their beak. They breed in companies in inundated marshes, raising the nest to a certain, height by heaping up the mud with their feet into a small hillock, which is concave at the top. In this the female lays her eggs, and it was formerly believed that she sat on them with her legs hanging down, like those of a man on horseback. But the nests are not so high as to allow of this, and the birds really sit with their legs doubled up under them.

FLAMSTEED, John, the first astronomer-royal of England, was born 1646, died 1719. He was appointed by Charles II. astronomical observator to the king, and carried on his observations at the Queen's House at Greenwich, until the observatory was built for him in 1676. Here he passed his life; formed the first trustworthy catalogue of fixed stars; and supplied the lunar observations by means of which Newton verified his lunar theory.

FLANDERS, a region of Europe, now included in Holland, Belgium, and France, stretching along the German Ocean. The erection of the territory into a county took place in the 9th century, and was made by Philip the Bold, king of France, in favor of his son-in-law, Baldwin. It afterwards passed to the united houses of Spain and Austria, and ultimately to the latter, but underwent considerable curtailment by the conquests of the French in the west, when part of it became French Flanders, and by the conquests of the Dutch in the north. The remainder still retains its ancient name, and forms the modern provinces of East and West Flanders, in Belgium.—The Belgian province of East Flanders (French, Flandre Orientale) has an area of 1157 square miles. The surface forms an extensive plain, sloping gently eastward. It wholly belongs to the basin of the Schelde. Its soil, partly of a sandy and partly of a clayey nature, is so industriously and skilfully cultivated that it has the appearance of a vast garden. The principal crops are wheat and flax. Linen, laces, and damask are among the important manufactures. Gand or Ghent is the capital. Pop. 1,039,138.—West Flanders (French, Flandre Occidentale) has an area of 1248 square miles. The surface in generally flat; the soil naturally sandy and poor, but well cultivated and fertilized, though not so productive as that of East Flanders. The most important branch of industry is linen. Great quantities of lace also are made. Bruges is the capital. Pop. 816,862.

FLANGE, a projecting edge, rim, or rib on any object, as the rims by which cast-iron pipes are connected together, or the projecting pieces on the tires of the wheels of railway cars to keep them on the rails.

FLANNEL, a woolen fabric of loose texture and various degrees of fineness, much used as a clothing both in hot and cold countries from its properties of promoting insensible perspiration, which is absorbed and carried off by the atmosphere. Welsh flannels have attained a high reputation. In flannel shirtings the wool is frequently mixed with silk, linen, and cotton.

FLAT, a character or sign in music, used to lower or depress, by the degree of a semi-tone, any note in the natural scale. It is marked thus ♭. An accidental flat is one which does not occur in the signature, and which affects only the bar in which it is placed.

FLAT-FISH, a fish which has its body of a flattened form, swims on the side, and has both eyes on one side, as the flounder, turbot, halibut, and sole. The sense is sometimes extended to other fishes which have the body much compressed, as the skate and other members of the ray family.

FLATHEAD INDIANS, tribes established on the Pacific coast, mainly of the now nearly extinct Chinook group of fish-eating Indians They flatten the skull of the infant by pressure. The same custom anciently prevailed among many tribes, but the practice is now nearly extinct. The name Flathead is improperly given to the small civilized tribe of Selish Indians, who do not flatten the heads of their children.

FLAUBERT(flō'bâr') Gustave, French novelist was born in Rome in 1821. He devoted his life to the production of five volumes of rare literary ability—Madame Borary, published in 1857, Salammbô in 1862, L'éducation Sentimentale in 1869, La Tentation de Saint-Antoine in 1874, and the Trois Contes in 1877. He died in 1880.

FLAX, the common name of herbs or small shrubs, with narrow leaves, and yellow, blue, or even white flowers arranged in variously-formed cymes. They occur in warm and temperate regions

Flax.

over the world. The cultivated species which is used for making thread, and cloth called linen, cambric, lawn, lace, etc., consists of the woody bundles of the slender stalks. The fine fibres may be so separated as to be spun into threads as fine as silk. A most useful oil is expressed from the seeds, and the residue, called linseed-cake, is one of the most fattening kinds of food for cattle. When the plant is ripe it is pulled up by the roots, tied together in little bundles, and usually left upright on the field till it becomes dry, when the seeds are separated, either by beating on a cloth or by passing the stems through an iron comb. The process of removing the seeds is called rippling. The stalks are then retted or rotted in water to free the flaxen fiber from the woody core or boon of the stem. Two operations are necessary to separate the fibers from the woody part of the stem. The flax is first broken by means of a wooden handle and grooved board, or by revolving grooved rollers, and then the boon or woody part is entirely separated from the fiber by a broad flat wooden blade called a scutching blade, or by a machine in which a number of knives attached to the arms of a vertical

wheel strike the flax in the direction of its length, and completely separate it. The flax is next heckled, or combed with a sort of iron comb, beginning with the coarser and ending with the finer, and is now ready for spinning. See Linen.

FLAXMAN, John, one of the most distinguished English sculptors, born at York 1755, died in London 1826. His earliest notions of art were derived from casts in the shop of his father, who sold

John Flaxman.

plaster figures, from many of which young Flaxman made models in clay. In 1770 he was admitted a student of the Royal academy, and for some time earned a living by producing designs for Wedgwood the potter. In 1787 he went to Italy, where he remained seven years, and left many memorials of his genius, besides executing designs in outline to illustrate Homer, Dante, and Æschylus, an extensive series for each.

FLEA, a name for several insects regarded by entomologists as constituting a distinct order Aphaniptera, because the wings are inconspicuous scales. All the

Common flea. (Line shows natural size.)

species of the genus are very similar to the common flea (Pulex irritans). It has two eyes and six feet; the feelers are like threads; the oral appendages are modified into piercing stilets and a suctorial proboscis. The flea is remarkable for its agility, leaping to a surprising distance, and its bite is very troublesome.

FLEA-BEETLE, the name given to different species of beetles which are destructive to plants. The turnip-flea, whose larvæ are sometimes so destructive to the turnip crops, furnishes an example.

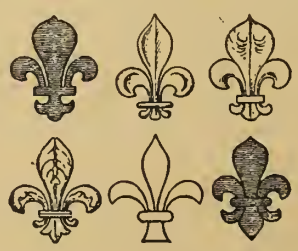
FLEMISH LANGUAGE AND LITERATURE, the Flemish or Vlæmisch language is a form of Low German, differing only slightly in pronunciation and orthography from the Dutch. It is spoken by a considerable number of the inhabitants of Belgium, especially in the provinces of East Flanders, West Flanders, Antwerp, Limburg, and Brabant. A fragment of a prose translation of the Psalms upward of a thousand years old is the oldest extant specimen of the Flemish. The "father of Flemish poetry," Jakob Van Maerlant, wrote several romances dealing with Merlin and the Holy Grail, The Mirror of History, etc., in the 13th century; and a version of Reynard the Fox belongs to the same period. The 14th century was remarkable for the number of wandering poets, authors of knightly romances. The translation of the Bible, which is considered the standard for the construction and orthography of the language, was finished in 1618. The 18th century produced several good writers on philology, but was barren in poetic genius. The French almost annihilated the native literature, and it did not revive till the revolution of 1830, since which time it has been very vigorous. The leaders in this revival were Willems, Blommaert, Van Ryswyck, Conscience, Van Duyse, Snellaert, Snieders, DeLaet, Dedecker, David, and Bormans.

FLEMISH SCHOOL, of Painting. See Painting.

FLESH, a compound substance forming a large part of an animal, consisting mainly of the muscles, with connective tissue, and the blood-vessels and nerves, etc., supplying them. It consists chiefly of fibrin, with albumen, gelatin, hæmatosin, fat, phosphate of sodium, phosphate of potassium, phosphate and carbonate of calcium, sulphate of potassium, and chloride of sodium. The solid part is, besides, permeated by an alkaline fluid, called flesh-juice. It has a red color, and contains dissolved a number both of organic and inorganic substances. The organic matter consists of albumen, casein, creatine and creatinine, inosic and several other acids; the inorganic, of alkaline sulphates, chlorides, and phosphates, with lime, iron, and magnesia.

FLETCHER, John. See Beaumont and Fletcher.

FLEUR-DE-LIS (fleur-dė-lē') Fr., "flower of the lily"), in heraldry a bearing as to the origin of which there is much dispute, some authorities maintaining



Various forms of the fleur-de-lis

that it represents the lily, others that it represents the head of a lance or some such warlike weapon. The fleur-de-lis has long been the distinctive bearing of the kingdom of France.

FLEURY, André Hercule de, cardinal and prime-minister of Louis XV., was born in 1653, died in 1743. In 1698 Louis XIV. gave him the bishopric of Fréjus, and shortly before his death appointed him instructor to Louis XV. After the death of the regent in 1723 he proposed the Duc de Bourbon as first minister, but in 1726 he overturned the government which he had himself set up, and from that date kept the direction of affairs in his own hands. In the same year he was made a cardinal. The internal affairs of France prospered under his administration, but his foreign policy was unfortunate.

FLIGHT. See Flying.

FLINT, the county seat of Genesee co., Mich., on Chi. and Gr. Trunk and Flint and P. Marq. R. Rs.; 61 miles N. W. of Detroit. It is the seat of the Michigan institution for the deaf and dumb. It has a large number of steam saw-mills (manufacturing about 60,000,000 feet of lumber annually). Pop. 15,672.

FLINT, a variety of quartz of a yellowish or bluish-gray or grayish-black color. It is amorphous, and usually occurs in nodules or rounded lumps. Its surface is generally uneven, and covered with a whitish rind or crust, the result of weathering or of the action of water percolating through the rocks. It is very hard, strikes fire with steel, and is an ingredient in glass and in all fine pottery ware. The fracture of flint is perfectly conchoidal; though very hard it breaks easily in every direction, and affords very sharp-edged splintery fragments, formerly made into arrow-heads, etc. (See Flint Implements.) Its true native place is the upper bed of the chalk formation, in which it is formed as a series of concretions, the silica in sponges and in other marine animals which live on the sea floor while the chalk was being deposited being attracted into nodules.

FLINT-GLASS, a species of glass, so called because pulverized flints were originally employed in its manufacture. It is extensively used for domestic purposes. Its dispersive power in regard to light renders it invaluable in the manufacture of the object-glasses of telescopes and microscopes, as by combining a concave lens of flint-glass with one or two convex lenses of crown-glass, which possesses a much less dispersive power, a compound lens is formed in which the prismatic colors arising from simple refraction are destroyed, and the lens rendered achromatic. Quartz and fine sand are now substituted for flint in the manufacture of this glass.

FLINT IMPLEMENTS, implements of flint used by man while unacquainted with the use of metals. For such implements granite, jade, serpentine, jasper, basalt, and other hard stones were also used, but the most numerous were formed of flint. They consist of arrow-heads, axe-heads, lance-heads, knives, wedges, etc. (See Celts.) Flint implements are still used by some savage tribes.

FLINT-LOCK, a musket-lock in which fire is produced by a flint striking on the steel pan, now superseded by locks on the percussion principle.

FLOATING QUARTZ, or **FLOAT-STONE,** a porous variety of quartz of a spongy texture, whitish-gray in color, so light as to float in water. It frequently contains a nucleus of common flint.

FLOCK, the refuse of cotton and wool, or the shearing of woolen goods, etc., used for stuffing mattresses, furniture,

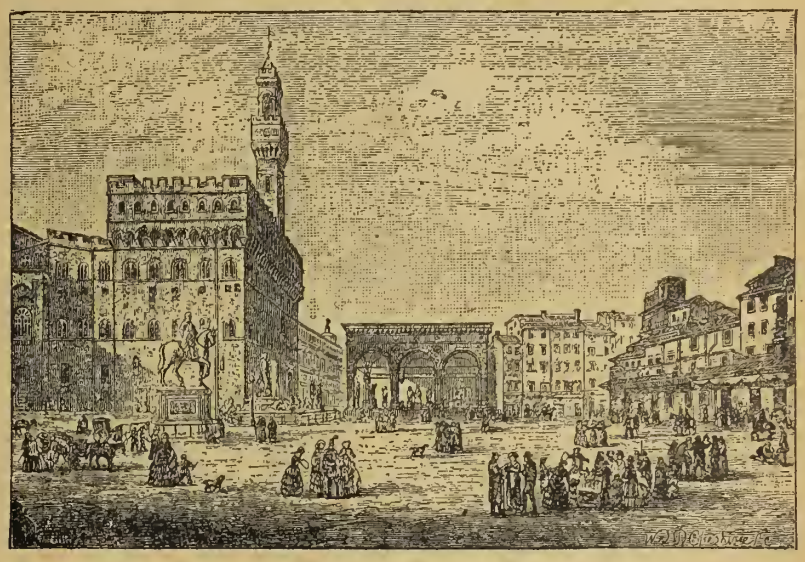
etc. Flockpaper is a kind of wall-paper, having raised figures resembling cloth, made of flock or of cloth cut up very fine, and attached to the paper by size or varnish.

FLODDEN, a village of England, in Northumberland, about 5 miles s. e. of Coldstream. Near it was fought the celebrated battle in which James IV. of Scotland was defeated by the Earl of Surrey (Sept. 9, 1513). The loss of the Scots was from 8,000 to 10,000 men, including the king, the Archbishop of St. Andrews, and a large number of the nobles; that of the English from 6,000 to 7,000. At the beginning of the battle the armies mustered respectively 30,000 and 32,000 men. The English victory was so near a defeat that Surrey was unable to prosecute the war with any vigor.

FLOQUET, (flō′kō′,) Charles Thomas, French statesman and journalist, born at Saint-Jean-de-Luz in Basses-Pyrénées, in 1828. In the organization of the government of national defense in 1870 and during the siege of Paris, Floquet was extraordinarily active, and was later chosen as representative to the national assembly by the department of the Seine. In 1876 he entered the chamber of deputies, voting with the extreme left. He was made prefect of the Seine in 1882, but reëntered the chamber soon after, and from 1885 to 1888, when he became prime minister, was president of that body. In February, 1889, on the defeat of his projected constitutional amendment, he resigned the premiership. The Panama disclosures in 1892–93 implicated Floquet and injured his political standing, although he was elected to the senate in 1894. He died January 18, 1896.

FLORA, the Roman goddess of flowers and spring, whose worship was established at Rome in the earliest times. Her festival, the Floralia, was celebrated from April 28 to May 1 with much licentiousness. In botany, flora signifies the plants of a region collectively, as fauna signifies the animals.

FLORENCE, a celebrated city of Italy, capital of a province of same name, 143 miles northwest from Rome, and 50 miles e. n. e. from Leghorn. The city is surrounded by hills, and is beautifully situated on both banks of the Arno, but the greater part of it lies on the right bank. Six bridges connect the banks of the Arno: the Ponte alle Grazie, constructed 1235, restored 1835; the Ponte Vecchio, said to date from the Roman period, reconstructed 1362, and consisting of three arches, on which are rows of shops, and over which a covered way is carried to connect the Pitti Palace and the Uffizi; the Ponte Santa Trinità, erected soon after 1567, adorned with statues; the Pontealla Carraja, 1218, restored in 1337, and again in 1559. There are, besides, two suspension bridges. On either side of the Arno, is a spacious quay called the Lung' Arno, a favorite promenade. The private dwellings are mostly handsome, and the palaces, of which there are many, are noble and impressive structures. The city contains numerous piazzas or squares, the most important of which is the Piazza della Signoria, surrounded by important buildings, and adorned with a marble fountain, and a bronze statue of Cosmo I. by John of Bologna. In this piazza is situated the Palazzo Vecchio, originally the seat of the government of the republic, and subsequently the residence of Cosmo I. The most remarkable building in Florence is the Duomo, or cathedral of St. Maria del Fiore, erected 1298–1474, but its façade not completed till 1887, surmounted by the magnificent dome of Brunelleschi, and situated in a spacious square nearly in the center of the city. Near the cathedral are the campanile designed by Giotto, and the small church of St. John (San Giovanni) the Baptistery, the three bronze gates of which, with figures in high relief, are celebrated as among the most beautiful works of the kind extant. One of these is by Andrea Pisano, the two others by Ghiberti. The church of S. Croce is the burial-place of many of the most eminent Tuscans, contains much fine sculpture and many interesting tombs, amongst others those of Michael Angelo Buonarotti, Galileo, Machiavelli, and Alfieri. In the Piazza S. Croce stands Dante's monument by Pazzi, inaugurated 1865. The chief art collection is the Galleria degli Uffizi. In this gallery are contained specimens of painting and statuary by the greatest masters in these arts. In statuary, among numerous antiques may be specified the Venus de' Medici, the Apollino, the Knife-grinder, the Dancing Faun, the Wrestlers, and the Group of Niobe and Her Children; and in painting there are works by Michael Angelo, Raphael, Titian, Fra Angelico, Fra Bartolomeo, Andrea del Sarto, Correggio, Guido, and numerous others of the first names in various schools. Other important art collections are preserved in the various churches and palaces, one of the principal being that in Pitti Palace.



Florence—Piazza della Signoria, Palazzo Vecchio, Loggia de Lanzi.

Florence was probably founded by the Romans in the 1st century B.C., and early attained considerable prosperity. During the dark ages it was frequently devastated, but it revived about the beginning of the 11th century, at which time the Florentines became extensive European traders. Their silk and woolen fabrics excelled, and their skill as workers in gold and jewels was unsurpassed. About this time Florence took an active part in the feud which broke out between the Guelphs and Ghibellines, the town generally supporting the former against the imperial party. In 1283 a species of republic was constituted; but about the year 1300 the party struggles again burst forth between the same rival families under the new names of the Whites and the Blacks, in which the Blacks (the Guelphs) were eventually victorious, and the Whites, among whom was the poet Dante, banished. In the course of these troubles a family of merchants named the Medicis rose to great influence in Florentine politics. One of them, Cosmo, born 1389, was the founder of the political greatness of his house. His grandson Lorenzo, surnamed Il Magnifico, as a statesman, scholar, and patron of art and literature, attained the highest celebrity. Under him Florence, which though calling itself a republic, was in reality ruled by him, rose to a great pitch of opulence and power, and notwithstanding the hostility of the pope he exercised a great influence throughout Italy. On the fall of the republic in the 16th century a member of a lateral branch of the Medici, the line of Cosmo having become extinct, was placed by Charles V. as Duke of Florence. The ducal dynasty of Medici continued to rule till the year 1737, when, becoming extinct, they were succeeded by Francis of Lorraine, afterward emperor of Germany. From this period the history of Florence merges into that of Tuscany until its amalgamation with the Kingdom of Italy. From 1865 till 1871 it held the dignity of capital of the kingdom, the seat of government being transferred to it from Turin Among the illustrious men it has produced are Dante, Petrarch, Boccaccio, Guicciardini, Lorenzo de' Medici, Galileo, Michael

Angelo, Leonardo da Vinci, Benvenuto Cellini, Andrea del Sarto, Amerigo Vespucci, Macchiavelli, and others. Pop. (including suburbs) ,204,950.—The province has an area of about 2262 English square miles. The surface is beautifully diversified by mountains, valleys, and plains. The climate is generally mild and healthy, and the soil very fertile. Pop. 937,786.

FLORENCE, William Jermyn, American comedian, born in 1831 at Albany. In 1853 he married Mrs. Malvina Pray Littell, with whom he won great applause in The Irish Boy and Yankee Girl, repeated in London three years later. Among his must successful characters were Bardwell Slote in the Mighty Dollar; Bob Brierley in The Ticket-of-Leave Man; and Sir Lucius O' Trigger in The Rivals. This last he played to the Bob Acres of Joseph Jefferson. He died in 1891.

FLORENTINE WORK, a kind of mosaic work, consisting of precious stones and pieces of white and colored marble, which has long been produced in Florence. It is applied to jewelry, and used for table tops, etc.

FLOR'IDA, one of the United States, forming the southeastern extremity of the country, and having the Gulf of Mexico on the south and west, and the Atlantic on the east. It consists partly of a peninsula stretching s. for about 400 miles, partly of a long, narrow strip of land running along the Gulf of Mexico to a distance of 350 miles from the Atlantic coast-line. The peninsula is about 90 miles in width, and contains about four-fifths of the total area, which is 59,268 sq. miles. The surface is in general level, rising little above the sea, especially in the southern parts, were it is almost one continued swamp or marsh. The northern portion is more broken and elevated, but the whole coast is flat. The principal river is the St. John's, flowing northward through peninsular Florida to the Atlantic. Its tributary, the Ocklawaha, has its course so flat that for a long distance it spreads out into the forest for half a mile or more on either side, so that nothing is seen but trees and water. The Appalachicola, Suwanee, etc., flow into the Gulf of Mexico. There are many lakes throughout the peninsula, the largest being Okeechobee (area 650 sq. miles). Numerous islands are scattered along the south and west coasts, the most remarkable of which is a group, or rather a long chain, called the Florida Keys at the southern extremity of Florida. The most important of these is Key West, containing the city and naval station of same name. The state produces tropical plants and fruits in great perfection, especially oranges, lemons, limes, shaddock, etc. The planting of orange groves has been carried on extensively in recent times, and oranges are now a speciality of Florida. Tobacco, cotton, sugar, maize, potatoes, rice, oats, etc., are among the other productions. The forests form an important source of wealth. The minerals are unimportant. The wild animals comprise panthers, cougars, wolves, bears, foxes, raccoons, opossums, deer, etc. Birds are extremely numerous and various. The coasts, rivers, and lakes swarm with fish; tortoises and turtles also abound. The swamps and other inland waters are infested with alligators. Snakes are numerous, but most of them are harmless. The climate in general is excellent, and the state is much frequented as a winter health resort for invalids, many large and elegant hotels having been built for the accommodation of visitors. Florida, long in a backward condition, has recently made great advances in prosperity, being now well supplied with means of communication, and towns and villages rapidly springing up. Tallahassee

Seal of Florida.

is the capital and seat of government, but the largest town is Key West (pop. 18,000); Jacksonville and Pensacola are thriving ports; St. Augustine is the oldest town in the United States. Proposals have been made to construct a ship-canal through Florida as a short route from the Atlantic to the Gulf of Mexico.

Tallahassee is the capital of the State. Two representatives are sent to the lower house of congress.

Florida was discovered on Easter Sunday, 1512, by Ponce de Leon, who landed near the site of the present Saint Augustine in search of the Fountain of Perpetual Youth. He failed to find the fountain, and, returning in 1521, found death instead. Ayllon carried off large numbers of Indians from Florida as slaves between 1520 and 1526, and in 1528 Panfilo Narvaez (q. v.) invaded the country with a force of 400 men eager for conquest and booty. Narvaez pushed into the wilderness north of the Gulf, and only survivors of his band, among them Cabeza de Vaca, succeeded in reaching Mexico after infinite hardships. In 1539 Hernando De Soto (q. v.) traversed the country. In 1559 a well-equipped expedition of 1500 men under Don Tristan de Luna sailed from Vera Cruz, and landed, August 14, on the shores of Santa Maria Bay, probably the Bay of Pensacola. The main body penetrated into the country for a distance of forty days' march, while a smaller detachment explored the region as far as the Coosa River in eastern Alabama. Discouraged by the hardships encountered, the expedition returned to Mexico, after passing more than a year in the country.

Réné Goulaine de Laudonniére, who had accompanied Jean Ribault in his expedition to Port Royal (1562), landed first at what is now St. Augustine, and built Fort Caroline in 1564. The colonists, who were Huguenots, were on the point of abandoning the settlement when reënforced by Ribault. Soon after Menendez surprised and massacred the garrison of Fort Caroline, carrying out to the letter his barbarous order to "gibbet and behead all Protestants in those regions."

On May 28, 1586, Sir Francis Drake, entered an inlet and came to the Fort St. Juan de Pinos, from which the garrison fled to St. Augustine; and on the approach of the English they also abandoned this place. Drake pursued his voyage to Virginia, where the queen had commanded him to afford relief to Sir Walter Raleigh's newly-planted colony.

The English colonists of Georgia and Carolina continued to wage war against the Spaniards in Florida. Governor Moore of South Carolina made an unsuccessful attempt on St. Augustine in 1702; and General Oglethorpe of Georgia besieged it in 1740 with the same result. Nearly a hundred years later, in 1837, the United States engineers found balls thrown by Oglethorpe in the moat of the old Spanish fortress. In 1763 Florida was ceded to Great Britain in return for Havana, captured by Albemarle the previous year. Vigorous efforts were made by the British Government to promote settlement by liberal grants of land to settlers. In 1781 Don Bernardo de Galvez, Spanish governor of Louisiana, having previously taken Mobile, besieged and captured Pensacola, thus completing the conquest of West Florida. In 1783 Florida was ceded back to Spain. In February, 1819, a treaty for the cession of Florida to the United States was concluded at Washington, and in 1821 was ratified by the king of Spain. Possession was taken in July by General Jackson, who had been appointed governor of the Floridas by the Government at Washington. Immigration flowed in rapidly from the southern states, the Bahamas, and even the North Atlantic States; but a great drawback to the prosperity of the newly-acquired territory was found in the determined resistance of the warlike nation of Seminole Indians to the encroachments of the whites upon their hunting-grounds. A resolution on the part of the United States Government to remove these Indians led to the long and bloody struggle known as the Seminole War, in which for seven years the Indians successfully defied every effort to subdue them, retreating into the fastnesses of the everglades when closely pressed. Osceola, chieftain of the Seminoles, having been captured by treachery, the war ended in 1842. The remnant of the Indians were removed beyond the Mississippi, and in three years after their expulsion (1845), Florida was admitted into the Union as a state.

On Jan. 10, 1861, Florida, by a convention assembled on the third, seceded from the Union. Fort Marion and the arsenals at St. Augustine and Chattahoochee were seized on the 7th, the forts and dockyards at Pensacola on the 12th, except Fort Pickens, on

Santa Rosa Island, which was held by the United States forces. In April, 1865, President Johnson, by a proclamation, declared the restrictions on commercial intercourse with Florida removed. A state convention assembled in October at Tallahassee, which repealed the ordinance of secession. Civil government was practically resumed the following year by the election of state officers and a legislature. A subsequent state convention met at Tallahassee, Jan. 20, 1868, to form a new constitution which was ratified by the people in May. In 1876 the election of Rutherford B. Hayes, Republican, as president of the United States, was determined by the electoral votes of Florida and Louisiana, which, by a decision of the extraordinary commission created by Congress, were counted for the former. Since 1876 the state has consistently gone Democratic. Population 1909, 683,000.

FLO'RES, the most westerly island of the Azores, about 30 miles long by nine miles broad, with a hilly surface. The chief products are wheat, pulse and poultry, and great numbers of small cattle are reared. Pop. about 10,000.

FLORID GOTHIC, that highly-enriched variety of Gothic architecture which prevailed in England in the 15th and at the beginning of the 16th century; often called the *Tudor style*, as it prevailed chiefly during the Tudor era.

FLORIDA, GULF OF, the narrow sea between Florida, Cuba, and the Bahama Islands.

FLORIDA KEYS. See Florida.

FLOSS-SILK, the portions of ravelled silk broken off in reeling the silk from the cocoons, carded and spun into a soft coarse yarn, and used for common fabrics, embroidery, etc.

FLOTOW (flō'tō), Friedrich Adolphus von, German musical composer, born 1812, died 1883. He studied music in Paris, but his earlier operas did not find favor with the Parisian opera-house directors, so he had to content himself with performances in the aristocratic private theaters. He was director of the court theater at Schwerin from 1855 to 1863; the last years of his life were chiefly spent at Vienna.

FLOTSAM, Jetsam, and Ligan, in law. Flotsam, or floatsam, is derelict or shipwrecked goods floating on the sea; jetsam, goods thrown overboard which sink and remain under water; and ligan, goods sunk with a wreck or attached to a buoy, as a mark of ownership. When found such goods may be returned to the owner if he appear; if not, they are the property of the state.

FLOUNDER, one of the most common of the flat-fishes, is found in the sea and

Four-spotted flounder.

near the mouths of large rivers. Flounders indeed have been successfully transferred to fresh-water ponds. They feed upon crustacea, worms, and small fishes, and are much used as food. The Argus-flounder is a native of the American seas.

FLOUR, the edible part of wheat, or any other grain, reduced to powder, and separated from the bran and the other coarser parts by sifting. The quality of flour depends principally on the fineness of the sieves through which it is passed and the amount of bran which it contains. The finest flour is obtained in the first grinding of the wheat. The other kinds—biscuit flour, middlings, seconds, etc.—consist of the flour which remains after the first grinding, ground and passed through coarser sieves.

FLOWER, Roswell Pettibone, American capitalist and politician; was born in 1835 in Jefferson county, N. Y. His ability as a financier was proved before removing to New York in 1869, where he soon became a recognized power in Wall Street, and was made director in various corporations. In 1881 he was elected by the democratic party to congress, and was governor of the state for the term of 1892–94. His many benevolences include the building in New York City of the Flower Hospital and of Saint Thomas' Home. He died in 1899.

FLOWER, in popular language, the blossom of a plant, consisting chiefly of delicate and gaily-colored leaves or petals; in botany, the organs of reproduction in a phenogamous plant. A com-

Parts of flower.

plete flower consists of stamens and pistils together with two sets of leaves which surround and protect them, the calyx and corolla. The stamens and pistils are the essential organs of the flower. They occupy two circles or rows, the one within the other, the stamens being in the outer row. The stamens consist of a stalk or filament supporting a roundish body, the anther, which is filled with a powdery substance called the pollen. The pistil consists of a closed cell or ovary at the base, containing ovules, and covered by a style which terminates in the stigma. These organs are surrounded by the corolla and calyx, which together are called the floral envelope, or when they both display rich coloring the perianth. The leaves of the corolla are called petals, and those of the calyx fepals. Some flowers want the floral envelope, and are called achlamydeos; others have the calyx but are without the corolla, and are called monochlamydeous. Flowers are generally bisexual, but some plants have unisexual flowers; that is, the pistils are in one flower and the stamens in another. See also Botany. The figure shows the common wallflower: a, peduncle; b, calyx; c, corolla; d, stamens; e, pistil.

FLOWER-DE-LIS. See Fleur-de-lis.

FLOWERS, Artificial, imitations of real flowers, made of various materials. These are not a modern invention. The Romans excelled in the art of imitating flowers in wax, and in this branch of the art attained a high degree of perfection. The Egyptian artificial flowers were made of thin plates of horn stained in different colors, sometimes also of leaves of copper gilt or silvered over. In modern times the Italians were the first to acquire celebrity for the skill and taste they displayed in this manufacture but they are now far surpassed by English and French manufacturers, but more especially by the latter.

FLOWERS, Language of:

Anemone — Frailty, anticipation.	Goldenrod — Encouragement.
Apple-blossom—Preference.	Heliotrope — Devotion.
Buttercups—Riches.	Honeysuckle — Fidelity.
Calla — Magnificent beauty.	Hyacinth—Sorrow.
Candytuft — Indifference.	Lilac—Fastidiousness.
Cowslip — Youthful beauty.	Marigold—Contempt.
Daffodil—Unrequited love.	Lily — Majesty, purity.
Dandelion—Coquetry	Narcissus—Self-love.
Forget-me-not—True love.	Pansy—Thoughts.
Foxglove — Insincerity.	Poppy—Oblivion.
Geranium—Deceit.	Snow-drop — Friend in need.
Gentian — Virgin pride.	Sweet-William — Gallantry.
	White Violet — Modesty.

FLOWERS, STATE, the following are "State Flowers" as adopted in most instances by the vote of the public school scholars of the respective states:

Alabama	Golden Rod
Arkansas	Apple Blossom
California	Eschscholtzia
Colorado	Columbine
Delaware	Peach Blossom
Idaho	Syringa
Illinois	Rose
Indiana	Corn
Iowa	Wild Rose
Kansas	Sunflower
Kentucky	Golden Rod
Louisiana	Magnolia
Maryland	Golden Rod
Michigan	Apple Blossom
Minnesota	Moccasin
Mississippi	Magnolia
Missouri	Golden Rod
Montana	Bitter Root
Nebraska	Golden Rod
New York	Rose
North Dakota	Wild Rose
Ohio	Scarlet Carnation
Oregon	Oregon Grape
Pennsylvania	Golden Rod
Rhode Island	Violet
South Dakota	Pasque
Texas	Blue Bonnet
Utah	Sego Lily
Vermont	Red Clover
Washington	Rhododendron
West Virginia	Rhododendron

In England the primrose is worn on the birthday of Lord Beaconsfield. On the anniverasry of Parnell's death his followers wear a sprig of ivy. The Jacobites wear white roses on June 10. In France the Orleanists wear white daisies and the Bonapartists the violet.

FLUID, a body whose particles on the slightest pressure move and change their relative position without separation; a liquid or a gas, as opposed to a solid. Fluids are divided into liquids, such as water and bodies in the form of water; and gaseous bodies or aeriform fluids. Liquids have been also termed non-elastic fluids, for although they are not altogether void of elasticity, they possess it only in a small degree. Air and aëriform bodies have been called elastic fluids on account of their great elasticity.

FLUORES'CENCE, a name given to the phenomena presented by the invisi-

ble chemical rays of the blue end of the solar spectrum when they become luminous and visible by being sent through uranium glass, or solutions of quinine, horse-chestnut bark, or Datura Stramonium. In this way green crystals, as of fluor-spar, may give out blue rays, due not to the color of the surface of the body, but to its power of modifying the rays incident on it. The phenomenon appears to be identical with phosphorescence. It is due to the refrangibility of the rays being lowered or degraded by the action of the substance. The term fluorescence is applied to the phenomenon if it is observed while the body is actually exposed to the source of light; phosphorescence to the effect of the same kind, but usually less intense, which is observed after the light from the source is cut off. Both forms of the phenomenon occur in a strongly-marked degree in the same bodies.

FLU'ORIDE, in chemistry, a compound obtained by heating hydrofluoric acid with certain metals, by the action of that acid on metallic oxides or carbonates, by heating electro-negative metals, as antimony, with fluoride of lead or fluoride of mercury, and in other ways.

FLU'ORINE, a very widely distributed element, which is known chiefly only in combination, though it has recently been isolated by De Moissan as a colorless gas, that attacks almost every substance and is the most active element known. Its most abundant compound is calcic fluoride, which not only exists in the mineral kingdom as fluor-spar (which see), but forms an essential part of the bones and teeth of animals. Fluorine has also been detected in the blood, milk, and urine; in plants; in volcanic sublimates; in rocks; in coprolites and mineral phosphates; and in a variety of minerals. Combined with hydrogen it forms hydrofluoric acid.

FLUOR-SPAR, DERBYSHIRE SPAR, or **FLUORINE,** fluoride of calcium, a common mineral found in great beauty in various localities. It generally occurs massive, but crystallizes in simple forms of the monometric system—viz. the cube, octahedron, dodecahedron, etc., and in combinations of the cube and octahedron. Pure fluor-spar contains 48·7 per cent fluorine, 51·3 calcium. It is of frequent occurrence, especially in connection with metalliferous beds, as of silver, tin, lead, and cobalt ores. It is sometimes colorless and transparent, but more frequently it exhibits tints of yellow, green, blue, and red.

FLUTE, a portable musical instrument, consisting of a tube furnished with six holes for the fingers, and from one to fourteen keys which open other holes. The sound, which is soft and clear in quality, is produced by blowing with the mouth into an oval aperture at the side of the thick end of the instrument. Its useful compass is about two and a half octaves, including the chromatic tones. It is usually made in four pieces, and of box or ebony, sometimes, however, of ivory, silver, or even of glass.

FLUTING, in architecture, channels or furrows cut perpendicularly in the shafts of columns. It is used in the Doric, Ionic, Corinthian, and Composite orders, but never in the Tuscan. When the flutes are partially filled up by a smaller round molding they are said to be cabled.

FLY, a winged insect of various genera and species, whose distinguishing characteristics are that the wings are transparent and have no cases or covers. By these marks flies are distinguished from beetles, butterflies, grasshoppers, etc. The true flies or Diptera have only two wings, viz.: the anterior pair. In common language, fly is the house-fly, of the genus Musca. The house-fly is found wherever man is, and in hot weather causes a good deal of annoyance. It is furnished with a suctorial proboscis, from which, when feeding on dry substances, it exudes a liquid, which, by moistening them, fits them to be sucked. From its feet being beset with hair, each terminating in a disc which is supposed to act as a sucker, it can walk on smooth surfaces, as a ceiling, even with its back down. The female lays her eggs in dung or refuse; the larvæ are small white worms. They change into pupæ without casting their skins, and in from eight to fourteen days the perfect fly emerges. The very small flies and the very large ones seen about houses belong to other species. See Blow-fly, Bot-fly, Gad-fly.

FLY-CATCHER, a name originally given to certain insessorial birds with a bill flattened at the base, almost triangular, notched at the upper mandible, and beset with bristles, about the size of

White-collared fly-catcher.

a sparrow. They perch on a branch, where they remain immovable watching for insects, only leaving to make a sudden dart at a passing fly, which they seize with a snap of the bill, and then return. The white-collared fly-catcher is a native of southern Europe. Numerous other birds receive the name of fly-catchers, and some, as the paradise fly-catchers of the Old World, are brilliantly colored. In America some of the tyrant birds are named fly-catchers.

FLYING, the power of locomotion through the air, possessed by various animals in different degrees. Birds, bats, and many insects can raise themselves into the air and sustain themselves there at will. Squirrels, phalangers, some lizards, one of the tree-frogs, and flying-fish can move through the air in one direction for a short time, but cannot, strictly speaking, fly. The wing of a bird or insect is an elastic flexible organ, with a thick anterior and a thin posterior margin; hence the wing does not act like a solid board, but is thrown into a succession of curves. When a bird rises from the ground it leaps up with head stuck out and expanded tail, so that the body is in the position of a boy's kite when thrown up. The wings are strongly flapped, striking forward and downward, and the bird quickly ascends. It has been shown that the wing describes a figure of 8 in its action, the margin being brought down so that the tip of the wing gives the last blow after the part next the trunk has ceased to strike; hence, standing in front of a bird, the wing would be divided into two, the upper surface of one half and the lower surface of the other being visible at the same time. These portions are reversed when the wing is drawn back and toward the body, before beginning another stroke; but it will be observed that during retraction the wing is still sloped, so that the resemblance to a kite is maintained. There are many varieties of flight among birds; of these the most remarkable is the sailing motion, in which the wings are but slightly moved. Probably the original impetus is maintained by the kite-like slope of the wing, and advantage may be taken of currents by a rotation of the wing at the shoulder, a movement invisible at any distance.

FLYING, Artificial. See Aeronautics.

FLYING-BRIDGE, a bridge made of pontoons, light boats, hollow beams, casks, or the like. They are made as occasion requires, chiefly for the passage of troops. The term is also applied to a kind of ferry in which the force of the current of a river is applied to propel a boat guided by a cable fastened from the one side to the other.

FLYING DUTCHMAN, a phantom ship said to be seen in stormy weather off the Cape of Good Hope, and thought to forebode ill luck. One form of the legend has it that the ship is doomed never to enter a port on account of a horrible murder committed on board; another, that the captain, a Dutchman, swore a profane oath that he would weather the cape though he should beat there till the last day. He was taken at his word, and there he still beats, but never succeeds in round the point.

FLYING-FISH, a name common to various fishes which have the power of sustaining themselves for a time in the air by means of their large pectoral fins. Generally, however, the name is limited

Common flying-fish.

to mackerel-pikes. The pectoral fins, which are very large, are the principal instruments in their flight, serving to sustain the fish temporarily in the air after it has acquired an initial velocity in its rush through the water. It can pass through the air to a considerable distance, sometimes as much as 200 yards, which it does to escape from the attacks of other fishes, especially the dolphin. It is most common between the tropics.

FLYING-LEMUR, a name given to insectivorous mammals, natives of the Indian Archipelago. They possess a flying membrane, which extends as a broad expansion from the nape of the neck to the tail. By means of this mem-

brane they can take extended leaps from tree to tree.

FLYING-SQUIRREL, a genus of rodent animals (squirrels), to which the skin of the flank, extending between the

European flying-squirrel.

fore and hind legs, imparts the faculty of supporting themselves for a moment in the air, as with a parachute, and of making very great leaps.

FLY-WHEEL, a wheel with a heavy rim placed on the revolving shaft of any machinery put in motion by an irregular or intermitting force, for the purpose of rendering the motion equable and regular by means of its momentum. A fly-wheel is also used as an accumulator of force; thus, when a small stream-engine sets in motion a very large fly-wheel, the wheel acts as a reservoir of all the small pressures which have been communicated to it, and having thus concentrated them can apply them all together and at once when some great effect is to be produced.

FO, the Chinese name of Buddha. See Buddha.

FOCUS, (1) in optics, a point in which any number of rays of light meet after being reflected or refracted by a mirror or a lens. (2) In geom. an important point on the principal axis of the parabola, ellipse, and hyperbola. The ellipse and hyperbola have each two foci, the parabola one, though in the latter case we may suppose a second focus at an infinite distance. The foci were so called from the fact that rays of light proceeding from one focus and reflected from a corresponding reflecting surface pass through the other focus.

FŒTUS. See Fetus.

FOG, a cloud at or near the surface of the earth, produced by the condensation of the invisible vapor of the atmosphere into minute watery particles, this condensation being caused by a cold current of air, or the contiguity of a cold surface.

FOGGIA (foj'â), a town of S. Italy, province of Foggia, 79 miles n. e. of Naples, with regular and spacious streets. Pop. 53,351.—The province, which is partly bounded by the Adriatic, has an area of 2954 sq. miles. It possesses rich pastures, and produces saffron, wine, etc. Pop. 418, 510.

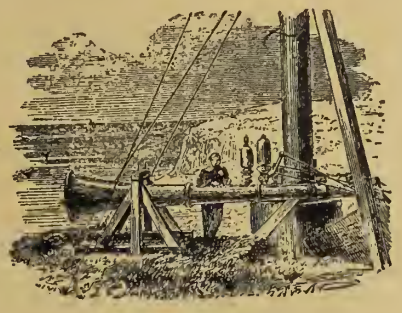
FOG-SIGNALS, signals given by means of sound to warn vessels during fogs, when lights or other visible signals cannot be perceived. Various kinds of fog-signals are used, among which may be mentioned bells, drums, gongs, guns, compressed-air whistles, steam-whistles, and fog trumpets or horns.

FOIL, a thin leaf of metal, as gold or tin, used for various purposes.

FOIL, in fencing, a rod of steel, representing a sword, with a handle or hilt at one end, and a leather button at the other to prevent accidents. Foils measure from 31 to 38 inches in length.

FOKIEN, a maritime province of Southeastern China; area, 46,320 sq. miles, The strait of Formosa separates it from the island so named The principal products are rice, wheat, barley, tea, silk, sugar, indigo, camphor, and tobacco. The capital is Foo-chow. Pop. 25,790,556.

FOLC-LAND, that is Folkland, the land of the people, that portion of Anglo-Saxon England which was retained on behalf of the community. See Feudal System.



Siren fog-horn.

FOLK-LORE, a useful term of recent introduction into the English language, signifying a scientific study of popular tales, traditions, primitive beliefs and superstitions, popular customs, usages, festivals, games, etc. Folk-lore, though it takes cognizance of many apparently trivial matters, is of great importance in the science of comparative mythology, and helps to throw much light on the relationships between races, and on the origin and development of religious beliefs and ceremonies.

FOMENTATION, in med. the application of warm liquids to a part of the body, by means of flannels or other cloths dipped in hot water or medicated decoctions, for the purpose of easing pain by relaxing the skin or of discussing tumors.

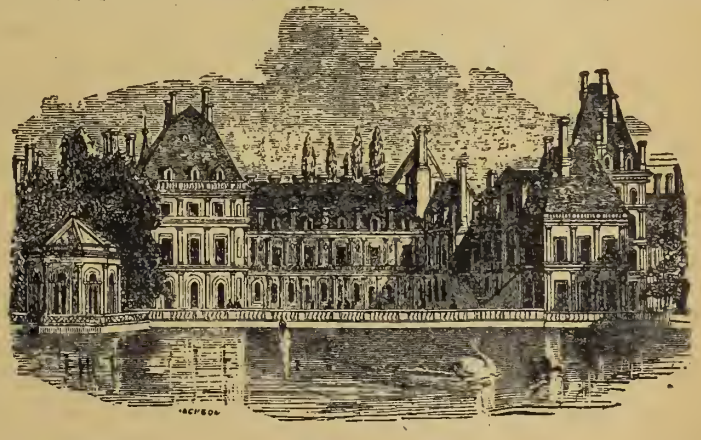
FOND DU LAC, a city in Wisconsin, at the mouth of Fond du Lac River, which opens on Lake Winnebago, 148 miles n. n. w. of Chicago. It is the center of several railways, and has a large trade. The manufactures include iron-founding, carriage and wagon making, tanning, saw-milling, etc. Pop. 18,210.

FONT, the vessel which contains the water for baptism in a church. It is frequently sculptured in stone or marble, with richly decorative designs.

Font, Cathedral of Langres, France, end of 13th century.

FONTAINE, Jean de la. See La Fontaine.

FONTAINEBLEAU (fon-tān-blō), a town of France, dep. Seine-et-Marne, in the midst of the forest of same name, about 2 miles from the Seine and 37 miles s.s.e. Paris. It owes its origin chiefly to the palace, and is a quiet place, with broad, clean streets. Pop. 13,340. The castle or palace of Fontainebleau is one of the most magnificent in France. It occupies the site of a fortified chateau founded by Louis VII. in 1162; this was converted into a magnificent palace by Francis I.; much added to by Henry IV., Napoleon I., Louis Philippe, and Napoleon III. The park is laid out like a vast garden, and adorned with statues, temples, fountains, lakes, and waterfalls. The forest, which is about 50 miles in circumference, covers an area of 42,500 acres, affords numerous pleasant walks, and abounds with game.



Palace of Fontainebleau.

FONTENOY, a village in Belgium, province of Hainaut, celebrated for the battle of May 11, 1745, in which the French under Marshal Saxe defeated the British, Austrian, and Dutch allied forces under the Duke of Cumberland.

FOO-CHOW, a town of China, capital of the province of Fokien, on the Min, 125 miles n. e. of Amoy. Pop. estimated at 630,000.

FOOD. See Aliment and Dietetics.

FOOD, PRESERVATION OF, from earliest times man's thoughts have been accupied in devising ways and means to prevent articles of food from deterioration or putrefaction. In their natural state most foods are seasonable only during limited periods of the year, and their consumption is restricted to certain localities. Their preservation in such a manner as to make them palatable during the entire year, in all localities, has been the subject of much research.

Independent experiments by such well-known scientists as Cagnaird de la Tour, Schwann, Helmholtz, Pasteur, Schultz, and others established beyond a doubt that the decomposition of food is due to the presence of a living organism known as "ferment." It was reasoned that anything that would kill this organism or preclude its presence would preserve the article treated. The known processes that will accomplish this result, and at the same time preserve the food, are desiccation, use of antiseptics, refrigeration, and canning. Desiccation, or drying, was undoubtedly the first method used, but food preserved by this means loses much of its natural flavor and becomes tough in texture. The same objection arises in the use of antiseptics. Refrigerated foods, unless great care is exercised in the thawing, are not palatable.

Prior to 1795, drying and the use of salt and sugar were the only methods used to any extent in the preservation of foods. At this time Nicholas Appert, a Frenchman, who had spent most of his life in the preparation and preservation of articles of food, being stimulated in his work by the offer of a reward by the French navy department for a method of preservation of foods for sea-service, submitted to his government an exhaustive treatise bearing upon the hermetic sealing of all kinds of food. His method was to inclose fruit in a glass jar, which was then corked, and subjected to the action of boiling water for a time, varying according to the nature of the article treated. A description of his process can be best summed up in his own words, as follows: "It is obvious that this new method of preserving animal and vegetable substances proceeds from the simple principle of applying heat in a due degree to the several substances after having deprived them a as much as possilble of all contact with the external air. It might, on the first view of the subject, be thought that a substance, either raw or previously acted upon by fire, and afterward put into hot bottles might, if a vacuum were made in those bottles and they were completely corked, be preserved equally well with the application of heat in the water bath. This would be an error, for all trials I have made convince me that the absolute privation of the contact of external air (the internal air being rendered of no effect by the action of heat) and the application of heat by means of the water bath, are both indispensable to the complete preservation of alimentary substances." Time has proved this method to be the most satisfactory for preserving food in its natural state. France purchased his process and gave it to manufacturing firms in France and England for the production of the goods. By this means the industry gradually spread over England, Ireland, and France.

In the year 1810 Peter Durant secured a patent from the English government for the preservation of fruits, vegetables, and fish in hermetically sealed tin and glass cans. He did not claim to be the discoverer of the process, but said that it had been communicated to him by a "foreigner residing abroad." The secret of the process was jealously guarded, but the employees of the different establishments became more or less familiar with its essentials, and in this manner the industry found its way to America.

One of the first men to come to America with a knowledge of the process gained in its actual use was Ezra Daggett, who arrived in New York some time between the years 1815 and 1818. In the year 1819 he and his son-in-law, Thomas Kensett, were engaged in the manufacture of hermetically sealed goods, the principal foods packed being salmon, lobsters and oysters. In the following year the industry was launched in Boston by William Underwood and Charles Mitchell, emigrants from England, where they had been employed in canning establishments. Their principal business however, during the early days of their establishment, was the preparations of pickles, sauces, jellies, jams, and mustard; but they also canned damsons, quinces, cranberries, and currants. The industry also owes much to Allen Taylor, an Englishman, and M. Gallagher, an Irishman, both of whom learned their trade at Sligo, Ireland, the latter having in his possession a copy of Appert's treatise on the subject of canning. These men came to America at about the time as those mentioned above, and were for a time employed in New York. Prior to 1840 the industry was established in Baltimore, and Kensett, Taylor and Gallagher did much to place it upon a permanent basis.

Glass jars were gradually abandoned, as it was found that they could not withstand the extremes of temperature and were expensive, bulky, and costly in transportation. In 1825, Thomas Kensett secured a patent on the use of tin cans in preserving food, and in the same year began using the patented process in his factory. Tin has been the favorite material for the construction of cans. Their early manufacture was by hand and very crude, the bodies being cut with shears and the side seam made with a plumb joint (that is, meeting, but not overlapping) and then soldered together Heads were made to set into the body, and were soldered in place in a very crude manner. The construction of the cans was slow and costly, the making of 100 being considered a good day's work. In 1847 Allen Taylor invented the stamp can, which proved a decided improvement over the plumb-joint can just described, and about two years later Henry Evans, jr., of New Jersey, invented the "pendulum" press for making can tops. The latest important improvement in can manufacture was the invention of the key-opening can, which by the genius of a Mr. Zimmerman has been so reduced in cost that it has come into general use.

Can making is now a distinct industry, and not usually carried on, as formerly, in connection with the actual canning of the foods. It is estimated, however, that about 10 per cent of the cans are still made by the canning establishments. For the past fifteen years labor-saving machines have been introduced in can manufacture until now all the parts are made and put together by mechanical devices. The tin cans are made from Bessemer steel plates cut into sheets 14 by 20 inches and weighing about one pound. They are then subjected to an acid to remove all dirt, grease, scales, etc., and coated with pure tin by the acid process or the palm-oil process, the latter being the safer and better of the two methods. The objection having been urged against the use of tin cans that the natural acids of fruits, vegetables, meats, and fish act upon the tin and solder in such a way as to form metallic salts or metallic compounds that are injurious to the health; the matter was carefully investigated by expert chemists, who reported that the objection is groundless if good tin is used. In the poorer grades of tin injurious substances were found, but in such small quantities that they were of no consequence.

By the Appert process the goods were cooked in open kettles, the highest temperature obtainable by this method being 212° F., or the temperature of boiling water. The process was necessarily slow, but gradually improvements were made in the methods and a higher degree of temperature was obtained by the addition of common salt to the water. This innovation was followed by the use of chloride of calcium, which made possible a temperature of 240° F. The cans, however, under this process become discolored, involving considerable expense in cleaning them to make the goods merchantable. In 1874 Mr. A. K. Shriver, of Baltimore, invented a closed-process kettle to cook the goods by superheating water with steam. About the same time Mr. John Fisher, of the same city, invented a patent-process kettle which secured the same results by the use of dry steam. By these methods, which are used at the present time, any desired temperature can be obtained and the heat regulated to meet requirements.

The use of antiseptics in the preservation of food in its simplest form is found in the employment of salt or strong brine to kill the bacteria and this is the method employed from primitive times in curing meat or fish. More dangerous, however, are the other antiseptics. The U. States department of agriculture has recently issued strong warnings against the use of formaldehyde, salicylic acid, sulphites, borax and benzoic acid. Their use is, however, almost universal although their danger is recognized by the national pure food laws which provide that preserved foods containing such substances shall be labeled in accordance with the preservatives used. The use of salicylic acid and sulphites

is forbidden by many governments as being generally regarded as more dangerous than the benzoic acid and borax.

Cold storage, the most modern method of preserving food dates from the last quarter of the 19th century In this process the use of other preservatives than cold is unnecessary. The subject is discussed in the article on refrigeration and its economic importance will be realized upon consulting the article devoted to the Packing Industry.

FOOL. See Jester.

FOOLS, Feast of, the name given to festivals regularly celebrated, from the 5th to the 16th century, in several countries of Europe, by the clergy and laity, with the most absurd ceremonies.

FOOLSCAP, paper of the smallest regular size but one (13 by 16 inches); so called from its water-mark in early times being the outline of a fool's head and cap.

FOO-SHAN, a town, China, prov. of Quangtong, 21 miles s. w. of Canton, on one of the branches of the delta of the Si-kiang. Pop. 200,000.

FOOT, a measure of length, the name of which is derived from the length of the human foot, containing 12 linear inches.—Square foot is a square whose side is one foot ,and is therefore equal to 144 square inches.—Cubic foot is a cube whose side is 1 foot, and the cube contains 1728 cubic inches. The foot is a common measure in various countries, but its dimensions vary considerably.

FOOT, in prosody, a measure consisting of a variety of syllables, two, three, or four, in combinations of long and short, or accented and unaccented. In Greek and Latin verse the feet depend on the quantity or length of the syllables each foot having a distinctive name—trochee, iamtris, dactyle, anapest, etc. The same are applied to English measures, an accented syllable in English being held to be equivalent to a long syllable in Latin or Greek, and an unaccented syllable to a short.

FOOT, in animals, the lower extremity of the leg; the part of the leg which treads the earth in standing or walking, and by which the animal is sustained and enables to step; or that surface of the body by which progression is effected among

Skeleton of the human foot.

a to *b b*, Tarsus. *b b* to *c c*, Metatarsus. *c c* to *d*, Phalanges. 1, Os calcis, calcaneum, or heel-bone. 2, Astragalus 3, Scaphoid bone. 4, Inner cunoid bone. 5, Middle cunoid bone. 6, Outer cunoid bone. 7, Cuboid bone. 8 to 12, Metatarsal bones. 13, First row of phalanges. 14, Last row of phalanges.

the mollusca. The foot of man is composed of twenty-six bones, seven of which constitute the tarsus or ankle, which articulates with the leg and corresponds to the carpus (wrist). Five bones form the metatarsus, which corresponds to the metacarpus, and articulates with the tarsus, behind, and with the toes in front. The foot is narrow and thick in its posterior part, thinner and broader anteriorly; it forms a right angle with the leg, and rests upon the ground at the extremities only. The middle portion is in the form of an arch, and, in consequence, resists shocks and supports pressure much better than it could if it were flat and touched the ground throughout its whole length.

FOOTA, a territory of Senegambia, W. Africa, on the lower Senegal, which bounds it on the northeast. It includes Foota Toro, and other districts. Area, about 15,000 sq. miles; pop. estimated at 400,000.

FOOTA-JALLON, a region of West Africa, intersected by lat. 11° n. and lon. 11° w. It is governed by an elective chief under the protection of France.

FOOT-AND-MOUTH DISEASE, a highly contagious eczematous affection which attacks the feet and mouths of cattle, manifesting itself by lameness, indisposition to eat, and general febrile symptoms, with ultimately eruptions of small vesicles on the parts affected, and general indisposition of the animal. The disease occasionally spreads to the udder of milch-cattle, and it is believed that it may be communicated to persons who drink the milk of cows so affected.

FOOTBALL, an outdoor game of considerable antiquity. In former times towns and villages were often matched against each other, the whole of the able-bodied inhabitants taking part in the struggle; the goals being often miles apart, and usually consisting of natural objects, as a brook or river. The modern form of the game is played by two parties of players, on a large level piece of ground, generally oblong in shape, and having in the middle of either of the ends a goal formed by two upright posts 6 to 8 yards apart, with a bar or tape extended between them at the height of 8 or 10 feet from the ground. There are various styles of playing the game, but those recognized in important matches are the Rugby, the Football Association and the American Association game. In both games the main object is for either party to drive the ball (which is kicked off in the center of the field) through the goal that their opponents are guarding, and thus count a goal against them. In the Rugby game the goal-posts are 18½ feet apart, and joined by a cross-bar at a height of 10 feet from the ground; and to score a goal the ball must be kicked over this bar by one of the opposite side. In the Association game the upright poles are 8 yards apart, and joined at 8 feet from the ground by a tape, under which the ball must pass to secure a goal. The Rugby game is much rougher and less scientific than the Association game which discourages rough play and relies mainly on the skilful manœuvring of the ball with the feet, it being forbidden to touch the ball with the hands; while by the Rugby rules the player may catch the ball in his hands, run with it, and kick it dropping. A regular game lasts an hour and a half, and at half-time the teams change ends in order that inequalities of situation may be neutralized.

The American Game.—The rules of the English Rugby Union, as they were in 1875, were adopted as the foundation of the American game; but in 1876 they were revised, so that in place of the former play the man who happened to have the ball when a "down" was made played it to one particular man—the "snap-back," and its destination then becomes part of a preconcerted and well-rehearsed play. He puts the ball in play behind him, and the men in his line act in concert, in a general, prearranged attack on the enemy's line, with the object of clearing a path for the man who runs with the ball. The work of the rushers has been specialized, light men put where their qualifications are most effective, and heavy men in the same way; end men selected who could make runs and free catches off short kicks. In the same way, guards to protect the quarter-back when he passed the ball, and tackles to break up the opponents' play, were early specifically selected for qualifications and specialized for the work. Every year has brought new plays to the fore, and every rule has been the subject of infinite thought on the part of the players, mainly to design some method of meeting them, each play in its turn resulting in still new rules—to wit, the "block system" of the early eighties was met by "the five-yard rule," designed to prevent one side keeping possession of the ball unduly, without material advance or retreat, by enacting that if in three "downs," or attempts to advance the ball, the side doing so has not made 5 yards toward the opponent's goal, or retreated 20 yards toward their own goal, they should surrender possession.

"Interference" was restrained but developed into "mass plays"—the grouping of a body of men some distance back of the line and starting them before the ball was put in play. This tendency called into existence the rules committee of the University Athletic Club, whose annual revisions have aimed at the greater protection of a man on a fair catch, and the encouragement of kicking and of a more open game generally. The time of play is two halves of thirty-five minutes each, with ten minutes intermission. Any player injured can be removed from the field and another player substituted, in which respect the American game differs from the British play, where each team has to play the game out with the members with which which they start the game, or such of them as are capable of play. These differing rules may account for the marked difference in the casualties in the field; a captain who has no reserves takes more care of his men than he who can replace an injured player with a substitute.

FOOTE, Andrew Hull, a distinguished officer of the U. States navy; was born in New Haven, Conn., in 1806. He was commissioned lieutenant on May 27, 1830; from 1837 to 1840 was executive officer of the John Adams, of the East India Squadron, during its cruise around the world, and from 1841 to 1843 was stationed at the Naval Asylum in Philadelphia, of which during the last two years he was in full charge. In 1852, he was promoted to the rank of commander. On February 6, 1862, he captured Fort Henry, and on the 14th he attacked Fort Donelson, before

which Grant with his army had arrived two days earlier; but was repulsed, and he himself was wounded. For several months in 1862–63 he was chief of the bureau of equipment and recruiting, and on June 4, 1863, was appointed to succeed Rear-Admiral Dupont as commander of the fleet off Charleston, but died at New York, on June 26, 1863.

FOOT-GUARDS. See Guards.

FOOT-LIGHTS, in theaters, the row of lights placed on the front of the stage and on a level with it, to light it up.

FOOT-POUND, in physics, the term expressing the unit selected in measuring the work done by a mechanical force. A foot-pound represents 1 lb. weight raised through a height of 1 foot; and a force equal to a certain number of foot-pounds, fifty for example, is a force capable of raising 50 lbs. through a height of 1 foot.

FOOT-ROT, a disease in the feet of sheep, the more common form of which is an inordinate growth of hoof, which at the toe, or round the margin, becomes turned down, cracked, or torn, through affording lodgment for sand and dirt. In the second form of the disease the foot becomes hot, tender, and swollen; there are ulcerations between the toes, followed by the sprouting of proud flesh.

FOR'AKER, Joseph Benson, American politician and legislator, born at Rainsboro, Ohio, in 1846. He studied law and was admitted to the bar at Cincinnati, where he practiced with success until 1879, when he was elected a judge of the superior court. He resigned from the bench in 1882, and in 1885 was elected governor of Ohio on the Republican ticket. He was reelected in 1887, and was defeated for a third term, in 1889, by James E. Campbell, although all the rest of the republican state ticket was elected. From his defeat as governor in 1889 to 1897 he was engaged actively in the practice of law at Cincinnati gaining a reputation as a corporation attorney. In 1897 he became United States senator, and was re-elected in 1902. In the senate he has taken an active and aggressive part in the debates, being one of the most radical advocates in that body of the war with Spain in 1898.

FORBES, James David, Scottish scientist born 1809, died 1868. His fame rests chiefly on his study of glaciers. See Glaciers.

FORBIDDEN FRUIT, a name fancifully given to the fruits of various trees grown in tropical countries, as the shaddock, a sort of thick-skinned orange, and the poisonous fruit of a tree of Ceylon, traditionally said to be the fruit of which Adam and Eve ate at the time of the fall in Eden.

FORCE, that which is the source of all active phenomena occurring in the material world, and of which motion, gravitation, heat, light, electricity and magnetism, cohesion, and chemical affinity are believed to be exhibitions. Mechanical force is the power which produces or modifies motion or tends to do so. It has its origin in three causes: (1) gravitation; (2) the unknown cause of the phenomena of light, heat, and electricity; and (3) life. Mechanical forces are of two sorts: one of a body at rest, being the same as pressure or tension; the other of a body in motion, being the same as impetus or momentum. When two forces act on a body in the same line of direction the resulting force, or resultant as it is called, will be the sum of both forces. If they act in opposite directions the body will remain at rest if the forces be equal; or, if the forces be unequal, it will move with a force equivalent to their difference in the direction of the greater. If the lines of direction make an angle with each other the resultant will be a mean force in an intermediate direction. The composition of forces is the combining of two or more into one (actually or hypothetically), which shall have the same effect when acting in some given direction; the resolution of forces is the decomposing of a single force into two or more forces, which, acting in different directions, shall be equivalent to the single force. Forces have different denominations according to their nature and the manner in which they act; thus we have accelerating forces, constant forces, parallel forces, uniform and variable forces, etc. The unit of force is a single force in terms of which the amount of any other force is ascertained. See Dynamics, Energy.

FOR'CEPS, a general name for a two-bladed instrument on the principle of pincers or tongs, used for seizing and holding, and for extracting objects, which it would be impracticable thus to treat with the fingers.

FORCE-PUMP. See Pump.

FORCING, a method of cultivation by which plants, flowers, and fruits are raised at an earlier season than the natural one by protecting them under glass, in hot or cold frames, by using stimulating fertilizers, and other means.

FORD, John Thomson, American theatrical manager, was born at Baltimore in 1829. He was the owner of Ford's Theater, the scene of the assassination of President Lincoln by Booth on April 14, 1865, and on suspicion of complicity was arrested and imprisoned for 40 days. He was then released as absolutely no evidence was adduced against him. He was long one of the board of governors of the Maryland penitentiary and at one time president of the board of directors of the Baltimore and Ohio Railway. He died in 1894.

FORD, Paul Leicester, American historian and novelist, was born in Brooklyn, N. Y., in 1865. After traveling extensively in both hemispheres he devoted himself to investigations in the sources of American history. He edited the writings of Thomas Jefferson, the writings of Thomas Dickinson and The Federalist. These studies led to the True George Washington, The Many Sided Franklin, etc. His best known works of fiction are: Janice Meredith, Wanted: A Matchmaker, The Hon. Peter Sterling. He died in 1902.

FORD'S THEATER, a Washington theater, in which President Lincoln was assassinated by Booth, April 14, 1865. The building was purchased in 1866 by the U. States government, and was used until 1887 as the Army Medical Museum, and later as the Pension and Records Bureau of the War Department. It collapsed, with the loss of many lives, on June 9, 1893.

FOR'DUN, John, the father of Scottish history, born probably at Fordoun Kincardineshire, soon after 1300; died about 1386.

FORE-AND-AFT, in ships, a term meaning in a line with the keel. Fore-and-aft sails are those that are set on a stay or gaff and boom, such as jibs, stay-sails, etc.

FORECASTLE, a short deck in the forepart of a ship of war, or forward of the foremast, above the upper deck. In merchant ships it is the forepart of the vessel, where the sailors live.

FORECLOSURE, the process whereby a mortgagor's right, or "equity," of redemption is cut off and the mortgagee's lien on the mortgaged lands or goods enforced. It is available to the mortgagee at any time after default, and is instituted by a bill of foreclosure asking that an account may be taken of the principal and interest due under the mortgage, and that the mortgagor, on failing to pay by a specified date, may forfeit his equity of redemption. If on the day fixed for payment the money be not forthcoming, the mortgagor will be declared to have forfeited his equity of redemption, and the mortgagee will be allowed to retain the estate in perpetuity.

In a few of the American states, the mortgage has come to be regarded as a mere lien, and not as a legal estate in the mortgagee, a statutory process, known also as a foreclosure, has been adopted in lieu of the foregoing process of "strict" foreclosure. This differs from the older method principally in the fact that it involves the satisfaction of the debt, not by a forfeiture, but by a sale of the mortgaged premises. The suit, which is also in equity, is instituted by the mortgagee as plaintiff, the mortgagor and all creditors, subsequent lienors, and other parties in interest, being made defendants. The demand is for a judgment that the defendants be foreclosed and cut off from all their interest in the mortgaged premises, and that the same be sold to satisfy the mortgage debt. The sale is made upon notice and is at public auction, generally by the sheriff or a referee oppointed by the court. After the sale the money in the hands of the referee will be applied to the payment of the mortgage, and any surplus may be claimed by subsequent mortgagees; or, if there is no other claim upon it, it will be paid to the mortgagor.

FOREIGN OFFICE, that department of the British government presided over by the secretary of state for foreign affairs, and having its locale in Downing street, Westminster, London. It was established in 1782, and has charge of British interests in foreign countries. The secretary for foreign affairs negotiates treaties, appoints diplomatic officers, etc.

FOREN'SIC MEDICINE, the branch of medical education which applies the principles and practice of the different branches of medicine to the elucidation of doubtful questions in a court of justice; otherwise called medical jurisprudence.

FORESHORTENING, in drawing and painting, the art of representing figures in such a manner as to convey to the mind the impression of the entire length of any object which is pointing more or

Foreshortened (after figure by Raphaël).

less directly toward the spectator standing in front of the picture. The projecting object is shortened in proportion to its approach to the perpendicular to the plane of the picture, and in consequence appears of a just length.

FOREST, a term properly applied to an extensive wood, or to a large tract of mingled woodland and open and uncultivated land; but also to a large tract of hilly or mountain land wholly or chiefly devoted to the purposes of the chase. Forests proper are of much importance in the general economy of the globe. They greatly affect climate; and their beneficial influence in a physical, economical, and hygienic aspect is now receiving increased attention. In German and various other European countries forest science constitutes a separate branch of education, but in Britain less regard is paid to it. Forest regulations did not for a time seem as necessary in the U. States, with its great forest wealth, as in Europe. However, with the destructive methods of lumbering and the enormous waste by forest fires, the supply has been so encroached upon that means have been taken to repair the damage and to provide against its continuance. Various states have enacted laws designed to correct the former abuses by granting bounties for tree-planting and remission of taxes upon purely forest areas. The general government has also attempted to aid by laws providing for the acquirement of land upon the condition of planting a portion to trees. Since the laws enacted by the general government were improperly prepared, interpreted, and enforced, and have resulted in little good, they have been repealed. The greatest good has probably come from the reservation of extensive areas about the watersheds and sources of some great rivers. There are over 40 forest reserves in the U. States, embracing more than 46,000,000 acres.

FORESTERS, Ancient order of, a fraternal organization founded in 1745 and introduced into the U. States in 1832. The growth of the Order was slow until 1864. In 1902 the courts numbered approximately 9,000, with a total membership of nearly 1,000,000. The Order is one of the largest beneficiary societies in existence, with courts in 36 countries. Funds are raised by fixed dues, and more than $5,000,000 annually are distributed in benefits.

FORESTERS, Independent Order of, a fraternal and benevolent society founded at Newark, N. J., in 1874, and reorganized in 1881. The Order is general throughout the U. States and Canada. Its government is vested in a Supreme Court, with delegates from all the countries represented. High Courts, corresponding to the grand lodges of other societies, have supervision of the Order in various states and countries. The local bodies are called courts. The Order has a membership of 200,000, has paid more than $13,000,000 in benefits since its organization, and has a surplus fund of nearly $6,000,000.

FOREST MARBLE, in geology, an argillaceous laminated shelly limestone, alternating with clays and calcareous sandstones, and forming one of the upper portions of the Lower Oolite: so called from Whichwood Forest, in England, where the finer bands are quarried as marble.

FOR'FEITURE, a punishment annexed to some illegal act or remissness of an owner or tenant of property, whereby he loses his interest therein, together with his title, the same going to the party injured by such act or remissness.

FORGE, a workshop or other establishment in which iron or other metal is hammered and shaped by the aid of heat; also, the works where iron is rendered malleable by puddling and shingling. For military purposes a traveling forge is used by forces in the field.

FORGERY, at common law, the fraudulent making or alteration of a writing to the prejudice of another man's rights, or making, of any written instrument for the purpose of fraud and deceit; the word making, in this last definition, being considered as including every alteration of or addition to a true instrument.

FORGET-ME-NOT, the name of a common plant growing generally in damp or wet places. Scorpion-grass is also a name for it and others of its genus. It is a very beautiful plant, and considered to be the emblem of friendship in almost every part of the world. Its flowers are bright blue with a yellow eye. The dark-blue forget-me-not of the Azores is now cultivated in greenhouses, and is much esteemed for the brilliancy of its flowers.

FORLI', a town of North Italy, capital of a province of same name, 38 miles southeast of Bologna. Pop. 279,072.

FORLORN HOPE, a body of men, usually volunteers, selected from different regiments, to lead an assault, enter a breach, or perform other service attended with uncommon peril. The term is of Dutch origin; hope being from Dutch hoop, a company.

FORMATION, in geology, any series of rocks referred to a common origin or period, whether they consist of the same or different materials. Geological strata are divided into certain groups of one era of deposition, sometimes of very dissimilar mineralogical character, but inclosing the same fossil species; as, the Carboniferous, Oolitic, Cretaceous, Silurian, Laurentian, etc., formations. See Geology.

FORMIC ACID, an acid obtained from ants, when repeated quantities of them have been infused in boiling water. It is contained in human sweat and urine, in the common nettle and other plants, and may be prepared artificially in various ways. It is a colorless volatile liquid, with pungent odor, and producing intense irritation on the skin.

FORMO'SA, an island in the Chinese Sea, separated from the Chinese prov. of Fokien by a strait about 80 miles wide where narrowest. The island is about 250 miles in length and 70 in average breadth. It is divided by a central range of mountains (rising to 14,000 feet) into a western and eastern part, the former of which (mostly a plain) is occupied by large numbers of immigrant Chinese, and highly cultivated, producing in abundance corn, rice, sugar, pepper, camphor, oranges, bananas, etc. The eastern part is inhabited mainly by wild tribes of Malayan race, who are gradually disappearing before the Chinese. Northern Formosa is volcanic, and earthquakes occur. Several ports have been opened to European commerce, chiefly Tai-nan (the capital), Tam-sui, Ke-lung, and Takow; and the trade of the island since then has greatly increased. The chief exports are coal, tea, camphor, sugar, indigo, timber; the imports are cottons, woolens, opium, etc. Formosa now belongs to Japan. Pop. 3,000,000.

FOR'MULA, a fixed form of words or symbols. In theology it is a formal statement of doctrines; in mathematics, a general theorem, a rule or principle expressed in algebraic symbols. In chemistry it is a mode of expressing the constituents of a compound by means of symbols and letters. Thus water is represented by H_2O, in which H_2 stands for the two proportions of hydrogen and O for the one of oxygen which are combined to produce water.

FORNICATION, the illicit carnal intercourse by an unmarried person with one of the opposite sex, whether married or unmarried. In most countries this offense has been brought within the pale of positive law at some period of their history, and prohibited by the imposition of penalties more or less severe; but it is now usually left to the restraints which public opinion imposes on it in every community which is guided by the principles of morality and religion. In a few of the U. States the offense is made a misdemeanor by statute, punishable by fine and imprisonment, but in most of the states the common-law rule prevails.

FOR'REST, Edwin, American tragedian; was born in Philadelphia, in 1806. He made his first regular appearance in 1820 at the Walnut Street Theater, in Philadelphia, in Home's Douglas. In Shakespeare his best roles were Richard III., Coriolanus, Lear and Othello, but he was even more effective in Virginius, Spartacus and characters of that range, and in 1826, at the Park Theater, New York, made a decided triumph in Othello. Thenceforward his career was one of distinction, both in this country and in England, where he made his first appearance at Drury Lane in The Gladiator in 1836. His last professional ap-

pearance was in 1871. He died in December 12, 1872.

FORREST, Nathan Bedford, American soldier, was born near the site of Chapel Hill, Tenn., in 1821; he removed with his father in 1834 to Tippah County, Miss. Though at first opposed to a dissolution of the Union, he entered the confederate army as a private in June, 1861. In 1862, he was promoted to be brigadier-general, and thereafter served in Kentucky for some time under General Bragg. On January 24, 1865, he was placed in command of the cavalry in Alabama, Mississippi, and east Louisiana; on February 28th became a lieutenant-general; in March was defeated at Selma, Ala., by Gen. J. H. Wilson; and in May surrendered at Gainesville, his troops being included in the arrangement made by Gen. Richard Taylor with General Canby. He died in 1877.

FORT, a small fortified place surrounded with a ditch, rampart, and parapet, for the purpose of defending a pass, river, road, harbor, etc. Forts are made of different forms and extent according to the exigencies of the case. See Fortification.

FORT DODGE, the county seat of Webster county, Ia., situated on Des Moines river, the Chi., R. I. and Pac., Ill. Cent., Mason City and Fort D., and Minn. and St. Louis R. Rs.; 90 miles n. of Des Moines. It has fine quarries of building-stone, large deposits of gypsum, coal, fire-clay, potter's clay, and water-lime, and various manufactures. Pop. 14,519.

FORT MADISON, the county seat of Lee county, Ia., situated on Mississippi river, 23 miles below Burlington, and on the Atch., Top. and S. Fé, Burl. Route, and Ch., Fort Mad. and Des Moines R. Rs.; 237 miles s.w. of Chicago; connected with Illinois by one of the finest wagon and railway bridges on the river. Pop. 11,215.

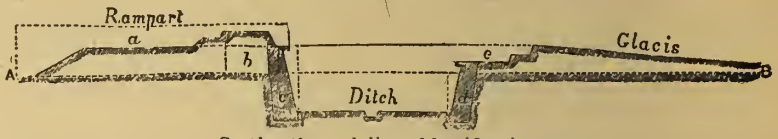
FORT SCOTT, the county seat of Bourbon county, Kan.; situated on the Marmaton river; 300 miles w. of St. Louis and 98 miles s. of Kansas City, Mo. Pop. 11,760.

FORT SMITH, one of the county seats of Sebastian county, Ark., situated at the confluence of Arkansas and Poteau rivers; 158 miles w. by n. of Little Rock. It has sawmills, planing-mills, furniture-factories, cotton compress and oil-seed mills, ice-factory, etc Pop. 14,320.

FORTH, a river of Central Scotland, formed in Perthshire by the junction of two streams, the Duchray and the Dhu, about 1 mile w. of Aberfoyle. From Aberfoyle the river flows southeast, forming for a considerable part of its course the boundary between the counties of Stirling and Perth, winding in its lower course in a series of curves known as the Links of Forth, and expanding thereafter into the Firth of Forth, which forms the most important harbor of refuge n. of the Humber. Its chief ports are Leith, Granton, Bo'ness and Grangemouth. The Forth is navigable for the smaller class of vessels as far up as Alloa. Its length is about 170 miles. It is a good salmon stream. There are several islands in the estuary, on two of which, the Isle of May and Inchkeith, lighthouses are erected. The firth is crossed at Queen's ferry by a bridge.

FORTH AND CLYDE CANAL, a canal in Scotland constructed in 1768–90, and extending from the Forth at Grangemouth to the Clyde at Bowling, thus giving communication by water from the east to the west coast. It is 35 miles long. The Union Canal, 31½ miles long, joins it near Falkirk and connects it with Edinburgh.

FORTIFICATION, the science of strengthening positions in such a way that they may be defended by a body of men much inferior in number to those by whom they are attacked; and more particularly, the science of strengthening positions so as that they may be held against the assault of troops supported by artillery. Fortifications are usually divided into permanent and temporary. Permanent fortifications are works required to remain effective for any length of time, for the purpose of defending important positions and cities, dockyards, arsenals, etc. Temporary fortifications are such as are designed merely to throw temporary obstacles in the way of the enemy, as field-works, etc. The former are constructed on the principle that each part must be its fire support and be supported by some other part; that the works must protect the defenders from the enemy's fire as well as possible, and that the fire of the fortress must completely sweep all parts of the ground in front of the fortified lines. The more important details of a regular fortification may be briefly described as under: Around the place to be defended is raised a mound or bank of earth called a rampart, on the upper surface of which, the terre-pleine (a), the troops and cannon are placed. The terre-pleine is protected from the enemy's fire by a breastwork or parapet (b), about 8 feet high, sometimes pierced at certain intervals with embrasures through which the guns are fired. Beyond the rampart is the ditch, usually about 12 feet in depth, but varying greatly in width. The ditch is sometimes filled with water; in other cases it is dry. The scarp or escarp (c) is the inner wall of the ditch, and it is faced with masonwork or hurdles, sods, etc. (the revetment) to retain the earth of the rampart in its place. The counterscarp (d) is the opposite or outer wall of the ditch. From the top of the counterscarp outwards is a space about 30 feet wide (the covered-way, (e) protected by a parapet, the long superior outward slope of which towards the open ground forms the glacis. The use of the covered-way is to allow the troops to be drawn up on it unseen by the besiegers for the purpose of making a sortie; it also enables the defenders to keep up a closer fire on the attacking forces. The slope of the glacis is so constructed as to bring the assailants in the direct line of fire from the artillery on the ramparts. In the sectional cut a is toward the interior of the fort, b toward the open country. At certain intervals there are often bastions or projecting works at salient angles, commanding by their fire the curtain or straight portion of the fortified line between them. The use of the bastion has given the name to what is called the bastionary system of fortification, which has in modern times largely given way to what is known as the polygonal or German system, which is considered to have various advantages in relation to the powerful artillery of the present day. The polygonal system has also been called the caponier system, from the use of powerful casemated caponiers constructed across the ditches and serving instead of bastions for their defense. The general plan of the works is polygonal, with the ramparts placed on the sides of the polygon. The connecting line of fortifications surrounding a place is called the fortified enciente, and the works in a regular fortress form a very complicated whole, including works to which such names as ravelins, demi-lunes, etc., are given. The fortified enceinte immediately surrounding a place is not now considered a sufficient defense, on account mainly of the long range of modern cannon. Hence it is usual to surround a fortress with a line of detached forts at some distance from the enceinte, or there may be more than one such line of advanced works. Fortifications intended to ward off attacks by sea have their sea-faces now commonly protected by plates of iron or steel. Scientific fortification may be said to commence with the great French engineer Vauban, who served under Louis XIV. He developed the bastioned system, which, as improved by Cormontaigne and others, is still the prevailing type of French fortification.



Section through line of fortifications.

Field Fortifications vary much according to the time allowed for construction, and during which they may prove useful. Among works of this nature are the redan, which consists of two parapets with a ditch in front, forming an angle facing the enemy; the lunette, which is a redan with short flanks; the redoubt, a closed work with a ditch and parapet all round. As none of those works has a flanking fire in itself, they have to be disposed so that they flank each other within rifle range. To do this effectually, and to strengthen the whole line, the plan generally adopted is to form an intrenched camp by a line of square redoubts, flanking each other, and also a line of simple redans in front of the intervals of the redoubts. When the time is not sufficient to throw up such works, simple forms of intrenchment, such as shelter trenches, are used to shelter troops or oppose the enemy's advance. A very shallow trench, with the earth thrown to the front, so as to afford shel-

ter to one man lying in it, may be made in somewhat less than half an hour; more elaborate forms in about one hour. So that by placing a man at every 4 feet, active troops can make good shelter for themselves in an hour. To impede the enemy's advance an abattis of felled trees may be used, also wire entanglements, chevaux-de-frise, etc.

FORTIS'SIMO (Ital.), in music, a direction to sing with the utmost strength or loudness.

FORTU'NA, the Roman goddess of success, corresponding to the Greek Tyche. She is generally delineated with a rudder, emblem of her guiding power; or later, with a bandage over her eyes and a scepter in her hand, and sitting or standing on a wheel or globe.

FORTUNA'TUS, the hero of an old popular legend. He obtained a wishing-cap and inexhaustible purse of gold, which finally ruined him and his sons. The first printed edition of the story appeared in Germany in 1509, but in various forms it has appeared in most of the languages of Europe.

FORT WAYNE, a flourishing city in Indiana, situated in a beautiful and well-cultivated country at the junction of the St. Mary's and St. Joseph's rivers, which here unite to form the Maumee. It has railroad and machine works, and derives its name from a fort erected here in 1794 by General Wayne. It is the seat of a Roman Catholic episcopal see. Pop. 1909 estimated 65,000.

FORT WORTH, an important railway center, the county seat of Tarrant co., Tex.; situated on Trinity river, 32 miles w. of Dallas and 210 miles n. of Austin. Among industrial establishments are grain elevators, flouring-mills, iron foundries, car-works, shops of the Fort Worth and Denver, the Texas and Pacific, and the Rio Grande Railways, large stock-yards, and one of the largest packing-houses in the Western U. States. Pop. 31,490.

FORUM, among the Romans, any open place where the markets and courts of justice were held. There were a number of such places in Rome, by far the most celebrated being the great Roman forum between Mount Palatine and the Capitoline Hill. This place, once adorned with the most beautiful statues and buildings, had become almost a waste known as the Campo Vaccino, or cattle-field, but of late years the government have made clearances and excavations, and taken charge of the valuable relics which are still left.—In legal phrase forum signifies the court or place where an action is instituted.

FOSS, or **FOSSE,** in fortification, a trench or ditch, often full of water, below the rampart of a fortified place, or a post that is to be defended. See Fortification.

FOSSIL, a term for the petrified forms of plants and animals which occur in the strata that compose the surface of our globe. Most of these fossil species, many of the genera, and some of the families, are extinct. When these remains are only partially fossilized, and occur in superficial or recent deposits, the term sub-fossil is employed. See Geology and Palæontology.

FOSTER, Birket, an English artist, born at North Shields in 1825. He learned wood-engraving under Landells, and in early life became a draughtsman. He soon achieved a high reputation as book illustrator, and illustrated the works of Goldsmith, Scott, Longfellow, Beattie, etc. His landscape drawings on wood are of great excellence. He afterwards devoted himself to water-color painting, in which his reproductions of rustic life were very successful. He died in 1899.

FOSTER, Charles, American politician and secretary of the treasury. He was born in 1828 near Tiffin, Ohio. During the Civil War he actively aided in the recruiting and equipment of the Ohio troops. It was not until 1870 that he entered political life. In that year he was nominated by the republicans of his district for congress, and was elected. He was reëlected in 1872, 1874, and 1876. In 1879 he was nominated for governor of Ohio, and in 1881, was re-elected, serving until January 1, 1884. In 1889 Foster was appointed by President Harrison chairman of a commission to draw up a treaty with the Sioux Indians. In February, 1891, he succeeded William Windom as secretary of the treasury in Harrison's cabinet. He died in 1904.

FOSTER, John Watson, American diplomat, born in Pike co., Ind., in 1836. At the beginning of the Civil War he entered the Union service as a major of volunteers, and after attaining the rank of colonel headed a brigade in General Burnside's expedition to East Tennessee and was the first to occupy Knoxville (1863). During the Bering Sea controversy he acted as agent of the United States before the arbitration tribunal. He succeeded to the secretaryship of state (1892–93). Later he was legal adviser to the Chinese plenipotentiaries in their peace negotiations with Japan (1895); again represented the United States in the Bering Sea question (1897); and in 1898 was a member of the Anglo-American joint high commission to settle the disputes between Canada and the United States.

FOSTER, Stephen Collins, American song composer, born in 1836 at Lawrenceville, near Pittsburg, Pa. Many of his songs, the first of which, "Open Thy Lattice, Love," was published in 1842, have become so popular that they may be regarded as veritable folk-songs; "Louisiana Belle," "Old Uncle Ned," "My Old Kentucky Home," "Massa's in the Cold, Cold Ground," "Ellen Boyne," "Old Folks at Home" ("Down on the Suwanee River"), "Come Where My Love Lies Dreaming," are some of the most popular of Foster's 175 published songs. He died in New York in 1864.

FOUCHE (fö-shā), Joseph, Duke of Otranto, a minister of Napoleon I., was born in 1763. On the fall of Robespierre (1794), Fouché, who had for some time tended towards the moderate party, managed to make friends with Barras, and was rewarded for his betrayal by the ambassadorship to Milan. He was minister of police at Napoleon's final abdication and played an important part in the arrangements. He remained in office under Louis XVIII. for a time, but the dislike of the royalist party at length forced him to resign (1815). He went as ambassador to Dresden, but afterward retired to Prague, and latterly to Trieste, where he died Dec. 25, 1820.

FOUNDATION, that part of a building which is under ground, or the portion of the ground on which walls, piers, etc., rest. Foundations are usually made by providing a hard impermeable base for the masonry by methods which vary according to the position and soil. Where there is rock below nothing more is needed than a dressing for the surface. Submerged foundations such as those for breakwaters, bridges, etc., form special cases for engineering.

FOUNDATION, a donation or legacy, in money or lands, for the maintenance or support of some useful charitable institution, as an hospital, a college, a school, etc.

FOUNDLING HOSPITALS, institutions for receiving children abandoned by their parents and found by strangers. Among such institutions are that of Paris, instituted in 1670, and that of London in 1739. The latter was originally a hospital for all exposed children; but the enormous increase in abandonments caused the hospital to be changed in 1760 to one for poor illegitimate children whose mothers are known.

FOUNT, or **FONT,** among printers, etc., a quantity of types, in proportions sorted for use, that includes ordinary letters, large and small capitals, single letters, double letters, points, commas, lines, numerals, etc.; as a fount of Pica, Bourgeois, etc.

FOUNTAIN, or **ARTIFICIAL FOUNTAIN,** a contrivance by which water is made to spout from an artificial channel, and often to rise up to a great height in a jet or jets. Rome, in particular, is noted for its fountains. At Paris, also, the fountains of the Place de la Concorde, the Tuileries, and at Versailles, are splendid structures.

FOURIER (fö-ri-ā), François Marie Charles, a French socialist and founder of the system named after him, was born in 1772 at Besancon. He died Oct 10, 1837. In his social system Fourier holds that the operations of industry should be carried on by Phalansteries, or associations of 1800 members combining their labor on a district of about a square league in extent, under the control of governors elected by each community. In the distribution a certain minimum is first assigned for the subsistence of every member of the society, whether capable or not of labor. The remainder of the produce is shared in certain proportions to be previously determined among the three elements, labor, capital, and talent. The capital of the community may be owned in unequal shares by different members, who would in that case receive, as in any other joint-stock concern, proportional dividends. The claim of each person on the share of the produce apportioned to talent is estimated by the grade which the individual occupies in the several groups of laborers to which he or she belongs, these grades being in every case conferred by the voice of his or her companions. The remuneration received would not of necessity be expended in common. Separate

rooms or sets of rooms would be set aside for those who applied for them, no other system of living together being contemplated than such as would effect a saving of labor in building and the processes of domestic life, and reducing the enormous portion of the produce of industry at present carried off by middlemen and distributing traders to the narrowest possible margin.

FOURTH, in music, a distance comprising three diatonic intervals, or two tones and a half. Three full tones compose a tritone or fourth redundant. The diminished fourth consists of a whole tone and two semi-tones.

FOWL, a word originally synonymous with bird, now used in a stricter sense to designate the common domestic fowl. The general form and characters of the bill, etc., agree with those of the pheasants, but the crown of the head is generally naked and furnished with a fleshy comb, the base of the lower mandibles also bearing fleshy lobes or wattles —characters which are most conspicuous in the males. The legs of the male are furnished with spurs which are much used in conflict, the cocks being very pugnacious and unable to suffer the presence of a rival. In the center of the cock's tail are two long feathers, which fall backward in a graceful arch and add great beauty to the whole aspect of the fowl. Except in the pure white breed the plumage of the cock is always more splendid than that of the hen. Among well-known varieties are the Cochin-China Fowl, the Game Fowl, the Darking, the Spanish Fowl, and the Bantam.

FOWLER, Orson Squire, American phrenologist, was born in Coshocton, N.Y. in 1809. After graduating he settled in New York, where he began writing and lecturing on phrenology. In 1836 he published his first book, Phrenology Proved, Illustrated, and Applied, and in 1838 founded the American Phrenological Journal. He was the founder of practical phrenology in the United States. Among his numerous published works are: Memory and Intellectual Improvement; Matrimony, or Phrenology Applied to the Selection of Companions; Love and Parentage; The Self-Instructor in Phrenology and Physiology; Sexual Science. He died in 1887.

FOX, an animal closely allied to the dog, with a straight bushy tail, elongated pupils, and erect ears. Foxes are natives

Red fox.

of almost every quarter of the globe, and are everywhere among the most sagacious and wily of all beasts of prey, very voracious, devouring birds and small quadrupeds, and committing ravages not only on animals, but on fruits, honey, eggs, etc. The common fox of America is well known. Among other species there are the Arctic fox celebrated for its glossy white winter fur; the black fox, similar to the common fox, but distinguishable by its rich, shining black fur, a native of the northern parts of Asia and America; the gray fox has a thick tail containing at its tip a tuft of stiff hairs, common through the northern parts of America; the red fox of America, generally of a pale-yellow hue; the crossed fox, fur a sort of gray, muzzle and lower parts of body black, a dark cross on the shoulders; the swift fox, an inhabitant of the plains which lie at the base of the Rocky Mountains.

FOX, Charles James, an eminent English statesman, born January 24, 1749, the second son of Henry, first Lord Holland. His father procured him a seat for the borough of Midhurst in 1768, before he was of legal age, and in 1770 he was appointed one of the lords of the admiralty, which situation he resigned in 1772, and was appointed a commissioner of the treasury. After being a supporter of the administration for six years, a quarrel with Lord North threw Fox into the ranks of the whig opposition, where along with Burke and others, he steadily assailed the government, especially on the score of their American policy. In 1780 he was elected member for Westminster, and on the defeat of the administration of Lord North, and the accession of that of the Marquis of Rockingham, he obtained the office of secretary of state for foreign affairs (1782). But the death of the Marquis of Rockingham suddenly divided the party; and when the Earl of Shelburne became first lord of the treasury Fox retired. Soon after a union took place between his friends and those of Lord North, known as the coalition ministry, which was overthrown by Fox's famous East India Bill (1783). He welcomed the breaking out of the French revolution, and his views on this subject led to a memorable break between him and his old friend Burke. Fox firmly opposed the principle on which the war against France was begun, and strenuously argued for peace on every occasion; but eventually, on becoming secretary for foreign affairs in 1806, acquiesced in its propriety. His

Charles James Fox.

health, which had been impaired by his loose manner of living, now began rapidly to decline, and he died the same year a few months after the death of Pitt, his great rival, in 1806.

FOX, George, the founder of the Society of Friends, or Quakers, was born at Drayton, in Leicestershire, in 1624. He was educated religiously, and at the age of nineteen pursuaded himself that he had received a divine command to forsake everything else and devote himself wholly to religion. In 1648 he commenced to preach publicly at Manchester, about which time he also adopted the peculiar language and manners of Quakerism. At Derby his followers were first denominated Quakers, in consequence of their trembling mode of delivery, and calls on the magistracy to tremble before the Lord. In 1655 he was sent a prisoner to Cromwell, who, having ascertained the pacific tendency of his doctrines, had him set at liberty. In 1666 he set about forming the people who had followed his doctrines into a formal and united society. In 1669 he married the widow of Judge Fell, and soon after went to America, where he remained two years, which he employed in making proselytes. On his return he was thrown into Worcester jail, but was quickly released, and went to Holland. In 1684 he again visited the continent. He died in 1691, the Society of Friends having by that time acquired considerable importance. The writings of Fox have been collected into three volumes.

FOX, George L., American comedian, born in Boston in 1825. Inspired by the famous Ravel Brothers to undertake pantomime, he created a distinct place for that kind of entertainment in New York City, first at the National Theater and later at the New Bowery, of which he was for a time lessee and manager. His principal rôle was that of the clown in Humpty Dumpty, and no one has ever equaled him in this character, which he may be said to have created. He was scarcely less distinguished in his burlesques on the famous tragedians of the day, and his resemblance to Booth in the character of Hamlet was remarkable. He died in 1877.

FOX-BATS, or **FLYING-FOXES,** a name given to the fruit-eating bats including some of the largest of the bat tribe, one species, or kalong, attaining a length of from 4 to 5 feet from the tip of one wing to the tip of the other. They inhabit Australia, Java, Sumatra, Borneo, etc., as well as the continents of Asia and Africa.

FOXE, John, an English church historian, born in 1517. He studied at Oxford, and was elected a fellow of Magdalen in 1543, from which he was expelled two years later on a charge of heresy. In the reign of Edward VI. he was restored to his fellowship, but during Mary's reign again went abroad, to Basel. On the accession of Elizabeth he returned to his native country, and was received in the most friendly manner by his former pupil, the Duke of Norfolk, who settled a pension on him. Secretary Cecil also obtained for him a prebend in the church of Salisbury; and he might have received much higher preferment if he would have subscribed to the

articles enforced by the ecclesiastical commissioners. He died in 1587. His principal work is the History of the Acts and Monuments of the Church, commonly called Foxe's Book of Martyrs, first printed in 1563, in one vol. folio.

FOX'GLOVE, a common plant growing on banks, pastures, etc., in hilly and especially subalpine and rocky countries in Europe. Its flowers are campanulate, and somewhat resembling the finger of a glove. It is one of the most stately and beautiful of the herbaceous plants, and one that has great reputation as a medicinal plant, being employed as a sedative, narcotic, and diuretic in diseases of the heart and in dropsy. Its medicinal properties are due to the poisonous substance known as digitalin. A decoction or infusion of the leaves is what is generally used.

FOXHOUND, a hound for chasing foxes, a variety of hound in which are combined, in the highest degree of excellence, fleetness, strength, spirit, fine scent, perseverance, and subordination. The foxhound is smaller than the staghound, its average height being from 20 to 22 inches. It is supposed to be a mixed breed between the staghound or the bloodhound and the greyhound. It is commonly of a white color with patches of black and tan.

FOX INDIANS, a tribe of N. American Indians, belonging to the Algonquin family, now few in numbers and scattered over the Indian territories, Iowa, Kansas, and Nebraska.

FOXTAIL-GRASS, the common name given to certain grasses because of the close cylindrical panicle in which the spikelets of flowers are arranged, having somewhat the shape of a fox's tail.

FOY (fwâ), Maximilian Sebastian, a French general, born in 1775. In 1812, after the defeat of the French at Salamanca, he succeeded Marmont as commander-in-chief, and showed much talent in his conduct of the operations on the Douro. He was present in all the battles of the Pyrenees, until he was dangerously wounded at Orthez in 1814. In 1815 he commanded a division at Waterloo, where he was wounded for the fifteenth time. In 1819 he was appointed division-inspector of infantry, and the same year was elected deputy by the department of the Aisne. He at once distinguished himself as one of the leading orators of the liberal party and became very popular. He died at Paris, Nov. 28, 1825.

FRA, an Italian prefix, derived from the word frate, brother, and used before the names of monks; for instance, Fra Giovanni, brother John.

FRACTION, in arithmetic and algebra a combination of numbers representing one or more parts of a unit or integer, thus, four-fifths $\frac{4}{5}$ is a fraction formed by dividing a unit into five equal parts, and taking one part four times. Fractions are divided into vulgar and decimal. Vulgar fractions are expressed by two numbers, one above another, with a line between them. The lower, the denominator, indicates into how many equal parts the unit is divided; and the number above the line, called the numerator, indicates how many of such parts are taken. A proper fraction is one whose numerator is less than its denominator. An improper fraction is one whose numerator is not less than its denominator, as $\frac{8}{8}$, $\frac{5}{2}$. A simple fraction expresses one or more of the equal parts into which the unit is divided, without reference to any other fraction. A compound fraction expresses one or more of the equal parts into which another fraction or a mixed number is divided. Compound fractions have the word of interposed between the simple fractions of which they are composed: thus, $\frac{1}{2}$ of $\frac{4}{5}$ of $1\frac{1}{4}$ is a compound fraction. A complex fraction is that which has a fraction either in its numerator or denominator, or in each of them: thus, $\frac{5\frac{1}{2}}{9}$, $\frac{8}{9\frac{1}{2}}$, and $\frac{5\frac{1}{2}}{6\frac{2}{3}}$ are complex fractions. In decimal fractions the denominator is 10, or some number produced by the continued multiplication of 10 as a factor, such as 100, 1000, etc.; hence, there is no necessity for writing the denominator, and the fraction is usually expressed by putting a point (·) before the numerator, as $\cdot 5 = \frac{5}{10}$; $\cdot 25 = \frac{25}{100}$; $\cdot 05 = \frac{5}{100}$. The expression $542\cdot461$ would thus be equivalent to $542\frac{461}{1000}$. All calculations are much simplified in decimal fractions; yet, simple as the system is, it was discovered first in the 15th century by the German mathematician Regiomontanus.

FRACTURE, in mineralogy, is the manner in which a mineral breaks, and by which its texture is displayed; thus, an even fracture shows a level face or plane of some extent; uneven, when the surface is rough and broken; conchoidal, when one side is convex and the other concave, as in a molluscous shell; fibrous, when the separated edges have the appearance of torn filaments; hackly when there are many fine sharp points or inequalities.

FRACTURE, in surgery, is the breaking of a bone. It is simple when the bone is only divided; compound when there is also a wound of the soft parts leading down to the fracture. A fracture is termed transverse, longitudinal, or oblique according to its direction in regard to the axis of the bone. It is called complicated if accompanied with dislocation, severe contusions, wounded blood-vessels, or any disease which prevents the union of the bones and causes them to be very easily broken. A comminuted fracture is one in which the bone is broken into several small pieces at the point of rupture. An incomplete fracture is one in which only a portion of the fibers is broken. A stellate fracture is a series of fractures radiating from a center. When a fracture takes place there is a pouring out of fluid—lymph—and cells from the blood contained in the vessels of the lining membrane of the bone as well as from the vessels of the soft parts which have also suffered injury. This material surrounds the broken ends of the bone, becomes firm and consolidated, and in about three weeks is hard enough to keep the broken ends in position. A formation of bone then takes place round the seat of fracture. This is called "provisional callus," because, when the process of repair is completed and true bone has formed to unite the break, it is re-absorbed and gradually disappears. Meanwhile a process of repair goes on between the broken ends, uniting them by the formation of true bone or "definite callus." The more quickly and accurately after the break the broken ends are brought together, the more rapid will be the reunion. The treatment of a simple fractured bone is to bring the portions into their natural position and to keep them permanently thus, by splints of some kind, pasteboard splints, for instance, dipped in warm water, with wooden ones exterior to them; or a mass of plaster of Paris may be used for the same purpose.

FRA DIAV'OLO, a celebrated Neapolitan brigand, whose real name was Michele Pezza.

FRANC, a modern French silver coin, but the name was given to two ancient coins in France, one of gold and the other of silver. The value of the gold franc was about $2.75. The silver franc was in value a third of the gold one. The name was given from the device Francorum Rex, king of the French, on the coin when first struck by King John in 1360. The modern French franc is a silver coin and money of account which since 1795 has formed the unit of the French monetary system, and has also been adopted as the unit of currency by Switzerland and Belgium. It is of the value of a little over 19 cents, and is divided into 100 centimes.

FRANCE (anciently Gallia), a maritime country in the west of Europe, forming one of its most extensive, most populous, and most influential states. It is situated between lat. 42° 20′ and 51° 5′ n.; and lon. 4° 50′ w. and 7° 40′ e., and is bounded n. by the Straits of Dover and the English Channel; w. by the Atlantic (Bay of Biscay); s. by Spain and the Mediterranean Sea; e. and n.e. by Italy, Switzerland, Germany, and Belgium. Its greatest length from north to south is 600 miles, and its greatest breadth 547 miles. The coast-line on the whole is considerably diversified by bays, estuaries, and indentations of various kinds, and presents numerous good harbors and roadsteads. It is studded by a number of islands, especially in the northwest and west, the largest being Oléron, Ré, and Belle Isle. The total area (including Corsica) is 204,092 sq. miles. The capital is Paris; the other large towns in order of population are Lyons, Marseilles, Bordeaux, Lille, Toulouse, Nantes, St. Etienne, Havre. The interior is traversed from southwest to northeast by successive chains of mountains, commencing with the Pyrenees and including the Cevenness, the Côte d'Or, the Vosges, and others, forming the water-shed, on one side of which the rivers flow west and north into the Atlantic and the English Channel, on the other side east and south into the Mediterranean. At its northeastern extremity this system is met by the Alps and the Jura. A considerable portion of the Western Alps belongs to southeastern France. Mt. Blanc itself (15,781 feet) is mostly within the French boundary-line.

The four great rivers of France are the Loire, Seine, Rhone, and Garonne. France has in all more than 200 navigable streams, with a total navigation of

about 6000 miles. Lakes are few, and individually very limited in extent.

About nine-tenths of the soil of France is productive, and about one-half of the whole is under the plough. The cereals forming the great bulk of the cultivated crops are wheat, oats, rye, and barley. The crops next in importance to these are potatoes, hemp, rape, corn, buckwheat, flax, and beet. Beet is cultivated extensively in some departments, especially in that of Nord, for the manufacture of sugar. The cultivation of tobacco is monopolized by the government, and is confined to certain departments. The rearing of sheep is successful, much of the wool being scarcely inferior to merino wool. Excellent horses are bred in the north. Asses and mules, generally of a superior description, are much employed. The cultivation of the vine is one of the most important branches of French agriculture, the total quantity of land in vineyards being nearly a twenty-fifth of the whole surface. In everything relating to this branch of culture the French are unsurpassed, the various first-class wines which they produce under the names of Champagne, Burgundy, Bordeaux, etc., being universally known. It is estimated that in good years France produces about one-half of the whole wine production of the world. The forests occupy about one-seventh of the whole territory.

Coal-fields are numerous, but only two are really of importance—that of Valenciennes in the northeast, forming the western extremity of the great Belgian coal-field and that of St. Etienne in the southeast, to which the manufactures of that town, Lyons, and the surrounding districts, are indebted for much of their prosperity. The annual output falls so far short of the annual consumption that a large import takes place from England and Belgium, particularly the latter, and wood continues to be the common fuel throughout France, at least for domestic purposes. The coal-fields contain seams of iron, which are extensively worked, and furnish ore to a great number of blast-furnaces; but of the total amount of ore smelted in the country a considerable proportion is imported. Other metals, such as lead, zinc, manganese, copper, etc., are obtained to some extent.

The most important of the textile manufactures is that of silk goods, having its chief seat at Lyons and the surrounding districts. It employs about two millions of persons, and furnishes about 27 per cent in value of the whole of the manufactured products of France. After silk goods, though at a considerable distance, follow cotton stuffs and woolens, made largely at Rheims, Amiens, and Beauvais; carpets at Abbeville; tapestry at Paris and Beauvais; linens, including fine muslin, gauze, and lace at St. Quentin, etc. The fisheries of France are important. Among the principal is that of sardines on the coast of the Bay of Biscay; that of herring, mackerel, turbot, salmon, etc., in the English Channel and the North Sea; that of tunnies and anchovies on the coasts of the Mediterranean. Oyster-breeding is largely engaged in, the most extensive oyster-beds being those of the basin of Arcachon in the department of the Gironde. Cod-fishing is carried on actively near the Newfoundland banks by French fishermen, and also near Iceland.

The principal towns from which the internal commerce emanates are Paris, Lyons, Rouen, Lille, St. Etienne, Toulouse, Nîmes, Nancy, Perpignan, etc. The shipping of France is much below what might be expected from the development of its foreign commerce, considerably more than one-half of which is carried by foreign vessels. The chief seaports are Marseilles, Havre, Bordeaux, Rouen, Nantes (including St. Nazaire), Dunkirk, Calais, Boulogne, Dieppe.

France possesses about 3000 miles of canals in addition to about 6000 miles of navigable rivers, giving a total equal to about 1 mile of internal navigation for every 25 sq. miles of surface. The railways in France partly belong to the state, and partly have been granted to private companies for a limited period, at the end of which they become state property.

In France the superintendence of education in all its branches is expressly committed to a high functionary, who takes the name of minister of public instruction and fine arts and is assisted by an educational council. For a good part of last century France had only one university, the University of France, embracing a series of "faculties" (facultés), which were a sort of university colleges, each specially devoted to literature, law, medicine, theology, etc. Since 1896 a number of local universities have been formed from these institutions, and university education is now in a flourishing state. Paris has again a university of her own, besides the Collège de France Ecole Polytechniqne, Ecole Normale Supérieure, etc. Secondary instruction, either classical or commercial and industrial, is given by the state in the lyceums, by the communes in the communal colleges, or in certain other seminaries. There are about 90 lyceums, generally situated in the capitals of the departments, and over 250 colleges. Primary instruction is given in the communal schools, being compulsory and free. Religion, in like manner, is taken under the cognizance of the state, and falls within the province of the minister of justice and religion. The state declares that the Roman Catholic is the religion of the majority, but does not establish it; on the contrary, it places all forms of religion which have more than 100,000 adherents, and are not obviously subversive of social order, on an equal footing, and professes to deal impartially with all by paying salaries to their ministers. The Protestants are less than 2 per cent of the whole population.

By law military service is declared to be obligatory upon every Frenchman who is not pronounced unfit for military service. They have to serve first in the army (armée active) for three years, then in the reserve of the regular army for ten years, next in the territorial army for six years, and finally in the reserve of the territorial army for six years. This gives France on a peace footing an army of more than half a million, which on a war footing may be brought up to two and a half millions or even more. The French navy is manned partly by conscription and partly by voluntary enrollment. In 1906 the effective war navy of France included 47 heavy fighting vessels, of which, however, some, though launched, were not completed; 13 more were for coast service, besides other iron-clads still on the stocks.

France has now a larger revenue, expenditure and public debt than any other country in the world. The estimate gross revenue for 1900 was fully $710,000,000, the expenditure being estimated at somewhat less. The consolidated debts amount to about $4,400,000,000, while the total national debt is at least about $6,000,000,000. The chief items of revenue are excise and customs, registration, stamps, posts and telegraphs, and other state monopolies, land tax, licenses, etc.

France has been a republic since the overthrow of the second empire on the 4th of September, 1870. The details of the constitution were fixed by a law passed by a national assembly which met in 1871 (some revision having been made since). This law places the legislative authority in the hands of an assembly composed of two chambers, the chamber of deputies and the senate. The chamber of deputies is elected by universal suffrage, each arrondissement forming an electoral district and a member being elected for every 70,000 inhabitants. The deputies are elected for four years. The senate consists of 300 members, of whom 75 were originally elected for life; but in 1884 it was enacted that vacancies among the life senatorships should be filled up as they arose by the election of ordinary nine-year senators. Both senators and deputies are paid. The head of the government is a president, elected for seven years by a majority of votes of the members of the two chambers sitting as one. The president is assisted by a body of ministers appointed by him. He has the appointment to all civil and military posts. The total French dominions are as follows:

	Area in Sq. Miles.	Population.
France	207,054	39,118,995
Colonies	4,089,076	53,412,340
	4,296,130	92,531,335

France or Gaul, at the earliest period of which anything is known with regard to it, was inhabited by a number of independent tribes, who appear to have been mainly Celtic in race. In the latter half of the 2d century B.C. the Romans conquered a portion of the southeast, and under Julius Cæsar the conquest of all Gaul was completed between 58 and 51 B.C. In the decline of the Roman empire German tribes began to make settlements in Gaul, and it was from a body of these known as Franks, that the name France arose. Toward the end of the 5th century Clovis, chief of the Salian Franks, made himself master not only of almost all France, but also of a considerable territory east of the Rhine. The dynasty which he founded was called the Merovingian from his grandfather Merovæus. Clovis died in 511, leaving his kingdom to be divided among his four sons as subsequent rulers

often did. It was reunited under Charlemagne who became sole ruler, and conquered and organized an empire which extended from the Atlantic on the west to the Elbe, the Saale, and the Bohemian mountains on the east, and embraced also three-fourths of Italy, and Spain as far as the Ebro. By Pope Leo III. on Christmas-day in the year 800 he was crowned in the name of the Roman people as Emperor of the West. There was as yet, strictly speaking, no kingdom of France, and Charlemagne was a German, and his empire a German one.

To Charlemagne succeeded in 814 his youngest son Louis the Pious. At the death of the latter the empire, after many disputes, was eventually divided by the Treaty of Verdun in 843 among his sons, the portion nearly corresponding to modern France falling to Charles the Bald. From this time the separate history of France properly begins, the history of the French language being also traced to the same period, while the eastern portion of the old Frankish territory remained German. The growth of French nationality began when upon the extinction of the descendants of Charlemagne, Hugh Capet, Duke of France, who had held the real power under three weak kings, mounted the throne himself, and thus became the founder of the Capetian dynasty. The Capets made Paris the center of the new monarchy.

The first task of the Capetian line was to reconquer the royal prerogatives from the great vassals, but for two centuries without much success until the growth of the towns ultimately became the allies of the kings, as a powerful check on the nobles.

Early in the 13th century the stability of the French throne was endangered by the influence acquired in France by Henry II. of England, who possessed, either by inheritance or by his marriage with Eleanor of Aquitaine, the whole of the west of France except Brittany. Louis was succeeded by his son Philip Augustus (Philip II.), who did much to strengthen the throne, depriving John, king of England, of Normandy, Maine, and Anjou. Under the wise rule of Louis IX. (St. Louis), and his successors, the influence of the crown went on increasing until the outbreak of the wars with England.

The first branch of the Capetian line of kings became extinct on the death of Charles IV., the last of the sons of Philip the Fair, the Salic law excluding the female succession. The crown thus fell to Philip of Valois, a cousin, who became king as Philip VI. His claim was disputed by Edward III. of England, and the dispute led to a series of wars which were not terminated for more than 120 years. During this period France was reduced to a state of great misery. Edward compelled the surrender to England of some of the finest provinces of France while the country was plundered by banditti, and the Jacquerie, a mass of furious peasants (about 1358), satiated their spirit of vengeance in the blood of the nobility. Charles (V.) the Wise, who succeeded John the Good in 1364, and his constable, Du Guesclin, were able to restore order only for a short time, although during this reign the English were driven out of most of their possessions in France. Then came the long and unhappy reign of the imbecile Charles VI. (1380–1422), during which Henry V. of England, reviving the claim of Edward III. to the French crown, invaded France, won the field of Agincourt, and obtained a treaty (Treaty of Troyes), acknowledged the right of succession to the French crown in himself and his descendants. Charles VI. died in 1422, a few weeks after Henry V., whose son, Henry VI., a minor, was acknowledged as king by the greater part of France. But between 1429 and 1431 the peasant girl Joan of Arc animated the French in the cause of the dauphin, who was crowned as Charles VII. at Rheims in 1429, and in 1451 the English had lost all their possessions in France, except Calais, which remained English until 1558. The shrewdness and perfidy of Louis XI. (1461–83) completed the subjugation of the great barons, and laid the foundation of absolute monarchy.

During the next hundred years five wars were fought with Germany in efforts to obtain territory.

The foundation of the national debt, the weight of which broke down the throne 250 years later, was laid in this period. Intrigue and corruption gave to women a dangerous influence at court and in public affairs. Under the administration of Charles IX. (conducted during his minority by the queen-mother, Catherine de' Medici) France was inundated with the blood of Frenchmen, shed in the religious wars from 1562. (See Bartholomew's Day.) When Henry IV. went over to the Catholic Church (1593), having hitherto been the leader of the Huguenots.

Henry IV. was the first French sovereign of the house of Bourbon, which inherited its right to the throne from a son of Louis IX. He united to the crown of France the Kingdom of Navarre, which he had inherited from his mother, Jeanne d' Albret. In his government of France Henry showed all the qualities of a great prince and a great statesman, establishing religious toleration (Edict of Nantes, 1598), and laboring diligently for the welfare of the state. He was cut off prematurely by the dagger of the fanatic Ravaillac (1610). During the minority of Henry's son Louis XIII. the French policy was at first wavering, until the prime-minister, Cardinal Richelieu, gave it a steady direction. He restored the French influence in Italy and the Netherlands, humbled Austria and Spain, and created that domestic government which rendered the government completely absolute.

Louis XIII. died in 1643, the year after his great minister, and was succeeded by Louis XIV., "le Grand Monarque." The policy of Richelieu was carried on by Mazarin during the regency of Anne of Austria, while Louis was still a minor, and also for some years after Louis was declared of age. During his ministry France obtained by the Peace of Westphalia (1648) the German province of Alsace, and by the Peace of the Pyrenees (1659) parts of Flanders, Hainault, Luxembourg, etc. After the death of Mazarin, in 1661, Louis XIV. took the government into his own hands, and ruled with an absolute sway. The period which immediately followed was the most brilliant in French history. His ministers, especially Colbert, and his generals, Turenne, Condé, Luxembourg, and the military engineer Vauban, were alike the greatest of their time; the writers of the period were also among the greatest in French literature. But Louis XIV.'s love of costly display upon which his reputation was built involved France in hopeless debt. Louis XV., the grandson of Louis XIV., succeeded in 1715 at the age of five years. During his minority the regent, the Duke of Orleans squandered the revenues in the most reckless manner, and matters went from bad to worse. In 1723 Louis was declared of age, but he sank under the pernicious influences of mistresses like Pompadour and DuBarry into extravagance and license, entering into useless and costly wars and contracting enormous debts. During this reign two important acquisitions were made by France, namely, Lorraine and Corsica.

With the reign of Louis XVI. began the period of expiation for the misdeeds of the French monarchy and aristocracy, which had culminated in the preceding reign. The king himself was amiable, but the whole administration was rotten, and the court, the nobility, and the clergy formed only one privileged class united to oppress the people. The good intentions of Louis were neutralized by a total lack of energy and firmness. The first difficulty of his government, and the rock on which it split, was the hopeless condition of the public finances, with which Turgot, Necker, Calonne, Brienne, and again Necker tried in vain successively to grapple. Finding all ordinary measures unavailing, Necker demanded the convocation of the states general which had not met since 1614. They met on 5th May, 1789, but as the nobles and clergy refused to conduct business so as to give the third estate its due weight, the deputies of this body assumed the title of the national constituent assembly, and resolved not to separate till they had given a constitution to France. The clergy and nobles then yielded, and the fusion of the three orders was effected on 27th June. Foreign troops, however, were brought to Paris to overawe the assembly. The people now demanded arms, which the municipality of Paris supplied; and on 14th July the bastille was captured and destroyed. Lafayette was made commander of the newly-established national guard. On the 4th August a decisive step was taken by the abolition of all feudal rights and privileges. On 5th October Versailles was attacked by the mob, and the royal family, virtually prisoners, were taken to Paris by Lafayette. The king tried to obtain the aid of some of the foreign powers against his subjects, and made his escape from Paris (20th June, 1791); but he was recognized, arrested at Varennes, and brought back to Paris. On 30th September, 1791, the assembly brought its work to a finish by producing a new constitution, which was sworn to by the king on 14th September, and he was then reinstated in his func-

FRANCE

tions. This constitution deprived the king of arbitrary powers, provided liberty of worship and freedom of the press, of commerce, of industry; abolished the laws of primogeniture and entail as well as titles.

The constitutionalists and monarchists invoked the aid of the Emperor of Germany and the King of Prussia, on behalf of the king, and on 20th April 1792, the assembly declared war against Austria and Prussia. Reverses to the French troops caused a popular rising, and the Tuileries, after a sanguinary combat, were taken and sacked. The king took refuge with his family in the assembly, which was invaded and compelled to submit to the dictation of the victors by assenting to the suspension of the king and the convocation of a national convention in place of the assembly. The first act of the convention was to proclaim a republic. On 3d December the King was cited to appear before it. On 20th January, 1793, he was sentenced to death within twenty-four hours, and on the 21st the sentence was executed. This violent inauguration of the republic shocked public opinion throughout Europe, and armed the neutral states against France. England, Holland, and Spain joined the coalition. The extremists in France only grew more violent, a committee of public safety, with sovereign authority, was appointed 6th April, and the reign of terror begun. Christianity was formally abolished. Risings against the government were put down with frightful bloodshed. Both in Paris and the provinces executions and massacres of persons alleged to be disaffected to the party in power followed each other daily. The queen was executed on 16th October, 1793, the Girondists on 31st October, and others followed, Robespierre being foremost in the bloody work. At length the reign of terror came to an end by the execution of Robespierre and his associates on 27th and 28th July, 1794. Danton and Hébert, his old allies, he had already brought to the scaffold. Marat, another man of blood, had perished by assassination. The campaigns of 1793 and 1794 resulted favorably to the French arms, which were carried beyond the French frontier, Belgium and Holland being occupied, Spain being invaded, and the allies being driven across the Rhine. These successes induced Prussia and Spain to sign the treaties of Basel (1795), recognizing the French republic. In 1795 the convention gave the republic a new constitution, a chamber of five hundred to propose the laws, a chamber of ancients to approve them, an executive of five members, one elected annually, called the directory. The convention was dissolved on 26th October.

Napoleon Bonaparte now began to be the most prominent figure in French affairs; and after his brilliant successes against the Austrians both north and south of the Alps, and his empty conquest of Egypt, it was not difficult for him to overthrow the government of the directory. This was accomplished in the revolution 18th and 19th Brumaire (9th 10th Nov. 1799), the directory being succeeded by the consulate, Bonaparte himself being appointed first consul for ten years. The other two consuls, were to have consultative voices only. Under the appearance of a republic it really established a military monarchy. The history of France for the next sixteen years is virtually the history of Napoleon. (See Napoleon I.) In 1802 the constitution was amended, Napoleon being made consul for life, with the right of appointing his successor. In 1804 he was proclaimed emperor, this being confirmed by a popular vote of 3,572,329 against 2569. The emperor was consecrated at Paris by Pius VII., and in 1805 he was also crowned King of Italy. For years the continental powers, whether singly or in coalitions, were unable to stand against him, though at sea France was powerless after the great victory by Nelson over the French and Spanish fleets at Trafalgar (1805). The Austrians and Russians were decisively defeated at the great battle of Austerlitz (1805); the king of Naples was dethroned and Napoleon's brother Joseph put in his place; another brother, Louis, was made king of Holland; while for a third, Jerome, the kingdom of Westphalia was erected (1807). Prussia was conquered and compelled to accede to humiliating terms. Napoleon was at the height of his power in 1810 and 1811, his empire then extending from Denmark to Naples, with capitals at Paris, Rome, and Amsterdam. By this time, however, the Peninsular War (see that art.) had broken out, which was one immediate cause of his downfall, the disastrous Russian campaign of 1812 being another. The latter cost the French the loss of at least 300,000 men. A new coalition was now formed against Napoleon, and in 1813 he was disastrously defeated by the allies at the great battle of Leipzig. By this time the Peninsular war was drawing to a close and Southern France was actually invaded by Wellington. The allies entered Paris on 31st March, 1814. Napoleon abdicated and received the island of Elba as a sovereign principality. Louis XVIII. was proclaimed king of France, and concluded the Peace of Paris (May 30, 1814). A congress of the great powers had assembled at Vienna to adjust European affairs, when it was announced that Napoleon had left Elba, returned to Paris 20th March, 1815, and been reinstated without resistance in his former authority. The allied sovereigns proclaimed him an outlaw and renewed their alliance against him. Napoleon, anticipating the attack, crossed the Sambre with 130,000 men, defeated Blücher in the battle of Ligny, and marched against the British, who had taken position at Waterloo. Here on the 18th was fought the decisive battle which resulted in his final overthrow. On the 7th July the allies entered Paris for the second time. Napoleon surrendered to the British and was sent to St. Helena as a prisoner.

Louis XVIII. at first governed with the support of a moderate liberal party, but the reactionary spirit of the aristocrats and returned émigrés soon got the upper hand; the country, however, was prosperous. Louis having died 16th Sept., 1824, his brother, Charles X., succeeded. On 26th July, 1830, the Polignac ministry, strongly reactionary in its tendencies published ordinances suppressing the liberty of the press and creating a new system of elections. The result was an insurrection during the three days 27th–29th July by which Charles X. was overthrown and Louis Philippe of Orleans proclaimed king 9th August, 1830. On 24th February, 1848, another revolution drove Louis Philippe into exile. A republic was proclaimed, and on the 10th December, 1848, Louis Napoleon, nephew of the great Napoleon was elected president for four years. The president, having gained the favor of the army, dissolved the legislative assembly on 2d December, 1851, put down all resistance in blood, and by this coup d'état established himself as president for the term of ten years. On 2d December the president was declared emperor under the title of Napoleon III. (a son of the great Napoleon being counted as Napoleon II.). In 1870 the uneasiness of Napoleon and the French at the steady aggrandizement of Prussia broke out into flame at the offer of the Spanish crown to a prince of the house of Hohenzollern. France, not satisfied with the renunciation of the German prince, demanded a guarantee from the King of Prussia that the candidature should never be resumed. This being refused France declared war. (See Franco-German War.) One French army was driven back by the Germans and cooped up in Metz, another was pushed northward to Sedan, and so hemmed in that it had to surrender with the emperor at its head. On the news of this disaster reaching Paris the republic was proclaimed. After an almost uninterrupted series of victories the Germans became masters of the French capital (28th January, 1871), and the war ended in France giving up to Germany Alsace and a part of Lorraine, and paying a war indemnity of five milliards of francs ($1,000,000,000). Meanwhile civil war had broken out in Paris, which was suppressed with great difficulty. (See Commune of Paris.) The assembly elected in 1871 for the ratification of peace with Germany found it expedient to continue their functions, Thiers being the head of the administration. In 1873 the Thiers administration was overthrown and replaced by one under Marshal MacMahon. In 1875 a republican constitution was drawn up. In 1879 MacMahon resigned his presidentship before its legal expiry, being succeeded by Jules Grévy, who has been followed by Carnot (assassinated), Casimir-Perier, Faure, Loubet, and Fallieres. In 1881 France occupied Tunis as a protectorate; the same year Primary Education was made compulsory and free; in 1883-84 France took possession of Tonquin, which led to hostilities with China. In 1885 Madagascar was reduced to submission. In 1906 Armand Fallieres was elected president. In 1907 the law separating church and state went into effect.

At the time of the conquest of Gaul by Julius Cæsar, the principal dialects spoken by the inhabitants were Celtic. After the conquest of Gaul by the Romans all these dialects were gradually supplanted by Latin except in Brittany, where a Celtic dialect still holds its

ground. The popular Latin of Gaul of course exhibited considerable differences from the written and classic Latin. It was still further modified by the influences introduced with the Teutonic invasions. The half-barbarous conquerors, incapable of mastering the intricacy of Latin inflections, mostly neglected them, using only the simpler forms. They enlarged the vocabulary also by a number of words, mostly terms of war, hunting, etc. After the Franks in Gaul had abandoned their native language and adopted this new Romanic or Romance tongue it became known as the Francisca, later Franceis, from which the modern term French is derived. At the beginning of the 16th century Francis I. prohibited the use of Latin at court and in the public tribunal and formally recognized the French as the national language. As one of the Romance languages it is a sister tongue of Italian, Spanish, and Portuguese.

French literature proper begins in the 11th century with the epic or narrative poems known as chansons de geste, and produced by the class of poets known as Trouvères. These poems belong to northern France and are very numerous. They are usually divided into three heads: poems relating to French history, in particular to the deeds of Charlemagne, his descendants and vassals; poems relating to Alexander the Great and to ancient history; and poems of the Arthurian cycle, or relating to King Arthur. They are generally written in verses of ten or twelve syllables, and are of a length varying from 1000 to 20,000 lines. One of the oldest and best examples of the first class is the Chanson de Roland, or Song of Roland.

An abundant lyric poetry flourished from the 11th century. This song literature is manily of a sentimental character, and is usually divided into two classes, romances and pastourrelles. It is in general remarkable for its lyric grace and skilful melody. François Villon (1431–1500), the greatest of French poets before the renaissance, wrote two compositions known as the Great and the Little Testament, interspersed with lyrical compositions of great poetic merit.

The revival of classical learning and the reformation of religion exercised a powerful influence on the French literature of the 16th century. Rabelais (1483–1553), a profound but often gross humorist, and Montaigne (1533–92), an interesting and instructive, though somewhat sceptical essayist, hold the first rank. Calvin (1509–64) did much by his great theological work, Institution de la Religion Chrétienne, to mould French prose in the direction of strength and gravity. With the renaissance translations of the classic dramas appeared, and a member of the Pléiade, Jodelle (1532–1573), wrote the first regular tragedy (Cléopatre) and comedy (Eugène). Pierre Corneille (1606–84), with his Cid, Cinna, Horace, and Polyeucte, brought French tragedy to a depree of grandeur which it has not surpassed. Of seventeenth century prose writers Pascal (1628–62) is vigorous and satirical in his Lettres Provinciales; profound, if sometimes mystical, in his Pensées. Descartes (1596–1650) showed in his Discours sur la Méthode that the language was now equal to the highest philosophical subjects.

The age of Louis XIV. is known as the golden age of French literature. Besides Corneille, Racine (1639–99) represented the tragic drama, and Molière (1639–93) brought his great masterpieces of comedy on the stage. The "inimitable" La Fontaine (1621–95) wrought his Contes and the most charming collections of fables. For his critical influence, if not for his poetry, Boileau (1636–1711) holds a prominent place. In eloquence the sermons and funeral orations of Bossuet, Bourdaloue, and Massillon take the first rank. Bossuet is also celebrated as a controversialist and theological historian. Very important, too, are the memoir and maxim writers of this time. Among the former are the Cardinal de Retz, Madame de Motteville, Madame de Sévigné (1627–96), and others; among the latter are La Rochefoucauld (1613–80), St. Evremond (1613–1703), La Bruyère (1639–99). In fiction Le Sage, who also wrote comedies, produced his immortal Gil Blas and the Diable Boiteux; and the versatile Fontenelle wrote his Dialogues des Morts.

Among the writers of the 18th century Voltaire holds the first place. He claims notice as an epic, lyrical, and comic poet, as a tragic and comic dramatist, as a historian, novelist, and philosopher, and he remained at the head of the republic of letters for more than half a century. Next to him in immediate influence on the age stands Jean Jacques Rousseau (1712–78), a writer of an eloquent sentimental vein, well represented by his Nouvelle Héloise and his famous Confessions. His new theories of politics and education are embodied in his Contrat Social and Emile. Buffon (1707–88) devoted himself to the production of his immense natural history. Montesquieu (1689–1755), commencing with the Lettres Persanes, a satire on French manners and government, followed with a historical masterpiece, Considérations sur la Grandeur et la Décadence des Romains, and finally with his great work, the Esprit des Lois. Diderot (1713–83), a powerful and suggestive writer in many departments, and D'Alembert (1717–83), a great geometrician, founded the Encyclopédie, a vast review of human knowledge, often hostile to social order and always to religion. Among the writers of fiction Bernardia de St. Pierre (1737–1814), author of Paul et Virginie, and Prévost (1697–1763), author of Manon Lescaut, are particularly worthy of mention; while dramatic literature was enriched by the Barbier de Séville and the Mariage de Figaro of Beaumarchais (1732–99).

Neither the revolution nor the first empire was favorable to literature. Châteaubriand (1768–1848) and Madame de Stael (1766–1817) gave a new turn to the taste and sentiment of the time, the former in his Génie du Christianisme and his Martyres, clothing the history of Christianity in the romantic hues of his imagination, the latter in her Corinne and De l'Allemagne introducing the idealistic spirit and thought of the Germans to her countrymen.

Later on in the 19th century the influence of Goethe, Schiller, Shakespeare, Scott, and Byron began to be felt, and a new school, called the romantic, as opposed to the old or classic, sprung up, headed by Victor Hugo (1802–85), who promulgated the new theories in the preface to his drama of Cromwell, and carried them into practice in numerous poems. On the stage the dramas of Alexandre Dumas, the elder (1803–74), though melodramatic and of inferior literary value, served as rallying points for the new school. To English readers, however, he is best known by his novels. Béranger (1780–1857), the greatest of French song-writers may be considered as belonging to neither of the two schools, nor can the sparkling comedies and vaudevilles of Eugène Scribe be claimed by any of the rival parties.

Among novelists, Balzac (1799–1850), by his astonishing series of works, intended to cover the whole ground of human life, has established his claim to the first place. The novels of George Sand (Madame Dudevant, 1804–76), perhaps equally famous, have gained her the reputation of possessing the finest style of any contemporary writer. Low life in Paris was vividly depicted by Eugène Sue (1804–57) in the Mystères de Paris, etc. Of a healty tone are the novels of Frédéric Soulié, Emile Souvestre, and Edmond About (1828–85), and the stories of the two novelists, conjoined in work as in name, Erckmann-Chatrian. The younger Dumas, Victorien Sardou, Octave Feuillet, Ernest Feydeau, Henri Murger, Gustave Flaubert have developed a realistic style of novel in which social problems are treated with more candor than delicacy. Of late years a school of writers has arisen who strive to outdo the most realistic of their predecessors. The chiefs of this school are Emile Zola, Emile Gaboriau, Victor Cherbuliez, Alphonse Daudet, etc.

FRANCE, Isle of, an ancient province of France, so called because it was originally bounded by the Seine, Marne, Ourcq, Aisne, and Oise, and formed almost an island.

FRANCESCA DA RIMINI (frăn-ches′kȧ dȧ rē′mi-nē), an Italian lady, daughter of Guido da Polenta, lord of Ravenna lived in the latter part of the 13th century. She was married to Lanciotto, the deformed son of the lord of Rimini, who, discovering an intimacy between her and his brother Paolo, put them both to death. The story forms an episode in Dante's Inferno, and is alluded to by Petrarch; it is the subject of a poem by Leigh Hunt and a tragedy by Silvio Pellico.

FRANCHISE, in a general and legal sense, a particular privilege or right granted by a prince, sovereign, or government to an individual, or to a number of persons. In politics, in regard to which the term is most commonly used, it is the right of voting for representatives to a legislative assembly or to a municipal body.

FRANCIS I., King of France, was born 1494; died 1547. He ascended the throne in 1515, having succeeded his uncle, Louis XII.

FRANCIS II., King of France, son of Henry II. and Catherine of Medici, born at Fontainebleau in 1544, ascended the throne on the death of his father, 1559.

Francis I.

The year previous he had married Mary Stuart, only child of James V., king of Scotland. Francis, died in December, 1560.

FRANCIS I., Emperor of Germany, eldest son of Leopold, duke of Lorraine was born in 1708. In 1736 he married Maria Theresa, daughter of the Emperor Charles VI. After the death of Charles VI. (1740) he was declared by his wife co-regent of all the hereditary states of Austria, but without being permitted to take any part in the administration. After the death of Charles VII. he was elected emperor in 1745. He died in 1765.

FRANCIS I., Emperor of Austria (previously Francis II., emperor of Germany), was born 1768, died 1835. He was the son of the Emperor Leopold II. and Maria Louisa, daughter of Charles III., King of Spain. He succeeded his father in 1792. France having been declared an empire in 1804, he assumed the title of hereditary Emperor of Austria; and on the establishment of the confederacy of the Rhine in 1806, he renounced the title of Emperor of Germany.

FRANCIS OF ASSISI, ST., founder of the Franciscans, was born at Assisi, in Umbria, in 1182, where he died in 1226. In youth Francis did not refrain from the pleasures of the world; but after a serious illness he became enthusiastically devout, left the paternal roof, and in 1208 gave himself to a life of the most rigorous poverty. His followers were at first few, but when they reached the number of eleven he formed them into a new order, made a rule for them, and got it sanctioned, though at first only verbally, in 1210, by Pope Innocent III. In 1212 he received from the Benedictines a church in the vicinity of Assisi, which now became the home of the order of the Francisans or Minorites. Francis afterward obtained a bull in confirmation of his order, from Pope Honorius III. After an unsuccessful attempt to convert the Sultan Meledin he returned to Assisi, when the order of St. Clara was founded under his direction, and a third order, called the Tertiaries, designed for penitents of both sexes. He was canonized by Pope Gregory IX. in 1228. His festival is on the 4th of October. See Franciscans.

FRANCIS OF PAULA, ST., was born in 1416 in the city of Paula, in Calabria; died in France 1507. To the three usual vows of a monk Francis added a fourth, that of keeping the Lenten fast during the whole year. Twelve years after his death he was canonized by Leo X., and the Catholic Church celebrates his festival April 2.

FRANCIS, Sir Philip, one of the many political writers to whom the authorship of Junius' Letters has been ascribed, was born in Ireland in 1740, died 1818. See Junius.

FRANCIS'CANS, are the members of the religious order established by St. Francis of Assisi about 1210. They are also called Minorites, or Fratres Minores ("lesser friars"), which was the name given them by their founder in token of humility, and sometimes Gray Friars, from the color of their garment. The order was distinguished by vows of absolute poverty and a renunciation of the pleasures of the world, and was intended to serve the church by its care of the religious state of the people. The rule of the order destined them to beg and to preach. The popes granted them extensive privileges, and they had an evil repute as spies, frequenting the courts of princes and the houses of noblemen, gentry, etc. Early in the

Franciscan or gray friar (conventual).

15th century they split up into two branches, the Conventuals and the Observants or Sabotiers. The former went barefooted, wore a long gray cassock and cloak and hood of large dimensions, covering the breast and back, and a knotted girdle. The Observants wore wooden sandals, a cassock, a narrow hood, a short cloak with a wooden clasp, and a brown robe. In France the members of the order not belonging to any particular sect are called Cordeliers, from the cord which they tie about them. The Capuchins, so called from the peculiar kind of hood or cowl (capuce) which they wear, originated in a reform introduced among the Observantists by Matthew of Baschi in the early part of the 16th century.

St. Francis himself collected nuns in 1209. St. Clara was their prioress; hence they were called the nuns of St. Clara. The nuns were also divided into branches, according to the severity of their rules. The Urbanists were a branch founded by Pope Urban IV.; they revered St. Isabelle, daughter of Louis VIII. of France, as their mother. St. Francis also founded in 1221 a third order, of both sexes, for persons who did not wish to take the monastic vows, and yet desired to adopt a few of the easier observances. They are called Tertiarians or Tertiarise, and were very numerous in the 13th century. From them proceeded several heretical fraternities, as the Fraticelli and Beghards. The whole number of Franciscans and Capuchins in the 18th century amounted to 115,000 monks, in 7000 convents. At the dissolution of the monasteries in England there were sixty-five houses of the Franciscans. The order has given five popes and more than fifty cardinals to the church.

FRANCIS JOSEPH I., Emperor of Austria and King of Hungary and Bohemia, born 1830; succeeded his uncle, Ferdinand, who abdicated in 1849.

FRANCIS-JOSEPH LAND. See Franz-Joseph Land.

FRANCIS XAVIER, ST. See Xavier.

FRANCO-GERMAN WAR OF 1870–71. The immediate occasion of this war was an offer made in June, 1870, by General Prim, then at the head of affairs in Spain, of the crown of that country to Leopold of Hohenzollern, a prince belonging to the reigning house of Prussia. The government of Napoleon III. demanded of the King of Prussia that he should forbid the candidature of the prince, and when the prince voluntarily retired from his candidature, still insisted that this renunciation should be formally made by the king, and a guarantee given that the candidature would not be revived. This demand was refused, and a formal declaration of war by France against Prussia was received by Count Bismarck, the Chancellor of the North German confederation, on the 19th of July. The French were the first in getting their troops to the frontier; but it soon became manifest that instead of being in a complete state of readiness for war, as the minister of war had declared, the French army was defective in almost everything essential to the equipment of an army.

In Germany everything formed a complete contrast to this state of matters. Each section of the army was completely organized in the head-quarters of the district which it occupied in time of peace, and was only sent to the frontiers after being furnished with every thing it required. In addition to this Prussia, against which country alone the war had been declared, was not only joined, according to treaty, by all the states of the North German confederation, but also by those of the south, upon whose neutrality, perhaps even upon whose alliance, Napoleon and the French had counted.

The German forces were divided about the end of July into three armies, one of which, known as the first army, had its headquarters at Trèves under General Steinmetz; another of which, known as the second army, occupied the Bavarian

Palatinate under Prince Frederick Charles; while the third army, under the Crown-prince of Prussia, was stationed in Northern Baden. The commander-in-chief of the whole forces was King William of Prussia, who was supported by a staff of general officers, with Von Moltke at their head. The French army, under Napoleon himself, had its head-quarters at Metz, and two advanced divisions were stationed on the borders of France and Germany, the one in the north on the Saar, under General Frossard, the other further south at Weissenburg, under General Douay. The victories of the third army, under the crown-prince, at Weissenburg (Aug. 4) and at Wörth (Aug. 6), and of the first and second armies at Forbach (Aug. 6), put the French army in retreat along its whole line, the southern half in the direction of Nancy, and the northern of Metz. The northern army under Bazaine was overtaken by those of Steinmetz and Frederick Charles on the 14th of August, when an engagement at Courcelles took place, in which the Germans were again victorious. This was followed by the battles of Vionville, or Mars-la-Tour, and Gravelotte, the result being that Bazaine withdrew his army under the protection of the fortifications of Metz, which was now surrounded by an army under the command of Prince Frederick Charles.

Meantime the Crown-prince of Prussia had advanced as far as Nancy, and was there awaiting the result of the battles around Metz. He had still the army of MacMahon to deal with, which had now reached Châlons, where it had been reorganized and strengthened to such a degree that the army of the Crown-prince was no longer able to cope with it unaided. Accordingly, out of three corps d'armée belonging to the second army, a new army was formed, which was afterward called the army of the Meuse, and was placed under the Crown-prince of Saxony. About the 20th of August these two armies set out on parallel routes in the direction of Châlons in order to engage the army of MacMahon, which it was expected would now retreat on Paris. Instead of this, however Count Palikao, minister of war at Paris, issued an order to Marshal MacMahon to strike northward to the Belgian frontier that he might thence make a descent upon Metz and relieve Bazaine. On the 27th of August, at Buzancy, an advanced detachment of cavalry belonging to the army of the Meuse dispersed a body of French chasseurs, and on the days immediately succeeding a number of engagements and strategic movements ensued, the result of which was that on the 1st of September the army of MacMahon was surrounded at Sedan by a force of overwhelmingly greater numbers, and on the following day both army and fortress surrendered by capitulation. On this occasion 50 generals, 5000 other officers, and 84,000 private soldiers became prisoners of war. Among these was Napoleon III., who was unexpectedly found to have been present with the army of MacMahon. He had a personal interview on the day after the battle with King William of Prussia, who assigned to him Wilhelmshöhe, near Cassel, as his place of residence during his captivity.

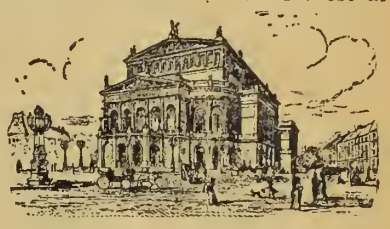
One of the first consequences of this defeat was an outburst of rage on the part of the Parisians against the Napoleon dynasty, which on the 4th of September was declared by Gambetta and some members of the corps législatif belonging to the left to be dethroned. The same members then proclaimed a republic. A government of national defense was formed, at the head of which was placed General Trochu. Meantime France had no availalble army which was strong enough to stand its ground for an instant before the German armies that were now enabled to continue their march upon Paris. The investment of the city was completed on the 19th of September. It was not till about the beginning of October that the French were able to organize a new army after the loss of that of MacMahon, and by the beginning of November the war in the open field had been resumed in different centers: but the capitulation of Metz with the army of Bazaine (28th Oct.), and that of Strasburg (27th Sept.), had set free for further operations large numbers of German troops, and the utmost efforts of the French could not relieve Paris.

The city had held out for a much longer period than even the most sanguine on the side of the French had at first expected that it would be able to do. Sallies were made at intervals by the garrison (Oct. 12, Oct. 21, etc.; Jan. 13, 14, 15, and 19), but not sufficiently often or in sufficient strength to have any decisive effect. On the failure of the last sally, which took place on the west side from Mont Valérien on the 19th of Jan., it was seen that a capitulation was inevitable. On 21st Feb. M. Thiers, head of the executive, arrived at Versailles along with a diplomatic commission, and preliminaries of peace were signed at Versailles on the 26th of Feb., and accepted by the assembly at Bordeaux on the 1st of March. The principal terms were the following:—1. That France should cede to Germany one-fifth part of Lorraine, including Metz, together with the whole of Alsace except Belfort and the surrounding district. 2. That France should pay to Germany a war indemnity of five milliards of francs ($1,000,000,000). 3. That certain departments of France should remain in the occupation of the Germans, and should not be fully evacuated until after the payment of the whole indemnity. The definitive treaty of peace, which was signed at Frankfort on the 10th of May, and ratified on the 21st, confirmed in all essential particulars the preliminaries of Versailles. The last installment of the war indemnity was paid on the 5th of Sept., 1873, and France completely evacuated by the Germans on the 13th of the same month.

FRANK, the signature of a person possessing the privilege of sending letters free of postage.

FRANKFORT, capital of Kentucky and of Franklin county, situated in a group of hills on both sides of the Kentucky river, and on the Louisville and Nashville and the Kentucky Midland Railway; 65 miles by rail e. of Louisville. Pop. 11,400.

FRANKFORT-ON-THE-MAIN, (German, Frankfurt am Main), a town of Prussia, in the province of Hessen-Nassau, 20 miles n.e. of Mayence(Mainz) It was formerly a free town of the empire, and down to 1866 one of the free towns of the German confederation and the seat of the diet. Frankfort is rich in collections connected with literature and art, and in establishments intended to promote them. The chief of these are

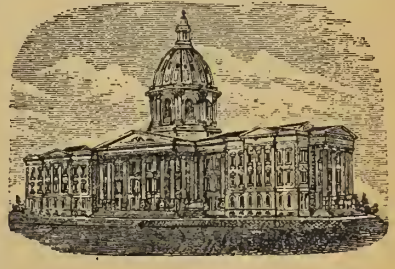


The Opera House, Frankfort.

the Historical Museum (in the Archive-building), the Städel Art Institute (in Sachsenhausen), containing a fine gallery of pictures and other collections; the Senckenberg Museum of Natural History; the town library, possessing over 150,000 printed volumes. There is also a Zoological garden and the Palm garden, both favorite places of resort. The manufactures comprise chemicals, ornamental articles of metal, sewing-machines, straw hats, soap, perfumery, beer, etc. Pop. 288,489.

FRANKFORT-ON-THE-ODER, a town of Prussia, province of Brandenburg, on the Oder, 52 miles e.s.e. Berlin. Pop. 61,852.

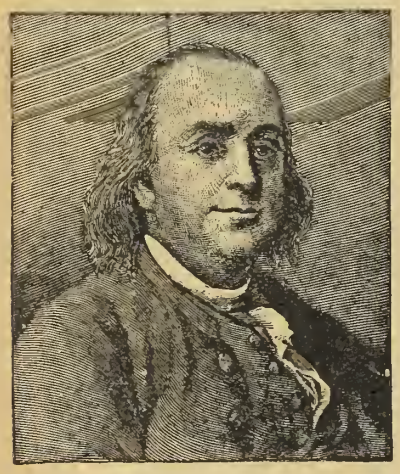
FRANK'INCENSE, a name given to the oleoresinous exudations from different species of conifers. American frankincense is got as a soft, yellow, resinous solid, with a characteristic turpentine odor. Another kind is exuded by the spruce fir, and forms a soft solid, the color of which varies from white to violet red. From this Burgundy pitch is prepared by melting in water and straining through a cloth. The frankincense



State capitol, Frankfort, Ky.

employed in religious ceremonies (called also incense) is a gum-resin obtained from a tree somewhat resembling the sumach and inhabiting the mountains of India. It comes to us in semi-transparent yellowish tears, or sometimes in masses, of specific gravity, 1·22, it possesses a bitter and nauseous taste, and is capable of being pulverized. When burned it exhales a strong aromatic odor, on which account it was much employed in the ancient temples, and still continues to be used in Catholic churches.

FRANKLIN, Benjamin, American writer and statesman, born at Boston Jan. 17, 1706, died at Philadelphia April 17, 1790. He was placed with his brother, a printer, to serve an apprenticeship to that trade, and his brother having started the New England Courant, Franklin secretly wrote some pieces for it, and had the satisfaction to find them well received. But, on this coming to the knowledge of his brother, he was severely lectured for his presumption, and treated with great harshness. Soon after he quitted his brother's employment, and at the age of seventeen started for Philadelphia, where he obtained employment as a compositor. Here he attracted the notice of Sir William Keith, the governor of Pennsylvania, who induced him to go to England for the purpose of purchasing type to establish himself in business. He got work in a printing-office, and after a residence of eighteen months in London returned to Philadelphia. Here he returned to his trade, and in a short time formed an establishment in connection with a person who supplied the necessary capital. They printed a newspaper, which was managed with much ability, and acquired Franklin much reputation. By his exertions a public library, improved systems of education, a scheme of insurance, etc., were established in Philadelphia. In 1732 he published his Poor Richard's Almanack, which continued to be issued till 1757. Being in Boston in 1746 he saw, for the first time, some experiments in electricity, which led him to begin those investigations which resulted in the identification of lightning and electricity, and the invention of the lightning conductor. As member of the provincial assembly of Pennsylvania he showed himself very active, and he was sent out (in 1757) to the mother country as the agent of the province. His reputation was now such, both at home and abroad, that he was appointed agent of the provinces of Massachusetts, Maryland, and Georgia. Oxford and Edinburgh conferred on him their highest academical degrees, and the Royal Society elected him a fellow. In 1762 he returned to America but was again appointed agent in 1764, and brought to England a remonstrance against the project of taxing the colonies. He opposed the stamp-act, and in 1774 presented to the king the petition of the first American congress. On his return he was elected member of the congress, and exerted all his influence in favor of the declaration of independence. In 1776 he was sent to France as commissioner plenipotentiary, to obtain supplies from that court. After the surrender of Burgoyne he concluded with France the first treaty of the new states with a foregin power (1778), and was subsequently named one of the commissioners for negotiating the peace with the mother country. On his return to his native country he filled the office of president of Pennsylvania, and served as a delegate in the federal convention in 1787, and approved the constitution then formed. His works include his unfinished autobiography, and a great number of political, anti-slavery, financial, economic, and scientific papers.



Benjamin Franklin.

FRANKLIN, Sir John, an English Arctic voyager, born in Lincolnshire in 1786, died near Lancaster Sound 1847. He entered the navy as a midshipman at the age of fourteen, and was present at the battle of Copenhagen in 1801. He afterward accompanied Captain Flinders on his voyage to the coast of Australia (1801–03). Shortly after his return he was appointed to the Belleropohn, and had charge of her signals during the battle of Trafalgar. His arctic work began in 1819, when he conducted an overland expedition for the exploration of the n. coast of America from Hudson's Bay to the mouth of the Coppermine river. In a second expedition he surveyed the coast from the mouth of the Coppermine west to Point Beechy, thus traversing in his two expeditions about a third of the distance between the Atlantic and the Pacific. In 1845 he took command of the Erebus and Terror in what proved his last Polar Expedition. The problem was an arctic water-way between the Atlantic and the Pacific. The expedition was seen in Melville Bay two months later, but from that time no direct tidings were received from it. Many expeditions were sent in search of him both from Britain and America, but with little success. At last an expedition, sent out under McClintock in 1857, discovered in 1859, at Point Victory, in King William's Land, a document which had been deposited in a cairn thirteen years before, and gave the latest details of the ill-fated expedition. This paper stated that Sir John died 11th June, 1847; that the ships were abandoned in April, 1848; and that the crews, 105 in number, had started for the Great Fish River. None survived, but many relics of the party have been recovered.

FRANKS, a Germanic tribe or aggregate of tribes which overthrew the Roman dominion in Gaul, and gave origin to the name France. See France.

FRANZ-JOSEPH LAND, an island group in the Arctic Ocean, lying north of Nova Zembla, and consisting of two chief islands, much broke up by fiords, and a number of smaller ones.

FRASER RIVER, the principal river in British Columbia, rising in the Rocky Mountains. It first flows northwest for about 270 miles, then turns south, and after a total course of about 500 miles falls into the Gulf of Georgia. Gold is found both on the Fraser and its affluent and the salmon fisheries are important. Its principal affluents are the Thompson, Quesnelle, and Stuart rivers. New Westminster, Hope, Yale, and Lytton are on its banks.

FRATERNAL ORGANIZATIONS, Membership of, according to the last reports of the supreme bodies of these organizations, the membership of the principal fraternal organizations in the U. States and Canada is as follows:

Odd Fellows	1,521,095
Freemasons	1,229,001
Modern Woodmen of America	813,642
Knights of Pythias	622,466
Independent Order of Rechabites	488,000
Woodmen of the World	450,211
Improved Order of Red Men	406,774
Knights of the Maccabees	325,000
Royal Arcanum	283,011
Ancient Order of United Workmen	275,603
Independent Order of Foresters	250,000
Order of Eagles	250,000
Foresters of America	211,110
Benevolent and Protective Order of Elks	215,000
Ancient Order of Hibernians	210,000
Knights of Columbus	166,494
Junior Order United Amer. Mechanics	163,205
Ladies of the Maccabees	145,293
Knights of the Modern Maccabees	125,000
Ladies Catholic Benevolent Association	95,500
Tribe of Ben Hur	92,500
Knights and Ladies of Honor	92,000
Improved Order of Heptasophs	70,439
Knights of the Golden Eagle	70,431
National Union	62,444
Brotherhood of American Yeomen	61,671
Protected Home Circle	59,981
Catholic Mutual Benefit Association	57,672
Order of Gleaners	56,000
Court of Honor	55,392
Brith Abraham Order	53,853
New England Order of Protection	43,167
Knights of Honor	40,126
Ancient Order of Foresters	38,898
United Order of American Mechanics	36,554
Sons of Temperance	34,789
Independent Order of B'nai B'rith	28,539
Knights of Malta	27,000
Smaller organizations	379,819
Total	9,656,280

FRATERNITIES, the name given to societies of students at American colleges that are usually secret in character. They are called also Greek letter societies because the Greek alphabet usually is employed to designate them, being known by the letters which are the initials of their name. These societies usually are national in character having branches at various colleges which branches are known as chapters. The first Greek letter society, Phi Beta Kappa, was organized at William and Mary College in 1776. This society has become an honorary scholarship organization somewhat different from the more mysterious organizations of which the first was Kappa Alpha established at Union College in 1825. The mysteries in the fraternity are rarely very great and for the most part their only function is to cement ties of friendship among groups of students. Often the fraternities have club-houses known as chapter houses. At these initiations take place which are more or less formidable. Until recent years there was some opposition among the college authorities to the fraternities but with the abolition of some abuses in initiation the attitude of the faculty has changed.

FRATER'NITY, an association of men who unite to promote their common interest, business or pleasure. In this wide sense it includes all secret and benevolent societies, the monastic and sacerdotal congregations, the orders of knighthood, and also guilds, trades-unions, and the like. In a limited sense it is applied to religious societies for pious practices and benevolent objects. They were often formed during the middle ages, from a desire of imitating the holy orders. Many of these societies which did not obtain or did not seek the acknowledgment of the church, had the appearance of separatists, which subjected them to the charge of heresy. The pious fraternities which were formed under the direction of the church, or were acknowledged by it, were either required by their rules to afford assistance to travelers, to the unfortunate, the distressed, the sick, and the deserted, on account of the inefficiency of the police, and the want of institutions for the poor, or to perform certian acts of penitence and devotion. Of this description were the Fratres Pontifices, a brotherhood that originated in Tuscany in the 12th century, where they maintained establishments on the banks of the Arno, to enable travelers to cross the river, and to succor them in case of distress. A similar society was afterward formed in France, where they built bridges and hospitals, maintained ferries, kept the roads in repair, and provided for the security of the highways. Similar to these were the Knights and Companions of the Santa Hermandad (or Holy Brotherhood) in Spain; the Familiars and Cross-bearers in the service of the Spanish Inquisition; the Calendar Brothers in Germany the Alexians in Germany, Poland, and the Netherlands, etc. The professed object of the Alexians, so called from Alexius, their parton saint, was to visit the sick and imprisoned; to collect alms for distribution; to console criminals, and accompany them to the place of execution; to bury the dead, and to cause masses to be said for those who had been executed, or for persons found dead. There were also Gray Penitents (an old fraternity of an order existing as early as 1264 in Rome, and introduced into France under Henry III.), the black fraternities of Mercy and of Death; the Red, the Blue, the Green, and the Violet Penitents, so called from the color of their cowl; the divisions of each were known by the colors of the girdle or mantle. The fraternity of the Holy Trinity, was founded at Rome in 1548 by Philip de' Neri for the relief of pilgrims and the cured dismissed from the hospitals. The Brothers and Sisters of Charity are another fraternity whose hospitals are found in all the principal cities of Catholic christendom.

FRAUD, an act or course of deception deliberately practiced with the view of gaining an unlawful or unfair advantage such as the obtaining of goods under false pretenses, and the like. All frauds or attempts to defraud, which cannot be guarded against by common prudence are indictable at common law, and punishable arbitrarily according to the heinousness of the offense. Every species of fraud which the law takes cognizance of renders voidable every transaction into which it enters as a constituent material element. Fraud may be by false representation, concealment of material circumstances that ought to be revealed, underhand dealing, and by taking advantage of imbecility or intoxication. A constructive fraud in law is such fraud as is involved in an act or contract which, though not originating in any actual evil or fraudulent design, yet has a tendency to deceive or mislead other persons, or to violate public or private confidence, or to impair or injure the public interests.

FRAUNHOFER (froun'hō-fĕr), Joseph von, German optician, born 1787, died 1826. He ultimately became a partner in a manufactory of optical instruments at Munich. His many improvements in glass-making, in optical instruments, and in the polishing of lenses, have been eclipsed by his investigation of the innumerable dark fixed lines in the solar spectrum, known as Fraunhofer's Lines. The importance of this discovery can scarcely be overestimated. It led to the invention and use of the spectroscope, to the science of spectroscopy, and to all our present knowledge of solar and stellar chemistry. See Spectrum, Spectroscope, etc.

FRAZER, Persifor, American geologist, born in 1844 in Philadelphia, Pa. He was an aide on the U. States coast survey in 1862–63; in 1869–70 he was mineralogist and metallurgist on the U. States geological survey; in 1870–74 was professor of chemistry in the University of Pennsylvania, and from 1874 to 1882 was assistant in connection with the second geological survey of Pennsylvania. Among his contributions to science may be cited his explanation of the cause of the white color of the moon as observed by day. He was elected to the American philosophical society in 1871.

FRED'ERIC, Harold, American novelist, was born in Utica, N. Y., in 1856. His first important story, Seth's Brother's Wife, was followed by The Lawton Girl, The Return of the O'Mahoney; The Copperhead, a story of the civil war; and Marsena, a collection of keenly humorous character stories. The Damnation of Theron Ware, a brilliant analysis of religious life minutely realistic in detail, clever in conversation, and unfailing in psychic insight, was immediately recognized by the public as a human document. His last works are Gloria Mundi, and In the Marketplace. He died in 1898.

FREDERICK, a town in Maryland, 44 miles n.w. of Baltimore. It has an extensive trade, chiefly in live stock, grain, flour, tobacco, wool, etc. During the civil war it was occupied on different occasions by the opposing armies. Pop. 10,160.

FREDERICK I., Barbarossa (or, as the Germans call him, Rothbart, both surnames meaning "Red-beard"), German emperor, son of Frederick, duke of Suabia, was born 1121, and received the imperial crown in 1152 on the death of his uncle the Emperor Conrad III. His principal efforts were directed to the extension and confirmation of his power in Italy. In his first expedition to Italy in 1154 he subdued the towns of Northern Italy, and then got himself crowned at Pavia with the iron crown of Lombardy (April 1155), and afterward at Rome by Pope Adrian IV. with the imperial crown (June 1155). In 1188 he assumed the cross, and with an army of 150,000 men and several thousand volunteers set out for Palestine. After leading his army with success into Syria he was drowned in crossing the river Kalybadnus (now Selef), 1190.

FREDERICK II., Hohenstaufen, grandson of the preceding, born 1194, was son of the Emperor Henry VI. and of the Norman Princess Constance, heiress of the two Sicilies. He remained under the guardianship of Innocent III. till 1209, when he took upon himself the government of Lower Italy and Sicily. The imperial crown of Germany was now worn by a rival, Otho IV., whose defeat at the battle of Bouvines opened the way to Frederick, who in 1215, after pledging himself to undertake a crusade, was crowned at Aix-la-Chapelle. He died in the midst of his wars in 1250. He was one of the ablest and most accomplished of the long line of German emperors, and art, literature, commerce, and agriculture received every encouragement at his hands. He himself was a good linguist, was acquainted with natural history, was a minnesinger, and a writer on philosophy.

FREDERICK I., King of Prussia, son of the great elector, born 1657, died 1713. He succeeded his father as Elector of Brandenburg, in 1688; became King of Prussia in 1700; and was all his reign bitterly opposed to France.

FREDERICK II., King of Prussia, known as Frederick the Great, born 1712, died 1786. He was the son of Frederick William I., and the Princess Sophia Dorothea of Hanover, sister of George II. of England. The death of his father raised him to the throne in 1740, and it was not long before he asserted

Frederick the Great.

the claims of the house of Brandenburg to a part of Silesia then held by Maria Theresa. But his proposals being rejected, he occupied Lower Silesia in December, 1740, defeated the Austrians near Mollwitz, and at Czaslau (Chotusitz) and the first Silesian war was terminated by the peace signed at Berlin July 28, 1742, leaving Frederick in possession of Silesia. Soon the second Silesian war broke out, the result of which was equally favorable for Frederick. By the Peace of Dresden (Decem-

ber 15, 1745) he retained Silesia and acknowledged the husband of Maria Theresa, Francis I., as emperor. During the eleven following years of peace Frederick devoted himself to the domestic administration, to the improvement of the army, and at the same time to the muses. He encouraged agriculture, the arts, manufactures, and commerce, reformed the law, increased the revenues of the state, and perfected the organization of his army. which was increased to 160,000 men. Secret information of an alliance between Austria, Russia, and Saxony gave him reason to fear an attack and the loss of Silesia. He hastened to anticipate his enemies by the invasion of Saxony (1756), with which the Seven Years' war, or third Silesian war, commenced. This was a far more severe struggle than either of the former. In it Frederick had against him Austria, Russia, France, Sweden, and greater part of Germany, though Britain and some of the German states were on his side. He gained victories at Prague, Rossbach, Leuthen, Zorndorf, Torgau, Freiberg, but suffered severe defeats in the battles of Kollin, Hochkirch and Kunersdorf. The Peace of Hubertsburg (1763) terminated this war, Frederick keeping Silesia and ceding nothing. On the partition of Poland in 1772 Frederick received a large accession to his dominion. In 1778–79 he frustrated the designs of the Emperor Joseph II. on Bavaria, and the war of the Bavarian Succession was terminated without a battle by the Peace of Teschen (May 13, 1779). Austria consented to the union of the principalities of Franconia with Prussia, and renounced the feudal claims of Bohemia to those countries. In the evening of his active life Frederick concluded, in connection with Saxony and Hanover, the confederation of the German princes, July 23, 1785. An incurable dropsy hastened the death of Frederick, who left to his nephew, Frederick William II., a kingdom increased by 29,000 square miles, a well-filled treasury, an army of 200,000 men, great credit with all the European powers, and a state distinguished for population, industry, wealth and science.

FREDERICK III., Emperor of Germany, born 1831, succeeded William I. March 9, 1888, died June 15, 1888. In 1858 he married the Princess-Royal of Britain, eldest daughter of Queen Victoria. He commanded the army of the Oder in the war with Austria (1866), and in the Franco-German war he led the army which ultimately forced Napoleon III. and his army to surrender at Sedan. He also took a prominent part in the siege of Paris. In 1887 he was attacked by a serious throat affection, which turned out to be of a cancerous character, and which after a series of relapses proved fatal. His renown as a military commander, his liberal views, his patience and fortitude under trouble, and his many lovable qualities made him extremely popular.

FREDERICK AUGUSTUS II. and III., electors of Saxony and kings of Poland. See Augustus.

FREDERICK CHARLES, Prince, known as the "Red Prince," born 1828, died 1885. He was nephew to the Emperor William I., and gained fame for his military exploits during the wars of 1866 and 1870. Sadowa, Thionville, Gravelotte, and St. Privat are among his chief achievements.

FREDERICK WILLIAM, of Prussia, generally called the Great Elector, was born in 1620, died 1688. At the age of twenty he succeeded his father as elector of Brandenburg. He must be considered as the founder of the Prussian greatness, and as the creator of a military spirit among his subjects. His reign began when the unhappy Thirty Years' war was was still raging in Germany, and his conduct toward both parties was prudent. He succeeded in freeing Prussia from feudal subjection to Poland; and obtained possession of Pomerania in 1648. In 1672 he concluded a treaty with the Dutch Republic, when this state was threatened by Louis XIV. In 1673 he concluded a treaty by which France promised to evacuate Westphalia, and to pay 800,000 livres to the elector, who, in return, broke off his treaty with Holland, and promised not to render any aid to the enemies of France. In 1674 the German Empire declared war against France. The elector marched 16,000 men into Alsace, but a Swedish army having been induced to invade Prussia, Frederick turned back and totally defeated them at Fehrbellin (1675). Some years after the Swedes again invaded his territories, but were driven back. France, however, demanded the restoration of all the conquered territories to Sweden. The elector, having refused compliance, formed an alliance with Denmark, and waged a new war against Sweden, but was at last obliged to submit. He paid great attention to the promotion of agriculture and horticulture, and, by affording protection to the French refugees, gained 20,000 industrious manufacturers, who were of the greatest advantage to the north of Germany. Berlin was much improved during his reign. He left to his son a country much enlarged and improved, an army of 28,000 men, and a well-supplied treasury.

FREDERICK WILLIAM I., King of Prussia, son of Frederick I. and father of Frederick the Great (II.), was born in 1688, died 1740. While crown-prince (1706) he married Sophia Dorothea, daughter of the Elector of Hanover, afterward George I. of England. On his accession to the throne, in 1713, he endeavored to increase the army and reform the finances, and became the founder of the exact discipline and regularity which have since characterized the Prussian soldiers. He was very miserly, eccentric, and arbitrary. He opposed Charles XII., and was the protector of the neighboring protestant states. His ridiculous fondness for tall men is well known. He left behind him an abundant treasury, and an army of about 70,000 men. His affairs were in the greatest order and regularity, and to his energy Prussia was much indebted for that prosperity and success which distinguished her till she was humbled by the power of Napoleon.

FREDERICK WILLIAM II., King of Prussia, born 1744, died 1797. He succeeded his uncle Frederick the Great in 1786, and shared in the second partition of Poland.

FREDERICK WILLIAM III., son of Frederick William II., born 1770, died 1840. During his reign Prussia suffered much at the hands of Napoleon, including defeats at Jena, Eylau, Friedland, etc., and lost a large portion of territory, which, however, was recovered after the fall of Napoleon.

FREDERICK WILLIAM IV., King of Prussia, son of Frederick William III., was born 1795, died 1861. He was carefully trained by the best masters in all the leading branches of knowledge and art, civil and military. He took part, though without any active command, in the campaigns of 1813—14. When he succeeded to the throne by the death of his father in 1840 his first proceedings were both of a popular and praiseworthy character. He soon, however, began to pursue a retrograde and absolutist policy. The popular movement which followed the French revolution of 1848 was at first met by the king with firmness, but on the demand of the people that the troops should be withdrawn from the capital, backed by an attack on the arsenal, the king offered concessions, which, however, he retracted on his power becoming more secure. Latterly his mind gave way, and he sank into a state of hopeless imbecility, which rendered it necessary to appoint this brother William regent of the kingdom He died without issue, and was succeeded by his brother, who ten years later became emperor of united Germany.

FREDERICTON, the capital of New Brunswick, Dominion of Canada, on the river St. John, about 84 miles from its mouth, and 54 miles n.n.w. of the town of St. John. It is well laid out, and has handsome public buildings, including the government house, the provincial buildings, court-house, town-hall, cathedral, university, etc.. The trade is extensive and increasing, the river being navigable for large steamers. Pop. 8117.

FREE CITIES, cities having an independent government of their own, and virtually forming states by themselves; a name given to certain cities of Germany which were members of the German confederation, and exercised sovereign jurisdiction within their own boundaries. At the time of the French Revolution the free or "imperial" cities numbered no fewer than fifty-one; but with the exception of Hamburg, Lübeck, and Bremen they have all been deprived of their privileges as the result of various political changes.

FREE COMPANIES, Free Lances, names given to the troops of private adventurers, who, in the middle ages, organized themselves into bands of mercenary soldiers, and let out their services to the highest bidder. They played their most conspicuous part in Italy, where they were called Condottieri.

FREE CONGREGATIONS, sometimes called "Protestant Friends," a sect of German rationalists, who at first professed to be Christians, but now reject the doctrines of miraculous revelation and a personal deity. There are upward

of 120 congregations of them in Germany, and a few in the U. States.

FREEDMEN, was the name applied by the Romans to those persons who had been released from a state of servitude. The freedman wore a cap or hat as a sign of freedom (hence the origin of the cap of liberty), assumed the name of his master, and received from him a white garment and a ring. With his freedom he obtained the rights and privileges of a Roman citizen of the plebian rank, but could not be raised to any office of honor.

FREEDOM OF THE CITY, distinguished visitors are sometimes the recipients of this honor which is in effect the making of such persons an honorary citizen. The custom of such a grant is a survival from medieval times when cities were close corporations and the right of citizenship could not be acquired until after a long term of residence usually seven years after enrollment. In those days when it was desired to honor a man by the abolition of the apprenticeship the magistrates would confer the freedom of the city by vote.

FREEHOLD, in law, an estate in real property, held either in fee-simple or fee-tail, in which case it is a freehold of inheritance, or for the term of the owner's life; also, the tenure by which such an estate is held.

FREE LANCES. See Free Companies.

FREE LIBRARIES. See Libraries.

FREEMAN, Edward Augustus, English historian and archæologist, born 1823, died in 1892. His works, which are very voluminous, include History of Architecture, 1849; History and Conquests of the Saracens, 1656; History of Federal Government, 1863; Old English History, 1869; Growth of the English Constitution, 1872; Historical Essays, 1872–79; History of the Norman Conquest, 1867–76; Historical Geography of Europe, 1881; the Reign of William Rufus, 1882; History of Sicily (unfinished), 1891–92; etc.

FREEMASONRY, a term applied to the organization of a society calling themselves free and accepted masons, and all the mysteries therewith connected. This society, if we can reckon as one a number of societies, many of which are unconnected with each other, though they have the same origin and a great similarity in their constitution, extends over almost all parts of the globe, and is consequently of the greatest service to travelers who are members of the craft. According to its own peculiar language it is founded on the practice of social and moral virtue. It claims the character of charity in the most extended sense; and brotherly love, relief, and truth are inculcated in it. Fable and imagination have traced back the origin of freemasonry to the Roman Empire, to the Pharaohs, the temple of Solomon, the Tower of Babel, and even to the building of Noah's ark. In reality it took its rise in the middle ages along with other incorporated crafts. Skilled masons moved from place to place to assist in building the magnificent sacred structures—cathedrals, abbeys, etc.—which had their origin in these times, and it was essential for them to have some signs, by which, on coming to a strange place, they could be recognized as real craftsmen and not imposters. Freemasonry in its modified and more modern form dates only from the 17th century. The modern ritual is said to have been partly borrowed from the Rosicrucians and knights templars, and partly devised by Elias Ashmole, the founder of the Ashmolean Museum. Freemasonry, thus modified, soon began to spread over the world. In 1725 it was introduced into France by Lord Derwentwater; and in 1733 the first American lodge was established. The United Grand Lodge of England recognizes only two species of Freemasonry—the Craft and the Royal Arch; Scotch, Irish, American, and Continental lodges acknowledge higher degrees; but these, with the exception of the mark degree, are not universal. In ordinary freemasonry there are three grades—those of apprentice, fellow-craft, and master-mason—each of which has its peculiar initiatory ceremonies; the last of these grades, however, is necessary to the attainment of the full rights and privileges of brotherhood.

FREEPORT, county seat of Stephenson co., Ill., 120 miles w. by n. of Chicago; the seat of a Presbyterian college, and manufactures machinery, carpets, etc. Pop. 16,210.

FREE SOIL PARTY, one of the ancestors of the republican party with which it was merged in 1856. During its eight years existence the free soil party's purpose was to prevent the extension of slavery in the territories. Displeased with the refusal of the democratic and whig national conventions to take a stand on the question of the free soil advocates held a national convention at Buffalo in August, 1848, and nominated a presidential ticket which received 291,263 popular votes but no electoral votes. Among its leaders were Chase and Sumner.

FREESTONE. See Sandstone.

FREETHINKERS, an epithet applied to the English Deists of the 17th and 18th centuries who argued for natural as against revealed religion. Anthony Collins (who first made it a name of a party by his Discourse of Free-thinking, London, 1713), and his friend, John Toland, are among the chief of the early freethinkers. Another able writer on the same side was Math. Tindal (died 1733), whose Christianity as Old as the Creation (1730) caused a great sensation. Lord Bolingbroke and Hume take the lead among advanced freethinkers. In France Voltaire and the encyclopedists D'Alembert, Diderot, and Helvetius led the opposition against revealed religion. The same spirit became fashionable in Germany in the reign of Frederick the Great. The term is now generally applied to designate Rationalists in general who are to be found among Christians as well as non-Christians.

FREE-TRADE, the term applied to national commerce when relieved from such interference as is intended to improve or otherwise influence it; that is, unrestricted by laws or tariffs, and not unduly stimulated by bounties. In all countries it was long held to be of importance to encourage native production and manufactures by excluding from their own markets, and from the colonial markets over which they had control the competing produce and manufactures of other countries. On this theory the great body of British commercial legislation was founded until 1846, when the policy of free-trade was introduced in grain, and afterward gradually extended by the repeal of the navigation laws in 1849 and other great measures, until nearly all British commercial legislation has been brought into conformity with it. Free-trade can hardly yet be said to have been adopted as a principle of commercial policy by any nation except Great Britain. As an economical principle free-trade is the direct opposite to the principle or system of protection, which maintains that a state can reach a high degree of material prosperity only by protecting its domestic industries from the competition of all similar foreign industries. To effect this protecting countries either prohibit the importation of foreign goods by direct legislation, or impose such duties as shall, by enhancing the price, check the introduction of foreign goods. The advocates of what is called fair trade in Britain profess a preference for free-trade were it universal or even common; but seeing that Britain is almost the sole free-trade country in the world, declare that a policy of reciprocity is required for the protection of British traders and manufacturers. The progress made by Britain since 1846 is adduced as a striking proof of the wisdom of a free-trade policy, even without reciprocity.

FREEZING, CONGELATION, or SOLIDIFICATION, the transformation of a liquid into a solid under the influence of cold. Each liquid always solidifies at the same temperature, which is called its freezing-point, and the solid also melts again at the same temperature. Thus the freezing-point and the melting point, or point of fusion, are the same, and the point is always the same for the same substance. Consequently the freezing-point of water, or the melting-point of ice (32° Fahr.), is taken for one of the fixed points in thermometry. The freezing-point of mercury is 39° below zero, of sulphuric ether 46° below zero, of alcohol 203° below zero Fahr. It has been shown that the increase of pressure upon water, and upon all substances which expand in freezing, will lower the freezing-point; and that such substances as wax, spermaceti, sulphur, and paraffin, which contract in freezing, have the freezing-point raised by pressure. Artificial freezing is attained by the liquefaction of solids or the evaporation of liquids. These processes absorb heat, and by abstracting it from the surrounding substances freeze the latter. Among freezing-mixtures are: (1) two parts of pounded ice or fresh snow and one part of common salt, which causes the thermometer to fall to −4°; (2) equal parts of water, of powdered crystallized nitrate of ammonia, and of powdered crystallized carbonate of soda, which produces a cold of −7°; (3) three parts of snow with four parts of crystallized chloride of calcium, producing a temperature of −54°; while (4) with a mixture of liquid

nitrous oxide and carbon disulphide a temperature of −220° is reached.

FREEZING, FUSING, and BOILING POINTS:

Substances.	Reaumur.	Centi-Grade.	Fahrenheit.
Bromine freezes at	− 17.6°	− 22°	− 7.6°
Olive Oil freezes at	8	10	50
Quicksilver freezes at	− 31.5	− 39.4	− 39
Water freezes at	0	0	32
Bismuth metal fuses at	211	264	507
Copper fuses at	963	1,204	2,200
Gold fuses at	1,105	1,380	2,518
Iron fuses at	1,230	1,538	2,800
Lead fuses at	260	325	617
Potassium fuses at	50	62.5	144.5
Silver fuses at	800	1,000	1,832
Sodium fuses at	76.5	95.6	204
Sulphur fuses at	92	115	239
Tin fuses at	182	228	442
Zinc fuses at	329.6	412	773
Alcohol boils at	63	74.4	167
Bromine boils at	50	63	145
Ether boils at	28.4	35.5	96
Iodine boils at	140	175	347
Water boils at	80	100	212

Authorities vary on some of these points. The best are given.

FRELINGHUYSEN, Frederick Theodore, American lawyer and political leader was born in Millstone, N. J., in 1817. In 1866 he was appointed by Governor Ward a U. States senator, to fill the vacancy caused by the death of William Wright. In 1871 he was elected to the U. States senate. After the disputed election of 1876 he was one of the framers of the bill creating the electoral commission, and after the commission was constituted, in 1877, served as one of its members. After several years spent in the active practice of his profession, he again entered political life, as the successor of James G. Blaine as secretary of state in the cabinet of President Arthur. He died in May, 1885.

FREMONT, county seat and capital of Sandusky co., Ohio. It has a considerable trade, lines of steamers running from the city, which stands at the head of steam navigation on the river Sandusky, to the principal ports of Lake Erie. Pop. 11,417.

FREMONT, John Charles, American explorer, born at Savannah, Georgia, 1813. He conducted five separate and adventurous expeditions which explored the passes of the Rocky Mountains, and practically opened up the great far west. He took an active part in the conquest of Upper California, and served in the civil war. Latterly he became a lawyer and an active promoter of railroads. He died in 1890.

FRENCH BEANS, or **KIDNEY-BEANS,** the haricots of the French, are the products of a native of the East Indies, but now commonly cultivated in all parts of the globe. This plant is a twining annual, bearing alternative leaves, on footstalks, composed of three oval pubescent folioles. The flowers are whitish, somewhat resembling those of the pea. The seeds are more or less kidney-shaped.

FRENCH, Daniel Chester, American sculptor, born at Exeter, N. H., 1850. The Minute Man, and the Gallaudet Monument in Washington and his relief Death and the Sculptor exhibited at the World's Fair in Chicago are among his best known works, but his monuments are scattered throughout the country.

FRENCH HONEYSUCKLE, the inappropriate name of a leguminous plant, a common perennial in gardens, where it is grown for the sake of its beautiful scarlet flowers. In Sicily and Spain it is largely cultivated as a green crop, yielding an enormous quantity of herbage.

FRENCH POLISH, a solution of shellac in alcohol, used for giving a smooth surface-coating to furniture and cabinet work. The most common of the varnishes known under the name of French polish are prepared as follows: Pale shell-lac, 5½ oz.; finest wood-naphtha, 1 pint: dissolve. Or pale shell-lac, 3 lb.; wood-naptha, 1 gallon. Methylated spirit (68 o.p.) may be substituted for the naptha in the above furmulæ. These varnishes are sometimes colored to modify the character of the wood. A reddish tinge is imparted by dragon's-blood or red sanders-wood, and a yellowish tinge by gamboge or turmeric-root.

FRENCH REVOLUTION. See France.

FRENEAU' (fre-nō'), Philip, the first genuine American poet of marked ability. His poetry is largely satirical. The beautiful lyric "The Indian Burying Ground," "The Wild Honeysuckle," and "Eutaw Springs" have had a permanent and enduring fame. He died in 1832.

FRESCO PAINTING, a method of mural painting in water colors on fresh or wet grounds of lime or gypsum. Mineral or earthy pigments are employed, which resist the chemical action of lime. In drying, the colors are incorporated with the plaster, and are thereby rendered as permanent as itself. In producing fresco paintings, a finished drawing on paper, called a cartoon, exactly the size of the intended picture, is first made, to serve as a model. The artist then has a limited portion of the wall covered over with a fine sort of plaster, and upon this he traces from his cartoon the part of the design suited for the space. As it is necessary to the success and permanency of his work that the colors should be applied while the plaster is yet damp, no more of the surface is plastered at one time than what the artist can finish in one day. A portion of the picture once commenced, needs to be completely finished before leaving it, as fresco does not admit of retouching after the plaster has become dry. On completing a day's work, any unpainted part of the plaster is removed, cutting it neatly along the outline of a figure or other definite form, so that the joining of the plaster for the next day's work may be concealed. The art is very ancient, remains of it being found in India, Egypt, Mexico, etc. Examples of Roman frescoes are found in Pompeii and other places. After the beginning of the 15th century fresco painting became the favorite process of the greatest Italian masters, and many of their noblest pictorial efforts are frescoes on the walls of palaces and churches. Some ancient wall-paintings are executed in what is called Fresco Secco, which is distinguished from true fresco by being executed on dry plaster, which is moistened with lime water before the colors are applied.

FRESNEL (frā-nel), Augustin Jean, French physicist, born 1788, died 1827. He did much to establish the undulatory theory of light, made several important discoveries in the polarizing of light, and greatly improved the apparatus for lighting lighthouses.

FRESNO, a city and county seat of Fresno county, Cal., 270 miles southeast of San Francisco, on the Southern Pacific and the Atchison, Topeka & Santa Fe railroads. Pop. 14,514.

FRETS, certain short wood, ivory, or metal cross-bars on the finger-boards of stringed instruments, as the guitar, etc., which regulate the pitch of the notes. By pressing the string down to the finger board behind a fret only so much of the string can be set in vibration as lies between the fret and the bridge.

FREYCINET (frā-si-nā), Charles Louis de Saulces de, French statesman, born at Foix (Ariége) 1828. He was trained as an engineer, and held several important appointments; he was elected to the senate in 1876; was minister of public works 1877; minister for foreign affairs 1877–79; and president of the council and minister for foreign affairs for longer or shorter periods in 1879, 1880, 1882, 1885, and 1886. He is the author of several important works on engineering.

FREYTAG (frī'tāh), Gustav, German poet, dramatist, and novelist, born 1816. He was editor of the Leipzig Grenzboten from 1848 to 1870, and has produced numerous successful plays, tales, and poems. Among his more famous works are: Debit and Credit; Pictures from the German Past; The Lost Manuscript; and Our Ancestors, a series of six romances illustrative of old German life. He died in 1895.

FRIAR, in the Roman Catholic Church an appellation common to the members of all religious orders, but more especially to those of the four mendicant orders, viz. (1) Minors, Gray Friars, or Franciscans, (2) Augustines; (3) Dominicans or Black Friars; (4) White Friars or Carmelites.

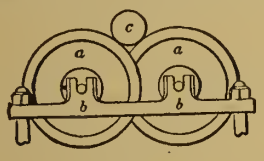
FRICASSEE (fri-kas-sē'), a dish of food made by cutting chickens, rabbits, or other small animals into pieces, and dressing them with a strong sauce in a frying-pan or a like utensil.

FRICTION, in physics, the effect of rubbing, or the resistance which a moving body meets with from the surface on which it moves. Friction arises from the roughness of the surface of the body moved on and that of the moving body. No such thing can be found as perfect smoothness of surface in bodies. In every case there is, to a less or greater extent, a roughness or unevenness of the parts of the surface, arising from peculiar texture, porosity, and other causes and therefore when two surfaces come together the prominent parts of the one fall into the cavities of the other. This tends to prevent or retard motion, for in dragging the one body over the other an exertion must be used to lift the prominences over the parts which oppose them. What is called the coefficient of friction for any two surfaces is the ratio that subsists between the force necessary to

move one of these surfaces horizontally over the other, and the pressure between the two surfaces. Thus the coefficient of friction for oak and cast-iron is 38:100, or ·38. Friction plays a most important part in nature and art; for instance, but for it threads could not be made nor textile fabrics manufactured.

FRICTION-ROLLERS, a name common to any small rollers or cylinders employed to convert sliding motion into rolling motion. Such cylinders are often placed under heavy bodies when they are required to be moved any short distance on the surface of the ground; and, in machinery, the same method is occasionally employed to diminish the friction of a heavily-loaded axis. In that case a number of small cylinders are inclosed round the axis, and partake of its motion.

FRICTION-WHEELS, in machinery, two simple wheels or cylinders intended to assist in diminishing the friction of a horizontal axis. The wheels are simply plain cylinders a, a, carried on parallel



Friction-wheels.

and independent axes b, b. They are disposed so as to overlap pair and pair at each end of the main axis c, which rests in the angles thus formed by the circumferences. The axis, instead of sliding on a fixed surface, as in ordinary cases, carries round the circumferences of the wheels on which it is supported with the same velocity as it possesses itself, and in consequence of the friction of the system is proportionately lessened.

FRIDAY, the sixth day of the week, from the Anglo-Sax. Frige-dæg, the day sacred to Frigga or to Freya, the Saxon Venus. See Good Friday.

FRIEDRICH, the German form of Frederick.

FRIENDLY ISLANDS, or **TONGA ISLANDS,** a cluster in the South Pacific Ocean, between lat. 18° and 23° s., and lon. 173° and 176° w. They consist of three groups, which are divided from each other by two narrow channels, and number altogether about 150, with a collective area of about 400 sq. miles The islands are nearly all volcanic, with coral reefs and rocks about them; earthquakes and volcanic eruptions are frequent, during one of which, in Oct., 1885, a new island 2 miles in circumference suddenly appeared. These islands were discovered in 1643 by Tasman, but received their collective name from Cook. They are now governed by a native Christian prince. The trade is considerable, the chief exports being copra, coffee, and wool. Pop. estimated at 17,500.

FRIENDLY SOCIETY, the name of English benefit associations established by the workingmen themselves for certain forms of self-help, but now developed into mutual insurance societies. The benefits given by friendly societies are generally for sickness and funeral allowances. Other forms of benefit sometimes found are: endowments, insurance for shipwrecks, loss or damage to boats, tools, or implements, medical aid dispensaries, widows' and orphans' funds, convalescent homes, asylums for the aged, and traveling relief for those out of employment. The strongly centralized societies have no social union, but only a business relationship with their members, as the dues are paid through agents or the post-office.

FRIENDS, THE SOCIETY OF, the denomination of Christians known as Quakers, dating from about 1647. In spite of cruel and severe persecutions, the Friends succeeded in establishing themselves in Europe and America. They have never been numerically powerful, having at no time exceeded, if indeed they have ever reached, 200,000 members; but the purity of life which has so honorably distinguished them as a class, has unquestionably exercised a salutary influence on the public at large; while in respect to certain great questions affecting the interests of mankind, such as war, slavery, and oaths, they have, beyond all doubt, originated or emphasized opinions and tendencies which are no longer confined to themselves, but have widely leavened the mind of Christendom.

FRIENDS. See Quakers.

FRIESLAND, the most northerly province of Holland, sometimes called West Friesland to distinguish it from East Friesland, now the district of Aurich in Hanover. It is generally flat, and parts of it are below sea-level. The area is 1281 sq. miles, four-fifths of which are under cultivation. Leeuwarden is the capital. Pop. 333,435. See Frisians.

FRIEZE (frēz), a kind of coarse woolen stuff or cloth, with a nap on one side.

FRIEZE (frēz), in architecture, that part of the entablature of columns which lies between the architrave and cornice. It is a flat member or face, usually enriched with figures or other ornaments of sculpture. See Entablature.

FRIG'ATE, in the navy, among ships of war of the older class, a vessel of a size larger than a sloop or brig and less than a ship of the line; usually carrying her guns (which varied from about thirty to fifty or sixty in number) on the main deck and on a raised quarter-deck and forecastle, or having two decks. Such ships were often fast sailers, and were much employed as cruisers in the great wars of the 18th and early part of the 19th centuries. Since the introduction of iron-clad vessels the term crusier has been applied to ships taking the place of the frigates of former days.

FRIGATE-BIRD, or **MAN-OF-WAR BIRD,** a tropical web-footed bird of the family Pelecanidæ. Including the long tail the male bird reaches 3 feet in length, but the body is comparatively small. The bill is longer than the head, strong, hooked at the point, and sharp. In proportion to their size their wings are longer than in any other bird, having an extent of 7 feet or more. Their flight is powerful and graceful; they neither swim nor wade, but catch the flying-fishes in the air, and cause fishing-birds to disgorge their prey, which they dexterously seize as it falls.

Frigate-bird.

FRIGGA, or **FRIGG,** in northern mythology, the wife of the god Odin, the goddess after whom Friday is named. She is a goddess in some respects corresponding with Venus.

FRILLED LIZARD, an Australian lizard, so called from a curious membrane-like ruff or tippet round its neck, covering its shoulders, and which lies

Frilled-lizard.

back in plaits when the animal is tranquil, but which elevates itself when it is irritated or frightened. A full-grown specimen is about 3 feet in length.

FRINGE-TREE, a small tree belonging to the same natural family with the olive, and having snow-white flowers which hang down like a fringe, inhabiting America from lat. 39° to the Gulf of Mexico. It is frequently cultivated in gardens as an ornamental plant. Four other species are known, two of which inhabit the West Indies, the third Ceylon, and the fourth Australia.

FRISIANS, a German tribe who, about the beginning of the Christian era, occupied the territory between the mouths of the Rhine and the Ems. They became tributaries of Rome under Drusus, and lived for some time on friendly terms with their conquerors, but were driven to hostilities by oppression. In time they extended as far eastward as Slesvig, and even made settlements on the Firth of Forth, and probably in other parts of Northern Britain. About the end of the 7th century the Frisians in the southwest were subdued by the Franks under Pépin d'Héristal, who compelled them to accept Christianity. A century later the eastern branch of the tribe was con-

quered and christianized by Charlemagne. Their country was divided into three districts, two of which were annexed on the division of the Carlovingian Empire to the possessions of Louis the German, and the other to those of Charles the Bald. The latter part was called West Frisia (W. Friesland), and the two former East Frisia (E. Friesland). Their modern history is chiefly connected with Holland and Hanover. The Frisian language holds in some respects an intermediate position between Anglo-Saxon and Old Norse. Of all the Teutonic dialects it is the most nearly related to English. Its ancient form exists only in some remarkable collections of laws. Three dialects of it are now recognized: the West Frisian, spoken in the Dutch province of Friesland, about Leeuwarden, Bolsward, etc., and used to some extent in literature; the East Frisian, spoken between the mouths of the Ems and Weser; and the North Frisian, spoken on the west coast of Schleswig, and South Jutland, and on the islands Sylt, Föhr, Amrun, etc.

FROEBEL (freu'bĕl), Friedrich Wilhelm August, German educationist, born 1782, died 1852. After an unsettled and aimless youth, and with somewhat imperfect culture, he started teaching, and soon developed a system which has become famous under the name of Kindergarten. He is the author of Human Education, and Mutter-und-Kose-lieder, a book of poetry and pictures for children.

FROG, the common English name of a number of animals belonging to the class Amphibia, having four legs with four toes on the fore feet and five on the hind, more or less webbed, a naked body, no ribs, and no tail. Owing to the last peculiarity frogs belong to the order of amphibians known as Anura or tailless Amphibia. The tongue is fleshy, and is attached in front to the jaw, but is free

Frog and its metamorphoses.
1, 2, 3, 4, Various stages of tadpole state; 5, fully formed animal.

behind, so that the hinder extremity of the tongue can be protruded. Frogs are remarkable for the transformation they undergo before arriving at maturity. In the spring the spawn is deposited in ponds and other stagnant waters in large masses, of gelatinous matter. These masses, with black globules scattered through them, soon manifest change, and after a time the young escapes as a tadpole, as an animal with short body, circular suctional mouth, and long tail, compressed from side to side. Gills project on either side of the head from a cleft which answers in position to the gill opening of fishes. The hind limbs first appear as buds, later the ore limbs project, the gills disappear, the lungs becoming more fully developed; the tail gradually shrinks and disappears, and the animal, which was at first fish-like, then closely resembled a newt (or tailed Amphibian), finally assumes the adult or tailless form. The mature frog breathes by lungs, and cannot exist in water without coming to the surface for air. The only British species is the common frog, but the tribe is very numerous, other varieties being the edible frog of the south of Europe, caten in France and south Germany, the hind quarters being the part chiefly used; the bull-frog of America, 8 to 12 inches long, so named from its voice resembling the lowing of a bull; the blacksmith frog of Janeiro; the Argus frog of America, etc. Frogs swim with rapidity, and move by long bounds, being able from the power of the muscles of their hind-legs to leap many times their own length.

FROH'MAN, Charles, American theatrical manager, was born in Sandusky, Ohio, in 1858. After having become an independent manager of various companies "on the road," he established himself in 1893 at the Empire Theater, New York, and in the season of 1895–96 formed with several managerial firms the "syndicate," which has gradually strengthened its position till in many parts of the country it has a practical monopoly of playhouses. He has brought out as stars Maude Adams, Julia Marlowe, John Drew, and other well-known actors.

FROHMAN, Daniel, American theatrical manager, born in Sandusky, Ohio, in 1853. He has managed the Fifth Avenue, Madison Square, the Lyceum and Daly's Theaters, besides the Daniel Frohman Stock Company and various special attractions.

FROISSART (frwâ-sâr), Jean, a French poet and historian, was born in 1337 at Valenciennes, died in Flanders between 1400 and 1410. At the age of eighteen he went to England, where, having already the reputation of being a gay poet and narrator of chivalric deeds, he was received with great favor, Philippa of Hainault, wife of Edward III., declaring herself his patroness.

FRONDE (frond), a French party during the minority of Louis XIV., which waged civil war against the court party on account of the heavy fiscal impositions laid on the people by Cardinal Mazarin, whom the queen-mother had appointed prime-minister after the decease of Louis XIII. (1648). At the head of the Fronde stood the Cardinal de Retz, and latterly the Prince Louis Condé. The result of this contest, which lasted from 1648 to 1654, served only to strengthen the royal power. The name is from Fr. Fronde, "a sling," a member of the parliament having likened the party to boys slinging stones in the streets, but who dispersed on the appearance of the authorities.

FROST, the name we give to the state of the weather when the temperature is below the freezing-point of water (32° F.). The intensity of the cold in frost is conveniently indicated by the popular expression so many degrees of frost, which means that the temperature of the atmosphere is so many degrees below the point at which the freezing of water commences. Frost is often very destructive to vegetation, owing to the fact that water, which is generally the chief constituent of the juices of plants, expands when freezing, and bursts, and thus destroys the vesicles of the plant. In the same way rain-water, freezing in the crevices of rocks, breaks up their surfaces, and often detaches large fragments. Hoar-frost is frozen dew. It may either freeze while it is falling, when it is found loosely scattered on the ground; or being deposited as dew in the early part of the night it may freeze during a subsequent part of it, owing to radiation. It is generally seen most profusely in spring and autumn; because at those times, while on clear nights the cold is sufficient to freeze the dew, the days are at the same time sufficiently warm to cause a very considerable quantity of moisture to evaporate into the air.

FROST-BITE, a condition caused by the action of frost on the human economy. It is generally local and partial, varying from ordinary chilblain to complete death of the part frozen. The simplest treatment consists in coaxing back the vitality of the part affected by means of friction.

FROSTED-GLASS, glass roughened on the surface, so as to destroy its tranparency, in consequence of which the surface has somewhat the appearance of hoar-frost.—The term frosted is also applied to the dead or lusterless appearance of gold and silver jewelry when polishing the surface is omitted.

FROUDE (frŏd), James Anthony, historian and miscellaneous writer, born at Totness, Devonshire, 1818. He was educated at Oxford, was elected fellow of Exeter College, and received deacon's orders. He resigned his fellowship and withdrew from orders on the publication of his Nemesis of Faith, 1848. Between the years 1856 and 1869 appeared his great work The History of England from the Fall of Wolsey to the Defeat of the Spanish Armada, which was very pŏpular, though it received but doubtful approval from historians. He was made literary executor to Carlyle, and his Life of Carlyle, and Carlyle's Reminiscences, and Letters and Memorials of Jane Welsh Carlyle, as edited by him, provoked an extraordinary amount of interest and controversy. Among his other works are Short Studies on Great Subjects; English in Ireland in the Eighteenth Century; Julius Cæsar; Oceana, or England and her Colonies; The English in the West Indies, etc. He died in 1894.

FRUIT, in botany, the seed of a plant, or the mature ovary, composed essentially of two parts, the pericarp and the seed. In a more general sense the term is applied to the edible succulent products of certain plants, generally covering and including their seeds.

FU-CHOW. See Foo-chow.

FUCHSIA (fu'shi-a), a genus of beautiful flowering shrubs, natives of South America, Mexico, and New Zealand, nat. order Onagraceæ, characterized by having a funnel-shaped, colored, deciduous, four-parted calyx, sometimes with a very long tube; four petals set in

the mouth of the calyx-tube and alternating with its segments; eight exserted stamens, and a long style with a capitate stigma. This is one of our most common decorative greenhouse plants, while the hardy varieties out of doors in the open border form an important feature with their drooping elegant habit and their wonderful profusion of flowers.

FUEL, carbonaceous matter, which may be in the solid, the liquid, or the gaseous condition, and which, in combining with oxygen, gives rise to the phenomenon of heat, the heat being made use for domestic, manufacturing, or other purposes. The most important of the gaseous fuels is common coal-gas, which is now commonly applied for the heating of rooms by means of gas-fires and gas-stoves. For such purposes the coal-gas should be mixed with air just below the point at which it is burned. It then gives a blue, hot, and smokeless flame. A gas-fire may be obtained in an ordinary grate by filling it with asbestos, which is heated to incandescence by gas properly applied. Gas-stoves of various constructions are also used for heating apartments, cooking, etc. Another gaseous fuel now coming into use for industrial purposes is water-gas, obtained by the decomposition of water. The principal liquid fuels are petroleum, shale-oil, creosote, the various animal and vegetable oils, and alcohol. It is only the mineral oils that are used to any great extent for producing heat. Alcohol is only employed in operations requiring the application of a small volume of heat, and in such it is as convenient and manageable a fuel as can be desired. Successful attempts have been made in recent times to discover methods by which liquid fuel, and more especially petroleum, may be applied to the heating of steam-boilers. In some of the systems it is the combustion of the oil itself, supplied in the form of spray, that produces the heat; in others the oil is volatilized by means of superheated steam, and the gas is burned in the furnace from ordinary pipes as in a gas-stove. The heating power of petroleum is considerably greater than that of coal, and in a ship, for instance, it would occupy less space, while the laborious process of stoking would be dispensed with. Creasote has been successfully employed as fuel in the process of armor-plate bending. Peat is used as a domestic fuel in many places, but, compared with the more solid fuels, it is unfit to be employed for producing very strong heats. An improvement in the use of it as a fuel, however, has been introduced by employing a process of compression, which gives it almost the solidity of coal. It is also sometimes soaked in oil or tar, and then used in the form of bricks. Wood, is in some countries almost the only sort of fuel to be had. In France, Germany, etc., it is extensively used in metallurgy as well as for domestic purposes. Before it is suited for making satisfactory fuel, wood must be dried for a considerable time either in the open air or under cover, but the latter method is better, as little or no decomposition of the wood goes on. Woods that have a close and compact texture, such as the oak, beech, or elm, burn much more slowly and with less flame than soft woods like the lime, horse-chestnut, or pine; the latter are consequently preferred as fuel for some purposes. Coal, as is well known, is of vegetable origin, and this is clearly seen in that variety of it known as lignite, which still retains its woody structure, even to the eye. Wood charcoal is another kind of fuel which is extensively used in metallurgy, chemistry, and in various industrial arts. It kindles quickly, emits few watery or other vapors while burning, and, when consumed, leaves few ashes, and those very light. They are, therefore, easily blown away, so that the fire continues open, or pervious to the current of air which must pass through it to keep it burning. This sort of fuel, too, is capable of producing as intense a heat as can be obtained by any; but in violent heats it is quickly consumed, and needs to be frequently supplied. Coke or pit-coal charred is a fuel which possesses in many respects the same properties as charcoal of wood. It is employed for producing intense melting heats. Various kinds of artificial fuel are manufactured. These are composed of different ingredients, of which coal slack or dust is the most important. The coal-dust is mixed with some adhesive substance, such as clay, lime, coal-tar, etc., and compressed into bricks. Slack-coal has also been employed as fuel in an entirely different mode. It is ground as fine as possible, and blown into the furnace, where it burns much in the same way as the spray of liquid fuel.

FUGITIVE SLAVE LAWS, the surrender of escaped slaves and criminals was authorized by a law passed in 1793 under a clause in article 4 of the United States constitution. The compromise of 1850 provided a new and more stringent law under which a marshal was liable to a fine for a refusal to execute writs under the act, and he was made liable for the value of a slave escaping from his custody. The testimony of the person claimed to be a slave was not to be considered. The commissioner was given a fee of $10 if the prisoner were adjudged a slave but only $5 were he declared free. Under this law the kidnaping of free negroes in the north became frequent and many cases of cruelty occurred. The law met with little support in the north, many of the states enacting legislation which rendered it nugatory and the south of course regarded this as a breach of faith. The fugitive slave laws were repealed in 1864.

FUGUE (fūg), a musical term derived from the Latin word fuga (a flight), and signifying a polyphonic composition constructed on one or more short subjects or themes, which are harmonized according to the laws of counterpoint, and introduced from time to time with various contrapuntal devices, the interest in these frequently-heard themes being sustained by diminishing the interval of time at which they follow each other, and monotony being avoided by the occasional use of episodes, or passages open to free treatment.

FUJI-YAMA or **FUSI-YAMA,** a dormant volcano of a symmetrical cone-like shape, in the island of Hondo, Japan, the sacred mountain of the Japanese. It has been quiescent since 1707; is 12,400 feet in height, and is visible in clear weather for a distance of nearly a hundred miles.

FULCRUM, in mechanics, the support or fixed point about which a lever turns. See Lever.

FUL'GURITE, any rocky substance which has been fused or vitrified by lightning. More strictly a vitrified tube of sand formed by the intense heat of lightning penetrating the sand, and fusing a portion of the materials through which it passes.

FULHAM (ful'am), one of the London mun. and parl. boroughs, bounded by the Thames, and the boroughs of Chelsea, Kensington, and Hammersmith. It contains the palace of the Bishop of London, and returns one member to parliament. Pop. of mun. bor. 137,289.

FULLER, George, American figure, portrait, and landscape painter, was born at Deerfield, Mass., in 1822. He spent several years in Boston, portrait painting, then removed to New York, and continued his studies at the academy. He was elected associate of the National academy in 1857. He went south for three years, making many studies of negro life. In 1860 he went to Europe. His later works show his keen appreciation of nature. In 1876 he exhibited fourteen pictures in Boston which were received with enthusiasm. This was followed by frequent exhibitions at the Academy. In 1879 Mr. Fuller showed the Romany Girl, and She Was a Witch. In 1880, the Quadroon, and in 1881, the loveliest of all his works—the "Winifred Dysart." "Turkey Pasture in Kentucky" is one of his finest examples. He died in 1884.

FULLER, Melville Weston, American jurist, a chief justice of the supreme court of the U. States, was born in Augusta, Me., in 1833. In 1856 he established himself at Chicago, Ill., where he continued to practice law until 1888. He was a member of the Illinois state constitutional convention of 1862, and in 1863 sat in the lower house of the Illinois legislature. In 1888 he was appointed by President Cleveland chief justice of the U. States supreme court, to succeed M. R. Waite, deceased. His term witnessed an expansion of the federal powers by means of the decision asserting the implied authority of the executive to protect the federal judges on occasions when there is just reason to believe that, while in the exercise of official duties, they are exposed to personal danger. In 1899 he was a member of the arbitration commission convened at Paris for the adjustment of the Anglo-Venezuelan boundary question.

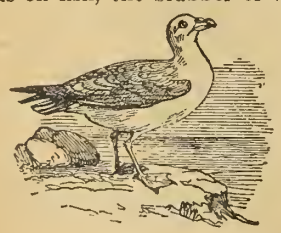
FULLER, Sarah Margaret (Ossoli), American critic and essayist, born at Cambridgeport, Mass., in 1810. She conducted the transcendental organ, The Dial (1840–42), made translations from the German, and published in 1844 her first volume, Summer on the Lakes, the record of a season of travel in 1843. In December (1844) she went to New York as literary critic of the Tribune, taking active part in the philanthropic, literary and artistic life of the

city. In 1846 she went to Europe, where she was received by social, political and literary leaders, residing for some time at Rome, where she married (December, 1847) Giovanni Angelo, Marquis d' Ossoli, by whom she had one child. She took an active part in the Italian struggle for independence, and served heroically in the hospitals during the French siege of Rome. On its capture (July 1849) she took refuge with her husband first in the mountains of Abruzzi, then at Florence, and on May 17, 1850, sailed for America. The voyage was most disastrous, The captain died of smallpox, her son was taken with the disease, and she and her husband and son were drowned off Fire Island Beach just as they were approaching New York on July 16.

FULLER'S EARTH, a variety of clay or marl, compact but friable, unctuous to the touch, and of various colors, usually with a shade of green. It is useful in scouring and cleansing cloth, as it imbibes the grease and oil used in preparing wool. It consists of silica 50 per cent, alumina 20, water 24, and small quantities of magnesia, lime, and peroxide of iron. There are very extensive beds of this earth in several counties in England.

FULLING-MILL, a mill for fulling cloth by means of pestles or stampers, which beat and press it to a close or compact state, and cleanse it. The principal parts of a fulling-mill are the wheel, with its trundle, which gives motion to the tree or spindle, whose teeth communicate that motion to the pestles or stampers, which fall into troughs, wherein the cloth is put, with fuller's-earth, to be scoured and thickened by this process of beating.

FULMAR, a natatorial or swimming oceanic bird about the size of a large duck. It inhabits the northern seas in prodigious numbers, breeding in Iceland Greenland, Spitzbergen, the Shetland and Orkney Islands, the Hebrides, etc. It feeds on fish, the blubber of whales,



Fulmar.

and any fat, putrid, floating substance that comes in its way. It makes its nest on sea-cliffs, in which it lays only one egg. The natives of St. Kilda value the eggs above those of any other bird. The fulmar is also valued for its feathers and down, and for the oil found in its stomach, which is one of the principal products of St. Kilda. When caught or assailed it lightens itself by disgorging the oil from its stomach. There is another and larger species found in the Pacific Ocean.

FULMINATION, a term used in chemistry to denote the sudden decomposition of a body by heat or percussion accompanied by a flash of light and a loud report. Fulminating compounds, or fulminates, are explosive compounds of fulminic acid with various bases, such as gold, mercury, platinum, and silver. The old fulminating powder is a mixture of sulphur, nitre, and potash. Fulminate of mercury forms the priming of percussion-caps.

FULMINIC ACID, a peculiar acid known only in combination with certain bases, and first discovered along with mercury and silver, with which it forms powerfully detonating compounds.

FULTON, Robert, an American engineer, the introducer of steam navigation on American waters, was born in Pennsylvania in 1765, died 1815. In his twenty-second year he went to England and became acquainted with the Duke of Bridgewater, Earl Stanhope, and James

Watt, and was led to devote himself to mechanical engineering. In 1794 he took a patent for a double inclined plane, which was intended to supersede locks on canals; and he also patented a mill for sawing marble, machines for spinning flax and making ropes, a dredging-machine, etc. In 1797 he went to Paris, where he produced the first panorama that was exhibited there. He also, after some trials, was successful in introducing a boat propelled by steam upon the Seine. During a visit to Scotland he had seen and obtained drawings of the Charlotte Dundas, a steam-vessel which had plied with success on the Forth and Clyde Canal. His chief occupation in Paris, however, was the invention of torpedoes for naval warfare. He returned to America in 1806, and built a steam-boat of considerable dimensions, which began to navigate the Hudson river in 1807. Its progress through the water was at the rate of 5 miles an hour. In 1814 he constructed the first war steamship, and was engaged upon an improvement of his submarine torpedo when he died.

FUNCTION, in math. a quantity so connected with another that no change can be made in the latter without producing a corresponding change in the former, in which case the dependent quantity is said to be a function of the other; thus, the circumference of a circle is a function of the diameter; the area of a triangle is a function of any two of the sides and the angle they contain. In order to indicate in a general way that one quantity y is a function of another x the notation $y = f(x)$, or something similar, is adopted; thus, if u be the area of a triangle, x and y two of the sides, and θ the contained angle, we should write $u = \phi(x, y, \theta)$.

FUNCTION, the specific office or action which any organ or system of organs is fitted to perform in the animal or vegetable economy.—Vital functions, functions immediately necessary to life, as those of the brain, heart, lungs, etc.—Natural or vegetative functions, functions less instantly necessary to life, as digestion, absorption, assimilation, expulsion, etc.—Animal functions, those which relate to the external world, as the senses, voluntary motions, etc.

FUNDAMENTAL NOTE, in music, the lowest or gravest note that a string or pipe can sound.—Fundamental tones are the tones from which harmonies are generated.

FUNDS AND FUNDING, money or other form of wealth accumulated and devoted to, or available for, some special purpose or enterprise. In Great Britain the securities issued for the national debt are known as the public funds, or simply as the funds. The process of funding a debt consists in dividing it into parts or shares (bonds) with stated times of payment of interest and principal, the latter usually at a remote date. The substitution of bonds of lower rate for those of higher rate is often called refunding; provision, made by agreement, from year to year, for the payment of the principal is known as a sinking fund Funded debt is opposed to floating debt, which consists of notes and overdue bills and to current debt, which consists of bills and other adverse balances already incurred but not yet overdue.

FUNDY, Bay of, a large inlet of the Atlantic, on the east coast of North America, separating Nova Scotia from New Brunswick. It is noted for its impetuous tides, which cause a rise and fall of from 12 to 70 feet, and the navigation is dangerous. A ship-railway is being constructed to connect Chignecto Bay with Northumberland Strait.

FU'NEN, the largest of the Danish islands except Seeland, from which it is separated by the Great Belt, and from Jutland by the Little Belt; circuit, about 185 miles; area, 1132 sq. miles. The chief towns are Odense, Svendborg, and Nyborg. The population is 279,501.

FUNERAL RITES, the rites and ceremonies connected with the disposing of the dead. Among the ancient Egyptians the friends af the deceased put on mourning habits, and abstained from gaiety and entertainments for from forty to seventy days, during which time the body was embalmed. Among the ancient Jews great regard was paid to a due performance of the rites of sepulture; and among the ancient Grecks and Romans to be deprived of the proper rites was considered the greatest misfortune that could happen. The decorus interring of the dead with religious ceremonies indicative of hopes of a resurrection is characteristic of all Christian

nations. With Roman Catholics the body is the object of solemn ceremonial from the moment of death until interment. The Church of England funeral service is too well known to require any notice. Among other Protestant bodies there is usually no formal service, but prayer is offered up or an ordinary religious service held before the interment in the house of the deceased or his relatives, or, in the case of a public funeral, in some public place. The practice of delivering funeral orations at the interment of the dead by laymen is common in France, and not unfrequent in America. The wake, or watching, is celebrated in some parts of the world particularly in its remoter districts.

FUNFKIRCHEN, a town of the Austrian Empire, in Hungary, on the slope of a hill, 105 miles s.s.w. Budapest. Pop. 43,982.

FUNGI (fun'jī), a large natural order of cryptogamous or flowerless plants, comprehending not only the various races of mushrooms, toad-stools, and similar plants, but a large number of microscopic plants growing upon other plants, and substances which are known as moulds, wildew, smut, rust, brand, dry-rot, etc. Fungi agree with algæ and lichens in their cellular structure, which is, with very few exceptions, void of anything resembling vascular tissue; but differ from them in deriving their nutriment from the body on which they grow, not from the medium by which they are surrounded. They are among the lowest forms of vegetable life, and, from the readiness with which they spring up in certain conditions, their germs are supposed to be floating in the atmosphere in incalculable numbers. Some diseases are produced by fungi. Fungi differ from other plants in being nitrogenous in composition, and in inhaling oxygen and giving out carbonic acid gas. Berkeley divides fungi into two great sections, the first having the spores naked, and comprising agarics, boleti, puff-balls, rust, smut, and mildew; the second comprising the murels, truffles, certain moulds, etc., in which the spores are in sacs. These are again subdivided into six principal orders, all formed on the mode in which the spores are borne. Fungi occur in every part of the earth where the cold is not too intense to destroy the spawn, though they abound most in moist temperate regions where the summer is warm. Several species afford excellent and abundant food, others are valuable in medicine, while many are among the greatest pests of the cultivator.

FUNK, Isaac Kauffman, American clergyman, publisher and editor, born at Clifton, Ohio, 1839. Pastor of St. Matthew's English Lutheran church in Brooklyn for seven years. Founder of the Literary Digest (1889), Standard Dictionary (1895), and Jewish Encyclopedia (1901).

FUNNEL, the shaft or hollow channel of a chimney through which smoke ascends; especially in steam-ships, a cylindrical iron chimney for the boiler-furnaces rising above the deck.

FUNNY BONE, the ulnar nerve is so slightly protected in the groove where it passes behind the internal condyle of the humerus that it is often affected by blows on that part. A peculiar electric thrill passes along the arm to the fingers whenever the nerve is struck or pressed.

FUNSTON, Frederick, American soldier, was born in Newcarlisle, Ohio, in 1865. He distinguished himself as a soldier in the war for the independence of Cuba, rising after many wounds in the insurgent army, to the rank of lieutenant-colonel. At the outbreak of the Spanish American war he organized the 20th Kansas volunteers of whom he became colonel. Fighting in the Philippines his bravery at Calumpit won him a commission as brigadier-general of volunteers. March 23, 1901, he captured Aguinaldo the Filipino insurgent leader and as a reward was commissioned brigadier-general U. S. A.

FUR, is the fine soft hairy covering of certain animals, especially the winter covering of animals belonging to northern latitudes. The term fur is sometimes distinctively applied to such coverings when prepared for being made into articles of dress, etc., while the name of peltry is given to them in an unprepared state or when merely dried. The animals chiefly sought after for the sake of their furs are the beaver, raccoon, musk-rat, squirrel, hare, rabbit, the chinchilla, bear (black, gray, and brown) otter, sea-otter, seal, wolf, wolverine or glutton, marten, ermine, lynx, coypou (nutria), polecat (fitch), opossum, fox, etc. (See under proper headings.) All the preparation that skins require before being sent to the market is to make them perfectly dry, so as to prevent them from putrefying. This is done by exposing them to the heat of the sun or a fire. The small skins are sometimes previously steeped in a solution of alum. When stored in large quantities they must be carefully preserved from dampness, as well as from moths. The fur-dresser, on receiving the skins, first subjects them to a softening process. He next cleans them from loose pieces of the integument by scraping them with an iron blade. Finally, the fur is cleaned and combed, after which it is handed over to the cutter, who cuts the furs out into the various shapes required to make different articles.

The principal North American fur-bearing animals are beaver, muskrat, hare, and squirrel; the mink, sable, fisher, ermine, weasel, raccoon, badger, and skunk; the lynx, northern and southern bears of several kinds; foxes of three or four varieties; two wolves; and most valuable of all, musk-ox, seal and sea-otter. Of foreign fur-bearing animals the most highly prized are the chinchilla, coypu (nutria), and various monkeys, marsupials (opossum, kangaroo, etc.), and cats.

FURIES, Eumenides, Erinnyes (among the Romans, Furiæ and Diræ), deities in the Greek mythology, who were the avengers of murder, perjury, and filial ingratitude. Later mythologists reckon three of them, and call them Alecto, Megæra, and Tisiphone. Æschylus, in his celebrated tragedy of the Eumenides, introduced fifty furies, and with them Fear and Horror, upon the stage. They were regarded with great dread, and the Athenians hardly dared to speak their names, but called them the venerable goddesses. It was by a similar euphemism the name Eumenides, signifying the toothed or well-pleased goddesses, was introduced. Erinnyes, the more ancient signifies the hunters or persecutors of the criminal, or the angry goddesses.

FURLONG, a measure of length, 40 rods, roles, or perches, equal to 220 yards, the eighth part of a mile.

FURLOUGH (fêr'lō), a military term signifying leave of absence given by the commanding officer to an officer or soldier under his command.

FURNACE, a place where a vehement fire and heat may be made and maintained, as for melting ores or metals, heating the boiler of a steam-engine, warming a house, baking pottery or bread, and other such purposes. Furnaces are constructed in a great variety of ways, according to the different purposes to which they are applied. In constructing furnaces the following objects are kept in view: (1) To obtain the greatest quantity of heat from a given quantity of fuel. (2) To prevent the dissipation of the heat after it is produced. (3) To concentrate the heat and direct it as much as possible to the substances to be acted upon. (4) To be able to regulate at pleasure the necessary degree of heat and have it wholly under the operator's management. An air-furnace is one in which the flames are urged only by the natural draft; a blast-furnace, one in which the heat is intensified by the injection of a strong current of air by artificial means; a reverberatory furnace, one in which the flames in passing to the chimney are thrown down by a low-arched roof upon the objects which it is intended to expose to their action.

FURNEAUX ISLANDS (fêr'nō), a group belonging to Tasmania, at the east end of Bass Strait, including Flinders Island with an area of 513,000 acres; Cape Barren Island, 110,000 acres, and Clarke Island, 20,000 acres. The inhabitants, who number about 620, many of them "half-castes," procure a living by seal-fishing and preserving mutton-birds, a species of petrel.

FUR'NESS, Horace Howard, American Shakespearean scholar, was born in Philadelphia in 1833. His Variorum Shakespeare issued in thirteen volumes, 1871–1891 is everywhere received as a monument of seholarship. Associated with him in his work was his wife, herself author of a concordance to Shakespeare's poems and his son Horace Howard Furness, Jr.

FUR-SEAL, a name given to several of the Otariidæ or "eared" seals which have a dense covering of fine under fur. The best known and most valuable is the fur-seal or sea-bear of some of the islands connected with Alaska, especially St. Paul's and St. George's, where it breeds.

FURTH (fürt), a town in Bavaria, 6 miles w.n.w. of Nürnberg, at the confluence of the Pegnitz with the Rednitz. Pop. 54,820.

FURZE, the common furze is a low shrubby plant, very hardy, and very abundant in barren, heathy, sandy, and gravelly soils throughout the west of Europe. The stem is generally 2 or 3 feet high, much branched and most of

the leaves converted into spines. The flowers are solitary and yellow. It often covers exclusively large tracts of country, and makes a splendid appearance when in flower. It is used as fuel, and sometimes the tops of the branches are used (especially the young tops) as fodder for horses and cattle, after having been beaten or bruised to soften the prickles.

FUSE, a tube filled with combustible matter, used in blasting, or in discharging hollow projectiles, etc. There are many varieties in use, such as the fuse used in mining and quarrying, which usually consists of a tube filled with a slow-burning composition, which gradually burns down to the charge; the concussion and percussion fuses for hollow projectiles, which explode the charge when an object is struck; the electric fuse, which is ignited by the passage of an electric spark through it; and time or mechanical fuses, used in some forms of torpedo, and with such explosives as dynamite and gun-cotton.

FUSEE', the cone or conical part of a watch or clock, round which is wound the chain or cord. It is a mechanical contrivance for equalizing the power of the mainspring; for as the action of a spring varies with its degree of tension,

Barrel and fusee of a watch.

the power derived from the force of a spring requires to be modified according to circumstances before it can become a proper substitute for a uniform power In order, therefore, to correct this irregular action of the mainspring, the fusee on which the chain or catgut acts is made somewhat conical, so that its radius at every point may be adapted to the strength of the spring.

FUSEL-OIL, a heavy oily inflammable fluid with a high boiling-point, disagreeable cutting odor, and pungent taste, which is separated in the rectification of ordinary spirit distilled from grain, malt, potatoes, molasses, beetroot, etc. The composition of this fluid depends on the materials used in the manufacture of the spirit, but it may be said to consist to a large extent of ethylic and amylic alcohol. Fusel-oil acts very deleteriously on the animal system, and this is the reason why inferior spirits are so injurious in their effects.

FUSIBLE METAL, an alloy, usually of lead, tin, and bismuth, compounded in such definite proportions as to melt at a given low temperature. In steam-engines, a plug of fusible metal is placed in the skin of the boiler, so as to melt and allow the steam to escape when a dangerous heat is reached.

FUSIBLE PORCELAIN, a silicate of alumina and soda obtained from cryolite and sand, fused and worked as glass.

FUSILIERS, formerly soldiers armed with a fusil or light flint-lock musket closely resembling a carbine. The name is given to nine or ten regiments in the British army, which differ from other regiments of the line chiefly in the busby worn by officers and non-commissioned officers.

FUSING-POINT, the degree of temperature at which a substance melts or liquefies. This point is very different for different metals. Thus potassium fuses at 136° Fahr., bismuth at 504°, lead at 619°, zinc at 680°, silver 1832°, gold 2282°. Malleable iron requires the highest heat of a smith's forge (2912°); while cerium, platinum, and some other metals are infusible in the heat of a smith's forge, but are fusible before the oxy-hydrogen blow-pipe. See Freezing, Fusing and Boiling Points.

FUSION, the conversion of a solid body into the liquid state by direct heat, as distinguished from solution, in which the effect is produced by means of a liquid. It is difficult, however, to draw a line between the two, for the main difference is in the temperature, and when a flux is employed all distinction disappears. The term is specially applied to the action of heat on the metals, but it is extended to any solid matter; thus the passage of ice into water at 32° F. is true fusion. There are bodies like carbon, lime, magnesia, zirconia, and other metallic oxides, which are practically, if not absolutely, infusible. See Fusing-point.

FUST, Johann, a goldsmith of Mainz, associated with Gutenberg and Schöffer in connection with the origin of printing. He probably died of the plague in 1466. See Printing.

FUSTIAN, a cotton or mixed linen and cotton fabric with a pile like that of velvet but shorter. It includes corduroy, moleskin, velveteen, etc.

FUSTIC, the wood of a tree of the mulberry order growing in the West Indies. It is a large and handsome tree, and the timber, though, like most other dye-woods, brittle, or at least easily splintered, is hard and strong. It is extensively used as an ingredient in the dyeing of yellow, and is largely imported for that purpose.—Young Fustic is the wood of the Venice sumach, a south European shrub with smooth leaves and a remarkable feathery inflorescence. It yields a fine orange color, which, however, is not durable without a mordant.

FYZABAD, or **FAIZABAD,** a town in British India. Pop., including cantonments, in 1901, 75,085.

G

G, the seventh letter in the English alphabet. English g hard is a gutteral mute, the "voiced" or soft or sonant sound corresponding to the "breathed" or hard or surd sound k (or c hard). This sound of g is what the letter always has before a (except in gaol), o, u, and when initial also before e and i in all words of English origin, and when final. The soft sound of g, or that which it more commonly has before e, i, and y, as in gem, gin, gymnastics, is a palatal sound the same as that of j, and did not occur in the oldest English or Anglo-Saxon.

G, in music, (a) the fifth note, and dominant of the normal scale of C, called also sol; (b) the lowest note of the grave hexachord; in the Guidonian system gamma ut; (c) a name of the treble clef, which is seated on the G or second line of the treble staff, and which formerly had the form of G.

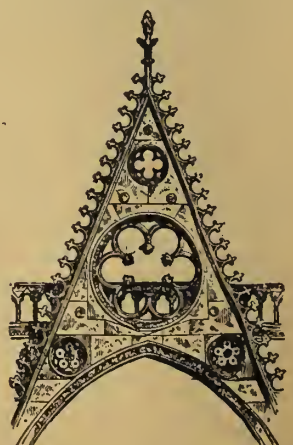
GA'BION, a large wickerwork basket of cylindrical form, but without bottom. In a siege, when forming a trench, a row of gabions is placed on the outside nearest the fortress, and filled with earth as it is thrown from the trench, so as to form a protection against the fire of the besieged. Each gabion is about 20 inches in diameter and 33 inches in

Part of trench with gabions and fascines.

height, but this height is usually increased by placing a row of fascines on the top after the interior has been filled up.

GABLE, the triangular end of a house or other building, from the eaves to the top; gable door, a door pointed at top like a gable.

GABORIAU, Emile, a French novelist, born 1834, died in Paris 1873. After



Gable of the south transcept door of Notre Dame, Paris; 13th century.

contributing to the smaller Parisian journals short sketches he achieved a

considerable success by his novel Dossier No 113 (1866). He continued to work this vein in a series of clever stories dealing with crime and its detection: Le Crime d'Orcival, L'Affaire Lerouge, Les Esclaves de Paris, La Vie Infernale, La Corde au Cou, L'Argent des Autres, etc.

GAB'RIEL ("hero or man of God"), according to Biblical history, the angel who announced to Zacharias the birth of John, and to Mary the birth of the Savior. In Jewish mythology he is one of the seven archangels. The rabbins say he is the angel of death for the Israelites, and according to the Talmud he is a prince of fire, who presides over thunder and the ripening of fruits. In Mohammedan theology he is one of the four angels employed in writing the divine decrees, and the angel of revelation, in which capacity he dictated the Koran to Mohammed.

GAD ("a troop"), one of the twelve tribes of Israel, which took its name from Gad, the son of Jacob and Zillah. At the time of the exodus the tribe numbered 45,650 men of twenty years old and upwards; and as being a pastoral tribe they were assigned a rich district in Gilead between Reuben and Manasseh. See Josh. xiii. 24–28.

GADFLY, a name commonly applied to various insects, is about 7 lines in length; thorax yellow, with a black band; abdomen white; terminal segments fulvous; wings dusky. This

Gadfly, natural size.

species attacks the horse also, the female depositing her eggs in the skin of these animals in considerable numbers. In a short time the eggs are matured, and produce a larva or worm, which immediately pierces the skin, raising large lumps or tumors filled with pus, upon which the larva feeds. It deposits its eggs upon such parts of the skin of horses as are subject to be much licked by the animal, and thus they are conveyed to the stomach, where the heat speedily hatches the larvæ, too well known under the name of botts. Another species deposits its eggs in the nostrils of sheep, where the larva is hatched, and immediately ascends into the frontal sinuses, attaching itself very firmly to the lining membrance by means of two strong hooks situated at its mouth. Other species infest the buffalo, camel, stag, etc. Even rhinoceroses and elephants are said not to be altogether exempt from their attacks. The characteristics of the genus are two enormous eyes, usually of a greenish-yellow colored, rayed or spotted with purple, antennæ scarcely longer than the head, the last joint with five divisions. These insects suck the blood of horned cattle, horses, and sometimes even of men.

GAD'OLINITE, a mineral, a silicate of yttrium, with a considerable proportion of lime and magnesia, of the oxides of iron, cerium, lanthanum, glucinum, and sometimes of other bases It is usually found in dull, amorphous masses disseminated through granite; is black, or very dark green, with a resinous luster. It was named after the mineralogist Gadolin, professor at Abo, 1785–1822.

GADSDEN, Christopher, American patriot; was born in Charleston, S. C., in 1724. He was, in 1765, elected a delegate to the Intercolonial convention held in New York City to protest against the stamp act. In 1774 he was a member of the first Continental congress in Philadelphia. In 1778 he was a member of the State Constitutional convention of South Carolina. Elected lieutenant-governor of the state, he signed the capitulation of Charleston when that city fell into the hands of Sir Henry Clinton, in May, 1780. In 1782 he was elected governor of South Carolina, but refused to accept the office, pleading that he was too old. He died in 1805.

GADSDEN, James, American soldier and diplomatist, born in Charleston, S. C., in 1788. He served with marked efficiency in the War of 1812, was appointed aide-de-camp to General Jackson in 1818, participated in the Seminole war, was appointed military inspector of the southern division in 1820, and subsequently conducted the removal of the Seminole Indians to the southern part of Florida. In 1853 he was sent to Mexico as U. States minister, and in December of that year concluded the treaty which provided for the readjustment of the boundary between the two counties, and the acquisition by the U. States of the tract of land subsequently known as the "Gadsden purchase."

GADSDEN PURCHASE, the, tract of land lying partly within the present New Mexico and partly within the present Arizona, purchased from Mexico by the U. States in 1874. It embraces 45,535 sq. miles, is bounded on the north by the Gila river, on the east by the Rio Grande, and on the west by the Colorado and has an extreme breadth from north to south of 120 miles. For this the U. States gave the sum of $10,000,000, while Mexico, besides making the cession, agreed (1) to the abrogation of the eleventh article of the treaty of Guadalupe Hidalgo (q. v.), and (2) to the abandonment of all damage claims arising from Indian incursions between 1848 and 1853. The land was regarded as of little use for agricultural purposes, and was purchased largely with a view to settling boundary disputes in that quarter between the two governments and to secure a desirable route for the projected Southern pacific railroad. The treaty of sale was negotiated with Santa Anna by James Gadsden (q.v.), then minister to Mexico, in December, 1853, and, after undergoing modifications in the U. States senate, was finally ratified and proclaimed on June 30, 1854, congress passing the necessary legislation on August 5th. The sale met with much opposition in Mexico, and caused the banishment of Santa Anna in 1855.

GADWALL', the common name of a species of duck not so large as the mallard, with long pointed wings and a vigorous and rapid flight. North America as far down as South Carolina is its favorite habitat.

GAEL (gāl), the name of a branch of the Celts inhabiting the Highlands of Scotland, Ireland, and the Isle of Man. Gadhel or Gael is the only name by which those who speak the Gaelic language are known to themselves. By way of distinction the Highlanders of Scotland call themselves Gael Albinnich (Gaels of Albin) and the Celtic population of Ireland call themselves Gael Erinnich (Gaels of Erin).

Gaelic is the name now generally restricted to that dialect of the Celtic language which is spoken in the Highlands of Scotlands, and hence distinguished from Manx and Irish, the other two kindred dialects, which scholars of the present day include under the name (or rather spelling) Gaedhelic. The modern Gaelic differs to some extent from the Irish in pronunciation, in grammar, in idioms, and in vocabulary. The literature of the Gaelic language is somewhat scanty, and is much less ancient and important than the Irish. The earliest written specimens of Gaelic are scraps contained in the Book of Deer, a religious manual belonging to the early part of the 12th century. To the 14th and 15th centuries a considerable number of pieces belong. A collection of the older poetry, ascribed to Ossian and others, was made in the first half of the 16th century by Sir James Macgregor, dean of Lismore—hence called "The Dean of Lismore's Book." Robert Calder Mackay, or Robb Donn, and Duncan Ban M'Intyre, of Glenorchy, are the two most noteworthy poets among the Scottish Highlanders in modern times. They both belong to the 18th century. This century also saw the publication of the Bible in Gaelic, the Irish Bible having been previously well known in the Highlands. The so-called poems of Ossian appeared about the same time, but in English, and it was not till 1818 that the corresponding Gaelic text appeared. A series of tales and legends of the Highlands of Scotland have been collected and published by J. F. Campbell. Various English works have been translated into Gaelic, and several collections of Gaelic poetry were published in the 19th century, as well as Gaelic periodicals. Gaelic poetry still continues to be written not only in Scotland but even in America.

GAFF, a spar used in ships to extend the upper edge of fore-and-aft sail which are not set on stays. The fore-end of the gaff, where it embraces the mast, is termed the jaw, the outer end the peak. The jaw forms a semicircle, and is secured in its position by a jaw-rope passing round the mast.

GAGE, Lyman Judson, American financier was born in De Ruyter, Madison co., N. Y., in 1836. In 1868 he became assistant cashier of the First national bank of Chicago, and in 1891 became its president. In 1892 he was elected president of the board of directors

of the World's Columbian exposition. In 1897 he was appointed by President McKinley secretary of the treasury, which office he continued to hold in McKinley's second administration and in that of President Roosevelt's up to January, 1902, when he resigned.

GAGE, Thomas, Lord, was born in England in 1720. He entered the army at an early age, was made major-general and governor of Montreal in 1761 and in 1763 succeeded to the command of the British forces in America. In 1774

General Gage.

he was appointed governor of Massachusetts and in that capacity was intrusted with carrying into effect the Boston Port Act. The battle of Lexington in which a detachment sent by him on April 18, 1775, to destroy the cannon and ammunition at Concord was defeated, inaugurated the American Revolutionary War. Although Gage gained the nominal victory at Bunker Hill he was unable to raise the siege at Boston and he was shortly after superseded by General Howe. He died in 1787.

GAG RULES, the name given to the resolutions passed by the house of representatives in 1837 against the reading, referring, debating or printing of any petition praying for the interference of the national government with the institution of slavery in any part of the United States. Each year at the opening of congress an effort was made to rescind the rule but not not until 1844 was it successful.

GAHNITE, a name given to automolite after Gahn. It is a native aluminate of zinc, crystallizes in octa- and tetra-hedrons, is of dark green or black color, and is not affected by the blowpipe, or by acids or alkalies.

GAINSBOROUGH, Thomas, an English painter was born at Sudbury, in Suffolk, in 1727. He was one of the original thirty-six academicians. He rivaled Sir Joshua Reynolds as a portrait-painter, and showed no less originality in landscape. His works are now very highly esteemed, more so than at any previous time. His death took place in 1788.

GAIUS, or **CAIUS,** a Roman lawyer of the time of Adrian and Antoninus Pius, of whose life very little is known. Of his numerous works, his Institutes are particularly important; first, as having been for centuries, down to the time of Justinian, one of the most common manuals of law; secondly, as having been the foundation of the official compendium of the law which occupies an important place in the reform of the judicial system by Justinian; and thirdly, as the only tolerably full, systematic, and well-arranged source of the old Roman law. The bulk of the work in MSS. was discovered in 1816 by Niebuhr.

GALAP'AGOS, a group of thirteen islands of volcanic origin in the North Pacific Ocean, about 600 miles west of the coast of Ecuador, to which they belong; area, 2950 sq. miles. The most important are Albemarle, 60 miles long by 15 broad, and rising 4700 feet above the sea; Indefatigable, Chatham, Charles, James, and Narborough. Of these some are used by the Republic of Ecuador as penal settlements. Many of the fauna and flora of the islands are peculiar to them, the most remarkable being a large lizard and the elephant tortoise.

GALATE'A, in classic mythology, the daughter of Nereus and Doris, who rejected the suit of the Cyclops Polyphemus and gave herself to the Sicilian shepherd Acis. The monster having surprised them crushed Acis beneath a rock.

GALATIA, the ancient name of an extensive region in Asia Minor, so called from its Gallic inhabitants, who in the first place formed part of the invading hordes of Gauls under Brennus in the 3d century B.C. These were compelled by Attalus, king of Pergamos, to settle within well-defined limits between Paphlagonia, Pontus, Cappadocia, Lycaonia, Phrygia, and Bithynia. With the Gauls were intermingled a considerable proportion of Greeks; hence the inhabitants were often called Gallogræci, as well as Galatians.

GALATIANS, Epistle to the, one of the most important epistles of St. Paul, written probably about 56 A.D., soon after his second visit to Galatia, recorded in Acts xviii. 23. It was directed against the spread of Judaistic practices in the Galatian churches and especially against the practice of circumcision. It has been the subject of numerous commentaries by Luther, Winer, Meyer, Ellicott, Alford, and others.

GALATZ, or **GALACZ,** a town and port in Roumania, in Moldavia, on the left bank of the Danube, between the confluence of the Sereth and Pruth. When made a free port in 1834 it had only 8000 inhabitants, but the population has since grown to 80,000. It ceased to be a free port in 1883.

GAL'AXY, in astronomy, that long luminous track which is seen at night stretching across the heavens from horizon to horizon, and which, when fully traced, is found to encompass the heavenly sphere like a girdle. This luminous appearance is occasioned by a multitude of stars so distant and blended as to be distinguishable only by the most powerful telescopes. At one part of its course it divides into two great branches, which remain apart for a distance of 150° and then reunite; there are also many other smaller branches that it gives off. At one point it spreads out very widely, exhibiting a fan-like expanse of interlacing branches nearly 20° broad; this terminates abruptly and leaves here a kind of gap. At several points are seen dark spots in the midst of some of the brightest portions; one of the most easily distinguished of these dark spots has long been known as the "coal-sack." According to Herschel's hypothesis, our sun and planetary system form part of the milky way.

GALEN, properly Claudius Galenus, a Greek physician, born A.D. 130, at Pergamus in Asia Minor. The most valuable of his works were those dealing with anatomy and physiology, and he was the first to establish the consultation of the pulse in diagnosis and prognosis. Till the middle of the 16th century his authority in medicine was supreme.

GALE'NA, the sulphide of lead, found both in masses and crystallized in cubes, but sometimes in truncated octahedra; its color is bluish-gray, like lead, but brighter; luster metallic; texture foliated, fragments cubical; soft, but brittle; specific gravity, 7·22 to 7·759; effervesces with nitric and hydrochloric acids. For the most part it contains about 86·6 per cent of lead and 13·4 of sulphur, generally some silver, and also antimony, zinc, iron, and bismuth. Where the proportion of silver is high it is known as argentiferous galena, and worked with a view to the extraction of this metal. Galena occurs principally in the older or primary rocks, being found in England mainly in the mountain limestone (base of the carboniferous formation). In the U. States it is very abundant, the deposit of galena in which the mines of Illinois are situated being the most extensive and important hitherto discovered.

GALENA, a city of remarkable growth during the last ten years in Cherokee co., Kan., seven miles west of Joplin, Mo., on the Saint Louis and San Francisco and the Kansas City, Fort Scott and Memphis railroads. It is engaged chiefly in mining, being the center of an important lead and zinc region. Pop. 12,000.

GALERIUS, a Roman emperor. See Maximianus.

GALESBURG, a city in Knox co., Illinois. It has railroad workshops, iron foundries, manufactures of agricultural implements, etc. Knox college and Lombard university are situated here. Pop. 20,000.

GALICIA, Kingdom of, a province of Austria, bounded by Russia, Bukowina, Hungary, and Moravia; area, 30,312 sq. miles; pop. (Polish in the west, Russniak in the east) 7,295,538. The great physical features of the country are, in a manner, determined by the Carpathians, which form a long and irregular curve on the south, and send out branches into Galicia. Farther to the north the hills subside rapidly, and finally merge into vast plains. It has several considerable rivers, those on the west being affluents of the Vistula, those in the east, of the Danube and Dniester. The climate is severe, particularly in the south, where more than one of the Carpathian summits rise beyond the snow-line. The summers are very warm but comparatively short. The soil in general is fertile, and yields abundant crops of cereals, hemp, flax, tobacco, etc. The domestic animals include great numbers of horned cattle and a fine hardy breed of horses. Sheep are in general neglected; but goats, swine, and poultry abound, and bee-keeping is practiced on a large scale. Bears and wolves are still found in the

forests; and all the lesser kinds of game are in abundance. The minerals include marble, alabaster, copper, calamine, coal, iron, and rock-salt. Only the last two are of much importance.

GALICIA, one of the old provinces of Spain, situated in the n.w., and bounded n. and w. by the Atlantic, s. by Portugal, and e. by the old provinces of Asturias and Leon. It is now divided into the provinces of Coruña, Lugo, Orense, and Pontevedra; area, 11,212 sq. miles. The peasantry are very poor, and many leave for service in other parts of Spain. Pop. 1,941,023.

GAL'ILEE, in the time of Jesus Christ, the most northern province of Palestine, bounded on the e. by the river Jordan, on the s. by Samaria, on the w. by the Mediterranean Sea and Phœnicia, and on the n. by Syria and the Mountains of Lebanon. It was in some sense the cradle of Christianity, Nazareth, Cana, Capernaum, Nain, and other places being intimately associated with the life of Christ. The inhabitants of this country, mostly poor fishermen, on account of their ignorance and simplicity of manners were despised by the Jews, who, by way of contempt, called Christians, at first, Galileans. At present Galilee is included in the vilayet of Syria.

GALILEE, Sea of, also called Sea of Chinnereth or Chinneroth, and the Lake of Gennesaret or Tiberias, a pear-shaped fresh-water lake in Central Palestine, 12½ miles long by 7½ broad. It was apparently formed by subsidence attended with volcanic disturbance; and is 682 feet below the level of the Mediterranean. On the east the coasts are nearly 2000 feet high, deeply furrowed by ravines but flat along the summit. The whole basin is bleak and monotonous, and has a scathed volcanic look, the cliffs and rocks along the shore being of hard porous basalt. At the time of Christ there were on its shores nine flourishing cities, of which seven are now uninhabited ruins, while Magdala and Tiberias are both in a poverty-stricken condition. The lake still abounds in fish, but the fishery is neglected.

GALILEI (gȧl-i-lā′ē), Galileo, a most distinguished Italian physicist, born 18th Feb., 1564, as Pisa. His father Vincenzo Galilei, a nobleman of Florence procured him an excellent education in literature and the arts, and in 1581 he entered the University of Pisa. At nineteen the swinging of a lamp in Pisa cathedral led him to investigate the laws of the oscillation of the pendulum, which he subsequently applied in the measurement of time; and in 1586 the works of Archimedes suggested his invention of the hydrostatic balance. He now devoted his attention exclusively to mathematics and natural science, and in 1589 was made professor of mathematics in the University of Pisa. In 1592 he was appointed professor of mathematics in Padua, where he continued eighteen years, and his lectures acquired European fame. Here he made the important discovery that the spaces through which a body falls, in equal times, increase as the numbers 1, 3, 5, 7. If he did not invent he improved the thermometer, and made some interesting observations on the magnet. To the telescope, which in Holland remained not only imperfect but useless, he gave a new importance. He noted the irregularity of the moon's surface, and taught his scholars to measure the height of its mountains by their shadow. A particular nebula he resolved into individual stars, and conjectured that the milky way might be resolved in the same manner. His most remarkable discovery was that of Jupiter's satellites (1610), and he observed, though imperfectly, the ring of Saturn. He also detected the sun's spots, and inferred, from their regular advance from east to west, the rotation of the sun, and the inclination of its axis to the plane of the ecliptic. In 1610 Cosmo II., Grand-duke of Tuscany, appointed him grand-ducal mathematician and philosopher, and with increased leisure he lived sometimes in Florence, and sometimes at the country seat of his friend Salviata, where he gained a decisive victory for the Copernican system by the discovery of the varying phases of Mercury, Venus, and Mars. In 1611 he visited Rome for the first time, where he was honorably received; but on his return to Florence he became more and more involved in controversy, which gradually took a theological turn. The monks preached against him, and in 1616 he found himself again obliged to proceed to Rome, where he is doubtfully said to have pledged himself to abstain from promulgating his astronomical views. In 1623 Galileo replied to an attack upon him in his Saggiatore, a masterpiece of eloquence, which drew upon him the fury of the Jesuits. In 1632 with the permission of the pope, he published a dialogue expounding the Copernican system as against the Ptolemaic. A congregation of cardinals, monks, and mathematicians, all sworn enemies of Galileo, examined his work, condemned it as highly dangerous, and summoned him before the tribunal of the inquisition. The veteran philosopher was compelled to go to Rome early in 1633, and was condemned to renounce upon his knees the truths he had maintained. At the moment when he arose, he is said (but this is doubtful) to have exclaimed, in an undertone, stamping his foot, "E pur si muove!" (and yet it moves). Upon this he was sentenced to the dungeons of the inquisition for an indefinite time, and every week, for three years, was to repeat the seven penitential psalms of David. After a few days' detention his sentence of imprisonment was commuted to banishment to the villa of the grand-duke of Tuscany at Rome, and then to the archiepiscopal palace at Sienna. He was afterward allowed to return to his residence at Arcetri, near Florence, where he employed his last years principally in the study of mechanics and projectiles. The results are found in two important works on the laws of motion, the foundation of the present system of physics and astronomy. At the same time he tried to make use of Jupiter's satellites for the calculation of longitudes; and though he brought nothing to perfection in this branch, he was the first who reflected systematically on such a method of fixing geographical longitudes. He was at this time afflicted with a disease in his eyes, one of which was wholly blind, and the other almost useless, when, in 1637, he discovered the libration of the moon. Domestic troubles and disease embittered the last years of Galileo's life. He died 8th Jan., 1642 (the year Newton was born). His remains were ultimately deposited in the church of Sta. Croce, at Florence.

GALL, in the animal economy. See Gall-bladder, Bile.

GALL, Franz Joseph, the founder of phrenology, born in 1758 in Tiefenbrunn in Baden. After a series of comparisons of the skulls both of men and animals he was led to assign the particular location of twenty organs. Gall's discoveries, which met with severe criticism at least gave an impulse to the accurate anatomical study of the brain. Dr. Gall died in 1828.

GALL, St. (German, St. Gallen), a northeastern frontier canton in Switzerland, abutting on Lake Constance, partly bounded by the Rhine, and inclosing the canton of Appenzell. Its area is 780 sq. miles. In the south it is one of the loftiest Alpine districts of Switzerland, and in other quarters is more or less mountainous. It belongs wholly to the basin of the Rhine, in the valley of which the climate is comparatively mild, in the mountainous districts it is very rigorous. The constitution is one of the most democratic in Switzerland. German is the language spoken. Pop. 228,174.—St. Gall, the capital and the see of a bishop, is situated on the Steinach, 2,165 feet above sea-level. Pop. 36,344.

GALLAIT (gȧl-lā), Louis, Belgian historical painter, born 1812, died 1887.

GALLAND (gȧl-äṇ), Antoine, a French oriental scholar, born in Picardy in 1646, principally known for his translation of the Arabian Nights Entertainments (1704–1717), the first into any European language. He died in 1715 while engaged in translating the Koran.

GALLATIN, Albert, American statesman and financier, was born in Geneva, Switzerland, in 1761; came to U. States in 1780 and after poor success in trade became a teacher of French. After serving in Pennsylvania legislature became a member of congress and was a leading critic of the poor state of the national finances. Jefferson in 1801 made him secretary of the treasury and in the eleven succeeding years he prevented the disorganization of the public financial system and laid the foundations of business-like administration. From 1816 to 1823 he was minister to France and afterwards minister to London. He died in 1849.

GALL-BLADDER, a small membranous sac, shaped like a pear, which receives the gall or bile from the liver by the cystic duct. It is situated on the inferior surface of the right lobe of the liver.

GALLE (gal), a seaport near the south-west extremity of Ceylon, on a low rocky projecting point of land. Pop. 37,326.

GAL'LEON, formerly a kind of vessel of war, used by the Spaniards and Portuguese, with from three to four decks. In more recent times those vessels were called galleons in which the Spaniards

transported treasure from their American colonies.

GAL'LERY, in architecture, a long, narrow room, the length of which is at least three times its width, often built to receive a collection of pictures. Among the most renowned European art-galleries are those of the Louvre at Paris, that of Versailles, the National Gallery in London, the Pitti and Uffizi galleries at Florence, the Dresden Gallery, the Real Museo of the Prado at Madrid, the Hermitage at St. Petersburg, the gallery of Berlin, the gallery of the Museo Borbonico at Naples, those at Venice, Antwerp, Turin, etc. The term gallery is also sometimes applied to what is more properly termed a corridor, likewise to a platform projecting from the walls of a building supported by piers, pillars, brackets, or consoles, and in churches, theaters, and similar buildings, to the upper floors going round the building next the wall.

GALLEY, a low, flat-built vessel with one deck, and navigated with sails and oars, once commonly used in the Mediterranean. The common galleys varied from 100 to 200 feet in length, those of smaller sizes being known respectively as half-galleys and quarter galleys. They carried as many as twenty oars on each side, each oar worked by one or more men, and they had commonly two masts with lateen sails. Raised structures in the stern, and even in the prow, were not uncommon. These, however, were more fully developed in the kind of galley known as the galleass, which carried three masts, from 200 to 300 rowers, and sometimes twenty guns. France formerly had a number of galleys for service in the Mediterranean, in which convicts were forced to labor. The term galley is also applied to the ships of the ancient Greeks and Romans, especially to their war-ships, which were propelled chiefly by oars.

GALLEY-SLAVE, a person condemned to work at the oar on board a galley, being chained to the deck. This mode of punishment was common in France previous to 1748.

GALL-FLY, a name for several insects which form the morbid products known as galls, each species seeming to be addicted to a particular plant and a particular part of the plant. The tumor or gall is due to the morbid action of an irritating fluid deposited with the egg of the insect. The large galls at the base of oak leaves are produced by a fly of a brown color, with black antennæ, chestnut brown legs, and white wings. The small galls on the under surface of oak leaves are due to another species. See Galls.

GALLIC ACID, an acid which derives its name from the gall-nut, whence it was first procured by Scheele in 1786. It exists ready formed in the seeds of the mango, has been found besides in many other plants, in acorns, colchicum, divi-divi, helleborc root, sumach, tea, walnuts, etc., and is a product of the decomposition of tannic acid. It crystallizes in brilliant prisms, generally of a pale-yellow color. It colors the persalts of iron of a deep bluish black. It is of extensive use in the art of dyeing, as it constitutes one of the principal ingredients in all the shades of black, and is employed to fix or improve several other colors. It is well known as an ingredient in ink. See Ink.

GAL'LICAN CHURCH, a distinctive name applied to the Roman Catholic Church in France. Latterly, and especially since the Vatican Council of 1870 the position of the Gallican Church toward the popes has essentially changed and the older Gallicanism may now be said to be represented by the Old Catholics of France.

GAL'LIOT, a Dutch or Flemish vessel for cargoes, with very rounded ribs and flattened bottom, with a mizzen-mast

Dutch galliot.

placed near the stern, carrying a square main-sail and main-top-sail, a forestay to the main-mast (there being no foremast), with forestay-sail and jibs.

GALLIP'OLI, a town in European Turkey, on a peninsula of the same name at the northeast end of the Dardanelles, 128 miles w.s.w. of Constantinople. Pop. about 50,000.

GAL'LIUM, a rare malleable metal, discovered by spectrum analysis in 1875 by De Boisbaudran in the zinc-blende of Pierre-fitte in the Pyrenees. It is of a grayish-white color, has a brilliant luster, and is fused by the mere warmth of the hand. In its properties it is related to aluminium.

GALLON, a standard measure of capacity, containing 277.27384 cubic inches being equal to 4 quarts or 8 pints. In England formerly three different gallons were in use, the old corn-gallon of 268.8 cubic inches, the old wine-gallon of 231 cubic inches, and the old beer-gallon of 282 cubic inches. The gallon of 231 cubic inches has been adopted the standard of the U. States.

GALLS, gall-nuts or nut-galls, a vegetable excrescence produced by the deposit of the egg of an insect in the bark or leaves of a plant. The galls of commerce are produced by a species of Cynips in the tender shoots of a species of oak, abundant in Asia Minor, Syria, Persia, etc. They are spherical and tubercular, and vary in magnitude from the size of a pea to that of a hazel-nut. White, green, and blue varieties are recognized, the latter kinds being the best. They are inodorous, but are strongly astringent from the tannin and gallic acid which they contain, and which are their chief products. Gall-nuts are extensively used in dyeing and in the manufacture of ink, and they are also frequently used in medicine. They are chiefly imported from Aleppo, Tripoli, and Smyrna. The Chinese galls, or woo-pei-tsze, differ from the foregoing in that they are really an unusually massive

Aleppo gall and gall-fly.

1, Gall split to show the cell in which the larva exists. 2, Exterior of the gall, showing the opening by which the perfect insect escapes.

kind of crust or cocoon, such as the aphides form on the surface of a plant; the tissues of the plant are not affected. Since the opening of the Japanese ports these have been imported in considerable quantities.

GALVANI, Luigi, Italian physician and physiologist, born at Bologna 1737, died 1798. He practiced medicine in Bologna, and was in 1762 appointed professor of anatomy at the university. He gained repute as a comparative anatomist; but his fame rests on his theory of animal electricity, enunciated in the treatise De Viribus Electricitatis in Motu Musculari Commentarius, published in 1791. Twenty years before the publication of this treatise he had been making experiments on the relations of animal functions to electricity. In 1797 he was deprived of his chair for refusing to take the oath of allegiance to the Cisalpine republic, but was restored to it in less than a year.

GALVANIC BATTERY, a combination of galvanic cells. In a galvanic cell chemical action takes place between a liquid and a metal—usually zinc—which is partially immersed in it; and there is another metal, or solid conduct-

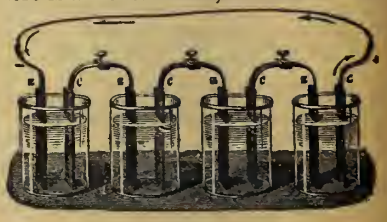


Fig. 1.—Simple galvanic battery.

ing substance of some kind, also partially immersed. The zinc and the other solid conductor are called the two plates of the cell. The plates must not be allowed to touch each other in the liquid; but a current through an external conductor can be obtained by connecting its ends with the two plates. When this connection is made there is a complete circuit round which the current flows, its course being from the zinc plate through the liquid to the other plate, and from this latter through the external conductor to the zinc plate again. There is a continual circulation of positive electricity in this direction as long as the chemical action continues, or, what is the same thing, there is a con-

tinual circulation of negative electricity in the opposite direction. The second or inactive plate is usually either of copper, of platinum, or still more frequently of gas carbon, that is, the carbon which is deposited in the retorts at gas-works. The liquid which acts on the zinc is most frequently dilute sulphuric acid—1 part of acid to 6 or 8 of water. In some of the best kinds of cell there are two liquids—one in contact with the zinc and the other with the inactive plate, with a

Fig. 2.—Bunsen's battery.

porous partition of unglazed earthenware between them. Fig. 1 shows a battery of four cells of the simplest kind, each containing a plate of zinc and a plate of copper immersed (except their upper portions) in dilute acid contained in a glass vessel. It will be observed that the copper (c) of each cell is connected with the zinc (z) of the next. The arrows show the direction of the current. Fig. 2 represents a very common form of battery called Bunsen's. The zinc plate consists of a slit cylinder surrounding the porous vessel in which the carbon plate stands, the whole being contained in a glass jar. The liquid in which the zinc is immersed is dilute sulphuric acid, and the liquid in contact with the carbon is strong nitric acid. Fig. 3 represents a Daniell's cell, which differs from Bunsen's in the contents of the porous cell. The plate within the porous cell is of copper, and the liquid in contact with the copper is a saturated solution of sulphate of copper, crystals of which are seen heaped up round the top. These

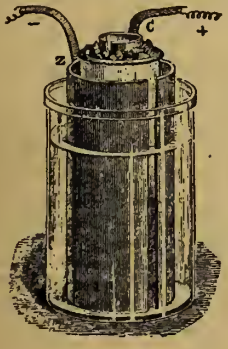


Fig. 3.—Daniell's cell.

crystals are supported by a cage of copper wire, and are intended for keeping the solution saturated.

In the simpler forms of galvanic cell, such as that represented in Fig. 1, there is a continual evolution of hydrogen at the inactive plate, while an equivalent quantity of oxygen enters into combination with the zinc plate, and goes to form sulphate of zinc. Some of the evolved hydrogen adheres to the copper plate and produces a rapid falling off in the eletromotive force of the cell. This action, which is the principal cause of the rapid weakening of the current in batteries composed of such cells, is called polarization. The purpose of the two-fluid arrangement illustrated in Figs. 2 and 3, is to intercept the hydrogen and prevent it from being deposited on the copper or carbon plate. In Daniell's battery, which was the first of the kind, the hydrogen is taken up by the solution of sulphate of copper, and displaces copper, which is deposited on the copper plate. In Bunsen's it is taken up by the nitric acid, which is thus gradually converted into nitrous acid.

It is usual to amalgamate the zinc plates of a battery, by washing them with acid, and then rubbing them with mercury. The reason for this operation is, that when ordinary commercial zinc is used without amalgamation, local currents are formed between different portions of the same plate, owing to inequalities or impurities. This local action, as it is called, eats away the plates without contributing to the current in the general circuit. Amalgamation renders the surface uniform and prevents this injurious action.

The strength of the current given by a battery depends partly on the electromotive force of the battery and partly on its resistance. If two batteries are connected into one circuit in such a way that they tend to drive currents round it in opposite directions, the one which prevails is said to have the greater electromotive force. The electromotive force is proportional to the number of cells, and is independent of their size. As regards resistance, the current will be strongest when the resistance is least, that is when the plates are very large and very near together.

Whenever chemical action takes place, heat is produced; but in the ordinary use of a galvanic battery only a portion of this heat is produced in the cell themselves; the rest of it is produced in the external conductor. When we heat a wire by sending the current of a battery through it, the heat generated in the wire is a portion of the heat due to the chemical action in the cells. In cells of high electromotive force the heat due to the chemical action is greater (for the same quantity of zinc dissolved) than in cells of low electromotive force. It is much higher for a Bunsen than for a Daniell cell.

GALVANIZED IRON, a name loosely given to sheets of iron coated with zinc by a non-galvanic process, the iron being first cleansed by friction and the action of dilute sulphuric acid, and then plunged into a bath composed of melted zinc and other substances, as sal-ammoniac, or mercury and potassium; more properly the name is given to sheets of iron coated first with tin by a galvanic process, and then with zinc by immersion in a bath containing fluid zinc covered with sal-ammoniac mixed with earthy matter. So long as the coating is entire, and so long as it is not exposed to corrosive substances, galvanized iron is very durable.

GALVANOMETER, an instrument for measuring an electric current by the de-

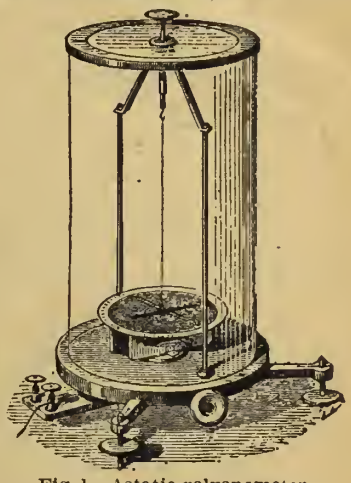


Fig. 1.—Astatic galvanometer.

flection of a magnetic needle. The current flows through a wire coiled usually into the form of a circle, which is placed vertically in the magnetic meridian and surrounds the needle. When no current is passing the needle points north and south, and the galvanometer should be so placed that the needle when so pointing lies in the plane of the coil. When a current passes through the coil, it exerts a force upon the needle tending to set it at right angles to the plane of the coil—that is, to set it east and west. The action of the earth on the other hand tends to set it north and south, and it will actually take an intermediate position which varies with the strength of the current. This position is read off on a graduated circle usually by means of a long light pointer which is attached to the needle at right angles. In some galvanometers, as in that represented in Figure 2, the coil can be turned till it

Fig. 2.—Sine galvanometer.

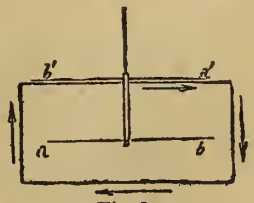


Fig. 3.

Fig. 4.—Mirror galvanometer.

overtakes the needle. The lower graduated circle is for the purpose of measuring the amount of this rotation.

For measuring very feeble currents, it is more usual to employ the "astatic" galvanometer, represented in Fig. 1. It has two needles, a′ b′, a b (Fig. 3), as nearly equal as possible, fastened to one upright stem, with their poles pointing opposite ways. The directive actions of the earth on the two needles are opposite, and hence the resultant directive action of the earth on the two combined is very small. The coil of the galvanometer, on the other hand, is so placed that the current tends to deflect both needles

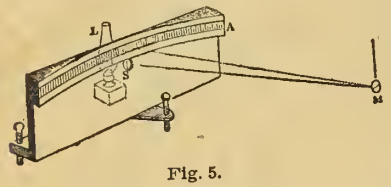


Fig. 5.

the same way. The coil, which is shown in section in Fig. 3, is approximately rectangular, its longest dimension being horizontal. One of the needles a′ b′ is just above, and the other a b is below the upper part of the coil. The current in this part of the coil would urge them opposite ways if their poles were similarly directed, but as their poles are oppositely directed it urges them the same way. The current in the lower part and ends of the coil assists in deflecting the lower needle, and is too distant from the upper needle to have much effect upon it. The coil is thus placed in a position of great advantage as compared with the earth, and the deflection is proportionately large.

Much greater sensitiveness can be obtained by the use of the mirror-galvanometer, Fig. 4. The round box in the center contains a coil of some hundreds of convolutions, with a very small needle fastened to a little glass mirror suspended in its center by a silk fiber. The mirror, with the needle fastened to its back, is shown at m in Fig. 5. Light from a lamp l comes through the hole s and falls upon the mirror, which, being slightly concave, reflects it to a focus on the scale aa, where a bright image of the flame is accordingly seen. The smallest angular movement of the mirror causes a very visible movement of the bright image on the scale. The curved bar m in Fig. 4 is a magnet (called the controlling magnet), which can be raised or lowered, and turned round. One use of it is to bring the needle into the plane of the coil when the coil is not standing north and south. It is better, however, to keep the coil north and south, and then the magnet m can be used to annul the earth's magnetism, thus conferring the same advantage which is obtained by the use of two needles in the astatic galvanometer.

For the general principle which governs the deflection of a needle by a current, see Electromagnetism.

GAL'VESTON, a city and seaport of Texas, at the northeast extremity of Galveston Island, at the mouth of Galveston Bay, about 450 miles south by west from New Orleans. It is one of the most flourishing ports in the Gulf of Mexico. Large quantities of cotton are shipped, the export to Great Britain alone being over 400,000 bales annually. The chief buildings are the custom and market houses, the town-hall, a number of churches, including a Gothic Episcopal Church and Roman Catholic cathedral, and the Roman Catholic university of St. Mary. Immense loss of life and damage to property was caused by a hurricane in 1900. Pop. 39,000.

GAL'WAY, a seaport of Western Ireland, prov. of Connaught, capital of county of same name, at the mouth of the Corrib, in Galway Bay, 117 miles west of Dublin. Pop. 13,414.—The county, which is washed by the Atlantic, has an area of 1,502,362 acres, of which one-eighth is under crops. In the northwest, or district of Connemara, it is rugged and mountainous; in the east, level but extensively covered with bog; and in the south, fertile and tolerably well cultivated, producing wheat, barley, and oats. Lough Corrib, which lies wholly within it, dividing the county into the e. and w. districts, is the third largest lake in Ireland. The minerals include lead, limestone, marble, and beautiful serpentine. The fisheries are valuable, but much neglected. The principal manufactures are coarse woolens and linens. Pop. 192,146.

GAMA, Dom Vasco da, the first navigator who made the voyage to the East Indies by the Cape of Good Hope, was born in 1450 at Sines, Portugal, of a noble family. The voyage had been projected under John II., and his successor, Emmanuel the Fortunate, having fitted out four vessels, intrusted Gama with the chief command. He sailed from Lisbon on July 8th, 1497, and doubling the Cape, visited Mozambique, Mombaza, Melinda, and Calicut, returning to Lisbon in 1479. For this exploit he was named Admiral of the Indies and received the title of Dom, with an annual pension and extensive privileges in Indian commerce. In the year 1502 he was placed at the head of a powerful fleet, with which he provided for the security of future voyagers by founding establishments at Mozambique and Sofala. He also inflicted signal reprisals on the town of Calicut, where the Portuguese residents had been massacred, and established the first Portuguese factory in the Indies. He re-entered Lisbon in 1503, and passed the next twenty years in obscurity. In 1524 he was appointed Viceroy of India by King John III., but his administration lasted only three months, his death taking place at Goa in December of that year.

GAMA'LIEL, the name of two persons mentioned in Bible history, of whom the first, Gamaliel, the son of Pedahzur (Numbers i. 10; ii. 20; vii. 54, 59; x. 23), was prince or head of the tribe of Manasseh. The other and better known Gamaliel is mentioned twice in the Acts of the Apostles, as a learned doctor of the law, of the sect of the Pharisees.

GAMBET'TA, Léon Michel, a French orator and statesman, born in 1838 at Cahors, of a family of Genoese extraction. On the downfall of the empire, after the surrender of Sedan in 1870, a government for the national defense was formed, in which Gambetta was nominated minister of the interior. The accidental discharge of a pistol caused his death at Paris in December, 1882.

GAMBIA, a British colony and protectorate in West Africa. Pop. 90, 000 (14,000 in colony).

GAMBIER ISLANDS, a group of small coral islands in the South Pacific, about lat. 23° 8′ s. and lon. 134° 55′ w.; belonging to France. Pop. about 2300.

GAMBLING, or **GAMING,** the practice of indulging in games involving some element of chance or hazard with a view to pecuniary gain. In many countries such games, and the collateral practices of betting on events, taking shares in lotteries, etc., are legally prohibited or restricted as frequently associated with fraud and as themselves demoralizing. At other times governments, tempted by the prospect of gain, have openly encouraged gambling by licensing gaming-houses, or instituting lotteries under their own authority. (See Lottery.) In France public gaming-tables were suppressed from 1st January, 1838, but lotteries are still sometimes carried on. Previous to the formation of the German Empire gambling was encouraged in both of the ways referred to in several of the principalities of Germany. Baden-Baden, in the Grand-duchy of Baden, and Homburg, in Hesse-Homburg, were the two most famous resorts in Europe of the frequenters of gaming-tables. After the formation of the empire gaming was suppressed in these places (31st December, 1872), and since that time the Italian principality of Monaco has become the last public resort of this species of gambling.

In the U. States one who keeps a gambling house is indictable at common law for maintaining a nuisance, and one who wins another's money with false dice, or the like, is punishable as a common law cheat.

GAMBOGE, a concrete, vegetable, inspissated juice or sap, or gum-resin, yielded by several species of trees, with handsome laurel like foliage and small yellow flowers. As a drug it has drastic purgative properties, but it is seldom administered alone. In doses of a drachm or even less it produces death.

GAME LAWS, laws relating to the killing of certain wild animals pursued for sport, and called game. Formerly in Britain certain qualifications of rank or property were needed to constitute the right to kill game; but by the Game Act of Will. IV. the necessity for any qualification except the possession of a game certificate was abolished, and the right given to any one to kill game on his own land, or on that of another with his permission.

In the U. States the chief restrictions are in regard to killing wild animals during the breeding season.

The following table shows the close season for all game in the U. States, with the exception of mountain sheep and goat and a few unimportant species. Where no dates are given kind of game does not exist or close season at all times. The first date of the close season and the first date of the open season are given. Open season may be found by reversing the dates.

		MAMMALS.				BIRDS.						
		Deer.	Elk, Antelope, Moose, Caribou.	Squirrel.	Rabbit.	Quail.	Grouse and Prairie Chicken.	Wild Turkey.	Pheasant.	Woodcock.	Duck, Goose, Swan.	Plover, Snipes, Rail.
1	Alabama [11]	Jan. 1-Sep. 1		Feb. 2-July 1		Local laws	Local laws	Local laws	Mar. 2-Nov. 15	Mar. 2-Nov. 15		
2	Alaska [11]	Feb. 1-Aug. 1	Jan. 1-Sept. 1 [2]				Dec. 16-Sept. 4				Feb. 1-Sept. 1	Dec. 16-Sept. 1
3	Arizona [11]	Dec. 1-Sept. 15	At all times			Mar. 1-Oct. 15.	Mar. 1-Oct. 15.	Dec. 1-Sept. 15	Mar. 1-Oct. 15.			
4	Arkansas [11]	Feb. 1-Sept. 1 [12]				Feb. 15-Nov. 1.	Dec. 1-Oct. 31	Mar. 1-Nov. 1.				
5	California [11]	Oct. 15-Aug. 1	At all times	Feb. 1-Aug. 1		Feb. 15-Oct. 15	Feb. 15-Oct. 1		At all times			Feb. 15-Oct. 15
6	Colorado	Oct. 1-Sept. 25	To 1907			To Oct. 1, 1920 [9]	Oct. 21-Sept. 1	To 1907	At all times		April 16-Sept. 10	April 16-Sept. 10
7	Conuecticut [11]	To June 1, 1911		Dec. 1-Oct. 1	Jan. 1-Oct. 1	Dec. 1-Oct. 1	Dec. 1-Oct. 1		June 1, 1906	Dec. 1-Oct. 1	May-Sept. 1	April 1-Sept. 1 [5]
8	Delaware				Jan. 1-Nov. 15	Jan. 1-Nov. 15	Jan. 1-Nov. 15				April 15-Oct. 1	
9	Dist. of Col. [11]	Jan. 1-Sept. 1		Feb. 1-Nov. 1	Feb. 1-Nov. 1	Mar. 15-Nov. 1	Dec. 26-Nov. 1	Dec. 26-Nov. 1		Jan. 1-July 1	April 1-Sept. 1	April 1-Sept. 1
10	Florida	Feb. 1-Nov. 1				Mar. 1-Nov. 1		Mar. 1-Nov. 1			April 1-Oct. 1	
11	Georgia	Jan. 1-Sept. 1				Mar. 15-Nov. 1	Mar. 15-Nov. 1	Mar. 15-Nov. 1	Nov. 30, 1905	Feb. 1-Sept. 1	Feb. 1-Sept. 1 [10]	
12	Idaho	Jan. 1-Sept. 1	Jan. 1-Sept. 1 [1]			Dec. 1-Nov. 1.	Dec. 1-Aug. 15		Mar. 11, 1907		Feb. 15-Sept. 15.	July 15-Feb. 15
13	Illinois	To 1913		Jan. 1-July 1		Dec. 20-Nov. 10	To 1907	To 1908	To 1908	Dec. 1-Aug. 1	April 15-Sept. 1.	May 1-Sept. 1
14	Indiana	At all times		Jan. 1-Nov. 10.		Jan. 1-Nov. 10	Jan. 1-Nov. 10	At all times	At all times	Jan. 1-Nov. 10.	April 15-Sept. 1.	
15	Long Island	4 days in Nov. [13]		Jan. 1-Nov. 1.	Jan. 1-Nov. 1	Jan. 1-Nov. 1	Jan. 1-Nov. 1		Jan. 1-Nov. 1	Jan. 1-Aug. 1	Jan. 1-Oct. 1	Jan. 1-July 1
16	Iowa	At all times	At all times	Jan. 1-Sept. 1.		Dec. 15-Nov. 1	Dec. 1-Sept. 1	Dec. 1-Nov. 1.		Jan. 1-July 10	April 15-Sept. 1.	April 15-Sept. 1.
17	Kansas [11]		At all times			Dec. 1-Nov. 15 [8]	Oct. 1-Aug. 15 [8]		Feb. 28, 1907		April 25-Sept. 1.	Sept. 15-July 15.
18	Kentucky	Mar. 1-Sept. 1		Feb. 1-Nov. 15.		Jan. 1-Nov. 16.	Jan. 1-Nov. 15	Feb. 1-Sept. 1.		Feb. 1-June 20	April 1-Sept. 1	
19	Louisiana [11]				April 1-Nov. 2	Mar. 1-Nov. 1.		April 1-Dec. 1.			April 1-Sept. 1	Dec. 1-Sept. 1
20	Maine	Dec. 15-Oct. 1 [12]	Dec. 1-Oct. 15 [2]		April 1-Sept. 1	At all times	Dec. 1-Sept. 15		To Mar. 22, 1911	Dec. 1-Sept. 13	Dec. 1-Sept. 1 [10]	May 1-Aug. 1
21	Maryland	Local laws		Dec. 1-Sept. 1	Dec. 25-Nov. 1	Dec. 25-Nov. 1.	Dec. 25-Nov. 4	Dec. 25-Nov. 1.	Dec. 25-Nov. 1	Dec. 25-Nov. 1	April 10-Nov. 1.	May 1-Aug. 15
22	Massachu'ts [11]	To Nov. 1, 1908		Mar. 1-Oct. 1	Mar. 1-Oct. 1	Dec. 1-Nov. 1.			To Feb. 13, 1905	Dec. 1-Oct. 1	Mar. 1-Sept. 1 [10]	Mar. 1-July 15
23	Michigan	Dec. 1-Nov. 10 [12]	To 1911	Dec. 1-Oct. 15.		To Oct. 15, 1907	Dec. 1-Oct. 15 [3]	To 1910	To 1910	Dec. 1-Oct. 20	Jan. 2-Sept. 1	Dec. 1-Oct. 1
24	Minnesota	Dec. 1-Nov. 10	Dec. 1-Nov. 10 [2]			Dec. 15-Oct. 1	Dec. 15-Oct. 1 [4]		At all times	Nov. 1-Sept. 1.	Dec. 1-Sept. 1	Nov. 1-Sept. 1
25	Mississippi	Mar. 1-Sept. 15				May 1-Oct. 1		May 1-Oct. 1				
26	Missouri	Jan. 1-Nov. 1				Jan. 1-Nov. 1	Jan. 1-Nov. 1 [4]	Jan. 1-Nov. 1	Jan. 1-Nov. 1	Jan. 1-Aug. 1	April 1-Oct. 1	Jan. 1-Aug. 1
27	Montana	Dec. 1-Sept. 1	At all times [1]			At all times	Dec. 1-Sept. 1		At all times		Dec. 1-Sept. 1	
28	Nebraska	Nov. 16-Aug. 16	At all times [7]			Dec. 1-Nov. 15.	Dec. 1-Oct. 1	At all times	At all times		April 16-Sept. 1	Oct. 31-April 15 [6]
29	Nevada [11]	Nov. 15-Sept. 15.				Mar. 1-Sept. 15.	Mar. 1-Sept. 15		Sept. 1, 1906	Mar. 1-Sept. 15	Mar. 1-Sept. 15	
30	New H'mps're	Dec. 1-Oct. 1	At all times	Jan. 1-Sept. 15	April 1-Oct. 1	Dec. 15-Oct. 1	Dec. 15-Oct. 1		To 1905	Dec. 15-Sept. 15	Feb. 1-Aug. 1 [10]	Feb. 4-Aug. 1 [6]
31	New Jersey	To April 14, 1905		Jan. 1-Nov. 10	Jan. 1-Nov. 10	Jan. 1-Nov. 10	Jan. 1-Nov. 10	Jan. 1-Nov. 10	Jan. 1-Nov. 1	Jan. 1-Oct. 1	May 1-Sept. 1	Jan. 1-May 1
32	New Mexico [11]	Jan. 1-Nov. 1	To Mar. 7, 1905			Mar. 1-Oct. 1	Jan. 1-Oct. 1	Jan. 1-Oct. 1	Mar. 14, 1906			
33	New York	Nov. 16-Sept. 1	At all times	Dec. 1-Sept. 16	Dec. 16-Sept. 16 [14]	Dec. 1-Nov. 1	Dec. 1-Sept. 16		To 1905	Dec. 1-Sept. 16	Jan. 1-Sept. 16	Jan. 1-Sept. 16
34	No. Carolina	Jan. 1-Oct. 1		Local laws		Mar. 15-Nov. 1		Mar. 15-Nov. 1		Local laws		
35	No. Dakota	Dec. 1-Nov. 10	At all times			Oct. 15-Sept. 1	Oct. 15-Sept. 1		Sept. 1, 1905	Oct. 15-Sept. 1	May 1-Sept. 1	
36	Ohio	Dec. 16-Nov. 10		Oct. 15-Sept. 1.	Oct. 15-Sept. 1	Dec. 2-Nov. 10.	To Nov. 10, 1904	Dec. 2-Nov. 10	Nov. 10, 1904	Dec. 1-Sept. 1	Dec. 1-Sept. 1	Dec. 2-Nov. 10
37	Oklahoma [11]	At all times	At all times			Feb. 1-Oct. 1	Jan. 1-Sept. 1	Jan. 1-Sept. 1	Jan. 1-Dec. 1			Jan. 1-Aug. 1
38	Oregon	Nov. 1-Aug. 15	To Sept. 15, 1907	Jan. 1-Oct. 1.		Dec. 1-Oct. 1	Dec. 1-Oct. 1	To Oct. 1, 1905	Oct. 1, 1905	Oct. 1, 1905	Mar. 1-Sept. 1	Jan. 1-Aug. 1
39	Pennsylvania	Dec. 1-Nov. 1	Dec. 1-Nov. 1 [1]	Dec. 16-Oct. 15	Dec. 16-Nov. 1	Dec. 16-Nov. 1	Dec. 16-Oct. 15	Dec. 16-Oct, 15	Dec. 16-Oct. 15	Dec. 16-Oct. 15	May 1-Sept. 1 [10]	Jan. 1-Sept. 1
40	Rhode Isl. [11]	Jan. 1, 1905		Jan. 1-Nov. 1	Jan. 1-Oct. 15	Jan. 1-Nov. 1	Jan. 1-Nov. 1		To Oct. 1, 1905	Dec. 16-Oct. 15	April 1-Aug. 15 [10]	
41	So. Carolina	Jan. 1-Sept. 1 [12]				April 1-Nov. 1	April 1-Nov. 1	April 1-Nov. 1	Jan. 1, 1905	April 1-Nov. 1		
42	So. Dakota	Dec. 15-Nov. 15	Jan. 1, 1911 [1]			Jan. 1-Sept. 1	Jan. 1-Sept. 1			Jan. 1-Sept. 1	May 1-Sept. 1	May 15-Sept. 1
43	Tennessee	To Oct. 1, 1907		Mar. 1-June 1		Mar. 1-Nov. 1	Mar. 1-Nov. 1	Mar. 1-Nov. 1	Jan. 1-Dec. 1	April 15-Oct. 1	April 15-Oct. 1	April 15-Oct. 1
44	Texas [11]	Jan. 1-Nov 1	To July 1, 1908			Feb. 1-Nov. 1	Feb. 1-Nov. 1	Feb. 1-Nov. 1.	July 1, 1908			
45	Utah	To Mar. 17, 1909	At all times			At all times	Dec. 1-Aug. 15		At all times		Mar. 15-Feb. 15.	
46	Vermont [11]	Oct. 29-Oct. 23	At all times		May 1-Sept. 1	Jan. 1-Sept. 1	Jan. 1-Sept. 1		Nov. 20-Oct. 1	Jan. 1-Sept. 1	Jan. 1-Sept. 1	Jan. 1-Sept. 1
47	Virginia	Jan. 1-Oct. 1			Local laws	Feb. 1-Nov. 1	Feb. 1-Nov. 1	Feb. 1-Nov. 1.	Local laws	Feb. 1-Nov. 1	April 1-Oct. 15 [10]	Jan. 1-July 20
48	Washington	Dec. 15-Sept. 15.	Nov. 1-Sept. 15			Jan. 1-Oct. 1	Jan. 1-Sept. 1		Oct. 15, 1906		Mar. 1-Sept. 1	Mar. 1-Aug. 15
49	West Virginia	Dec. 15-Oct. 15		Jan. 1-Sept. 15	Jan. 1-Sept. 15	Dec. 20-Nov. 1	Dec. 15-Oct. 15	Dec. 15-Oct. 15		Nov. 2-July 15.	April 1-Oct. 1	
50	Wisconsin	Dec. 1-Nov. 11 [12]		Mar. 1-Sept. 1.	May 1-Sept. 1	To Sept. 1, 1905	Dec. 1-Sept. 1		Sept. 1, 1905	Dec. 1-Sept. 1	Jan. 1-Sept. 1	Dec. 1-Sept. 1
51	Wyoming	Nov. 15-Sept. 15.	Nov. 15-Sept. 15 [1]			At all times	Oct. 15-July 15 [4]		Sept. 1, 1906		May 1-Sept. 1	May 1-Sept. 1

1 Elk only. 2 Moose and caribou, Oct. 15, 1905. 3 Grouse. 4 Prairie chicken—Minnesota, Nov. 1–Sept. 1; Missouri, Dec. 1–Sept. 1; Wyoming, Dec. 1–Sept. 1. 5 Snipe—New Hampshire, Dec. 15–Sept. 15; Connecticut, May 1–Aug. 1; Nebraska, April 16–Sept. 1. 6 Elk, to Sept. 15, 1904. 7 Antelope—Nebraska, Nov. 16–Aug. 15; Nevada, Nov. 15–Sept. 15. 8 In 20 counties to March 18, 1906. 9 Except crested quail. 10 Certain species. 11 Local Laws. 12 Local exceptions. 13 First two Wednesdays and first two Fridays after first Tuesday in November. 14 Except some counties where local laws govern. Prohibitory laws against hunting doves and robins exist in nearly all states. Sale of game during close season is prohibited in most states. License fees from non-residents required in some states. In most states female deer and elk and deer without horns protected at all times.

GAME LAWS

GAMES, a name of certain sports or amusements carried on under regular rules and methods, as with cards or dice, billiards, baseball, tennis, etc. Among the ancients there were public games or sports, exhibited on solemn occasions, in which various kinds of contests were introduced. The Grecian games were national festivals attended by spectators and competitors from all parts of Greece, the chief being the Olympic, Pythian, Nemean, and Isthmian. They consisted of chariot races, running, wrestling, and boxing matches, etc., and to be victorious in one of these contests was esteemed one of the highest honors of a Greek citizen. The Roman games were held chiefly at the festivals of the gods. They might, however, be exhibited by private persons to please the people, as the combats of gladiators, theatrical representations, combats of wild beasts in the amphitheater, etc.

GAM'UT, or GAMMUT, in music, the entire series of musical tones in the natural order of ascent or descent. With the musicians of the 11th century A represented the lowest note in their instruments, and a lower note having been introduced, the Greek gamma (Γ) was taken to represent it. From its prominent place as first note of the scale its name was taken to represent the whole.

GANDO, a kingdom of the Western Soudan, intersected by the Niger, and inhabited chiefly by Fellatahs, with a capital of some name. It is most fertile, and has a population of perhaps 5,000,000 Mohammedanism is the prevalent religion. The territory is now partly British, partly French.

GANESA (ga-nā'sa), an Indian god, the son of Siva and Pârvati, represented

Ganesa.

by a figure half man half elephant, having an elephant's head.

GANGA, in Hindu mythology, the personified goddess of the river Ganges.

GANGES (gan'jez), a river of Hindustan, one of the greatest rivers of Asia, rising in the Himalaya Mountains, in Garhwal state, and formed by the junction of two head streams, the Bhagirathi and the Alaknanda, which unite at Deoprag, 10 miles below Srinagar, 1500 feet above sea level. The Bhagirathi, as being a sacred stream, is usually considered the source of the Ganges, rising at the height of 13,800 feet, but the Alaknanada flows further and brings a larger volume of water to the junction. In the rainy season the flat country of Bengal is overflowed to the extent of 100 miles in breadth, the water beginning to recede after the middle of August. The Ganges is navigable for boats of a large size nearly 1500 miles from its mouths and it forms a great channel for traffic. It is an imperative duty of the Hindus to bathe in the Ganges, or at least to wash themselves with its waters, and to distribute alms, on certain days. The Hindus believe that whoever dies on its banks, and drinks of its waters before death, is exempted from the necessity of returning into this world and commencing a new life. The sick are therefore carried to the bank of the Ganges, and its waters is a considerable article of commerce in the remoter parts of India.

GANGES CANAL, Upper, a lateral canal in Northern India (N. W. Provinces), constructed for purposes of irrigation and supplementary navigation, extending on the right of the Ganges from Hardwar to Cawnpore. The trunk of the canal measures 445 miles. The Lower Ganges Canal is a sort of continuation of the Upper, intended for irrigation purposes.

GANG'LION, in anat., an enlargement occurring somewhere in the course of a nerve, and containing nerve cells in addition to nerve filaments. There are two systems of nerves which have ganglia upon them. First, those of common sensation, whose ganglia are near to the origin of the nerve in the spinal cord. Secondly, the great sympathetic nerve, which has ganglia on various parts of it. In the invertebrates ganglia are centers of nervous force, and are distributed through the body in pairs, one for each ring of the body, connected by fibers as in the figure. The cerebral ganglia of vertebrates are the brain itself, the masses of gray matter at the base of the brain, as the optic thalamus, etc.

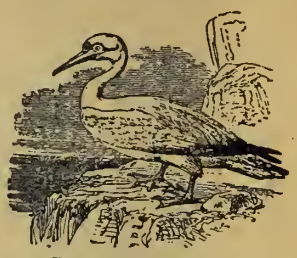
GANGPUR', a native state of Bengal, in Chota Nagpur, consisting mainly of hills, forest, and jungle; area, 2484 sq. miles; pop. 107,965.

GANGRENE (gang'grēn), the death of some part of a living body, wherein the tissues begin to be in a state of mortification, there being also complete insensibility. A gangrened part must be removed either by amputation or by natural process, but if a vital part is so affected death will ensue.

GANGWAY, a narrow platform or bridge of planks along the upper part of a ship's side for communication fore and aft; also a sort of platform by which persons enter and leave a vessel.

GANJAM, a decayed town of India, in the Madras Presidency, formerly capital in the district of same name, near the coast of the Bay of Bengal. The district, one of the five Circars, is one of the most productive under the Madras Presidency, yielding rice, cotton, sugar, rum, and pulse, etc. Area, 8313 sq. miles; pop. 1,896,803.

GANNET, the solan goose, is about 3 feet in length, and 6 in breadth of wings from tip to tip; the whole plumage, a dirty white, inclining to gray; the eyes, a pale yellow, surrounded with a naked skin of a fine blue color; the bill straight, 6 inches long, and furnished beneath with a kind of pouch. The gannets are birds of passage, arriving in Great Britain about March and departing in August or September, their move-



Gannet or solan goose.

ments being partially determined by those of the herring, on which they feed. They migrate to the southward in the winter, and appear on the coast of Portugal. In the breeding season they retire to high rocks on unfrequented islands—the Hebrides, Orkneys, St. Kilda, Ailsa Craig, and the Bass Rock. The nests are generally formed of seaweed. The female lays only one egg, though, if it be removed, she will deposit another. The young, which are much darker than the old birds, remain in the nest until nearly their full size, becoming extremely fat. In St. Kilda they form part of the food of the inhabitants, being taken by men lowered from the top of the cliffs.

GANNETT, Henry, an American geographer, was born in Bath, Maine, in 1846. In 1882 he became chief topographer of the U. States geological survey. He contributed much of the geographical matter to the present edition of the New International Encyclopædia. His publications include: A Manual of Topographic Methods; Dictionary of Altitudes; and Building of a Nation.

GAN'OIDS, the second order of fishes according to Agassiz. The families of this order are chiefly characterized by angular, rhomboidal, polygonal, or circular scales composed of horny or bony

Scales of ganoid fishes.
1, Lepidosteus. 2, Cheiracanthus. 3, Palæoniscus. 4, Cephalaspis. 5, Dipterus. 6, Acipenser.

plates covered with a thick plate of glossy enamel-like substance. The ganoids were most numerous in Palæozoic and early Mesozoic times, but are now represented by seven genera.

GAN'YMEDE (-mēd), in Grecian mythology, great-grandson of Dardanus, the founder of Troy, and son of Tros and of Callirrhoë, daughter of Scamander. Zeus sent his eagle to carry him off from Mount Ida to Olympus, where he held the office of cup-bearer to the immortals in succession to Hebe.

GAPES, a disease of fowls and other Rasorial birds, arising from the presence in the windpipe of small parasitic worms which cause the bird to continually open its beak. They may be dislodged with an oiled feather, or by mixing a little epsom salts with the food.

Ganymede and the Eagle—Museo Nazionale, Naples.

GARCILASO DE LA VEGA, called the prince of Spanish poets, born at Toledo in 1500 or 1503. His name is associated with that of his contemporary Boscan in the impetus given to Spanish literature by the imitation of the Italian poetic style as exemplified in Petrarch, Aristo and Sannazaro. His works, which consist of eclogues, epistles, odes, songs, sonnets, etc., are graceful and musical. He died in 1536.

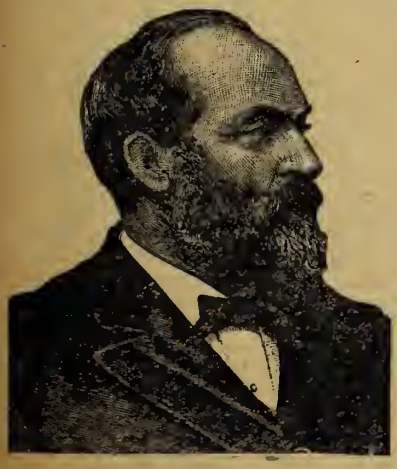
GARD (gär), a department of southern France, abutting on the Gulf of Lyons; area, 2256 sq. miles. Pop. 417,099.

GARDE NATIONALE (nâ-syo-nâl), a guard of armed citizens instituted at Paris, July 13, 1789, for the purpose of preserving order and protecting liberty.

GARDENING. See Horticulture.

GARDNER-GUN. See Machine-gun.

GARFIELD, James Abram, the twentieth president of the U. States, was born in Ohio, where he worked on a farm till



James A. Garfield.

his fourteenth year. He acquired a good education, however, studied law, and in 1859 was elected to the Ohio state senate. In 1861 he entered the army, was appointed colonel, became chief of staff to Rosecranz, and major-general of volunteers. He resigned his command on his election to congress in 1863. He sat in nine congresses for the same constituency, serving on important committees and winning ground no less by strong intelligence than uncompromising honesty. In 1880 he was elected to the senate, and in the same year became president of the U. States. Many reforms seemed about to be inaugurated, when he was shot by a disappointed office-seeker named Guiteau in the railway station at Washington. He lingered eighty days, dying at Long Branch, Sept. 19, 1881.

GAR-FISH, SEA-PIKE, or **GAR-PIKE,** a fish, known also as the sea-needle, making its appearance on the American coasts in summer, a short time before the mackerel.

GAR'GARA, the highest mountain of the ridge of Ida, in Asia Minor, near the Gulf of Adramyti, on the north.

GARGLE, a liquid application to the throat. In using a gargle the head should be thrown well back so as to keep the liquid in contact with the throat, and by expelling the air from the lungs through the liquid the passage may be thoroughly washed. Care should be taken not to swallow the gargle.

GAR'GOYLE, in Gothic architecture, a projecting spout, for throwing the

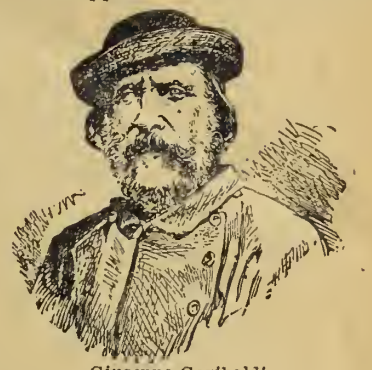
Gargoyle, Stony-Stratford.

water from the gutter of a building, usually of some grotesque form, such as the head or figure of an animal or monster.

GAR'HWAL (gar-hwäl'), or **GURHWAL,** a district of India, in the United Provinces, bounded on the north by Tibet, east by Kumaun, south by Bijnaur district, and west by the Garhwal state; area, 5500 sq. miles; pop. 407,818. There are good roads, and a considerable trade with Tibet.

GARHWAL, or **TEHRI,** a native Indian state under British protection, west of the district of the same name (see above); area, 4164 sq. miles; pop. 241,242. Chief town, Tehri; chief river, the Alaknanda and other head-waters of the Ganges.

GARIBAL'DI, Giuseppe, Italian patriot and hero, was born at Nice, 1807 his father being a poor fisherman. In 1834 he became a member of the "Young Italy" party, and being condemned to death for his share in the schemes of Mazzini, escaped to Marseilles, took service in the fleet of the Bey of Tunis and finally went to South America. In 1848 he returned to Italy, raised a band of volunteers, and harassed the Austrians until the cessation of hostilities and re-establishment of Austrian supremacy in Lombardy. He then retired to Switzerland, but in the spring of 1849 proceeded to Rome to support Mazzini's republic. He was appointed to command the



Giuseppe Garibaldi.

forces, but the odds were overwhelming, and after a desperate defense of thirty days Garibaldi escaped from Rome with 4000 of his followers. He then purchased a part of the small island of Caprera, on the north coast of Sardinia, and made this his home for the rest of his life. Latterly the subscriptions of his admirers enabled him to become owner of the whole island. In the war of 1859, in which Sardinia recovered Lombardy, Garibaldi and his chasseurs of the Alps did splendid service; and on the revolt of the Sicilians in 1860 he crossed to the island, wrested it after a fierce struggle from the King of Naples, recrossed to the mainland and occupied Naples, where he was procliamed dictator of the Two Sicilies. It was now feared that Garibaldi might prove untrue to his motto—Italy and Victor Emmanuel—but he really acquiesced in the annexation of the Two Sicilies to Italy, and declining all honors retired to his island farm. In 1864 he received an enthusiastic welcome in Britain. In 1870 he gave his services to the French republican government against the Germans, and with his 20,000 men rendered valuable assistance in the southeast. At the end of the war he was elected a member of the French assembly, but speedily resigned his seat and returned to Caprera. Rome now became the capital of the united Italy, and here in January, 1875, Garibaldi took his seat in the Italian parliament. The latter part of his life was spent quietly at Caprera. After 1870 he wrote two or three novels—very mediocre productions. He died somewhat suddenly June 2, 1882. His autobiography has been published in English.

GAR'LAND, Augustus Hill, American politician, was born in Tipton county, Tenn., in 1832, but when less than a year old was taken by his parents to Arkansas. He was elected to the provisional congress of the confederate states in 1861; was re-elected to the house of the same congress in 1862, and was afterward elected to the confederate senate, of which he continued to be a member until the close of the war. He then devoted himself to his profession

and in 1874 was elected governor of Arkansas, under the new constitution. He was a member of the U. States senate from 1877 to 1885, and from 1885 to 1889 was attorney-general of the U. States in the cabinet of President Cleveland, after which, until his death, in 1899, he practiced law in Washington, D. C.

GARLIC, a hardy, perennial allied to the onion, indigenous to the south of Europe, and forming a favorable condiment among several nations. The leaves are grass-like, and differ from those of the common onion in not being fistulous; the stem is about 2 feet high; the flowers are white; and the root is a compound bulb, consisting of several smaller bulbs, commonly denominated cloves, enveloped by a common membrane. It has a strong, penetrating odor, and a pungent acrid taste. Used as a medicine it is stimulent, tonic, and promotes digestion; it has also diuretic and sudorific qualities, and is a good expectorant.—Oil of garlic is a sulphide of allyl, a colorless, strongly-smelling oil, exceedingly irritant to the palate and the skin. It is contained also in the onion, leek, asafœtida, etc.

GARNET, a beautiful mineral, or group of minerals, classed among the gems, and occurring generally in mica-slate, hornblende-slate, gneiss, and granite, usually as more or less regular crystals of from twelve to sixty or even eighty-four sides. The prevailing color is red of various shades, but often brown and sometimes green, yellow, or black. They vary considerably in composition, but admit of classification into three principal groups according to their chief sesquioxide basic components, viz. alumina, iron, and chrome garnets. Among the varieties are common garnet, pyrope, alamandine, precious or oriental garnet, allochroite, melanite or black garnet, etc. By jewelers garnets are classed as Syrian, Bohemian, or Cinghalese, rather, however, from their relative value and fineness than as necessarily implying that they came from these places. The first, named after Syrian, in Pegu, long the chief mart for garnets, are the most esteemed, being a violet-purple unmixed with black and taking an orange tint by artificial light. The Bohemian garnet is usually a dull poppy red with hyacinth orange tint when held between the eye and the light; the pyrope is a full crimson form of this class. Coarse garnets reduced to powder are sometimes used in place of emery for polishing metals.

GARNISHMENT, a process by which chattels, rights, or credits belonging to the defendant in an action, but which are in the possession of a third person are seized and applied to the plaintiff's claim. It is not a common-law process and is regulated by statute in the states where it exists. Such statutes are, as a rule, strictly construed, and their requirements must be fully and fairly complied with by a plaintiff who would take advantage of them. It is held that only such property in the hands of the third party—the garnishee—is liable to this process as is not incumbered with trusts, and such as may be handed over or paid by the officer executing the process, under the order of the court and free from incumbrances, which can be properly determined and adjusted only by equity tribunals. Garnishment proceedings reach only such debts as are owing to the defendant at the time the process is served. A judgment obtained in a federal court cannot be garnisheed in an action in a state court. Such garnishment would operate to oust the federal court of its proper control over its own judgments.

GARONNE', a river of s.w. France, rising in the vale of Aran, in the Spanish Pyrenees; length, about 350 miles.

GARONNE, HAUTE, a department, south of France, one of the five separated by the Pyrenees from Spain. Capital of department, Toulouse. Area, 2,529 sq. miles. Pop. 439,769.

GARRICK, David, actor, born at Hereford, Eng., Feb. 20, 1717. He had a strong passion for acting, and in 1741 joined Giffard's company at Ipswich under the name of Lyddal. At Giffard's theater in Goodman's-fields he achieved a great success as Richard III., and in 1742 was not less successful at Drury Lane. In 1745 he became joint manager with Mr. Sheridan of a theater in Dublin, and after a season at Covent Garden (1746) purchased Drury Lane in conjunction with Mr. Lacy, opening it 15th September, 1747, with the Merchant of Venice, to which Dr. Johnson furnished a prologue. From this period may be dated a comparative revival of Shakespeare, and a reform both in the conduct and license of the drama. In 1763 he visited the Continent for a year and a half. He had already written his farces of The Lying Valet, Lethe, and Miss in her Teens; and in 1766 he composed, jointly with Colman, the excellent comedy of the Clandestine Marriage. After the death of Lacy, in 1773, the sole management of the theater devolved upon Garrick, until 1776, when he sold his moiety of the theater for £37,000, performed his last part, Don Felix in The Wonder, for the benefit of the theatrical fund, and bade an impressive farewell to the stage. He died January 20, 1779, and was buried with great pomp in Westminster Abbey.

GAR'RISON, William Lloyd, American journalist and founder of the anti-slavery movement in the U. States, born 1805. He was apprenticed to a shoemaker, but eventually became a compositor on the Newburyport Herald. In 1827 he became editor of the National Philanthropist, the first American temperance journal, and afterward of a journal in support of the election of John Quincy Adams. With Mr. Lundy, a Quaker, he then started the paper called the Genius of Universal Emancipation (1829), his denunciations of slave-traders leading to his imprisonment for libel. On his release he commenced lecturing in Boston, started the Liberator (1831), published weekly with the aid of one assistant and a negro boy. In 1832 appeared his Thoughts on African Colonization, and in the same year he established the American anti-slavery society. He subsequently visited England, where he was welcomed by Wilberforce, Brougham, Buxton, and others. In 1835 he was saved with difficulty from a Boston mob; but his principles made steady progress until 1865, when the anti-slavery society was dissolved with its work accomplished. He died at New York, 1879. A volume of sonnets (1843) and one of selections (1852) bear his name.

GARROTE (gar-rō'tā), a mode of punishment in Spain by strangulation, the victim being placed on a stool with a post or stake (Spanish, garrote) behind, to which is affixed an iron collar with a screw; this collar is made to clasp the neck of the criminal, and drawn tighter by means of the screw till life becomes extinct. This word, with the French spelling and pronunciation garrote, has become naturalized in Great Britain as a term for a species of robbery effected by throttling the victim and stripping him while insensible.

GARTER, Order of the, the highest and most ancient order of knighthood in Great Britain. The origin of the order, though sometimes assigned to Richard I., is generally attributed to Edward III., the legend being that Countess of

Insignia of the garter.

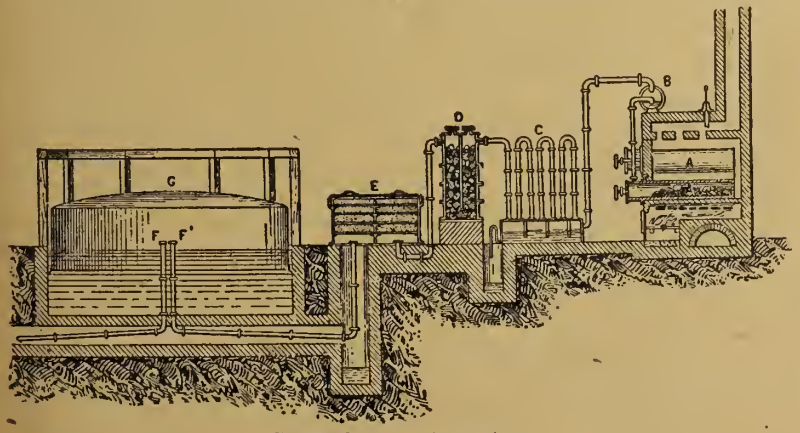
Salisbury having dropped her garter while dancing, the king restored it, after putting it round his own leg, with the words, which became the motto of the order, "Honi soit qui mal y pense"—Shame be to him who thinks evil of it. The date of the foundation or restoration by Edward III. of the order, as given by Froissart, is 1344, while other authorities, founding on the statutes of the order, assign it to 1350. The statutes of the order have been repeatedly revised, more particularly in the reigns of Henry V., Henry VIII., Edward VI., and George III.—the last in 1805. Ladies are said to have been admitted up till the reign of Edward IV. Until the reign of Edward VI. the common title of the order was the Order of St. George, and it still bears this title, as well as that of the Garter. The original number of knights was twenty-six, including the sovereign, who was its permanent head; and this number is still retained, except that by a statute passed in 1786 princes of the blood are admitted as supernumerary members. The peculiar emblem of the order, the garter (5), a dark-blue ribbon edged with gold, bearing the motto and with a gold buckle and pendant, is worn on the left leg below the knee. The mantle is of blue velvet, lined

with white taffeta, the surcoat and hood of crimson velvet, the hat of black velvet with plume of white ostrich feathers, having it the center a tuft of black heron's feathers. The collar of gold (3) consists of knots alternating with garters inclosing roses, with the badge of the order, called the George (4), pendent from it. This consists of a figure of St. George on horseback fighting the dragon. The lesser George (2) is worn on a broad blue ribbon over the left shoulder. The star (1), formerly only a cross, is of silver, and consists of eight points, with the cross of St. George in the center, encircled by the garter. A star is worn by the knights on the left side when not in the dress of the order.

GARTER-SNAKE, an elastic name given in North America to any of various small snakes, but properly applied to striped species, which includes those most often seen of all our serpents. Several of these are very slender, mainly green with lighter stripes, and are popularly distinguished as ribbon-snakes. One Oregon species is black, and some semi-tropical species have the stripes broken so as to form series of spots or cross-bars. The best-known species is the ordinary garter-snake, which is distributed over the whole U. States, Southern Canada, and the lowlands of Mexico and Guatemala.

GARY, IND., founded in 1906 on Lake Michigan at the mouth of the Calumet river near Chicago. The town was made to order as the home of a $75,000,000 plant for the United States steel corporation. Estimated population, 40,000.

GAS, an elastic aeriform fluid, a term originally synonymous with air, but afterward restricted to such bodies as were supposed to be incapable of being reduced to a liquid or solid state. Under this supposition gas was "a term applied to all permanently elastic fluids or airs differing from common air." After the liquefaction of gases by Faraday, the old distinction between gas and vapor, viz. that the latter could be reduced to a liquid or solid condition by reduction of temperature and increase of pressure, while a gas could not be so altered, was no longer tenable, so that the term has resumed nearly its original signification, and designates any substance in an elastic aeriform state. Gases are distinguished from liquids by the name of elastic fluids; while liquids are termed non-elastic, because they have, comparatively, no elasticity. But the most prominent distinction is the following:—Liquids are compressible to a certain degree, and expand into their former state when the pressure is removed; and in so far they are elastic, but gases appear to be in a continued state of compression, for when left unconfined they expand in every direction to an extent which has not hitherto been determined. In respect of this indefinite expansiveness, all gaseous bodies obey more or less strictly two laws, commonly called the "gaseous laws." The first, known as the law of Boyle and Mariotte, given first by Robert Boyle in 1662, and then by Mariotte in 1676, is that:—The volume of a given mass of gas varies inversely with the pressure to which the gas is subjected; or, in other words, the density of a given mass of gas is in direct proportion to the pressure that the gas is subjected to. The second of the gaseous laws is commonly called the law of Dalton and Gay-Lussac. It is, however, properly called Charles' law. Dalton published it in 1801; but Gay-Lussac, who stated it in 1802, gives the credit of having discovered it, fifteen years previously, to Citizen Charles. The law may be stated as follows:—The volume of a gas maintained under constant pressure increases for equal increments of temperature by a constant fraction of its original volume; and this fraction is the same whatever is the nature of the gas. A mass of gas, whose volume is 1000 at 0° C., becomes, at 100° C., 1366·5, the pressure remaining constant. In virtue of these laws a gas may now be defined to be a substance possessing the condition of perfect fluid elasticity, and presenting under a constant pressure a uniform state of expansion for equal increments of temperature—a property distinguishing it from vapor. There is, however, no known gas that obeys these two laws perfectly: thus, of the six gases whose liquefaction has been attended with most difficulty (oxygen, hydrogen, nitrogen, carbonic oxide, nitric oxide, and light carburetted hydrogen), all except hydrogen are more compressible than they should be theoretically, while hydrogen deviates slightly in the opposite direction, being less compressible than Boyle's law would indicate. The other gases exhibit even greater deviations from Boyle's law, and the amount of the deviation rapidly increases as the gas is brought nearer and nearer to liquefaction. The law of Dalton or Charles which gives for equal elevation of temperature equal increments of volume is also deviated from by every gas, and more and more so as the point of liquefaction is approached.



Gas-work, shown in section.

The liquefaction of gases is effected by the application of cold or pressure, or both combined. For any given pressure there is a particular temperature at which the gas liquefies. At a certain point, however, called by Andrews the critical point of temperature, the distinction between liquid and gas appears completely lost. At and above this temperature no pressure that can be applied will convert the fluid into the form of a liquid even though the volume is diminished by pressure so much as to make the density of the fluid greater than that of the liquid obtained at lower temperatures. By 1878 all gases had been liquefied.

The power of motion inherent in all parts of aeriform matter is accounted for by the kinetic theory of gases, according to which a gas consists of an enormous number of molecules moving about with very great velocity. Great as is their number, however, the molecules are sparsely distributed through space, in comparison with their distribution when the substance is in the solid or liquid condition. A molecule of a gas flying about moves on in a stright line till it meets another molecule, or till it impinges on a side of the containing vessel. Meeting another molecule the two turn each other aside, just as two billiard balls when they come into collision are both deflected from their previous paths. Passing thence each flies on in a straight line till it meets a fresh molecule, and each is again deflected. When the molecules impinge on the side of the vessel that contains the gas they rebound as a billiard ball does from the cushion of the billiard table; and the perpetual shower of molecules that strike and rebound from the sides gives rise to the phenomenon of gaseous pressure, just as an umbrella held out in a hail-storm is pressed downward owing to the numerous impulsive blows that act upon it. When the temperature of a gas is raised the energy of the molecules is increased. They strike with greater velocity, and the number of blows on the side of the vessel is also increased. The pressure is therefore greater; and the law of Dalton or Charles is easily shown to be a consequence of the kinetic theory. Boyle's law also follows very simply from it; for if we diminish the volume of the containing vessel to one-half, one-third, or to any other fraction of its original volume, we increase the number of molecules in a given space, a cubic inch for instance, in the same ratio. Consequently the number of impacts on a square inch of the surface of the containing vessel will also be increased in the same ratio, and the pressure will thus be increased in that ratio too. It is estimated that in a cubic centimeter of gas at standard temperature and pressure there

are nineteen million million million molecules.

In 1739 the Rev. Mr. Clayton published a paper in the Philosophical Transactions, on the inflammable nature of the gases obtained by the decomposition of pit-coal in heated close vessels; but no practical application of this discovery was made before 1792, when Mr. W. Murdoch, a native of Ayrshire, in the employ of Messrs. Watt and Boulton, lighted his own house and offices at Redruth on this principle. In 1798 he erected a gas apparatus on a large scale at Soho Foundry, Birmingham, and in 1802 M Le Bon lighted his house in Paris by gas, and made a proposal to supply the whole city. In 1803 Mr. Winsor exhibited gas illuminations at London in the Lyceum, and afterward raised the sum of $250,000 from a number of subscribers who formed themselves into a National Light and Heat Company (1810). With this money Mr. Winsor lighted Pall Mall, but was soon succeeded by Mr. Samuel Gleg, who invented the hydraulic main, the wet-lime purifier, and the wet gas-meter. From this time coal gas became the most common illuminating agent wherever it could be prepared economically.

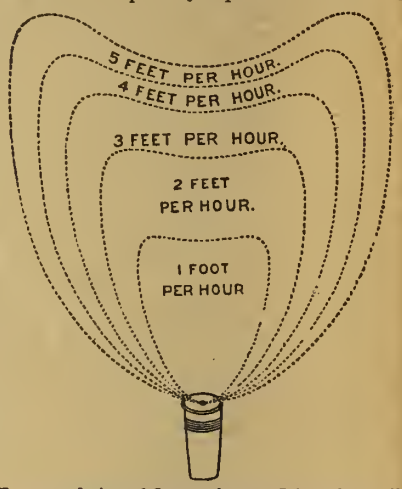
Gas is obtained from coal, the best sorts being bituminous coals. The coal is distilled in retorts of cast-iron (a), or now more generally of fire-clay, heated to a bright red heat. As they issue from the retort into the hydraulic main (b) the products of distillation contain vapors of tar and naptha, together with steam impregnated with carbonate of ammonia and hydrosulphate of sulphide of ammonium. These vapors would condense in the pipes in which the gas must be distributed, and would clog them up; they must therefore be so far removed by previous cooling as to cause no inconvenient condensation at ordinary temperatures. The crude gas contains, besides, sulphuretted hydrogen, the combustion of which would exhale an offensive odor. Carbonic acid weakens the illuminating power of the gas, and has also to be removed. In the hydraulic main—a large horizontal pipe at first about half-filled with water—some separation is effected between the liquid products of distillation and the gaseous, which bubble up through the liquid into the upper portion of the main. At the end of the main the liquids fall by their greater gravity into the sunk reservoir known as the tar-well, while the gas is conducted to the condenser or refrigerator (c), a series of bent iron tubes kept cool either by exposure to currents of air or by allowing water to flow over them. In these there is a further deposit of tar and water, and the gas passes on to the washer, a series of cells in which the gas is forced through water or exposed to water spray for the removal of ammonia. The scrubber (d), which is sometimes used in place of the washer, is a large chamber filled with coke kept constantly wet with sprays of water. The gas in passing up the scrubber leaves its last traces of ammonia and its compounds, and then enters the purifiers (e), which are iron chambers containing a series of perforated trays on which are spread slaked lime (in the form of dry hydrate), or a mixture of sawdust and oxide of iron. These remove carbonic acid and the greater portion of the sulphur compounds, and the gas is then conveyed by means of a pipe (f) to the gas-holder (g) a store-house or reservoir, in which it is subjected to uniform pressure, and from which it is discharged (f) into the street or other mains in the constant stream necessary to produce a steady flame from the burners in the houses of those using it. The gas-holder, sometimes called a gasometer, is usually a very large cylindrical air-tight structure of iron plates, closed at top, open below, and having the lower end immersed in a water reservoir. It is supported by chains passing over pulleys on iron columns, the greater part of the weight of the gas-holder being counterbalanced by weights attached to the chains, so that it can exercise a certain regulated pressure on the gas contained in it.

The quantity of gas used by each consumer is measured by an instrument called a meter, of which there are two classes—the wet and the dry. The wet meter is composed of an outer box about three-fifths filled with water. Within this is a revolving four-chambered drum, each chamber being capable of containing a definite quantity of gas, which is admitted through a pipe in the center of the meter, and, owing to the arrangement of the partitions of the chambers, causes the drum to maintain a constant revolution. This sets in motion a train of wheels carrying the hands over the dials which mark the quantity of gas consumed. The dry meter consists of two or three chambers, each divided by

The index of a dry meter.

a flexible partition or diaphragm, by the motion of which the capacity on one side is diminished while that on the other is increased. By means of slide-valves, like those of a steam-engine, worked by the movement of the diaphragms, the gas to be measured passes alternately in and out of each space. The contractions and expansions set in motion in clockwork which marks the rate of consumption. The diaphragms in all the chambers are so connected that they move in concert.

The profitable consumption of gas, whereby the strongest light can be had at the least expenditure of gas, depends considerably upon the form of the burner, and the mode by which the flame is fed with the air necessary for its combustion. There must be a sufficient supply of oxygen to convert the carbon of the gas into carbonic acid, and the hydrogen into water. If there is not a sufficient supply of oxygen, the flame will be smoky from excess of carbon. In this case the remedy is either to reduce the supply of gas or increase the supply of air. This may be effected by modifying the form of the burner, or in the case of the Argand burner by having a different shape of glass chimney. As to the form of the burner, it has been found that a plain jet ¼ inch in diameter



Form and size of flames from a 5-foot fish-tail, lava-tip burner.

at the orifice, will not give a flame free from smoke of a greater height than 2½ inches; but the same quantity of gas which would give a smoky flame from a plain jet, will produce a clear bright flame by extending or dividing the aperture of the jet so as to expose a larger surface of flame to the atmosphere. It is not, however, necessary to increase the superficial area of the flame; it may even be diminished with a more intensely luminous effect by having instead of one aperture two small ones pierced at an angle to each other, so that the jets may cross each other. This forms the union jet. Another form is the slit or batwing burner, in which a clean slit is cut across the top of the beak. In the Argand burner a circle of small holes supplies the gas, and a current of air is admitted through the center of the flame, which is surrounded by a glass chimney. In the Welsbach incandescent lamp the light is produced by causing the burning gas to raise to white heat what is known as the mantle, suspended over the burner. The mantle consists essentially of cotton yarn steeped in a solution of salts of such metals as thorium, cerium, yttrium, lanthanum, magnesium, etc., and when the thread has been burned away there remains a skeleton of the oxides of the metals used.

GAS'CONY, an old division of France, between the Garonne, the sea, and the Pyrénées. It composes the departments of Hautes Pyrénées, Gers, and Landes, with part of those of Bas Pyrénées, Haute Garonne, Lot-et-Garonne, and Tarn-et-Garonne. The Gascons, who are of mixed Basque and Gothic descent, used to have the character of being brave, faithful, and peculiarly tenacious of purpose, but much given to boasting, whence the word gasconnade.

GAS ENGINE, an engine in which the movement of the piston is caused by the explosive energy of a mixture of in-

flammable gas with atmospheric air. After various attempts by Huyghens, Pepin, and others to utilize explosive agents like gunpowder in working machines, a French artisan, Lebon, patented in 1799 an engine in which energy was obtained by exploding charges of coal-gas mixed with air on each side of the piston alternately, the explosion being effected by an electric spark. Modifications of this engine were patented by Lenoir in 1860, by Hugon, and by Messrs. Siemens. The most satisfactory are probably those known as Brayton's high-pressure gas engine, and Otto's gas engine. The latter consists of an upright cylinder in which works a heavy piston, the rod of which forms a rack-gearing with a cog-wheel on the shaft of the fly-wheel. As the piston ascends the cog-wheel slips loosely on the shaft; as it descends its energy is transferred to the shaft through the cog-wheel, the force of the down-stroke being due to the rapid condensation of the gases after the explosion aided by the weight of the piston itself. The mixed gases—coal-gas and air—are introduced at the base of the cylinder and fired, as in Hugon's patent, by communication with a gas-jet kept constantly burning. The great objection to this engine—its noise in working—has been overcome in the Otto silent gas engine, in which the working cylinder is horizontal and considerably shorter than in the old form.

GAS'KELL, Elizabeth Cleghorn, novelist, daughter of William Stevenson, editor of Scott's Magazine, born at Chelsea in 1810. In 1857 appeared her admirable Life of Charlotte Brontë, and in 1860 Sylvia's Lovers. Wives and Daughters appeared posthumously in 1866. The work that she is best known by is Cranford, a delightful story of village life, classed by literary critics as one of the classics.

GASKETS, cords fastened to the sail-yards of a ship, and used to furl or tie up the sail firmly to the yard by wrapping round both.

GAS'TEROPODS, a class of molluscs, consisting of animals inhabiting a univalve shell, although some of the group are wholly destitute of a shell. The shell

A gasteropod.
Common garden-snail. *f*, Foot extending the whole length of the under side of the body.

is either a small internal plate, as in slugs; or cone-shaped and spiral, as in the majority; or multivalve, the pieces following each other along the middle line, as in the chitons. No known gasteropod has a bivalve shell. The distinguishing characteristic is the foot, which is broad, muscular, and disc-like, and attached to the ventral surface. The class is divided into two sub-classes, the Branchiata or Branchiogasteropoda, breathing water by gills, and the Pulmonata or Pulmogasteropoda, breathing air by a sort of lung apparatus. The former includes whelks and periwinkles, etc.; the latter include the ordinary land-snails, slugs, pond-snails, etc.

GASTON DE FOIX (fwâ), Duke of Nemours, French soldier, born 1489, son of John de Foix, count d'Estampes, and Mary of Orleans, sister of Louis XII., whose favorite he became. At the age of twenty-three he routed a Swiss army rapidly crossed four rivers, drove the pope from Bologna, and won the celebrated battle of Ravenna (1512), but was killed while attempting to cut off a body of retreating Spaniards.

GASTRIC JUICE, a clear colorless fluid with a saline taste and sour odor secreted by the mucous membrane of the stomach, and chief agent in the process of digestion. It is acid, and contains pepsin, its essential nitrogenous principle. The activity of the fluid has been ascribed to various acids present, lactic, acetic, and butyric; but it appears that free hydrochloric acid is that which is secreted by the stomach, the others being the products of change of food undergoing digestion. The acid is necessary for the pepsin to exercise its properties, which are limited to the conversion of nitrogenous substances into peptones, fatty matters not being affected by it. (See Pepsin.) Gastric juice also holds in solution various inorganic salts, chiefly chlorides and phosphates, occasionally also abnormal substances such as urea, ammonia, salts, and biliary acids. It is not possessed of any marked reactions with ordinary chemical reagents, does not become turpid by boiling, and gives no striking precipitates with acids, alkalies, or mineral salts. The amount secreted daily in the human adult is estimated to be about 14 pounds, but as it is continually re-absorbed, there is no great quantity present at any one time.

GASTRIC SYSTEM, all the parts of the body which contribute to digestion.

GASTRI'TIS, or **GASTRO-ENTERITIS.** See Enteritis.

GASTROCNE'MIUS, the most external of three superficial muscles forming the calf of the leg and terminating above the heel in the tendo Achillis.

GATES, Horatio, an American officer during the revolutionary war, born in England in 1728. He rose to the rank of major by merit alone. At the capture of Martinique he was aide-de-camp to General Monkton, and he was with

General Gates.

Braddock when the latter was defeated in 1755. On the conclusion of peace he purchased an estate in Virginia, on which he resided until the revolutionary war in 1775, when he was appointed adjutant-general by congress, with the rank of brigadier. At the head of the American army of the north he compelled the British general Burgoyne to surrender his whole army at Saratoga (1777). In 1780, after the capture of General Lincoln, Gates received the chief command of the southern districts, but was defeated two months later by Cornwallis at Camden. He was then superseded by General Greene and brought to court-martial, but was finally acquitted, and reinstated in his command in 1782 after the capture of Cornwallis. He then retired to Virginia, and in 1790, having emancipated all his slaves, he removed to New York, where he died in 1806.

GATESHEAD, mun., county, and parliamentary borough, England, county Durham, on the right bank of the Tyne, opposite Newcastle, of which it is practically part, being connected with it by three bridges. Pop. 109,887.

GATH (Hebrew, "wine-press"), one of the five royal cities of the Philistines, which, from its situation on the borders of Judah, was of much importance in the wars of the Jews and Philistines.

GATLING-GUN. See Machine-gun.

GAUGE (or Gage), Steam and Water, the instruments fixed to engine boilers for registering the force of steam and the level of the water.

GAUGE, a standard of measurement. As applied to railways, gauge signifies the distance between the centers of each pair of rails, which in England and the United States or narrow gauge is 4 feet 8½ inches. The broad gauge is 7 feet; the Irish, Indian, and Spanish gauge is 5 feet 6 inches. Special narrow gauges have recently been adopted for mountain and mineral lines, such as the 3 feet 6 inch gauge of the Norwegian lines. Gauge is also the name applied to various contrivances for measuring any special dimensions, such as the wire-gauge, an oblong plate of steel, with notches of different widths cut on the edge and numbered, the size of the wire being determined by trying it in the different notches until one is found which it exactly fits. The thickness of sheet-metal is tried by a similar gauge.

GAUL, Gallia, in ancient geography, the country of the Gauls, the chief branch of the great original stock of Celts. It extended at one time from the Pyrenees to the Rhine, and included also a part of Italy. Hence it was divided into Gaul on this side (the Roman side) of the Alps, or Gallia Cisalpina, and Gaul beyond the Alps, or Gallia Transalpina.

More than a century after the burning of Rome, the eastern Gauls, in 280–278 B.C., made three destructive irruptions into Macedonia and Greece. Several tribes pursued their course into Asia Minor, where, under the name of Galatians, they long retained their national peculiarities. After these migrations the Gauls along the banks of the Danube and in the south of Germany disappear. Tribes of German origin occupy the whole country as far as the Rhine, and even beyond that river. The Belgæ, who were partly German, occupied the northern part of Gaul, from the Seine and Marne to the British Channel and the Rhine, from

whence colonists passed over into Britain, and settled on the coast districts. The Celts in Gaul had attained some degree of cultivation by intercourse with the Greeks and Carthaginians before they came in contact with the Romans. On the appointment of Julius Cæsar to the proconsulship over the countries bordering on Gaul, he resolved to subject all Gaul, and executed his purpose in less than nine years (58–50) (B.C.), in eight bloody campaigns. The dominion of the Romans in Gaul was confirmed by colonies, and the liberal grant of the Roman citizenship to several Gallic tribes. The religion of the Druids, being suppressed in Gaul by Tiberius and Claudius, gradually retreated into Britain, soon also conquered by the Romans. After the extinction of the Cæsars, the Gauls once more attempted to recover their liberty by aid of the Germans, but after this last effort became entirely Romanized, even their ancient language, the Celtic, being supplanted by a corrupt Latin dialect. About the year 486 the Franks subdued the greater part of Gaul, and put a period to the dominion of the Romans in that country. See France.

GAUSS (gous), Karl Friedrich, a German mathematician, born 1777. In 1801 he published his Disquisitiones Arithmeticæ, treating of indeterminate analysis or transcendental arithmetic, and containing, in addition to many new theroems, a demonstration of the theroem of Fermat concerning triangular numbers. He also calculated, by a new method, the orbit of the planets Ceres and Pallas. In 1807 he became professor of mathematics and director of the observatory at Göttingen, a position which he held till his death in 1855.

GAU'TAMA, a name of Buddha, the founder of Buddhism. See Buddha.

GAUTIER (gō-ti-ā), Théophile, French poet and critic, born 1811 at Tarbes (Hautes-Pyrénées). In 1832 appeared his poem Albertus; but his first great success was the romance Mademoiselle de Maupin, which led to his engagement by Balzac as secretary. In 1872 he was sent by the republican government on a literary mission to Italy, and died in the same year.

GAUZE, a thin transparent stuff of silk, linen, or cotton. It is either plain or figured, the latter being sometimes worked with flowers of silver or gold.

GA'VIAL, the Indian crocodile, characterized by the narrow, almost cylindrical jaws which form an exceedingly elongated muzzle. The teeth (about 120

Head of gavial, or gangetic crocodile.

in number) are of equal length, and the feet are completely webbed. The males can be distinguished from the females the shape of the muzzle, which is much smaller at the extremity. The only extant species occurs in South and Eastern Asia, especially in the Ganges. It feeds on fishes and small prey.

GAVOTTE', an air for a dance with two strains, each of four or eight bars, in $\frac{2}{4}$ or $\frac{4}{4}$ time, the starting notes occupying half a bar. Like the minuet, it has been introduced for free treatment into suites, sonatas, etc. The name is said to be derived from the Gavots, the inhabitants of the Gap, in France.

GAY, John, English poet, born near Barnstaple in 1688, and apprenticed to a silk mercer in London. In 1712 he became secretary to Anne, Duchess of Monmouth. In 1713 he published his Rural Sports, which he dedicated to Pope, with whom he formed a close friendship. In 1720 he published his poems by subscription, in 1724 his tragedy, The Captives, and in 1727 his well-known Fables. His Beggar's Opera, the notion of which seems to have been afforded by Swift, was first acted in 1728, at Lincoln's Inn Fields. He also wrote the pastoral Acis and Galatea and the opera Achilles. He died in 1732.

GAYA, the chief town of a district of the same name in Bengal, on the right bank of the Phalgu, a tributary of the Ganges, 260 miles n.w. of Calcutta. Pop. 71,288. The district has an area of 4712 sq. miles, and pop. 2,138,331.

GAY-LUSSAC (gā-lus-āk), Louis Joseph, French chemist and physicist, born at St. Léonard (Haute-Vienne) 1778, died at Paris 1850. He was educated in the Ecole Polytechnique from 1797 to 1800, and afterward in the Ecole des Ponts et Chaussées, but preferring chemistry, he entered Berthollet's Ecole Laboratory. In 1802 he returned to the Polytechnique as demonstrator of chemistry, and in 1804 performed his two balloon ascents for scientific purposes, the first with Biot, the second by himself, an account of which appeared in the Journal de Physique. In 1806 he was elected to the Academy of Sciences. He was especially celebrated for his researches into the chemical and physical properties of gases and vapors.

GAZELLE', the type of a sub-family of antelopes (Gazellinæ), which includes some 23 species of small, mostly desert-

Gazelles.

loving forms. Its color is a light fawn upon the back, deepening into dark-brown in a wide band which edges the flanks and forms a line of demarcation between the color of the upper portions of the body and the pure white of the abdomen. The eye of the gazelle is large, soft, and lustrous. Both sexes are provided with horns, round, black, and lyrated, about 13 inches long. It seems to be confined to the north side of the Atlas Mountains, Egypt, Abyssinia, Syria, Arabia, and South Persia.

GAZETTEER', a geographical dictionary; a book containing descriptions of natural and political divisions, countries, cities, towns, rivers, mountains, etc., alphabetically arranged.

GAZ'OGENE, an apparatus used for manufacturing aerated water on a small scale for domestic use, by the combination of an alkali and an acid, as carbonate of soda and tartaric acid, which yield carbonic acid when mixed with water.

GEARING, in machinery, the parts collectively by which motion communicated to one portion of a machine is transmitted to another, generally a train of toothed wheels. There are two chief sorts of wheel gearing, viz.: super-gearing and beveled gearing. In the former the teeth are arranged round either the concave or convex surface of a cylindrical wheel in the direction of radii from the center of the wheel, and are of equal depth throughout. In beveled gearing the teeth are placed upon a beveled surface round a wheel which if the slope of the bevel were continued would form a cone, the teeth sloping similarly.

GEBER (gē'bêr), Arabian chemist or alchemist, often designated the father of chemistry, flourished during the 8th century. He was acquainted with nearly all the chemical processes in use down to the 18th century. His writings describe various kinds of furnaces and other apparatus, and cupellation, distillation, and other chemical processes; the purification, composition, and properties of the metals then known—gold, silver, copper, lead, tin, and iron, and the functions of mercury, sulphur, and arsenic. He is the reputed author of an immense number of works as well on metaphysics, language, astronomy, etc., as on chemistry.

GED (ged), William, inventor of stereotyping, born in Edinburgh about the beginning of the 18th century, died in poor circumstances in 1749. He first practiced his great improvement in the art of printing in 1725; and some years later he entered into a partnership in London, the result of which was the production of two prayer-books only. He returned to Scotland in 1733, and published a stereotype edition of Sallust.

GEHEN'NA, a term used in the New Testament as equivalent to place of fire or torment, and rendered in the authorized (and the revised) version by hell and hell-fire.

GEIBEL (gī'bl), Emanuel, German poet, born at Lübeck 1815, died 1884. He wrote Brunhild, a tragedy; The Loreley, an opera in rhyme, and several other plays, but his fame rests on his lyrics, which are immensely popular.

GELATIN PROCESS, is used in many photographic and photo-mechanical processes as a vehicle for certain chemicals which either alone or in combination are sensitive to the action of light, and under its influence experience changes in their condition. The substitution of the gelatin film of the dry plate for the collodion surface of the wet plate was an important development in photography, while the fact that gelatin mixed with bichromate of potash becomes insoluble when acted

upon by light furnishes the basis for many photographic processes.

GELATINE (jel'a-tin), a concrete animal substance, transparent, and soluble slowly in cold water, but rapidly in warm water. It is confined to the solid parts of the body, such as tendons, ligaments, cartilages, and bones, and exists nearly pure in the skin, but it is not contained in any healthy animal fluid. Its leading character is the formation of a tremulous jelly when its solution in boiling water cools. Gelatine does not exist as such in the animal tissues, but is formed by the action of boiling water. The coarser forms of gelatine from hoofs, hides, etc., are called glue; that from skin and finer membranes is called size; and the purest gelatine, from the air-bladders and other membranes of fish, is called isinglass. With tannin a yellowish white precipitate is thrown down from a solution of gelatine, which forms an elastic adhesive mass, not unlike vegetable gluten, and is a compound of tannin and gelatine. It is this action of tannin on gelatine that is the foundation of the art of tanning leather. Gelatine when acted upon by sulphuric acid yields gelatine sugar on glycocoll. When treated with potash it is said to yield plycocoll and leucine. Gelatine is nearly related to the protcids. No chemical formula has yet been deduced for it. It is a nutritious article of food, and as part of the diet in hospitals produces the best effects; but animals fed exclusively on it die with the symptoms of starvation, as it cannot yield albumen, fibrine, or caseine. Its ultimate components are 47·8 carbon, 7·9 hydrogen, 16·9 nitrogen, 27·4 oxygen.

GELDERLAND, GUELDERLAND (gel'), a province of the Netherlands; area, 1,963 English sq. miles. Pop. 566,549.

GEMINI (jem'-inī), the Twins, the third sign of the zodiac, so named from its two brightest stars, Castor, of the first magnitude, farthest to the west, and Pollux, of the second, farthest to the east. Its constituent stars form a binary system revolving in about 250 years. The sun is in Gemini from about the 21st May till about the 21st June, or the longest day.

GEMMATION, in zool. a mode of reproduction among certain animals of low type, which consists in the production of a bud or buds, generally from the exterior, but sometimes from the interior, of the body of the animal, which buds are developed into independent beings that may or may not remain attached to the parent organism. This mode of reproduction is seen in the seamats, the fresh-water polyp, etc.

GEMS, or precious stones, are sometimes found crystalized in regular shapes and with a natural polish, more commonly of irregular shapes and with a rough coat. The term gem often denotes more particularly a stone that is cut, polished, or engraved, and it also includes pearls and various artificial productions. The first and most valuable class of gems includes diamonds, emeralds, rubies, sapphires, and a few others; the second class includes the amethyst, topaz, garnet, etc ; while agate, lapis-lazuli, cornelian, etc.; though much used for ornament, can scarcely be called gems. The various precious stones are described under their proper heads. The fabrication of artificial gems is now prosecuted with skill and capital, and has become an important industrial art. The base of one class of imitations is a peculiar kind of glass of considerable hardness, brilliancy and refractive power called paste or strass, which is distinguished from ordinary glass by the presence of 50 per cent of oxide of lead among its constituents. When the strass is obtained very pure it is melted and mixed with substances having a metallic base, generally oxides, which communicate to the mass the most varied colors. Another class, called semi-stones or doublets, are made by affixing thin slices of real gem to an under part of strass by means of an invisible cement. In some cases an imitation is made by setting uncolored strass or quartz in jewelry with some colored "foil" at the back of it. Attempts have within recent years been made with a fair measure of success to manufacture true gems by artificial processes. The French chemists Becquerel, Ebelman, Gaudin, Despretz, and others have done much in this direction. In 1858 MM. Deville and Caron communicated to the Academy of Sciences, Paris, a process for the production of a number of gems of the corundum class, as rubies, sapphires, etc. The process essentially consisted in exposing the fluoride of aluminium, together with a little charcoal and boracic acid, in a plumbago crucible protected from the action of the air, to a white heat for about an hour. Many experiments with a view to producing diamonds artificially have also been made. From hydrocarbons, subjected to a very intense heat and enormous pressure, minute fragments of crystalline carbon, differing from natural diamond in no respect save brilliancy, have been produced. In art and archæology the term gem is usually applied to a precious stone, cut or engraved in ornamental designs, or with inscriptions. Stones on which the design is raised above the general surface are called cameos; those having the design sunk below the surface are called intaglios. Early specimens of cut gems are seen in the scarabæi or beetle-shaped signets worn in rings by the ancient Egyptians. Among the Greeks, Etruscans, and Romans gem-sculpture held a high place, reaching its highest point under Augustus. Modern gem-engraving dates from the beginning of the 15th century, the chief seats of the art being Italy and Germany. Rome is now the headquarters of the seal-engraving art. The tools of the engraver consist of a lathe, and a series of little rods with heads of different shapes, all of which can be adjusted to the lathe. The axis of the lathe is pierced at the center with an orifice, into which the tools for cutting the stone are firmly fixed by means of a screw. The engraver wets the extremity of the mounted rod with diamond dust made into a paste with olive-oil, and as the wheel is in motion he applies the stone, firmly cemented to a piece of reed, to the revolving tool. The diamond dust enables the tool to cut into the stone with ease. As the design is frequently very elaborate and of the greatest delicacy, the tools are necessarily multiform. The stones used for cameo-cutting often exhibit layers of different colors, so that the raised design has a tint distinct from the ground. Intaglios are very often executed in transparent stones, and the subjects treated in this manner are more limited in number. They are chiefly such as seals, devices, coats of arms, etc.

GENDARMES (zhaṅ'dārm), the name originally given in France to the whole body of armed men, but after the introduction of standing armies to a body of heavy-armed cavalry, which composed the chief strength of the forces.

GENDER, in gram. one of those classes or categories into which words are divided according to the sex, natural or metaphorical, of the beings or things they denote. It may be exhibited by a class of words marked by similarity in termination, the termination having attached to it a distinction in sex, as seen in nouns, adjectives, participles, etc. There are three genders in all: masculine feminine, and neuter, but these distinctions only exist in some languages.

GENEAL'OGY, the systematical investigation and exhibition of the origin, descent, and relations of families (or their pedigree). Persons descended from a common father constitute a family. Under the idea of degree of relationship is denoted the nearness or remoteness of relationship in which one person stands with respect to another. A series of several persons, descended from a common progenitor, is called a line. A line is either direct or collateral. The collateral lines comprehend the several lines which unite in a common progenitor. For illustrating descent and relationship genealogical tables are constructed, the order of which depends on the end in view. The common form of genealogical tables places the common stock at the head, and shows the degree of each descendant by lines. Some tables, however, have been constructed in the form of a tree, in which the progenitor (German, Stammvater) is placed beneath, as if for a root.

GENERAL, a military rank and title denoting an officer holding a general command, or a rank and grade equivalent thereto. In modern armies, practically every officer commanding an organization of troops larger than a regiment is a general officer. In the U. States the rank has the following grades: brigadier-general, major-general and one lieutenant-general in supreme active command of the army as a whole. Officers of other ranks are sometimes given the temporary and relative rank of general, as inspector-general, judge advocate-general, quarter-master-general, etc. In European armies the rank of general is a step higher than that of lieutenant-general, and is the next in importance to field-marshal in England, and to marshal in the armies of Continental Europe.

GENERAL LIEN, in law, the right to retain possession of a chattel until payment be made, not only of any debt due in respect of that particular chattel, but of any balance that may be due on

general account in the same line of business. General liens do not exist at common law, but depend entirely upon contract, express or implied from the special usage of dealing between the parties.

GENERAL SERVICE AND STAFF COLLEGE, a military school for the further technical and professional education of military officers of the U. States Army, situated at Fort Leavenworth, Kan. The staff of the college detailed to assist the commandant, who is also the commanding officer of the post of Fort Leavenworth, consists of an assistant commandant, and the instructors in charge of departments. The instructors are detailed by the war department, and there are four departments—tactics, engineering, military law, military sanitation and hygiene. The course of instruction covers one year of two terms, the first term beginning on the 1st of September, unless that date fall on Saturday or Sunday, in which case the course begins on the following Monday. It ends on the 21st of December, concluding with the semi-annual examinations. The second term embraces the period from the 4th of January to the 30th of June following, concluding with the final examinations. The students are all graded in one class, which is divided into sections of convenient size and adaptation. The staff of the college note the names of students who have shown marked proficiency in any branch, with a view to the student's projessional employment in that particular branch.

GENERAL STAFF, an organization of superior or selected officers, appointed to the staff of a general officer commanding, whose duties may be generally described as converting the ideas of their chief into orders, not only by conveying them to the troops, but by working out all necessary matters of detail. The general staff organization was originally peculiar to Germany, but is now being generally adopted throughout Continental Europe.

GENERAL THEOLOGICAL SEMINARY, the leading seminary in the U. States of the Protestant Episcopal Church. The seminary was established by order of the general convention in 1817, and instruction was begun in New York City in 1819. The theological course proper extends over three years, and there is also a post-graduate course. The degrees of D.D. and B.D. are conferred; the former is both a higher academic and an honorary degree, while the latter is usually conferred in course on students holding prior academic degrees, who have completed the regular course in high standing. The control of the seminary is vested in a board of trustees composed of the bishops of the church, twenty-five members elected by the general convention, and certain other members elected by the various dioceses, principally that of New York. The student attendance is approximately 150. No tuition fee is charged, and many prizes of value are offered. Within twenty-five years the student body has largely increased, and extensive buildings have been elected, including the library, Hoffman Hall, the Chapel of the Good Shepherd, and nine dormitories.

GENERATION, a single succession of human beings (or animals) who are born, grow up, and reproduce their kind; hence, an age or period of time between one succession and the next, as the third, the fourth, or the tenth generation. The length of a generation is usually estimated at about thirty years.

GENERATION, SPONTANEOUS, or **ABIO-GENESIS,** the doctrine that living matter may originate spontaneously, "that under certain circumstances dead matter may build itself up into living matter without the intervention of already existing protoplasm." In the 17th century this was the dominant view, sanctioned alike by antiquity and authority, and was first assailed by Redi, an Italian philosopher. Buffon held the doctrine in a very modified degree. He held that life is the indefeasible property of certain indestructible molecules of matter which exist in all living things, and have inherent activities by which they are distinguished from not-living matter, each individual living organism being formed by their temporary combination. Of course it is only animals or plants of very low type and minute size that have been supposed thus to be produced spontaneously from dead matter; and the readiness with which such appear, in circumstances in which one might suppose no germs of them could be present, gives some countenance to the belief. Thus even at the present day authorities are found who still declare their adherence to the doctrine of spontaneous generation, but there is every reason to believe that, whatever may have been the case with the first beginnings of life, living matter is now invariably derived from pre-existent living matter.

GENERIC NAME, in natural history, the denomination which comprehends all the species of a genus: thus, Canis is the generic name of animals of the dog kind.

GENESEE (jen-e-sē'), a river which rises in Pennsylvania, flows north through New York, and falls into Lake Ontario 6 miles below Rochester, after a course of 145 miles. It is notable for its varied and romantic scenery, and its extraordinary falls. These falls are five in number; three of them occur about 90 miles from the mouth of the river, and are respectively 60, 90, and 110 feet high. The other two are near Rochester, and are both about 100 feet high.

GENESIS, (Greek, creation, birth, origin), the first book of the Bible and of the Pentateuch, named in the Hebrew canon B'reshith (in the beginning), from the term with which it commences. From the Greek translators it received the name it is now commonly known by. Genesis consists of two great but closely-connected divisions:—(1) The history of the creation, the fall of man, the flood, the dispersion of the human race, chap. i.-xi. (2) The history of the fathers of the Jewish race, chap. xii.-l. A certain apparent difference of style and language, the occurrence of what seem gaps on the one hand, and repetitions and contradictions on the other, and the different use of the term for the divine name (Jehovah, Everlasting; and Elohim, Almighty), led very early to the question of the integrity of the book, and various critics have assumed larger or smaller interpolations.

GENEVA, a town in Switzerland, capital of the canton of the same name situated at the western extremity of the Lake of Geneva, where the Rhône issues, here crossed by several bridges, and dividing the town into two portions, the larger and more important of which is on the left or south bank. The more important public buildings are the cathedral or church of St. Pierre, a Gothic structure of the 10th, 11th, and 12th centuries, occupying the highest site in the town, and by its three towers forming the most conspicuous object within it, somewhat defaced externally by a very incongruous Greek peristyle; the town-house in the Florentine style; the Musée Rath, containing a collection of pictures and other works of art; the university building, nearly opposite the botanic garden, rebuilt in 1867–71, and containing the public library, founded by Bonivard, the prisoner of Chillon, in 1551, and now numbering 90,000 vols.; and the museum of natural history. The only important manufactures of Geneva are that of watches, musical-boxes, and jewelry. Geneva has ample railway communication, and is one of the principal entrances for tourists and travelers into Switzerland. Pop. 105,139.—The canton is bounded by the canton of Vaud and the Lake of Geneva, and by France. Area, 109 sq. miles. Manufactures consist chiefly of clocks and watches, musical boxes, mathematical instruments, gold, silver, and other metal wares, woolen cloths, and silk cloths of various descriptions, hats, leather, and articles in leather; and there are numerous cotton mills, calico-printing works, and dye-works. The territory of Geneva having, by the arrangements of the congress of Vienna, obtained an accession of fifteen communes, detached from France and Savoy, was admitted a member of the swiss confederation in 1814, and ranks as the twenty-second canton. Its constitution of 1848 is the most democratic in the federation. All religious denominations are declared to have perfect freedom, but two of them are paid by the state—the Roman Catholics, amounting to rather more than a third of the population, and the Protestant National Church. The language spoken is French. Pop. 131,674.

GENEVA, a city in Ontario co., N. Y., on Seneca Lake, the Seneca and Cayuga Canal and the Fall Brook, the Lehigh Valley, and the N. Y. C. and H. R. railroads. It is the seat of Hobart college, the State agricultural experiment station. Pop. 11,543.

GENEVA, LAKE OF, or **LAKE LEMAN,** the largest of the Swiss lakes, extending in the form of a crescent, with its horns pointing southward, between France on the south, and the cantons of Geneva, Vaud, and Valais: length, measured on its north shore, 55 miles, and on its south shore 40 miles; central breadth, about 6 miles; area, 331 sq. miles; greatest depth, 900 feet. It is 1150 feet above the sea.

GENEVA BIBLE, a copy of the Bible in English, printed at Geneva; first in 1560. This version was in common use till the version made by order of James I was introduced.

GENEVA CONVENTION, an agreement concluded at an international conference held in Geneva in 1864, for the succor of the sick and wounded in time of actual warfare. The neutrality of hospitals, ambulances, and the persons attending on them was provided for; and the use of the red cross on a white ground as a sign of neutrality has received the adhesion of all civilized powers.

GENEVIEVE, the name of two female saints.—1. St. Geneviève, the patron saint of Paris; born at Nanterre, about 5 miles from Paris, in the year 423; died at Paris about the beginning of the 6th century. 2. St. Geneviève, by birth Duchess of Brabant, wife of Siegfried, count palatine in the reign of Charles Martel (about 570).

GENGHIS KHAN, or **JENGHIS KHAN** (jen'gis), Mongol conqueror, born about 1160, died 1227. His father was chief over thirty or forty clans, but paid tribute to the Tartar Khan. He succeeded his father when only fourteen years of age, and made himself master of the neighboring tribes. A great number of tribes now combined their forces against him. But he found a powerful protector in the great Khan of the Karaite Mongols, Oung, or Ung, who gave him his daughter in marriage. After much intestine warfare with various Tartar tribes Genghis was proclaimed Khan of the United Mongol and Tartar tribes. He now professed to have a divine call to conquer the world, and the idea so animated the spirit of his soldiers that they were easily led on to new wars. The country of the Uigurs, in the center of Tartary, had long excited his ambition. This nation was easily subdued, and Genghis Khan was now master of the greatest part of Tartary. Soon after several Tartar tribes put themselves under his dominion, and in 1209 he passed the great wall of China. The conquest of China occupied the Mongols more than six years. The capital, then called Yenking, now Peking, was taken by storm in 1215 and plundered. The murder of the ambassadors whom Genghis Khan had sent to the King of Kharism (now Khiva) occasioned the invasion of Turkestan in 1218 with an army of 700,000 men; and the two cities of Bokhara and Samarcand were stormed, pillaged, and burned. Seven years in succession was the conqueror busy in the work of destruction, pillage, and subjugation, and extended his ravages to the banks of the Dnieper. In 1225, though more than sixty years old, he marched in person at the head of his whole army against the King of Tangut (Southwestern China), who had given shelter to two of his enemies, and had refused to give them up. A great battle was fought, in which the King of Tangut was totally defeated with the loss of 300,000 men. The victor remained some time in his newly-subdued provinces, from which he also sent two of his sons to complete the conquest of Northern China. At his death his immense dominions were divided among his four sons.

GENIUS, a tutelary deity; the ruling and protecting power of men, places, or things; a good or evil spirit supposed to be attached to a person and influence his actions. The Genii of the Romans were the same as the Daimones (Demons) of the Greeks. According to the belief of the Romans, which was common to almost all nations, every person had his own Genius; that is, a spiritual being which introduced him into life, accompanied him during the course of it, and again conducted him out of the world at the close of his career. The Genii of women were called Junones. The Genii were wholly distinct from the Manes, Lares, and Penates, though they were allied in one important feature—the protection of mortals.

The term genii (with the singular genie) is also used as equivalent to the jinn (singular jinnee) of Arabic tales. These are supposed to be a class of intermediate beings. See Jinn.

GENLIS (zhän'lēs), Stéphanie Félicité Ducrest de St. Aubin, Countess de, French authoress, born near Autun 1746, died at Paris 1830.

GENOA (jen'o-a), a seaport of N. Italy, the chief commercial city of the kingdom, on the coast of the Mediterranean, at the head of the gulf of the same name, 75 miles s.e. of Turin. It

Strada Balbi, Genoa.

is beautifully situated at the foot and on the slope of the Ligurian Alps, the lower hills of which form a background to the city. In the newer quarters many of them are spacious, and are lined with palaces and other noble edifices. Some of the palaces are filled with works of art by the greatest masters. The principal are—the Ducal palace (now containing the law-courts and various public offices), the Palazzo del Municipio or town-hall, the Palazzo Brignole or Rosso (with the largest picture-gallery in Genoa), the Palazzo Pallavicini, the Palazzo Reale, built in the 16th century for the Durazzo family, was purchased in 1815 by the royal family, and the palaces of Doria, Serra, Cambasio, Balbi, and Duracco. The most remarkable of the churches is the Duomo, or Cathedral of St. Lorenzo, founded in the 11th century, but not completed till the beginning of the 12th; S. Maria in Carignano, built in imitation of the original plan of St. Peter's at Rome; S. Stefano, a Gothic church, the oldest parts of which date from the end of the 12th century; S. Ambrogio, containing two paintings by Rubens, and the Assumption of Guido Reni. The principal charitable institution is the Albergo de' Poveri, in which 1600 individuals, orphans and old people, find shelter. Others are the Ospedale del Pammatone founded in 1430; and a hospital recently built by the Galliera family. Among the theaters of the city may be mentioned the Teatro Carlo Felice, an elegant structure, with a splendidly fitted up interior. Besides the university, founded in 1775, the chief educational institutions are the theological seminary, the school of fine arts, the royal marine school, and the navigation school. It contains fine mortuary buildings and much statuary in white marble. The manufactures of Genoa include cotton and silk goods, gold, silver, paper and leather goods, sugar, and preserved fruits. The principal articles of export are cereals, oils, fruit, cheese, rags, the products of its manufactures, etc. Many emigrants embark here. Imports—cotton, wool, wheat, sugar, coffee, coal, hides, iron, etc.—Under the Romans Genoa was famous as a seaport. After the breaking up of the empire of Charlemagne, it constitued itself a republic, presided over by doges. From 1119 it was almost constantly at war with Pisa down to 1284, when Genoa inflicted a crushing defeat on Pisa. The Genoese obtained the supremacy over Corsica, and nominally over Sardinia, possessed settlements in the Levant, on the shores of the Black Sea, on the Spanish and Barbary coasts, and had a very flourishing commerce. The rivalry between Genoa and Venice was a fruitful source of wars during the 12th–14th centuries. Meanwhile the city was internally convulsed by civil discord and party spirit. The hostility of the democrats and aristocrats, and the different parties among the latter, occasioned continual disorder. From the contests of noble rivals, in which the names of Doria, Spinola, Grimaldi, and Fieschiare prominent, Genoa was drawn into the Guelph and Ghibelline contest. In the absence of internal tranquility the city sometimes submitted to a foreign yoke in order to get rid of anarchy. Pop. 234,800.

GENOA, Gulf of, a large indentation of the Mediterranean, in North Italy, at the head of which lies the city and port of Genoa. No precise points can be named as marking its entrance; but it may, perhaps, be generally said to comprise the entire space north of lat. 43° 40′ n.

GENRE (zhän'r') **PAINTING,** a term used in art to denote that class of subjects which portray the intimate and every-day life of any people This class of painting is characteristic of the Dutch school by which it was first largely practiced. Its chief masters in that school were Terburg, Brower, Ostade, Rembrandt, the younger Teniers, Metzu,

Gerard Dow, Frans Hals, and others. Their subjects were the familiar life of the family; street scenes and sports; festivals and picnics, tavern scenes—that goes to make up the occupations of a people. These might be comic, serious, or pathetic, but genre painting, strictly, speaking, always includes as a dominent note the human element. Pictures of this class are usually of small dimensions but they are always valuable and interesting records of contemporary life. In British art Wilkie and Hogarth are prominent examples of genre painters. Hogarth was probably the greatest master in English genre painting and his pictures portraying the weaknesses and follies of the life of his time are powerful parables, and full of artistic strength. Genre work was done in Spain by Velasquez and Murillo, and in France during the 18th century by Watteau, Greuze, and others. There was a general revival of this kind of subject during the 19th century, and among the many painters of all nations who have practiced it we need only mention such names as Meissonier in France, Fortuny in Spain, Kraus, Defregger, and Grützner in Germany.

GENSERIC (jen'), a king of the Vandals, who, having obtained joint possession of the throne of Spain with his brother Gonderic, crossed the Straits of Gibraltar with 50,000 men, A.D. 429, on the invitation of Bonifacius, the Roman governor of Africa, to assist him against the Moors. Two unsuccessful attempts were made by the eastern and western emperors to overthrow his power, but Genseric secured all his conquests, and, notwithstanding all his cruelties, was permitted to die in peace A.D. 477.

GENTIAN, a large genus of bitter herbaceous plants, having opposite, often strongly ribbed, leaves, and blue,

Yellow gentian.

yellow, or red, often showy flowers. The root has a yellowish brown color and a very bitter taste, and is exported in considerable quantities, and is used medicinally, and also as an ingredient of cattle foods.

GENTILE, in Scripture, anyone belonging to the non-Jewish nations and not a Christian; a heathen. The Hebrews included in the term goim, or nations, all the tribes of men who had not received the true faith, and were not circumcised. The Christians translated goim by the L. gentes, nations, and imitated the Jews in giving the name gentiles to all nations who were not Jews or Christians. In civil affairs the denomination was given to all nations who were not Romans.

GENUFLEXION, the act of bending the knees in worship. There are frequent allusions to genuflexion in the Old and New Testaments, and it would appear that the use was continued among the early Christians. Genuflexion obtains, both by rule and prescription, in various places in the offices of the Roman Catholic Church, and at different parts of the services of the Church of England.

GENUS, in scientific classification, an assemblage of species possessing certain characters in common, by which they are distinguished from all others. It is subordinate to order, tribe, and family. A single species, possessing certain pecular characters which belong to no other species, may also constitute a genus, as the giraffe.

GEODESY (jē-od'e-si), the science of surveying extended to large tracts of country; the branch of applied mathematics which determines the general figure and dimensions of the earth, the variations of the intensity of gravity in different regions, etc., by means of direct observation and measurement.

GEOFFROY ST. HILAIRE (zhof-rwà saṇ tē-lār), Etienne, French naturalist, born in 1772, died in 1844. As a member of the Egyptian expedition in 1798 he founded the Institute of Cairo, and returned about the end of 1801 with a rich collection of zoological specimens. In 1807 he was made a member of the Institute, and in 1809 professor of zoology at the Faculty of Sciences. He devoted himself especially to the philosophy of natural history. The fundamental idea brought conspicuously forward in all his works is, that in the organization of animals there is only one general plan, one original type, which is modified in particular points so as to present differences of genera. This view met with strong opposition from Cuvier. Among his principal works are Sur le Principe de l'Unité de Composition Organique; Philosophie Anatomique; Historie Naturelle des Mammifères, written in conjunction with Cuvier; Notions de Philosophie Naturelle (1838).

GEOFFROY ST. HILAIRE, Isidore, physiologist and naturalist, son of the preceding, was born at Paris 1805, died 1861. He devoted himself to natural history, and in 1824 was appointed assistant to his father at the Jardin des Plantes. He was the means of founding the Acclimatization Society of Paris.

GEOGRAPHICAL SOCIETIES, are associations formed with the view of obtaining and disseminating geographical knowledge. In point of seniority the first of these associations is the Société de Géographie of Paris, founded in 1821. The Prussian Gesellschaft für Erdkunde held its first sittings in Berlin in 1828. The Royal Geographical Society, established in London in 1830, The Royal Scottish Geographical Society, founded in 1884. The Russian Geographical Society, founded at St. Petersburg in 1845, has greatly extended our knowledge of Asia, and especially Asiatic Russia. The American Geographical Society was founded at New York in 1852, and the National Geographical Society at Washington in 1888. Italy has her Società Geografica, founded at Florence in 1867.

GEOGRAPHY, the science which treats of the world and its inhabitants giving an account of the earth as a whole and of the divisions of its surface, natural and artificial, describing the different countries, states, provinces, islands, cities, etc. It may be regarded as embracing several departments or branches. Mathematical Geography is that branch of the general science which is derived from the application of mathematical truths to the figure of the earth, and which determines the relative positions of places, their longitudes and latitudes, the different lines and circles imagined to be drawn upon the earth's surface, their measurement, distance, etc. Physical Geography treats of the physical condition of the earth, its great natural divisions of land and water, the atmosphere, and the movements of oceanic and aërial currents; the geological structure of the earth; and the natural products of the earth, vegetable and animal. It is concerned chiefly with general laws and principles, as they are manifested upon a grand scale, and in the organic kingdom with the existence of groups of animals and plants. This branch approaches at various points the sciences of geology, hydrology, meteorology, botany, zoology, and ethnology. Political Geography embraces the description of the political or arbitrary divisions and limits of empires, kingdoms, and states; and treats of their government, laws, social organization, etc.

The earliest idea of the earth formed by mankind seems to have been that it was an immense disc, in the center of which their own land was situated, surrounded by the ocean, and covered by the sky as with a canopy. The Phœnicians were the first people who made any great progress in extending the bounds of geographical knowledge. They seem to have explored all the shores of the Mediterranean, and at an early period to have passed the Pillars of Hercules (the Straits of Gibraltar), and visited to some extent the Atlantic shores of Europe and Africa, extending their voyages as far north as Britain, and as far south as the Tropic of Capricorn. In the Homeric poems (which may be regarded as representative of the ideas entertained by the Greeks about the commencement of the 9th century B.C.) the earth is supposed to resemble a circular shield surrounded by a belt of water which was the source of all other streams. The world of Herodotus (born 484 B.C.) extended from the Atlantic to the western boundary of Persia, and from the Red Sea or Indian Ocean to the amber lands of the Baltic. The Indian expedition of Alexander the Great (330 B.C.) greatly enlarged the ancient knowledge of Northern and Eastern Asia. About 320 B.C. Pytheas, a seaman of Massilia (ancient Marseilles), a Greek colony, sailed along the western coasts of Spain and Gaul, visited Britain, and, pursuing his voyage, discovered an island, henceforward famous as Ultima Thule, which is supposed to have been Iceland. Eratosthenes (276–196 B.C.) first used parallels of latitude and longitude, and constructed maps on mathematical principles. He considered the world to be a sphere revolving with its surrounding atmosphere on one and the same axis, and having one center The Geography of Strabo, a Greek of Pontus,

written about the beginning of the Christian era, embodies all that was known of the science at that period. The countries lying round the Mediterranean were known with tolerable accuracy, but the Atlantic shores of Europe were very vaguely comprehended, while of the northern and eastern portions the most erroneous notions prevailed. Pomponius Mela, an early Roman geographer, wrote about the time of the emperor Claudius. He divided the world into two hemispheres, the Northern or known and the Southern or unknown; the former comprising Europe n. of the Mediterranean and w. of the Tanis (Don); Africa s. of the Mediterranean and w. of the Nile; and Asia. The next famous geographer is Ptolemy, who lived at Alexandria about the middle of the 2d century A.D. In Europe, Spain and Gaul were now correctly delincated, together with the southern shores of Britain. Northern Germany and the southern shores of the Baltic were pretty well known, as also some portion of Russia in the neighborhood of that sea, and the southern part of European Russia. In Asia it was considered certain that there were wide regions inhabited by nomadic tribes called Scythians, while from the far east came some vague reports of China. The geography of Ptolemy remained the acknowledged authority during the whole of the middle ages. From his time up till the 13th century no advance was made in geographical knowledge until Marco Polo opened up new fields of inquiry. The account of his travels first made known to Europe the existence of Japan and of many of the East Indian islands and countries. Then followed the discovery of America in 1492, and from this time forward the progress of discovery was extremely rapid. In 1497 the Cape of Good Hope was doubled by Vasco da Gama, four years after its discovery by Bartholomew Diaz. Within thirty years from the date of the first voyage of Columbus the whole of the east coast of America from Greenland to Cape Horn had been explored. In 1520 Magellan passed the straits which bear his name, and his vessel, crossing the Pacific and Indian Oceans, returned to Europe by way of the Cape of Good Hope, being the first that had circumnavigated the globe. The west coast of America was explored as far as the Bay of San Francisco about the middle of the 16th century. At the same time discovery in the east advanced with rapid strides. Within twenty years of Gama's arrival in India the coasts of East Africa, Arabia, Persia, and Hindustan had been explored, and many of the islands of the great Archipelago discovered. The expeditions of Willoughby and Frobisher in 1553 and 1576, of Davis in 1585, of Hudson in 1607, and of Baffin in 1616, though they failed in their object of finding a n.w. passage to India, materially enlarged our knowledge of the Arctic regions. By the middle of the 17th century the Dutch, under Tasman and Van Dieman, made the Australian Islands known to the world. Late in the following century Captain Cook added largely to geographical knowledge by his survey of the Pacific and its innumerable islands. The Antarctic continent was discovered in 1840 by American, English, and French expeditions, and the northwest passage round N. America was found by McClure in 1850. The travels of Humboldt, Spix and Martius, Lewis and Clark, Fremont, and others, have made us acquainted with the general features of the American continent. In Asia numerous travelers have contributed much to render our knowledge certain and precise in respect to a great part of the continent. The interior of Australia has been explored by Sturt, Eyre, Leichhardt, Burke, Wills, King, McDouall Stuart, etc. The opening up of the African interior has been materially advanced by the explorations of a host of travelers, including Bruce, Park, Denham, Clapperton, the Landers, Burton, Speke, Grant, Baker, Barth, Livingstone, Rohlfs, Schweinfurth, Cameron, Stanley, etc. The progress which has marked recent discovery has been materially assisted by the governments of various countries, and by the numerous geographical societies formed during the 19th century. The scientific study and teaching of geography are becoming more and more recognized to be of high importance, and in both at present Germany takes the lead. See also Geographical Societies, the articles on the different countries, and such articles as Earth Climate, etc.

GEOLOGY, is the science which treats of the history of the earth, as ascertained by the study of its exterior or crust, investigating the successive changes which have taken place in the rock-masses composing it, their relations, structure and origin, and discussing also the main features of the animal and vegetable life of the past as bearing on the earth's history. The present condition and conformation of the earth is the result of vast changes in the past and of agencies working through immense periods of time, and the same or similar agencies may still be seen at work producing similar changes. Thus rocks, both aqueous and igneous, are still being formed. The former receive their name from owing their origin mainly to water, which acts both chemically and mechanically on the crust of the earth, in wearing down rocks and soils and carrying the debris often to considerable distances. The sediments thus carried to sea, or into lakes and estuaries, are spread abroad in the water, and form stratified deposits, which in course of time solidify into rock. With sufficient time all land would thus be eventually degraded beneath the sea, were it not that the loss is compensated by disturbance and elevation of land always slowly taking place over great portions of the continents and islands of the world. Such disturbances have produced strange phenomena among the stratified rocks, which may be contorted, tilted up, dislocated, or otherwise changed from their original arrangement. The strata resulting from aqueous deposits are consolidated (petrified) chiefly by pressure and chemical decomposition and recomposition. Some formations are many thousands of feet in thickness. Contraction of the crust of the earth due to radiation of the heat of the earth into space, has also had its immense effects, the result being that over broad areas rocky masses have been contorted and compressed to a great degree, and mountain ranges upheaved.

Igneous rocks also form a considerable portion of the visible crust of the earth, though much smaller in amount than those of sedimentary origin. Some of the igneous rocks consist of beds of volcanic ashes, others of old lavas, others of masses of matter which were intruded in a melted state from below among the strata. Granite is the most important and widely-spread of the igneous rocks, and is generally regarded as the fundamental rock of the earth's crust. Rocks that have been melted are known to be igneous by their structure, and also by the effects they have produced on the strata with which they are associated. Shales, sandstones, etc., are often hardened, bleached, and even vitrified at the points of junction with greenstone, basaltic, and felspathic dykes, or old lava beds, and the same kind of alteration takes place on a greater scale when large masses of igneous rocks have been intruded on the strata.

That the rocks which form the crust of the earth had the same general origin with the igneous rocks and sedimentary strata now forming has been well established, and that there is a regular succession of strata from the older to the newer the oldest being normally lowermost, the newest uppermost, is also well ascertained. A corresponding succession in regard to the animal and vegtable life of former ages has also been proved by the fossils that accompany the successive strata. This superposition of strata and the succession of life in time are two cardinal doctrines in geology. Observation and experiment alike established the doctrine of superposition. Thus at the edges of the strata on which London stands, the rocks known as the Woolwich and Reading beds are seen to lie on the chalk. Far within these edges, well-sinkers are well aware that often after sinking several hundred feet through the London clay the chalk is reached. In like manner proceeding westward across the middle of England, it is found that the Chalk rests on the Green-sands, the Green-sands on the Upper Oolites, the Lower Oolites on the Lias, the Lias on the New Red marl, and so on through lower members of the geological series of English rocks. Each great group of rocks consists of several subdivisions called formations, and each group, and even to a considerable extent each minor subdivision, is characterized by the presence of distinct assemblages of organic remains. The successive appearance of such remains, which constitutes the succession of life in time, was the great discovery of Wm. Smith, made nearly a century ago.

Igneous rocks also are associated in different localities with the systems named in the following table.

In the small area of Great Britain a more complete series of rocks exists than in any other part of the earth's surface of equal dimensions—so far as is known. The greater part of the European series is, indeed, nearly complete in England and Wales alone; and since the days of William Smith, the British rocks have

GEOLOGY

generally been the types to which formations in other parts of the world have been referred.

The main rock-systems into which the earth's crust is divided, and which are based on the characteristics of the organic remains contained in them, are shown in the following table in ascending order:

Life Periods.	Rock Systems.	
Post-Tertiary or Quaternary	Recent—Alluvium, Peat, etc.	
	Pleistocene.	
Tertiary or Kainozoic	Pliocene.	
	Miocene.	
	Oligocene.	
	Eocene.	
Secondary or Mesozoic	Cretaceous.	
	Jurassic.	Oolitic.
		Liassic.
	Triassic.	
Primary or Palæozoic	Permian.	
	Carboniferous.	
	Devonian and Old Red Sandstone.	
	Silurian.	
	Cambrian.	
Archæan, Laurentian, or Eozoic	Fundamental Gneiss.	

Archæan, Pre-Cambrian, or Laurentian Rocks.—The Laurentian are the oldest known of the sedimentary rocks. They are metamorphic (that is, changed from their original structure), and mostly gneissic in character, and were for long classed as granitic and igneous rocks till their true nature was shown by Sir William Logan. They occupy vast tracts of country in Labrador and Canada. They there consist of two divisions, Lower and Upper Laurentian. The gneiss of the lower division is interstratified with several thick bands of crystalline limestone, in one of which a remarkable structure believed by Dawson, Carpenter, and others to be a foraminifer and called Eozoon Canadense was found. This is the oldest known fossil, if indeed it be a true fossil. In the Outer Hebrides and on the west coast of the North Highlands, rocks occur of highly metamorphic gneiss, which are probably of Laurentian age. The term Pre-Cambrian or Archæan is now applied to these rocks in the British area; they crop out also in North and South Wales, in the Malvern Hills, and in Charnwood Forest in Leicestershire. No fossils have yet been observed in these rocks. The Huronian Rocks of N. America are possibly intermediate in age between the Laurentian and the rocks next mentioned.

Cambrian.—These rocks come next in succession to the Laurentian strata. The term Cambrian has been used differently by geologists. In most places they are unfossiliferous (or only doubtfully so), but at St. David's, in North Pembrokeshire, numerous fossils in purple shales among the lowest beds of the series have been found, including a small bivalve crustacean and two brachiopods. In a higher part of the series two sponges and varied trilobites have been found. In Sutherlandshire, red Cambrian conglomerates lie on the Laurentain strata uncomformably. Cambrian strata also occur in the hills of the Longmynd of Shropshire, in South Staffordshire, etc.

The Silurian Rocks were first worked out in detail in South Wales and the bordering counties by Sir Roderick Murchison, and an account of them published in the year 1839 in his Silurian System. The Silurian is divided into the Lower and Upper Silurian. The former comprises in ascending order the Lingula beds (so named from a characteristic fossil shell), the Tremadoc slate, the Llandeilo flags, and the Caradoc or Bala beds. The Lingula flags (Potsdam sandstone of North America) rest conformably on, and in fact pass by gradations into the Cambrian rocks. They are best developed in Wales, in Merionethshire, Carnarvonshire, and at St. David's, and consist of black and gray slaty rocks with beds of grit. The mass of hills that extends across the south of Scotland, from Wigtonshire on the southwest to St. Abb's Head on the eastern coast, is mostly formed of Lower Silurinan strata. They chiefly consist of gray grits and gray and black shales here and there containing fossils. Further south, in Cumberland, Westmoreland, and North Lancashire, Lower Silurian strata form the chief mass of the mountains known as the Cumbrian region. The Skiddaw region consists of black slates. Above these there lies a great series of volcanic rocks, consisting of felspathic lavas and ashes, commonly known as the green slates and porphyries. The Llandeilo flags in North Wales are named from the town of Llandeilo in Carmarthenshire, where they occur in a typical form. Above and passing into these lie the Caradoc or Bala beds. (Trenton limestone of N. America). The most characteristic fossils of the Lower Silurian are the crustaceans known as trilobites, of which more than 200 species are known to belong to these rocks. Other fossils include hydrozoa, corals, echinodermata, numerous mollusca (brachiopods in particular, also lamellibranchiates, pteropods, gasteropods, cephalopods or cuttle-fishes). No fishes nor any other vertebrate animals have yet been found in the Lower Silurian rocks. The Lower Silurian rocks in the British and in some other areas were upheaved, contorted, and denuded before the deposition of the Upper Silurian strata, which, therefore, lie generally unconformably upon them. The chief groups forming the Upper Silurian are, in ascending order, the Pentamerus beds (so called from the brachiopod Pentamerus oblongus), the Tarannon shale, Woolhope limestone, Wenlock shale, Wenlock limestone, and Ludlow rocks, in the middle of which is the Aymestry limestone. In North America the Oriskany and Niagara beds are of this age. The Upper Silurian limestones are absent in Scotland and over the greater part of Wales. All of these formations are in general terms fossiliferous. The Wenlock limestone is in great part formed of corals, encrinites, shells, and trilobites, corals predominating. Near the top of the Upper Ludlow strata there are several thin bone-beds containing small teeth and scales and defenses of placoid fish: with the exception of a fragment of a fish found in the Lower Ludlow beds in Shropshire, these are the oldest known fishes. Many geologists now classify the Silurian system very differently from the above method. They assign the Tremadoc and Lingula beds to the Cambrian formation; and the Llandeilo and Caradoc beds are put into a distinct formation called the Ordovician.

Old Red Sandstone and Devonian.—Old Red Sandstone first received that name in contradistinction to the New Red Sandstone, the former occurring below, and the latter above the Carboniferous strata. Where the uppermost Silurian strata join the Old Red Sandstone there is a gradual passage between them. A broad belt of Old Red Sandstone crosses Scotland in a northeast direction between the Firth of Clyde and Montrose and Stonehaven. This broad tract lies uncomformably on Lower Silurian clay-slates, and dips to the southeast under the Carboniferous or coal-bearing rocks that occupy the great central depression through which the Forth and Clyde chiefly run. On the southeast side of this broad undulating hollow the Old Red Sandstone again rises from beneath the Coal-measures with a general northwest dip, and skirting the Lammermuir Hills, strikes southwest into the sea south of Ayr. On the south side of the Lammermuirs it again appears on the hills between Berwick and Hawick, dipping under the Carboniferous rocks that, without a break, stretch from Berwick to the neighborhood of Derby. The first compendious account of the Old Red Sandstone of Scotland was given by Hugh Miller, those rocks and the remarkable forms of fish (Pterichthys, Cephalaspis, etc.) they contain being till his time almost unknown. In North Wales and Cumberland narrow streaks of red sandstone here and there show themselves between the Silurian rocks and Carboniferous limestone. South of Coalbrookdale it ranges, in great force, through parts of Shropshire, Herefordshire, and Gloucestershire, into South Wales, where it stretches westward to the west coast of Pembrokeshire, the whole being about 8000 feet in thickness. These English and Welsh rocks are united by their fossils to the Old Red Sandstone of Scotland. The absence of marine shells and the nature of the fossil fishes of the Old Red Sandstone indicate that the formation was deposited, not in the sea, but in a great fresh-water lake, or in a series of lakes, for the nearest living analogues of many of the fish are the Polypterus of the African rivers, the Ceratodus of Australia, and in less degree the Lepidosteus of North America. In Canada, the sandstones of Gaspé are of Devonian age, as is found by their containing Cephalaspis.

The name Devonian has been given to a series of rocks in Devonshire bearing fossils intermediate in character between those of the Upper Silurian and those of the Carboniferous limestone, and which are considered as the equivalents of the Old Red Sandstone of the west of England and of Scotland. The terms Devonian and Old Red Sandstone are thus generally considered equivalent in point of time. These rocks have been divided into Lower, Middle, and Upper Devonian. The lower beds chiefly consist of slaty beds, and green and purple sandstones, with brachiopods. The middle group, which includes the Plymouth limestone, contains numerous corals. The Upper Devonian group contains

GEOLOGY

land plants (Stigmaria, etc., and many shells), some of which are identical with those found in the Lower Carboniferous limestone-shades.

Carboniferous Rocks.—In the south and middle of England, and in Ireland the Carboniferous Rocks so named on account of the masses of coal contained in them, consist chiefly of limestone at the base and Coal-measures above. Including the South Wales, the Forest of Dean, and the Somersetshire areas, a typical section of the beds is as follows:

	Feet.	Feet.
Coal-Measures	1,000 to	12,000
Millstone grit	500 "	1,000
Yoredale rocks	100 "	1,000
Carboniferous or Mountain limestone	500 "	2,500
Carboniferous limestone shale	100 "	500
Yellow Sandstone, with plants	100 "	200

Generally resting on Old Red Sandstone.

The Yellow Sandstone beds form a kind of passage from the Old Red Sandstone to the Carboniferous rocks, and the plants have carboniferous affinities. The overlying shales in Pembrokeshire, etc., contain numerous fish-teeth, Spirifers Productas, and a few Lingulas (all brachiopods); and the limestone, which is more than 2000 feet thick in South Wales, near Bristol, and in Somersetshire, is also so highly fossiliferous that it may be stated that the whole of this limestone has once formed parts of animals. The Yoredale rocks of Yorkshire consist chiefly of shales and sandstones, with marine shells and occasional land-plants. The Millstone grit of South Wales is comparatively unfossiliferous, but sometimes contains the remains of plants, and more rarely marine shells. The Coal-measures and Millstone grit of Monmouthshire, Glamorganshire, and Pembrokeshire, lie in a great oval basin, encircled by a rim of limestone, beneath which lies the Old Red Sandstone. The Coal-measure beds consist of alternations of sandstone, shale, fire-clay or under-clay coal, and ironstone. Underneath each bed of coal is a bed of underclay with the roots known as Stigmariæ, forming the soil in which the plants were rooted, by the decay of which, passing into peat, material was supplied for the production of coal. The Gloucestershire and Somersetshire coal-field was originally joined to the South Wales Carboniferous rocks. The Coal-measures of the Bristol and Somersetshire coal-field are altogether about 7000 feet thick, and contain in all about forty-six beds of coal, with a total thickness of about 98 feet. The Coalbrookdale coal-field contains several bands of good nodular ironstone. There are in places twenty-two beds of coal, about ten of which are workable, some of them from 3 to 6 feet thick. The North Wales coal-field lies on a great thickness of Carboniferous limestone. The Denbighshire part contains at least seventeen beds of coal, most of which are worked, and the Flintshire part at least twelve beds. The basement beds of the South Staffordshire coal-field rest directly upon Upper Silurian rocks. This field, in the northern part, contains fourteen beds of coal. In the south several of these coalesce to form the thick coal, in places 40 feet in thickness, with two thin partings. The Warwickshire coal-field contains six beds of workable coal, besides ironstone. The Ashby-de-la-Zouch coal-field contains fifteen beds of coal. The Coalbrookdale, South Staffordshire, and Warwickshire coal-fields present so many points of resemblance, that undoubtedly they were all originally formed as one coal-field. North of this coal-field the Carboniferous rocks are somewhat modified in details. The Lancashire and Cheshire and North Staffordshire coal-fields, exclusive of the Mill stone grit, vary from about 3500 to 750 feet in thickness, including about forty-six coal beds in North Staffordshire, and fourteen in Lancashire. There are also many beds of ironstone. The Nottingham, Derbyshire, and Yorkshire coal-fields united give about fifteen beds of workable coal. All these are ironstone areas, and North Staffordshire is also the great pottery district of England. The Newcastle coal-field is about 1600 feet thick, and contains about sixteen beds of coal throughout the district. The lower coal-field of Northumberland is of the date of the Mountain limestone. A smaller coal-field overlies the Carboniferous limestone northeast of Whitehaven in Cumberland. The Whitehaven Coal-measures, which lie on the Carboniferous limestone, have fourteen beds of coal. The great Scottish coal-fields lie in a broad synclinal hollow, in which are the valleys of the Clyde and Forth. The whole tract is about 100 miles in length, by 40 to 50 in breadth. The Carboniferous strata of the Lothians cross the Firth of Forth beneath the sea, and form great part of Kinross and Fife. By far the larger part of the surface of Ireland, from the southern coast to Lough Neagh and Donegal Day, consists of the Carboniferous limestone series, lying sometimes on Old Red Sandstone, sometimes on Silurian rocks. There are a few small coal-fields, but these are merely the relics of one great coal-field that originally overspread the Carboniferous limestone of Ireland.

In the Carboniferous rocks more than 500 species of fossil plants have been named, a large proportion of which are ferns, including some tree-ferns. The remaining chief plants are gigantic club-mosses known as Calamites, Lepidodendron, and Sigillaria. Coniferous trees also occur, as do the wings and wing-cases of beetles and other insects, spiders etc., and some reptile forms. In the purely marine series of rocks, of which the Carboniferous limestone forms the most important part, we find corals, very numerous crinoids, brachiopods, also exceedingly numerous, and Lamellibranchiate molluscs. Many cuttle-fishes and numerous fish also occur; trilobites are scarce.

Coal-fields occur in France, Belgium, European Turkey, Hungary, Russia, India, China, Borneo, New Zealand, Australia, etc. The largest known coal-fields in the world are in the U. States. See Coal.

The Permian series succeeds the Carboniferous rocks, and were long considered as part of the New Red Sandstone. They were named Permian by Sir Roderick Murchison, from the government of Perm, in European Russia, where they largely occur. They consist of sandstone, red marl, etc., and contain a bed of the Magnesian limestone. Between the north of the Tyne and the neighborhood of Nottingham the Permian rocks skirt the Carboniferous rocks and lie on them unconformably. In Lancashire and Cheshire they chiefly consist of red marl and sandstone. The same rocks generally skirt the South Staffordshire coal-field, and the south part of the North Wales coal-field, and the east side of Coalbrookdale, is also bordered by Permian marls and sandstones. The fossils of the Permian group are generically and specifically few in number, but as a whole their affinities and grouping are decidedly Palæozoic. All the Permian fish have heterocereal tails, like the majority of the Palæozoic genera, in which the vertebral column is prolonged into the upper lobe of the tail, whereas in the modern fishes the vertebral column is not prolonged into either lobe. Excepting the Magnesia limestone, all the Permian rocks are red, and all, including this limestone, seem to have been deposited, not in the sea, but in an island salt lake, or in lakes.

The New Red Sandstone, or Trias, succeeds the Permian strata. It has received the name of Trias from the fact that when fully developed, as in Germany, it consists of three great divisions of Keuper, Muschelkalk, and Bunter Sandstein. Few old genera and no species pass thus far upward. The majority of the genera of Brachiopoda disappear, and the whole grouping of the fossils now ceases to be Palæozoic, and assumes a character common to the Secondary rocks. Triassic rocks extend from Devonshire along the Severn, round the eastern borders of the Palæozoic rocks of Herefordshire and North Wales. From thence they stretch eastward to the Permian and Carboniferous rocks of Lancashire, North Staffordshire, and Derbyshire. They surround all the midland coal-fields and Permian beds between Shrewsbury, Coventry, and Derby, and, everywhere unconformably overlying the Permian rocks, stretch north in a long band from Nottingham to the river Tees. In its greatest development in England, the Bunter series (of soft red standsone and quartz conglomerate) is about 3000 feet thick. The Muschelkalk (absent in Britain) may be well seen, among other places, near Gotha, and at Eisenach in Thuringia. It is a gray shelly limestone, rich in fossil mollusca. No fossils are known in the Bunter Sandstones of England, though a few are found in equivalent strata on the Continent. In England, above the upper soft red sandstone are beds of red, white, and brown Keuper sandstone, and red marl, often ripple-marked, and containing bones and footprints, chiefly of Labyrinthodont reptiles, together with a few plants, and a peculiar fish. The rock-salt of England lies in the Triassic red marls of the plains of Lancashire, Cheshire, and Worcestershire. This rock-salt was deposited in super-saturated salt lakes during the Keuper period; and this could only have been done by the evaporation due to solar heat acting on the waters of salt lakes which had no outflow, like the Great Salt Lake of Utah, for example, or the salt lakes of Central Asia. The Keuper red

marl (Upper Trias) varies from 500 to 2000 feet in thickness, and contains, besides other fossils, footprints and bones of reptiles. In the U. States the Triassic rocks of Virginia and N. Carolina contain workable beds of coal. The red sandstone of the Connecticut valley is of Bunter age. Above the Keuper strata occur a series of beds called the Rhætic beds, from similar strata in the Rhætic Alps. All over England, wherever the base of the Lower Lias is well seen, the Rhætic beds, rarely more than 50 or 100 feet thick, are found to lie between the Lias above and the New Red Marl of the Trias below. They must be considered as true beds of passage between the red marl and the next series of strata. At the base of the Rhætic beds have been found minute teeth of the earliest known mammal (Microlestes rhæticus), a small insect-eating marsupial.

The Lias and Oolite series succeed the New Red and Rhætic beds. On the Continent of Europe the Lias and Oolite together are termed Jurassic, because in a typical form they are largely developed in the range of the Jura. The Lias in England consists, in descending order, of the Upper Lias shale, or clay; Marlstone; Lower Lias shale, or clay and limestone. The Lower Lias is about 900 feet thick, and consists of beds of blue clay interstratified with beds of blue argillaceous limestone, which is largely quarried in Leicestershire, Warwickshire, etc., for hydraulic lime. The Lower Lias is well exposed in the coast section at Lyme-Regis. From thence the Lower Lias strikes north to the junction of the Severn and Avon, and again n.e. and n. to the sea-coast of Yorkshire, e. of the river Tees. The Lower Lias clay and lime, as a whole, is rich in the remains of life. These include crinoids, decapod crustaceans, Terebratulæ, and other Brachiopoda, and numerous Lamellibranchiate molluses. Cephalopoda, such as ammonites and belemnites, are especially numerous, together with species of nautilus. Fish are numerous, and there appear in the Lower Lias a great number of remarkable reptiles, some of gigantic size, as the Ichthyosaurus, the Plesiosaurus, and the well-known Pterodactyle. The Marlstone series, or Middle Lias, which is generally a brown, ferruginuos, soft, sandy rock, is rich in many forms of ammonite and belemnite, etc. From the Upper Lias clay much alum shale, as also the well-known Whitby jet, is obtained. It is a stiff unfertile dark-blue clay. In Yorkshire, at the top of the Lower Lias and in the Marlstone, there are the well-known beds of ironstone so extensively worked at Middlesborough.

The Oolitic strata as a whole stretch across England from southwest to northeast, or from Portland Bill to North Yorkshire. The Inferior Oolite, the lowest member of the Lower Oolite, chiefly consists of beds of yellow limestone. Much of the limestone is oolitic that is to say, it is formed of small concretionary bodies, like the roe of a fish cemented together in a calcareous matrix. Above the Inferior Oolite limestone lies the Fuller's earth, so name because it contains in places beds of that substance. The formation consists of stiff blue clay, which varies in thickness from a few feet to 200 feet near Bath. The Great or Bath Oolite succeeds, and consists of Great Oolite, covered by Forest Marble, and passing downward into Stonesfield Slate, which forms its base. The Stonesfield slate consists of beds of shelly laminated and oolitic limestone, with numerous fossils among them remains of mammals, viz.: the lower jawbones of four genera of small insectivorous marcupials. The Bath Oolite, of which the Forest Marble forms the upper part, is best developed near Bath, where it yields the celebrated stone of which that city is built. Among fossils of the Bath or Great Oolite are reptiles of the genera Teleosaurus and Megalosaurus, together with the gigantic Ceteosaurus (or whale-lizard), probably about 50 feet in length. During this part of the Oolitic epoch, while in the south of England the strata were exclusively marine, in the middle and north they were to a great extent estuarine, freshwater, and terrestrial.

The Middle Oolite consists of the Upper Calcareous Grit, Coral Rag, Lower Calcareous Grit, Oxford Clay, and the Kelloway Rock. The Oxford Clay is a dark blue clay, about 600 feet thick where best developed, running in a long band of varying width from the coast of Dorsetshire to the Derwent, in Yorkshire. The Kelloway Rock is an occasional thin band of calcareous sandstone near its base. The Coral Rag is a rubbly limestone, trending, with occasional interruptions, from Somersetshire to Yorkshire. It is associated in places with sandy strata known as the Calcareous Grits, and is often almost entirely composed of broken shells and sea-urchins.

The Upper Oolite consists of the Portland Limestone and Sand and Kimmeridge Clay. The Kimmeridge Clay is well exposed in Kimmeridge Bay, on the Dorsetshire coast, whence its name. Occasionally interrupted, it runs from thence north into Yorkshire. In places it is 500 or 600 feet thick, and consists of a stiff blue and sometimes black clay or shale. The Portland Limestone and Sand are best seen in the Isle of Portland. The celebrated Portland stone has been used in many public buildings, including St. Paul's. Like those of all the other Oolite formations it is cream-colored, and generally fossiliferous.

In Scotland the Lias, Inferior Oolite, Middle Oolite, and Oxford Clay occur in the Islands of Skye and Mull. On the east of Scotland, at and near Brora, in Sutherland, the Liassic and Oolitic strata have been long known. Oolitic rocks, known by the name of Juriassic, almost identical with those of Britain, occur largely in France; and the mountain range of the Jura, dividing France and Switzerland, is chiefly formed of Liassic and Oolitic rocks. From thence they range interruptedly northward and eastward, covering a large part of the plains of European Russia, and extending along the Himalayas.

As regards the fossil remains of the Lias and Oolite, a remarkable feature is the vast development of Cephalopoda, especially of the genera Belemnites, Nautilus, Ammonites, and Ancyloceras. There are also many genera and species of fishes, chiefly in the Lias, and the genera and species of reptiles are so numerous that this life-period has been sometimes called "the age of reptiles." The plants include ferns, horse-tails, conifers, cycads, etc. Viewed as a whole, the Liassic and Oolitic strata seem to have been deposited in warm seas round groups of islands formed of the older Palæozoic rocks of Europe, of which the Highlands of Scotland, Cumberland, and Wales formed parts, and from which rivers flowed, at the mouths of which the estuarine and fresh-water deposits of the north of England and Scotland were accumulated.

Purbeck and Wealden Strata.—These form a series of transition strata between the Oolite and the Cretaceous systems. They belong chiefly to the district of Kent and Sussex known as the Weald, and comprise the Weald clay, the Hastings sands and clays, and the Purbeck limestones, marls, and clays. The Purbeck beds, which succeed the Portland stone, are chiefly fresh-water strata, and the Hastings sand and Weald clay are almost exclusively fresh-water beds. Several remarkable reptiles occur in the Weald, including the Iguanodon, Plesiosaurus, and Pterodactyle, together with a number of Crocodiles.

The Cretaceous Formation is divided into a lower and an upper series of strata. The chief member of the former is the Lower Green-sand, forming a series of strata overlying the Wealden beds, and occurring in magnificent sections along the southern cliffs of the Isle of Wight, and elsewhere round the Wealden area. The general characters of the whole formation are white, yellow, ferruginous, and gray and green sands.

The Gault, which forms the base of the Upper Cretaceous series, is a stiff blue clay about 300 feet thick in its thickest development. It appears in the Isle of Wight, ranges round the escarpment of the Weald, and in the center of England, from the neighborhood of Devizes to the Wash in Norfolk. In general lithological characters, the Upper Green-sand in places somewhat resembles the Lower Green-sand. In part of the Wealden area it is difficult to separate from the Gault, there being a passage from one to the other. In Wiltshire the Upper Green-sand is about 200 feet thick.

The Chalk, from its familiar characters and uniformity of structure, is the most easily recognizable of all the British formations. From west to east it stretches from the neighborhood of Beaminster, in Dorsetshire, to Beachy Head and the North Foreland, and from thence north to Speeton, in Yorkshire. Its area in Europe and Asia is immense. It consists of a soft white limestone, and on examination with the microscope, much of it is found to consist of shells of Foraminifera, Diatomacea, spiculæ and other remains of sponges, Polyzoa, and shells, highly comminuted. Somewhat similar deposits are now forming in the open Atlantic at great depths, chiefly of Foraminifera of the genus Globingerina. In its thickest development in England the Chalk is about 1200 feet thick (in Dorsetshire, Hampshire, etc.). The Lower Chalk usually

contains no flints, and is somewhat marly at the base, while the Upper Chalk is interstratified with many beds of interrupted flints. As a whole, the Chalk dips gently from its western escarpment to the east and south, underlying the Tertiary strata of the Hampshire and London basins, and reappearing with precisely the same characters on the coast of France. Beyond England it stretches through France, northward into Sweden, and eastward into Asia. Plants are comparatively few in the Chalk, but animal remains are very numerous. More than eighty species of fish are known; various great reptile forms, as the Mosasaurus, Plesiosaurus, and Ichthyosaurus, Pterodactyles, etc. In England, and generally in Europe, there is a marked discordance between the fossils of the Chalk and those of the overlying Tertary rocks; no fossils (except, perhaps, one Terebratula) being common to the two groups. In America the Cretaceous epoch presents some extraordinary reptilian forms of immense size, also various birds. The sands and marls of New Jersey, U. States, are of this age, and similar beds occupy extensive tracts in the western regions; but there is no true white chalk in America.

Of the Tertiary strata the Eocene Rocks form the lowest division. In England these lie in two basins, those of London and Hampshire, both surrounded and underlaid by the Chalk. The strata are divided into the Lower Eocene and the Upper Eocene or Oligocene. The Lower Eocene rocks lie sometimes on upper beds of Chalk, and sometimes on beds lower in the series. They are therefore highly unconformable, and in this we have the reason of the complete difference in the species of the Cretaceous and Eocene rocks, for great continental areas of Chalk were upheaved above the sea, and remained as dry land for a period of time so long that when they were again submerged the life of Cretaceous times had died out, and other forms appeared. To the Lower Eocene belong the Thanet Sand, the Woolwich and Reading beds, the London Clay, and the Bagshot Sands and Clays. The London Clay usually consists of brown and bluish-gray clay, and in the London basin varies in thickness from 50 to 480 feet. Its fossil remains include various palm-nuts and other fruits and leaves. Remains occur of birds allied to the vulture and kingfisher, and a small swimming-bird with tooth-like serratures on the bill; turtles and river tortoises are numerous. The Upper Eocene or Oligocene includes the Headon Hill Sands, the Osborne Beds, Bembridge Beds, and Hempstead Beds, groups of strata be longing to Hampshire and the Isle of Wight. In these beds various Ungulate mammalia are found, such as the Anoplotherium, Palæotherium, a kind of river-hog, tapirs, etc. In France, in the Paris basin, the Eocene strata are largely developed. The Wahsatch, Bridger and Uinta beds of N. America are of Eocene age.

The Miocene Rocks are not found in Britain, but are well represented by strata (mostly of fresh-water origin in Central France (Auvergne, etc.) and Switzerland. Over many parts of Europe, Asia, and America there are other Miocene strata, each more or less possessing peculiarities.

The Pliocene strata in Britain consist in descending order of the Cromer Forest Bed, Chillesford Clay, Mammaliferous or Norwich Crag, the Red Crag and the Coralline or White Crag of Suffolk. The Coralline or White Crag lies on the London clay in Suffolk, and consists of a patch of about 20 miles in length, and generally of less than 100 feet in thickness. It is rich in Polyzoa (formerly called Corallines, whence the name Coralline Crag). The general character of the climate seems to have been milder than at present. The Red Crag often lies in denuded hollows on the Coralline Crag, and is chiefly a ferruginous, shelly sand, very irregularly bedded. Many of its shells now live in British seas, and there are many reasons for believing that during the later part of the Eocene and through the Miocene epoch the area now called Britain was joined to the Continent. The Mammaliferous or Norwich Crag consists of sands, gravels, and shells, and contains remains of species of mastodon, elephant, hippopotamus, and horse, as also of the common otter, deer, etc. From the nature of the fossils it is believed to have accumulated near the mouth of a river.

The Post-tertiary or Quaternary Epoch is that immediately before the period in which we now are (the recent). It is characterized especially by various glacial phenomena, and in particular by numerous evidences of a glacial period, when the northern hemisphere was subjected to a climate of the utmost rigor. During this period what is now the British Islands was in great part covered by glacier ice, probably as thick as that of the north of Greenland at the present day. When the most extreme cold prevailed, the mountains of Scotland and Wales were literally smothered in ice. Much of the boulder clay which is found more or less all over the British Islands north of the Thames valley is simply the moraine matter of clay and boulders that in places lay below the ice, and was more or less urged forward by the advancing glacier mass. (See Glaciers.) It is believed that subsequently a slow submersion of the land took place, and that then icebergs deposited the stones, earth, etc., carried by them over part of what is now the low lands of England and other regions, and of neighboring seas; hence the presence of sands, gravels and clays, full of boulders and ice-scratched stones, intermingled with shells of aretic or semi-arctic type sometimes lying at heights of from 800 to 1200 and 1400 feet above the present sea-level. The same kind of phenomena are more or less universal over great part of Northern Europe and North America. On the elevation of the country after the cold had passed away Britain was reunited to the Continent and Ireland to Britain, by plains of boulder-drift across which many mammalia (including the mammoth), migrated into the country, some of them for the second time. Man also migrated into the British area along with such mammalia. Among Post-tertiary plants there are Scotch firs, pines, yews, oaks, alders. The mammalian remains include those of elephants, rhinoceroses, hippopotamus, the common horse, bison, aurochs, red deer, roe-deer, Irish elk, Machairodus (a tiger?), etc. Many of these animals remains are found in the celebrated bone caves, several notable examples of which have been investigated in Britain. (See Cave.) In these have been found not only such remains as those of the cave bear, cave hyena, fox, wolf, cat, lion, reindeer, Irish elk, bison, rhinoceros elephant, etc., but also the works of man, such as flint implements, and on the Continent of Europe his skull and other bones associated with the above-named mammalia.

GEOLOGICAL SOCIETY OF AMERICA, an organization for the promotion of the science of geology in North America, formed in 1888 as an outgrowth of the geological section of the American association for the advancement of science. The society is almost strictly professional with a membership of about 300. The organization issues the bulletin of the geological society of America.

GEOLOGICAL SURVEY, U. States, a bureau of the department of the interior, organized in 1879 as a consolidation of the independent surveys that had been active for several years in exploring the Western states and territories.

The functions of the geological survey, as originally outlined by law of congress, with subsequent modifications, include the preparation of a topographic map of the U. States; the investigation and mapping of the areal geology; the examination of mineral deposits; the collection of mineral statistics; the study of hydrography with reference to water-power and the irrigation of arid regions; and the classification of public lands. The preparation of the topographic map, a necessary preliminary to the geologic and hydrographic work, is carried on by the topographic branch of the survey. When completed the topographic map will give an accurate presentation of the surface features of the country. The geologic branch of the survey investigates the maps of the geological formations. The map, as rapidly as completed, is issued in folios; it shows the areal distribution of the various rocks, their geological structure, and the location of mineral resources For the purpose of conducting special investigations of scientific or economic value, the geologic branch is organized in divisions, each of which covers a particular field.

GEOMETRICAL PROGRESSION, a series of numbers which increase or decrease by equal ratios: as, 2, 4, 8, 16, or 16, 8, 4, 2.

GEOMETRY, as its name implies, was primarily the mathematical science which has for its object the measurement of portions of the earth's surface; but now geometry may be termed the science which treats of the properties and relations of definite portions of space, such as surfaces, volumes, angles, lines. The relation between the parts of the same figure may be of two kinds,—of position or of magnitude; for example, two points in a straight line, four points on the

same circle, two straight lines perpendicular to one another, a straight line tangent to a circle, are relations of position. On the other hand, the proportionality of homologous lines of two similar figures, the equality of the square constructed on the hypotenuse of a right-angled triangle to the sum of the squares constructed on the sides containing the right angle, that of the volumes of two pyramids on equal bases and of the same height, are relations of dimension. But the relations of position govern the relations of dimension, and vice versa; that is, the one set of relations depend upon the other. Thus it is because a triangle is rectangular that the square constructed on one of its sides is equivalent to the sum of the squares constructed on the other two, and, vice versa, that relation between the magnitudes of the squares on the three sides depends on the triangle being right-angled. The geometer may draw indifferently from the study of a figure either the knowledge of the relations of position or that of the relations of dimension, on the condition that he knows how to apply relations of the one kind to those of the other; and the principal aim of geometry is to examine into the connection between the relations of magnitude and those of position.

Geometry may be conveniently divided into several principal sections—elementary geometry, practical geometry, analytical geometry, infinitesimal geometry, etc. Elementary geometry comprehends two parts—plane geometry, the object of which is the study of the simplest figures formed on a plane by straight lines and circles; and solid geometry or geometry of three dimensions, which treats of straight lines and planes considered in any relative position whatever, of figures terminated by planes, of the cylinder, of the cone, and of the sphere. Analytical geometry, either plane or solid, makes use of the method of co-ordinates introduced by Descartes and primarily applied to curves. In ancient times, though curves were studied and the principal properties of conic sections known, still no connection existed between these curves, nor was there any means of establishing one, so that the study of one was of no value to that of another. The first question in introducing the analytic method was then to fix upon some means which should serve to construct every curve by successive points as numerous and as closely brought together as is necessary in order to lay down the curve. Now the position of a point in a plane may be determined by two intersecting perpendiculars drawn from two fixed lines—the co-ordinates axes—at right angles to each other. An equation may then be found which states the relation between the co-ordinates of any point, that is, its distance from the two co-oridnate axes. (See Co-ordinates.) The study of the curves will thus be simply the study of their equations. In this way a typical equation for a curve in a certain system may be got, so that if at another time the curve is represented under another definition in investigating its equation in the same system of co-ordinates, particularized so as to simplify as much as possible the calculations, it will suffice to compare the particular equation with the general one to verify the identity of the curve, to give it its name, and to know all the properties of it which have been studied previously. In a similar way the analytical geometry of solid bodies is based on the fact that the position of any point in space can be determined by reference to three intersecting planes. Infinitesimal geometry is simply a continuation of the analytical geometry of Descartes, of which it may indeed be said it forms a part; the difference consists simply in the nature of the questions which, as they involve the measurement of magnitudes, the incessantly variable elements of which cannot be summed up by finite parts, require the use of the infinitesimal calculus. Descriptive geometry consists in the application of geometrical rules to the representation of the figures and the various relations of the forms of bodies according to certain conventional methods. In the descriptive geometry the situation of points in space is represented by their orthographical projections, on two planes at right angles to each other called the planes of projection.

GEORGE, Henry, American economist, born in 1839 in Philadelphia, Pa. In 1865 he began to write for the press and one of his earliest productions urges workingmen to think about political and social conditions, to find if it be possible to "check the tendency of society to resolve itself into classes that have too much or too little." At this time he was engaged as a reporter on the San Francisco Times, where he was quickly promoted to the position of chief of staff. The great fortunes acquired in California through the rapid increase in the value of land fixed his attention upon the land problem; and in a pamphlet published in 1871, entitled Our Land Policy, he advanced most of the ideas that later appear in Progress and Poverty, his most important work—that the value of land represents in the main a monopoly power, and that the entire burden of taxation should be levied upon it, thus freeing industry from taxation, and equalizing opportunities by destroying monopoly advantages.

In 1886 George became a candidate for the mayorality of New York City, but was defeated by Abram S. Hewitt. In 1896 he again ran for mayor, but died before election day.

GEORGE, St., a saint venerated both in the eastern and western churches, and the patron saint of England. He was canonized in 494 or 496 by Pope Gelasius. His origin is very obscure, one of many legends representing him as a prince of Cappadocia, martyred by Diocletian. Gibbon has sought to identify this legendary saint with the notorious and turbulent Arian heretic George of Cappadocia, who was slain in 361 in a rising of the populace who had been infuriated by his oppression and his violence against pagans and orthodox. But the most eminent scholars, both Roman Catholic and Protestant, are of opinion that the veneration of St. George has been traced up to so early a period as to make it very improbable that a notorious Arian could have been foisted on the Catholic Church as a saint and martyr. The killing of a dragon that was about to swallow a maiden is a legendary feat attributed to him. He was adopted by the Genoese as their patron saint, and in 1222 the Council of Oxford ordered that his day (the 23d of April) should be observed as a national holiday in England; in 1350 he was made the patron of the order of the garter by Edward III.

GEORGE I., King of Great Britain, and Elector of Hanover, was the son of the Elector Ernest Augustus, by Sophia, daughter of Frederick, elector palatine, and grand-daughter to James I. He was born May 28, 1660, and in 1682 was married to Sophia Dorothea of Zell, whom, in 1694, on account of a suspected intrigue with Count Königsmark, he caused to be imprisoned and kept in confinement for the rest of her life. In 1698 he succeeded his father as elector. He commanded the imperial army in 1707 during the war of the Spanish succession; and ascended the throne of Great Britain on the death of Queen Anne in 1714. Among the notable events of his reign were the rising of the Scottish Jacobites (1715–16); the Triple and Quadruple Alliances against Spain (1717 and 1718); the failure of the South Sea Company (1720). The private character of George I. was bad, but he showed much good sense and prudence in government, especially of his German dominions. By Sophia Dorothea he had a son, George, afterwards George II. of England, and a daughter, Sophia, the mother of Frederick the Great. He died in 1727.

GEORGE I., "King of the Hellenes," was born at Copenhagen Dec. 24, 1845, second son of the King of Denmark. In 1863 he was elected king by the Greek national assembly. In 1867 he married the Princess Olga, a niece of the Russian czar.

GEORGE II., King of Great Britain, son of George I., was born Oct. 30, 1683. He married in 1705 Wilhelmina Carolina of Brandenburg-Anspach. In 1708, then only electoral prince of Hanover, he distinguished himself at Oudenarde under Marlborough. In 1727 he succeeded his father on the English throne, but inherited to the full the predilection of George I. for Hanover. His reign is notable for the great events with which it is filled, and for the number of men great in art, letters, war, and diplomacy which then adorned England. The war of the Austrian succession, in which George II. himself took part at Dettingen, the Jacobite rebellion of 1745, the conquest of Canada, and the growth of the British empire in India are among the chief events of his reign. George II. died suddenly Oct. 25, 1760. He was a prince of very moderate abilities, regardless of science or literature; of obstinate temper and vicious habits; but honest and open in his disposition.

GEORGE III., King of Great Britain, born in 1738, was the eldest son of Frederick, prince of Wales, by the Princess Augusta of Saxe-Gotha, and succeeded his grandfather, George II., in 1760. In the following year he mar-

ried the Princess Charlotte Sophia of Mecklenburg-Strelitz. The sixty years of his reign are filled with great events, among which are the Wilkes' controversy, the American revolution, 1775–83; the French revolution, 1789, and the

King George III.

Napoleonic wars which followed; the Irish rebellion, 1798, etc. His private life was very exemplary. In 1810 the king's mind, which had already given way several times, finally broke down, and from that time to his death on Jan. 29, 1820, his biography is a blank.

GEORGE IV., King of England, son of George III. and the Princess Charlotte of Mecklenburg-Strelitz, born in 1762, died June 26, 1830. In 1811 George became regent, and, on the death of George III. in 1820, king. The most important event after his attaining the throne was the passing of the Catholic emancipation act, by the Wellington ministry, in 1829. George IV. left no descendants, his only daughter, the Princess Charlotte, wife of Leopold of Saxe-Coburg, having died childless in 1817. He was therefore succeeded by his brother, William, duke of Clarence (William IV.) See Britain.

GEORGETOWN, a suburb of Washington, D. C., contains the Georgetown college (the oldest Catholic college in the U. States), the Peabody library, etc. The Chesapeake and Ohio canal commences here.

GEORGETOWN, or **DEMERARA,** the capital of British Guiana, at the mouth of the Demerara. The chief exports are sugar, rum, and coffee. Pop. 53,176, about one-seventh being whites.

GEORGIA, was formerly a kingdom, but is now included in the Russian government of Tiflis, though the name is sometimes loosely employed to designate a much larger portion of the territory possessed by Russia south of the Caucasus. In the latter sense it has an area of say 34,000 sq. miles, but Georgia proper does not exceed about 15,000 sq. miles. The natives are a fine-looking race, the Georgian women, like the Circassians, being celebrated for their beauty. The Georgian language, together with that of the Mingrelains, Lazes, and other Caucasian peoples, seems, according to the latest researches to form a perfectly distinct linguistic family. It possesses a not unimportant literature, commencing with the introduction of Christianity, into the country. The history of the Georgians first becomes trustworthy about the time of Alexander the Great, to whom they became subject. About B.C. 324 they gained their independence under Pharnavas. They became Christianized toward the end of the 4th century. After yielding for a time to the supremacy of the Arabian caliphs Georgia regained its independence toward the end of the 10th century, which it retained till 1799, when Heraclius, successor of George XI., formally ceded his dominions to the Russian emperor Pau.

GEORGIA, one of the southern U. States, bounded n. by Tennessee and North Carolina, e. by South Carolina and the Atlantic, s. by Florida, and w. by Alabama; length, north to south, 320 miles; breadth, 255 miles; area, about 58,000 sq. miles (same as England and Wales). The coast is bordered by a chain of islands, separated from the mainland by narrow lagoons or sounds. On them the famous sea-island cotton is raised. The land is low toward the coast, beginning as a salt marsh, grown over with tall reeds, continuing next as swampy rice plantations and then as "pine barrens" about 60 or 90 miles inland, latterly gradually rising as a sandy district, interspersed with fertile tracts, till it reaches the lower falls of the Savannah, Ogechee, Oconee, and other rivers. Here the hilly and finally mountainous region called the Upper Country begins, a fertile and salubrious region extending north and west till it rises into the Appalachian mountain chain. Of the rivers the Chattahoochee, which flows under the name of the Appalachicola into the Gulf of Mexico, is navigable for steamers for 300 miles; the Savannah is navigable for steamers part of the year for 250 miles; and the

Seal of Georgia.

Altamaha and its affluents are navigable for small vessels 300 miles upwards. The climate is mild, but unhealthy in the low country during July, August, and September. The soil in many parts is very rich. Cotton, rice, maize, and the sugar-cane are the staple productions; but tobacco, the sweet potato, and other crops are cultivated with success. The fruits, which include peaches, apples, melons, oranges, bananas, etc., are of the finest. Copper and iron, also gold in considerable quantities, are found in the northern parts. Atlanta is the seat of the legislature and the largest town; the other principal towns are Savannah (the chief seaport), Augusta, Macon, and Columbus. A charter for the foundation of a colony in the territory now called Georgia was obtained in 1732 by General Oglethorpe from George II., after whom the state was named. Georgia was one of the thirteen original states.

The first English settlement in the state was made in 1733, by a band of immigrants under the direction of Gen. James Oglethorpe, who first landed at Savannah. The relations between the Indians (of whom there were two powerful tribes—the Cherokees and the Creeks) and the settlers at first were amicable, and were never disturbed until the French and Indian war, during which the Cherokees plundered and burned some of the remote frontier hamlets and killed a few of the settlers. The extent of the territory comprised in the original colony was much greater than the area of the present state, and by treaty with France and Spain at one time it extended to the Mississippi River on the west and included a goodly portion of Florida on the south. When the revolutionary war began, Georgia was in a flourishing condition, having a population , including negroes (slavery having been introduced in 1750), estimated at over 75,000. The state was destined to become the scene of important military operations during the progress of the war, and several hard-fought battles between the British on the one side, and the French and Americans on the other, took place, those of greatest magnitude being at Augusta and Savannah. Although defeated and compelled to abandon Augusta at first, the British recaptured the town, and held Savannah and the entire state in subjection (with the exception of minor guerrilla warfare) until General Greene succeeded in forcing them to retire, in 1782, after the surrender of Cornwallis, and before the signing of the treaty of peace between England and America. In 1803 two new territories were erected out of her domains, and these were afterward admitted to the Union as the States of Mississippi and Alabama, which loss of territory was, in a measure, compensated by possession of the large tract of country before that time occupied by the Creek Indians, who ceded it to the state in 1804. From 1815 to 1825 the troubles between the whites and Indians were of a nature so serious that the general government had to interfere and remove the Indians beyond the Mississippi.

When the civil war broke out, in 1861, Georgia passed the ordinance of secession, being the fifth state in order of priority to leave the Union. Atlanta fell before the victorious arms of Sherman, in September, 1864, and thence that general took up his "march to the sea," appearing before Savannah, December 10, 1864. After two weeks' hard fighting he succeeded in capturing the defenses and occupied the city. After the fall of the Confederacy Jefferson Davis fled to Georgia, and was captured near Macon by a detachment of Federal cavalry, which had previously invaded the state and taken various points of importance.

The history of Georgia, since the war, has been one of steady progress. In the fall of 1865, the ordinance of secession from the statute book was repudiated, acquiesced in and ratified the emancipation proclamation of the

president, and voided all public debts on account of the war. In 1868 a constitution was framed and the state government was organized. Five years after the war Georgia was in full possession of all her rights as a State of the union, and her reconstruction was complete. With energy and pluck her people went to work to retrieve their fallen fortunes and at present no southern state has a brighter future. In national elections the state has invariably gone Democratic. In 1908, a law prohibiting the sale of alcoholic beverages became effective.

The Cotton Exposition of 1881, and the Cotton States and International Exposition of 1898, both held at Atlanta, testified to the prosperity of the state. The division of races continued cleaneut; and though there was no disposition among the better class of whites to hinder the negro in the exercise of his civil rights, political equality was begrudged him, and social equality absolutely denied. As late as 1891 the legislature decreed that separate public conveyances be provided for whites and negroes, and as late as 1897 the appointment of a negro as postmaster was made impossible by public opinion. Instances of mob law and racial feud were frequent after 1894.

In national politics the state was democratic throughout the nineteenth century, except in 1840 and 1848, when it cast its electoral vote for the whig candidate. In state politics, Georgia, since 1874, has been immaculately democratic, and since 1882 the republicans have not participated in the state elections. From 1890 to 1898, however the populist party was very powerful. The present constitution was adopted in 1877, when Atlanta was made the capital. Pop. 1909, 2,675,000.

GEORGIA BARK, a small tree of the southern states closely resembling the cinchona or Peruvian bark, and belonging to the natural order Cinchonaceæ. It has pretty large white flowers, with longitudinal stripes of rose-color, disposed in beautiful clusters at the extremities of the branches; each flower is accompanied with a floral leaf, bordered with rose-color near the upper margin; the corolla is tubular; the stamens five, with a single style; and the capsule contains two cells and numerous seeds. The wood is soft and unfit for use in the arts. The inner bark is extremely bitter, and is employed with success in intermittent fevers.

GEORGIA, GULF OF, a large gulf of the North Pacific Ocean, between the continent of North America and Vancouver's Island; about 120 miles in length from north to south; the breadth varies greatly in its different parts, from 6 miles to 20. It communicates with the ocean on the north by Queen Charlotte's Sound, and on the south by the Strait of Juan de Fuca.

GEORGIA, University of, an institution of higher education, chartered in 1785, and formally opened at Athens, Ga. in 1801. Its government is vested in a board of trustees appointed by the governor. The proceeds of the sales of lands received by Georgia under the U. States land grant act of 1862 were transferred to the university in 1872, and the university, which in its inception was designed as a classical school has, broadened its scope, and in 1902 comprised: Franklin College; the State College of Agriculture; the Graduate School; the Law School; the North Georgia Agricultural College, situated at Dahlonega; the Medical College, situated at Augusta; the School of Technology situated at Atlanta; the Normal and Industrial School for Girls, situated at Milledgeville; the State Normal School; and the Industrial College for colored persons, which includes a well-equipped trade department.

GEORGIAN BAY, formerly called Lake Manitoulin, the northeastern part of Lake Huron, partly separated from the main body of the lake by the peninsula of Cabot's Head and the island of Great Manitoulin. It is about 120 miles long and 50 broad.

GEOT'ROPISM, in botany, a disposition or tendency to turn (or ineline towards the earth, as the charaeteristic exhibited in a young plant when deprived of the counter-aeting influence of light, of directing its growth towards the earth.

GEOTRU'PIDÆ, a family of burrowing lamellicorn beetles. They inhabit temperate climates, and are useful in removing disgusting substances. When alarmed they feign death. The watchman-beetle of Britain, is the tpye of the family.

GERANIUM, popular name crane's-bill. They have usually palmately divided leaves and regular flowers with ten stamens and five carpels. An American species, from its astringency called "alum-root," is used medicinally as a gargle and otherwise. Cultivation has produced many varieties, which from their beauty are great favorites.

GERARD (zhā'rär), François Pascal, Baron, a French historical and portrait-painter, born at Rome in 1770; went to Paris (1786), and studied under David. In 1795 he exhibited his first notable painting, Belisarius. He was much patronized by Napoleon, for whom he painted the battle of Austerlitz, and was made a baron by Louis XVIII., after completing his large painting of the Entrance of Henry IV. into Paris. Among his portraits the most famous are those of Tallyrand, Talma, Louis Philippe, Madame Récamier, Mdlle. Mars, etc. He died in 1837.

GERBA, or **JERBA,** an island in the Gulf of Cabes, off the coast of Tunis. It is about 20 miles long and 14 broad. The surface is level and fertile, and occupied by a population of 30,000, mostly Berbers.

GERHARD (ger'hârt), Eduard, a German archæologist, born 1795, died 1867. Among his numerous works are the following:—Antike Bildwerke (with 140 plates); Auserlesene Griechische Vasenbilder (330 plates); Etruskische und Campanische Vasenbilder, Griechische Mythologie, etc.

GERHARDT (ger'hârt), Karl Friedrich, German chemist, born 1816. He was the first to introduce the new combining weights, or rather to subject more completely combination by weight to combination by volume; to originate the theory of types, and to furnish new ideas on classification, homology, and similar subjects. The methods he originated have had a great influence on modern chemistry. He died in 1856.

GERHARDT, Paul, the greatest of German hymn-writers, born in 1607. In 1668 he was made archdeacon in Lübben, where he died in 1670. His excellent book of hymns appeared at Berlin in 1667 (Geistliche andachten). Many particular hymns have found English translators.

GERM, in physiol. the earliest form under which any organism appears, that is the rudimentary or embryonic form of an organism. The name is also given to certain minute organisms which give rise to disease. See Germ Theory.

GERMAIN (zher-man), St., the name of a number of places in France, among which is St. Germain-en-Laye, a town in the department of Seine-et-Oise, about 6 miles north from Versailles and 11 miles w.n.w. from Paris, on the left bank of the Seine. The most remarkable building is the royal palace, commenced by Charles V. in 1370, and embellished by several of his successors, especially Francis I. and Louis XIV. It was used as a prison during the revolution, afterward as a school for cavalry officers, and was ultimately restored in 1862 by Napoleon III., who established in it a museum of Gallo-Roman antiquities. The forest of St. Germain is one of the finest in France, extending over 10,000 acres. Pop. 14,280.

GERMAN'ICUS, Cæsar, a distinguished Roman, son of Nero Claudius Drusus and the younger Antonia, a niece of Augustus, was born B.C. 15. He was adopted by Tiberius, his paternal uncle, and married Agrippina, the grand-daughter of Augustus. When Augustus died, in A.D. 14, Germanicus was invited by the rebellious legions on the Rhine to assume the sovereignty, but refused, and quelled the revolt. He then crossed the Rhine, surprised and defeated the Marsi with great slaughter. Next year (A.D. 15) a campaign against the Catti and the Germans, led by Arminius, resulted in a series of victories. The following year he again made his way into Germany, defeated the Cherusci twice, and made an incursion into the country of the Marsi. Tiberius now became jealous of the glory of Germanicus, called him home under pretense of granting him a triumph, then, to get rid of him, sent him into the East to compose the disturbances in Armenia and Cappadocia. This he performed in A.D. 18, visited Egypt the following year, and died on his return to Syria (A.D. 19) under some suspicion of having been poisoned by Cn. Piso, the governor of Syria.

GERMAN OCEAN. See North Sea.

GERMAN SARSAPARILLA, a name given to certain roots or rhizomes from their being occasionally used in Germany as a substitute for sarsaparilla.

GERMAN SILVER, Nickel Silver, or Packfong, is an alloy of copper, nickel, and zinc in different proportions, among which the following may be mentioned: Spoons and forks are made from 2 parts copper, 1 nickel, 1 zinc; knife and fork handles from 5 copper, 2 nickel, 2 zinc,

a mixture closely resembling alloyed silver; addition of lead produces an alloy which appears well fitted for casts, and for making candlesticks, etc.; iron or steel, on the other hand, makes the alloy whiter, harder, and more brittle. German silver is harder than silver, and takes a high polish. It melts at a red heat, the zinc being volatilized in the open air. It is attacked by the strong acids, but it is also affected by common organic acids, such as vinegar, and by some saline solutions.

GERMAN TINDER, or **AMADOU,** is prepared from a fungus growing on the oak, birch, willow, cherry, plum, and other trees. The fungus is removed with a sharp knife, washed, boiled in a strong solution of saltpeter, beaten with a mallet, and dried. In surgery it is sometimes used to stop local bleeding.

GERMANTOWN, a northern suburb of Philadelphia, pleasantly situated on high ground, and containing numerous elegant residences. Here the British, under General Howe, defeated the Americans under Washington, 4th Oct., 1777.

GERMANY, the name given collectively to the states in Central Europe which constitute the German Empire. The limits of Germany have varied greatly at different times; and at present there are large numbers of people Germans in race and language not included within the boundaries of the empire, many being natives of Austria and Switzerland. On the other hand, the political boundaries of Germany contain several millions of Slavs, Lithuanians, Poles, etc. As one of the Teutonic peoples the Germans are akin by race to the Dutch, English, and Scandinavian peoples. The capital of Germany is Berlin; other large towns are Hamburg, Breslau, Munich, Dresden, Leipzig, Cologne. As each state is described under its own name, the description given below is confined to leading features which belong to Germany as a whole. The following table shows the component parts of the empire:—

	Area in square miles.	Population.
KINGDOMS.		
1. Prussia	134,506	34,472,509
2. Bavaria	29,283	6,176,057
3. Würtemberg	7,530	2,169,480
4. Saxony	5,788	4,202,216
IMPERIAL TERRITORY.		
5. Alsace-Lorraine	5,600	1,719,470
GRAND-DUCHIES.		
6. Baden	5,824	1,867,944
7. Hesse	2,965	1,119,893
8. Mecklenburg-Schwerin	5,080	607,770
9. Mecklenburg-Strelitz	1,130	102,602
10. Oldenburg	2,479	399,180
11. Saxe-Weimar	1,390	362,873
DUCHIES.		
12. Brunswick	1,424	464,333
13. Saxe-Meiningen	953	250,731
14. Saxe-Coburg and Gotha	755	229,550
15. Saxe-Altenburg	511	194,914
16. Anhalt	885	316,085
PRINCIPALITIES.		
17. Waldeck	433	57,918
18. Lippe	469	138,952
19. Schaumburg-Lippe	130	43,132
20. Schwarzburg-Rudolstadt	362	93,059
21. Schwarzburg-Sondershausen	332	80,898
22. Reuss (elder line)	122	68,396
23. Reuss (younger line)	318	139,210
FREE TOWNS.		
24. Bremen	98	224,882
25. Hamburg	160	768,349
26. Lübeck	115	96,775
	208,626	56,367,178

Germany, as regards its surface, may be divided into three different regions. Farthest south is the Alpine region along the southern frontier, comprising parts of Bavaria, Würtemberg, and Baden lying next to Austria and Switzerland. North of this the Suabian-Bavarian plateau extends to the mountain region of Central Germany, where the chain known as the Fichtelgebirge is continued east by the Erzgebirge and the Riesengebirge forming the boundary next Austria; west by the Thüringerwald, Rhöngebirge, and Spessart; farther north lie the Harz Mountains. The great plain in the north extends without interruption to the German Ocean and the Baltic. Germany is remarkably well watered. Its central mountain region and plateau forms part of the great water-shed of Europe. The Danube proceeds across it in an eastern direction, and the Rhine, though it neither rises nor terminates within Germany flows within it for the greater part of its course. After these come the Elbe, Oder, Vistula, Weser, Main, Neckar, Mosel, Ems, and Eider—all of them navigable. Germany possesses much and varied mineral riches, the most important minerals being common coal and brown coal, iron, zinc, lead, and salt. Germany is likewise extremely rich in mineral waters, especially in the southern parts. Though the country extends over 8½° of latitude, its mean annual temperature is remarkably uniform. This is owing mainly to the different elevations of the surface, the low plains of the north having a higher, while the hills and plateaux of the south have a lower temperature than their latitudes might seem to indicate. The mildest climate is enjoyed by the valleys of the Rhine and the Main.

Agricultural products are varied and numerous. With exception of the loftier mountain districts, where the surface is fit only for pasture, the growth of all the ordinary cereals is universal. Potatoes, hemp, and flax also form most important crops, and in many parts sugar-beet, tobacco, and hops are cultivated on an extensive scale. Wine is produced in many districts. The cultivation of the vine diminishes in importance from southwest to northeast, but is carried on to some extent even in the Prussian provinces of Saxony, Brandenburg, and Posen. The forests are of great extent and value, particularly in the mountain districts.

Linens are made in every part of Germany, but more especially in Westphalia, Silesia, Bohemia, and Saxony; woolens in the Prussian provinces of the Rhine, Saxony, Brandenburg, and Silesia, in the kingdom of Saxony, and in Alsace; the cotton manufacture constitutes the chief manufacturing industry in Alsace-Lorraine, the kingdoms of Saxony and Würtemberg, and the grand-duchy of Baden, and flourishes in Bavaria, Prussia, and other parts, the silk manufacture flourishes in the Rhine provinces and in Baden; iron manufactures are carried on in most of the states, but principally in Prussia, Alsace-Lorraine, Bavaria, and Saxony; steel is largely manufactured in the Rhine provinces. The manufactures of beet-sugar, of leather, of metals, porcelain, glass, fancy flowers, hats, musical instruments, watches, clocks, wooden wares, including toys, etc., are likewise important; and breweries and distilleries are to be met with everywhere.

The commerce is very extensive, and is administered and guided by special laws of a union called the zollverein or customs union, which embraces the whole of Germany and also the grand-duchy of Luxemburg. The exports and imports comprise a great variety of manufactured goods and raw products. The manufactures of Germany are now sent to all parts of the world. By far the principal seaport is Hamburg; others are Bremen and Bremerhaven, Stettin, Königsberg, Danzig, Lübeck, etc. The total length of railways is about 28,000 English miles, five-sixths of which are state railways. By the law of Dec. 4, 1871, a uniform gold standard was introduced for the monetary system of the whole German empire. The denominational unit is the mark, nearly equal to 25 cents and divided into a hundred pfennige. Since 1872 the French metrical system of weights and measures has been in force throughout the German empire.

The revenue is derived principally from the customs duties collected throughout the zollverein from excise duties on beet-sugar, salt, tobacco, and malt, and from the contributions made by each state in proportion to its population. The debt of the empire is about $600,000,000.

The constitution of the German empire is based upon the decree of the 16th of April, 1871, which took effect on the 4th of May following. The presidency of the empire belongs to the crown of Prussia, to which is now attached the title of German Emperor (Deutscher Kaiser). The prerogatives of the emperor are to represent the empire in its relation to other states, to declare war if defensive, and conclude peace in name of the empire, to contract alliances etc. The emperor has also the supreme command of the army and the navy, appoints and dismisses officials of the empire, appoints consuls, and superintends the entire consulate of the empire. The legislative authority is vested in the bundesrath (federal council) and the reichstag (imperial diet) the former consisting of 58 representatives of the different states of the empire, namely, 17 from Prussia, 6 from Bavaria, 4 each from Saxony and Würtemberg, 3 each from Baden and Hesse, 1 each from Saxe-Weimer and others. The reichstag consists of 397 deputies elected by ballot and universal suffrage in all the states of the empire. On the average one member is returned to the reichstag for every 124,500 of the inhabitants.

Service in the army or navy is obligatory on every man in Germany who is not morally or physically unfit, and no substitution is allowed. Liability to serve begins from the completion of the seventeenth year, but as a rule, the six years' service required in the standing army (seven in the cavalry and field artillery) is from the twentieth to the twenty-seventh year. Two of the six years (or three as the case may be) must be spent

in active service, and the remaining four in the reserve. After quitting the army of reserve the next five years are passed in the first-class of the landwehr, and seven in the second. All able-bodied men, from seventeen to forty-five, who are not in the line, the reserve, or the landwehr, must belong to the landsturm, which is called out only in case of invasion of the territory of the empire. Educated young men above seventeen years of age who volunteer for active service, and equip and maintain themselves during their service, are admitted into the reserve after one year's continuous service. The peace strength of the army is about 584,000 men, and the total war strength of trained soldiers 3,000,000. The German navy has been greatly strengthened in recent years, and this is still going on the chief naval bases being Kiel and Wilhelmshaven.

Education is compulsory throughout Germany. Every commune or parish must support at its own cost a primary school. Every town in addition must maintain one or more middle schools, which supply a higher education than the elementary schools. Above these are real schools (realschulen) giving a still higher education, nearly corresponding to the American high school; institutions of similar standing called gymnasiums, giving an education in which the ancient languages form a more important element; and, above all, the universities, of which there are 21 in the country, the chief being those of Berlin, Leipzig, and Munich. The Germans as a whole are perhaps the best-educated people in the world.

The date of the first arrival of the Germanic or Teutonic races in Europe is unknown. At the close of the 2nd century B.C. Germanic tribes called Cimbri and Teutones left their homes in the Danish peninsula, and descending upon Italy were defeated by Marius at Aquæ Sextiæ (Aix in Provence) and Vercellæ in Northern Italy. The Romans did not come again in contact with the Germans till Cæsar's invasion of Gaul brought on a contest with the Suevian prince Arioviştus (58 B.C.) At that time several German tribes had crossed the Rhine and settled in the district between that river and the Vosges Mountains, while others had pushed their way through what is now Belgium. The Germans on the left bank of the Rhine were soon subjugated, and two expeditions were made by Cæsar across the Rhine. Under Augustus a systematic attempt was made to subjugate the vast and little-known region Germania, extending between the Rhine and the Vistula, and from the Danube to the North Sea. Tiberius reduced all the tribes between the Rhine and the Elbe, but a few years later there was a revolt, in which three Roman legions under Varus were annihilated by Arminius, leader of the Cherusci, about 9 A.D. The attempt to subjugate the Germans was given up by Augustus; and Germanicus, although he avenged the defeat of Varus by a succession of campaigns, failed to recover the Roman ascendency. About this time each tribe or nation among the Germans is described as having been divided into four classes:—1. The nobles, from whom the kings and chiefs of the districts were chosen. 2. The freemen, who, with the nobles, had the right to choose their residence and hold heritable property, who formed the chief strength of the armies and voted in the popular assemblies. 3. The freedmen, a middle class between freemen and slaves, had no landed property, but farmed the land; they were not admitted to the popular assemblies. 4. The slaves, who were entirely in the power of their masters. In religion the Germans were polytheists. Among their great gods were Woden (or Odin), Donar (Thor), Thiu (Tyr), Frigga, etc. They erected no temples and had no idols, but believed in a future life and in eternal justice.

As the aggressive force of the Roman empire abated, it continued to be more and more subject to the incursions of the Germans, who by the end of the 5th century had overrun Gaul, Italy, Spain, and part of Africa. After this Germany itself continued in a divided state till it came under the single rule of Charlemagne. (See France.) The history of the German empire properly commences with the Treaty of Verdun (843 A.D.), which separated the land of the Eastern Franks under Ludwig the German from that of the Western and Central Franks. Out of Ludwig's kingdom was developed the German nationality. Charles the Fat became emperor in 881, and three years later was also elected king of the West Franks, thus again uniting under one scepter the monarchy of Charlemagne. After his deposition in 887 the two territories of the Eastern and Western Franks were again separated.

Under Henry III., whose reign began in 1039, the imperial power was at its highest point, and he exercised more despotic authority in Germany than any of his predecessors. The fruits of his policy were lost by his son Henry IV. (1056–1106), who was passionate and weak. In his reign occurred the famous quarrel with the pope regarding investitures, which ended in Henry having to humble himself before the pope at Canossa.

Succeeding monarchs were less and less powerful, the internal divisions of Germany deprived the office of all authority, and until 1273 the German Empire had no real head.

Rudolph, count of Hapsburg and Cyburg, the most powerful prince in Helvetia, was chosen emperor (1272). He enriched his own family by his victories over the King of Bohemia, and acquired Austria, Styria, and Carinthia as imperial fiefs for his sons Albert and Rudolph. Frederick III., (1439–93) was the last emperor who was crowned in Rome. Henceforth the German emperors were always of the house of Austria.

Since its rise the empire had undergone many changes. At the extinction of the Carlovingian dynasty Germany was divided into five nations or dukedoms—Franconia, Suabia, Bavaria, Saxony, and Lorraine. Henry the Fowler and the Ottos added the marches of Austria and Misnia; Henry the Lion and Albert of Brandenburg, Mecklenburg and Pomerania. The house of Austria added Styria, Carinthia, Carniola, and the Tyrol. But Switzerland had been lost, and the old Burgundian territories of the empire, Franche Comté the Lyonnais, and Provence, had gone to consolidate the French monarchy under Louis XI. Bohemia and Hungary, and many of the Italian cities, especially in the north, were also connected with the empire, but the connection was more formal than real, and ten circles established by the Diet of Cologne (1512) represented at that time the estates of the empire, viz.: 1. Austria, 2. Bavaria, 3. Suabia, 4. Franconia, 5. the Upper Rhine (Lorraine, Hesse, etc.), 6. the Lower Rhine, or the Electorates (Mainz, Trier, Cologne), 7. Burgundy (Netherlands), 8. Westphalia, 9. Lower Saxony (Brunswick, Lüneburg, Lauenburg, Holstein, etc.), 10. Upper Saxony (Saxony, Brandenburg, Pomerania, etc.).

The chief political machinery of the empire was connected with the diet. The exact constitution of the early German diets is not known. In the 12th century the counts of the empire became distinguished from the princes, and lost the right of voting in the diets. The election of an emperor was at first undertaken by the whole diet. In the 13th century the number of electors was restricted to seven, to which two more were afterward added. The diets were called by the emperor at his own pleasure, but as they had the power of granting supplies their meetings were frequent; and as their authority over the different states was partial, and their policy could only be carried out by the executive force of the emperor, they can hardly be regarded as an independent power in the state. Neither the time nor the place of meeting of the diets was at first fixed. From an early period the cities of Germany were represented in the diet. In early times they generally supported the authority of the emperor, as their interest was common with his in diminishing the power of the greater vassals. Municipalities were at first established about the reign of Frederick I., and soon began to assert their independence. The predatory habits of the nobles, besides the claims of superiority over entire cities or particular citizens asserted by the princes involved the cities in continual warfare with the feudal nobility, and often also with their ecclesiastical superiors. The necessity of defending their privileges compelled them to enter into leagues among themselves. Among the earliest of these combinations was the Hanseatic league, formed to resist both the oppression of rulers and the depredations of land and sea robbers. A league was formed in 1255 by more than sixty cities in the Rhine, headed by the three ecclesiastical electors, to resist the depredations of the lesser nobles. The Suabian League, formed in 1376, was of similar origin. These leagues were met by counter associations of nobles and princes.

The reign of Charles, the most important in the German annals and the most brilliant in the 16th century, was divided among three great conflicts—the continued struggle between France and

Germany, the conflict with the encroaching Ottoman empire, and that with the Reformation. Germany was devastated for thirty years by a religious war, hence called the Thirty Years' war.

The invasion of Germany by Christian IV. of Denmark in 1625, the peace of Lübeck (1629), the invasion of Gustavus Adolphus (1630), the battles of Leipzig in 1631, of the Lech and Lützen in 1632, of Nördlingen in 1634, the war with France in 1635, belong to the history of the Thirty Years' war (which see). As its outcome greater power was given to the Protestants; and the right of the princes and states to make war and alliances among themselves or with foreigners was recognized.

The league of Augsburg, in which the emperor, Leopold I., joined, led to a protracted war with France, which was concluded by the Peace of Ryswick. In 1692 the emperor erected Hanover into an electorate, and in 1700 he permitted the Elector of Brandenburg, Frederick III., to take the title of King of Prussia. The war of the Spanish Succession, in which Great Britain, Holland, and the empire were leagued against France, was begun in 1702. To it belong the victories of Marlborough and Eugene (Blenheim, Oudenarde, Malplaquet). The alliance against France was dissolved by the Peace of Utrecht in 1713, to which the emperor refused to accede, and was left alone against France. After a brief campaign between Prince Eugene and Villars he acceded to the Treaty of Rastadt, negotiated between these commanders, 7th March, 1714. The Spanish Netherlands, and Naples, Milan, Sardinia, and other Italian conquests were left to the emperor. Having no male heirs Charles had promulgated in 1713 the Pragmatic Sanction, regulating the succession to his hereditary dominions in favor of his daughters in preference to those of his brother, Joseph I. He died in 1740. Charles Albert, elector of Bavaria, son-in-law of Leopold I., got himself chosen emperor (as Charles VII). in 1742. He laid claim to the hereditary possessions of the House of Austria, and entered into an alliance with France, Spain, Prussia, etc., against Maria Theresa, daughter of Charles VI. But he died in 1745, and Francis I., grand-duke of Tuscany, the husband of Maria Theresa, was elected emperor; thus the house of Hapsburg-Lorraine, which had succeeded to the hereditary possessions of Austria, was recognized as the head of the empire. After a brief interval took place the Seven Years' war (1756–63), in which Austria, Russia, France, and Saxony combined against Prussia, then ruled by Frederick the Great. The peace of Hubertsburg (15th Feb., 1763) concluded the war, Prussia retaining her acquisitions. In 1804 Francis II. took the title of hereditary Emperor of Austria, renouncing two years later that of head of the German Empire, which, indeed, had ceased to exist, owing to the conquests of Napoleon.

The States of Germany were again united by the treaty of Vienna (1815), in a confederation called the German confederation (der Deutsche Bund). In 1818 a general commercial league, called the zollverein, was projected by Prussia, and was gradually joined by most of the German states, exclusively of Austria. Revolutionary outbreaks caused great disturbances in various German states in 1830 and 1848, particularly the latter. The German diet was restored in 1851 by the efforts of Prussia and Austria, who were latterly rivals for the supremacy in the confederation. In 1866 the majority of the diet supported Austria in her dispute with Prussia respecting the disposal of the duchies of Schleswig and Holstein, whereupon Prussia withdrew from the confederation and declared it dissolved. The Seven Weeks' war between Austria and Prussia ended in the defeat of the former the loss of her Italian possessions, and her exclusion from the German confederation, which was re-formed by Prussia under the title of the North German confederation. After the Franco-German war (which see), in which the South German States, as well as the North German confederation, supported Prussia, the King of Prussia was proclaimed German Emperor at Versailles on 18th January, 1871. The parliament of the new German Empire met at Berlin on 21st March, and adopted the new constitution. Since the unity of the empire was attained endeavors have been made to establish a colonial empire, principally in Africa. In Polynesia Germany has acquired a portion of New Guinea, the chief Samoan islands, and other groups. In recent years the manufacturing industries and foreign trade of the empire have developed greatly, and the present emperor (William II.) is bent on making Germany a great naval power.

German is one of the Teutonic family of languages, of the Aryan or Indo-European stock, and hence is a sister tongue with Gothic, Anglo-Saxon and English, Dutch, Danish, Swedish, and Icelandic. The German dialects spoken in the lower and more northern localities have long exhibited considerable differences from those spoken in the higher and more inland, thus giving rise to the distinction between High German and Low German. What is ordinarily called German (called Deutsch by the Germans) is High German. Low German includes Dutch, Frisian, etc.

German literature received its first impulse from the fondness of the early Germanic races for celebrating the deeds of their gods and heroes. According to Tacitus the warriors would advance to attack chanting wild war-songs, with their shields held close to their mouths, which added to the discordant effect of the unknown and uncouth tongue. Of these early songs nothing even in a translated form has been handed down to us. The legends immediately connected with the Gothic, Frankish, and Burgundian warriors of the period of national migration—Dietrich (Theodoric), Siegfried, Hildebrand, etc.—have for the most part some historical foundations, and many of them were eventually incorporated in the Nibelungenlied, the most celebrated in production of German mediæval poetry.

In the 13th century under the cultured emperors of the house of Hohenstaufen, the first bloom of German literature came. Many of the poets of this period were nobles by birth, some of then even princes. Heinrich von Weldeke was the first to introduce into his heroic poem Eneit that spirit of devotion to women, called by the old Germans Minne (Love, hence the name Minnesänger, Love-Minstrel). A still greater name is that of Wolfram von Eschenbach, the author of Parsival, a poem embodying the legends of King Arthur, the Knights of the Round Table, and the San Graal (Holy Grail). These traditions, together with the exploits of Charlemagne, of Alexander the Great, and the Trojan heroes, inspired also the lays of Gottfried of Strasburg, Hartman von der Aue, and others. These subjects were all taken from the romances of the French trouvères, and treated in a style closely resembling theirs. But we have besides real national epics in the Nibelungenlied and Gudrun. The lyrics or minnesongs of this period are not less remarkable than its romances and epics. Perhaps the most gifted lyrist is the celebrated Walther von der Vogelweide. Several hundreds of these poets were engaged in traveling from palace to palace and from castle to castle. During the troublous times of the interregnum (1256–73) poetry passed to the homes of the private citizen and the workshops. These plebeian songsters formed themselves into guilds in the imperial cities—Nürnberg, Frankfort, Strasburg, Mainz, etc., and were called Meistersänger, in contradistinction to the knightly Minnesänger.

The invention of printing caused an increasing literary activity, and the works printed in Germany between 1470 and 1500 amounted to several thousand editions.

In the 16th century a new era opens in literature with Luther's translation of the Bible. The writings of Luther, Zwingli (1484–1531), Sebastian Frank (1500–45?), Melanchthon (1497–1560), Ulrich von Hutton (1488–1523), one of the chief writers of the Epistolæ Obscurorum Virorum, constitute the principal theologic literature of the Reformation. History was now written in a superior style, and with greater comprehensiveness, by Frank in the Zeitbuch and Weltbuch, and by Sebastian Münster (1489–1552) in his Kosmographie; also by Tschudi (1505–72) in Chronicles of Switzerland, and by Aventinus (1477?–1534), the Bavarian chronicler.

By the beginning of the 17th century literature was on the decline. This century is known in German literature as the period of imitation. Most of the poets were graduates of universities; and learned societies were formed for the purpose of improving the language and literature.

In the 18th century poetry revived with Haller (1708–77), remarkable as a descriptive poet, and Hagedorn (1708–54), a lyrist of considerable merit. The Saxon school headed by Gottsched (1700–66) aimed at a reformation of German poetry in the direction of French clearness and correctness, modeling the drama as far as possible on the works of Corneille and Racine.

Gotthold Ephriam Lessing (1729–81) gave a new direction to German literature. He established a new school of criticism and dealt the fatal blow at French influence. His tragedy, Emilia Galotti, his comedy of Minna von Barnhelm, and his philosophic drama Nathan der Weise, were the best models of dramatic composition which German literature had yet produced, and his direction of the German mind toward Shakespeare and the English drama was not the least of the many impulses he contributed to the literary growth of his countrymen. Herder (1744–1803), with his universal knowledge and many-sided activity, followed Lessing as another great influence in the literary world. The researches of Winckelmann (1717–68) in ancient sculpture led to a new understanding of art, as those of Heyne in ancient literature mark the development of modern German scholarship.

This period was followed by a time of transition and excitement known in Germany as the sturm-und-drang periode (storm and stress period), which found its fullest expression in an early work of Goethe's (1749–1832), the Sorrows of Werther. The literary excitement was raised to the highest pitch by the Räuber (Robbers) of Schiller (1759–1805), afterward the friend and coadjutor of Goethe. By the joint exertions of these two great men German literature was brought to that classical perfection, which, from a purely local, has since given it a universal influence. Of a highly individual character are the works of Jean Paul Richter (1763–1825), a writer of profound humor and pathos.

Partly produced by the influence of the sturm-und-drang period, and partly trained in the laws of art laid down and worked out by Goethe and Schiller, the so-called romantic school, distinguished by its enthusiasm for mediæval subjects and its love of what is mysterious and transcendental in life or thought, gradually succeeded in gaining public attention about this epoch.

The war of liberation against Napoleon I. introduced a strong manly enthusiasm for a time into the hitherto gloomy and melancholy productions of the romanticists. Among the patriotic poets of the time Ernst Moritz Arndt (1769–1860) and Theodor Körner (1791–1813) hold the first place. The ballads and metrical romances of Ludwig Uhland (1787–1872) have brought him a world-wide fame. During the excitement produced by the July Revolution in France (1830) a school of writers arose in whose works the social and political ideas of the time were strongly reflected. The most prominent names among this party are Ludwig Börne (1786–1837) and Heinrich Heine (1799–1856), whose writings combine the keenest satire and the finest pathos. As in England and France of late, the novel, especially the novel, of a social or political character, has taken a prominent place in literature. Most distinguished are Freytag, Spielhagen, Heyse, Auerbach, Fanny Lewald, Hackländer, Reuter, Jensen, Storm, Rosegger, etc. Of late, however, science and learning rather than literature and the arts have produced the names of most eminence. Alexander von Humboldt (1769–1859) gave a great impulse to almost all branches of knowledge by his Cosmos, his Travels, and his Views of Nature, and by the general suggestiveness of his labors. In history, Niebuhr and Theod. Mommsen, the historians of Rome; Leopold Ranke, the historian of the Popes; Dahlmann, Giesebrecht, Julian Schmidt, H. Kurz, and others may be mentioned. German modern theology and biblical criticism had lately much influence in the religious world. Gaur, Bleek, and Ewald, are among the widely-known names. Histories of art have been written by Kugler, Burckhardt, Lübke, and others. The brothers Grimm—Jakob (1785–1863), Wilhelm (1786–1859), were the founders of a new branch of philological and poetic investigation in ancient German literature. Eminent names in general philological science are those of Bopp, Pott, Schleicher, Steinthal, and Karl Brugmann. In natural sciences Oken, Burmeister, Carus, Cotta, Liebig, Helmholtz, Virchow, Schleiden, Grisebach, Vogt, Bessel, Brehm, Häckel, Bastian, etc., are the eminent names; in philosophy, Schopenhauer, Feuerbach, Rosenkranz, Kuno Fischer, von Hartmann, Lotze, etc. Among recent poets Anastasius Grün (pen-name of Count von Auersperg) and Nikolas Lenau among Austrian, and Meissner and Hartmann, natives of Bohemia, have a considerable reputation. Hervegh, Hoffmann, von Fallersleben, Freiligrath, and Franz Dingelstedt infuse strong political sentiments into their poetry. Emmanuel Geibel, Von Scheffel, Bodenstedt, and others represent a poetry more comprehensive in its aims and tendencies.

GERMINAL VESICLE, (a) in animal physiol. the nucleus of the ovum or egg of animals. It contains within it a nucleolus called also the germinal spot. The germinal vesicle undergoes important changes in the early stages of the development of the egg into the embryo. (b) In bot. a cell contained in the embryo sac, from which the embryo is developed.

GERMINATION, the first act of growth by an embryo plant. The immediate causes of germination are the presence of moisture and atmospheric

Seeds germinating. (In centre a plant which has newly appeared above ground.)

air and a certain elevation of temperature. Moisture softens the integuments of the seed and relaxes the tissue of the embryo; atmospheric air supplies oxygen and nitrogen; and a temperature which must be at least as high as 32° Fahr., by exciting the vitality of the embryo, enables it to take advantage of the agents with which it is in contact. During germination various changes take place in the chemical constituents of the seed, and are usually accompanied with increase of temperature, as is seen in the process of malting. Along with these other changes commonly take place; a root is produced, which strikes perpendicularly downward; and, fixing itself in the soil, begins to absorb food; a growth upward then commences and ends in the protrusion of a stem and leaves.

GERM THEORY OF DISEASE, the theory that certain diseases are communicated from an infected person to an uninfected one by living organisms which gain access to the body of the affiicted person by the air or food, or drink, and which, growing and multiplying in the body they invade, produce the changes characteristic of the particular disease. The period during which the living particles of contagious matter retain their vitality, like the rate of their growth and multiplication, varies in different cases, but is limited in all. Few, if any, resist the destructive influence of a temperature of 300° Fahr., while most succumb at the temperature of 200° or even less, particularly if exposed for sometime. Animal poisons generally are destroyed by boiling, and clothes, sheets, etc., infected, may be rendered pure by being exposed to a temperature of 300° Fahr. These living organisms are grouped together as microbes or microorganisms, and are divided into different classes. The micrococcus is a round form about the 32,000th of an inch in size, and multiplies by fission. The bacterium is rod-shaped, about the 10,000th of an inch long, with rounded ends; it also multiplies by fission. The bacillus is a third form also rod-shaped, and somewhat larger than the bacterium. They often form long chains or threads, and increase by division and by spore formation. Vibrio and spirillum are somewhat similar forms; and, like the others, increase with a rapidity beyond conception. The connection between these micro-organisms and the various forms of zymotic disease has been thoroughly established. The only method of investigation that yields reliable results is to separate the organism supposed to be the cause of the disease, and cultivate it outside of the body. Thus a drop of blood from a person suffering from a special disease, which contains the bacteria, or bacilli, etc., believed to be the producers of the disease, is placed in a flask containing a nourishing material, care having been taken to destroy all other organisms in the flask. The special microbe flourishes there, let us suppose. It is then cultivated in one flask after another through successive generations, only a single minute drop of the material in one flask being used to inoculate a succeeding one. In this way a pure cultivation is obtained, a cultivation, that is, containing the particular microbe and none other. If this is the true cause of the disease, then a drop of the solution containing it introduced into the body of an animal, capable of the disease ought to produce it, and the particular organism introduced should be found

multiplying in the blood and tissues of the inflected animal. Such a demonstration has been given of the cause of a few diseases. Dr. Koch, of Berlin, published in 1876 a paper giving a full account of the life history of the bacillus organism which had been observed in animals dead of splenic fever; and in 1877 the great French chemist, Pasteur, proceeded to investigate the subject, and his investigations conclusively support the germ theory of disease. In 1882 Dr. Koch, of Berlin, announced the discovery of a micro-organism in tuberculosis, a disease believed to be the chief, if not the only, cause of consumption of the lungs. These microbes are found not only in the lungs of persons who have died of tubercle, but also in the spit of tubercular and consumptive patients, and multiply also by spores. Thus it is that the spit of a consumptive patient, even after it has dried up, may be capable of imparting the disease, owing to spores being scattered in the air. After the epidemic of cholera in Egypt in 1883 which spread to France and Italy, investigations were undertaken by French, German, and British commissioners. Dr. Koch detected a peculiar bacillus, shaped like a comma (,), in the intestines of persons who had died of cholera, in the discharges from cholera patients, etc. He believed that this bacillus was the active agent in the production of the disease; but other authorities were unable to accept Dr. Koch's view that the comma-bacillus was the cause of the disorder. All investigation, however, seems to point to the fact that every infectious or contagious disease is due to some form of micro-organism, and that there is one particular organism for each particular disease. Each organism produces its own disease and none other; and the special disease cannot arise unless its germ has gained entrance to the body. The channels through which these germs obtain entrance are innumerable, but they have one origin and one only, and that is a preceding case of disease. The "germ" theory affords the hope and suggestion of a method of diminishing, if not of getting rid of, such diseases altogether, and to some extent also indicates the direction which in their cure is to be sought. If the particular microbe of each contagious disease were known, the condition of its life and activity understood, there is great probability that its multiplication in the living body could be arrested, and the disease thus cured. Even without such knowledge, however, the germ theory indicates that the means for arresting the spread of contagious diseases and diminishing their occurrence consist in preventing the spread of the germs from an existing case of disease. See Disinfectant.

GEROME (zhā-rōm), Jean Léon, a French painter, born in 1824 at Vesoul. Among the chief works of Gérôme are: Louis XIV. and Molière, Death of Cæsar, The Plague at Marseilles, Rex Tibicen, L'Eminence Grise, and various scenes from Oriental life. M. Gérôme received the Prussian order of the Red Eagle and was a commander of the legion of honor. He died in 1904.

GERONA (hā-rō'nȧ), a fortified town of n.e. Spain, capital of the province of Gerona, in Catalonia, at the confluence of the Oña and the Ter, 52 miles northeast of Barcelona. Pop. 16,081.—The Province, area 2270 sq. miles, abuts on the Mediterranean, is mountainous and mostly rugged, but with many fertile valleys. Pop. 299,287.

Jean Léon Gérôme.

GERRY (gĕr'rĭ), Elbridge, American statesman, was born at Marblehead, Mass., in 1744. In May, 1772, he entered upon his long political career as a member of the general court of Massachusetts and here immediately identified himself with the partiot party. He was re-elected in 1773; was soon afterward appointed by the legislature, with Hancock and Orne, a member of the committee of correspondence. In 1776 Gerry was elected to the continental congress, and was conspicuous as a vigorous advocate of the declaration of independence, which he signed. In 1787 was sent as one of the Massachusetts delegates to the constitutional convention at Philadelphia, where he was prominent as an opponent of the constitution as finally adopted, refusing, along with Randolph and Mason, to affix his signature. He was several times defeated for governor of Massachusetts, but was successful in 1810, and in 1811 was re-elected. His administration was fiercely criticised by the federalists on the ground of its alleged partisanship, and color was given to the charge by the enactment by the republican legislature of a law, which Gerry signed, but of which he seems to have disapproved, for redistricting the state in such a manner as to annihilate the federalist majorities in several counties. (See Gerrymander.) From 1813 until his death, on November 23, 1814, he was vice-president of the United States.

GERRY, Elbridge Thomas, American lawyer and philanthropist, born in New York City in 1837. He became prominently connected with numerous reformatory and benevolent organizations, and in 1874 founded the society for the prevention of cruelty to children. In 1886 he was chairman of the commission which advocated the abolition of the gallows and the substitution of electricity for capital punishment in New York.

GERRYMANDER, (gĕr'rĭ-măn'der), a word belonging to the political vocabulary of the U. States, and used to denote an unfair division of the electoral districts in a state, made in the interest of one of the political parties. The word was coined in 1812, though the practice probably originated earlier. At that time the federalist and republican parties in Massachusetts were nearly evenly balanced in numerical strength, but the republicans took advantage of a temporary majority in the legislature to divide the state into new senatorial districts in such a manner that those sections which gave a large number of federalist votes might be brought into one district. Previously each county had constituted a senatorial district, and the power of rearranging old districts or creating new ones, bestowed on the legislature by the state constitution, had never been exercised. Elbridge Gerry was at that time governor, and through his signature, though he seems not to have wholly approved the measure, the work of the legislature became a law. The form of one of the districts into which Essex County was divided was somewhat like that of a monstrous animal, and when some one suggested that it looked like a salamander, the name "gerrymander" was given to it, instead. The passage of the law caused a great outcry from the federalists, and early in 1813, this party having again secured a majority and elected a governor to succeed Gerry, the law was repealed. The device, however, has since been repeatedly used in various states.

GERS (zhăr), a department in the s.w. of France, separated from the Bay of Biscay by the department of Landes; area, 2425 sq. miles. The southern part is covered with ramifications of the Pyrenees separated by valleys, each of which is watered by its own stream. The chief of these are the Gers, Losse, Save, etc. Auch is the capital. Pop. 238,448.

GESNER (ges'nĕr), Konrad von, German scholar, born at Zürich in 1516, studied at Strasburg, Bourges, and Paris and became schoolmaster in his native town. His Historia Animalium must be regarded as the foundation of zoology; and in botany he was the inventor of the method of classifying the vegetable kingdom according to the characters of the seeds and flowers. He died of the plague at Zürich, 1565.

GESSLER. See Tell.

GESTATION, in physiology, the name given to the interval which elapses between the impregnation of any of the mammalia and the period of birth. This period varies from 25 days, in the case of the mouse, to 620, in that of the elephant.

GETHSEMANE, an olive garden or orchard in the neighborhood of Jerusalem, memorable as the scene of the last sufferings of Christ. The traditionary site of this garden places it on the east side of the city, a very little beyond the Kedron, near the base of Mt. Olivet. It contains some very old olive-trees, piously regarded as having stood there in the time of our Lord.

GETTYSBURG, the capital of Adams co., Pennsylvania. Here are the Pennsylvanian college (Lutheran), founded in 1832; the national cemetery for Union soldiers, and a national homestead for the orphans of Union soldiers. At Gettysburg a battle was fought (July 1, 2, and 3, 1863,) between the Union forces under

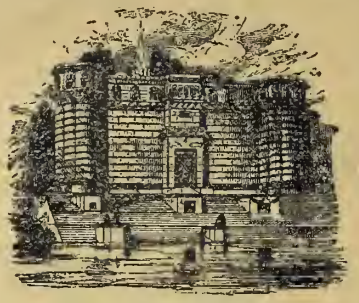
General Meade and the confederate forces under General Lee, in which the latter suffered a disastrous defeat.

GEYSERS, a slight alteration of the Icelandic name geysir, from geysa, to gush or rush forth, and applied to natural springs of hot water of the kind that were first observed in Iceland. The geysers of Iceland, about a hundred in number, lie about 30 miles n.w. of Mount Hecla, in a plain covered by hot-springs and steaming apertures. The two most remarkable are the Great Geyser and the New Geyser or Strokkur (churn), the former of which throws up at times a column of hot water to the height of from 80 to 200 feet. The basin of the Great Geyser is about 70 feet across at its greatest diameter. The New Geyser which is only 100 yards distant, is much inferior in size. The springs are supposed to be connected with Mount Hecla and the phenomenon of eruption has been explained by Tyndall as due to the heating of the walls of a fissure, whereby the water is slowly raised to the boiling point under pressure, and explodes into steam, an interval being required for the process to be repeated. The geysers of Iceland, however, have been surpassed by those discovered in the Rocky Mountains in the Yellowstone Region of Wyoming Territory, the largest of which throw up jets of water from 90 to 250 feet high. (See Yellowstone.) The hot-lake district of Auckland, New Zealand, is also famous in possessing some of the most remarkable geyser scenery

Giant geyser, Yellowstone national park.

in the world. These phenomena are of three kinds: the puias (fire-springs), geysers continually or intermittently active; ngawhas or inactive puias, which emit steam, but do not throw up columns of water; and waiariki or hot-water cisterns. This region is remarkable for the number of natural terraces containing hot-water pools or cisterns, and its lakes all filled at intervals by the boiling geysers and thermal springs, but the configuration of the country was considerably altered by the disastrous volcanic outbreak of 1886. Ngahapu or Ohopia, a circular rocky basin, 40 feet in diameter, in which a violent geyser is constantly boiling up to the height of 10 or 12 feet, emitting dense clouds of steam, is one of the natural wonders of the southern hemisphere.

GHATS (gäts), or **GHAUTS,** a Hindu term employed to designate landing-stairs on a river, especially when large and substantially constructed. These



Ghoosla ghat, Benares.

ghâts are very numerous on the Ganges, and are great places of resort by the people of the towns where they are situated. Some of them are noteworthy from an architectural point of view, having temples, bathing-houses, etc., at the top.

GHATS, or **GHAUTS,** Eastern and Western, two ranges of mountains in the peninsular portion of Hindustan, the former running down the east side of India, but leaving broad tracts between their base and the coast; the latter running down the west side, but leaving only a narrow strip between them and the shore. Both meet near Cape Comorin. The general elevation of the Western Ghâts varies from 4000 to 7000 feet. The Eastern Ghâts are of considerably less elevation, on the average about 1500 feet, and have none of the beauty of the western range. They are, however, rich in metals.

GHAZIPUR, a town in Hindustan, headquarters of the Ghazipur District, in the United Provinces, about 44 miles northeast of the town of Benares. Pop. 39,429.

GHEE (gē), or **GHI,** a peculiar kind of butter in use among the Hindus. It is made from the milk of the buffalo or the cow. The milk is boiled for an hour or so, and cooled, after which a little curdled milk is added. Next morning the curdled mass is churned for half an hour; some hot water is then added, and the churning continued for another half-hour, when the butter forms. When, after a few days, it becomes rancid, it is boiled till all the water is expelled, and a little more curdled milk added with some salt or betel-leaves, after which it is put into pots. In this state it will keep for a long time. It is too strong for European taste, but is a favorite article of consumption among rich Hindus.

GHENT, a town in Belgium, capital of the province of East Flanders, in a fertile plain at the confluence of the Lys with the Scheldt. It is upwards of 6 miles in circumference, and is divided by canals into a number of islands connected with each other by bridges. In some of the older parts it is well built, and has a number of fine promenades and many notable buildings. Among the latter are the cathedral of St. Bavon, a vast and richly-decorated structure, dating from the 13th century; the church of St. Nicholas, the oldest in Ghent; the church of St. Michael, with a celebrated Crucifixion by Vandyk; the university, a handsome modern structure, with a library of about 200,000 volumes and 2500 MSS.; the hôtel-de-ville; the belfry, a lofty square tower surmounted by a gilded dragon, and containing a fine set of chimes consisting of forty-four bells, one of which is the famous "Roland of Ghent;" the new palais-de-justice; the marché du vendredi, an extensive square, interesting as the scene of many important historical events; and les béguinages, extensive nunneries founded in the 13th century, the principal occupation of whose members is lace-making. Ghent has long been celebrated as a manufacturing town, especially for its cotton and linen goods and lace. Pop. 160,848.

GHENT, Treaty of, a treaty between the U. States and Great Britain which ended the war between the two countries known as the "War of 1812." The American negotiators were John Quincy Adams, James A. Bayard, Henry Clay, Jonathan Russell, and Albert Gallatin. The British representatives were Lord Gambier, Henry Goulburn, and William Adams. The treaty was signed on December 24, 1814, was ratified by the U. States senate on February 17, 1815, and was formally proclaimed by President Madison on the following day.

GHETTO (get'to), a name used in different towns of Italy, Germany, and other countries to indicate the quarter set apart for the residence of Jews.

GHIBERTI (gē-ber'tē), Lorenzo, Italian statuary, born about 1378 at Florence. He was engaged in painting frescoes at Rimini, in the palace of Pandolfo Malatesta, when the priori of the society of merchants at Florence invited artists to propose models for one of the bronze doors of the baptistery of San Giovanni. The judges selected the works of Donatello and Ghiberti as the best (according to Vasari, also that of Brunelleschi, who is not mentioned by Ghiberti himself as one of the competitors); but the former voluntarily withdrew his claims, giving the preference to Ghiberti. After twenty one years' labor Ghiberti completed the door, and, at the request of the priori, executed a second, after almost as long a period. Michael Angelo said of these, that they were worthy of adorning the entrance to paradise. During these forty years Ghiberti also completed other works, bas-reliefs, statues, and some excellent paintings on glass, most of which may be seen in the cathedral and the church of Or San Michele at Florence. He died about 1455.

GHILAN (gi-lân'), a province of Persia on the southwest shore of the Caspian Sea; area, about 4250 sq. miles. The province is rich in metals and very fertile. The capital is Resht. Pop. about 150,000.

GHOST, HOLY. See Holy Ghost.

GHOSTS, the belief in ghosts is one of the earliest of all religious phenomena. It is found in one form or another at all ages and among all peoples. To such an extent does belief in ghosts prevail, that one school of comparative religion

of whom Herbert Spencer and Julius Lippert are the chief representatives, has sought to find the origin of all religion in ghost-cults. The importance of ghost-worship as a religious factor cannot be denied, and it is certainly one of the main sources of religious belief. Its chief development is found in the widespread existence of ancestor-worship.

The ghost idea in its most primitive form seems to be as follows: The phenomenon of dreams is one of the starting-points. According to the reasoning of the primitive mind, the self, while the body is unconscious and inert, wanders to places familiar or even unknown, experiences pleasure and pain, converses with friends perhaps dead, and performs other things which have no connection with the body. From sleep and dreams the savage proceeds by analogy to death. To him the distinction between slumber and death is one of degree rather than of kind, and it is well known how universal is the belief that sleep and death are near akin. As in slumber the soul left the body for a time, but returned to it, so in the long sleep, as the primitive mind regards it, of death, the soul is supposed to remain near the body. As it is obviously impossible to keep a corpse from dissolution, and as the progress of decay renders the body more and more uninhabitable for the spirit which has left it, the soul, or the ghost as it may now be called, becomes a source of much anxiety to the kinsman and other friends of the dead. In primitive religion the element of terror is one of the most important factors, and at first exercises a far greater influence than hope. The ghost is, then, more terrible than was the man whose body it had animated. It is no longer limited by bodily restrictions, it can traverse space with infinite speed, and may be invisible. Fortunately, and somewhat curiously, the ghost, like demons generally, is rather stupid, and is also bound by certain limitations. Upon such an apparently flimsy foundation, which is, however, logical to the primitive man, is built a complicated system of mortuary customs, and the idea of immortality. The ghost, which, as has been said, delights to hover around its earthly home, is not a cheerful companion to the living, and must therefore be kept away. This is accomplished by various methods as by building a new hut for the survivors, or, more easily, by carrying the corpse out by a hole broken in the side of the dwelling, which is subsequently walled up. The ghost is then unable to find its way back, and the house is safe from its invasion. The superstition here noted still survives. The so-called haunted houses and haunted rooms are cases in point, and it is important to note that it is the malignant ghosts, chiefly those who have been involved in murder or other evil acts, which especially linger around the scene of their earthly activities. To avert the influence of maleficent ghosts, various forms of sacrifice and magic are employed. These ceremonies have as their primary object the satisfaction of the ghost's wants. Thus the bow and arrows are laid with the warrior, a woman's jewelry is buried with her, and a child's toys rest beside its body. It was also common in many places, notably in Dahomey and Polynesia, to sacrifice slaves to attend their master in the spirit world, while among the ancient Germans horses and even wives (as in the Indian suttee) were often slain at the funeral pyre. It is also probable that to wish to appease ghosts many of the elaborate mourning customs of primitive peoples may be traced. Under this category come such acts as shaving the hair, cutting the flesh, fasting, neglect of the toilet, use of unbecoming clothing, and the like. It is, of course, true that at a comparatively early time the development of civilization rendered mourning for the dead an act of affection and not of fear; but it is hard to believe that the savage who put to death the aged members of his tribe was moved by any high ideals in the beginning of mortuary customs. In line with mourning are the offerings of food, drink, clothing, and, as in China, of money to the deceased.

GIANT POWDER, a name for dynamite.

GIANTS, people of extraordinary stature. History, both sacred and profane, makes mention of giants, and even of races of giants, but this in general occurs only at an early stage of civilization when the national mind is apt to exaggerate anything unusual. The first mention of giants in the Bible is in Gen. vi. 4, where the Hebrew word used is nephilim, a word which occurs in only one other passage, where it is applied to the sons of Anak, who dwelt about Hebron, and who were described by the terrified spies as of such size that compared with them they appeared in their own sight as grasshoppers. A race of giants called the Rephaim is frequently mentioned in the Bible, and in Gen. xiv. and xv. appear as a distinct tribe, of whom Og, king of Bashan, is said to have been the last. Other races of giants are mentioned, such as the Emim, the Zuzim, and the Zamzummim. The giants of old Greek or of Norse mythology have, of course, merely a symbolic existence, representing benignant or adverse forces of nature on which man might count in his struggle to reduce the world around him into some kind of order. The tales of old writers regarding gigantic human skeletons have now no importance, it being most certainly that these bones do not belong to giants, but to animals of the primitive world which, from ignorance of anatomy were taken for human bones. The ordinary height of men is between 5 and 6 feet; among the Patagonians of South America, however, the average seems to be considerably higher, though not so high as to entitle them to be considered a race of giants. Notable deviations from this medium height are not at all uncommon, especially among the Teutonic peoples. As a rule giants are comparatively feeble in body and mind, and are short-lived. Gigantic stature is generally accompanied by a want of proportion in parts, some parts growing too quickly for others, or continuing to grow after the others have ceased. The relation between the upper and lower half of the body is not disturbed; but the skull, brain, and forehead are relatively small, the jaws very large, the shoulders, breast, and haunches very broad, and the muscular system comparatively weak.

GIANT'S CAUSEWAY, an extensive and extraordinary assemblage of polygonal and basaltic columns on the north coast of Ireland, in the county of Antrim between Bengore Head and Port Rush. The name is sometimes given to the whole range of basalt cliffs along the coast, some of which reach the height of 400 or 500 feet; but it is more properly restricted to a small portion of it where a platform of closely arranged basalt columns from 15 to 36 feet in height runs down into the sea in three divisions, known as the Little, the Middle, and the Grand Causeway. The last is from 20 to 30 feet wide, and stretches some 900 feet into the sea. The Giant's Causeway derives its name from the legend that it was built by giants as a road which was to stretch across the sea to Scotland. There are similar formations on the west coast of Scotland, on the islands of Staffa.

GIBBON, a name common to the apes which inhabit the islands of the Indian Archipelago. It is distinguished from other quadrumanous animals by the

Gibbon.

slenderness of its form, but more particularly by the extraordinary length of its arms, which, when the animal is standing, reaches nearly to the ankles, and which enables it to swing itself from tree to tree with wonderful agility. Its color is black, but its face is commonly surrounded with a white or gray beard.

GIBBON, Edward, an eminent English historian, was born at Putney in Surrey, April 27, 1737. In 1770 he published a pamphlet entitled Critical Observations on the Sixth Book of the Æneid. In 1776 the first quarto volume of his Decline and Fall of the Roman Empire was published, and at once made a public reputation for its author. In 1778 he drew up on behalf of the English government a Mémoire Justification in answer to the manifesto of the French court, and for this service he was made one of the lords of trade. On the retirement of North he lost his appointment, and soon after withdrew to Lausanne (1783), where, in the course of four years, he completed the three remaining volumes of his history, which were published together in 1788. In 1793 he returned to England, where he died 16th

confections, infusions, pills, etc. The special preparations are the tincture and the essence of ginger; syrup, prepared by mixing twenty-five parts of

Ginger plant.

syrup with one of the strong tincture. Infusion of ginger is a preparation useful for flatulence.

GINGER-ALE, an aërated water made in the same way as lemonade, but flavored with ginger instead of lemon.

GINGER-BEER, a pleasant, non-alcoholic, effervescing beverage, made by mixing together ginger, cream of tartar, sugar, yeast, and water and allowing the whole to ferment for a time, then bottling. Ginger-beer may also be prepared thus: Add to each gallon of water 1 lb. of refined sugar, and ½ oz. of ground ginger. Boil for an hour, add the white of two eggs, remove the scum. Strain into a vessel to cool, cask it up with the juice and peel of a lemon. Add a very small amount of brewer's yeast, and bung up tightly for a fortnight.

GINGER-BREAD, a well-known cake made in many ways, the chief ingredients being flour and treacle, with ginger butter, eggs, etc.

GINGER-CORDIAL, or **GINGER-WINE,** a beverage made from raisins, lemon rind, ginger, sugar, and water, with some whisky or brandy.

GINGHAM (ging'am), a cotton fabric distinguished from calico by having the colors woven with the fabric, not printed on it. The patterns are various; sometimes fancy designs, sometimes checkered and sometimes striped. Umbrella ginghams are all of one color.

GINSENG (jin'seng), a plant of Northern Asia, herbaceous, and about 1 foot high. Its root is regarded as a sort of

Ginseng.

panacea among the Chinese, and is largely imported, but it appears to be really of very little efficacy; the taste is sweet and mucilaginous, and also accompanied with some bitterness, and also slightly aromatic. Another species of ginseng inhabits Canada and the northeastern parts of the U. States. Quantities of its root are sent to China.

GIPSY. See Gypsies.

GIRAFFE, a ruminant animal inhabiting Africa, and constituting the only species of its genus and family. It is the tallest of all animals, a full-grown male reaching the height of 18 or 20 feet. This great stature is mainly due to the extraordinary length of the neck, in which, however, there are but seven vertebræ, though these are extremely elongated. It has two body excrescences on its head resembling horns. Its great height is admirably suited with its habit of feeding on the leaves of trees, and in this the animal is further aided by its tongue, which is both prehensile and capable of being remarkably elongated or contracted at will. When it browses the herbage on the ground it stretches

Giraffe.

out its fore-legs as wide as possible till it can reach the ground by means of its long neck. Its color is usually light fawn, marked with darker spots. It is a mild and inoffensive animal, and in captivity is very gentle and playful. The giraffe is a native of a great part of Africa, from Abyssinia and Sennaar to Senegal and the regions adjacent to the Cape Colony.

GIRARD COLLEGE, an institution in Philadelphia, Pa., founded by the bequest of about $8,000,000, left by Stephen Girard, for the benefit of poor white male orphans, who are admitted between the ages of six and ten, and, according to the will of the founder, are to be apprenticed to some industrial occupation when between the ages of fourteen and eighteen. The buildings are situated 2 miles n. w. of the old state-house, in a fine enclosure of 41 acres. The principal building (169 feet long, 111 feet wide, and 97 feet high, with fine Corinthian columns, each 55 feet high) is by far the best specimen of Greek architecture in the U. States. It is built mainly of white marble, with no inflammable material, as nearly as possible in accordance with the minute directions left by Mr. Girard, according to whose will no minister or ecclesiastic of any sect or church is allowed to visit the premises on any pretext or to have any connection with the institution. The construction of the buildings was begun in 1833, and finished in 1848. In 1900 the value of the residuary fund was $15,958,293 and the building accommodated about 2,000 boys.

GIRARD, Stephen, philanthropist, born near Bordeaux, France, May 24, 1750; became a sailor, and before the revolution in North America engaged as the master of vessels in the American coasting and West India trade; and during the revolution was a grocer, sutler, and liquor-seller in and near Philadelphia In 1812 he became a private banker, and was later a director of the second U. States bank. He was for years by far the wealthiest man in the U. States. He was very eccentric in his habits, a freethinker, ungracious in manner, ill-tempered, and lived and died without a friend; but was always a liberal benefactor of the public charities and even of churches, which he despised. During several yellow fever seasons in Philadelphia he was active in relieving distress by free expenditure of money and personal care of the sick; and at his death nearly all his estate was bequeathed to various charitable and municipal institutions of Philadelphia and New Orleans, and to the founding of the Girard college for orphan boys. He died in Philadelphia, Dec. 26, 1831.

GIRDER, a main beam, either of wood or iron, resting upon a wall or pier at each end, employed for supporting a superstructure, or a superincumbent weight, as a floor, the upper wall of a house when the lower part is sustained by pillars, the roadway of a bridge, and the like. Wooden girders are sometimes cut in two longitudinally and an iron plate inserted between the pieces, and the whole bolted together. This species of girder is called a sandwich-girder. For bridges cast-iron girders are sometimes cast in lengths of 40 feet and upward, but when the span to be crossed is much greater than 40 feet, recourse is had to wrought-iron, or to trussed, lattice, or box girders, and cast-iron is now little used. A trussed-girder is a wooden girder strengthened with iron. A lattice-girder is a girder consisting of two horizontal beams united by diagonal crossing bars, somewhat resembling wooden lattice-work. A box-girder is a kind of girder resembling a large box, such as those employed in tubular bridges. There are also bowstring-girders, which are varieties of the lattice-girder, and consist of an arched beam, a horizontal tie resisting tension and holding together the ends of the arched rib, a series of vertical suspending bars by which the platform is hung from the arched rib, and a series of diagonal braces between the suspending bars.

GIRDLE OF VENUS, an animal belonging to the Ctenophora, found in the Mediterranean. In shape it resembles a ribbon, and it is apparently propelled by the cilia which fringe its edge. The mouth is situated on the inferior edge. It is iridescent by day, and brilliantly phosphorescent at night.

GIRGEH (jir'je), town, formerly capital, of Upper Egypt, on the left bank of the Nile. It possesses a Roman Catholic convent, the oldest in Egypt. Pop. 10,000.

GIRGENTI (jir-jen'tē), a town in the southwest of Sicily, capital of the prov-

ince of same name. The province has an area of 1490 sq. miles, and is rather mountainous in character. Pop. 371,471.

GIRONDE (zhē-rōnd), a department of France, on the Bay of Biscay, named from the Gironde estuary; area, 3610 sq. miles. Bordeaux is the capital. Pop. 820,781.

GIRONDE, River. See Garonne.

GIRONDISTS (Girondins), one of the great political partics of the first French revolution. The Girondists were republicans, but were more distinguished for visionary ideals than for a well-defined policy; hence they fell an easy prey to the party of the Mountain. Their leaders were three of the deputies of the Gironde—Verginaud, Guadet, and Gensonné, hence the name. Louis XVI. was obliged, in 1792, to select a ministry from among the Girondists, but it was short-lived. In the convention their struggles with the Montagnards forced them into extreme measures which they would otherwise have avoided. They wished to save the king, but many of them, from a mistaken policy, voted for his death. Their fall dates from their unsuccessful impeachment of Marat (1793), soon after which a large number of them were proscribed, and twenty-one of them were condemned and executed.

GIRTY (ger'ti) Simon, renegade leader of the Indians, was born in Pennsylvania in 1741, was captured by the Indians, along with the rest of his family at Fort Granville, in 1756; was released in 1759, and acted as an interpreter for some time after the conspiracy of Pontiac. In Lord Dunmore's war he served against the Indians, and for a short time thereafter was a second lieutenant in the Virginia militia. In 1776 he was appointed an Indian interpreter for the U. States, but was soon discharged, after which he enlisted troops in the vicinity of Fort Pitt for service against the English. He went over to the English in April, 1776, was attainted of high treason by the Pennsylvania legislature in July, and became an interpreter in the employ of the British Indian department. He commanded the Indians who attacked Dunlap's Station, on the Great Miami, in February, 1791; led the Wyandots at the defeat of Saint Clair; commanded the Indians who attacked Fort Jefferson, on the Mississippi, in June, 1791; and in 1794 participated in the battle of Fallen Timbers. He died in 1818.

GIULIO ROMANO (jō'lē-ō rō-mä'nō), or **GULIIO PIPPI,** Italian painter, architect, and engineer, the most distinguished of Raphael's scholars, born at Rome near the end of the 15th century. After the death of Raphael he gave himself up to his own imagination, and astonished all by the boldness of his style, by the grandeur of his designs, by the fire of his composition, by the loftiness of his poetical ideas, and his powerful expression.

GIZZARD, a strong muscular part of the alimentary canal of birds, which enables them to grind their food. A gizzard occurs also in many gasteropods, and in certain cephalopods and crustaceans. In birds it is lined by a thick muscular coat, and usually contains pieces of gravel, etc., to facilitate the grinding process.

GLACIAL PERIOD, or **ICE AGE,** in geology, denotes that portion of the post-tertiary period, in which Britain, Europe, and, in short, all parts of the Old and the New World north of latitude 50°–40° were subjected to intense cold, and covered with ice and glaciers. This phenomenon has been demonstrated from a study of the actual effects of glaciers in the Alps, etc. The traces of ancient glacial action are abundantly discoverable in the Highlands of Scotland, in England, in the Scandinavian range, the Jura, the Black Forest, etc. In Asia they are perceptible in the Himalaya, while North America abounds with them. See Geology.

GLACIERS, icy masses of great bulk, harder than snow, yet not exactly like common ice, which cover the summits and sides of mountains above the snow-line. They are found in Switzerland, Scandinavia, the Andes, etc. They extend down into the valleys often far

Glacier of Zermatt, Switzerland.

below the snow-line, and bear a considerable resemblance to a frozen torrent. They take their origin in the higher valleys, where they are formed by the congelation and compression of masses of snow in that condition called by French writers névé, by German authors firn. The ice of glaciers differs from that produced by the freezing of still water, and is composed of thin layers filled with air-bubbles. It is likewise more brittle and less transparent. The glaciers are continually moving downward, and not unfrequently reach the borders of cultivation. The rate at which a glacier moves generally varies from 18 to 24 inches in twenty-four hours. At its lower end it is generally very steep and inaccessible. In its middle course it resembles a frozen stream with an undulating surface, broken up by fissures or crevasses. As it descends it experiences a gradual diminution from the action of the sun and rain, and from the heat of the earth. Hence a phenomenon universally attendant on glaciers—the issue of a stream of ice-cold turbid water from their lower extremity. The descent of glaciers is shown by changes in the position of masses of rock at their sides and on their surface. A remarkable glacier phenomenon is that of moraines, as they are called, consisting of accumulations of stones and detritus piled up on the sides of the glacier, or scattered along the surface. They are composed of fragments of rocks detached by the action of frost and other causes. The fissures or crevasses by which glaciers are traversed are sometimes more than 100 feet in depth, and from being often covered with snow are exceedingly dangerous to travelers. One of the most famous glaciers of the Alps is the Mer de Glace, belonging to Mont Blanc, in the valley of Chamouni, about 5700 feet above the level of the sea. It is more especially, however, in the chain of Monte Rosa that the phenomena of glaciers are exhibited in their greatest sublimity, as also in their most interesting phases from a scientific point of view. Glaciers exist in all zones in which mountains rise above the snow-line. Those of Norway are well known, and they abound in Iceland and Spitzbergen. Hooker and other travelers have given accounts of those of the Himalaya. They are conspicuous on the Andes, while the Southern Alps of New Zealand rival in this respect the Alpine regions of Switzerland.

The problem of the descent of the glaciers is of extraordinary interest, and various theories have been put forward to account for it. It was shown by Professor J. D. Forbes, of Edinburgh, that a glacier moves very much like a river; the middle and upper parts faster than the sides and the bottom; and he showed that glacier motion was analogous to the way in which a mass of thick mortar or a quantity of pitch flows down in an inclined trough. His theory is known as the viscious theory of glaciers, which presupposes that ice is a plastic body, and this plasticity has been satisfactorily explained by Professor James Thomson of Glasgow by the phenomenon of the melting and refreezing of ice. Water, he discovered, when subjected to pressure, freezes at a lower temperature than when the pressure is removed. Consequently when ice is subjected to pressure it melts; if it is relieved of pressure the water again solidifies. Therefore if two pieces of ice are pressed together, they tend to relieve themselves by melting at their points of contact, and the water thus produced immediately solidifies on its escape. If ice is strained in any way it similarly relieves itself at the strained parts, and a similar regelation follows. This, when applied to the glaciers, gives a complete explanation of their plasticity. Pressed downward by the vast superincumbent mass, the ice gradually yields. Melting and refreezing takes place at some parts, at others the gradual yielding at strained points goes on. In the latter process there is no visible melting but there is the gradual yielding from point to point to the pressure above and there is the transference relatively to each other of the molecules that constitute the, at first sight, solid mass. If however, at certain points the strain is intense, the ice becomes extremely brittle. The latter fact disposes of Tyndall's objection to Forbes' theory, which was based on the fact that crevasses proved the brittleness, and not the viscosity of ice.

GLACIER TABLES, large stones found on glaciers supported on pedestals of ice. The stones attain this peculiar position

by the melting away of the ice around them, and the depression of its general surface by the action of the sun and rain. The block, like an umbrella, protects the ice below it from both; and accordingly its elevation measures the level of the glacier at a former period. By and by the stone table becomes too heavy for the column of ice on which it rests, or its equilibrium becomes unstable, whereupon it topples over, and falling on the surface of the glacier defends a new space of ice, and begins to mount afresh.

GLADBACH (Mönchen-), a town of Prussia, province of Rheinland, 16 miles west of Düsseldorf, with extensive manufactures of cotton and mixed cotton goods, etc. Pop. 58,023.

GLADIA'TORS, combatants who fought at the public games in Rome for the entertainment of the spectators. The first instance known of gladiators being exhibited was in B.C. 264, by Marcus and Decimus Brutus at the funeral of their father. They were at first prisoners, slaves, or condemned criminals; but afterward freemen fought in the arena, either for hire or from choice; and latterly men of senatorial rank, and even women, fought. The regular gladiators were instructed in schools (ludi), and the overseer (lanista) purchased the gladiators and maintained them. Men of position sometimes kept gladiatorial schools and lanistæ of their own. The gladiators fought in the schools with wooden swords. In the public exhibitions, if a vanquished gladiator was not killed in the combat, his fate was decided by the people. If they wished his death, perhaps because he had not shown sufficient skill or bravery, they held up their thumbs; the opposite motion was the signal to save him. The victor received a branch of palm or a garland. The gladiators were classified according to their arms and mode of fighting; thus there were retiarii who carried a trident and a net (L. rete) in which they tried to entangle their opponent; Thracians, who were armed with the round Thracian buckler and a short sword; secutores, who were pitted against the retiarii; etc.

GLADSTONE, Right Hon. William Ewart, a great British statesman, was born at Liverpool in 1809, and died at Hawarden in 1898. In 1832 the first reform act was passed, and Mr. Gladstone's public career commenced by his being returned for Newark, and when Peel assumed office in 1834 he accepted the post of junior lord of the treasury. He took part with Peel in the repeal of the corn-laws, a course which cost him his seat for Newark. In 1847 he was returned for Oxford university, and he then supported the bill for the removal of Jewish disabilities, the repeal of the navigation laws, etc. He now began to develop remarkable ability as a financier and fiercely attacked Mr. Disraeli's budget of 1852. The same year he became chancellor of the exchequer under the Earl of Aberdeen, a post which he also held for a short time in 1855 under Lord Palmerston. In 1858 he became high commissioner extraordinary to the Ionian Islands, and his Studies on Homer appeared about the same time. In 1859 he again took office as chancellor of the exchequer under Lord Palmerston. At the general election of 1865 Mr. Gladstone was returned for South Lancashire, and on the decease of Lord Palmerston he became the liberal leader in the commons in the Russell administration, still continuing to hold the chancellorship of the exchequer. The government, being defeated on the reform question, went out in 1866, and Lord Derby came into power. Parliament was dissolved in 1874, and the conservatives ousted Mr. Gladstone from office, as they had secured a good majority. During Lord Beaconsfield's

Right Hon. W. E. Gladstone.

tenure of office Mr. Gladstone denounced the Bulgarian atrocities, the Anglo-Turkish treaty, and the Afghan war, and his speeches during his candidature for Midlothian greatly helped to render the government unpopular. In 1880 the general election reinstated Mr. Gladstone firmly into power (Midlothian being now his constituency), and his second Irish land bill became law in the following year. In 1882 a prevention of crimes and an arrears act for Ireland were passed, and in 1883 measures relating to bankruptcy, etc., were also carried. In 1884 the bill extending household suffrage to the counties was carried, and the Gladstone ministry fell the next year. Lord Salisbury, who had formed an administration, got the redistribution of seats bill passed, and under it took place the general election of 1885, Mr. Gladstone still continuing to represent Midlothian. Next year Lord Salisbury resigned after an adverse vote in the commons, and Mr. Gladstone again came into power. He now introduced a home rule bill for Ireland (April 8, 1886). It failed to pass the commons, and the result of the general election which followed was emphatically adverse to Mr. Gladstone's proposals. He had to make way for Lord Salisbury, but in 1892 he again became premier. After passing a home rule bill through the commons he resigned office in 1894, and next year retired from political life. His works include The State in its Relations with the Church (1838); Studies on Homer and the Homeric Age; Juventus Mundi; Homeric Synchronism; Landmarks of Homeric Study; The Impregnable Rock of Holy Scripture, etc.

GLAMOR'GAN, or GLAMORGANSHIRE, a county in South Wales; area, 547,070 acres. The north and northeast parts of the county are extremely mountainous, and often exhibit scenes of the most romantic beauty. The southern portion is comparatively level and very fertile, particularly the vale of Glamorgan. Towns: Cardiff, the capital; Merthyr-Tydfil, Swansea, and Neath. Pop. 860,022.

GLANDERS, one of the most formidable diseases to which horses are subject, indicated by a discharge of purulent matter from one or both nostrils, with a hard enlargement of the submaxilliary glands. In acute glanders the discharge, by its copiousness, impedes respiration and ultimately produces suffocation. The disease is highly infectious, and may even be communicated to man by the purulent matter coming in contact with any part where the skin is broken. The discase is rarely if ever cured.

GLANDS, a certain class of structures in animals, some of them forming organs which are the scat of an excretion, and provided with an excretory canal. In man there are two lachrymal glands, situated at the external angle of the eyes under the upper eyelid; six salivary, of which three are on each side, behind and under the lower jaw; two parotid, two submaxillary, two sublingual, two mammary, confined to the female (the breasts in women); the liver, the pancreas, the two kidneys, etc. The lymphatic glands, which take up and elaborate the lymph, are somewhat different from these in character; and still more different are certain other bodies so denominated, as the spleen, thymus, pineal, etc. Botanists have given the name of glands to small bodies observed upon the surfaces of plants, and many of which seem to secrete certain fluids.

GLAS'GOW, the largest city in Scotland, and the second largest in the United Kingdom, is situated mainly in the county of Lanark (but is now a

The Trongate, Glasgow.

county of itself), on both banks of the Clyde, the largest and more important part of it on the right or north bank. The southern portion is mainly built

on low-lying level ground, the northern portion to a great extent on a series of elevations of varying heights. The river is crossed by ten bridges (including railway bridges), as also by ferries; and there are also tunnels under it. Glasgow has several large and attractive public parks. There are also botanic gardens with extensive hot-houses. There is a public museum, and a collection of pictures belonging to the city, containing a number of very valuable works especially of the Venetian school. The principal libraries are the University Library, the Mitchell Free Library, the libraries of the Faculty of Medicine and of the Faculty of Procurators, and the combined Glasgow and Stirling's Libraries. Among educational institutions after the university are Anderson's College Medical School, St. Mungo's College, the Glasgow and West of Scotland Technical College, the U. F. Church College, Queen Margaret College for Women, the normal institutions of the Established and United Free Churches, the Glasgow School of Art, the Veterinary College, the High School, under the management of the school board, and the Glasgow Academy. The industries are unequaled for variety by any town in the kingdom, with the exception, perhaps, of London. They embrace cotton, linen, woolen, silk and jute, in all the processes of manufacture; calico-printing, dyeing, and bleaching; pig and malleable iron and steel, and machinery and metal goods of all descriptions; shipbuilding, which might almost be called a staple, over 400,000 tons of shipping having been launched in some years on the Clyde; extensive chemical works, potteries, glass-works, brick-works, breweries, distilleries, tanneries, tobacco-works, sugar-refining works, etc. The commerce is commensurate in extent with the manufactures. The river itself, the chief highway of this commerce, has been made navigable for large vessels up to the heart of the city, and the harbor accommodations is still being extended by the construction of docks, quays, etc. In a sanitary point of view Glasgow has greatly improved in recent times, but it still remains less healthy than it might be; and its atmosphere is polluted with smoke, soot, and vapors from the public works, and its river with sewage. There is, however, a great difference between the sanitary conditions of different districts. The city is excellently supplied with water from Loch Katrine, a distance of about 30 miles. The works are capable of supplying 60,000,000 gallons daily. Pop. in 1901, 761,709.

GLASGOW UNIVERSITY, was founded by a bull of Pope Nicholas V., 1450–51, which conferred not only the power of creating masters and doctors, but privileges and immunities identical with those of the University of Bologna. In 1577 James VI. prescribed rules for the government of the university, giving it a new charter. It has been reconstituted by the Scottish universities acts of 1858 and 1889, and its constitution is similar to that of the others. The old university buildings and ground were sold to the Glasgow Union railway co. in 1864 for $500,000, a sum which, supplemented by university funds, government grant, public subscriptions and donations, has enabled upward of $3,000,000 to be expended on fine new buildings in the west end of Glasgow. The university comprises five faculties, viz., art, science, divinity, law, and medicine, each of which embraces a suitable equipment of chairs and professors, the latter numbering 31 in all, besides a number of lecturers. With it is incorporated Queen Margaret College for women. The university library numbers about 175,000 volumes.

GLASS, an artificial substance, hard, brittle, and in its finest qualities quite transparent, formed by the fusion of silicious matters with an alkali. Of the origin of its manufacture nothing is known, but the ancient Egyptians carried the art to great perfection, and are known to have practiced it as early as 2000 B.C., if not earlier. The Assyrians, the Phœnicians, the Greeks and Etruscans were all acquainted with the manufacture. The Romans attained peculiar excellence in glass-making, and among them it was applied to a great variety of purposes. Among the most beautiful specimens of their art are the vases adorned with engraved figures in relief; they were sometimes transparent, sometimes of different colors on a dark ground and very delicately executed. The Portland or Barberini vase is almost the only surviving specimen of this kind. The mode of preparing glass was known long before it was thought of making windows of it. The first mention of this mode of using glass is to be found in Lactantius, in the 3rd century after Christ. St. Jerome also speaks of it being so used (422 A.D.). Benedict Biscop introduced glass windows into Britain in A.D. 674. In church windows it was used from the 3d century. The Venetians were long celebrated for their glass manufacture, which was established before 700 A.D. Britain did not become distinguished for glass until about the commencement of the 16th century. Glass is largely made in France, Germany, Belgium, and the United States. For colored glass Bohemia has long had a high reputation.

Glass is formed by the fusion of silicious matter, such as powdered flint or fine sand, together with some alkali, alkaline earth, salt, or metallic oxide. The nature of the glass will depend upon the quality and proportion of the ingredients of which it is formed; and thus an infinite variety of kinds of glass may be made, but in commerce five kinds are usually recognized : 1. Bottle or coarse green glass. 2. Broad, spread, or sheet window-glass. 3. Crown-glass, or the best window-glass. 4. Plate-glass, or glass of pure soda. 5. Flint-glass, or glass of lead. Colored glass may be mentioned as a sixth kind. The physical properties of glass are of the highest importance. Perhaps the chief of these is its transparency, and next to that its resistance to acids (except hydrofluoric). It preserves its transparency in a considerable heat, and its expansibility is less than that of any other known solid. Its great ductility, when heated is also a remarkable property. It can, in this state, be drawn into all shapes, and even be spun into the finest threads. It is a bad conductor of heat, and is very brittle. It is usually cut by the diamond.

The works in which glass is made are called glass-houses. They are commonly constructed of brick, and made of conical form. A large vault is made in the interior of the cone, extending from side to side, and of sufficient height to allow workmen to wheel in and out rubbish from beneath the furnace, which is placed over the vault, and separated from it by an iron grating. The materials used for the formation of the glass are sometimes calcined in a calcar or fritting furnace, and a chemical union between the ingredients commenced, forming a frit. But this process is not essential,and the materials, after being ground and thoroughly mixed up together, are now usually placed at once in melting pots or crucibles made of Stourbridge fire-clay, or other similar material, the melting-pots being then placed in the melting furnace or oven. This is a kind of reverberatory furnace, is often circular in form, arched or domed above, and capable of keeping up an intense heat. The crucibles are placed in the furnace at equal distances from each other round the circumference, each pot being opposite to an opening in the wall of the furnace in order that the crucible may be charged or discharged by the workman from without. In recent times a furnace called a tank furnace has come into use and enables melting pots to be dispensed with, as the material can be—melted in and worked from the furnace directly. The use of the annealing furnace, is also essential in glass-making, the process of allowing the glass to cool there being called annealing. Unless this process be carefully managed, the articles formed in the glass-house can be of no use, from their liability to break by the slightest scratch or change of temperature.

GLASS-PAINTING, the art of producing pictures upon glass with colors that are burned in, or by the use of pieces of colored glass, in which the color forms part of the composition of the glass itself. Originally there was but one method of making ornamental glass windows, which was by the latter process: the pieces of stained or colored glass were cut to the desired shape, and let into the grooves of finely-made leaden frames which formed the pattern in outline, so that the pictures resembled mosaic work. In the 16th century, the enamel colors having been discovered, a new process came into vogue, the designs being now painted on the glass and burned in. At the present day the two methods, or a combination of the two, are chiefly employed, the mosaic-enamel method being the most common, and consisting of a combination of these two. The chief seats of the art in Britain are Birmingham and Edinburgh; in France, Paris and Sèvres; and in Germany, Munich and Nürnberg.

GLASS PAPER, or **CLOTH,** is made by strewing finely pounded glass on a sheet of paper or cloth which has been besmeared with a coat of thin glue, the glue being still wet. It is much used for polishing metal and wood-work.

GLAUBER, John Rudolph, a German chemist, born in 1603 or 1604. He is chiefly remembered for his discovery of sulphate of soda or Glauber's Salt, which he termed sal mirable, in consequence of his great faith in its medicinal qualities.

GLAUBER'S SALT, sulphate of sodium, so called because of the importance attached to its chemical and medicinal properties by Glauber. It forms large colorless monoclinic prisms, which effloresce on exposure to the air. It is soluble in water, and when heated melts in its water of crystallization. It is found in many localities, both dissolved in the water of mineral-springs and of salt lakes, round which it effloresces.

GLAUCO'MA, in med. an almost incurable disease of the eye, in which the eyeball becomes of stony hardness by the accumulation of fluid within, and the consequent increase of pressure causes disorganization of all the tissues. Loss of sight is sometimes very rapid. Called also Glaucosis.

GLAZING, is the covering of earthenware vessels with a vitreous coating in order to prevent their being penetrated by fluids. The materials of common glass would afford the most perfect glazing were it not that a glazing of this sort is liable to cracks when exposed to changes of temperature. A mixture of equal parts of oxide of lead and ground flint is found to be a durable glaze for the common cream-colored ware, and is generally used for that purpose. See Pottery.

GLEE, in music, a composition in three or more parts, generally consisting of more than one movement, the subject of which may vary greatly, from grave to gay, etc. Instrumental accompaniment is illegitimate.

GLEIWITZ (glī'vits), a town, Prussia, province of Silesia, on the Klodnitz. It has an extensive government iron-works, foundries, machine-works, glass-works, worsted and other mills, etc. Pop. 52,362.

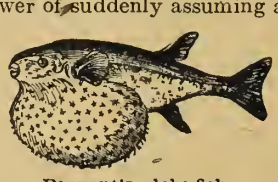
GLENS FALLS, The, Warren co., N. Y., on the Hudson river, between Saratoga Springs and Lake George, and on the Delaware and Hudson canal company's railroad; 50 miles n. of Albany. Pop. 15,109.

GLOBE, a sphere, a round solid body, which may be conceived to be generated by the revolution of a semicircle about its diameter. An artificial globe, in geography and astronomy, is a globe of metal, plaster, paper, pasteboard, etc., on the surface of which is drawn a map, or representation of either the earth or the heavens, with the several circles which are conceived upon them, the former being called the terrestrial globe and the latter the celestial globe. In the terrestrial globe the wire on which it turns represents the earth's axis, the extremities of it representing the poles. The brazen meridian is a vertical circle in which the artificial globe turns, divided into 360 degrees, each degree being divided into minutes and seconds. The brass meridian receives the ends of the axis on which the globe revolves. At right angles to this, and consequently horizontal, is a broad ring of wood or brass representing the horizon; that is, the true horizon of the earth which lies in a plane containing the earth's center. The horizon and brass meridian are connected with the stand on which the whole is supported. On the surface of the globe, as on other maps, are marked

The globe.

parallels of latitude, meridians, etc. On a globe of some size the meridians are drawn through every 15° of the equator, each answering to an hour's difference of time between two places. Hence they are called the hour circles. A number of problems or questions, many of them more curious than useful, may be solved by means of a terrestrial globe. Among the most important are such as to find the latitude and longitude of a place, the difference of time between two places, the time of the sun's rising and setting for a given day at a given place, etc.

GLOBE-FISH, the name given to several fishes remarkable for possessing the power of suddenly assuming a glob-



Pennant's globe-fish.

ular form by swallowing air or water, which, passing into a ventral sac, inflates the whole animal like a balloon.

GLOB'ULIN, a substance forming a considerable proportion of the blood globules, and also occurring, mixed with albumen, in the cells of the crystalline lens of the eye. It resembles albumen.

GLORIA IN EXCELSIS DEO, "glory to God in the highest," the initial words (sung by the angels when the birth of Christ was announced to the shepherds) of a short Latin hymn known as the greater doxology, and used in the service of many Christian churches.

GLORIA PATRI, "glory be to the Father," the initial words of a short formula or hymn of praise to the Trinity known as the lesser doxology.

GLORIO'SA, a genus of tuberous-rooted climbing herbs of the nat. order Liliaceæ, so named from the splendid appearance of its flowers. They have branched stems and flowers mostly of a beautiful red and yellow color, with six long lanceolate undulated segments, which are entirely reflexed.

GLOS'SARY, a limited or partial dictionary, a vocabulary of words used by any author, especially in an old author, or one writing in a provincial dialect or of words occurring in a special class of works, of the technical terms of any art or science, of a dialect, and the like.

GLOTTIS, the opening at the upper part of the trachea or windpipe, and between the vocal chords, which, by its dilatation and contraction, contributes to the modification of the voice.

GLOUCESTER (glōs'tėr), a city, county of itself, parliamentary borough, and river port, England, capital of the county of same name, on the left bank of the Severn, here divided into two channels inclosing the Isle of Alney and crossed by two fine bridges, 33 miles north by east of Bristol, and 95 miles west by north of London. It carries on a considerable shipping trade, the Gloucester and Berkeley canal giving access to the docks. Pop. 47,943. The county is bounded by the Severn, Monmouth, Hereford, Worcester, Warwick, Oxford, Berks, Wilts, and Somerset; area, 804,977 acres, of which five-sixths are under crops and pasture. Pop. 634,666.

GLOUCESTER, a town and port of Essex co., Mass., near the extremity of Cape Ann, 28 miles n.n.e. of Boston. It is a popular summer resort; and fisheries and granite quarrying are the chief industries. About two miles distant is Norman's Woe, the scene of the wreck of the "Hesperus" celebrated by Longfellow. Pop. 31,430.

GLOVERSVILLE, a town in Fulton co., New York, 44 miles n.w. of Albany. Glove-making is the principal business, hence the name of the place. Pop. 21,615

GLOVES, coverings for the hand, or for the hand and wrist, with a separate sheath for each finger. They are made of leather, fur, cloth, silk, linen, thread, cotton, worsted, etc. The chief leathers used in glove manufacture are doe, buck, and calf-skins; sheep-skin for military gloves; lamb-skin for much of the so-called kid gloves; true kid for the best and finest gloves; dog, rat, and kangaroo skins, etc. The leather in all cases undergoes a much lighter dressing than when used for boots and shoes. Leather gloves are usually cut out by means of dies, and sewed by a machine of peculiar construction. The best woolen, thread, and silk gloves are made by cutting and sewing, but commoner gloves are made by knitting and weaving. Gloves are a very ancient article of dress, and many curious customs and usages are connected with them. Throwing the glove down before a person amounted to a challenge to single combat. The judges in England used to be prohibited wearing gloves on the bench; and it was only in case of a maiden assize that the sheriffs were allowed to present a judge with a pair of gloves.

GLOW-WORM, an insect, the name being strictly applicable only to the female, which is without wings, somewhat resembles a caterpillar, and emits a shining green light from the extremity of the abdomen. The male is winged, and flies about in the evening, when it is

attracted by the light of the female, out gives out no light itself. It would seem that the glow-worm possesses the power of moderating or increasing the light at will. Decapitated specimens retain their

Glow-worm.

1, Male. 2, Female, upper side. 3, Female, under side, showing the three posterior segments (*a*) from which the light proceeds.

power of giving out light for a considerable time. In pure oxygen, warm water, or when crushed, the light of the luminous organs is increased in intensity. The larvæ are very voracious, living on snails, which they attack and kill.

GLOXIN'IA, a genus of plants, distinguished by the corolla approaching to bell-shaped, the upper lip shortest and

Gloxinias.

two-lobed, the lower three-lobed, with the middle lobe largest, and also by the summit of the style being rounded and hollowed. The species are natives of tropical America,.

GLUCK (gluk), Christoph Wilibald, Ritter von, German musical composer, born in Bavaria in 1714; died at Vienna 1787. In 1740 he was employed to compose an opera for the court theater of Milan. The text chosen for him was the Artaxerxes of Metastasio, and the opera was a triumph, in spite of the innovations of style which the author introduced. In 1742 he wrote Demofoonte for Milan; Demetrio and Ipermnestra for Venice; in 1743 Artamene for Cremona, and Siface for Milan; in 1744 Fedra for the same theater; and in 1745 Allessandro nell' Indie for Turin, all founded on classical subjects. Invited to London, he produced La Caduta de Giganti (Fall of the Giants), which was not a success. In London Gluck became deeply impressed with the majestic character of Handel's airs and choruses. The Trionfo di Clelia (1762) was the last of his operas in his first style. The composer found a poet in the person of Raniero Calzabigi, who sympathized with him in his ideas, and the result of their co-operation was the Orfeo ed Euridice, performed publicly for the first time in 1762. This opera marked a new era. The fame it acquired at once it never lost. Various works of lighter character filled up the interval between this year and 1766, when his second great opera of Alceste was produced, which raised public feeling to the point of enthusiam. A Frenchman of culture and genius, Bailly du Rollet, adapted Racine's Iphigénie en Aulide for musical treatment, and after a considerable amount of opposition from the musical critics of the old Italian and French school, at that time represented in Paris by Paccini, the piece was brought out in 1774. The intensest excitement prevailed; all Paris took sides, and for a long time the Gluckists and Piccinists contended with much bitterness, but ultimately the victory remained with the Gluckists. Shortly after the production of the Iphigénic, the Orfeo was adapted for and put on the French stage, and was followed by the Armide in 1777, by the Iphigénie en Tauride in 1779, Gluck's last important work, and by many considered his greatest. It ends the series of works which gave a direction to the operatic genius of Méhul and Cherubini in France, and of Mozart and Beethoven in Germany.

GLU'COSE, a variety of sugar, less sweet than cane-sugar, existing in grapes, and produced from cane-sugar, starch, dextrin, cellulose, etc., by the action of acids, certain ferments, and other reagents. There are two varieties of it, distinguished by their action on polarized light, viz. dextro-glucose which turns the plane of polarization to the right and lævo-glucose, which turns it to the left. When heated up to 400° it becomes caramel, and is used by cooks and confectioners as a coloring matter. It is called also grape-sugar and starch-sugar, and is produced both in the solid and in the liquid form, its manufacture being now of considerable importance. In the United States the liquid sugar, as prepared from Indian corn starch, is what is generally known as glucose, and it is used for various purposes, as for confectionery, canning fruits, making artificial honey, for table syrup, in brewing, etc.

GLU'COSIDES, a large class of substances occurring in animal or vegetable products, possessing the common property of yielding glucose and other products when they are boiled with dilute acids, or are acted on by certain ferments.

GLUE, a gelatinous substance obtained from different tissues of animals, and used as a cement for uniting pieces of wood or other material. The best quality is obtained from fresh bones, freed from fat by previous boiling, the clippings and parings of ox-hides, the older skins being preferred; but large quantities are also got from the skins of sheep, calves, cows, hares, dogs, cats, etc., from the refuse of tanneries and tawing works, from old gloves, from sinews, tendons, and other offal of animal origin. By a process of cleaning and boiling the albuminoid elements of the animal matter are changed into gelatine. This in a soft jelly-like state constitutes size; dried into hard, brittle, glassy cakes, which before use must be melted in hot water, it forms the well-known glue of the joiner, etc. When a solution is mixed with acetic or nitric acid it remains liquid, but still retains its power of cementing; in this state it is called liquid glue. Marine glue is a cement made by dissolving india-rubber in oil of turpentine or coal-naptha, to which an equal quantity of shellac is added.

GLUTEN, a tough elastic substance of a grayish color, which becomes brown and brittle by drying, found in the flour of wheat and other grain. It contributes much to the nutritive quality of flour, and gives tenacity to its paste. A similar substance is found in the juices of certain plants.

GLUTTON, a carnivorous quadruped, about the size of a large badger, and intermediate between the bear family and the weasels, resembling the former family in general structure and the latter in dentition. It inhabits Northern Europe and America, and is known also by the name of wolverene or wolverine.

GLYCERINE, a transparent colorless liquid, obtained from the by-products of candle and soap factories by saponification with alkalies or by the action of superheated steam. It sometimes solidifies at a low temperature to a crystalline mass. It absorbs moisture from the air, and dissolves in or mixes with water and alcohol in all proportions, but is insoluble in ether. It is the starting-point of certain valuable chemical products, one of the chief of which is nitro-glycerine.

GLY'CON, an Athenian sculptor known by his colossal marble statue of Hercules, commonly called the "Farnese Hercules," now in the museum at Naples. He probably lived in the 1st century B.C.

GLYP'TODON, a gigantic fossil edentate animal, closely allied to the armadilloes, found in the upper tertiary

Glyptodon.

strata of South America. It was of the size of an ox, and was protected by a coat of mail formed of polygonal osseous plates united by sutures.

GNAT, the name applied to several species of insects. The common gnat is of wide geographical distribution, and is noted for its power of inflicting irritating wounds. The female deposits her eggs on the surface of stagnant water in a long mass. After having remained in the larva state for about twenty days, they are transformed into chrysalids, in which all the limbs of the perfect insect are distinguishable, through the diaphanous robe with which they are then shrouded. After remaining three or four days wrapped up in this manner, they become perfect insects. The troublesome mosquito belongs to the same genus.

GNEISS (nīs), a species of rock, composed of quartz, felspar, and mica, arranged in layers. The layers, whether straight or curved, are frequently thick, but often vary considerably in the same specimen. Gneiss passes on one side into granite, from which it differs in its foliated structure, and on the other into mica slate. It is rich in metallic ores,

gold, silver, cobalt, antimony, copper, iron, etc., occurring in this rock, but it contains no fossil remains. In the United States gneiss is a common rock, especially in New England and the eastern and southern parts of New York.

GNOME (nōm), a short, pithy saying, often expressed in figurative language, containing a reflection, a practical observation, or a moral maxim. Among the Greeks Theognis, Phocylides, and others are called the gnomic poets, from their sententious manner of writing.

GNOME (nōm), in the cabalistic and mediæval mythology, the name given to the spirits which dwell in the interior of the earth, where they watch over mines, quarries, and hidden treasures. They assume a variety of forms, but are generally grotesque dwarfs, ugliness being their appropriate quality, though the females, gnomides, are originally beautiful.

GNOSTICS (nos'tiks), a general name applied to early schools of speculators, which combined the fantastic notions of the oriental systems of religion with the ideas of the Greek philosophers and the doctrines of Christianity. They nearly all agreed on the points that God is incomprehensible; that matter is eternal and antagonistic to God; that creation is the work of the Demiurge, an emanation from the Supreme Deity, subordinate or opposed to God; and that the human nature of Christ was a mere deceptive appearance. Certain forms of Gnosticism are mere adaptations of the Persian dualism to the solution of the problem of good and evil; while the pantheism of India seems to have been a pervading influence in others. Simon the magician (Simon Magus), of whom Luke speaks in the Acts of the Apostles, is generally looked on as the first of the Gnostics. There have been no Gnostic sects since the 5th century; but many of the principles of their system of emanations reappear in later philosophical systems, drawn from the same sources as theirs.

GNU, the wildebeeste of the colonists, the name given to two species of South African antelope. The former species is now rarely found south of the Vaal; its form partakes of that of the antelope, ox, or horse. Both sexes have horns

Common or white-tailed gnu.

projecting slightly outward and downward, then forming an abrupt upward bend. They have bristly black hair about the face and muzzle, a white stiff mane, and horse-like tail. They attain a length of about nine feet, and stand about four feet high at the shoulder. They live in herds; are said to be fierce when attacked, but when taken young have been found to be capable of domestication. The brindled gnu is larger than the common gnu, has black stripes on the neck and shoulders, and a black tail. Both species wheel in a circle once or twice before setting off when alarmed.

GOA, a city in Hindustan, on the Malabar coast, capital of the Portuguese territory of the same name. The name is applied to two distinct places, namely, Old Goa, and New Goa or Panjim. The former was once the chief emporium of commerce between the East and West, and had a population of 200,000, but it is now nearly deserted, though some pains are taken to keep the ancient churches and convents in repair. New Goa or Panjim was chosen as the residence of the Portuguese viceroy in 1759; and in 1843 it was made the capital of Portuguese India. The trade of Goa, at one time the most extensive of any place in India, is now inconsiderable. Pop. 8440. The territory around Goa belonging to the Portuguese has an area of 1062 sq. miles. It is well watered and fertile. About two-thirds of the total population, numbering 494,836, are the descendants of Hindus converted to Christianity on the subjugation of the country by the Portuguese.

GOALPA'RA, a district of British India, prov. of Assam; area 3897 sq. miles; pop. 452,304.

GOAT, a well-known horned ruminant quadruped. The horns are hollow, erect, turned backward, annular on the surface, and scabrous. The male is generally

Goat of Cashmere.

bearded under the chin. Goats are nearly of the size of sheep, but stronger, less timid, and more agile. They frequent rocks and mountains, and subsist on scanty coarse food. Their milk is sweet, nourishing, and medicinal, and their flesh furnishes food. Goats are of almost interminable variety, and it is not certainly known from which the domestic goat is descended, though opinion favors the wild goat of Western Asia. Goats are generally subdivided into ibexes and goats proper. They are found in all parts of the world, and many varieties are valued for their hair or wool. The skin is prepared for a variety of purposes, and yields the leather well known under the name of morocco. The cashmere goat, as its name indicates, is a native of Cashmere; it is smaller than the common domestic goat, and has long silky, fine hair. The angora goat is also furnished with soft silky hair of a silver white color, hanging down in curling locks 8 or 9 inches long. Its horns are in a spiral form, and extend laterally.

GOATSUCKER, a name common to certain birds, as also to all belonging to the same family from the erroneous opinion that they suck goats. The European goatsucker feeds upon nocturnal insects, as moths, gnats, beetles, etc., which it catches on the wing, flying with its mouth open. Its mouth is compara-

Goatsucker.

tively large, and lined on the inside with a glutinous substance to prevent the escape of those insects which fly into it. It has a light, soft plumage, minutely mottled with gray and brown, and is about 10 inches in length. The American chuckwill's widow, whip-poor-will, and night-hawk belong to the same family.

GOBELINS (gob-lan), **MANUFACTORY,** a tapestry manufactory at Paris, established by Colbert in 1667, on the site of a previously existing manufactory which had been set up by Gilles Gobelin, a celebrated dyer in the reign of Francis I. Colbert collected into it the ablest workmen in the divers arts and manufactures connected with house decoration and upholstery. The Gobelins has since then continued to be the first manufactory of the kind in the world. Many celebrated paintings of the old Italitan, French, and Spanish schools have, in the most ingenious manner, been transferred to tapestry.

GOBI, Desert of, the Shamo or "sand-sea" of the Chinese, an immense tract of desert country, occupying nearly the center of the high table-land of Eastern Asia, between lat. 37° and 48° n., and long. 95° and 118° e., and extending over a large portion of the Chinese territory of Mongolia. Its length is probably about 1000 miles; mean breadth, between 350 and 400 miles; area, 360,000 sq. miles. Its general elevation is over 4000 feet above sea-level.

GOD, the self-existent, eternal, and Supreme Being, the creator and upholder of the universe, worshiped by most civilized nations. The Christian God is an infinite and absolute being; a perfect personal spirit; eternal; immutable; omniscient; omnipotent; and perfectly good, true, and righteous. The arguments for the existence of God have been divided into the ontological, the cosmological, the psychological, the physico-teleological, and the moral. The ontological argument starts from the idea of God itself, and professes to demonstrate the existence of God as a necessary consequence from that idea. This form of argument is, in some shape or other, a very old one, but was first

fully developed and applied by Anselm in the 11th century. The manner in which it was stated by Anselm is this: "God must be thought of as that being than whom none can be thought greater; but this being the highest and most perfect that we can conceive, may be thought as existing in actuality as well as in thought—that is to say, may be thought as something still greater; therefore, God, or what is thought as greatest, must exist not only in thought but in fact." This argument has been presented in other forms. Descartes, while refuting Anselm's form of the ontological argument, revived it himself in another form. Applying the test of truth which he derived from his celebrated formula—"I think, therefore I am," that whatever we clearly and distinctly perceive to belong to the true and unalterable nature of a thing may be predicated of it, he found on investigating God that existence belongs to his true and unalterable nature, and therefore may legitimately be predicated of him. Another argument was adduced by Descartes to prove the existence of God, which, although not the same with the ontological argument, appears to resemble it. It is called the psychological argument. Like the ontalogical argument, it starts from the idea of a supreme and perfect being, but it does not assert the objective existence of that being as implied in its idea, but infers such objective existence on the ground that we could have acquired the idea only from the being which corresponds to it. The cosmological argument starts not from an idea, but from a contingent existence, and infers from it an absolutely necessary being as its cause. Stated syllogistically the argument is: Every new thing and every change in a previously existing thing must have a cause sufficient and pre-existing. The universe consists of a system of changes. Therefore the universe must have a cause exterior and anterior to itself. The argument called the physico-teleological is that which is commonly known as the argument from design, which has been so fully illustrated by Paley in his Natural Theology. It is simply this, that in nature there are unmistakable evidences of the adaptation of means to ends, which lead us inevitably to the idea of one that planned this adaptation, that is, of God. The moral argument is derived from the constitution and history of man and his relations to the universe, being based on such considerations as our recognition of good and evil, right and wrong, the monitions of conscience, and the fact that a moral government of the world may be observed. Another argument is based on the (alleged) fact that a belief in the existence of a Supreme Being is everywhere found to be implanted in the breast of man. This argument is used among others by Cicero, and many thinkers are inclined to give a good deal of weight to it; still it is pronounced by others to be at best only a probable argument, if it may be accepted as valid to prove anything at all. Others argue the existence of God from the manifestations which he has made of himself to men, but these, as well as miracles, it is admitted even by Christians theists, can only be accepted as real by such as previously believed in the divine existence.

GODA'VARI, a large river of Central India, which rises about 50 miles from the shores of the Indian Ocean, flows across the Deccan from the Western to the Eastern Ghats in a general south-easterly direction, and being joined by several affluents, falls by three principal mouths into the Bay of Bengal, after a course of 900 miles. Before the river divides there are three great obstacles to navigation, caused by three rocky barriers.—Godavari is also the name of a British district of the Madras Presidency; area, 7857 sq. miles; pop. 2,078,782. Coringa and Coconada are its chief ports.

GODFREY OF BOUILLON, leader of the first crusade, son of Eustace II., count of Boulogne, born near Nivelles, 1061; died at Jerusalem, 1100. He distinguished himself while fighting for the Emperor Henry IV. in Germany and Italy, and was made Duke of Bouillon. In order to expiate his sin of fighting against the pope, he took the cross for the Holy Land in 1095, and led 80,000 men to the East by way of Constantinople. The defeat of the Egyptians at Ascalon placed him in possession of all the Holy Land, excepting two or three places. Godfrey now turned his attention to the organization of his newly-established government, and promulgated a code of feudal laws called the Assize of Jerusalem. Godfrey was a favorite subject of mediæval poetry, and is the central figure of Tasso's "Jerusalem Delivered."

GODI'VA, the wife of Leofric, Earl of Mercia and lord of Coventry in the reign of Edward the Confessor, heroine of a celebrated tradition. In 1040 certain exactions imposed on the inhabitants bore heavily on them, and Godiva interceded for their relief. Leofric, however, only laughed at her, and when she persisted in her entreaties at last said to her, half jocularly, that he would grant her request if she would ride naked through the town of Coventry. Godiva took her husband at his word, proclaimed that on a certain day no one should leave his house before noon, that all windows and other apertures in the houses should be closed, and that no one should even look out until noon was past. She then mounted naked on her palfrey, rode through the town, and returned; and Leofric, in fulfillment of his promise, freed the inhabitants from the burdens he had imposed on them. Only one person, "Peeping Tom," the story says, attempted to look out, and he was immediately struck blind. A yearly pageant, in which a young woman enacted the part of Godiva, was long kept up at Coventry, and still occasionally takes place. Tennyson's poem on Godiva is well known.

GOD'KIN, Edward Lawrence, American editor, was born in Moyne, County Wicklow, Ireland, in 1831. In 1856 he came to the United States, where he read law under David D. Field, was admitted to the bar in 1859. In 1865 he established and became the editor of the Nation. In 1881 the Nation was merged with the Evening Post, of which it became the weekly edition, and was thereafter editor and proprietor of the combined publications. His editorials in the Nation from the first influenced in manifold ways the best thought of the time, and he made the Evening Post, of which he became editor-in-chief in 1883, the leading independent American daily. He died in 1902.

GODWIN, Earl of Wessex, an Anglo-Saxon noble, born about 990; died 1052. In 1018 he was created an earl by Canute, and married the king's niece Gytha. During the reign of Edward the Confessor, who married Godwin's daughter, a quarrel arose between Godwin and the king, occasioned by the partiality of Edward for Norman favorites, and Godwin was compelled to quit the kingdom. In 1052, however, he returned with an army, forced Edward to enter into negotiations with him, re-established himself triumphantly in his old supremacy, and caused the expulsion from the kingdom of most of the Norman intruders. He was the father of Harold, the last Anglo-Saxon king.

GOETHE (geu'tè), Johann Wolfgang von, the greatest figure in German literature, was born August 28, 1749, at Frankfort-on-the-Main, died at Weimar, March 22, 1832. He was sent to the University of Leipzig to prepare himself for the legal profession, but he did not follow any regular course of studies. Goethe began at this period what he practiced throughout his life, to embody in a poem, or in a poetical form, whatever occupied his mind intensely; and no one, perhaps, was ever more in need of such an exercise, as his nature continually hurried him from one extreme to another. In 1768 he left Leipzig, and after an illness of some length went in 1770 to the University of Strasburg, to pursue the study of law, according to the wish of his father. In 1771 he took the degree of doctor of jurisprudence, and wrote a dissertation on a legal subject. He then went to Wetzlar to practice law, where he found, in his own love for a betrothed lady, and in the fate of a young man named Jerusalem, the subjects for his striking work, The Sorrows of Werther, which formed an epoch in German literature. The attention of the public had already been attracted to him, however, by his drama Götz von Berlichingen (published 1773). Werther appeared in 1774. Not long after the publication of Werther, Charles Augustus, the hereditary duke of Saxe-Weimar, made the acquaintance of Goethe on a journey, and when in 1775 he took the government into his own hands, he invited Goethe to his court. Goethe accepted the invitation, and on the 7th of November, 1775, arrived at Weimar. In 1776 he was made privy-councillor of legation, with a seat and vote in the privy-council. In 1782 he was made president of the chamber, and ennobled. In 1786 he made a journey to Italy, where he remained two years, visited Sicily, and remained a long time in Rome. This residence in Italy had the effect of still further developing his artistic powers. Here his Iphigenia was matured, Egmont finished, and Tasso projected. The first of these was pub-

lished in 1787, the second in 1788, and the third in 1790. In the same year with Tasso was published the earliest form of the first part of Faust, with the title Dr. Faust, ein Trauerspiel (Dr. Faust, a Tragedy), a poem in a dramatic form, which belongs rather to Goethe's whole life than to any particular period of it. In 1794–96 Goethe published Wilhelm Meister's Lehrjahre (Wilhelm Meister's Apprenticeship), a novel which has become well known to English readers through the translation of Carlyle, and which had as a continuation Wilhelm Meister's Wanderjahre (that is, his travels as a journeyman; 1821). His next work of importance was Hermann und Dorothea (1797), a narrative poem, in hexameter verse, the characters of which are taken from humble life. In 1806 Goethe married Christiane Vulpius, with whom he had lived since 1788, and of whom he always spoke with warmth and gratitude for the degree in which she had contributed to his domestic happiness. In 1808 he published another edition of Faust in a considerably altered form. In 1809 was published Elective Affinities. In 1811-14 appeared Goethe's autobiography, in 1819 the Westöstlicher Divan, a remarkable collection of oriental songs and poems. Goethe's last work was the second part of Faust, which was completed on the evening before the last anniversary of his birthday which he lived to see.

GOG AND MAGOG, Ezekiel predicts the destruction of Gog and Magog (ch. xxxviii and xxxix,) by the Jews, and mention is also made of them in Revelation (ch. xx.). Interpreters generally understand them to be symbolical expressions for the heathen nations of Asia. Magog is mentioned as the second son of Japheth in Genesis (ch. x, 2). Gog and Magog are also the names given to two reputed giants of early British history, whose statues are erected in the Guildhall in London. These statues are supposed to have been originally made for carrying about in pageants. The present figures of Gog and Magog, which are 14 feet high, were erected in 1708.

GOGAL, Nikolai Vassiljevich, Russian author, born in the province of Poltava 1809, died in 1852. Among his most notable works are—Evenings at the Farm (1832); Mirgorod, a collection of Tales (1834); the Dead Souls (1842), a satirical novel, depicting the public abuses and barbarism of manners prevalent in the provinces and Revisor, a comedy. His later years were tinged with religious mysticism, and he wrote some curious Confessions.

GOITRE (goi'tĕr), or **BRONCHOCELE,** a disease endemic in Derbyshire, Switzerland, some parts of France and South America, and in many other parts of the world, chiefly in valleys and elevated plains in mountainous districts. It is a morbid enlargement of the thyroid gland, forming a soft and more or less mobile tumor or swelling, without any sign of inflammation, on the anterior part of the neck. It sometimes grows to such a size as to hang down over the breast, and respiration and swallowing may be impeded by it, though often it causes little inconvenience. It is regarded as the result of a combination of causes, among which malarial influences probably concur with those of the drinking water in developing the disease.

A female affected with goitre.

GOLD, a precious metal of a bright yellow color, and the most ductile and malleable of all the metals; symbol Au (Lat. aurum); atomic weight, 196. It is one of the heaviest of the metals, and not being liable to be injured by exposure to the air, is well fitted for coin and jewerly. Its ductility and malleability are very remarkable. It may be beaten into leaves so exceedingly thin that 1 grain in weight will cover 56 square inches, such leaves having the thickness of only $\frac{1}{282000}$th part of an inch. It is also extremely ductile; a single grain may be drawn into a wire 500 feet long, and an ounce of gold covering a silver wire is capable of being extended upward of 1300 miles. It may also be melted and remelted with scarcely any diminution of its quantity. It is soluble in nitro-muriatic acid or aquatzegia, and in a solution of chlorine. Its specific gravity is 19·3, or it is about nineteen times heavier than water. The fineness of gold is estimated by carats, pure gold being 24 carats fine. Jeweler's gold is usually a mixture of gold and copper in the proportions of three-fourths of pure gold with one-fourth of copper. Gold is seldom used for any purpose in a state of perfect purity on account of its softness, but is combined with some other metal to render it harder. Articles of jewelry in gold are made of every degree of fineness up to 18 carats, i. e. 18 parts of gold to 6 of alloy. The alloy of gold and silver is found already formed in nature, and is that most generally known. It is distinguishable from that of copper by possessing a paler yellow than pure gold, while the copper alloy has a color bordering upon reddish yellow. Palladium, rhodium and tellurium are also met with as alloys of gold.

Gold has been found in smaller or larger quantities in nearly all parts of the world. It is commonly found in reefs or veins among quartz, and in alluvial deposits. It is separated, in the former case, by quarrying, crushing, washing, and treatment with mercury. The rock is crushed by machinery, and then treated with mercury, which dissolves the gold, forming a liquid amalgam, after which the mercury is volatilized and the gold left behind. Other processes are also in use. In alluvial deposits it is extracted by washing, in dust, grains, laminæ, or nuggets. Previous to the use of water, crushing may have to be employed. In modern times large supplies of gold were obtained after the discovery of America from Peru, Bolivia, and other parts of the New World. A chief source of the supply has long been the Ural Mountains, whence gold is still obtained. An immense increase in the world's production was caused by the discovery of gold in California in 1848, and Australia in 1851. Goldmines are also extensively worked in New Zealand, and considerable quantities of the precious metal have been obtained in British Columbia, and elsewhere in Canada. In the United States, apart from California, gold in considerable quantities is found in several states and territories (especially Colorado). The production of both Australia and America has shown much fluctuation in recent years, and latterly a very rich source of supply has been discovered in South Africa (the Transvaal). It is only since 1886 that the Transvaal has risen into importance as a gold-producing country, the chief locality where the metal is mined being the Witwatersrand. There are also gold-mines in India that are worked with great success. In Western Australia also many mines have recently been opened (Coolgardie being the chief center), and the Yukon district of Canada (Klondike) is now a recognized gold-field. British Guiana also begins to promise well as a gold-yielding country. Gold has been found in various parts of the United Kingdom, as in Sutherlandshire, the Wicklow hills, and many places in Wales. The total value of the gold produced throughout the world, from 1493 to 1850, is estimated at $3,314,500,000 and from 1851 to 1885, at $4,452,500,000. In 1887 the world's production was estimated at $110,000,000; in 1898 at about 300,000,000; in 1906, $400,245,300. Enormous quantities of gold are consumed in the arts and are lost by wear of coin and jewelry.

GOLD-BEATING, the art or process of producing the extremely thin leaves of gold used in gilding, etc. The gold is cast into ingots weighing about 2 oz. each, and measuring about ¾ of an inch broad. These ingots are passed between steel rollers till they form long ribbons of such thinness that a square inch will weigh 6½ grains. Each one of these is now cut into 150 pieces, each of which is beaten on an anvil till it is about an inch square. These 150 plates are interlaid with pieces of fine vellum about 4 inches square, and beaten till the gold is extended nearly to the size of the vellum leaves. Each leaf is then divided into four, interlaid with gold-beater's skin, and beaten out to the dimensions of the skin. Another similar division and beating finishes the operation, after which the eaves are placed in paper books ready for use.

GOLD COAST, a British crown-colony in West Africa, on the Guinea coast, extending from 3° 30′ w. to 1° 30′ e. lon., between Germany Togoland and the French Ivory Coast, and stretching inland so as to include the Ashantee country; estimated area, 75,000 sq. miles. Pop. 1,486,000.

GOLDEN AGE, that early mythological period in the history of almost all races, fabled to have been one of primeval innocence and enjoyment, in which the earth was common property, and

brought forth spontaneously all things necessary for happy existence, while beasts of prey lived at peace with other animals. The Romans referred this time to the reign of Saturn. The so-called "golden age" of Roman literature is reckoned from the time of Livius Andronicus, 250 B.C., to the death of Augustus Cæsar, A.D. 14.

GOLDEN-BEETLE, the popular name of several beetles. There are some British species, most are tropical. Their most obvious characteristic is the great brilliancy of their color. There are none of large size.

GOLDEN-CRESTED WREN, Golden-crested Regulus, or Kinglet, a beautiful bird distinguished by an orange crest. It is the smallest of British birds, being only about 3½ inches in length, is very agile, and almost continually in motion. The eggs are nine or ten in number.

GOLDEN FLEECE, in classical myth. the fleece of gold in quest of which Jason undertook the Argonautic expedition to Colchis. The fleece was suspended in an oak tree in the grove of Ares (Mars), and was guarded by a dragon. When the Argonauts came to Colchis for the fleece, Medea put the dragon to sleep and Jason carried the fleece away.

GOLDEN FLEECE, Order of the, the Toison d'or, a military order instituted by Philip the Good, Duke of Burgundy, in 1429, on the occasion of his marriage with the Portuguese princess, Isabella. The order now belongs to both Austria and Spain. The knights carry suspended from their collars the figure of a sheep or fleece in gold.

GOLDEN HORN, the harbor of Constantinople, an inlet of the Bosphorus, so called from its shape and beauty.

GOLDEN-ROD, is a genus of plants, chiefly natives of North America. Most of the species have erect, rod-like, scarcely-branched stems, with alternate serrated leaves, and terminal spikes or racemes of small yellow flowers.

GOLDFINCH, a bird belonging to the Finch family. It is about five inches in entire length, black, scarlet, yellow and white being beautifully mingled in its

The common goldfinch.

plumage. The colors of the female are duller than those of the male. Its brilliant plumage, soft and pleasant song and docility make it a favorite cage-bird. Gold-finches feed on various kinds of seeds, particularly those of the thistle, dandelion, and groundsel.

GOLDFISH, the name of a beautiful species of carp, found in the fresh waters of China. It is greenish in color in the natural state, the golden yellow color being found only in domesticated specimens, and retained by artificial selection. These fishes are reared by the Chinese in small ponds, in basins, or porcelain vessels, and kept for ornament. By careful selection, many strange varieties and monstrosities have been propagated. They are now distributed over nearly all the civilized parts of the world, but in large ponds they readily revert to the color of the original stock.

GOLD LACE, a fabric woven of silken threads which are either themselves gilt or are covered with fine gilt silver wire. In the former the gold-leaf is fixed directly on the threads by means of gum. In the latter and finer kind the fine gilt silver wire is twisted compactly round the silk threads, which are then ready for being manufactured into lace.

GOLDSCHMIDT, MADAME. See Lind, Jenny.

GOLDSMITH, Oliver, poet and miscellaneous writer, born Nov. 10, 1728, at Pallas county Longford, Ireland, died in London April 4, 1774. In 1761 he was introduced to Dr. Johnson. In 1764 he appeared as a poet by the publication of

Oliver Goldsmith, from the statue by Foley.

his Traveler. In 1766 appeared his Vicar of Wakefield, which at once secured merited applause. His poetical fame was greatly enhanced by the publication of his Deserted Village in 1770. In 1773 he produced his comedy of She Stoops to Conquer, which was completely successful. He also compiled histories of England, Greece, and Rome; and a History of the Earth and Animated Nature, a pleasing work, but one of no scientific value. The manners of Goldsmith were eccentric, even to absurdity. As a poet, his Traveler and Deserted Village have given him a deserved reputation; and his Vicar of Wakefield is one of the best known and most delightful of English novels.

GOLF, a game played with clubs and balls, generally over large commons, downs, or links, where a series of small round holes are cut in the turf at distances of from 100 to 500 yards from each other, according to the nature of the ground, so as to form a circuit or round. The clubs are of different uses, and have different names according to the purpose for which they are respectively designed; as the driver, putter, brassey, mashie, cleek, iron, niblick, etc. The rival players are one on each side, or two against two, in which case the two partners strike the ball on their side alternately. The object of the game is, starting from the first hole, to drive the ball into the next hole with as few strokes as possible, and so on with all the holes in succession, the side which "holes" its ball on any occasion with the fewest strokes being said to gain the hole. The match is usually decided by the greatest number of holes gained in one or more rounds, or the aggregate number of strokes taken to hole one or more rounds. In medal play the score is always reckoned by strokes.

GOL'GOTHA. See Calvary.

GOLI'ATH, a giant of Gath slain by David (1 Sam. xvii.). His height was "six cubits and a span," which, taking the cubit at 21 inches, would make him a little over 11 feet. The Septuagint and Josephus read, "four cubits and a span."

GOLOSH'ES, a word introduced into our language from the French galoche, but originally derived from the Spanish galocha, meaning a wooden shoe or clog. It was formerly applied by the English to a kind of wooden clog. The name is now restricted to overshoes, now generally made of vulcanized india-rubber.

GOMEZ Y BAEZ, Maximo, Cuban general, born in 1826 at Bani, Santo Domingo. He served in the Spanish army in Santo Domingo and in Cuba. He left the Spanish army, settled down as a planter, and in the insurrection of 1868–78 joined the insurgents, and was made colonel by the Cuban president Céspedes. He became general-in-chief of the forces of the Republic of Cuba in 1895, when the second revolution broke out, and was especially active in Camaguey, where his perfect familiarity with the country stood him in good stead. He did little open fighting, but accomplished much by harassing the Spaniards and destroying their supplies. He put his small force at the disposal of the Americans as soon as they landed in Cuba, and was markedly friendly to this country. In March, 1899, he was deposed from his supreme command by the Cuban assembly for traitorously receiving for his army the three million of dollars voted by the United States government. He died in 1906.

GOMOR'RAH. See Sodom and Gomorrah.

GOM'PERS, Samuel, American labor leader, born in London, England, in 1850. He came to the United States in 1863, and in 1864 became the first registered member of the Cigar-makers' international union, of which he was secretary and president, and which he made one of the most successful of American trades unions. He was elected vice-president of the Federation of labor in 1881, and from 1882, with the exception of the year 1894, when he was defeated by John McBride, representing the coal-miners, was its president. Among the state and federal laws passed at his instance are the eight-hour law for government work, the ten-hour law for the employees of street railways, and that making the first Monday of September a legal holiday with the title "Labor Day." His writings include pamphlets on labor matters.

GON'DOLA, a sort of barge, curiously ornamented, and navigated on the canals of Venice. The middle-sized gondolas are upwards of 30 feet long and 4 broad; they always terminate at each end in a very sharp point, which is

raised perpendicularly to the height of a man. Toward the center there is a curtained chamber for passengers.

Gondola.

GON'FALON, an ensign or standard; especially an ensign having two or three streamers or tails, fixed on a frame made to turn like a ship's vane, or, as in the case of the Papal gonfalon, suspended

Gonfalon.

from a pole similarly to a sail from a mast. The person intrusted with the gonfalon in many of the mediæval republican cities of Italy was often the chief personage in the state.

GONG, a Chinese musical instrument made of an alloy of copper (about seventy-eight parts) and tin (about twenty-two parts), in form like a round flat dish with a rim 2 to 3 inches in depth. It is struck by a kind of drumstick, the head of which is covered with leather, and is used for the purpose of making loud sonorous signals, of marking time, and of adding to the clangor of martial instruments.

GONORRHŒA (gon-o-rē'a), a specific contagious inflammation of the male urethra or the female vagina, attended, from its early stages, with a profuse secretion of much mucus intermingled with matter. This secretion contains the contagion of the disease. Though termed a venereal disease, it is totally distinct from syphilis. It is a painful disease, and may result in the chronic catarrh called gleet, or may lead to stricture and other serious evils.

GONSAL'VO, Hernandez y Aguilar, de Cordova, Spanish soldier, called the great captain, was born at Montilla, near Cordova, in 1453, died at Granada 1515. He distinguished himself in the Portuguese war which began in 1475, and in the great war with the Moors, which ended with the conquest of Granada in 1492. In 1495 he was sent to assist Ferdinand II., king of Naples, against the French, who occupied the whole of that kingdom. In less than a year Gonsalvo drove the French over the Neapolitan frontiers, and returned to Spain, where he was engaged in subjecting the Moors in the Alpujarras, when Louis XII. of France renewed the war against Naples. Gonsalvo again took the field, and by the victory near Seminara in 1502 obtained possession of both Calabrias. In 1503 he gained a still more important victory near Cerignola, in consequence of which Abruzzo and Apulia submitted, and Gonsalvo marched into Naples. He then sat down before Gaëta. As the siege was protracted, he gave up the command to Don Pedro Navarro, and advanced to meet the enemy. He defeated the Marquis of Mantua; and on the Garigliano, with 8000 men, obtained a complete victory over 30,000 French, the consequence of which was the fall of Gaëta. The possession of Naples was now secured. He was viceroy in Italy until 1507, when, through the jealousy of the king and the calumnies of the courtiers, he was deprived of his office, and retired to Granada, where he died.

GONZAGA FAMILY, a famous Italian family who ruled over Mantua for over three centuries Many illustrious soldiers, statesmen, churchmen, and promoters and cultivators of arts, science, and literature sprang from this stock. They became extinct in 1708.

GOOD-FRIDAY, a fast of the Christian Church in memory of our Savior's crucifixion, kept on the Friday of Passion-week, that is the Friday before Easter. It has been celebrated from a very early period. In the Roman Catholic Church the celebration of this fast includes prayers for all classes of people, including heretics, schismatics, pagans, and Jews, and the "Adoration of the Cross," but no mass is celebrated. In Protestant churches, with but a few exceptions, the day is observed with more or less solemnity. The practice of eating "cross-buns" on this day has now no religious significance.

GOOD HOPE, Cape of. See Cape of Good Hope.

GOODRICH, Samuel Griswold, American author, born at Ridgefield, Connecticut, 1793; died 1860. He is best known as "Peter Parley," a pseudonym which he assumed in writing, editing, and compiling upwards of 100 children's books. In 1851 he acted as American consul at Paris, and published there in French a treatise on American Geography and History. He also wrote Recollections of a Lifetime; Sketches from a Student's Window; A History of all Nations; The Outcast and other Poems; and a general Natural History.

GOODS AND CHATTELS, a legal as well as popular phrase, in common use, to signify personal property. It is not unfrequently used in wills, but seldom in any other legal instrument; and when used in wills, it generally includes all the personal property of the testator. The two words are not identical in meaning, however, the term chattels being the more extensive in signification and including the other. The term goods corresponds closely in meaning to the bona of the common law, and to movables of the civil law, whereas, chattels includes as well certain rights in land.

GOOD TEMPLARS, a temperance brotherhood which combines the principles of teetotalism with certain mystic rites, imitated more or less from free masonry, having secret signs, passwords, and insignia peculiar to itself. It originated in New York in 1851, and extended to Britain in 1868. The organization consists of local "subordinate" lodges, county "district" lodges, national "grand" lodges, and an international "right worthy" grand lodge. A "juvenile order" is also attached.

GOOD-WILL, the benefit derived from a business beyond the mere value of the capital, stock, funds, or property employed in it, in consequence of the general public patronage and encouragement which it receives from constant and habitual customers. It is legally considered a subject of sale along with the stock, premises, fixtures, trade debts, etc.

GOOSE, the common name of a well-known family of natatorial birds. The domestic goose lives chiefly on land and feeds on grass; there are many varieties, but they do not differ widely from each other. It is valued for the table, and on account of its quills and fine soft feathers. The common wild goose, or grey-lag, which is migratory, is believed to be the original of the domestic goose. The Snow-goose of North America is 2 feet 8 inches in length, and its wings are 5 feet in extent. The bill of this bird is very curious, the edges having each twenty-three indentations or strong teeth on each side. The inside or concavity of the upper mandible has also seven rows of strong, projecting teeth, and the tongue, which is horny at the extremity, is armed on each side with thirteen long and sharp bony teeth. The flesh of this species is excellent. The Laughing or White-fronted Goose inhabits the northern parts of both continents, and migrates to the more temperate climates during the winter. The Bean-goose is also common to both continents. The Canada-goose is the common wild goose of the United States, and is known in every part of North America. It is also found in Europe, and even breeds in Britain.

GOOSEBERRY, a low, branching shrub, growing wild in Siberia and the north of Europe, other species being found in N. America. The branches are armed with numerous prickles, and bear three to five lobed leaves and inconspicuous flowers. The fruit is a succulent berry, very wholesome and agreeable, of various colors—whitish, yellow, green, and red. Gooseberries are popular fruits for preserving, and are extensively cultivated, being of very easy culture. They may be raised from slips, which is the usual mode of perpetuating varieties; new varieties are raised from seed. The plant of four years old produces the largest and finest fruit; afterward the fruit becomes smaller but increases in quantity. An American species has fine white flowers, and is cultivated as an ornamental shrub.

GOPHER, the name of various burrowing animals, natives of N. America. The pouched rat has large cheek-pouches extending from the mouth to the shoulders, incisors protruding beyond the lips, and broad, mole-like fore-feet. Several American burrowing squirrels also get this name, as also a species of

burrowing land-tortoise of the Southern States, whose eggs are valued for the table.

GOPHER-WOOD, the wood of which Noah's ark was built, but whether it was cypress, pine, or other wood is an unsettled point.

GORAKHPUR, a town of Hindustan, United Provinces, and division of Benares, capital of the district of same name, on the left bank of the Rapti. It has a considerable trade in grain and timber, sent down the Rapti to the Gogra and the Ganges. Pop. 64,148.—The district has an area of 4598 square miles. It is generally flat, and traversed by numerous streams of which the principal are the Rapti and larger Gandak. Pop. 2,994,057.

GORDIAN KNOT. See *Gordius.*

GORDIUS, in Greek legend, a Phrygian peasant, father of Midas, who was raised to the Phrygian throne in accordance with an oracle which declared to its Phrygian consulters that their seditions would ceasc if they elected as king the first man they met, mounted on a chariot, going to the temple of Zeus. This was Gordius, who, to evince his gratitude, consecrated his chariot to Zeus, and fastened the pole with so ingenious a knot that the oracle promised the dominion of the world to him who should untie it. Alexander the Great cut it with his sword, and to "cut the Gordian knot" became a proverb.

GORDON, Charles George, British soldier, known also as "Chinese Gordon" and Gordon Pasha, was born at Woolwich 1833, killed at Khartoum 1885. He entered the Royal Engineers in 1852, and served in the Crimea (1854–56). During the Taeping rebellion in China, Gordon succeeded in completely crushing the revolt by means of a specially-trained corps of Chinese, exhibiting marvelous feats of skilful soldiership. On his return to England with the rank of colonel he was appointed chief engineer officer at Gravesend, where his military talents and philanthropy were conspicuously displayed. From 1874 to 1879 he was governor of the Soudan under the Khedive. For a few months in 1882 he held an appointment at the Cape, and he had just accepted a mission to the Congo from the king of the Belgians, when he was sent to withdraw the garrisons shut up in the Soudan by the insurgent Mahdi. He was shut up in Khartoum by the rebels, and gallantly held that town for a whole year. A British expeditionary force under Lord Wolseley was despatched for his relief; an advance corps of which sighted Khartoum on 24th January, 1885, to find that the town bad been treacherously betrayed into the hands of the Mahdi two days before, and Gordon murdered. Gordon's character was marked by strong religious feelings, which latterly became so intensified as to make him somewhat of a religious enthusiast and fatalist.

GORDON, John Brown, American soldier and politician, was born in Upson co., Ga., in 1832. In 1861 he entered the confederate army as captain of infantry, and rose to the grade of lieutenant-general. At the time of General Lee's surrender at Appomattox, General Gordon commanded one wing of the army. From 1873 to 1880, and from 1891 to 1897, he was a member of the United States senate, where he was one of the leaders of the democratic party, and was known as an eloquent speaker. From 1887 to 1890 he was governor of Georgia. He died in 1904.

GORGET, a piece of body armor, either scale work or plate, for the protection of the throat. The camail, or throat covering of chain mail, which is sometimes called the gorget of mail, belonged more to the helmet than to the body armor.

GORGONS, in Greek mythology, three frightful goddesses whose names were Sthcno, Euryale, and Medusa. They were all immortal, except Medusa. Their hair was said to be entwined with serpents, their hands were of brass, their body was covered with impenetrable scales, their brazen teeth were as long as the tusks of a wild boar, and they turned to stones all those who looked upon them.

GORIL'LA, the largest animal of the ape kind. It attains a height of about 5½ feet or more, is found chiefly in the woody equatorial regions of Western Africa, is possessed of great strength and fierceness, is a great frequenter of trees,

Gorilla.

and feeds chiefly on vegetable substances, as roots and fruits. The erect position is more readily assumed by the gorilla than by most of the other anthropoid apes, owing to the shape of the sole of the foot, which is not inverted and is shorter and broader; but the ordinary gait is on all fours. It has a ferocious and brutal cast of features, due to the prognathism of the jaws, the extremely prominent supra-orbital ridges, and retreating forehead. Gorillas make a sleeping-place somewhat like a hammock, connecting the branches of a tree by means of the long, tough, slender stems of climbing plants, and lining it with dried fronds of palms or long grass. This abode is constructed at different heights from the ground, but there is never more than one such nest in a tree. The gorilla, like the chimpanzee, has thirteen ribs, whereas man and the orang have twelve. The gorilla and chimpanzee also have eight bones in the carpus or wrist, while the others have nine. The bones of the arm are much longer than in man, and the upper arm is longer than the forearm; the leg bones are shorter than in man. In the proportion of its molar teeth to the incisors and in the form of its pelvis it approaches somewhat closely the human form. It is less intelligent and docile than several other apes. The Phœnician navigator Hanno found the name in use in the 5th century B.C. in W. Africa.

GOR'KY, Maxim, a Russian author, was born at Nizhni-Novgorod in 1868. His story "Maker Chudra" appeared in the Tiflis Kavkaz in 1892, and was followed by a rapid series of works, of which Foma Gordyéeff, an international success, was the most noteworthy. Gorky's collected works appeared at Saint Petersburg in 1901. In 1906 he paid a short visit to the United States.

GORLITZ (geur'lits), a town in the Prussian government of Liegnitz, province of Silesia, on the left bank of the Neisse. It is well-built, having generally substantial houses, several large squares and spacious streets. Its industries include woolens, linens, and cottons, machinery, iron-founding, glass, porcelain, leather, soap, etc. The town was an important place for three centuries before the reformation; it afterward declined, but has rapidly increased in prosperity since the laying down of the railways; the population, which in 1831 was only 8000, was in 1906, 84,931.

GORMAN, Arthur Pue, American senator, was born in Howard co., Maryland, in 1839. In 1866 he was appointed collector of internal revenue in the fifth district of Maryland. In 1869 he was made general superintendent of the Chesapeake and Ohio canal company, and in 1872 its president. He was elected to the house of delegates in Maryland in 1870, and by re-election he held the office until 1875, during the last part of his term serving as the speaker. From 1875 to 1881 he was state senator. He was then elected United States senator and continued in that office until 1899. After three years of private life, he was again elected to the senate in 1902. He led the opposition to the force bill in 1889, and was one of the democratic senators who remodeled the Wilson tariff bill in 1894. He died in 1906.

GORTSCHAKOFF, Alexander Michaelovitch, Russian diplomatist, was born 1798, died 1883. He entered the diplomatic service in 1824, as secretary to the Russian embassy in London. His experience in diplomacy was extended in Vienna, Florence, Stuttgart, etc , and he showed considerable dexterity in securing the neutrality of Austria during the Crimean war. In 1856 he became minister of foreign affairs, and in 1862 chancellor of the empire. He was a prominent member of the Berlin Congress, 1878.

GORTSCHAKOFF, Prince Michael, Russian general, born in 1792, died 1861. He took part as an artillery officer in the battle of Borodino in 1812, and served in the subsequent campaigns of the allies against the French. He took a prominent part in

the Turkish war (1828–29); the Polish war (1831); the invasion of Hungary (1849); and in the war with Turkey and the western powers (1853–55). In the Crimea he held the command in Sebastopol during the siege. After the war he was made governor of Poland

GOSCHEN (gō'shen), George Joachim, politician and financier, born in London 1831, educated at Rugby and Oxford. He entered parliament in 1863. In 1865 he was sworn of the privy-council on becoming a member of the Russell ministry. In 1868 he became president of the poor law board, and subsequently first lord of the admiralty. In 1886 he succeeded Lord R. Churchill as chancellor of the exchequer under Lord Salisbury, and in 1895 he again took office under the same leader as first lord of the admiralty. In 1900 he was raised to the peerage as Viscount Goshen.

GOSHAWK, a raptorial bird of the hawk kind, The general color of the plumage is a deep brown, the breast and belly white. A full-grown female is 23 or 24 inches in length, the male a good deal smaller. It was formerly much used in falconry. This bird flies low, and pursues its prey in a line after it, or in the manner called "raking" by falconers. The female was generally flown by falconers at rabbits, hares, etc., and the larger-winged game, while the male was usually flown at the smaller birds, and principally at partridges.

GOSHEN, in ancient geography, a district of Egypt, which Joseph procured for his father and brethren. It is supposed that the land of Goshen lay between the eastern part of the ancient Delta and the western border of Palestine.

GOSPEL, Gospels. The Greek word for which gospel has been used as the equivalent is evangelion, or rather euaggelion, a good or joyful message. In the New Testament it denotes primarily the glad tidings respecting the Messiah and his kingdom—this was emphatically the gospel (Anglo-Saxon, gôd-spell, good tidings). It was quite naturally employed as a common title for the historical accounts which record the facts that constitute the basis of Christianity. It may be fairly said that the genuineness of the four narratives written by Matthew, Mark, Luke and John rests upon better evidence than that of any other ancient writings. They were all composed in the latter half of the first century; those of Matthew and Mark some years before the destruction of Jerusalem; that of Luke about the year 64; and that of St. John about the close of the century. Before the end of the 2d century we have abundant evidence that the four gospels as one collection, were generally used and accepted. While the early existence of these gospels has been admitted, much discussion has taken place regarding their origin, and their relation one to another. They seem to have been viewed as so many original and independent sources, each one as much so as the others. The critical spirit of modern times has refused to halt at this point; it has sought to get at, so to speak, the genealogy of the several gospels with their different degrees of relationship. Each of the four gospels has in turn been assumed by different critics to be the first out of which the others arose; and the theory has been more than once propounded of some prior, more strictly original document, no longer extant, which formed the common basis of them all. The supposition of an original document from which the three synoptical Gospels (those of Matthew, Mark, and Luke) were drawn, each with more or less modification, would naturally occur to those who rejected the notion that the evangelists copied from each other. The fourth Gospel, as the narrative coincides with that of the other three in a few passages only, is not drawn in to the discussion, and the received explanation is the only satisfactory one with respect to it, namely, that John, writing last, had seen the other gospels, and purposely abstained from writing anew what had been sufficiently recorded. Another conjecture is that the gospels sprang out of a common oral tradition. According to this view of the origin of the gospels, that of Mark, if not the oldest in composition, is yet probably the most direct and primitive in form; it is the testimony delivered by Peter, possibly with little alteration. The Gospels of Matthew and Luke, again, "represent the two great types of recension to which it may be supposed that the simple narrative was subjected. Luke represents the Hellenic, and Matthew the later Hebraic form of the tradition, and in its present shape the latter seems to give the last authentic record of the primitive Gospel." A comparison of the three synoptical Gospels yields some interesting results. If we suppose the history they contain to be divided into sections, in forty-two of these all the three narratives coincide; twelve more are given by Matthew and Mark only, five by Mark and Luke only, and fourteen by Matthew and Luke. To these must be added five peculiar to Matthew, two to Mark, and nine to Luke. But this applies only to general coincidence as to the facts narrated; the number of passages either verbally the same, or coinciding in the use of many of the same words, is much smaller. Briefly stated the critical result is as follows: There is a singular coincidence in substance in the three synoptical gospels. The verbal and material agreement is such as does not occur in other authors who have written independently of one another. The agreement would be no difficulty without the differences; it would only mark the one divine source from which they were all derived. The difference of form and style, without the agreement, would offer no difficulty, since there may be a substantial harmony between accounts that differ greatly in mode of expression and the very difference might be a guarantee of independence. Several biographies of Jesus and the holy family written by unknown authors of the 2d, 3d and later centuries are known as Apocryphal Gospels. They have no historical nor doctrinal value whatever. The titles of the best known of these are: The Gospel of James, The Gospel of Joseph the Carpenter; The Gospel of Thomas, The Gospel of Nicodemus, The Acts of Pilate, and his Letter to Tiberias, etc.

GOS'SAMER, is the name of a fine filmy substance, like cobweb, which is seen to float in the air in clear days in autumn, and is most observable in stubble-fields, and upon furze and other low bushes. This is formed by several kinds of small spiders, and only, according to some, when they are young.

GOTHARD, St., a mountain group, Switzerland, on the confines of the cantons Tessin and Uri, belonging to the Lepontine or Helvetian Alps, which it connects with the Bernese Alps. It forms a kind of central nucleus in the great watershed of Europe. Its culminating point has a height of 10,600 feet. The Col of St. Gothard, at its summit level, where the Hospice stands, is 6808 feet high. Over it an excellent carriage road was completed in 1832. A railway tunnel has been pierced through this mountain group between Göschenen on the north and Airolo on the south, thus directly connecting the railway system of North Italy with those of Switzerland and Western and Central Germany. This tunnel is the longest in the world, being of the total length of 16,295 yards, or rather more than 9¼ miles. Its construction, begun in 1872, was completed in 1881, and it was opened for traffic early in 1882.

GOTHIC ARCHITECTURE, a term applied to the various styles of pointed architecture prevalent in Western Europe from the middle of the 12th century to the revival of classic architecture

Gothic architecture—Salisbury cathedral.

in the 16th. The chief characteristics of Gothic architecture are: The predominence of the pointed arch and the subserviency and subordination of all the other parts to this chief feature; the tendency through the whole composition to the predominance and prolongation of vertical lines; the absence of the column and entablature of classic architecture, of square edges and rectangular surfaces, and the substitution of clustered shafts, contrasted surfaces, and members multiplied in rich variety. This style orginated in France and

spread very rapidly to England, Germany, Italy, Spain, and the Scandinavian countries. In England it was introduced by William of Sens, who built Canterbury Cathedral in 1174, and here followed an independent course of development. The Gothic architecture of Britain has been divided into four principal epochs—the Early English, or

Gothic Architecture.
ab, Early English windows. *c*, Transition. *d*, Geometrical. *e*, Perfect decorated. *fg*, Perpendicular.

general style of the 13th century; the Decorated, or style of the 14th century; the Perpendicular, practiced during the 15th and early part of the 16th century (Flamboyant being the contemporary style in France); and the Tudor, or general style of the 16th century.

GOTHS, an ancient Teutonic tribe occupying when first known to history the region adjacent to the Black Sea north of the lower Danube. A people of similar name is mentioned by Tacitus as dwelling south of the Baltic, and Geats or Gauts are known to us from the the Anglo-Saxon poem Beowulf as inhabitants of southern Sweden; but there is no necessary connection between these and the Goths proper. About the middle of the 3d century these began to encroach on the Roman Empire. Having seized the Roman province of Dacia, they were assailed by Decius, whom they twice defeated. In 253 they captured Trebizond, where a large fleet of ships fell into their hands. With this force they sailed down the Ægean and plundered the coasts of Greece and Illyria. They now began to threaten Italy, but in 269 they were defeated with great slaughter by the Emperor Claudius. His successor Aurelian was, notwithstanding, compelled to cede to them the large province of Dacia, after which there was comparative peace between them for many years. In the 4th century the great Gothic kingdom extended from the Don to the Theiss, and from the Black Sea to the Vistula and the Baltic. About the year 369 internal commotions produced the division of the Gothic kingdom into the kingdom of the Ostrogoths (eastern Goths) and the kingdom of the Visigoths (western Goths). In 396 Alaric, king of the Visigoths, made an irruption into Greece, laid waste the Peloponnesus, and became prefect of Illyria. He invaded Italy and sacked Rome in 409, and a second time in 410. After his death (in 410) the Visigoths succeeded in establishing a new kingdom in the southern parts of Gaul and Spain, of which, toward the end of the 5th century, Provence, Languedoc, and Catalonia were the principal provinces, and Toulouse the seat of government. The last king, Roderick, died in 711 in battle against the Moors, who had crossed from Africa, and subsequently conquered the Gothic kingdom. After the fall of the Western Roman Empire, by the invasion of Odoacer in 476, the Eastern emperor, Zeno, persuaded Theodoric, king of the Ostrogoths, to invade Italy in 489. The Goth became king of Italy, in 493, and laid the foundation of a new Ostrogothic kingdom, which, together with Italy, comprised Rhætia (a part of Switzerland and the Tyrol), Vindelicia (part of Bavaria and Swabia), Noricum (Saltzburg, Stiria, Carinthia, Austria), Dalmatia, Pannonia (Further Hungary, Slavonia), and Dacia beyond the Danube (Transylvania, Walachia). This kingdom came to an end in 554. Subsequently the Goths both here and in Spain entirely disappeared as a distinct people.

GOTTENBURG, or **GOTHENBURG,** a seaport town in Sweden, the second in respect of population and trade, capital of the län of the same name, situated at the mouth of the Göta, in the Kattegat,

255 miles w.s.w. Stockholm, intersected by canals. It is one of the best built towns in Sweden, and the seat of a bishopric. It has manufactures of sailcloth, cotton, and other goods, and possesses ship-building yards, tobacco factories, breweries, sugar refineries, etc. Pop. 130,619.

GOTTINGEN (geut'ing-en), a town of Prussia, province of Hanover, on the Leine, 59 miles s.s.e. Hanover. Its chief attraction is the university, founded in 1734 by George II. of England and elector of Hanover, opened in 1737 and which has a European reputation. It has an average attendance of over 1000 students. Connected with the university are a museum, an observatory, an anatomical theater, botanical garden, and a library possessed of 500,000 printed volumes and 5000 MSS. The manufactures comprise woolens, chemicals, scientific instruments, etc. Pop 30,234.

GOTTLAND, or **GOTHLAND,** an island of the Baltic, belonging to and 55 miles east of the coast of Sweden. Pop. 52,570

GOULD, Benjamin Apthorp, American astronomer, was born in Boston, Mass., in 1824. In 1852 he was appointed director of the longitude determinations of the coast survey, and in 1867, after having organized and greatly developed this service, retired. From 1855 to 1859 he was director of the Dudley observatory, at Albany, N. Y., and in 1866 he established by means of the Atlantic cable, the relations in longitude between America and European stations. In 1870 he established at Cordoba, Argentina, the National observatory, where he accumulated the material for his Uranometria Argentina and Catalogo de Zonas Estelares, both classic in the literature of astronomy. In 1872 with the assistance of the Argentine government, he further established a system of meteorological stations extending southward to Tierra del Fuego and eastward to the Atlantic. He died in 1896.

GOULD, Helen Miller, American philanthropist, was born in New York City in 1868. At the commencement of the Spanish-American war she presented $100,000 to the United States government, and during the war, as a member of the women's national war relief association, was prominently active. She gave $50,000 for necessary supplies for the care of soldiers in hospitals, and at Camp Wyckoff, near Montauk point, Long Island, did personal work in that connection. Her benefactions to New York university have also been notable, and include the library building of the university, with its well-known "Hall of Fame."

GOULD, Jay, an American capitalist, born in 1836 in Roxbury, Delaware co., N. Y. In the great financial depression following the panic of 1857 he bought a controlling interest in the Rutland and Washington railroad running from Troy, N. Y., to Rutland, Vt., for 10 cents on the dollar. Of this company he became president, treasurer, and general manager, and subsequently brought about a consolidation of his road and the Rensselaer and Saratoga Railroad. In 1859 he sold out his stock in the consolidated roads at 120, and removed to New York, where he embarked in the brokerage business. By methods new in railway speculation Gould secured control of the Erie railroad, and in 1868 was elected its president. The manipulation of the Erie was the first of a long series of speculations by which Gould obtained the mastery of some of the greatest railway corporations in the country. In 1880 he controlled fully 10,000 miles of road, more than one-ninth of the mileage of the country. Gould also consolidated competing telegraph lines into the Western Union system in 1881, and obtained control of the Manhattan elevated railroad in the same year. He died in 1892.

GOUNOD (gō-nō), Charles François, French operatic composer, born at Paris, 1817; his first important work was

Faust (1859), which raised him to a high rank among composers. Other operas followed, among which are Mireille (1864), Romeo et Juliette, Cinq Mars (1877), and Polyeucte (1878). He wrote also a Messe Solennelle, a motet Gallia, and other choral works and songs; oratorios, Redemption (1882), Mors et Vita (1885), and a Mass for the Jeanne D'Arc festival (1887). He died in 1893.

GOURD (gŏrd), the popular name of a genus of plants. The same name is given to the different kinds of fruit produced by the various plants of this genus. These are held in high estimation in hot countries; they attain a very large size,

Flower and fruit of squash.

and most of them abound in wholesome nutritious matter. The pumpkin, acquires sometimes a diameter of 2 feet. The squash is cultivated in America as an article of food. The water melon serves the Egyptians for meat, drink and physic. The orange-fruited gourd is cultivated only as a curiosity, and is a native of the East Indies. The bottle gourd, a native both of the East and West Indies, is edible, and is often 6 feet long and 18 inches in circumference. The outer coat or rind serves for bottles and water-cups.

GOUT, a form of arthritis, a constitutional disorder giving rise to paroxysms of acute pain with a specific form of inflammation, appearing after puberty chiefly in the male sex, and returning after intervals. It is often preceded by, or alternates with, disorder of the digestive or other internal organs, and is generally characterized by affection of the first joint of the great toe, by nocturnal exacerbations and morning remissions, and by vascular plethora; various joints, organs, or parts becoming affected after repeated attacks without passing into suppuration. It may be acquired or hereditary. In the former case it rarely appears before the age of thirty-five; in the latter, it is frequently observed earlier. It appears that the disease is due to an excess of uric acid in the blood, this either being formed in the body in too large quantity, or not being removed from the blood by the kidneys in the urine as it ought to be. Indolence, inactivity, and too free use of tartareous wines, fermented liquors, and very high-seasoned and nitro-genous foods, are the principal causes which give rise to this disease. Gout is also called, according to the part it may affect, Podagra (in the feet), Gonagra (in the knees), Chiragra (in the hands), etc. It may be acute or chronic, and may give rise to concretions, which are chiefly composed of urate of soda. Strict regulation of the habits of life is one of the most important elements in the treatment of gout.

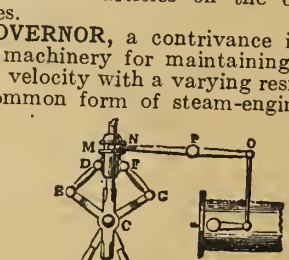
GOV'AN, a town of Scotland, county of Lanark, on the left bank of the Clyde, to the west of Glasgow, of which it forms a suburb. It is the site of extensive ship-building yards, engineering works, dye-works, etc. Pop. of town 82,174.

GOVERNMENT, is a word used in common speech in various significations. It denotes the act of governing, the persons who govern, and the mode or system according to which the sovereign powers of a nation, the legislative, executive, and judicial powers are vested and exercised. See Aristocracy, Democracy, Monarchy, Oligarchy, Republic, Local Government, etc.

GOVERNMENT LAND, all land within the United States the title to which is not in a state or an individual. This includes all land occupied for governmental purposes, as for military or naval posts and stations, public buildings, etc., but the term is popularly used as being synonymous with "public lands." In this sense, only such land, owned by the government, as is unsurveyed and open to sale or occupation under the "homestead laws," is included. Land may be acquired by the government for public use under the power of eminent domain, and property thus acquired would be "government land" in the broadest sense, but not as the term is commonly used, as such lands would not be open to public occupation and pre-emption.

GOVERNOR, the chief executive officer in the states of the American union. He is elected by the people of the state, and his rights and duties are, in general, those usually associated with the head of the executive department in a republican form of government, namely, the appointment of certain classes of officials, the exercise of the pardoning power and the right of veto and the command of the state militia. The term of office and the specific limitations of the governor's powers vary naturally, from state to state, and will be found under the heading Constitution, in the articles on the different states.

GOVERNOR, a contrivance in mills and machinery for maintaining a uniform velocity with a varying resistance. A common form of steam-engine gov-



Governor of a steam-engine.

ernor consists of a pair of balls A B suspended from a vertical shaft kept in motion by the engine. When the engine goes too fast the balls fly farther asunder and depress the end of a lever N P which partly shuts a throttle-valve, and diminishes the quantity of steam admitted into the cylinder; and on the other hand, when the engine goes too slow, the balls fall down toward the spindle and elevate the valve, thus increasing the quantity of steam admitted into the cylinder. By this ingenious contrivance, therefore, the quantity of steam admitted to the cylinder is exactly proportioned to the resistance of the engine, and the velocity kept constantly the same. A similar contrivance is employed in mills to equalize the motion of the machinery. When any part of the machinery is suddenly stopped, or suddenly set agoing, and the moving power remains the same, an alteration in the velocity of the mill will take place, and it will move faster or slower. The governor is used to remedy this.

GRAAFIAN VESICLES, in anatomy, numerous small globular transparent follicles found in the ovaries of mammals. Each follicle contains one ovum, which is expelled when it reaches maturity. Small at first, and deeply imbedded in the ovary, they gradually approach the surface, and finally burst and discharge the ovum.

GRACCHUS, a Roman family of the Sempronian gens, several members of which have become historical: Tiberius Sempronius Gracchus, a general of the Second Punic war, was consul 215 B.C., defeated Hanno 214 B.C., and was killed 212 B.C.—Another Tiberius Sempronius Gracchus became consul 178 B.C., and again 163 B.C. He married Cornelia, a daughter of Scipio Africanus, and was the father of the two most celebrated Gracchi, Tiberius Sempronius and Caius, the former born about 169 B.C., killed 133 B.C., the latter born 159 B.C., killed 121 B.C. The brothers having lost their father early, received from their mother Cornelia a careful education. At a more advanced age their minds were formed and ennobled by the Greek philosophy. Tiberius early made himself conspicuous in the military service. Under the command of his brother-in-law, the younger Scipio, he served at the siege of Carthage. While he was yet a mere youth he was received into the College of Augurs, an honor usually conferred only upon distinguished statesmen. He was subsequently quæstor to the Consul Mancinus, and was employed in the Numantian war, in which he greatly distinguished himself by the conclusion of a treaty by which he saved the lives of 20,000 men who were entirely at the mercy of the Numantines. In 133 B.C., he offered himself as a candidate for the tribuneship, which office rendered his person inviolable so long as he was invested with it, and place him in a situation to advance his great plans for the improvement of the condition of the people in a legal way. The aristocracy and the tribune Marcus Octavius, whose veto retarded the passage of the bill. Tiberius, however, by managing all the prerogative of his office, managed to pass his bill, and three commissioners were appointed to carry it into execution, namely, Tiberius himself, his brother Caius, and his father-in-law Appius Claudius. He was accused of having violated his office; of aspiring to be king; and at the next election for the tribuneship he was slain, with 300 of his followers, at the entrance to the

Temple of Fides. Ten years after the death of his brother Tiberius, the younger Gracchus obtained the tribuneship. Several popular measures gained him great favor with the people, but the intrigues of the nobles ultimately caused his fall. A tumult, in which a lictor of Opimius was killed, gave the senate a pretense for empowering the consuls to take strong measures. Opimius made an attack upon the supporters of Gracchus with a band of disciplined soldiers. Nearly 3000 were slain, and Gracchus escaped to the grove of the Furies, where he was slain at his own request by a slave, who then killed himself.

GRACE, Days of, in commerce, a certain number of days immediately following the day, specified on the face of a bill or note, on which it becomes due. Till the expiry of these days payment is not necessary. In Britain and America the days of grace are three. Austria (three days) and Russia (ten days) are the only other countries which allow days of grace.

GRACES (Greek, Charities, translated by the Romans Gratiæ), the goddesses of grace, from whom, according to Pindar, comes everything beautiful and agreeable. According to most poets and mythologists they were three in number, the daughters of Zeus and Eurynomè, and Hesiod gives them the names of Aglaïa (brilliancy), Thalia (the blooming), and Euphrosynè (mirth). Homer mentions them in the Iliad as handmaids of Hera (Juno); but in the Odyssey as those of Aphroditè (Venus), who is attended by them in the bath, etc. He conceived them as forming a numerous troup of goddesses, whose office it was to render happy the days of the immortals. The three graces are usually represented slightly draped or entirely nude, locked in each other's embraces, or hand in hand.

GRA'DIENT, in roads and railways, a term used to signify the departure of the track from a perfect level, usually expressed as a fraction of the length: thus 1 in 250 signifies a rise or fall of 1 foot in 250 feet measured along the line.

GRADUATION, the art of dividing into the necessary spaces the scales of mathematical, astronomical, and other philosophical instruments. Common graduation is simply effected by copying from a scale prepared by a higher process; original graduation is chiefly performed either by stepping or bisection. Stepping consists in ascertaining by repeated trial with finely-pointed spring dividers—which are made, as it were, to proceed by successive steps—the size of the divisions required, their number being known, and then finally marking them. In bisection the beam compasses are used, an arc with a radius of nearly half the line being described from either end of the line, and the short distance between the arcs bisected with the aid of a magnifier and a fine pointer. The process is repeated, for each of the two halves thus obtained, until by subdivision the required graduation is obtained. Ordinary instruments are graduated by machines, most of which are based upon the principle of that invented by Ramsden in 1766.

GRADY, Henry Woodfen, American journalist, was born at Athens, Ga., in 1851. In 1880 he purchased an interest in and became editor of the Atlanta Constitution. In 1886 he delivered a speech in New York on "The New South," which attracted considerable notice. Mr. Grady was one of the first prominent representatives of the New South to express the willingness of that generation and section to throw in their lot with the rest of the nation. He died in 1889.

GRAFTING, an operation by which a bud or scion of an individual plant is inserted upon another individual, so as to become organically united with the stock on which it has been placed. Grafting can only take place between plants which have a certain affinity, individuals of the same species, genus,

Splice-grafting. Saddle-grafting. Cleft-grafting.

or order. The graft does not become identified with the stock to which it is united, but retains its own peculiarities of variety or species. The parts between which grafting is effected must be actively vegetating. The advantages derived from grafting are the preservation of remarkable varieties, which could not be reproduced from seed; the more rapid multiplication of particular species and the anticipation of the period of fructification, which may thus be advanced by several years. The principal methods of grafting are—1. By approach.—This process is intended to unite at one or more points two plants growing from separate roots. Plates of bark of equal size are removed, the wounds are kept together and protected from air. Stems, branches, or roots may be united in this way. 2. By scions.—Under this head there are a variety of methods, such as whip, splice, cleft, saddle, crown grafting, etc. In whip-grafting or tongue-grafting the stock is cut obliquely across and a slit or very narrow angular incision is made in its center downward across the cut surface, a similar deep incision is made in the scion upward, at a corresponding angle, and, a projecting tongue left, which being inserted in the incision in the stock, they are fastened closely together. Splice-grafting is performed by cutting the ends of the scion and stock completely across in an oblique direction, in such a way that the sections are of the same shape, then laying the oblique surfaces together so that the one exactly fits the other, and securing them by tying or otherwise. In cleft-grafting, the stock is cleft down, and the graft, cut in the shape of a wedge at its lower end, is inserted into the cleft; while, in saddle-grafting, the end of the stock is cut into the form of a wedge, and the base of the scion, slit up or cleft for the purpose, is affixed. Crown-grafting or rind-grafting is performed by cutting the lower end of the scion in a sloping direction, while the head of the stock is cut over horizontally and a slit is made through the inner bark. A piece of wood, bone, ivory, or other such substance, resembling the thinned end of the scion, is inserted in the top of the slit between the alburnum and inner bark and pushed down in order to raise the bark, so that the thin end of the scion may be introduced without being bruised. The edges of the bark on each side are then brought close to the scion, and the whole is bound with matting and a lump of clay put round it. 3. By buds.—This consists in transferring to another stock a plate or bark, to which one or more buds adhere. Bud-grafting is the most commonly practiced, especially for multiplying fruit-trees and roses, owing to the facility with which it may be performed.

GRAIL, the legendary holy vessel, supposed to have been an emerald, from which Christ dispensed the wine at the last supper. It was said to have been brought to England by Joseph of Arimathea, but to have been taken back to heaven until the appearance of heroes worthy to be its guardians. Titurel, a descendant of the Asiatic prince Perillus, whose descendants had allied themselves with the family of a British sovereign, was chosen as its keeper. He erected for it a temple on the model of that at Jerusalem, and organised a band of guardians. It was visible only to the baptized and pure of heart. With this legend that of King Arthur became connected. Three of his knights, Galahad, Percival, and Bors, had sight of it, and on the death of Percival, its last guardian, it was again taken to heaven.

GRAIN, includes all those kinds of grass which are cultivated on account of their seeds for the production of meal or flour. All kinds of grain contain in varying quantities the following elements: gluten, fecula or starch, a sweet mucilage, a digestible aromatic substance contained in the hulls, and moisture, which is predominant even in the driest grain, and serves, after planting, to stimulate the first motions of the germ.

GRAIN ELEVATOR. See Elevator.

GRAIN-LEATHER, dressed horse-hides, goat-skins, seal-skins, etc., blacked on the grain side, that is the hair side, for shoes, boots, etc.

GRAIN-MOTH, a minute moth whose larvæ or grubs devour grain in granaries. The moths have narrow, fringed wings, of a satiny luster.

GRAINS OF PARADISE, Guinea grains or Malaguetta pepper, a plant of tropical Western Africa. They are chiefly used in cattle medicines and to give a fiery pungency to cordials. The "Grain Coast" of Africa takes its name from the production of these seeds in that region.

GRALLATO'RES, an order of birds which formerly included the heron, ibis, stork; but these are now put into an-

other order, and the Grallatores, properly so called, consist of the following families, namely, those of the snipe, stint, and ruff; the red-shanks, greenshanks, and sand-pipers; the curlews, phalaropes, stilts, and avocets; the plovers, oyster-catchers, turnstones, lap-

Grallatores—Head and foot of crane.

wings, coursers; the jacanas, the bustards; the rails and coots; and the cranes. They are generally known as wading-birds, as they frequent shores and banks of streams, marshes, etc., and their legs and beak are commonly rather long.

GRAMMAR, in reference to any language, is the system of rules, principles, and facts which must be known in order to speak and write the language correctly. Comparative grammar treats of the laws, customs, and forms which are shown by comparison to be common to various languages; general or universal grammar, of those laws which, by logical deduction, are demonstrated to be common to all. The divisions of grammar vary with the class and also with the method of treatment. In common English grammars the division is generally fourfold: Orthography, which treats of the proper spelling of words, and includes orthoepy, treating of the proper pronunciation; etymology, which treats of their derivations and inflections; syntax, of the laws and forms of construction common to compositions in prose and verse; prosody, of the laws peculiar to verse. Although the systematization of grammar had begun in some sort in Plato's time it was chiefly to the Alexandrian writers that it owed its development. The first Greek grammar for Roman students was that of Dionysius Thrax, in use about 80 B.C. Comparative grammar can only be said to have existed from the beginning of the last century, when the critical study of Sanskrit established the affinities of the languages of the Indo-European group. The names of Bopp, Grimm, Pott, Schleicher, Müller, etc., are especially associated with its development.

GRAMMAR-SCHOOLS, an old name of a class of schools at which a secondary education is given, as a preparation for a university course. The term seems to have arisen from the once almost exclusive occupation of these schools in the teaching of the elements or grammar of the Latin and Greek languages. In England the character of the teaching in secondary schools, where not restricted by endowments, is necessarily influenced by the course of instruction in the universities, in which the classical element still preponderates.

The term Grammar School is now used in the United States to designate the upper grades, ordinarily the fourth to the eighth, inclusive, of the common school, in which not only grammar, but also arithmetic, geography, history, elements of natural science, usually drawing, some form of manual training, and sometimes elementary algebra or geometry, with a foreign language, enter into the curriculum.

GRAMME, the unit of weight in France = 15.4323 grains. A decagramme or ten grammes 5.644 drams; a hectogramme (100 grammes) = 3.527 oz.; a kilogramme (1000 grammes) = 2.205 lbs.; a myriagramme (10,000 grammes) = 22.046 lbs.

GRAMPUS, a name for several marine cetaceous mammals allied to the dolphins, especially those of the Atlantic and North Sea, which grow to the length of 25 feet, and is remarkably thick in proportion to its length. The spout-hole is on the top of the neck. The color of the back is black; the belly is of a snowy whiteness, and on each shoulder is a large white spot. The grampus is carnivorous and remarkably voracious, even attacking the whale.

GRANADA (grȧ-nä′dȧ), a city in the south of Spain, capital of the province of Granada. The streets rise picturesquely above each other, with a number of turrets and gilded cupolas, the whole being crowned by the Alhambra, or palace of the ancient Moorish kings. In the background lies the Sierra de Nevada, covered with snow. Its university was founded about 1530, and is attended by some 1000 students. The city was founded by the Moors before 800, and from 1036 to 1234 was included in the Kingdom of Cordova. In 1235 it became the capital of the Moorish kingdom of Granada, and attained almost matchless splendor. In 1491 it remained the last stronghold of the Moors in Spain, but was taken by the Spaniards under Ferdinand and Isabella in 1492, along with the kingdom having a population of perhaps 500,000. Its prosperity continued almost without diminution till 1610, when the decree expelling the Moors from all parts of Spain told severely upon it, and it has never recovered. Pop. 75,054.—The province, which is partly bounded by the Mediterranean, has an area of 5610 sq. miles. Pop. 478,846.

GRANADA, formerly a Moorish kingdom in Spain, bordering on the Mediterranean, now represented by the three provinces, Granada, Almeria, and Malaga; area, 11,000 sq. miles. In 1492 it passed into the possession of the Spaniards.

GRAN CHACO, El, a territory of the Argentine Republic, lying mainly between the Vermejo, Paranȧ, and Salado. It is inhabited by various Indian tribes, the total Indian population being estimated at from 20,000 to 40,000.

GRAND ARMY OF THE REPUBLIC, shortly after the close of the civil war, Dr. B. F. Stephenson, who had been a surgeon in a volunteer regiment suggested the organization of Union veterans into a national association for mutual assistance. The first post was formed at Decatur, Ill., April 6, 1866. The objects of the order were "to maintain and strengthen the fraternal feelings which bind together the soldiers, sailors and marines who united to suppress the Rebellion; to perpetuate the memory of those who have died and to lend assistance to the needy veterans and their widows and orphans." The "post" is the local organization, the "department" is the state or territorial organization. National annual meetings called encampments are held. On these occasions and in its parades the members wear a dark blue uniform and black slouch hat. The official badge consists of a miniature strap and ribbon showing the national flag from which is hung the brass star of the membership badge. Although in 1869 The Grand Army declared against participation in partisan politics, yet its close organization and the preponderance of republicans in its ranks made it a strong factor in politics and every republican president from Grant to McKinley was a veteran of the civil war and polled practically the entire Grand Army vote. The organization also has influenced pension legislation. Its membership has been dwindling rapidly through deaths and it is now less than 200,000.

GRAND-DUKE, the title of the sovereign of several of the states of Germany, who are considered to be of a rank between duke and king; also applied to members of the imperial family of Russia.

GRANDEE′, in Spain a noble of the first rank, which consisted partly of the relatives of the royal house, and partly of such members of the high feudal nobility distinguished for their wealth as had, by the grant of a banner received from the king, the right to enlist soldiers under their own colors.

GRAND JURY. See Jury.

GRAND JURY, the institution of the grand jury dates from the times of the Saxons when it had much the same function as now being present at the opening of each term of court for the purpose of inquiring into the charges of offenses and returning to the court its opinion thereof. Today in America and in England its functions are practically as in the olden days. The charges against the accused are laid before the grand jury and the duties of the members is to inquire whether there is sufficient prima facie evidence to require a trial. For this purpose it may summon witnesses which are usually for the prosecution, the witnesses for the defense not appearing until the prisoner is brought to trial, before the petit jury. If the prima facie evidence is sufficient a bill of indictment is returned. The grand jury also is supposed to inquire into all matters affecting the general conditions of the public weal and often makes investigations of public abuses with recommendations for their reform.

GRAND PRE, a beautiful village on the basin of Minas, King's county, Nova Scotia; the scene of Longfellow's Evangeline. The French settlers there were expelled by Virginian colonists in 1613. Pop. 1600.

GRAND RAPIDS, county seat of Kent co., Michigan, situated on the rapids of the Grand river, 40 miles from its mouth. It is handsomely built, and has a pleasant and healthy situation. It is connected with the railway system of the United States and Canada, and is an

important center for the distribution of pine and hard-wood lumber. It has large manufactures of furniture, wooden ware, agricultural implements, brushes, machinery, etc. Pop. 1909. 114,000.

GRANGE, in the United States, a combination, society, or lodge of farmers for the purpose of promoting the interests of agriculture, more especially for abolishing the restraints and burdens imposed on it by the commercial classes, the railroad and canal companies, etc., and for doing away with middlemen. Granges originated in the great agricultural regions of the Mississippi, and still prevail most generally there.

GRANGERS, the local lodges of the patrons of husbandry organized in 1867 at Washington were called granges and hence the nickname of the secret society. Its object was to aid the farmers by enabling them to co-operate and purchase their supplies at first hand and by offering opportunities for social and intellectual improvement. Lack of business training caused financial reverses in many of the enterprises which were undertaken. Entering politics the association in the middle west threw its support to candidates representing their theories and in 1873 and 1874 carried the legislatures of Illinois and Wisconsin which passed stringent laws directed against "extortion and unjust discrimination in the rates charged for the transportation of passengers and freights." The acts were subsequently repealed when the grangers lost their influence.

GRAN'ILITE, indeterminate granite; granite that contains more than three constituent parts.

GRANIL'LA, the dust or small grains of the cochineal insect.

GRANITE, an unstratified rock, composed generally of the minerals quartz, felspar, and mica, mixed up without regular arrangement of the crystals. The grains vary in size from that of a pin's head to a mass of 2 or 3 feet, but they seldom exceed the size of a large gaming die. When they are of this size or larger, the granite is said to be "coarse-grained." Granite is an igneous or fire-formed rock which has been exposed to great heat and pressure deep down in the earth. It is one of the most abundant of the igneous rocks seen at or near the surface of the earth, and was formerly considered as the foundation rock of the globe, or that upon which all sedimentary rocks repose; but it is now known to belong to the various ages from the Pre-Cambrian to the Tertiary, the Alps of Europe containing granite of the later age. In Alpine situations it presents the appearance of having broken through the more superficial strata; the beds of other rocks in the vicinity rising toward it at increasing angles of elevation as they approach it. It forms some of the most lofty of the mountain chains of the eastern continent, and the central parts of the principal mountain ranges of Scandinavia, the Alps, the Pyrenees, and the Carpathian Mountains are of this rock. Granite supplies the most durable materials for building, as many of the ancient Egyptian monuments testify. It varies much in hardness as well as in color, in accordance with the nature and proportion of its constituent parts, so that there is much room for care and taste in its selection. Granite in which felspar predominates is not well adapted for buildings, as it cracks and crumbles down in a few years. The Aberdeen bluish-gray granite is celebrated for its great durability, and also for its beauty. The Peterhead red granite, the hue of which is due to its felspar being the flesh-colored potash variety called orthoclase, is highly esteemed for polished work, as columns, pillars, graveyard monuments, etc. Granite, in which mica is replaced by hornblende is called syenite; when both mica and hornblende are present it is called syenitic granite; when talc supplants mica it is called protogene, talcose, or chloritic granite; a mixture of quartz and hypersthene, with scattered flakes of mica, is called hypersthenic granite; and the name of graphic granite, or gepmatite, is given to a variety composed of felspar and quartz, with a little white mica, so arranged as to produce an irregular, laminar structure. When a section of this latter mineral is made at right angles to the alternations of the constituent materials, broken lines resembling Hebrew characters present themselves; hence the name. Granite abounds in crystallized earthy minerals; and these occur for the most part in veins traversing the mass of the rock. Of these minerals beryl, garnet, and tourmaline are the most abundant. It is not rich in metallic ores. The oriental basalt, found in rolled masses in the deserts of Egypt, and of which the Egyptians made their statues, is a true granite, its black color being caused by the presence of hornblende and the black shade of the mica. The oriental red ganite chiefly found in Egypt, and of which Pompey's Pillar and Cleopatra's Needles were constructed, is composed of large grains or imperfectly formed crystals of flesh-colored felspar, of transparent quartz, and of black hornblende.

GRANT, in law, a gift in writing of such a thing as cannot be passed or conveyed by word only; thus, a grant is the regular method by the common law of transferring the property of incorporeal hereditaments, or such things whereof no actual delivery of possession can be had.

GRANT, Ulysses S., general and president of the United States, born in 1822 at Point Pleasant, in Clermont co., Ohio. His real name was Hiram Ulysses Grant, the name afterwards used by him having arisen out of an error in the registration of his cadetship. After having studied in the military academy at West Point, he served during the Mexican war, taking part in every battle except Buena Vista, and being brevetted captain for gallantry. In 1854 he resigned his commission and engaged first in farming near St. Louis, and then in the leather trade with his father at Galena, Illinois. On the declaration of war in 1861 he was chosen captain of a company of volunteers, and was rapidly promoted to a brigadier-generalship of volunteers. He seized Paducah, commanding the Tennessee and Ohio navigation, checked the departure of reinforcements from Belmont, captured Fort Henry and Fort Donelson, and won the two days' battle of Shiloh. He then gained a new victory at Juka, and after repulsing the confederates before Corinth commenced operations against Vicksburg. After a siege of some months in the course of which he took the town of Jackson, and scattered an army under Johnston, the town surrendered. For this Grant was made major-general in the regular army, and placed in command of the Mississippi division. The battles of Chickamauga and Chattanooga, which followed, opened the way into Georgia for the federal troops. In Feb. 1864, he was appointed lieutenant-general, and assumed command of the armies of the United States. In a succession of hotly-contested battles at the Wilderness, Spottsylvania, North Anna, and Cold Harbor, he steadily advanced

Ulysses S. Grant.

on Petersburg and Richmond. These speedily fell, and Lee, defeated at Five Forks and completely surrounded, surrendered to Grant, April 9, 1865. Grant returned to Washington, and in 1866 was made general of the armies of the United States. After exercising an important influence during the presidency of Johnson, Lincoln's successor, he was himself elected president in 1868. His administration allayed the soreness which still survived from the great struggle between the states, and was also noteworthy for the reduction of the national debt and the settlement of the Alabama dispute with England. He was re-elected in 1872. On his retirement he spent some time in travel. Latterly he became involved in a bubble company which exploited his name and left him heavily in debt. He manfully endeavored to repair his fortune by writing and publishing his Memoirs, and in this he was successful, though suffering greatly from the cancerous disease of which de died in 1885.

GRANULATION, the subdivision of a metal into small pieces or thin films, effected either by pouring the metal in a fine stream or through a sieve into water. It is employed in chemistry to

increase the surface, so as to render the metal more susceptible to the action of reagents, and in metallurgy for the subdivision of a tough metal like copper. Small shot is made by a species of granulation.

GRANULATION, in surgery, the formation of little grain-like fleshy bodies on the surfaces of ulcers and suppurating wounds, serving both for filling up the cavities and bringing nearer together and uniting their sides. The color of healthy granulations is a deep florid red. When livid they are unhealthy, and have only a languid circulation.

GRANVELLA, or **GRANVELLE,** Antoine Perrenot, Cardinal de, minister of state to Charles V. and Philip II. of Spain, was born in 1517 near Besançon. He studied at Padua and at Louvain, in his twenty-third year was appointed Bishop of Arras, and was present at the diets at Worms and Ratisbon. In 1545 he was sent to the Council of Trent, and on the death of his father in 1550 was appointed by Charles V. to succeed him in the office of chancellor. In 1552 he negotiated the Treaty of Passau, and in 1553 arranged the marriage of Don Philip with Mary Queen of England. Under Philip II. he remained chief minister, and in 1559 negotiated the peace of Câteau-Cambrésis. In 1570 Philip sent him to Rome to conclude an alliance with the pope and the Venetians against the Turks, and afterward to Naples as viceroy. In 1575 he was recalled to Spain, and placed at the head of the government with the title of president of the supreme council of Italy and Castile. In 1584 he was created Archbishop of Besançon, and died at Madrid in 1586.

GRANVILLE, Granville George Leveson-Gower, 2d Earl, K. G., English statesman, was born in London in 1815; educated at Eton and Christ Church, Oxford; entered parliament in 1836 for Morpeth, afterward for Lichfield, both in the liberal interest. In 1868 he was colonial secretary under Gladstone, and on the death of Clarendon in 1870 succeeded to the secretaryship of foreign affairs, which he held until 1874. During this period he negotiated the treaty of 1870, guaranteeing the independence of Belgium, and "protested" against the Russian repudiation of the Black Sea clause of the treaty of Paris. On the return of Gladstone to office in 1880 Lord Granville again became foregin secretary until Lord Salisbury came into power in 1885. He died in 1891.

GRAPE. See Vine.

GRAPE-SHOT, a kind of shot generally consisting of three tiers of cast iron balls arranged, three in a tier, between four parallel iron discs connected together by a central wrought-iron pin. Case-shot is now more used than grape-shot.

GRAPH'ITE, one of the forms under which carbon occurs in nature, also known under the names of Plumbago, Black-lead, and Wad. It occurs not unfrequently as a mineral production, and is found in great purity at Borrowdale in Cumberland, and in large quantities in Canada, Ceylon, and Bohemia. Graphite may be heated to any extent in close vessels without change; it is exceedingly unchangeable in the air; it has an iron-gray color, metallic luster, and granular texture, and is soft and unctuous to the touch. It is used chiefly in the manufacture of pencils, crucibles, and portable furnaces, in burnishing iron to protect it from rust, for giving a smooth surface to casting moulds, for coating wax or other impressions of objects designed to be electrotyped, and for counteracting friction between the rubbing surfaces of wood or metal in machinery.

GRAPNEL, or **GRAPLING,** a sort of small anchor, fitted with four or five flukes or claws, and commonly used to fasten boats or other small vessels. The name was also given to the grappling-iron formerly used in naval engagements to hold one ship to another.

GRASS-CLOTH, the name of certain beautiful light fabrics made in the East from China grass. None of the plants yielding the fiber are grasses.

GRASSES, a very extensive and important order of endogenous plants, comprising about 250 genera and 4500 species, including many of the most valuable pasture-plants, all those which yield corn, the sugar-cane, the tall and graceful bamboo, etc. The nutritious herbage and farinaceous seed furnished by many of them render them of incalculable importance, while the stems and leaves are useful for various textile and other purposes. The roots are fibrous; the stem or culm is usually cylindrical and jointed, varying in length from a few inches to 80 or 90 feet, as in the bamboo(in the sugar-cane the stem is solid, but porous), and coated with silex; leaves, one to each node or joint, with a sheathing petiole; spikelets terminal, panicled, racemose, or spiked; flowers hermaphrodite or polygamous, destitute of true calyx or corolla, surrounded by a double set of bracts, the outer constituting the glumes, the inner the paleæ; stamens hypogynous, three or six; filaments long and flaccid; anthers versatile; ovary solitary, simple, with two (rarely three) styles, one-celled, with a single ovule; fruit known as a caryopsis, the seed and the pericarp being inseparable from each other. The more important divisions of the natural order of grasses are: the millet, fundi, Guinea grass, the sugar-cane, dhurra, lemon-grass, gama-grass, etc., (maize, Job's tears, canary-grass, foxtail-grass, soft-grass, Timothy grass, rice, feather-grass, (esparto); bent-grass, oats, vernal grass; fescue, meadow-grass, manna-grass, teff, cock's-foot grass, tussac grass, dog's-tail grass; bamboo; wheat, barley, rye, spelt, rye-grass, lyme-grass. In its popular use the term grasses is chiefly applied to the pasture grasses as distinct from the cereals, etc.; but it is also applied to some herbs, which are not in any strict sense grasses at all, e.g. rib-grass, scurvy and whitlow grass. After the culture of herbage and forage plants became an important branch of husbandry, it became customary to call the clovers, trefoils, sainfoin, and other flowering plants growns as fodder, artificial grasses by way of distinction from the grasses proper, which were termed natural grasses. Of the pasture grasses, some thrive in meadows, others in marshes, on upland fields, or on bleak hills, and they by no means grow indiscriminately.

GRASS'HOPPER, the name of various leaping insects nearly akin to the locusts. They are characterized by very long and slender legs, the thighs of the hinder legs being large and adapted for leaping, by large and delicate wings, and by the wing-covers extending far beyond the extremity of the abdomen. Grasshoppers form an extensive group of insects, and are distinguished by the power which they possess of leaping to a considerable distance, and by the stridulous chirping noise the males produce by rubbing their wing-covers together. They are generally of a greenish color.

GRASS-OIL, Oil of Geranium, or Oil of Spikenard, a fragrant volatile oil, used chiefly in perfumery, and obtained from Indian grasses.

GRASS-TREE, the popular name of a genus of Australian plants, having shrubby stems with tufts of long grass-like wiry foliage, from the center of which arise the tall flower-stalks, which

Grass-tree.

sometimes reach the height of 15 or 20 feet, and bear dense cylindrical spikes or blossoms at their summit. The base of the leaves forms, when roasted, an agreeable article of diet, and the leaves themselves are used as fodder for all kinds of cattle. A resin, known in commerce as akaroid resin, is obtained from all the species, which are also popularly known as black-boys.

GRATTAN, Henry, Irish orator and statesman, born at Dublin, in 1746; called to the Irish bar in 1772, and in

Henry Grattan.

1775 elected member for Charlton in the parliament of Ireland. In 1780 he moved resolutions asserting the crown to be the only link between Britain and Ireland, and in 1782 led the volunteer movement, which was instrumental in securing the concession of independence

to Ireland. In 1800 he came forward as member for Wicklow to oppose the union, and on the passage of Pitt's measure was returned to the imperial parliament in 1805 for Malton in Yorkshire, and in 1806 for Dublin. He supported the war policy of the administration, but was latterly chiefly occupied in promoting catholic emancipation. He died in 1820, and was interred in Westminster Abbey.

GRATZ, or **GRAZ,** a town of Austria, capital of Styria, picturesquely situated on the Mur, 90 miles south-west of Vienna. The older town on the left bank, is connected with the suburbs Lend and Grics, on the right by several bridges, besides a railway bridge. The Schlossberg rises 400 feet above the river, but the fortifications of the town have given place to avenues and pleasure grounds. The manufactures consist of woolens, cotton, and silk tissues, machinery, steel, rails, wagons, soap, leather, ironware, etc. Pop. 138,370.

GRAVEL, in pathology, small concretions or calculi in the kidneys or bladder.

GRAVING, the act of cleaning and repairing a ship's bottom. At seaports this is usually done in a dry-dock called a graving-dock. See Docks.

GRAVITATION, the force by reason of which all the bodies and particles of matter in the universe tend toward one another. According to the law of gravitation discovered by Newton, every portion of matter attracts every other portion with a force directly proportional to the product of the two masses, and inversely proportional to the square of the distance between them. Kepler had given the laws, deduced from observation, according to which the planets describe their orbits. From these Newton deduced the laws of the force in the case of planets; and subsequently he generalized the statement of them, by showing the identity of the nature of the force that retains the moon in her orbit, with that which attracts matter near to the surface of the earth. The application of the grand law that he had discovered subsequently occupied a large part of the mathematical labors of Newton. Attacking the problem of lunar inequalities, he accounted for them by considering the perturbations due to the attraction of various bodies of the solar system; and by accounting for all the observed perturbations by means of his newly-discovered law he confirmed the truth of the law itself in such a way as to put it beyond all question. The computation of these various attractions has reached such a degree of accuracy in the hands of mathematicians since Newton, that the most complicated motions of the heavenly bodies can be predicted. The law has also been applied successfully in weighing the planets, explaining the paths of comets, the motions of the tidal wave, etc. It has also been demonstrated to hold good in the case of comparatively small bodies. Thus Maskelyn determined the attraction of a particular mountain, and Cavendish and Bailly measured the attractions of a ball of lead on light finely-balanced bodies, and thus determined the mean density of the earth.

GRAVITY, the term applied to the force with which the earth attracts every particle of matter. The force of gravity is least at the equator, and gradually increases as we recede toward the poles. Thus a given mass, if tested by means of a spring-balance of sufficient delicacy, would appear to weigh least at the equator, and would seem to get heavier and heavier as the latitude increases. This is due to two causes: first, the centrifugal force at the equator is greater than that in high latitudes because of the greater radius of the circle described at that place; and, second, the attraction is diminished by the greater distance of objects on the surface from the earth's center. From both causes combined a body which weighs 194 lbs. at the equator would weigh 195 lbs. at either pole. Experiments to determine the force of gravity from point to point are made by determining the length of a pendulum that beats seconds at each place. By experiments made by Captain Kater at Leith Fort it was found that the force of gravity at that place is such that a body, unresisted by air or otherwise, would acquire in one second, under its influence, a velocity of 32.207 feet per second. At Greenwich the acceleration is 32.1912 feet.

GRAVITY, Specific. See Specific Gravity.

GRAY, Asa, American botanist, born 1810. He was appointed Fisher professor of natural history in Harvard university in 1842, and held the chair till 1873, when he retired from its more active duties. His death took place in 1888. His works include Elements of Botany (1836), A Manual of Botany (1848), and other botanical text-books; also portions of works on the flora of North America and the Genera Boreali-Americana, a Free Examination of Darwin's Treatise (1861), a volume entitled Darwiniana (1876), etc.

GRAY, Elisha, American inventor, born in 1835 at Barnesville, in Ohio. In 1867 he obtained his first patent, which was for telegraphic apparatus. Subsequently, he received nearly fifty patents, relating principally to the telephone and other electrical apparatus. Claims were advanced in behalf of Gray as one of the inventors of the speaking telephone, for which he filed specifications, February 14, 1876; but the patent was awarded to Alexander Graham Bell, whose rights were sustained by the supreme court. Among his other inventions were a system of multiplex telegraphy, a type-printing telegraph, the telautograph, and numerous telegraphic and telephonic appliances and adjuncts. He was for a number of years engaged in the manufacture of telegraphic apparatus in Chicago and Cleveland. He died in 1901.

GRAY, Thomas, English poet, born in London in 1716; educated at Eton with Horace Walpole, and at Cambridge. In 1747 his Ode on a Distant Prospect of Eton College appeared, and in 1751 his Elegy Written in a Country Churchyard, which went through four editions in two months. In 1757 he declined the laureateship, and the same year published his odes, On the Progress of Poesy, and The Bard. He died in 1771, and was buried at Stoke Pogis, Buckinghamshire.

GRAY-LAG, a popular name for the

Gray-lag.

common wild goose. See Goose.

GRAYLING, a genus of fishes. The common grayling is found in many English streams, and also in some in

Grayling.

Scotland. It is scattered over Europe from Lapland to North Italy, and also over part of Asia.

GREAT BAHAMA. See Bahama.

GREAT BRITAIN. See the articles Britain, England, Scotland, and Wales.

GREAT CIRCLE SAILING, or **TANGENT SAILING,** a method of navigating a vessel according to which her course is always kept as nearly as possible on a great circle of the sphere, that is a circle which has for its center the center of the sphere. An arc of such a circle joining two places gives the shortest distance between them, consequently the course of a vessel sailing on this arc will be the shortest possible. A simple instrument called a spherograph is employed for finding the great circle course between places, and this is accompanied by tables compiled for the same purpose.

GREAT EASTERN, an iron steamship, the largest vessel of her time, built (1854–58) at Millwall, on the Thames; length, 680 feet; breadth, 82½, or, including paddle-boxes, 118 feet; height, 58 feet (70 to top of bulwarks). She had six masts, five of iron and one of wood, and could spread 7000 yards of sail, besides having eight engines, divided between her screws and paddles, and capable of working at 11,000 horse-power. From the first her career was unfortunate, the launching process alone lasting three months and costing $300,000. After several unremunerative trips to New York she was employed first as a troopship, and then as a cable-laying ship for which her size and steadiness specially qualified her. Various attempts were afterward made to utilize her, but she at last came to be a mere holiday spectacle, and was broken up in 1888.

GREAT FALLS, a city and port of entry; county seat of Cascade co., Mont., at the junction of the Sun and Missouri rivers, near the falls of Missouri, and on the G. F. and Canada, the Gt.

Northern, and several branch railways. It is in an agricultural region, and near by are rich mines of gold, copper, silver, lead, ore, and coal, and quarries of sandstone. Pop. 17,430.

GREAT LAKES, comprising lakes Superior, Michigan, Huron, Saint Clair, Erie, and Ontario. They lie on the frontier of the United States and Canada and are drained by the Saint Lawrence river into the Atlantic. Their aggregate area is over 90,000 sq. miles, exceeding that of any other series of fresh-water lakes in the world. Lake Superior, the largest, has an area of about 31,000 sq. miles. The Great Lakes occupy depressions that are only slightly defined from the drainage system of the Mississippi and from the depression of Hudson Bay. Their elevation ranges from about 600 feet in Lake Superior to 250 feet in Lake Ontario, but from Lake Superior to Lake Erie the fall is less than 30 feet, so that almost the entire descent is accomplished in the Niagara and Saint Lawrence rivers. The Great Lakes exercise a very beneficial influence upon the climate of the country, particularly by moderating the temperature. This explains the extensive development of fruit culture in part of the Great Lake region, notably in the vicinity of Lake Erie.

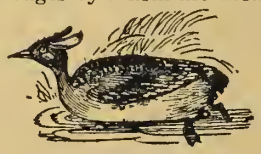
The magnitude and importance of transportation upon the Great Lakes are not generally realized. More than one-half of the number of vessels registered in the United States are found upon the Great Lakes. A greater tonnage annually passes through the Detroit river than that which enters and clears in the foreign trade of the Atlantic and Pacific coast ports. No other artificial channel equals the canal at Saint Mary's Falls in the amount of traffic which annually goes through it, the tonnage even exceeding that of the Suez Canal With respect to rapidity, economy, and efficiency, the lake traffic excels that of the ocean. The greatest significance of the lakes is due to their relation to the mining of iron ore and the manufacture of iron products. Viewed in this light, lake transportation is found to be the key to the modern industrial progress and supremacy of the United States. It is generally admitted that but for the cheapness of the lake transportation the iron ore resources of the Lake Superior region would have been scarcely exploited. Without the supply of iron ore many vast industries could not have thrived.

There are numerous harbors along the coast line of the lakes. Many of these havens are shallow, and constant dredging is required to keep them accessible. The national government has expended large sums on harbor improvements. In late years there has been a serious lowering in the level of the lakes' surface, to the great detriment of the harbors. Different plans have been projected for preventing further harm in this respect. Dams have been constructed across the exit channels of the lakes. One of the most serious advantages with which the lake commerce has to contend is the winter ice, which stops all traffic. The cessation of general lake traffic begins about the first of December and continues four or five months, about 222 days being the average annual time during which the canals are open. Much has recently been done to continue the period of traffic by the construction of boats with special provisions for ice crushing. A railroad ferryboat has also been constructed which is able to crush its way through three feet of ice.

The Great Lakes are valuable for their fisheries. Nearly $4,500,000 of fish is taken from them annually, considerably over half by American fishermen.

GREAT SALT LAKE, a lake in the state of Utah, 4000 feet above sea-level, 70 miles in length north to south and 48 miles east to west. Five gallons of its water yield, by evaporation, 14 pints of salt. It has several islands, which, with its shores, are whitened by the salt; and it receives the Bear, the Utah, and several other streams. It contains no fish, but has several species of insects and a crustacean, and is frequented by immense flocks of gulls, ducks, geese, and swans.

GREBE, the common name of the birds characterized by a straight conical bill, no tail, tarsus short, toes flattened, separate, but broadly fringed at their edges by a firm membrane, and



Horned grebe.

legs set so far back that on land the grebe assumes the upright position of the penguin. The geographical distribution is very wide, these birds haunting seas as well as ponds and rivers. They are excellent swimmers and divers; feed on small fishes, frogs, crustaceans, and insects; and their nests, formed of a large quantity of grass, etc., are generally placed among reeds and sedges, and rise and fall with the water.

GREECE, a country, now a kingdom, of Southeastern Europe, the earliest portion of this continent to attain a high degree of civilization, and to produce works of art and literature as yet unsurpassed. It forms the southern extremity of what is called the Balkan Peninsula, and itself partly consists of a well-marked peninsula, the Morea or Peloponnesus, united to Northern Greece by the Isthmus of Corinth. The name Greece (Latin, Græcia) is of Roman origin, the native name for the country being Hellas, and the people calling themselves Hellēnes. Anciently Hellas was used in a wider sense, so as to include both Greece itself and all countries that had become Greek by colonization. Modern Greece is separated from Turkey on the north by a winding, mostly artificial, boundary extending from the Gulf of Arta on the west to the Gulf of Salonica on the east, and comprising rather less than ancient Greece, which also took in part of what is now Albania. Ancient Greece was divided into a number of independent states or territories, namely, in Northern Greece, Thessaly, Epirus (not in the modern kingdom), Locris, Phocis, Bœotia, Œtolia, Acarnania, Attica, Megaris; in the Peloponnesus, Corinth, Argolis, Achaia, Elis, Messenia, Laconia (Sparta), and Arcadia the last entirely inland These names are still kept up, but the country is now divided into nomes, or nomarchies, some of which are formed of the Greek islands, namely, Eubæa, Corfu, Cephalonia, Zante, and the Cyclades. The total area is 25,014 sq. miles; the pop. 2,433,806.

Greece proper is remarkable for the extent of its coast-line, formed by numerous gulfs which penetrate into it in all directions. The largest, the Corinthian Gulf, or Gulf of Lepanto, on the east, and the Saronic Gulf, or Gulf of Ægina, on the west, which nearly meet at the Isthmus of Corinth, separate Northern Greece from the Morea. Another striking feature is the mountainous character of the interior. The rock most largely developed in the mountains of Greece is limestone, which often assumes the form of the finest marble. Granite occurs in patches.

The climate is generally mild, in the parts exposed to the sea equable and genial, but in the mountainous regions of the interior sometimes very cold. In ancient times, when the country was more thickly peopled and better cultivated, the climate seems to have been better.

Greece is mainly an agricultural country, though agriculture is in a somewhat backward state. The land is largely held by peasant proprietors. The principal crops are wheat, barley, and corn. The cultivated land produces all the fruits of the latitude—figs, almonds, dates, oranges, citrons, melons, etc. The vine also grows vigorously, as it did in ancient Greece. But a much more important produce of Greece, especially on the coasts of the Peloponnesus, and in the islands of Cephalonia, Zante, Ithaca, and Santa Maura, is the Corinthian grape or currant. The olive is also largely grown as in ancient times. The domestic animals are neither numerous nor of good breeds. Asses are almost the only beasts of burden employed; and dairy produce is obtained from the sheep and the goat.

The manufactures are extremely limited, but with all other branches of industry in Greece are increasing. They include cottons, woolens, earthenware, leather, etc.; and ship-building is carried on largely at various points of the coast, and at the Piræus. The greatest hindrance to the development of Greece at the present time is the want of good roads, but this is being gradually remedied. The money unit of Greece is the drachma of 100 lepta, which is nominally 1 franc.

According to the present constitution the throne is hereditary in the family of King George (second son of the King of Denmark). The legislative authority is vested in a single chamber, called the Boulē, the members of which (proportioned in number to the amount of the population) are elected for four years, ballot by manhood suffrage. The executive power rests with the king and ministry. The Greek Church alone is established, but all forms of religion enjoy toleration. Justice is administered, on

the basis of the French civil code. Greece has a large public debt, an estimated total being $115,000,000. All able-bodied males are liable to military service from the age of 21, the periods being two years in the active army, ten in the reserve, eight in the national guard, and ten in the national guard reserve. In 1900 the total nominal strength of the army was 25,333. The navy consisted of five ironclads (three of them of some fighting power), and a number of other vessels. Several vessels are being added.

The ancient Greeks were an Aryan race, probably most closely akin to the Italian peoples. They were noted for physical beauty and intellectual gifts. The present population contains a considerable intermixture of foreign stocks, among which the Albanese, or Arnauts, are the most numerous; but the great majority, though not without some taint in their blood, are of Greek extraction. While the population of Greece proper is not more than 2,400,000, the whole Greek nationality reaches nearly 8,000,000, of whom 3,500,000 are found in European Turkey and 2,000,000 in Asia Minor. Education in Greece is free and compulsory in theory (from the age of five to twelve), but a large proportion of the people can neither read nor write. The national dress of the Greeks resembles the Albanian costume. In the men it consists of a tight jacket, generally scarlet, wide trousers descending as far as the knee, and embroidered gaiters; in the women it consists of a vest fitting close to the shape, and a gown flowing loosely behind.

The earliest inhabitants of Greece were the Pelasgians, of whom little or nothing is known with certainty. The Pelasgians were succeeded by the Hellenes, or Greeks proper, who may have been simply one of the Pelasgian tribes or races. To the early period of the Hellenic occupation of Greece belong the legends of the Trojan War, of Theseus, of Jason and the Argonauts, etc. The Hellenes were divided into four chief tribes—the Æolians, occupying the northern parts of Greece (Thessaly, Bœotia, etc.); the Dorians, occupying originally a small region in the neighborhood of Mount Œta; the Achæans, occupying the greater part of the Peloponnesus; and the Ionians, occupying the northern strip of the Peloponnesus and Attica. Of the four principal tribes the Ionians were most influential in the development of Greece. The distribution of the Hellenic tribes was greatly altered by the Dorian migration, sometimes called "the return of the Heracleidæ" (descendants of Hercules), placed by Thucydides about eighty years after the fall of Troy or about B.C. 1104, according to the ordinary chronology.

In course of time many Greek settlements were made on the coasts of the Hellespont, the Propontis (Sea of Marmora), and the Black Sea, the most important being Byzantium (Constantinople), Sinope, Cerasus, and Trapezus (Trebizonde). There were also flourishing Greek colonies on the coasts of Thrace and Macedonia; for example, Abdera, Amphipolis, Olynthus, Potidæa, etc.; and the Greek colonies in Lower Italy were so numerous that the inhabitants of the interior spoke Greek, and the whole region received the name of Greater Greece (Magna Græcia).

Although ancient Greece never formed a single state, the various Greek tribes always looked upon themselves as one people, and classed all other nations as barbaroi (foreigners). There were four chief bonds of union between the Greek tribes. First and chiefly they had a common language, which, despite its dialectic peculiarities, was understood throughout all Hellas or the Greek world. Secondly, they had common religious ideas and institutions, and especially, in the oracle of Delphi, a common religious sanctuary. Thirdly, there was a general assembly, of the Greeks, the amphictyonic league, in which the whole people was represented by tribes (not by states), and the chief functions of which were to guard the interests of the sanctuary of Delphi, and to see that the wars between the separate states of Greece were not too merciless. The fourth bond consisted in the four great national festivals or games, the Olympian, Isthmian, Nemean, and Pythian, on the first of which the whole of Greece based its calendar.

The various separate states of Greece may be divided, according to the form of their constitution, into the two great classes of aristocratic and democratic. Sparta or Lacedæmon, the chief town of Laconia and of the Doric tribe, was the leading aristocratic state; and Athens, the capital of Attica and the chief town of the Ionic tribe, was the leading democratic state; and as a rule all the Doric states, and subsequently all those under the influence of Sparta, resembled that city in their constitution; and all the Ionic states, and those under the influence of Athens, resembled it. These two tribes or races are the only ones that come into prominence during the earlier part of Greek history subsequent to the Doric migration. Sparta is said to have derived its form of government, and all its institutions, in the 9th century B.C., from Lycurgus, whose regulations developed a hardy and warlike spirit among the people, the results of which were seen in their conquests over surrounding states, especially over the Messenians in the 8th and 7th centuries B.C.

The constitution of Athens appears from the legends of Theseus and Codrus to have been at first monarchical, and afterward aristocratic, and to have first received a more or less democratic character from Solon at the beginning of the sixth century B.C. This was followed about fifty years later by a monarchical usurpation under Pisistratus, and his sons Hippias and Hipparchus, the last survivor of whom, Hippias reigned in Athens till 510 B.C. After the expulsion of Hippias the republic was restored, under the leadership of Cleisthenes, in a more purely democratic form than at first. A brief struggle with the Spartans, whose aid was invoked by some of the nobles, now took place, and Athens emerged from it well prepared for the new danger which threatened Greece.

The Greek colonies in Asia Minor and the adjacent islands, after being conquered by Crœsus, king of Lydia, fell with the fall of Crœsus into the power of Cyrus, king of Persia. In B.C. 500, however, the Ionians revolted with the assistance of the Athenians and Eretrians, and pillaged and burned Sardis. The rebellion was soon crushed by Darius, who destroyed Miletus, and prepared to invade Greece. In 492 he sent an expedition against the Greeks under his son-in-law Mardonius, but the fleet which carried his army was destroyed in a storm off Mount Athos. A second army, under the command of Datis and Artaphernes, landed on Eubœa, and after destroying Eretria, crossed the Euripus into Attica; but it was totally defeated in B.C. 490 on the plain of Marathon by 10,000 Athenians and 1000 Platæans, under Miltiades. In the midst of preparations for a third expedition Darius died, leaving his plans to be carried out by his son Xerxes, who, with an army of 1,700,000 men, crossed the Hellespont in 481 by means of two bridges of boats, and marched through Thrace, Macedonia, and Thessaly, while his fleet followed the line of coast. In the pass of Thermopylæ he was held in check by Leonidas with 300 Spartans and 700 Thespians; but the small band was betrayed and annihilated (480 B.C.); and the way through Phocis and Bœotia being now open he advanced into Attica, and laid Athens in ruins. The deliverance of Greece was chiefly due to the genius and courage of Themistocles. The united fleet of the Greeks had already contended with success against that of the Persians off Artemisium, and had then sailed into the Saronic Gulf, followed by the enemy. Themistocles succeeded in inducing the Persians to attack in the narrow strait between Attica and Salamis, and totally defeated them.

The brilliant part taken by the Athenians under Themistocles in repelling this invasion of Athens greatly increased her influence throughout Greece. From this date begins the period of the leadership or hegemony of Athens in Greece, which continued to the close of the Peloponnesian war, 404 B.C. The first thing which Athens exerted her influence to effect was the formation of a confederacy, including the Greek islands and maritime towns, to supply means for the continuance of the war by payments into a common treasury established on the island of Delos, and by furnishing ships. In this way Athens gradually increased her power so much that she was able to render tributary several of the islands and smaller maritime states. In 469 B.C. the series of victories won by the Athenians over the Persians was crowned by the double victory of Cimon over the Persian fleet and army on the Eurymedon, in Asia Minor, followed by the Peace of Cimon, which secured the independence of all Greek towns and islands. Shortly after followed the brilliant administration of Pericles, during which Athens reached the height of her grandeur.

The position of Athens, however, and the arrogance and severity with which

she treated the states that came under her power made her many enemies. In the course of time two hostile confederacies were formed in Greece, one consisting of Athens and the democratic states of Greece; the other of Sparta and the aristocratic states. At last, in 431, it was declared by Sparta on the complaint of Corinth that Athens had furnished assistance to Corcyra in its war against the mother city; and on that of Megara, that the Megarean ships and merchandise were excluded from all the ports and markets of Attica; and thus began the Peloponnesian war which for twenty-seven years devastated Greece.

The period which follows the fall of Athens is that of Sparta's leadership or hegemony in Greece, which lasted till the battle of Leuctra, in 371 B.C. The Spartan rule was not more liked than that of Athens, and the character of the Spartan state itself, with its increase of wealth and power, underwent great change.

Philip, the father of Alexander the Great, became king of Macedonia, and after the Locrian war (339–338) acquired a firm hold in Greece. He then collected an army for the invasion and conquest of the rotten empire of Persia, and got himself declared commander-in-chief by the amphictyonic league at Corinth in 337 B.C.; but before he was able to start he was assassinated, B.C. 336.

The design of Philip was taken up and carried out by his son Alexander the Great, during whose absence Antipater was left behind as governor of Macedonia and Greece. Soon after the departure of Alexander, Agis III. of Sparta headed a rising against Antipater but was defeated at Megalopolis in 330 B.C., and no other attempt was made by the Greeks to recover their liberty for nearly a hundred years. At the close of the wars which followed the death of Alexander, and which resulted in the division of his empire, Greece remained with Macedonia.

In the course of the first half of the third century B.C. several of the Achæan towns expelled the Macedonians, and revived an ancient confederacy, which was now known as the Archæan League. The league was at first worsted, and was only finally successful when Aratus sacrificed the ultimate end of the league by calling in the aid of the Macedonians.

About this time the Romans, who had just come out victorious from a second war with Carthage, found occasion to interfere in the affairs of Greece. Philip V. of Macedon having allied himself with Hannibal, the Romans sent over Flamininus to punish him, and in this war with Philip the Romans were joined by the Achæan League. Philip was defeated at Cynoscephalæ in 197 B.C., and was obliged to recognize the independence of Greece. The Achæan League thus became supreme in Greece, having been joined by all the states of the Peloponnesus. But the league itself was in reality subject to Rome, which found constant ground for interference until 147 B.C., when the league openly resisted the demand of the senate, that Sparta, Corinth, Argos, and other cities, should be separated from it. In the war which ensued, which was concluded in 146 B.C. by the capture of Corinth by the Roman consul Mummius, Greece completely lost its independence, and was subsequently formed into a Roman province.

On the division of the Roman Empire Greece fell of course to the eastern or Byzantine half. From 1204 to 1261 it formed a part of the Latin Empire of the East, and was divided into a number of feudal principalities. In the latter year it was reannexed to the Byzantine Empire, with which it remained till it was conquered by the Turks between 1460 and 1473. In 1699 the Morea was ceded to the Venetians, but was recovered by the Turks in 1715. From 1715 till 1821 the Greeks were without intermission subject to the domination of the Turks. The rising of the Greeks took place on the 6th of March, under Alexander Ypsilanti, and on the 1st of January, 1822, they published a declaration of independence. In the same year Ali was assassinated by the Turks, but the Greeks, encouraged by most of the European nations, continued the struggle under various leaders, of whom the chief were Marco Bozzaris, Capo d' Istria, Constantine Kanaris, Kolocotroni, etc. On the 3d of February, 1830, a protocol of the allied powers declared the independence of Greece, which was recognized by the Porte on the 25th April of this year. The crown was offered to Leopold, prince of Saxe-Coburg, and when he refused it, to Otho, a young prince of Bavaria, who was proclaimed king of the Hellenes at Nauplia in 1832 But his arbitrary measures, and the preponderance which he gave to Germans in the government, made him unpopular and although after a rebellion in 1843 a constitution was drawn up, he was compelled by another rebellion in 1862 to abdicate. A provisional government was then set up at Athens, and the national assembly offered the vacant throne in succession to Prince Alfred of England and Prince William George of Denmark. The latter accepted it, and on March 30, 1863, was proclaimed as King George I. In 1864 the Ionian Islands, which had hitherto formed an independent republic under the protection of Britain, were annexed to Greece.

In 1897 an insurrection in Crete led to the interference of the Greeks and to war with Turkey, the result being the speedy defeat of Greece, entailing the payment of a heavy war indemnity with some loss of territory on the Tessalian frontier.

The religion of the ancient Greeks was polytheism, there being a great number of divinities, many of whom must be regarded as personifications of natural powers, or of phenomena of the external world, personified sentiments, etc. Thus there were gods corresponding to Earth and Heaven, the Ocean, Night, etc. The Romans, when they became acquainted with the literature and religion of the Greeks, identified the Greek deities with those of their own pantheon. In this way the Greek and Roman deities came to be confounded together, and the names of the latter even came to supersede those of the former. The supreme ruler among the gods was Zeus (Roman Jupiter or Juppiter), the son of Krones (Roman Saturn), who after the subjugation of the Titans and Giants ruled in Olympus, while his brother Pluto reigned over the lower world (Hades, Tartarus), and Poseidōn (Neptune) ruled in the sea. Like reverence was paid to Hēra (Juno), the sister and wife of Zeus, and the queen of Heaven; to the virgin Pallas Athēnē (Minerva); to the two children of (Lētonā), namely, Apollo, the leader of the Muses, and his sister the huntress Artĕmis (Diana), the goddess of the moon; to the beautiful daughter of Zeus, Aphroditē (Venus), the goddess of love; to Arēs (Mars), the god of war, Hermēs (Mercury), the herald of the gods, and others besides. In addition to these there was an innumerable host of inferior deities (Nymphs, Nereids, Tritons, Sirens, Dryads and Hamadryads, etc.) who presided over woods and mountains, fields and meadows, rivers and lakes, the seasons, etc. There was also a race of heroes or demigods (such as Heracles or Hercules, Perseus etc.) tracing their origin from Zeus, and forming a connecting link between gods and men, while on the other hand the Satyrs formed a connecting link between the race of men and the lower animals.

The true teachers of the Greek religion were the poets and other writers, and it is to the hymns, epics, dramas, and histories of the Greeks that we must turn in order to learn how they regarded the gods. No degree of consistency is to be found in them, however, the personality and local origin of the writers largely moulding their views. In their general attitude toward men the gods appears as inspired by a feeling of envy or jealousy. Hence they had constantly to be appeased, and their favor won by sacrifices and offerings. The Greeks appear to have had at all times some belief in a future existence, but in the earliest times this belief was far from being clearly defined.

The Greek language belongs to the Indo-European group, and is thus a sister of the Sanskrit, Latin, Teutonic and Celtic tongues. It is customary to distinguish three leading dialects according to the three leading branches of the Greeks, the Æolic, the Doric, and the Ionic, to which was afterward added the mixed Attic dialect; besides these there are several secondary dialects. Akin to the Ionic is the co-called Epic dialect, that in which the poems of Homer and Hesiod are written, and which was afterwards adopted by other Epic writers. The Doric was hard and harsh; the Ionic was the softest. In each of these dialects there are celebrated authors. The Ionian dialect is found pure in Herodotus and Hippocrates. The Doric is used in the poem of Pindar, Theocritus, Bion, and Moschus. In Æolic we have fragments of Alcæus and Sappho. After Athens had obtained the supremacy of Greece, and rendered itself the center of all literary cultivation, the master-pieces of Æschylus, Sophocles, Euripides, Aristophanes, Thucydides, Xenophon, Plato, Aristotle, Isocrates, Demosthenes, etc.,

made the Attic the common dialect of literature.

At what time this language first began to be expressed in writing has long been a subject of doubt. According to the usual account of Cadmus the Phœnicians introduced the alphabet into Greece; and it is an undoubted fact that the most of the Greek letters are derived from the Phœnician ones. The Greek alphabet possesses the following twenty-four letters:

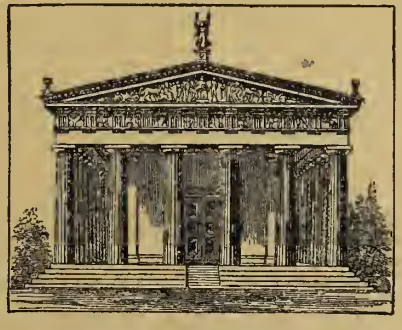
—A, α (alpha), *a*; B, β (beta), *b*; Γ, γ (gamma), *g*; Δ, δ (delta), *d*; E, ε (epsilon), *ĕ*; Z, ζ (zeta), *z*; H, η (eta), *ē*; Θ, θ, ϑ (theta), *th*; I, ι (iota), *i*; K, κ (kappa), *k*; Λ, λ (lambda), *l*; M, μ (mu), *m*; N, ν (nu), *n*; Ξ, ξ (xi), *x*; O, ο (omicron, *i.e.* small o), *ŏ*; Π, π (pi), *p*; P, ρ (rho), *r*; Σ, σ, ς (sigma), *s*; T, τ (tau), *t*; Υ, υ (upsilon), *u*, commonly transliterated by *y*; Φ, φ (phi), *ph*; X, χ (chi), *ch* guttural (as in Scotch *loch*); Ψ, ψ (psi), *ps*; Ω, ω (omega, or great o), *ō*. The alphabet originally introduced into Greece is said to have consisted of but sixteen letters; Θ Ξ Φ X Z H Ψ Ω being of later introduction.

Modern Greek, as spoken by the uneducated classes, is called Romaic, from the fact that those who speak it considered themselves before the descent of the Turks upon Europe as belonging to the Roman Empire, and hence called themselves Romaioi, or Romans. The Greek of the educated classes, that used in the newspapers and other literature of the present day, is distinguished from it by a greater resemblance to the Greek of antiquity, which renders it easy for any one who has a satisfactory acquaintance with ancient Greek to read the modern literary Greek.

The commencement of extant Greek literature is to be found in the two epic poems attributed to Homer, the Iliad and the Odyssey, which it is commonly believed took shape on the Ionian coast or its islands somewhere between 950 and 850 B.C., and came thence to Greece proper (but see Homer). The former deals directly with the Trojan war, the latter describes the wanderings of Ulysses in returning from it. In European Greece there appeared about the middle of the 9th century, at Ascra in Bœotia, the poet Hesiod, who stood at the head of another epic school. Of the sixteen works attributed to him there have come down to us the Theogony or Origin of the Gods, the Shield of Heracles (a fragment of a larger poem of late authorship), and, most important of all, the Works and Days, a didactic work on agriculture. The works of Homer and Hesiod constituted in a certain degree the foundation of youthful education among the Greeks. Two principal schools may be distinguished, the Æolian and the Dorian. To the former belong Alcæus (611–580), Sappho (610), and Anacreon (530), though the works which now bear Anacreon's name are spurious. In the Dorian school the chief was undoubtedly Pindar (522–443). About this time began a new literary development, that of the drama. The performance at first, however, was merely a sort of oratorio or choral entertainment, until Æschylus (525–456) introduced a second actor, and subordinated choral song to dialogue. A third and even a fourth actor was added by Sophocles (495–405 B.C.), who supplemented the heroic tragedy of Æschylus with the tragedy of human character and the fundamental passions. Euripides (480–406) brought new qualities of picturesqueness, homeliness, and pathos with a less rigid artistic method, and formed a fitting third in the great tragic triad. With this rapid growth of tragedy there was a corresponding development of comedy which assumed an artistic form about 470 B.C. The names of Cratinus (448) and Eupolis (430) are overshadowed by that of Aristophanes (448–385), who for nearly forty years was the burlesque commentator upon the life of the period.

Altars—1, Assyrian, 2, Grecian. 3, Roman.

Thucydides (471–400?) was the founder of philosophic history, and Xenophon (431–354), who has left excellent historic narratives, was also the earliest Greek essayist. The oldest piece of Attic prose is the essay on Athenian polity wrongly assigned to Xenophon. The study which oratory and rhetoric received in Athens was an important factor in shaping Attic prose, the chief orators being Demosthenes (384–322) with his contemporaries Æschines, Lycurgus, and others, and Demetrius of Phalerum (318) who ushered in the decline of oratory. Philosophy shared the development of history and oratory, reaching a rare elevation in Plato (429–347), a rare comprehensiveness in Aristotle (384–322), the founders of the academic and peripatetic schools.

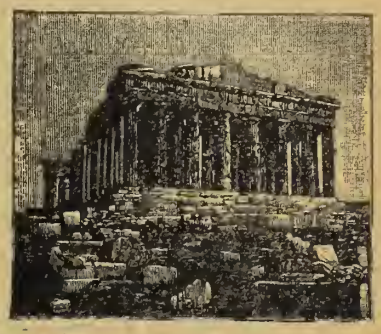


Temple of Zeus at Olympia—Doric order.

From about the year 300 B.C. the literary decadence may be held to date. During this period philosophy is in the main divided between Stoicism and Neoplatonism, the former represented by Epictetus (90 A.D.) and Marcus Aurelius (170), the latter by Plotinus (240), Porphyry, and Iamblichus.

On the fall of Constantinople in 1453 the cultivated classes who still retained the pure Greek either perished or took to flight, or adopted the language of the conquerors. The popular Greek, however, survived, and despite its vulgarization and the modification of its grammatical forms and syntax, it cannot be said that Greek has been a dead language at any period since Homer.

As in literature so in art the Greeks attained the highest pitch of excellence, and in architecture and sculpture furnished models for the rest of the world.



Greek architecture—The Parthenon at Athens, from the northwest.

In no other race has the artistic spirit been so generally diffused throughout the people, expressing itself in the minor arts of life, in the practical application of ornament in the forms of domestic furniture, pottery, metal work, mosaics, and the like, not less perfectly than in the master-works of architecture and sculpture.

Throughout the history of the art it is the public buildings, more particularly the temples, in which the genius of the Greeks displayed itself. The private houses remained simple and even rude in appearance, rarely rising above a single story, and having no external decoration. The temples were for the most part rectangular, though the circular form sometimes occurs in the later periods of Greek art. Three orders are distinguished in Greek architecture according to the treatment of the pillars and of the entablature—the Doric, Ionic and Corinthian (which see). The beauty of the Greek buildings was heightened in respect of form by a deviation from ordinary rectilinear construction, in the systematic substitution of delicately-curved lines for straight lines in the columns and steps of their temples, and wherever the illusion attending the sight of straight lines in perspective was likely to prove an element of weakness. The colonnades and porticoes, which were usually built round market-places and along quays in seaport towns, were similar in style to the temples. See also Architecture.

Greek sculpture has been divided into five principal periods, namely, 1. The Dædalian or Early (–580 B.C.). 2. The Æginetan or Archaic (580–480 B.C.). 3. The Phidian or Grand (480–400 B.C.). 4. The Praxitelean or Beautiful (400–250 B.C.). 5. The Decline (250 B.C. onwards). The age of Dædalus marks an advance from an earlier primitive

sculpture in which blocks of wood and stone were rudely fashioned into the semblance of life, the imperfections of the art being concealed by real hair and adventitious draperies. To Phidias, besides his statues of Athena and Zeus, were due the designs for the sculptures of the Parthenon, the actual work of these, however, being probably done by his pupils Alcamenes, Agoracritus, and other artists of his time. To this age belonged the sculptor and architect Polycletus (about 452–412 B.C.), whose statue of a youth holding a spear obtained the name of The Canon, as being a standard of form. About the same time the Bœotian sculptor Myron flourished, the famous Discobolus being a reproduction in marble of one of his bronzes. The Praxitelean period is characterized by greater grace and elegance in choice of subject and treatment, together with more of the sensual element making for ultimate decline. Praxiteles excelled in female figures, his Aphrodite at Cnidus in Caria being his most famous work. His rival, Scopas of Paros, was employed on the bas-reliefs of the Mausoleum at Halicarnassus, and was the sculptor of the famous group representing the destruction of the children of Niobe. In Lysippus of Sicyon, in the time of Alexander the Great, the Praxitelean school found its last great figure prior to the decline of the art.

Painting in Greece is said to have had its origin in Sicyon, and to have existed as mere outline and monochrome until Cimon of Cleonæ introduced variety in coloring, foreshortening, and a less rigid art. The Greek artists worked in wax or resin or in water-color, brought to the required consistency by mixing with gum, glue or white of egg; and they painted upon wood, clay, plaster, stone, parchment, and canvas. Until a late period, however, they rarely painted upon walls, usually painting upon panels or tablets to be encased in walls. The earlier masters appear to have used only four colors—red, yellow, white, and black, but by the time of Apelles and Protogenes many other pigments were in use.

GREEK CHURCH, or Holy Oriental Orthodox Apostolic Church, that section of the Christian Church dominant in Eastern Europe and Western Asia, especially in Turkey, Greece, Russia, and some parts of Austria. In the first ages of Christianity numerous churches were founded by the apostles and their successors in Greek-speaking countries; in Greece itself, in Syria, Egypt, Mesopotamia, Asia Minor, Thrace, and Macedonia. These were subsequently called Greek, in contradistinction to the churches, in which the Latin tongue prevailed. The removal of the seat of empire by Constantine to Constantinople, and the subsequent separation of the eastern and western empires afforded the opportunity for diversities of language, modes of thinking, and customs to manifest themselves, and added political causes to the grounds of separation. During the earliest period the chief seats of influence in the Eastern Church were Jerusalem, Antioch, and Alexandria, the seat of that mystical philosophy, by which the oriental church was distinguished. In 588 the phrase "Filioque" ("and the Son") was added by the Latins to the Nicene creed (which now read "proceeding from the father and the son"), an addition to which the Greek Church was opposed.

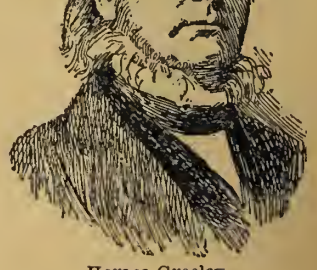
The Greek Church is the only church which holds that the Holy Ghost proceeds from the Father only; the Roman Catholic and Protestant Churches deriving the Holy Ghost from the Father and the Son. Like the Roman Catholic Church it has seven sacraments—baptism, chrism, penance, preceded by confession; the eucharist; ordination; marriage; and unction. But it is peculiar—1, in believing in baptism by threefold immersion, the chrism (confirmation) following immediately after it; 2, in adopting, as to the eucharist, the doctrine of the real presence and transubstantiation; but in ordering the bread to be leavened, the wine to be mixed with water, and both elements to be distributed to every one, even to children; 3, the parochial clergy are required to be married, but only once and to a virgin, and marriage must take place before ordination; widowed clergy are not permitted to retain their livings, but go into a cloister, where they are called hieromonachi. Rarely is a widowed bishop allowed to preserve his diocese. The Greek Church grants divorce in case of proved adultery, but it does not allow even the laity a fourth marriage. It differs also from the Roman Catholic Church in anointing with the holy oil, not the dying but the sick, for the restoration of health, forgiveness, and sanctification. It rejects the doctrine of purgatory, works of supererogation, indulgences, and dispensations, but admits prayers for the dead, whose condition appears to be considered undetermined until the final judgment. It recognizes no visible vicar of Christ on earth, but the spiritual authority of a patriarch is little inferior to that of the pope. It allows no carved, sculptured, or molten image of holy persons or subjects; but the representations of Christ (except in the crucifix), of Mary, and the saints, must be merely painted, and at most inlaid with precious stones. In the Russian churches, however, works of sculpture are found. In the invocation of the saints, and especially of the Virgin, the Greeks resemble the Latins. They also hold relics, graves, and crosses sacred; and crossing in the name of Jesus they consider as having a wonderful and blessed influence. Among the means of penance, fasts are particularly numerous with them. They fast Wednesday and Friday of every week, and besides observe four great annual fasts, namely, forty days before Easter; from Whitsuntide to the days of Sts. Peter and Paul; the fast of the virgin Mary, from the 1st to the 15th of August and the apostle Philip's fast, from the 15th to the 26th of November; besides the day of the beheading of John the Baptist, and of the elevation of the cross. The calendar of the Greek Church is in the old style, their new year's day falling on Jan. 13th.

The services of the Greek Church consist almost entirely in outward forms. Preaching and catechizing constitute the least part of it. Instrumental music is excluded altogether. The mass is considered of the first importance. The convents conform for the most part, to the strict rule of St. Basil. The Greek abbot is termed higumenos, the abbess higumene. The abbot of a Greek convent which has several others under its inspection is termed archimandrite, and ranks next a bishop. The lower clergy in the Greek Church consist of readers, singers, deacons, etc., and of priests or popes and protopopes or archpriests, who are the first clergy in the cathedrals and metropolitan churches. The members of the lower clergy can rise no higher than protopopes, for the bishops are chosen from among the monks, and from the bishops are selected the archbishops, metropolitans, and patriarchs. In Russia there are twenty-four dioceses. With which of them the archiepiscopal dignity shall be united depends on the will of the emperor. The seats of the four metropolitans of the Russian Empire are St. Petersburg, Kiev, Kason, and Tobolsk. In the Turkish dominions the dignities of Patriarch of Constantinople. Alexandria, Antioch, and Jerusalem still subsist. The Patriarch of Constantinople still possesses the ancient authority of his see; the other three patriarchs exercise a very limited jurisdiction, and live for the most part on the aid afforded them by the Patriarch of Constantinople.

GREEK FIRE, an imflammable and destructive compound used in mediæval warfare, especially by the Byzantine Greeks. It was poured from cauldrons and ladles, vomited through long copper tubes, or flung in pots, phials, and barrels. The art of compounding it was concealed at Constantinople with the greatest care, but it appears that naphtha, sulphur, and niter entered into its composition.

GREEK LANGUAGE, LITERATURE, ETC., See under Greece.

GREELEY, Horace, American journalist and politician, born at Amherst, N. H., in 1811; in 1831 he went to New York, where, after an unsuccessful attempt to start the Morning Post, the



Horace Greeley.

first penny paper, he commenced in 1834 to issue the Weekly New Yorker, which ran for seven years. The Log Cabin, another weekly, established by him in 1840, reached a circulation of 80,000, and gave him a reputation which ensured

the success of his Daily Tribune, founded in 1841, and edited by him till his death. In 1848 he was elected to congress, but failed to impress his constituents with the necessity of returning him a second time. In 1851 he visited Europe, and was one of the jurors in the Great Exhibition. He opposed the civil war, but was a firm supporter of the Union and of President Lincoln, and at the close of the war advocated a general amnesty and universal suffrage. In 1872 he was nominated for the presidency in opposition to General Grant, but was defeated. The strain of electioneering and the death of his wife brought on an illness, of which he died a few weeks later. Chief among his miscellaneous works are his Hints toward Reforms (1850), Glances at Europe (1851), History of the Struggle for Slavery Extension (1856), The American Conflict (1864) Recollections of a Busy Life (1869). He died in 1872.

GREE'LY, Adolphus Washington, American Arctic explorer and meteorologist, was born in Newburyport, Mass., in 1844. In July, 1861, he enlisted as a private in the Nineteenth Massachusetts volunteer infantry, in which he served throughout the war. In 1867 he was appointed a second lieutenant in the regular army. In 1881 he was appointed to command the government expedition planned in pursuance of the recommendations of the International geographical congress at Hamburg, in 1879, that thirteen circumpolar stations be established in the Arctic regions. The party wintered two years at Discovery Harbor, Grinnell Land, whence expeditions were sent both into the interior of Grinnell Land, and across the straits into Greenland, one of the exploring parties under Lockwood and Brainard reaching, in May, 1882, latitude 83° 24′, the farthest north attained up to that time. He was awarded the Founder's medal of the Royal geographical society, and the Roquette medal by the Société de géographie, Paris, and was promoted to the rank of captain in the United States army. In 1887 he was appointed by President Cleveland to succeed Gen. W. B. Hazen as chief signal officer, with the rank of brigadier-general.

GREEN, John Richard, historian, born in 1837. For some time he wrote constantly for the Saturday Review; but he was comparatively little known until the publication in 1874 of his Short History of the English People, which secured him immediate fame. It was followed by a larger edition of the same work entitled A History of the English People (1877–80), a volume of Stray Studies from England and Italy, and the Making of England (1882). Latterly his work was carried on in distressing conflict with lung disease, and he died in 1883. The Conquest of England, his last work, was published posthumously by his wife, being almost complete at his death.

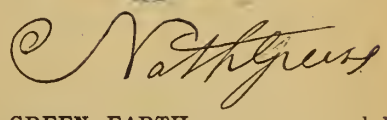
GREEN, Seth, American pisciculturist, was born in Rochester, N. Y., in 1817. He devoted his life to the artificial propagation of fish and the breeding of the better kinds for stocking lakes and streams. He stocked the Connecticut, the Hudson, the Potomac, and many other streams with enormous numbers of shad, trout, and other species. He also introduced shad into Pacific Coast waters. He died in 1888.

GREENBACK PARTY, greenbacks is the popular name given to non-interest bearing notes unsecured by gold or deposits of bonds, large numbers of which notes were issued during the civil war. Their issue resulted in an inflation of the currency which naturally was followed by an increase in prices especially of agricultural products. With the contraction of the currency which followed the limiting of unsecured paper money there was a fall of prices. This being coincident with a period of agricultural and business depression a demand for the retention of the greenbacks arose and the supporters of the idea held a convention in 1874 at which the government was asked to withdraw all bank currency and issue only national currency and to pay the national debt in the "greenbacks." Many democrats favored the idea but as the party as a whole refused to indorse these views the Greenback Party was organized in 1876 with Peter Cooper, the New York philanthropist as its candidate for the presidency. The party polled 80,000 votes mainly in the middle west. Labor troubles in 1878 led to the fusion with local workingmen's parties under the name Greenback-Labor Party and in that year they polled 1,000,000 votes at the congressional elections electing 14 congressmen. James B. Weaver, the presidential candidate in 1880 received 300,000 votes and eight congressmen were elected. The last candidate of the party was General Benjamin F. Butler, who in 1884 received 150,000 votes.

GREENBACKS, the popular name given to the paper currency first issued by the United States government in 1862 during the civil war. It is sometimes used also to include United States bank-notes.

GREEN BAY, a city in Wisconsin, on Fox river, near the head of Green Bay. It has a great trade in lumber and various flourishing industries. Pop. 21,526.

GREENE, Nathaniel, a general of the American revolutionary army, was born at Potowhommet, Rhode Island, in 1742. In 1770 he was elected to represent Coventry in the general assembly of Rhode Island, and was soon after excommunicated by the Quakers for taking arms on the prospect of war with Britain. In 1774 he joined the Kentish Guards as a private, and in May, 1775 he was appointed brigadier-general and commander of the Rhode Island contingent in the army before Boston. He gained at once the confidence of Washington, was made major-general and appointed to the command in New Jersey. At Trenton (1776) and Princeton (1777) he led a division, and in the subsequent fighting he held important commands, and repeatedly distinguished himself. In 1778 he was quarter-master-general, and in 1780 presided at the trial of Major André. In the same year he was appointed to the command of the southern army, and succeeded, after repeated defeats, in wresting Georgia and the Carolinas from the British. He died in 1786.



GREEN EARTH, an opaque, dull, olive-green, soft, earthy mass, generally met with in cavities in amygdaloidal rocks. It consists of silicate of iron and aluminium, with potassium and sodium in water.

GREEN-EBONY, an olive-green wood obtained from a South American tree, used for round rulers, turnery, marquetry work, etc., and also much used for dyeing, yielding olive-green, brown, and yellow colors.

GREENFINCH, GREEN-LINNET, or **GREEN GROSBEAK,** a bird of the finch family, and one of the most common of British and European birds. It frequents hedges, gardens, and small plantations, and feeds on grain, seeds, or insects. Its song is not melodious, but it easily becomes tame. It builds in hedges, bushes, and low trees, the nest being of green moss and coarse fibrous roots, lined with finer roots, horse-hair, and feathers. The eggs (four to six) are bluish white, spotted at the larger end with purplish gray and dark brown. The general colors of the male are green and yellow, those of the female inclining to brown.

GREEN GAGE, a variety of the plum, the reine claude of the French, introduced into Britain by a person named Gage. It is large, of a green or yellowish color, and has a juicy, greenish pulp of exquisite flavor.

GREENLAND, an extensive island belonging to Denmark, situated on the northeast of the continent of North America, from which it is separated by Davis's Straits, Baffin's Bay, and Smith's Sound. A small part of its northern and precipitous eastern coast is yet unknown but it does not extend further north than about lat. 83°. Like the northern parts of N. America generally, Greenland is colder than the corresponding latitudes on the east side of the Atlantic. In June and July the sun is constantly above the horizon, the ice on the coast is broken up and floats southward, and a few small lakes are opened; but the short summer is followed by a long and dreary winter. The interior, which is lofty and has the appearance of one vast glacier is uninhabitable, and all the

villages are confined to the coasts, which are lined with numerous islands, and deeply penetrated by fiords. The Danish colony extends north, on the western coast, to the Bay of Disco, in lat. 69° n. The inhabitants are largely dependent upon hunting and fishing. Whale blubber and seal oil are used as fuel. Despite the proximity of America the flora and fauna are rather of an European character. The land animals are the Esquimaux dog, the reindeer, the polar bear, the Arctic fox (blue and white), the ermine, the Arctic hare, and the musk ox. Among the amphibia the walrus and several species of seal are common. The seas abound in fish, the whale and cod fisheries being of special importance. Sea-fowl are abundant in summer, and largely killed. The chief mineral product is cryolite, but graphite and miocene lignitic coal are also found. Oil, eider down, furs, and cryolite are exported. The population, which is chiefly Esquimaux, numbers about 10,000.

GREEN MOUNTAINS, a mountain range, commencing near New Haven, Connecticut, and extending north through Massachusetts and Vermont, between Lake Champlain and the Connecticut river. The highest summits are Mansfield Mountain (4279 feet) and Camel's Hump (4188) feet, both in Vermont.

GREENOCK, a parliamentary burgh and seaport town of Scotland, county Renfrew, on the southern shore of the estuary of the Clyde, here between 3 and 4 miles wide, about 20 miles west by north of Glasgow. Pop. 68,142.

GREEN PAINTS, are for the most part compounds of copper and of chromium. The best known greens are the following: Bremen green, or verditer, consisting mainly of a basic carbonate of copper. Brunswick green, a hydrated oxychloride of copper; but the name is sometimes given to a hydrated basic carbonate, also known as mountain green. Chrome and emerald green are oxide of chromium. Emerald green (which see) is also used as synonymous with Schweinfurt green. English green is a mixture of Scheele's green with gypsum. Guignet's green is oxide of chromium prepared in a peculiar way. Hungary green is a kind of malachite found in Hungary. Rinman's green is got by heating zinc oxide with a cobalt compound. Saxony green is an indigo color used in printing. Scheele's green is arsenite of copper, and Schweinfurt green, Veronese green, and Vienna green, are also compounds of arsenic and copper. Verdigris is a hydrated basic carbonate of copper, often seen in copper saucepans. Besides there are green colors derived from plants. Of these may be mentioned chlorophyll, the green color of leaves; sap green, the juice of Rhamnus catharticus or buckthorn, made into a green lake with alumina; Chinese indigo-green, etc.

GREEN RIVER, a river in Kentucky, flows generally west and north-west, and enters the Ohio 200 miles below Louisville. It is navigable for boats for about 200 miles.

GREENSBORO, the county seat of Guilford co., N. C., on the Richmond and Danville and the Cape Fear and Yad. Valley railways; 48 miles s.s.w. of Danville, 81 miles w.n.w. of Raleigh. It is in a tobacco, wheat, corn, oats, and fruit region, with gold, copper, and iron mines. Pop. 12,160.

GREENSHANK, a well-known species of sand-piper often called the whistling snipe from the shrill note it utters when first flushed. The bird is about 12 inches long, rather prettily marked, and has the legs and toes olive-green.

GREEN-SICKNESS. See Chlorosis.

GREEN-TEA, a tea of a greenish color. The green color should be due to the mode in which the leaves of the tea are treated in the process of drying.

GREENVILLE, the county seat of Greenville co., S. C., on the Car., Knox. and W., the Port Royal and W. Car., and the Richmond and Danville Railways; 141 miles n. w. of Columbia, 158 miles e.n.e. of Atlanta, Ga. Pop. 14,170.

GREEN-VITRIOL, a name formerly given to sulphate of iron.

GREENWICH (grĕn'ich), a mun. and parl. bor. in the county of London, on the right bank of the Thames, about 5 miles s.e. of London bridge. There are extensive iron foundries and engineering works, barge and boat-building yards, boiler works, mast, block, and sail works, telegraph cable works, roperies, chemical factories, etc. The object of greatest interest is the magnificent hospital, the oldest portion of which was originally a palace of Charles II. In 1865, it ceased to be an asylum for seamen, and is now the seat of the Royal naval college for the education of naval officers. It also contains a naval museum and picture gallery. Adjoining it are the Royal naval school for boys, and an infirmary for sick and disabled seamen. The celebrated observatory of Greenwich, erected by Charles II. for Flamsteed, stands upon an eminence in the park. The longitude of all British maps and charts, also of those issued by the government of the United States of America, as well as many of those published in other countries, is computed from this observatory, which is 2° 20′ 23″ w. from the observatory of Paris, and 18° e. from the meridian of Ferro. Pop. 95,757.

GREG, William Rathbone, English writer, born in 1809. Besides his miscellaneous essays and pamphlets (collected in 1881 and 1882) he was the author of Sketches in Greece and Turkey (1833), The German Schism and the Irish Priests (1845), The Creed of Christendom (1851), Essays in Political and Social Science (1853), Enigmas of Life (1872), Rocks Ahead (1874), and Literary and Social Judgments (1877). He died in 1881.

GREGORIAN CALENDAR, the calendar as reformed by Pope Gregory XIII. in 1582.

GREGORY, the name of thirteen popes, of whom we need notice only the following: Gregory I., called also the Great, born at Rome, of noble family, about 540. He became a member of the senate, and was made a prefect of Rome in 573. He expended his inheritance in the foundation of monasteries and charitable institutions, and then took monastic vows himself. Pope Pelagius II. sent him on an embassy to Constantinople, and afterward made him papal secretary. On the death of Pelagius in 590 he was chosen his successor. He displayed great zeal for the conversion of heretics, sending missionaries to Sicily, Sardinia, Lombardy, England, etc., as well as for the advancement of monachism, and the enforcement of clerical celibacy. He died in 604. The work ascribed to him are very numerous; his genuine writings consist of a treatise on the Pastoral Duty, Letters, Scripture Commentaries, etc. Gregory VII. (Hildebrand), born about 1020 at Soana, in Tuscany; passed part of his early life in Rome, became a monk at Cluny, and then returned to Rome with Druno on the election of the latter to the papal chair. He exercised great influence over Leo IX. (Pruno) and his successors, Victor II., Nicholas II., and Alexander II.; and under Nicholas II. he succeeded in depriving the clergy and people of Rome of a voice in the election to the pontificate by giving the power of nomination to the cardinals alone. On the death of Alexander II. (1073) he was raised to the papal chair. His chief aim was to found a theocracy in which the pope should be the sovereign ruler, in political as well as ecclesiastical matters. He therefore prohibited simony and the marriage of priests (1074), and abolished lay investiture (1075), the only remaining source of the authority of princes over the clergy of their dominions. The Emperor Henry IV. refused to obey this decree, and Gregory, after deposing several German bishops who had bought their offices of the emperor, and excommunicating five imperial councillors concerned in his transaction, summoned the emperor before a council at Rome to defend himself against the charges brought against him. Henry then caused a sentence of deposition to be passed against the pope by a council assembled at Worms. The pope, in return, excommunicated the emperor, and Henry, finding himself in difficulties, went to Italy and submitted at Canossa (1077) to a humiliating penance, and received absolution. After defeating Rudolph of Suabia, however, Henry caused the pope to be deposed by the council of Birxen, and an anti-pope, Clement III., to be elected in 1080, after which he hastened to Rome and placed the new pope on the throne. Gregory passed three years as a prisoner in the castle of St. Angelo, and though finally liberated by Robert Guiscard, he was obliged to retire under the protection of Guiscard to Salerno, where he died in 1085. Gregory XIII. (Ugo Buoncompagno), born at Bologna in 1502; created cardinal in 1565; chosen successor of Pius V. in the popedom in 1572. He permitted the Cardinal of Lorraine to make a public thanksgiving for the massacre of St. Bartholomew, encouraged plots against Queen Elizabeth, and incited Philip II. to attack her. His foreign policy cost him much money for subsidies to excite enemies to the Turks and heretics, and his financial expedients to fill his exchequer ruined the trade and disturbed the peace of his own dominions. He did much to encourage education, his expenditure for this pur-

pose exceeding two million Roman crowns, out of which many colleges at Rome were endowed. He reformed the Julian calendar (see Calendar). He died 10th April, 1585.

GREGORY, James, mathematician and inventor of the reflecting telescope, was born at Drumoak, in Aberdeenshire, about 1638. In 1663 he published Optica Promota, explaining the idea of the telescope which bears his name. He spent some years in Italy, and published at Padua in 1667 a treatise on the Quadrature of the Circle and Hyperbola. He died suddenly in 1675.

GRENA'DA, one of the British West Indian Islands; about 85 miles northwest of Trinidad; oblong in form, 24½ miles long, n. and s., and 10 miles broad; area 133 sq. miles. Pop. 64,288 (about 900 whites).

GRENADE, a small hollow bullet or ball of iron or other metal, or annealed glass, about 2½ inches in diameter, filled with gunpowder, and fired by a fuse, so as to cause it to burst when thrown among the enemy. The term was first used by Du Billey, in reference to the siege of Arles (1536). Until about the end of the 17th century, when musketry became common, soldiers of the line were trained to throw grenades by the hand, hence the name grenadier. See the following article.

GRENADIER, originally a soldier destined to throw the hand-grenades. Soldiers of long service and acknowledged bravery were selected for this service, so that they soon formed a kind of élite. There were at first only a few grenadiers in each regiment. Companies of grenadiers were formed in France in 1670, in England a few years later. With the development of the musket the name soon became only a souvenir of the ancient practice; the troops so called generally formed one battalion of a regiment, distinguished by the height of the men and a particular dress, as, for instance, the high bear-skin cap. With the British and French the grenadier company was the first of each battalion. The name in the British army remains only in the regiment of Grenadier Guards.

GREN'ADINE, a thin gauzy silk or woolen fabric, plain, colored, or embroidered, used for ladies' dresses, shawls, etc.

GREN'ADINES, a chain of small islands and rocks, West Indies, between the islands of Grenada and St. Vincent; principal island, Carriacou. They produce coffee, indigo, cotton, and sugar. Pop. about 7000.

GRENO'BLE, a fortified town of southern France, capital of dep. Isère, finely and strongly placed on the Isère, 60 miles s.e. Lyons. It has a cathedral, and a noteworthy church (Saint-André), with the tomb of Bayard; a public library of 170,000 volumes and 7500 MSS.; a college, museum, bishop's palace, court-house, arsenal, and extensive public gardens. The manufactures consist of gloves, linen goods, liqueurs, leather, etc. Pop. 68,052.

GRENVILLE, George, a British minister, younger brother of Earl Temple, and father of William Wyndham the first Lord Grenville; born in 1712; died in 1770. He became treasurer of the navy in 1754; secretary of state and subsequently Irish lord of the admiralty in 1762; first lord of the treasury and chancellor of the exchequer in 1763. In 1763 he introduced a scheme of colonial

George Grenville.

taxation, and in 1764 proposed a stamp tax to be levied in the American colonies which was one of the causes of the American war of independence. In 1765 he was succeeded in office by Lord Rockingham.

GRENVILLE, Sir Richard, one of England's naval heroes, a cousin of Sir Walter Raleigh, born about 1541. Sir Richard died in 1591. Tennyson's grand ballad of The Revenge is well known.

GRENVILLE, William Wyndham, Lord, third son of George Grenville, was born 1759. In 1783 he was appointed paymaster-general of the army; in 1789 became speaker, and in the same year became secretary of state for the home department. In 1790 he was created Baron Grenville, and from 1791 till Pitt's resignation in 1801 held the post of foreign secretary. On the return of Pitt to office in 1804 he declined to join him, and continued in opposition till Pitt's death, when he became the head of a coalition ministry, including Fox and Grey, 1806. This ministry resigned in 1807, after having passed an act for the abolition of the slave-trade. He did not again take office. He died in 1834.

GRESHAM, Walter Quinton, American jurist and politician, was born near Lanesville, Harrison co., Ind.; was admitted to the bar in 1853, and in 1860 was elected as a republican to the state legislature. In 1861 he enlisted as a private in the Thirty-eighth volunteers. For bravery at the siege of Vicksburg he was promoted to be brigadier-general. He was appointed in 1869 by President Grant United States district judge for Indiana, and in 1882 resigned his seat on the bench in order to accept President Arthur's tender of the office of postmaster-general. In 1884 he was made secretary of the treasury, a position which he held for a few months, when he was appointed United States circuit judge for the seventh judicial circuit. He was a candidate for the republican nomination for president in 1884 and 1888. He was appointed secretary of state by Cleveland in 1892. Died 1905.

GRETNA GREEN, a village of Scotland, in Dumfriesshire, on the Solway Firth, 8 miles north of Carlisle, for nearly a century notorious for the celebration of the marriages of fugitive lovers from England. To conclude a lawful (though irregular) marriage in Scotland, it is only necessary for an unmarried couple to go and declare themselves man and wife before witnesses, and it was in this way that these runaway couples were married; but such marriages were put an end to in 1856, by an act declaring that no irregular marriage in Scotland shall be valid unless one of the parties has resided in Scotland for twenty-one days next preceding such marriage.

GREY, Charles, Earl, English statesman, eldest son of Charles, first Earl Grey; born in 1764; died in 1845. He was educated at Eton and at King's college, Cambridge. In 1786 he was returned to parliament as member for Netherlands. On the accession of the Grenville ministry in 1806, Grey, now Lord Howick, was made first lord of the admiralty, and on the death of Fox succeeded him as secretary for foreign affairs and leader of the House of Commons. The death of his father in 1807 raised him to the House of Peers, and

Earl Grey.

from this period up to 1830 he headed the opposition in the lords, and especially opposed the proceedings against Queen Caroline. On the accession of William IV. and the retirement of the Wellington ministry, Earl Grey was summoned to office. The great event which marks his administration is the passing in 1832 of the first reform bill. In 1834 Earl Grey resigned, and was succeeded by Lord Melbourne. The remainder of his life was chiefly spent in retirement.

GREY, Lady Jane, an interesting figure in English history, the daughter of Henry Grey, marquis of Dorset, afterward duke of Suffolk, by Frances, daughter of Charles Brandon, duke of Suffolk, and Mary, younger sister of Henry VIII., in whose reign Lady Jane was born, in 1537. She displayed much precocity of talent; and under the tuition of Aylmer, afterward bishop of London, she acquired a knowledge of the learned languages, as well as French and Italian. She was married to Lord Guildford Dud-

ley, fourth son of the Duke of Northumberland, in 1553. Edward VI., who died in 1553, was induced on his deathbed to settle on her the succession to the crown. The council endeavored to keep his death secret, with a view to secure the persons of the princesses, Mary and Elizabeth, and when Mary discovered the design the council proclaimed Lady Jane queen. On the approach of Mary, however, the council deserted Lady Jane, and Mary was proclaimed queen. She was beheaded on Tower Hill, February 12, 1554, her husband having previously suffered the same day.

GREY FRIARS. See Franciscans.

GREYHOUND, a variety of dog, distinguished by a greater length of muzzle than any other; very low forehead, short lips, thin and long legs, small muscles, contracted belly, and semipendent ears. There are several varieties, as the Irish greyhound, the Scottish, the Russian, the Italian, and the Turkish. The common greyhound is of an elegant make of body, and is universally known as the fleetest of dogs. A good hound has a fine, soft, flexible skin, with thin, silky hair, a great length of nose, contracting gradually from the eye to the nostril, a full, clear, and penetrating eye, small ears, erect head, long neck, chest capacious, deep, but not wide, shoulders deep and placed obliquely, ribs well arched, contracted belly and flank, a great depth from the hips to the hocks of the hind-legs, fore-legs, straight and shorter than the hinder. The name appears to have no reference to the color, but is derived from the Icelandic grey, a dog. They are chiefly used in the sport of coursing, a work for which their peculiar shape, strength, keenness of sight and speed make them exceedingly well fitted. This sport is preferred by many to horse-racing and large kennels of greyhounds are kept by several of the nobility and gentry, who also further the sport by preserving hares, and providing suitable coursing grounds. The chief breeds are the Newmarket, the Lancashire, and the Scotch.

GRIFFIN, or **GRYPHON,** a fabulous monster of antiquity, also common in heraldry, commonly represented with the body, the feet, and claws of a lion,

Medieval griffin.—Porch of the Duomo, Verona, Italy.

and the head and wings of an eagle. India, or Scythia, was anciently assigned as the native country of the griffins; and it was alleged that they guarded the gold in the mountains.

GRIMAL'DI FAMILY, one of the four families of the high nobility in Genoa. The lordship of Monaco belonged, for more than 600 years (beginning with 980), to the Grimaldi, and the ruler is still a Grimaldi. With the Fieschi they always played an important part in the history of Genoa, especially in the disputes between the Ghibellines and the Guelfs, to which latter party both families belonged.

GRIMALDI'S FRINGES, a term in optics given to the colored bands observed when a beam of light passing through a narrow slit falls on a screen.

GRINDING, a mechanical process in which certain effects are produced by attrition. This process prevails in various mechanical arts, as in grinding corn, etc., the object of which is to reduce the materials to a fine powder; or in grinding metals for the purpose of giving them a certain figure, polish, or edge. In the first case the grinding or crushing is effected by rough stones, or, as in crushing ores, between heavy metal cylinders, by or a heavy stone or iron cylinder revolving upon a smooth plate. (See Mill.) The grinding of cutlery is effected by means of the grindstone (see below); emery powder grinds glass lenses and specula. Ornamental glass is ground into facets by stones and lap-wheels. Diamonds and other precious stones are ground with diamond dust. What is called dry grinding is the grinding of steel with dry grindstones. The points of needles are produced by this means, also the finishing of steel pens. Sand-jet grinding is a process in which abrasion is effected by the percussion of small hard particles on a plain surface, sharp siliceous sand being impelled by a blast artificially produced of steam or of air. By the use of flexible jointed connecting tubes the jet can be turned in any direction.

GRINDSTONE, a cylindrical stone, on which sharpening, cutting, and abrasion are effected by the convex surface while the stone is revolving on its axis. They are made of sandstone, or sandstone grit of various degrees of fineness. Artificial grindstones have been successfully tried.

GRIQUALAND EAST, a district of South Africa, lying south of Natal between Pondoland and Basutoland; fertile and suited for stock-raising. It was incorporated with Cape Colony in 1874. Area, 7480 sq. miles. Pop. about 153,000.

GRIQUALAND WEST, a district of South Africa north of the Orange river, and west of the Orange River colony; 180 miles from east to west, and 120 from north to south; area, about 17,800 sq. miles. The prevailing character of the surface is that of undulating grassy plains suitable for grazing. In 1870 large finds of diamonds in that district began to attract wide notice, and in 1871 Waterboer, the Griqua chief, ceded all his rights to the British government, and the territory was incorporated with Cape Colony. The chief center of the diamond-mining industry, and the seat of government, is Kimberley. Pop. estimated at 84,000.

GRISONS (grē-sōn), the largest and most easterly canton of Switzerland, bordering on Austria and Italy; area, 2773 sq. miles. The climate varies greatly, ranging from the perpetual winter of the mountains to the almost Italian air of some of the valleys. The canton is in general pastoral, feeding large numbers of cattle and sheep. The mountain forests supply much timber. A considerable transit trade is carried on between Italy and Germany. The canton was admitted into the confederation so late as 1803. Both the protestant and the Roman Catholic religion are established. The language of the public acts is German, and the people speak German, Romanish, or Italian. Pop. 104,510.

GRISWOLD, Rufus Wilmot, D. D., American writer, born in Vermont, 1815. After having traveled extensively both in his own country and in Europe, he became successively a printer, a baptist preacher, and a journalist. He was the author of The Poets and Poetry of America, etc. He was one of the editors of Edgar A. Poe's works. He died in 1857.

GRIT, is a sandstone, coarse-grained, with particles more or less angular, connected by a cement of a hard siliceous nature.

GROATS, the seeds of oats prepared as an article of food by being deprived of their hulls. They are much used in the preparation of gruel for invalids.

GRODNO, a town, Russian Poland, capital of the government of same name, on the Niemen, 160 miles, northeast of Warsaw, Pop. 49,788.—The government has an area of 14,931 sq. miles, largely occupied by pine forests and swamps. Pop. 1,321,157.

GROIN, the angular curve made by the intersection of two semi-cylinders or arches. It is either regular or irregular: —regular, as when the intersecting

a a, Groins.

arches are of the same diameters and heights; and irregular, when one of the arches is semi-circular, and the other semi-elliptical. In Gothic architecture groins are always ribbed.

GRONINGEN (grō'ning-en), a town of Holland, capital of a province of same name, situated on the river Huns, here converted into a canal, 92 miles northeast of Amsterdam. Pop. 67,563.—The province forms the north-eastern portion of Holland; area, 790 sq. miles. It is protected against the encroachments of the sea by dykes, is very level, and is intersected by innumerable canals. The inhabitants, 302,681, nearly all belong to the Calvinistic Church.

GROSBEAK, a general popular name for birds of at least three groups belonging to the conirostral division of the Insessores. The first comprises the crossbills; in the second group is the East Indian representative genus, with the beak large and parrot-like, but not crossing; the third group includes the pine grosbeak and the bullfinch. The term

grosbeak was given to birds which had beaks proportionally larger than in the most familiar forms.

GROTE, George, English historian and politician, was born in 1794, died in 1871. In 1846 appeared the first two volumes of his History of Greece. The remaining ten volumes followed in rapid succession, the final volume being published in 1856. The work terminates with the death of Alexander the Great, and as a whole is a monument of erudition. In 1865 he published Plato and the Other Companions of Socrates, and was engaged at the time of his death on an elaborate treatise on Aristotle and the Peripatetics. In the latter part of his life he was concerned in the management of University college, the London university, and the British museum.

GROTESQUE, in art, a capricious variety of arabesque ornamentation, which, as a whole, has no type in nature, the parts of animals, plants, and other incongruous elements being combined together; used by the Romans in decorative painting and revived by the artists of the renaissance.

GROUCHY (grö'shē), Emmanuel, Marquis, de, a noted French general, born at Paris, 1766. He entered the Royal life guards at the age of fourteen, saw much service, and highly distinguished himself. In the war with Prussia in 1806, and Russia (1807), and at Wagram, he acquired increased renown. In 1815 he defeated Blücher at Ligny. Having been ordered to follow the Prussian retreat, he was unable to aid Napoleon at Waterloo. He was banished under the second restoration, and lived for a few years at Philadelphia. He returned to France in 1821, and died in 1847.

GROUND DOVE, a name of various species of pigeons, which resemble the

Dwarf ground-dove.

gallinaceous birds in living mainly on the ground, their feet being better suited for walking than perching.

GROUND-HOG. Same as Aard-vark.

GROUND IVY, a common British plant with a creeping stem and purple flowers. Tea made from it is used by the poor for pectoral complaints. It was formerly employed to flavor ale.

GROUND-NUT, a term which denotes the seeds or pods of certain umbellifers (earth-nuts)' The nut or pod is situated at the end of a stalk of some length and is ripened under ground, this stalk having the peculiarity after flowering of bending down and pushing the fruit into the earth. The plant is extensively cultivated in tropical countries. The nuts have a flavor similar to almonds, and yield an oil that may be used for olive-oil. See Peanut.

GROUND-PINE, a herbaceous labiate plant, so called from its resinous smell. Also a name given to some lycopods or club-mosses.

GROUND-RENT, in English law, is the rent paid to a landowner by a person for the use of ground on which buildings are erected. The usual arrangement is

Ground-nut.

for a specified time, generally ninety-nine years. On the expiration of this period the whole of the buildings become the property of the ground-landlord.

GROUND SQUIRREL, the name of squirrels somewhat resembling the marmot. They differ from the common squirrel in possessing cheek-pouches, and in retreating into burrows. They are well known in America, but species are also found in Asia and Africa.

GROUSE, the general name of gallinaceous birds, whose distinguishing mark is a naked band, often of a red color, in place of an eyebrow. They are wild, shy, and almost untamable. They live in

Red grouse.

families, in forests and barren regions, and feed on berries, buds, and leaves. They are polygamous, the male abandoning the female, and leaving to her the whole care of the progeny. The eggs number eight to fourteen. To this genus belong several species peculiar to North America, the most remarkable of which is the pinnated grouse or prairie hen, which inhabits open desert plains in particular districts of the Union. The male is furnished with wing-like appendages to his neck, covering two loose, orange sacs, capable of being inflated. Another species is the cock of the plains (which see). See also Hazel Grouse, Ruffed Grouse, Sand Grouse.

GROVES, among various ancient nations groves have been, probably on account of the mental impressions their stillness is calculated to make, considered as suitable localities for religious rites. The Hebrew word asherah, translated "grove" in the authorized version of the Old Testament, seems to signify some idol or idolatrous symbol. See Asherah.

GROW, Galusha Aaron, American politician, was born at Ashford, Conn., in 1823. In 1851 he was elected to congress from Pennsylvania and continued to be a member of that body until 1863. He was speaker of the house of representatives from 1861–1863. He declined the Russian mission in 1879. From 1894 until his death in 1906 he was congressman at large from his state.

GRUB, the term applied to the soft, wormlike larvæ of coleopterous and other insects. Some species do much injury to the roots of plants, growing corn, etc.

GRUBBER, an agricultural implement for tearing and loosening soil, and for eradicating roots, etc. It consists of an iron framework with handles and wheels, and provided with curved tines or teeth. In the most approved kinds the wheels are arranged three in front, and two behind. The depth to which the teeth may penetrate is regulated by suitable mechanism.

GRUGRU, the larva of the palm weevil, found in the tropical parts of America. It is of the length and thickness of a man's thumb, burrows in cabbage-palms, and canes, and is, when cooked, considered a great delicacy.

GRUNT, Grunter, an American fish, also termed pig-fish and red-mouth. The first of these names relates to the sound it emits when taken out of the water, the last to blood-red marks on the gums or lips. The Growler, found in America, also emits a grunting sound.

GRUS, the genus to which the crane belongs.

GRYSBOK, a species of antelope found in Southern Africa. It attains about 3 feet in length, is 1½ feet high at the shoulder, and its color is reddish-gray. It is hunted for the sake of its flesh.

GUACHARO, a bird of the goat-sucker family, of nocturnal habits, a native of South America, and found in great numbers in certain caves of Venezuela, Trinidad, and elsewhere. It is about the size of a common fowl, with a curved and toothed bill, wings long and pointed. It is called also Oil-bird.

GUADALAJARA (gwä-dä-lä-hä'rä), a town in Spain, capital of the province of same name, on the Henares, 44 miles northeast of Madrid. Pop. 8503.—The province, area 7012 sq. miles, is mountainous, or forms part of an elevated plateau. Pop. 205,495.

GUADALAJARA, a city of Mexico, capital of the state of Jalisco, in the fruitful valley of Atemajac, on the Rio de Santiago; a large and handsome city, with a fine cathedral and other good buildings; a university, a mint, convents, etc. Various manufactures are carried on, as those of silversmiths' and goldsmiths' wares, paper, leather, hats, pottery, cloth, etc. Pop. 95,000.

GUADELOUPE (gä-dē-löp), one of the French West Indies, composed of two

portions, separated by a narrow arm of the sea called Rivière Salée (Salt River). The western and larger portion is Basse-terre, or Guadeloupe Proper, 27 miles long by about 15 miles broad. The eastern portion, called Grande terre, is nearly 30 miles long by 10 to 12 miles broad. Guadeloupe Proper is of volcanic formation, the culminating point being La Soufrière, 5018 feet. Grande-terre, on the other hand, is generally flat, and of coral formation. Guadeloupe is watered by a number of small streams which become dry in summer. Grande-terre has only a few springs of brackish undrinkable water. The climate is hot and unhealthy, with a remarkably humid atmosphere, and hurricanes are frequent and destructive. The soil is fertile. The chief exports are sugar, coffee, dye and cabinet woods, pepper, manioc, tobacco, etc. The chief town is Basse-terre. Pop. 172,097, or with dependencies (Marie Galante, Desirade, etc.), 200,000.

GUAIACUM (gwī'a-kum), a genus of plants, containing four or five arborescent species, natives of the West Indies and the tropical parts of America. Among other uses it is employed in the

Guaiacum plant.

construction of ornamental articles of furniture, being susceptible of a fine polish. This tree yields the resin known as guaiacum, which either flows spontaneously from the tree, or from incisions or perforations in the stem, or is got by extraction by means of spirit from the wood. It is greenish-brown, has a balsamic odor, taste somewhat bitter and pungent, and it dissolves freely in spirit, but it insoluble in water. Its chief use is in medicine, the resin (as well as a decoction of the bark and wood) acting as a stimulant in chronic rheumatism, and being used also in gout, scrofula, syphilis, etc.

GUAIRA. See Guayra.

GUAM (gwäm), the largest of the Ladrone Islands, lying in the Pacific Ocean, and belonging to the United States. It is about 1500 miles east of Manila, and nearly the same distance southeast of Yokohama. It is 31 miles long and from 5 to 7 miles wide, and has an area of about 195 sq. miles. The climate is humid, with rain at all seasons but not unhealthful. The cocoanut-palm and the bread-fruit tree, rice, sugar, and indigo are cultivated, and the farms are well stocked with domestic animals. The island is of little importance to the United States except as a naval station and port of transit between America and Asia, to which end the barbor of Apra is being extensively improved. The population is about 9000, of whom more than half live in the capital, Agaña. Guam was captured by the United States cruiser Charleston on June 21, 1898, and by the treaty of Paris was ceded by Spain to the United States.

GU'AN, a gallinaceous bird. The sides of the head and front of the throat are naked and wattled, the wattles capable of inflation. The name Guan is more particularly applied to the largest bird of the genus, measuring about 30 inches. The guans perch on trees, descending in search of grain and fruits, and are natives of Brazil and Guiana.

GUANACO (gwän-a'ko), a South American ruminant, closely akin to the llama, alpaca, etc. It abounds most in Chili and Patagonia.

GUANAXUATO (gwä-nä-hwä'tō), a city of Mexico, capital of the state of the same name, 160 miles northwest of Mexico. Pop. 56,000.—The state is situated in the center of Mexico; area, 11,411 sq. miles; population, 968,113. Its mines, once the richest in the world, still yield a large amount of gold and silver. The surface is traversed by the cordillera of Anahuac, 9711 feet in height.

GUAN'O (Peruvian huano, dung), a valuable manure, consisting of the partially decomposed and dry excrement of the fish-eating seabirds, which has in some places accumulated in great masses. The name has been also extended to accumulations of a similar kind from land birds, and even from bats in caverns. Owing to the fact that rain washes such deposits away, great accumulations of guano exist principally in hot and dry tropical regions. The most important of all were the deposits on the Chincha Islands off the coast of Peru, which yielded a considerable revenue to the country, but are now quite exhausted. From 1853 to 1872 about 8,000,000 tons were got from these islands. Other deposits of less extent have from time to time been found, and Peru still remains the chief source of supply, its deposits being now, however, worked under the Chilian government. Guano varies extremely in composition, but it may be roughly divided into nitrogenous and phosphatic. The first of these contains about 21 per cent of ammonia. This is the case with the Peruvian variety, which contains almost all the inorganic matter required by a plant, and that in a highly available form, so that it is looked upon as one of the best of all fertilizing agents for different crops. Its use as a manure was was known to the native Peruvians centuries ago, but no attention was paid to the accounts by modern travelers of its wonderful efficacy until A. von Humboldt brought some to Europe and had it analyzed. It began to be brought to Europe about 1846. It is used raw or in its natural state, but most of the phosphatic guanos (some of which hardly deserve the name of guano) require to be dissolved by sulphuric acid before using. There are also manures known as fish guano, prepared from fish or fish refuse, flesh guano, blood guano, etc. Large quantities of fish guano are made in the United States from the menhaden, the oil being first extracted.

GUARDIAN, in law, the custodian of persons incapable of directing themselves and especially of infants, that is persons under 21 years of age. They may be said to be of five kinds: 1st, testamentary, or appointed by will; 2d, customary, by local usage; 3d, ad litem, or appointed by a court in order to conduct legal proceedings; 4th, by appointment of chancery; 5th, in tort, or by intrusion. Guardianship lasts in the case of the young until they have attained the age of twenty-one.

GUARDIAN ANGEL, the angelic guardian who, by some, is supposed to watch over every human being with a view of preserving him or her from moral evil. The notion is based on Gen. xlviii: 16, Matt. xviii: 10, and Heb. i: 14.

GUATEMALA (gwä-te-mä'lä), a republic of Central America; area estimated at 46,800 sq. miles; pop. (1900), 1,574,340. It is in general exceedingly picturesque, and distinguished by a luxuriant and varied vegetation. It is wholly mountainous or elevated, the main chain of the Central American system traversing it southeast to northwest, and sending off numerous branches. Along the main chain are a considerable number of volcanoes, several of which are said to be active—as Fuego and Agua (14,890 feet high), which sends forth torrents of water. The state is well watered by numerous streams, none of much importance. On the table-land, of which a considerable portion of the state is formed, the climate is mild; but in more elevated situations the cold is intense. There is much valuable timber. The soil generally is of great fertility, producing according to altitude, soil, etc., corn, wheat, rice, coffee, cotton, tobacco, sugar, cochineal, cacao, indigo, vegetables, and tropical fruits in great variety. Fiber plants are numerous, including ramie, henequen, and others. The most important product is coffee, and the other chief exports are skins, caoutchouc, cochineal, wool, etc. The trade is chiefly carried on with Britain, the United States, Germany, and France. In the altos or mountainous parts of the northwest considerable flocks of sheep are raised, the wool of which is manufactured into coarse fabrics. Great attention is now being paid to education, the children, even Indians, in small and remote villages being compelled to attend school. The capital is Guatemala la Nueva (New Guatemala). The chief port is San José on the Pacific; Champerico on the Pacific, and Livingston in the Bay of Honduras are the other ports. The legislative power is vested in a national assembly elected for six years by universal suffrage. The executive is vested in a president, elected for four years.—New Guatemala, or Santiago de Guatemala, the capital, is situated about 5000 feet above the sea, and 80 miles distant from the Pacific. Pop. 85,000.—Old Guatemala, the former capital, is 10 miles southwest of New Guatemala. It was founded by the Spanish in 1542, and continued to be the capital till 1774, when it was destroyed by a volcanic outbreak. It has been rebuilt, however, and the population is now about 20,000.

GUAVIARE (gwä-vi-ä′rā), a river of Colombia, South America, an affluent of the Orinoco; length, 900 miles.

GUAYAQUIL (gwī-ä-kēl′), a city and seaport in Ecuador. It is the chief port of Ecuador, and one of the best of the west coast of South America. Its principal exports are cacao, coffee, and ivory nuts. Pop. estimated at 40,000.

GUDGEON, a fresh-water fish, belonging to the carp family. It has short dorsal and anal fins, without spines; on each side of the mouth there is a small barbel; neither jaw is furnished with teeth, but, at the entrance of the throat, there are two triangular bones that perform the office of grinders. These fish are taken in gentle streams, and measure only about 6 inches.

GUELFS or **GUELPHS,** the name of a distinguished princely family which originated in Germany, but was also at one time connected with Italy, and which still flourishes in the two lines of the house of Brunswick, the royal (to which the reigning family in Britain belongs) and the ducal. The first who bore the name is said to have been Welf, the son of Isenbrand, whose grandfather was a vassal of Charlemagne. See Brunswick (Family of) and Guelfs and Ghibellines.

GUERNSEY, (gèrn′zi), the second largest and most western of the Channel Islands, lying off the north coast of France, 46 miles from Cherbourg, and about 68 miles from Start Point in Devonshire. The principal exports are cattle (the dairy cows being renowned), fruits, vegetables in the early spring; granite for paving, etc. Steamers ply regularly between Guernsey and London, Southampton, Plymouth, and Weymouth. It is strongly fortified, and has a well-organized militia. Pop. 35,339. See Channel Islands.

GUERRERO (ger-rä′ro), a state of Mexico; area, 24,227 sq. miles. Its surface is finely diversified by mountain and valley, and partly covered by native forests; and it is rich in minerals, including gold, silver, copper, and iron. The principal port is Acapulco. Pop. 474,-594, mostly Indians.

GUERRILLAS (ge-ril′az), a name first given in Spain to light, irregular troops, consisting chiefly of peasants who fought against the invading French in the early part of the present century. The name has now become quite a general term for such irregular troops, and has traveled far beyond Spain.

GUIANA (gī-an′a), British, a colony in the north of South America, about 560 miles long, and about 200 miles broad, having e. Dutch Guiana, w. Venezuela and Brazil, n. and n.e. the Atlantic, and s. Brazil; estimated area, 109,000 sq. miles. It is divided into three settlements—Berbice, Demerara, and Essequibo. The coast tract forms a dreary belt, 10 to 40 miles broad, of mud-banks and shallows, and when drained the surface sinks 1 foot below the sea-level, hence strict attention must be paid to dams and sluices. This alluvial deposit is succeeded by a range of low hills not exceeding 200 feet in height. Gold occurs in various places, and is now mined with success. Rock crystals and red agate are met with; and very white clay is found in the Essequibo. The extensive flats along the shore are composed of alluvial soil and clays, resting upon granite. The chief rivers are the Essequibo, Demerara Berbice, and Corentyn. The climate, though moist and warm, is not on the whole unhealthy. Among the animals are the jaguar, tapir, armadillo, sloth, vampire bat, alligator, etc., and many species of birds, such as humming-birds, parrots, etc. Snakes, some of them

Indians of Guiana.

venomous, and troublesome insects are numerous. Guiana has two dry and two wet seasons, each continuing for three months: The mean annual temperature is nearly 81° 2′. Sugar, rum, and molasses are the principal exports. Pop. (1901), 300,748, of which a great proportion are of African race or coolies from India.

GUIANA BARK, the bark of Cinchona, considered to possess great value as a febrifuge.

GUIANA, DUTCH, or **SURINAM,** a Dutch colony in South America, situated between English and French Guiana; area, about 60,000 sq. miles. Only a small part of the colony is under cultivation. On the Surinam river, about 10 miles from its mouth, is situated the capital, Paramaribo. The principal exports are sugar, coffee, molasses, and rum. The government is vested in a governor-general and council. Pop. 72,533.

GUIANA, FRENCH, a French colony in South America, between Dutch Guiana and Brazil; area, about 35,000 sq. miles. The colony comprises the the island of Cayenne, celebrated for the pepper bearing that name. Gold has also been found in considerable quantities. The French are said to have first settled in Cayenne in 1604. Pop. 30,000.

GUIDON (gī′don), the little flag or standard of a troop of cavalry.

GUIGNET'S GREEN (gē-nyā), a pigment prepared by heating in a reverberatory furnace a mixture of three parts boracic acid and one of bichromate of potassium, made into a thick paste with water. This color is quite fixed—it does not alter by light or reagents, and it is quite harmless, so that it forms an excellent substitute for the greens which contain arsenic and copper.

GUILD, a society or association for carrying on commerce, a handicraft, or some other undertaking. Such associations are known from very early times in various countries. The societies of tradesmen exclusively authorized to practice their art, and governed by laws of their own, played a very important part in the middle ages. They often formed a bulwark against the oppression of the nobility, and were thus extremely conducive to the growth of municipal and civil liberty. Traces of these trade societies are found in the 10th century. In Milan we find the mechanics united under the name credentia. At Florence the trades were federated into twenty-one guilds or arti. These originated in 1282, on the overthrow of the nobility, and every candidate for citizenship was obliged to enter some particular guild. With the view of destroying the political influence which they had acquired the emperor Frederick II. abolished them by a decree issued in 1240; but the decree remained without effect, as did also the clauses inserted with a similar view into the Golden Bull in 1356, and it was not until the present century that unrestricted freedom to practice any trade was established in the German states. In Austria this was done in 1860, and in 1868 it was done for all the states of the North German confederation. In Britain trade guilds long possessed an importance which was mainly political. As the right of voting was involved in the membership of a guild, many persons, not mechanics, acquired the rights of "freemen" by connecting themselves with some body of this kind. These guilds, in England, had no legal right to prevent any man from exercising what trade he pleased. The only restriction on the exercise of trades was the statute of Elizabeth, requiring seven years' apprenticeship. This the courts held to extend to such trades only as were in being at the time of the passing of that statute.; but by an act passed in 1835, every kind of restriction on artisans, trades, etc., was abolished. The guilds or companies of the city of London (among the oldest of which are the weavers, founded in 1164; the parish clerks, in 1232; the saddlers, in 1280, the fishmongers, in 1284) are still very important corporations, which give relief to poor and decayed members, and also manage vast funds bequeathed for benevolent purposes. Besides the secular guilds there were from a very early period, in Britain, religious guilds. The property of the religious guilds was sequestrated in the reign of Henry VIII. In France guild-privileges were sold by the state from the 10th century till the revolution of 1789, but at that date guilds were entirely abolished. This was done also at a later period in Belgium, Holland, Italy, Sweden, and Denmark. Many of the trades-unions have now somewhat of the character of the ancient guilds.

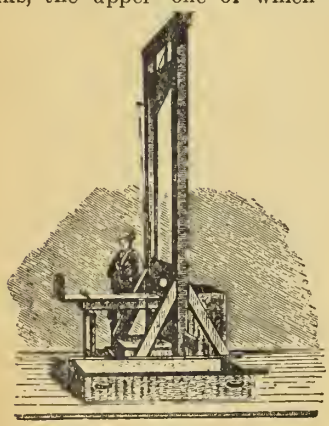
GUILDHALL, the city hall of London, Cheapside, first built in 1411, all but consumed in the great fire of 1666; and in 1669 rebuilt. The front was not erected until 1789. The most remarkable room is the hall, 153 feet long, 48 broad, and 55 high, used for city feasts, etc. It contains the curious wooden statues of Gog and Magog. In the common-council room is a collection of pictures, some of them very valuable. There is also a library in the Guildhall.

GUILLEMOT (gil'e-mot), a name for several web-footed birds belonging to the family of auks. The guillemots have a straight, compressed, and pointed bill, covered with feathers as far as the nos-

Black guillemot.

trils, and have no hallux or hind-toe. The wings are pointed and very short, the legs also short, and placed far back. They live on fish, and build on precipitous rocks adjoining the sea.

GUILLOTINE, (gil-lo-tēn'), an engine for beheading persons at one stroke—an invention of the middle ages—adopted with improvements by the national assembly of France during the first revolution on the proposal of a Dr. Guillotin, after whom it is named. In this apparatus decapitation is effected by means of a steel blade loaded with a a mass of lead, and sliding between two upright posts, grooved on their inner sides, the person's neck being confined in a circular opening between two planks, the upper one of which also



Guillotine as used in Paris.

slides up or down. The condemned is strapped to a board, which in the cut is shown resting horizontally on the table in front of the upright posts, but which is easily drawn forward and set upright when necessary, and again canted over upon the table and rapidly moved up so as to place the neck of the condemned within the semicircle of the lower plank, the other being raised for the purpose. On the right of the table is a large basket or trough of wicker-work for the reception of the body. Under the place where the head rests is an oblong trough for its reception. The knife is fixed to the cap or lintel on the top of the posts by a claw in the form of an 8, the lower part of which opens as the upper closes. This claw is acted upon by a lever to which a cord is attached. When the head of the condemned is in position the cord is pulled, and by the action of the lever the knife is set at liberty, descending by the grooves in the upright posts and falling upon the neck of the condemned just behind the planks which keep the head in position. The scaffold, which is surrounded by an open railing, is raised 6 or 7 feet from the ground. The same name is given to a machine which cuts by a knife descending between grooved posts, much used for cutting paper, straw, etc.

GUINEA (gin'ē), a geographical division of Western Africa, including the Atlantic coast-line and an indefinite area of the interior between the frontiers of Senegambia and Cape Negro, or Cape Frio (where German territory now begins). It is divided into two districts, lying north and south of Cape Lopez: the former, called Upper Guinea, includes Sierra Leone, Liberia, the Grain, Ivory, Gold, and Slave coasts, parts of Nigeria, German Cameroon territory, etc.; the latter, called Lower Guinea, includes part of French Congo, Angola, etc. See Africa, and the separate articles.

GUINEA, Gulf of, that portion of the Atlantic which washes the shores of Upper Guinea, between Cape Palmas and Cape Lopez, and including the bights of Benin and Biafra. The islands of Fernando Po, Prince's, and St. Thomas, are within this gulf.

GUINEA, New. See New Guinea.

GUINEA-CORN, a name given to durra, one of the grains also called millet. In the United States it is cultivated under the name of broom-corn.

GUINEA-FOWL, or **PINTADO,** a genus of pheasants, originally all natives of Africa. The common guinea-fowl, now well known as a domestic fowl, has a

Guinea-fowl.

slate-colored plumage varied with round white spots. It is about the size of a common fowl, and is of a noisy and quarrelsome disposition. Its eggs are esteemed.

GUINEA-GRASS, a very tall species of grass, a native of Africa, of the same genus with the millet, often 6 and sometimes even 10 feet in height. It has been naturalized in South America and the West Indies, and largely cultivated for fodder. It does not perish even in Britain, but there it is not so productive as in warmer climates.

GUINEA PEPPER, a lofty tree of the same family with the custard apple. Its fruit, consisting of dry carpels, is used as pepper, "negro pepper." The term Guinea Pepper is often used as an equivalent for Grains of Paradise, or Malaguetta. See Caspsicum.

GUINEA-PIG, a well-known rodent mammal. It is a native of South America and resembles the pig only in its grunting voice. It is a timid little animal, extremely prolific, and it feeds on vegetables, especially parsley, bread, grain, etc. It is very destitute of intelligence.

GUINEA-PLUM, the fruit of a West African tree, growing to the height of 60 feet.

GUINEA-WORM, a parasitic of the thickness of pack-thread, somewhat attenuated at the hook-shaped posterior extremity. It varies in length from 6 inches to several feet, and it is found in the intertropical regions of the Old World.

GUIPUZCOA (gē-puth'ko-à), one of the three Basque provinces, in the n. e. of Spain, bounded n. by the Bay of Biscay; n. e. by France; area, 728 sq. miles. Pop. 195,850.

GUISCARD (gis-kär), Robert, Duke of Apulia and Calabria, a son of Tancred de Hauteville, born in 1015. His brothers, having acquired large possessions in Italy, Robert followed them about 1053 and in the same year captured Pope Leo IX. at Civitella. On the death of his brother Humphrey he was proclaimed count of Apulia in 1057. He then conquered Calabria, and Pope Nicholas II. made him gonfalonier of the Church. In 1074 he was excommunicated by Gregory VII. for refusing to become his vassal, but the ban was removed in 1080. As his daughter Helen was betrothed to the son of the Byzantine emperor, Michael VII., Guiscard, on the latter's deposition, took up arms in his favor, and defeated Alexis Comnenus at Durazzo (1082). He was upon the point of advancing against Constantinople, when he died in the island of Cephalonia in 1085.

GUISE (gwēz), a distinguished ducal family of France, a branch of the house of Lorraine. The founder was Claude, a son of René II., duke of Lorraine. who in 1506 became naturalized in France. In his favor the county of Guise was erected in 1528 by Francis I. into a duchy. He died in 1550, leaving behind him five daughters (the eldest of whom, Marie, married James V. of Scotland, and was the mother of Mary, queen of Scots) and six sons—François, who succeeded him, Charles (Cardinal of Lorraine), Louis (Cardinal of Guise), Claude, François, and René. The family acquired great political importance on the accession of Francis II., who was married to Mary, queen of Scots. The direct line became extinct in 1675. In 1704 the title was revived for the house of Condé.—Two of the dukes require particular mention.—François de Lorraine, the second duke, born in 1519, early distinguished himself in war, especially at Metz, which he defended with success against Charles V., and at the battle of Renti, 1544. In his Italian expedition (1556–57) he failed to conquer the kingdom of Naples. But he was successful in that which resulted in the final annexation of Calais to France. Under Henry II. and Francis II. he was the virtual ruler of France. On the death of Francis II. the factions of Condé and Guise arose, the Protestant (Huguenots) being on the side of the former, the Catholics on that of the

latter. When civil war broke out the Duke of Guise took Rouen and Bourges, and won the battle of Dreux in 1562. He was preparing for the siege of Orleans, the central point of the protestant party, when he was assassinated by a Huguenot nobleman, Feb. 1563. He left memoirs written by himself.—Henry, third duke, eldest son of the preceding, was born in 1550. He was a bitter opponent of the Huguenots, and fought against them at Jarnac and Moncontour, and advised the massacre of St. Bartholomew (1572). From revenge he personally conducted the assassins to the house of Coligny. In 1576 was formed the catholic league, first projected by his uncle, the Cardinal of Lorraine. A period of civil war followed, the party of Guise proved too strong for his opponents, and having brought about a rising of the catholics in Paris (May, 1588), he entered the city in triumph. He might now have made himself master of the throne, but negotiations were set on foot, and the duke's displays of imprudent ambition led to his assassination in the king's cabinet, Dec. 23, 1588, at Blois, whither the states had been summoned in order finally to ratify the treaty that had been arranged.

GUITAR (gi-tär'), a stringed instrument with a hollow body, and a neck somewhat similar to that of a violin, used especially to accompany the voice. The modern or Spanish guitar has six

1, French guitar of 17th century.
2, Modern guitar.

strings, the three highest of gut, the three lowest of silk covered with fine wire, tuned respectively to the E in the second space of the bass staff, A its fourth, and the treble D, C, B, and E. The intermediate intervals are produced by bringing the stirngs, by the pressure of the fingers of the left hand, into contact with the frets fixed on the keyboard, while those of the right pluck or twitch the strings. It is extremely popular in Spain. The Spaniards derived it from the Moors, who brought it from the east.

GUIZOT (gē-zō), François Pierre Guillaume, French historian and statesman, born at Nimés, 1787, died 1874. In 1812 he married Mdlle. de Meulan, editor of the Publiciste, and became professor of history at the Sorbonne. In 1816 he published Du Gouvernement Représentatif et de l'Etat Actuel de la France, and Essai sur l'Instruction Publique. In 1820 the Duc de Berry was assassinated, and Guizot's party fell before an ultra-royalist reaction. In 1825 he was deprived of his chair on account of the political character of his lectures, but it was restored to him in 1828. In 1829 he again became councillor of state, and in 1830 was elected deputy for the arrondissement of Lisieux. After the July revolution he was appointed minister of the interior, but resigned in 1831. After the fall of Louis Philippe, Guizot escaped and fled to England. Henceforth he practically retired from public life. Among his numerous works may be mentioned Histoire de la Civilisation en France, Histoire Générale de la Civilisation en Europe; Histoire de la Révolution d'Angleterre; Washington; Discours Sur la Révolution d'Angleterre; Méditations et Etudes Morales; Guillaume le Conquérant; Mémoires pour Servir à l'Histoire de Mon Temps (1858–68); Méditations sur l'Etat Actuel de la Réligion Chrétienne; Mélanges Biographiques et Littéraire; Histoire de France, Racontée à Mes Petits Enfants, etc.

GUJERAT, GUJARAT, or **GUZERAT,** a maritime province in Western Hindustan, presidency of Bombay; total area, 70,000 sq. miles; pop. 11,000,000. Gujerat compriscs a number of native states within its area, the chief being the scattered territories of the Gaekwar or Guicowar of Baroda. The population presents an extraordinary assemblage of sects and castes. It gives name to the vernacular language of Northern Bombay—Gujarati. The area of the British portion, comprising the districts of Surat, Broach, Kaira, Panch Mahals, and Ahmedabad is 10,158 sq. miles, and the pop. 3,098,197.

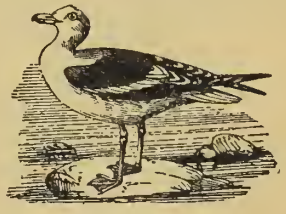
GUJRANWALA, a town of India, in the Punjab, administrative headquarters of district of same name. It has inconsiderable manufactures of country wares, such as brass vessels, etc. Pop. 29,224.—Area of district, 3017 sq. miles. Pop. 690,169.

GUJRAT, a district of India in the lieutenant-governorship of the Punjab, in the Rawal Pindi division between the Jehlam and the Chenab. Pop. 760,875. —Gujrat, the capital, 5 miles from the Chenab, is a commercial center. Its manufactures are principally of cotton and of Gujrat ware, that is inlaid work in gold and iron. Pop. 18,743.

GULF STREAM, one of the most celebrated of the oceanic currents, so called because it issues from the Gulf of Mexico. It owes its origin to the fact that the westward-moving waters of the tropical portion of the Atlantic, encountering the eastward projection of South America, become divided into two currents, one setting southward along the Brazilian coast, and the other northward past the mouths of the Amazon and Orinoco, into the Caribbean Sea. It then enters the Gulf of Mexico, and thence emerges through the Channel of Florida as the Gulf Stream. Its course is next to the north and eastward, in a direction parallel to the coast of the United States, past Cape Hatteras (lat. 35° 13′), along the southern edge of the "great banks" of Nantucket and Newfoundland (between the meridians of 48° and 60° west), after which its course as a distinct current cannot be traced. In the earlier part of its course, especially when rounding the extremity of Florida, the Gulf Stream forms a well-defined current, distinguished by its high temperature and its deep blue or indigo color. On account of the descent of the polar or Baffin Bay current along the coast in a direction opposite to that of the Gulf Stream, the water on its inland side is colder than that to the eastward of it. The difference of temperature between the Gulf Stream and this cold current sometimes amounts to 20° (or even 30°) Fahr. The velocity of the Gulf Stream varies with its course. Within the Florida Channel it attains a mean of 65 miles per day, this sinks to 56 miles off Charleston, becomes 36 miles to 46 off Nantucket, and 28 miles to the south of the Newfoundland banks; 300 miles to the eastward of Newfoundland its movement is hardly perceptible. At the bottom of the Flordia Channel the observed temperature is 34°, that of the surface from 80° to 84°. Geographers have greatly exaggerated the influence of the Gulf Stream on the temperature of Europe. If it possesses any direct influence such must be extremely small, as the current is both too narrow and too shallow, and its slight amount of superior heat probably vanishes after it has passed Cape Hatteras. The relatively high temperature of western and northwestern Europe must rather be referred to the general set of the tropical waters to the northeast, and to the warm winds blowing in the same direction, and not to the Gulf Stream exclusively.

GULF-WEED, a genus of sea-weeds which grows on tropical coasts, and accumulates in great floating beds, but does not propagate when detached.

GULL, the general name of a family of birds distinguished by their straight bill, bending downward toward the point, and marked below the under mandible by a triangular prominence,



Lesser black-backed gull.

by their large wings, slender legs, palmated feet, and small hind toe. Generally seen in large flocks, the larger species frequent the sea, the smaller, lakes or rivers. They swim well, but are incapable of diving. Their flight is rapid and long sustained. They are extremely voracious, and feed on every kind of animal food, putrid or fresh. Their principal food is fish, which they catch with great agility, darting down like an arrow. They breed only once a year, laying two to four eggs. The species are exceedingly numerous, and resemble each other greatly. Among the principal are the common gull which breeds on the coast, or inland in moory districts; the lesser black-backed gull, the black-headed gull, the ivory gull, the Iceland gull, distinguished by its white quill feathers from the herring gull, the great black-backed gull; the burgomaster; the little gull; sabine's gull; the kittiwake, etc.

GUM, a substance of various properties which exudes spontaneously from

the bark of certain trees, such as the plum, the peach, etc.; or from incisions made in the bark to facilitate the flow. Gums form non-crystalline rounded drops or tears, the purest varieties being transparent or translucent, of a pale yellow but sometimes of a dark color. When dissolved in water gum forms a thick, smooth fluid, with considerable viscosity. Some gums, such as gum-arabic, dissolve in water; others, like tragacanth, are only partially soluble; they are insoluble in alcohol. By being insoluble in alcohol gums are distinguished from resins. They have no odor, and only a very faint taste. The different kinds of gums receive their names from the countries from which they are imported—such as gum-arabic, gum-senegal, Barbary gum, East India gum, etc., and from individual features, as cherry-tree gum, tragacanth, etc. Gum-resins require water and alcohol to dissolve them. See Gum-resins.

GUM-ARABIC, is the purest form of gum, and may be regarded as typical. It comes from various species of Acacia. The gum exudes spontaneously, and its appearance is an indication of the tree being in an unhealthy condition; but in order to get it in sufficient quantity incisions are made in the bark. Gum-arabic is very largely employed in the finishing and dressing of fabrics; for thickening the colors in calico-printing; in pharmacy; as a cement; in ink-making; for making crayons and water-color cakes, and for many other purposes. The purest gum-arabic is in round tears, transparent, and almost colorless, faintly odorous, completely soluble in water, the solution being feebly acid.

GUM-BOIL, an abscess in the gum generally the result of toothache or of the presence of decayed teeth or stumps. The carious tooth or stump, if the inflammation proceeds from this cause, should be removed. The purulent matter should be evacuated by a free incision, and the mouth frequently washed with tincture of myrrh and water.

GUM-ELASTIC, caoutchouc or india-rubber.

GUM-JUNIPER, the resin of a coniferous tree of Barberry, used in varnish etc.

GUMMING, a disease of certain fruit-trees, as cherries, plums, apricots, peaches, etc., consisting in a morbid exudition of gum, and generally resulting in the death of the tree.

GUM-RESINS, solidified juices obtained from plants. They contain a gum, which is soluble in water, and a resin, which dissolves in spirit, so that the body usually is nearly quite soluble in dilute alcohol; but there are usually present in addition essential oil, and a variety of impurities. The gum-resins have frequently a strong and characteristic taste and smell. They are solid, opaque, and brittle. The common gum-resins are aloes, ammoniacum, asafœtida, bdellium, galbanum, gamboge, myrrh, olibanum, opoponax, sagapenum, and scammony.

GUN, a missile weapon, causing destruction by the discharge of a ball, bullet, or other substance, through a cylindrical tube, along which it is propelled by the action of gunpowder or other explosive substance. One of the famous guns of history is the great "Mons Meg," which was made at Mons, Brittany, in 1486, and which was burst in 1682 while firing a salute. It was made of iron bars, hooped together. Another is the "Tsar Cannon," or "King of Cannons," preserved in the Kremlin at Moscow. Other noted guns are the Turkish pieces guarding the Dardanelles, the gun at Dover, an inscription on which says:

"Load me well and keep me clean
And I'll land a ball at Calais green."

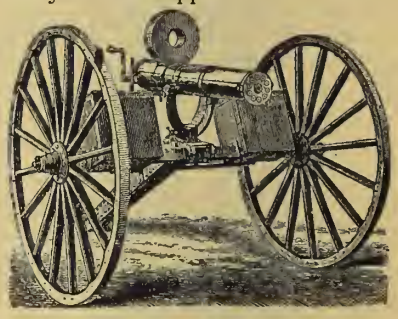
In recent times progress has been made by the improvement of the breech-loading method, in the method of rifling, and in the size of ordnance, particularly the monster guns made by the Krupp company at Essen, Germany. Machine guns of the Gatling type were introduced half a century ago, and the first automatic gun was devised by Maxim, on the principle of using the recoil to reload and fire. See Cannon, Rifle, Machine-gun, etc.

GUN-BOAT, a term applied to small war-vessels mounting often only a single heavy gun, and employed in coast defense or in attacking large and heavy-armored vessels. Some gun-boats have their one gun on the deck mounted so as to be turned in any direction by means of a pivot. In others the single gun is placed on a platform, which can be raised to the deck or lowered to the hold. The gun in this case does not turn on a pivot, the manœuvring being effected entirely by the turning of the vessel. Some of the gun-boats of the present day are armed with several powerful breech-loading guns besides quick-firing and machine guns; and they may also be fitted for discharging torpedoes. Many of them are very swift.

GUN-CARRIAGE, the structure on which a cannon is mounted, and on which it is fired. Gun-carriages are of very various constructions. In the case of a field or siege piece the carriage is united, for traveling, with a two-wheeled fore-part, termed a limber, to which the horses are attached, so as to form a single four-wheeled carriage. In action the gun is unlimbered, and then rests on its pair of wheels, and on a strong support termed the trail. A gun in a fortress has its carriage commonly mounted on what is termed a traversing platform, that is, a strong framework supported on metal trucks or small wheels. In mortars a cast-iron bed takes the place of a carriage.

GUN-COTTON, or Pyroxyline, is an explosive substance formed by the action of nitric acid on cotton. In the process of manufacture sulphuric acid is mixed with the nitric, its function being to absorb the water formed by the weakening of the nitric acid as it gradually combines with the cotton. The product of this process is a chemical compound of four or five times the explosive power of gunpowder. The cotton is generally reduced to a finely divided condition, and the gun-cotton moulded into disks of suitable sizes. When ignited in a free state it burns with a strong flame; it is only when fired by a detonating fuse or when heated in confinement that it explodes. The presence of water and other substances does not interfere with this kind of explosion. From this follows the important fact that it can be kept wet with safety while in a condition in which it may be exploded by means of a detonator. In short, when wet it is quite safe and yet quite ready for work at a moments notice; for, while it refuses to burn even in the heat of a powerful flame, the application of a large or of a small detonator inserted in one dry disk of gun-cotton causes the wet mass to explode with its full violence. Bursters of gun-cotton and water have been used in shells for certain purposes. When exploded it produces little smoke and a very small amount of residual matter. There are also preparations allied to gun-cotton with wood-fiber as a basis, such as Schulze's powder, sawdust powder, etc. An imperfect chemical form of gun-cotton termed collodion, soluble in a mixture of ether and alcohol, is used in photography.

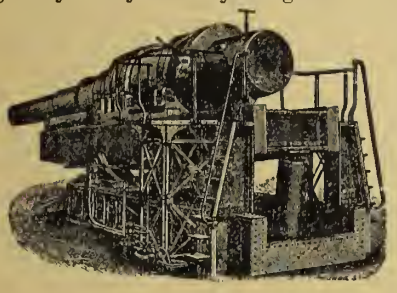
GUNNERY, the science of conducting the fire of artillery. Gunnery may be divided into the theoretical and practical branches. The former consists chiefly in the application of mathe-



Gatling gun.

matics to the solution of the problems in dynamics involved in the consideration of the motion of shot through the air, and is essential to the design of good systems of rifling and well-proportioned projectiles. Practical gunnery, which deals with the actual firing, has reference rather to the use of individual guns than to the handling of artillery on a large scale. Theoretical gunnery would be simple were the projectiles fired in vacuo, as gravity alone would, in such a case, require to be taken into account, and the path of projectiles would simply describe a parabola. The line taken by a projectile (or its trajectory as it is called) is, however, subject to modifications caused by the resistance of the air, the form of the shot, etc. Among things to be considered in gunnery are the velocity of the projectile, initial and subsequent, the angle of elevation of the piece, the range or distance to which the projectile is carried, etc. With cast-iron spherical shot the chief complication arises from the centre of gravity never falling exactly in the centre of the figure. Rifled guns, however, fire projectiles with a certain known rotation, and in the

case of elongated shot, these are more accurately centerd in the bore by the action of the grooves, and possess the faculty of traveling point first, and of thus overcoming the resistance of the air. One mechanical disadvantage belongs to rifled shot—namely, the wild irregularity of their ricochet—a disadvantage which, however, does not apply to shells burst on the instant of graze by percussion fuzes, or before contact by time fuzes. All the British service projectiles have their centres of gravity nearly half way along their axes,



Krupp's 15.6 breech-loading gun. Breech open.

and in flight they carry toward the right hand of the person laying the gun —a species of deviation to which the name of drift or deflexion is given. In determining the velocity of projectiles various instruments are used. Among these are Wheatstone's electromagnetic chronoscope, the Bashforth chronograph, the Noble chronoscope, etc. In ordinary artillery fire the charge is a fixed one, and the elevation is varied according to the range. Horizontal fire against the front of a column or line of works is termed direct fire; that which sweeps along a line of men or earthworks, enfilade fire; vertical fire is when the piece is fired at a high angle of elevation.

GUNNY-BAGS, are bags made of a coarse cloth or sacking manufactured in India of some native fiber, chiefly jute. They are extensively used in India in packing rice, sago, spices, etc., for export, and in America for bales of cotton.

GUNPOWDER, is a mixture of saltpeter, sulphur, and charcoal. We hear of gunpowder from a very early period. It appears to have been used in China at, if not before, the Christian era. Marcus Græcus, who lived about the 9th century, describes its composition, which was also known to Roger Bacon, who refers to it in 1267. It was also apparently known to the Arabs at an early period. In 1342 the Moors employed it in the siege of Algesiras. According to the common story the discovery of its propulsive power was due to the German monk Barthold Schwartz between 1290 and 1320. Guns are said to have been employed by Edward III. in 1327, on his invasion of Scotland. It is also asserted that gunpowder was employed in 1346 by the English at Crécy. It was not, however, until the 16th century that its use in warfare became general. The proportion of the ingredients in the composition of gunpowder is different in different countries. In Britain the proportions for different kinds, such as sporting and mining powders, differ slightly. The gunpowder of the mills at Waltham Abbey contains 75 saltpeter, 15 charcoal, and 10 sulphur. The crude saltpetre is dissolved in an equal weight of boiling water in a copper boiler, filtered, and allowed to cool and crystalize in a trough in order to purify it from nitrates of soda and lime, chlorides of potassium and sodium, etc., the liquid being continually agitated, so that the crystals may be formed small and pure. They are then washed and allowed to drain. The sulphur is purified and ground. The charcoal is obtained from alder or willow wood, or from dogwood for the finest powder. These ingredients are first roughly mixed, then sprinkled with water and incorporated under rollers in a mill, and formed into a cake termed "mill cake." This is broken up under grooved rollers, and brought by pressure into "press cake." After this it is granulated, by being passed between toothed rollers, and separated into classes by sieves of different sizes of mesh. Latterly a very large grain has been adopted for the heaviest charges; this is termed pellet or pebble powder. "Pellet" powder is made by filling the cylindrical holes in a thick gun-metal plate with mealed powder, and by means of pistons under a hydraulic press, forming them into short cylinders or "pellets," with a small cavity at one end to catch a flame the more readily. "Pebble" powder is made by cutting or pressing edges which divide the press cake into small cubes; these, like pebbles, have their corners rubbed off and rounded by friction. The largest pebble powder consists of cubes of 1½ inches. There is also a gunpowder known as "prismatic," the grains forming large hexagonal prisms with a hole through the center. "Cocoa" powders are made with other kinds of carbon than wood charcoal. Smokeless powder has been introduced ("cordite" may here be named), but has not yet been properly tested in war. Gun-cotton is the base or an important ingredient of all the well-known smokeless powders. As it is necessary that the flame must traverse the interstices between the grains of powder, the grains must be suited to the size of the charge of the gun. The greatest precautions must be taken to prevent fire or water from coming into contact with gunpowder. Hence it is usually kept in magazines which are of great strength in defensive works, although lighter and well-ventilated buildings suffice under other conditions. In the transportation of gunpowder, the casks should be dust-proof, and the carriages and vessels containing it should be water-tight. As iron vessels are dangerous, gunpowder is usually packed in copper-hooped barrels made with copper nails. The explosive powder of gunpowder is very great. It is, however, necessary to place it within a confined space, as, when it is heaped up in the open air, it explodes without report or much effect. As the result of experiments it appears that the weight of the gases produced by inflaming gunpowder is about $\frac{6}{10}$ths of that of the powder, and their volume 288 times its bulk, when they have attained an elasticity equal to that of the air. If the effect of heat evolved during the combusiton be added, the elastic force is increased to 1000 atmospheres in round numbers, i.e. a pressure of about 6½ tons to the sq. inch.

GUNPOWDER PLOT, a conspiracy formed in England in 1604, the second year of the reign of James I., by some Roman Catholics, to blow up the king and parliament in order to be revenged on the government for its severities against their religion. The time ultimately fixed for the execution of the plot was the 5th of November, 1605, when parliament was to be opened by the king in person. The plot originated with Robert Catesby, Thomas Winter, and John Wright, and was at once made known to Guido Fawkes, a zealous Catholic, who had served in the Spanish army in Flanders, and to Thomas Percy, a relation of the Earl of Northumberland. The plot was subsequently communicated to Sir Everard Digby, Ambrose Rookwood. Francis Tresham, Thomas Keyes, and to some Jesuit fathers and others.. Fawkes, Rookwood, Winter, and others were tried at Westminster on 27th of Jan., 1906, and executed on the 30th and 31st.

GUNTER'S CHAIN, the chain in common use for measuring land; so called from its inventor, Edmund Gunter. Its length is 66 feet, or 22 yards, or 4 poles of 5½ yards each; and it is divided into 100 links of 7.92 inches each. 100,000 square links make 1 acre.

GUNTER'S SCALE, a scale having various lines upon it, of great use in working problems in navigation. This scale is usually 2 feet long and about 1½ inches broad. On the one side are the natural lines, and on the other the artificial or logarithmic ones.

GUR'NARD, or **GURNET,** the popular name of acanthopterous fishes. The head is angular, and wholly covered with bony plates. The body is elongated, nearly round and tapering; there are two dorsal fins; the pectoral fins are large; the teeth are small and numerous.

GUSTAF V. GUSTAF, Adolf, King of Sweden, son of Oscar II., was born in 1857. He was trained for the army and has been inspector general of the military schools of Sweden. In 1881 he married Princess Victoria of Baden, a cousin of Emperor William of Germany. He became king in 1907, on the death of his father, Oscar II.

GUSTA'VUS I., commonly called Gustavus Vasa, was born in 1490, or, according to others, in 1496. He roused the peasants to resist Danish oppression, defeated the Danes, took Upsala and other towns, and in 1523 was elected king. In 1529 he procured the abolition of the Roman Catholic religion in Sweden, and established Protestantism. He died in 1560.

GUSTAVUS II., Gustavus Adolphus, King of Sweden, a grandson of Gustavus Vasa, was born in 1594. He was trained to war under experienced generals, took his place in the state councils at the age of sixteen, and was in command of the army in his seventeenth year during the war with Denmark, which was concluded in 1613, and by which Sweden recovered important possessions on the Baltic. He

then turned his arms against the Russians, drove them from Ingria, Karelia, and a part of Livonia, which were secured to him by the peace of Stolbova in 1617. After taking many fortified towns, repeatedly defeating the imperial generals, at Leipzig (1631), Würzburg (1631), Passage of the Lech (1632), and conquering a great part of Germany, he was killed in the battle of Lützen, against Wallenstein, 16th November, 1632. (See Thirty Years' War.)

GUSTAVUS III., King of Sweden, born in 1746, succeeded his father, Adolphus Frederick, in 1771. In 1788 he took command of the army against Russia and Denmark, and stormed the defenses of Frederickshall, destroying a great number of vessels. On the outbreak of the French revolution he made strenuous exertions to form a coalition between Russia, Denmark, Sweden, and Spain, but while preparations were making a conspiracy of the nobles was formed against him, and he was shot at a masquerade by Ankarstroem, a disbanded officer, on 16th March, 1792. He died on 29th March.

GUSTAVUS IV., (Adolphus), King of Sweden, was born on 1st November, 1778, and succeeded his father, 29th March, 1792. After the Peace of Tilsit he exposed himself to a war with Russia while he was at war with France, by

Gustavus Adolphus, King of Sweden.

refusing to join the continental blockade and opening his ports to England; and in 1808 he quarreled with England, his only ally. Finland was lost to Sweden, and in 1809 a revolution took place. Gustavus was dethroned, and his uncle, the Duke of Sudermania, proclaimed king under the title of Charles XIII. Gustavus died February 7th, 1837.

GUTENBERG, Johan, the reputed inventor of printing with movable types, was born at Mayence or Mainz, about the end of the 14th century. In 1850 he formed a copartnership with Johann Fust, and established mainly with the money of the latter, a press, in which the Mazarin Bible, the Letters of Indulgence and the Appeal against the Turks were printed. After five years this connection was dissolved, and Fust sued Gutenberg for large advances which he could not pay, and by a judgment at law obtained possession of most of the printing materials, with which, in company with his son-in-law Schöffer, he continued to print books. After this, according to some, Gutenberg carried on a separate printing establishment; but this is doubtful, and there is no book or printed matter which can certainly be ascribed to Gutenberg after the date 1454. Gutenberg seems to have died at Mainz in 1468.

GUTHRIE, the county seat of Oklahoma Territory and of Logan co., on the Cottonwood river and on the Atch., Topeka and S. Fé, Eastern Oklahoma, and Chicago, Rock Island and Pacific railroads. Pop. 12,160.

GUTTA-PERCHA, (pėr'cha; Malay name, meaning "gum-tree"), a substance resembling caoutchouc in many of its properties, but stronger, more soluble, and less elastic. It is the inspissated milky juice of trees of the nat. order

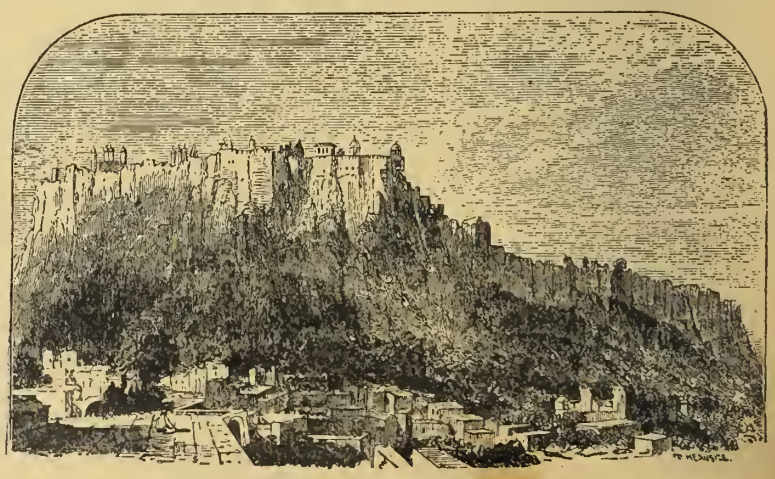
Sprig of gutta-percha tree.

Sapotaceæ. It chiefly comes from Malacca, Borneo, and other islands of the Indian Archipelago. When pure, gutta-percha is of a brownish-red color. Below the temperature of 50° it is as hard as wood and excessively tough. By an increase of heat it becomes more flexible, until at a temperature of 115° F. it becomes pasty, and between this and 140° or 150° it may be moulded into all varieties of forms with the greatest ease, retaining precisely the same form as it cools and hardens to its previous state of rigidity. It is insoluble in water, soluble with difficulty in ether and other caoutchouc solvents, but very readily in oil of turpentine and naphtha. It is not attacked by solutions of alkalies nor by hydrofluoric acid, but it is acted on by sulphuric, nitric, and hydrochloric acids. Gutta-percha has been applied to a variety of purposes: as a substitute for leather, especially in the soles of shoes, etc., as an insulating coating for the copper wires of submarine telegraph cables, as an ingredient in mastics and cements, for the manufacture of flexible hose-tubes, bottles, etc.

GUY OF WARWICK, an old English metrical romance, whose hero is an Anglo-Danish knight said to have been the son of Siward, baron of Wallingford, to have become Earl of Warwick, and to have slain in single combat the Danish giant Colbrand, the Dun-Cow of Dunsmore, and the dragon of Northumberland, and many other wonderful feats. He is said ultimately to have become a hermit in Warwick.

GUYOT (gē-yo), Arnold, geographer and physicist, born in Switzerland in 1807, died in the United States in 1884. He studied theology at Berlin, then took up natural science, and became professor of history and physical geography in the Academy of Neufchâtel. He shared in Agassiz's investigations of glacier phenomena of the Alps. In 1848 he emigrated to the United States and delivered lectures in Boston, which afterward appeared under the title Earth and Man. He rendered much service to meteorological science in connection with the Smithsonian Institution, and traveled extensively in the United States. In 1855 he was appointed professor of geology and physical geography in the College of New Jersey, Princeton.

GWAL'IOR, a city and fortress of Hindustan, capital of the state of Gwalior, situated 65 miles south from Agra. The fortress is the largest, the strongest, and the most magnificent in India. It stands on an isolated rock about 350 feet high and nearly perpendicular in the upper part. The fortress contains wells and reservoirs of water, and is inaccessible except by steps up the side of the rock. Old Gwalior, the town at the northern angle of the base of the rock, is built of stone, and has some remarkable



The Fortress of Gwalior.—From an original sketch.

ruins of temples and an interesting example of old Hindu palace architecture. Pop. about 25,000. The new town, known as New Gwalior or Lashkar (the camp), the residence of the ruler, Maharajah Sindhia, has sprung up recently on the southeastern skirt of the rock, but is already a flourishing city with a population of 89,154, of whom the majority are Hindus.—The state of Gwalior, in political relationship with the government of India, consists of several portions of territory, otherwise known as Sindhia's Dominions, the largest and most compact portion, usually known as Gwalior, being the one containing the above town and fortress. The total area of Gwalior is 29,067 sq. miles. Gwalior is not as a whole very fertile; one of its most notable products is opium. The drainage is chiefly taken by the Chambal. Pop. 3,525,233.

GWYNN, Eleanor, better known by the name of Nell, a celebrated mistress of King Charles II., was at first an orange girl, and also gained her bread by singing from tavern to tavern. About 1667 she became the mistress of Lord Buckhurst, who surrendered her about 1670 to the king. As mistress of the king she had an establishment, and was made lady of the privy chamber to Queen Catherine. She was merry and open-hearted, is said to have been faithful to Charles, mindful of old friends, and a liberal patroness of the poets Dryden, Lee, Otway, and Butler. From her are sprung the dukes of St. Albans. She died, according to some accounts, in 1687, according to others in 1691.

GYMNA'SIUM (jim-), the name given by the Greeks to the public building where the young men, quite without clothes (hence the name, from gymnos, naked), exercised themselves in leaping, running, throwing the discus and spear, wrestling, and pugilism. Its objects, however, were extended also to the exercise of the mind; for here philosophers, rhetoricians, and teachers of other branches of knowledge delivered their lectures. Gymnasia were at first only open level places, surrounded by a wall, and partitioned off for the different games. Latterly they were composed of a number of connected buildings, spacious enough to admit many thousands. See Gymnastics.

GYMNASIUM, a term applied in Germany to a class of schools corresponding pretty nearly to the American small college.

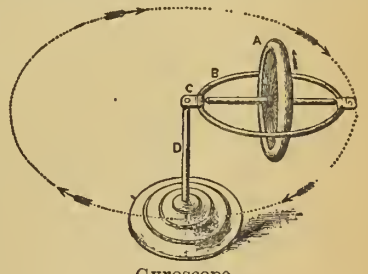
GYMNASTICS, (for derivation, see Gymnasium) is the technical term used to designate any system of exercises specially designed to promote the development of physical, and especially of muscular powers. An excellent gymnastic training is given by baseball, cricket, football, rowing, and similar amusements, but the special value of formal gymnastic exercises is that they are capable of being scientifically arranged so as to secure not only a general development of muscular power, but also an accurate knowledge of the uses of the various muscles, and further that they are capable of being applied to each individual case, so as to meet, allow for, and as far as possible overcome defects in physical organization. For these purposes an elementary course of gymnastics is of great value to all, especially to the sedentary student. In regard to gymnastic exercises two general rules may be laid down, which will form an efficient guide in self-imposed exercises. The first is the universal rule in mechanics that the strength of any machine is the strength of its weakest part; the second is the fundamental law of muscular exercise, that it is exercise within the extreme power of the muscle which develops and improves, while straining weakens and injures, and excessive exercise develops particular muscles abnormally at the expense of the general health. It is quite possible, indeed, to carry physical exercises as a whole too far, and to develop muscular power at the expense of vital strength. Till the age of twelve the ordinary games and pastimes of childhood are generally quite sufficient exercise; after that some very light system of gymnastics may be adopted to aid the development of the system. After the age of thirty-five unusual muscular efforts are apt to leave persistent strains, and moderate exercise becomes the safest means of developing and giving tone to the muscular system.

GYPSIES, (from Egyptians, the name by which they were called in the English statutes), a wandering nation, whose physical characteristics, language, and customs differ much from those of European nations. They call themselves Rommany, from rom (man). This race is slowly melting away. Its present total number hardly reaches 500,000; of whom there are about 120,000 in European Turkey; 140,000 in Hungary; 60,000 in Transylvania; 40,000 in Spain; 40,000 spread over Germany, France, and Italy; 18,000 in Britain, of whom, however, only a small number are tent-gypsies, preserving the language and traditions of their race; and the remainder scattered over other countries. The gypsies are now considered to have come from India, the main body of their language, though mixed with a great number of borrowed words, having a close affinity with some of the Indian languages. Gypsies are remarkable for the yellow brown, or rather olive color, of their skin; the jet-black of their hair and eyes, the extreme whiteness of their teeth, and generally for the symmetry of their limbs. The typical gypsies rarely settle permanently anywhere, but live in tents, wandering about working in wood and iron, making domestic utensils, telling fortunes, practicing tricks, etc. Their talent for music is remarkable, and some of their melodies have become the much-valued property of other nations, or are incorporated in some of our favorite operas. They have no peculiar religion. Among the Turks they are Mohammedans; and in Spain at least, as well as in Transylvania, they follow the forms of the Christian religion, without, however, caring for instruction, or having any real interest in religion. The marriage ceremony is of the simplest kind. If the husband becomes tired of his wife, he will turn her off without ceremony. There is no idea of education among them. The children grow up in idleness and the habits of stealing and cheating.

GYPSUM (jip'sum), a monoclinic mineral, chemically a hydrated calcic sulphate. It is found in a compact state as alabaster, or crystallized as selenite, or in the form of a soft chalky stone, which in a very moderate heat gives out its water of crystallization, and becomes a very fine white powder, extensively used under the name of plaster of Paris (which see).

GYPSY-WORT, a labiate plant found in Britain in ditches and on river banks. It yields a dye said to be used by the gypsies to render their skin darker.

GYROSCOPE, an apparatus, consisting of a rotating disc mounted by very accurately fitted pivots in a ring or rings (forming a sort of gimbals), for illustrating the properties of rotation generally. The fundamental principle of



Gyroscope.

the whole is the resistance which a disc in rapid motion presents to any change of direction in the axis of rotation. Some curious phenomena may be exhibited by it difficult to explain without resorting to mathematical formulæ. The figure shows a simple gyroscope. If the disc A which revolves on an axis within the ring B is set very rapidly in motion by the unwinding of a string round the axis, and if the part C is then rested on a pivot at the top of the upright support D, the apparatus instead of falling will go slowly round in the direction shown by the arrows.

H

H, the eighth letter of the English alphabet, often called the aspirate, as being a mere aspiration or breathing, though not the only aspirated letter in English. The sound that distinctly belongs to it is that which it has at the beginning of a syllable before a vowel, as in hard, heavy. It is very commonly joined to other consonants to represent sounds for which there are no special letters in the alphabet, as in the digraphs ch, sh, th (child, ship, thin, this),

or in other consonantal combinations of various origins and values, as in the words enough (gh = f), plough (gh silent), philosophy (ph = f), rhetoric (h silent), etc. Ch is common in words taken from the Greek, but in this case it generally has the k sound, as in chemistry, chyle, logomachy, etc.

HAARLEM (här'lem), a town of Holland, province N. Holland, 10 miles w. Amsterdam, intersected by the Spaarne, which is joined by canals from Leyden and Amsterdam, and along which a considerable traffic is maintained. Pop. 64,836.

HABEAS CORPUS, in law, a writ addressed to one who has a person in custody, commanding him to produce the body of the person named at a certain place and time.

HABITANTS, or **HABITANS,** a name applied to the inhabitants of Canada, especially in Quebec province, who are of French extraction, still speak the French language and preserve French costumes. See Canada.

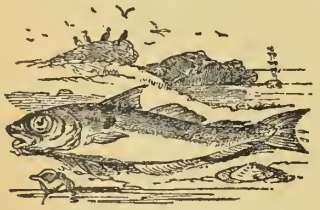
HACKBERRY, the popular name of the North American varieties of the nettle-tree, belonging to the nettle family Urticaceæ.

HACKENSACK, the capital of Bergen co., N. J., on the Hackensack river, and the N. J. and N. Y., the N. Y., Susq. and W., and the W. Shore railways; 8 miles s.e. of Paterson, 13 miles n. of New York. Pop. 11,741.

HACKNEY, a municipal and parliamentary borough of London, 3 miles n.n.e. of St. Paul's. Pop. 253,215.

HACKNEY COACH, a coach let out for hire. Hackney coaches began first to ply under this name in London in 1625, when they were twenty in number. Hackney coachmen are generally put under police regulations, and a tariff of fares imposed upon them. Cabs are now the common kind of hackney coaches.

HADDOCK, a well-known fish of the cod family. It is smaller than the cod, which it much resembles, but it has a dark spot on each side of the body just behind the head. This fish commonly



Haddock.

weighs from 2 to 6 lbs., though sometimes as high as 10 lbs. It breeds in immense numbers in the northern seas in February and March, and constitutes a considerable article of food.

HADES (hā'dēz), originally the Greek name of the lord of the lower or invisible world, afterward called Pluto; but in later times, as in the Greek Scriptures, it is applied to the region itself. With the ancients Hades was the common receptacle of departed spirits, of good as well as bad.

HADJ, the Mohammedan pilgrimage to Mecca, which every Mohammedan ought to perform once in his life, and after which he is entitled to prefix Hadji to his name. The pilgrimage has been made in disguise by Burckhardt in 1814, by Burton in 1853, and by T. F. Keane in 1878, each of whom has published accounts of his journey.

HADLEY, Arthur Twining, American educator, was born at New Haven, Conn., in 1856. In 1879–83 he was tutor in Yale college. He was university lecturer on railroad transportation from 1883 to 1886; commissioner of labor statistics for Connecticut from 1885 to 1887; professor of political science at Yale university, 1886–98; and in 1899 was made president. In 1885 he published Railroad Transportation: Its History and Its Laws, which at once gained him the position of an authority on the subject; it was translated into Russian in 1886, and into French in 1887. He also published: Report on the Labor Question; Report on the System of Weekly Payments; Economics; Education of the American Citizen. President Hadley's writings place him in the first rank among American economists.

HADLEY, John, English astronomer, born toward the end of the 17th century. He is the reputed inventor of the quadrant that goes by his name, though the honor is also claimed for Newton, from whom Hadley got a description of the instrument in 1727, and for Thomas Godfrey of Philadelphia, who produced his instrument about the same time as Hadley in 1731. The Royal Society decided that Godfrey and Hadley were both entitled to the honor of the invention. Hadley also invented the sextant. He died in 1744.

HA'DRIAN, in full, Publius Ælius Hadrianus, the fourteenth in the series of Roman emperors, born at Rome, 24th Jan., 76 A.D. His father, who was cousin to the emperor Trajan, died when he was ten years old, and left him under

Coin of Hadrian.

the charge of his illustrious kinsman. He married Sabina, Trajan's grand-niece, accompanied the emperor on his expeditions, filled the highest offices of state, and, on the death of Trajan, assumed the government as his adopted son (117). Hadrian's policy was a peaceful one, because he saw that the further extension of the empire only weakened it. Although avoiding war as much as he could, he kept the armies in excellent condition, fortified the frontiers in Germany, and, crossing over into Britain, constructed the wall known as Hadrian's Wall (or that of Severus), which protected the Roman province from the barbarous tribes of the north. In 131 he promulgated the Edictum Perpetuum, a fixed code of laws, which forms an important epoch in the development of Roman law. Hadrian died at Baiæ in 138.

HADROSAURUS, a genus of large extinct reptiles, whose remains have been found in the newer cretaceous strata of the United States. It appears to have

Skeleton of hadrosaurus.

resembled the gigantic iguanodon of Europe in its enormous dimensions, herbivorous habits, and anatomical structure.

HÆCKEL (hek'l), Ernst, a German naturalist, born at Potsdam in 1834, studied medicine and science at Berlin, Würzburg, and Vienna; traveled in Norway and Italy, became professor of zoology at Jena in 1865. He is the most prominent exponent of the Darwinian theories in Germany. Among his works we may mention The Radiolariæ (1862), The History of Creation (1868), Anthropology (1874), History of the Evolution of Man (1875), Collected Popular Discourses on the Development Theory (1878–79), Origin and Development of Animal Tissues (1884), etc.

HÆ'MATIN, HEMATINE, the red coloring matter of the blood occurring in solution in the interior of the blood corpuscles or cells. It is the only structure of the body, except hair, which contains iron.

HÆ'MATITE, Red and Brown. See Hematite and Iron.

HÆMOG'LOBIN, HÆMOGLOB'ULIN, the semi-fluid or quite fluid matter of a red color contained in the red corpuscles of the blood. It can be resolved into an albuminous substance called globulin and the coloring matter hæmatin.

HÆMOP'TYSIS, the coughing up of blood, sometimes produced by fulness of the blood-vessels of the lungs or throat, or by the rupture of blood-vessels as a consequence of ulceration. It is distinguished from blood coming from the stomach by the comparative smallness of its quantity, and by its usually florid color. It occurs in heart disease, in pneumonia, and tubercular disease. It is sometimes a case of vicarious menstruation.

HÆMORRHAGE. See Hemorrhage.

HÆMORRHOIDS. See Hemorrhoids.

HAG, the name of fishes, which, with the allied lampreys, constitute the order of Marsipobranchii. They are of worm-like form, and have no eyes or scales, the mouth is formed for suction, is without lips, and furnished with fleshy filaments or barbels. There is a single fang upon the palate and other horny teeth by which the hag eats its way into the interior of other fishes, such as the cod, ling, or haddock.

HAGEN (hä'gĕn), a thriving manufacturing town of Prussia, in Westphalia, at the confluence of the Volme and Ennene. It has iron and steel works, manufactures of metal goods, textiles, etc. Pop. 50,612.

HAGERSTOWN, a town in Maryland, 6 miles north of the Potomac river. Pop. 14,785.

HAGGARD, Henry Rider, English novelist, born in 1856; held several civil appointments in South Africa, and has made Africa the scene of some of his novels. He became widely known by King Solomon's Mines (1886), and still more by his romantic She (1887), which have been followed by Allan Quatermain, Jess, Maiwa's Revenge, Cleopatra, Eric Bright-eyes, Montezuma's Daughter, Joan Haste, etc. His tales are strong in incident and adventure, but weak in character-drawing.

HAGUE, THE, practically, though not formally, the capital of the Netherlands, in the province of South Holland, 33 miles southwest from Amsterdam, and within 3 miles of the sea. It is the residence of the king and of the foreign

The Hague—The Binnenhof on the Vijver or Pond.

ambassadors, and the seat of the states-general of the Netherlands. It is pleasantly situated, and is distinguished for width and straightness of streets, and general elegance of public buildings. Among the most important structures are the royal palace, the palace of the Prince of Orange, the Binnenhof, a large irregular building, founded in 1249, and containing the hall of assembly of the states-general, and various government offices; also the provincial government-house, a large roomy edifice, the town hall, royal library (200,000 vols.); the Groote Kerk, or Church of St. James, with hexagonal tower and finely vaulted interior; the Mauritshuis, built by Prince John Maurice of Nassau, now converted into a museum containing some of the finest works of the Dutch masters. The Hague arose as a hunting-seat of the Counts of Holland in 1250, and became the political capital of the states in the 16th century. Pop. 205,328.

HAGUE PEACE CONFERENCE, in response to an invitation addressed by the Czar of Russia to the principal states of the civilized world, an international conference of delegates which assembled at The Hague on May 18, 1899, with a view to concerted action for the maintenance of a general peace and the amelioration of the hardships of war, and with a view to the possible reduction of the military and naval armaments of the world. One hundred delegates representing the United States, Mexico, China, Japan, Persia, Siam, and twenty-one European powers were present. No delegates from the Central or South American republics attended. The conference was in session from May 18 to July 29, and was presided over by Baron de Staal of the Russian delegation.

President Roosevelt in his annual message to congress, December 5, 1905, made the following statement of the status of The Hague Peace Conference question:

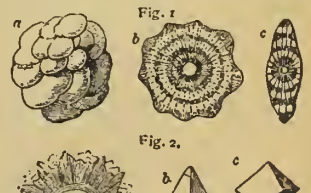
The first conference of nations held at The Hague in 1899, being unable to dispose of all the business before it, recommended the consideration and settlement of a number of important questions by another conference to be called subsequently and at an early date. These questions were the following: (1) The rights and duties of neutrals; (2) the limitations of the armed forces on land and sea, and of military budgets; (3) the use of new types and calibers of military and naval guns; (4) the inviolability of private property at sea in times of war; (5) the bombardment of ports, cities and villages by naval forces. In October, 1904, at the instance of the Interparliamentary Union, which at a conference held in the United States and attended by the lawmakers of 15 different nations, had reiterated the demand for a second conference of nations, I issued invitations to all the powers signatory to The Hague Convention to send delegates to such a conference, and suggested that it be again held at The Hague. In its note of December 16, 1904, the United States government communicated to the representatives of foreign governments its belief that the conference could be best arranged under the provisions of the present Hague treaty.

From all the powers acceptance was received, coupled in some cases with the condition that we should wait until the end of the war then waging between Russia and Japan. The emperor of Russia, immediately after the treaty of peace which so happily terminated this war, in a note presented to the president on September 13, through Ambassador Rosen, took the initiative in recommending that the conference be now called. The United States government in response expressed its cordial acquiescence and stated that it would, as a matter of course, take part in the new conference and endeavor to further its aims. We assume that all civilized governments will support the movement and that the conference is now an assured fact. This government will do everything in its power to secure the success of the conference to the end that substantial progress may be made in the case of international peace, justice, and good will.

HAHNEMANN (hä'nĕ-mân), Samuel Christian Friedrich, the founder of the homœopathic system, born at Meissen in 1755. After practicing in various places, he published in 1810 his Organon der Rationellen Heilkunde, which fully explained his new system of curing any disorder by employing a medicine which produces a similar disorder. (See Homœopathy.) Hahnemann was driven from Saxony by the government prohibiting him from dispensing medicines, but found an asylum ultimately in Paris, where his system was authorized by the government and acquired a certain popularity. He died at Paris in 1843. Among his works notice is due to his Dictionary of Materia Medica, his Essays on Poisoning by Arsenic, and on the Effects of Coffee, and his Treatise on Chronic Affections.

HAIDUCKS, or HAIDUKS, a term originally applied to the herdsmen of Hungary, and afterwards to the bands of Magyar foot soldiers, who placed themselves at the service of any potentate who was willing and able to pay them.

HAIL, small masses of ice or frozen rain falling from the clouds in showers



Forms of Hailstones.

Fig. 1. *a*, Hailstone which fell at Bonn in 1822; diameter 1½ inch, weight 300 grains. *b c*, Sections of differently shaped hailstones which fell on the same occasion. Fig 2. *a*, Section of hailstone with minute pyramids on its surface. *b c d e*, Fragments of do. when burst asunder.

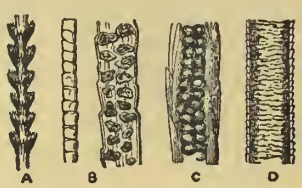
or storms, varying in their form, being either angular, pyramidal, or stellated, as well as in their consistency, being

sometimes as hard as ice and sometimes as soft as snow. At the center there is generally an opaque spongy mass, resembling sleet in its composition, and round this a semi-transparent congealed mass, consisting of a succession of layers or strata, is formed. Properly there are two kinds of hail—the small grains which generally fall in winter and usually before snow; and the large hail which occurs chiefly in spring and summer, and is most severe in very hot climates. The small-grained hail is probably formed by the freezing of rain-drops as they pass in falling through colder air than that from which they started. The large or common hail is probably due to the meeting of two currents of air, of very unequal temperature and electric tension. The usual size of hailstones is about ¼ inch in diameter, but they are frequently of much larger dimensions, sometimes even 3 or 4 inches in diameter. In hot climates they are very destructive to crops.

HAINAN, an island of China, belonging to the province of Quang-Tung, between the China Sea and the Gulf of Tonquin, and separated from the mainland by a channel of 15 miles, encumbered with shoals and coral reefs. It is almost oval in shape, and has an area of over 16,000 sq. miles. The fertile lowlands on the northern and western coasts are occupied by immigrant Chinese, to the number of about 1,500,000, who cultivate rice, sugar, tobacco, etc. The fisheries are also productve. The interior, which is mountainous and covered with forests, is inhabited by a distinct race still in a very primitive stage. The capital is Kiang-chow, on the northern coast, a large seaport.

HAINAUT, or **HAINAULT,** province of Belgium, bounded on the south and west by France; area, 1406 sq. miles. About three-fourths of the whole surface is arable, and scarcely a hundredth part is waste. The soil is generally fertile and there are extensive coal-fields, coal, together with flax, linen, hemp, tobacco, and porcelain being the chief articles of export. Manufactures, chiefly cutlery, woolen and linen goods, etc., are carried on to a great extent. The capital is Mons. Pop. 1,029,885.

HAIR, the fine, threadlike, more or less elastic substance, of various form and color, which constitutes the covering of the skin in the class of mammalia. It has the same use as feathers in birds, and scales in fishes and reptiles. No species of mammalia is without hair in an adult state, not even the whales. In quadrupeds it is of the most various conformation, from the finest wool to the quills of a porcupine or the bristles of the hog. The human body is naturally covered with long hair only on a few parts; yet the parts which we should generally describe as destitute of it produce a fine, short, colorless, sometimes hardly perceptible hair. The only places entirely free from it are the palms of the hands and the soles of the feet; but the body of the male often produces hair, like that of the head on the breast, shoulders, arms, etc. Each hair consists of a shaft and a root. The color of the hair is a race character; and the shape of the shaft has likewise been used in this way, transverse sections showing circular, oval, flat, or reniform outlines. The human hair varies according to age, sex, country, and circumstances. At birth an infant generally has light hair It always grows darker and stiffer with age. The same is the case with the eyelashes and eyebrows. At the age of



Hairs of various animals magnified.
A, Indian bat. B, Mouse. C, Sable. D, Human.

puberty the hair grows in the armpits, etc., of both sexes, and on the chin of the male. The hair of men is stronger and stiffer; that of females longer (even in a state of nature), thicker, and not so liable to be shed. Connected with the hairs are small glands which secrete an oily substance, serving as a lubricant to the skin as well as the hair. These are called sebaceous glands. If the root is destroyed there is no means of reproducing the hair; but if it falls out without the root being destroyed, as is often the case after nervous fevers, the hair grows out again of itself. Each hair, indeed, lasts only a certain time, after which it falls out and is replaced by another as long as the papilla is not weakened. Grayness of hair is caused by a deficient amount of pigment granules in the hair cells. The deficiency arises at the hair bulb where the cells are produced. Any influences that affect the nutrition of the bulb may thus affect the color as well as the growth of the hair. Baldness is caused by atrophy of the papilla, generally due to lessened circulation of the blood in the scalp. For some diseases which have a close connection with the hair, see Plica Polonica, Ringworm, Sycosis. Under ordinary circumstances hair is a very stable substance. It is the last thing which decays, and it often grows after death and lasts for centuries. Hair is not acted on by water, but heated in it under pressure it decomposes, evolves sulphuretted hydrogen, and dissolves; it is also dissolved by alkalies and acids. When burned it emits a disagreeable odor as of burning horn.

Hair for manufacture is furnished chiefly from the horse, the ox, the hog, the goat, especially the Angora or Mohair goat, the camel, and the alpaca. That of the first three is most used for upholstery purposes, the short hair being manufactured into curled hair for stuffing, and the long straight hair manufactured into hair-cloth for seating. The long hair is also reserved for the manufacture of fishing-lines, brushes, etc. White hair is of the most value, being most adapted for dyeing and for the manufacture of fancy articles. The horse-hair used for weaving comes chiefly from Russia, Germany, Belgium, South America, and Australia. Russia chiefly furnishes the bristles, so largely used for brushes. The sable, the minniver, the martin, the badger supply the finer brushes on hair-pencils of painters. The hair of the goat, the camel, and the alpaca is chiefly used in combination with or subordinated to wool and other fibers for spinning and weaving into dress fabrics. Human hair is used chiefly for the manufacture of wigs, curls, beards, chignons, etc. Most of the supply comes from France, Germany, and Italy, where the peasant girls sell their hair to itinerant dealers. In every case, and for any purpose, hair is always best taken from the living subject, dead hair being much inferior.

HAIR-DYES, substances for giving hair some particular color desired. The numerous preparations sold for this purpose have generally a basis of lead or nitrate of silver. Bismuth, pyrogallic acid, sulphur, the juice of green walnut shells and other astringent vegetable juices, are also employed.

HAIR-GRASS, a genus of grasses belonging to that division of the order in which the spikelets have two or more florets, and the inflorescence is a loose panicle. It is of little use for cattle, which dislike it, but may serve where covert is wanted for game.

HAIR-POWDER, a preparation of pulverized starch and some perfume, formerly much used to whiten the head, Sometimes the powder was colored. The custom of wearing it was introduced from France into England in the reign of Charles II. To make the powder hold, the hair was usually greased with pomade. It is now scarcely to be seen except on the heads of footmen in attendance on people of rank or wealth.

HAIR-SPRING, in watches, the fine hair-like spring made of steel, which is attached to the axle of the balance wheel and serves by its resisting power to equalize the vibrations of the escapement wheel.

HAKE, a species of North American fishes belonging to that division of the cod family or Gadidæ, which has the

Hake.

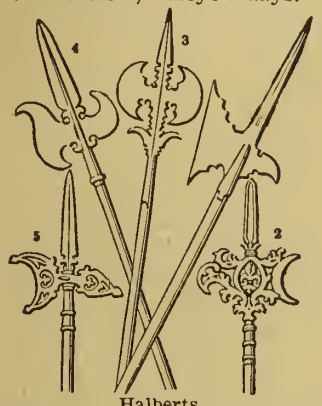
head much flattened, and two dorsal and one long anal fin. The European hake is known in some places as king of the herrings, on which it preys.

HAKODA'TE, a city of Japan, near the south end of the island of Yesso, at the foot of a hill on the shore of a beautiful and spacious bay, which forms one of the best harbors in the world. Hakodate is one of the ports opened to British commerce through Lord Elgin's treaty with the Japanese government in 1858. Pop. 78,040.

HALBERD, or **HALBERT,** an offensive weapon consisting of a pole or shaft about 6 feet long, having its head armed with a steel point edged on both sides. Near the head was a cross piece of steel somewhat in the form of an axe, with a spike or hook at the back. It was much used in the English army in the 16th century, and gave its name to troops called halberdiers, to whom was confided the defense of the colors, and other special

duties. It is now used only on ceremonial occasions.

HAL'CYON, an old or poetical name of the kingfisher. It was fabled to lay its eggs in nests that floated on the sea, about the winter solstice, and to have the power of charming the winds and waves during the period of incubation, so that the weather was then calm; whence the term, halcyon days.



Halberts.

1, Halbert (time of Henry VIII.) 2, Do. with fleur-de-lis (Henry VII.) 3, Double-axed halbert (Charles I.) 4, Halbert (Charles II.) 5, Do. (William III.)

HALE, Edward Everett, American author and clergyman, was born in 1823. He was a Unitarian pastor at Worcester from 1846 to 1850. He contributed voluminously to magazines and newspapers, and edited several of them. He also took great interest in history, and edited Lingard's England, wrote a Chautauquan History of the United States; a Life of Washington, and other works. He is best known for his short story, the famous and effective Man Without a Country. But his most influential book is his Ten Times One is Ten (1870), which led to the formation of many charitable organizations. His Memories of a Hundred Years appeared in 1902.

HALE, Eugene, American legislator, was born in Maine in 1836. He was elected to the forty-first congress in 1868 and was four times re-elected. He declined the post-office folio in Grant's second cabinet and the post of secretary of the navy offered to him by President Hayes. He was elected to the senate in 1881 and has served continuously until the present time, his term ending in 1911.

HALE, John P., a statesman and Free-soil candidate for the presidency, was born in New Hampshire in 1806. Elected to congress in 1842, he became prominent in his opposition to slavery. In 1846 he was chosen United States senator. In 1847 he was nominated for the presidency by the national liberty party, and in 1852 by the free-soil party. His speeches were replete with humor and pathos. His sixteen years in the senate were devoted to the agitation of the slavery question. He was appointed by President Lincoln minister to Spain, where he served four years. He died in 1873.

HALE, Nathan, soldier and hero, was born in Coventry, Conn., in 1755. He enlisted as a volunteer in the revolutionary war, and became lieutenant in Colonel Webb's regiment. On Washington's call for a volunteer to enter the British line and procure intelligence, he responded. Disguised as a schoolmaster, he visited all the enemy's camps in New York and Long Island. He obtained the information required and was about to return when he was arrested as a spy, tried, and condemned to be hanged. The execution took place in New York City. His last words were: "I only regret that I have but one life to lose for my country." He died in 1776.

HALEVY (á-lā-vē), Jacques François Fromental Elie, a French musical composer, born of Jewish parentage at Paris, 1799. The first of his pieces performed was a little comic opera, L'Artisan, given at the Théâtre Feydau in Paris, in 1827. His chefd'œuvre, La Juive, appeared in 1835, and rapidly obtained a European celebrity. Among his other works are L'Eclaire, Guido et Ginevra, La Reine de Chypre, Le Val d'Andorre, La Fée aux Roses. He died at Nice in 1862.

HALF-BLOOD, in law, relationship by being born of the same father, but not of the same mother (consanguinean relationship); or born of the same mother, but not of the same father (uterine relationship). In the succession to real or landed property in England, the half-blood relations by the fathers' side succeed after the full-blood relations; and next, the half-blood relations by the mother's side.

HALF-BREEDS, a nickname given in 1881 to members of a faction in the republican party in the state of New York, which favored the administration in the controversy between President Garfield and Senators Platt and Conkling, and opposed the regular republican candidate for the governorship of the state, Folger, thus bringing about the election of the democratic candidate, Grover Cleveland. The name was given in derision, as denoting those who were but half republican, by the members of the opposite faction denominated "stalwarts".

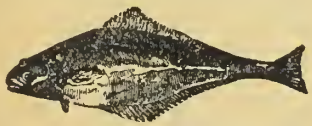
HALFTONE ENGRAVING, a process of engraving plates in relief. These plates have a surface broken into numerous fine square or round dots. These dots are small and separated from each other by wider spaces in the high lights of the picture, are larger and tend to merge into each other in the middle tones, and run together into solid surfaces in the deepest shadows, only broken by very small white points, or even quite devoid of them and in places yielding solid blacks when printed. When viewed at ordinary distances the print from such a plate appears to pass by insensible gradations from white into black, the same as a photograph or photogravure, but closer examination shows the fine texture of dots, usually square, running all over the plate. The method of making these plates is simple in theory but complicated in practice, and involves the use of many of the most recent discoveries of science. The process of negative making is usually the "wet" or collodion method of the early days of photography, as negatives made in this way are more plastic, easier modified, intensified, or reduced. Essential to the process is the presence in the camera of a grating or "screen" made by ruling very fine lines upon a plate of glass. In practice two plates are ruled with these lines diagonally from corner to corner, and are then cemented to each other with the two sets of ruled lines crossing at right angles. The number of lines to the inch is determined by the fineness of engraving desired. The range of screens is from 75 to 200 lines to the inch. This screen is placed in the camera quite close in front of the sensitive plate, so that the image thrown thereon by the lens passes through the openings of the crossed lines. Each of these microscopic openings acts as a separate lens projecting upon the sensitive plate its separate image of the stop opening in the large lens in front. The effect of diffraction causes those openings opposite the most brilliant parts of the image to cast larger as well as more brilliant micro-images or dots upon the plate, while the lesser amount of light passing through the openings opposite the dark parts of the picture produces correspondingly smaller and weaker dots, or even has no perceptible effect. Consequently when the negative is developed it is found to consist of a great number of small dots of sizes graduated in proportion to the light and shade of the picture. The process of reversing the negative to printing upon metal is the same as in zinc etching. The negative is, when dry coated first with a solution of rubber to make it insoluble in the succeeding treatment, and when this is set is again coated with a thick pellicle of plain collodion to give it body and strength It is then, when dry, cut around the edges and laid in a tray of acidulated water. After a few moments the film loosens from the glass and by cautious handling is peeled from its support and laid face downward upon another plate of glass. It is thus reversed to bring the print upon metal in the proper position to give direct impression when printed. If this were not done, the picture would face the wrong way when completed. In some cases a reversed negative is made in the first instance by using a reflecting prism or a mirror in front of or behind the lens. The metal used for halftone plates is usually copper, but zinc and brass are sometimes employed. It is finely polished, placed upon a whirling machine and coated with a solution of fish glue, albumen, water, and bichromate of ammonia, and dried by gentle heat. It is then locked down upon the negative in a strong printing frame and printed from five to twenty-five minutes by electric light. The development varies with different operators but consists essentially in soaking in running water until the soluble parts of the coating are washed away, leaving a faintly visible image formed of dots of insoluble glue upon the plate. This is burned in over a gas furnace until the metal passes into a silvery hue and the image shows brilliantly in a clear, deep maroon color. The etching is rapidly done by the use of various acid solutions, the one most used being the acid perchloride of iron When fully etched, the plate is proved and if satisfactory given to the finisher to receive any needed hand engraving or

corrections, after which the edges are beveled upon a beveling machine, it is nailed upon a block of wood, the edges of the black trimmed square, the back shaved off to type height, and it is then ready for the press. The most recent and most rapid of modern engraving methods it is also one requiring the highest skill and technical as well as artistic knowledge to produce satisfactory results.

HALIAETUS (hal-i-a'ē-tus), the genus of birds to which belong the white-tailed sea-eagle of Britain, and the white-headed or bald eagle of America, the chosen symbol of the United States. See Eagle.

HAL'IBURTON, Thomas Chandler, Anglo-American humorous writer, born at Windsor, Nova Scotia, in 1796. He practiced as a barrister in Halifax, wrote a Historical and Statistical Account of Nova Scotia, in 1829, and contributed a series of humorous letters to Halifax newspapers under the pseudonym of "Sam Slick." These were published in book form and were augmented by others, forming The Clockmaker, or Sayings and Doings of Samuel Slick. He died in 1865.

HAL'IBUT, or **HOL'IBUT,** one of the largest of the Pleuronectidæ or flat-fish family, sometimes weighing more than 300 lbs. The fish has a compressed body,



Halibut.

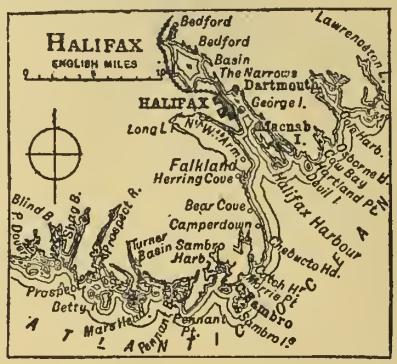
one side resembling the back and another the belly, and both eyes on the same side of the head. It is caught on both sides of the Atlantic, and is much prized for the table.

HALICARNAS'SUS, in ancient geography, the capital of Caria, in Asia Minor, once an important city. Halicarnassus was the native place of Herodotus.

HAL'IFAX, a municipal, parl., and county borough of England, in the county of York (West Riding), on the Hebble, 36 miles w.s.w. York. Halifax commands abundant supplies of coal and water, and an extensive inland navigation connecting it with Hull and Liverpool. It is one of the centers of the woolen and worsted manufactures in Yorkshire, a great variety of goods being produced. There are also iron, chemical, and machine-making works. Pop. 104,933.

HALIFAX, a city, and the capital of Nova Scotia, situated on the slope of a commanding hill, on the western side of Halifax harbor. The harbor is one of the best and most spacious in America. It is easy of access at all seasons of the year. Its length from north to south is about 16 miles, and it terminates in a beautiful sheet of water called Bedford Basin, within which are 10 square miles of good anchorage. The harbor is well fortified, and has an extensive government dockyard. It is the principal naval station of British America, has an extensive foreign and coasting trade, and exports large quantities of fish, lumber, and coals. There are also considerable manufactures embracing iron castings, machinery, nails, soap, leather, tobacco, paper, etc. Pop. 40,832.

HALIFAX, Charles Montague, Earl of, an English poet and statesman, born 1661. He became first lord of the treasury in 1714, and died in 1715. His character was a mixture of meanness and arrogance, but his taste in literature and the arts was good, and he had a great talent for finance.



HALL, Asaph, an American astronomer, was born in 1829 at Goshen, Conn. He studied under Drünnow at Ann Arbor, where he made his first acquaintance with astronomy, and in 1857 went to Cambridge as assistant to Professor Bond. In 1862 he took a civil-service examination and became an aid, and a year afterward professor of mathematics in the United States naval observatory. His greatest fame came from his discovery in 1877 of the two satellites of Mars, which he called Deimos and Phobos. In recognition of this discovery he received a gold medal from the Royal astronomical society, and the award of the Lalande prize from the Paris academy. In 1902 he was president of the American association for the advancement of science.

HALL, Charles Francis, an Arctic explorer, born at Rochester, New Hampshire, United States, in 1821. He began life as a blacksmith, became a journalist in Cincinnati; in 1860 organized an Arctic expedition in search of Franklin, an remained among the Esquimos two years, acquiring their language and habits. In 1864 he undertook a second expedition to the same regions, where he remained till 1869. In 1871, at the instigation of Hall, the United States government fitted out the Polaris for an expedition to the North Pole, and placed Captain Hall in command. The Polaris sailed from New York June 29, 1871, and on 30th Aug. reached lat. 82° 16′ n., and then turned back to winter in a sheltered bay, lat. 81° 38′, where Hall died on Nov. 8. The Polaris was ultimately abandoned by her crew, who reached home only after experiencing many privations and adventures. An account of his first expedition was given by Capt. Hall in his Arctic Researches and Life among the Esquimos.

HALL, Edward, an English chronicler, born in London about 1495. He was a lawyer by profession, and attained the rank of a sergeant, and the office of a judge in the sheriff's court. He had a seat in the House of Commons, and was a zealous Catholic. His death took place in 1547. Hall's Chronicle was published in 1548, and is a curious picture of the manners and customs of the age.

HALLAM, Henry, English historian, a son of the dean of Bristol, born at Windsor in 1777. His contributions to the Edinburgh Review brought him into notice, and his View of the State of Europe, during the Middle Ages, which appeared in 1818, at once established his reputation. His next work, the Constitutional History of England, published in 1827, showed like the first the solid learning, patient research, accuracy and impartiality of statement, which are the characteristics of Mr. Hallam's work. In 1837–39 appeared his last great work, the introduction to the Literature of Europe, He died in 1859.

HALLE (hăl'lĕ), usually called Halle an der Saale (Halle on the Saale), to distinguish it from other places of the same name, an important German town in the Prussian province of Saxony, about 20 miles northwest of Leipzig, on the river Saale. The older streets are narrow and crooked, but the appearance of the town has of late been much improved. Halle is mentioned as early as 806. It was long a powerful member of the Hanseatic League. Pop. 156,611.

HALLECK, Fitz Greene, an American poet, born in 1790. He became a clerk in a New York banking-house, and for years was in the employment of John Jacob Astor. In 1809 poems by him and a friend (J. R. Drake) appeared in the New York Evening Post under the signature of Croaker & Co., and attracted some attention. In 1820 he published Fanny, his longest poem, a satire on the follies and fashions of the day. In 1822 he visited Europe. Among his best poems are Marco Bozzaris, To the Memory of Burns, Alnwick Castle, and Red Jacket. He died in 1867.

HALLECK, Henry Wager, an American general, born at Utica, near New York, in 1815, was educated for the army at West Point, and entered the engineers in 1839. In 1846 he published Elements of Military Art and Science, and he was raised to the rank of captain for his services in the Mexican war. In 1854 he left the army and settled in San Francisco as a lawyer and director of a mining company. On the outbreak of the civil war in 1861 he was created major-general in the United States army. After the victories at Paducah, Fort Henry, Fort Donelson, and the capture of Corinth, be became in 1862 commander-in-chief till superseded by General Grant in 1864. Ultimately he received the command of the South Division at Louisville, where he died in 1872. Among his writings are two works on International Law.

HALLELUIA, or **HALLELUJAH,** or **ALLELUIA** (praise ye the Lord), a Hebrew formula of praise often occurring in the Psalms, and which is retained in the translations of the various Christian churches, probably on account of its full and fine sound, so proper for public religious services. The Great Halleluja is the name given by the Jews to Psalms cxiii.—cxvii., which are sung

on the feasts of the Passover and Tabernacles.

HALLEY, Edmund, an English mathematician and astronomer, born in 1656. In 1682 he discovered the comet which bears his name, and his prediction of its return in 1759 was the first of its kind that proved correct. In 1713 he was made secretary of the Royal society, and astronomer-royal in 1719. He died in 1742.

HALLEY'S COMET, discovered in 1682 by Edmund Halley. Halley's demonstration that this comet was the same with the comet of 1456, 1531, and 1607 first fixed the identity of comets. It performs its revolution in about 75 years. Its last appearance was in 1835.

HALLIWELL-PHILLIPPS, James Orchard, originally J. O. Halliwell, Shakespearean scholar, born 1820, died 1889. His chief Shakespearean publications are a Life of Shakespeare (1848), the Works of Shakespeare in 16 folio volumes, only 150 copies printed, and a great number of pamphlets on Shakespeare. He also published a valuable Dictionary of Archaic and Provincial words.

HALL OF FAME, AMERICAN. "The Hall of Fame for Great Americans" is the name of a building on University Heights in New York city, in which are inscribed on bronze tablets the names of famous American men and women. Nominations for the honor are made by the public and are submitted to a committee of 100 eminent citizens. In the case of men fifty-one votes are required, and in the case of women forty-seven. The first balloting took place in October, 1900. The following have been chosen:

George Washington.	Horace Mann.
Abraham Lincoln.	Henry W. Beecher.
Daniel Webster.	James Kent.
Benjamin Franklin.	Joseph Story.
Ulysses S. Grant.	John Adams.
John Marshall.	Wm. E. Channing.
Thomas Jefferson.	Gilbert Stuart.
Ralph W. Emerson.	Asa Gray.
H. W. Longfellow.	Chosen in 1905:
Robert Fulton.	John Quincy Adams.
Washington Irving.	Jas. Russell Lowell.
Jonathan Edwards.	Wm. T. Sherman.
Samuel F. B. Morse.	James Madison.
David G. Farragut.	John Quincy Adams.
Henry Clay.	John G. Whittier.
Nath. Hawthorne.	Alex. Hamilton.
George Peabody.	Louis Agassiz.
Robert E. Lee.	John Paul Jones.
Peter Cooper,	Mary Lyon.
Eli Whitney.	Emma Willard.
John J. Audubon.	Maria Mitchell.

HALLOW-EVEN, or **HALLOWE'EN,** the evening of the 31st of October, so called as being the eve or vigil of All Hallows, or All Saints, which falls on the 1st of November. It is associated in the popular imagination with the prevalence of supernatural influences, and in Scotland is frequently celebrated by meetings of young people, with the performance of various mystical ceremonies humorously described by Burns in his poem Hallowe'en.

HALLUCINATIONS, according to Esquirol, are morbid conditions of mind in which the patient is conscious of a perception without any impression having been made on the external organs of sense. Hallucinations are to be distinguished from delusions, for in these there are real sensations, though they are erroneously interpreted. Pinel was the first who connected hallucinations with a disturbance of the phenomena of sensation, and the investigation has been pursued further by Esquirol, Maury, Brière de Boismont, and others. All the senses are not equally subject to hallucinations; the most frequent are those of hearing; next, according to many, come those of sight, smell, touch, and taste; and hallucinations of several senses may exist simultaneously in the same individual, and also be complicated with certain delusions. The simplest form of hallucinations of hearing is the tingling of the ears; but the striking of clocks, the sounds of musical instruments and of the human voice are often heard, and in these instances, as in those of the perturbations of the other senses, there must be a diseased sensorium, though there should be no structural derangement of the nerves. Hallucinations are not confined to those whose mental faculties have been alienated, but occasionally assail and torment even the sane. Occasionally hallucinations supervene where the system is healthy, and the individual fully conscious of the unreality of the objects that address his senses, and this disorder is often associated with much ability and wisdom in the conduct of life.

HA'LO, the name given to colored circles of light sometimes seen round the sun or moon, and to other connected luminous appearances. These phenomena are classified as: (1) halos proper consisting of complicated arrangements of arcs and circles of light surrounding the sun or moon, accompanied by others tangent to or intersecting them; (2) coronas, simple rings, generally somewhat colored; (3) aureolas, the name given to the kind of halo surrounding a shadow projected upon a cloud or fog-bank, or to the colored rings observed by aeronauts on the upper surface of clouds. All these appearances are the result of certain modifications which light undergoes by reflection, refraction, dispersion, diffraction, and interference when it falls upon the crystals of ice, the raindrops, or the minute particles that constitute clouds.

HALSTEAD, MURAT, journalist; born in Butler Co., O., 1829. Began newspaper work on a literary weekly; joined staff of Cincinnati Commercial, later consolidated with Gazette as Commercial Gazette, of which he became editor-in-chief. Author: The Story of Cuba; Life of William McKinley; The Story of the Philippines; The War between Russia and Japan, 1905. He died in 1908.

HALYARDS, HALLIARDS, or **HAULYARDS,** the ropes or tackles usually employed to hoist or lower any sail upon its respective yard, gaff, or stay.

HAM, one of the three sons of Noah. He had four sons—Cush, Mizraim, Phut, and Canaan—from the first three of whom sprang the tribes that peopled the African continent, as Canaan became the father of the tribes that principally occupied the territory of Phœnicia and Palestine.

HAM, the inner angle of the joint which unites the thigh and the leg of an animal, but more generally understood to mean the cured and smoked thigh of the ox, sheep, or hog, especially the last. Usually the meat is first well rubbed with salt, and a few days after it is rubbed again with a mixture of salt, saltpeter, and sugar, though sometimes the saltpeter is omitted. After lying for eight or ten days it is ready for drying. The smoking of hams consists in subjecting them to the smoke of a fire, wood being used in preference to coal in the process of smoking. A good ham should have the recently-cut fat hard and white, the lean fine-grained and of a lively red.

HAM'ADRYAD, in Greek mythology, a kind of wood-nymph conceived to inhabit each a particular tree, with which they were born and with which they perished.

View in Hamburg lower harbor.

HAMBURG, one of the free cities of Germany, a member of the Germanic Empire, and the greatest commercial port on the continent of Europe, is situated about 80 miles from the North Sea, on the north branch of the Elbe,

which is navigable for large vessels. The town of Altona adjoins it on the west From the Elbe proceed canals which intersect the eastern and lower part of the city in all directions, and it is also intersected by the Alster, which here forms two fine lakes, the Binnenalster and Aussenalster. The quays and harbors accommodation are very extensive. After the destructive fire of 1842 whole streets were rebuilt in a magnificent and expensive style. Hamburg is not, however, very rich in notable buildings. Among the most important are the church of St. Nicholas, a noble Gothic structure with a lofty tower and spire, built between 1845 and 1874; St. Peter's, another lofty Gothic edifice; St Michael's, the largest of the churches; St. Catharine's, an ancient edifice; St. James', erected in 1354, but surmounted by a modern tower; an elegant Jewish temple; an exchange, a noble edifice, consisting chiefly of a magnificent hall, surrounded by a fine colonnade. There are also the Johanneum institution, containing an ancient college, museums, and the city library, with about 300,000 volumes; several well-endowed hospitals, zoological and botanic gardens; the Kunsthalle, a large collection of pictures and sculpture; theaters, etc. Hamburg is of most importance on account of its great shipping trade and the business of banking, exchange, marine insurance, etc., carried on in connection with that Its manufactures, though large, are less important, including ship-building, tobacco and cigar making, iron-founding, brewing, etc. A great many emigrants embark here. The state of Hamburg embraces a territory of 160 sq. miles, and consists of two divisions, viz:—City of Hamburg, with a population of 705,738; outlying towns and bailiwicks (Cuxhaven, Ritzebüttel, etc.), pop 62,611. The legislative power belongs in common to the senate and the house of burgesses, but the executive power is vested chiefly in the senate, which is composed of eighteen members, of whom nine must have studied law or finance, and of the other nine seven must belong to the commercial class. The members are elected for life. The house of burgesses consists of 160 members, half of whom are elected every three years by the votes of all tax-paying citizens, while the other half are chosen partly by a much-restricted franchise, and partly deputed by guilds and corporations. In 1815 it joined the Germanic confederation as a free city. In 1888 the city was included in the Zollverein or German customs union.

HAMIL'CAR, the name of several Carthaginian generals, of whom the most celebrated was Hamilcar, surnamed Garca (the lightning), the father of the great Hannibal. While quite a young man he was appointed to the command of the Carthaginian forces in Sicily, in the eighteenth year of the first Punic war, B.C. 247, when the Romans were masters of almost the whole island. For two years he defied all the efforts of the Romans to dislodge him; but the Carthaginian admiral, Hanno, having been totally defeated off the Ægates, B.C. 241, he reluctantly consented to evacuate Sicily. A revolt of the returned troops, joined by the native Africans, was successfully repressed by Hamilcar. He then entered on a series of campaigns in Spain, where he founded a new empire for Carthage. Here he passed nine years, and had brought the whole southern and eastern part of the country under Carthaginian rule when he was slain in battle against the Vettones, B.C. 229. His great design of making Spain a point of attack against Rome was ably carried out by his son Hannibal.

HAMILTON, a thriving town of Canada, in the province of Ontario, county of Wentworth, on the south side of Burlington Bay, Lake Ontario, the principal part being built about 1 mile from the bay. It is the seat of an active and increasing trade, and has manufactures of paper, soap, iron goods, glass, carriages, etc. Pop. 52,634.

HAMILTON, a town in Ohio, county seat of Butler county, on the Miami river, 25 miles n. of Cincinnati. It is a prosperous manufacturing place, has woolen and cotton factories, paper and saw mills, and iron-foundries. Pop. 28,564.

HAMILTON, Alexander, a distinguished American officer and legislator during the contest for independence, was born in 1757 in the island of Nevis, West Indies. At the age of sixteen he became a student of Columbia College, New York. On the outbreak of the war he received (1776) a commission as captain of artillery, and soon attracted the attention of Washington, who appointed him his aide-de-camp and employed him in the most delicate and difficult affairs. In 1781 he left the service, studied law, became a delegate from the state of New York in 1782, and in 1787 was one of the delegates who revised the articles of confederation. He was a strong supporter of the federal party, and by the letters which he wrote to the Daily Advertiser of New York, afterward published under the title of The Federalist, contributed greatly to the success of the party. On the organization of the federal government in 1789, with Washington at its head, Hamilton was appointed secretary of the treasury. This office he held till 1795, when he resigned and retired into private life. In 1798 he was appointed second in command of the provisional army raised under the apprehension of a French invasion, and on the death of Washington, in 1799, he became commander-in-chief. In 1804 he became involved in a political dispute with Mr. Aaron Burr, then candidate for the governorship of New York, accepted a challenge from that gentleman man, and was shot by him July 11, 1804.

HAMILTON, Family of, a family long connected with Scotland, though probably of English origin, the name being evidently territorial. The first person of the name in Scotland of whom we have information was Walter Fitz-Gilbert of Hamilton, who, in 1296, swore fealty to Edward I. of England for lands in Lanarkshire, and held Bothwell Castle for the English at the time of the battle of Bannockburn. For his early surrender of this fortress King Robert Bruce gave him important grants of land. He continued faithful to King David Bruce, and had a command at Halidon Hill under the Stewart of Scotland. In 1445 the family was ennobled in the person of Sir James Hamilton of Cadyow, who was created Lord Hamilton of Cadyow.

HAMILTON, GAIL. See Dodge, Mary Abigail.

HAMILTON, Sir William, a metaphysician, the most acute logician and most learned philosopher of the Scottish school, was born in 1788 at Glasgow, where his father and grandfather held in succession the chairs of anatomy and botany. In 1846 he published an annotated edition of the works of Thomas Reid, and in 1854 the first volume of a similar edition of the works of Dugald Stewart. He died suddenly at Edinburgh in 1856. His lectures on logic and metaphysics were collected and edited by Dean Mansel and Professor Veitch.

HAMITES (descendants of Ham), the name given to a number of races in North Africa, who are regarded as of kindred origin and speak allied tongues. They include the ancient Egyptians and their modern descendants, the Copets, the Berbers, Tuaregs, Kabyles, the Gallas, Falashas, Somali, Dankali, etc.

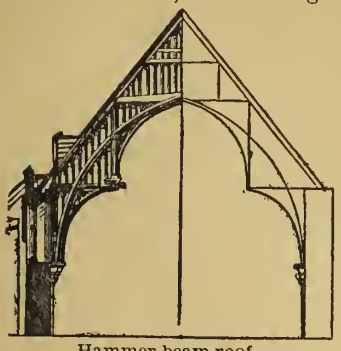
HAMLET, Prince of Denmark, the hero of Shakespeare's famous tragedy. The story is founded on an old tradition, related, among others, by Saxo-Grammaticus, of a Danish prince, Hamlet, who lived about 500 B.C., but essentially altered in details and conclusion.

HAMLIN, Hannibal, American statesman, was born in Maine in 1809. He served in, and was speaker of the lower house of the Maine legislature, and in 1843 was elected to congress. From 1848 to 1857 he was United States senator, for a short time governor of Maine (1857), and again senator. He was elected vice-president of the United States on the ticket with Lincoln in 1860; in 1865 became collector of customs at Boston, and 1869–81 served again in the senate. Later he became minister to Spain. He died in 1891.

HAMMER, a well-known tool used by mechanics, of which there are various sorts, but they all consist of an iron or steel head fixed crosswise to a handle of wood. See Steam-hammer.

HAMMER-BEAM, a short beam attached to the foot of a principal rafter in a roof, in the place of the tie-beam. Hammer-beams are used in pairs, and project from the wall, extending less than half-way across the apartments.

The hammer-beam is generally supported by a rib rising up from a corbel below; and in its turn forms the support of another rib, constituting with



Hammer-beam roof.

that springing from the opposite hammer-beam an arch.

HAMMER-CLOTH, a cloth sometimes used to cover the box-seat of a private carriage. It usually bears the coat of arms of the owner of the carriage.

HAMMERSMITH, a municipal and parliamentary borough of London, about 6 miles w.s.w. of the general post-office. The Thames is here crossed by a fine suspension bridge. Pop. 112,245.

HAMMOCK, a rectangular piece of cloth or netting about 6 feet long and 4 feet wide, gathered together at the two ends and slung horizontally, forming a sort of bed or place in which one may recline for pleasure. Hammocks are in common use on board ships of war. The word is said to be of Caribbean origin, and the Caribs certainly make use of similar hanging beds.

HAMMOND, a city in Lake co., Ind., 21 miles south by east of Chicago, Ill. The industries include extensive steel-spring and chemical works, nail-mills, a slaughtering and meat-packing plant, flour-mills, carriage-works, a distillery, starch-works, a glue-factory, brick-yards, etc. Pop. 14,670.

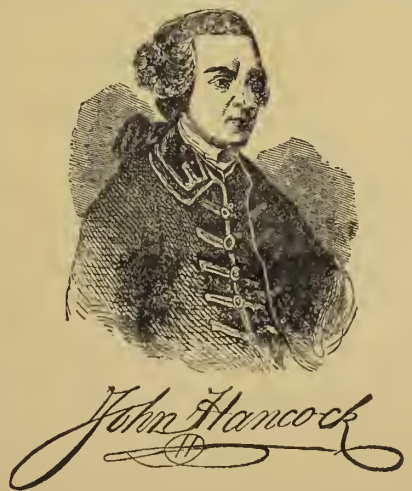
HAMMOND, John Hays, an American mining engineer, born in 1855 at San Francisco. In 1893 he was appointed consulting engineer to various mining companies operated by a London firm in South Africa, and later to the British South Africa company, known as the Chartered company, to the Consolidated Gold Fields company, and other organizations of promoters acting in that region. While in South Africa he was connected with the Jameson raid, was tried for complicity in the revolt against the South African republic, and was sentenced to death. This sentence was commuted to fifteen years' imprisonment. Hammond was later released by the Boer authorities upon the payment of a fine of $125,000. Afterward he established himself in London, whence he directed mining interests in Mexico and the United States.

HAMPDEN, John, celebrated for his patriotic opposition to taxation by prerogative, was born in London in 1594, being cousin-german by the mother's side to Oliver Cromwell. Although for some years a uniform opposer of the arbitrary practices in church and state, it was not till 1636 that his resistance to Charles' demand for ship-money made him the argument of all tongues. Although the decision in the court of exchequer was given against him by seven voices to five, the victory, as far as regarded public opinion, was his. In the following year (1637) he was one of those who meditated emigration to America, which they were prevented from carrying out by an order in council detaining them. Henceforward he took a prominent part in the great contest between the crown and the parliament, and was one of the five members whom the king, in 1642, so imprudently attempted, in person, to seize in the House of Commons. When the appeal was made to the sword, Hampden accepted the command of a regiment in the parliamentary army under the Earl of Essex, and was fatally wounded on Chalgrove Field, 24th June, 1643.

HAMPSHIRE, Hants, or Southamptonshire, a maritime county, including the Isle of Wight, in the south of England; area, 1,037,764 acres. Pop. 798,756.

HAMPSTEAD, a municipal and parliamentary borough of London. Hampstead Heath crowns the summit of the hill, and is now sprinkled over with handsome villas. Pop. 82,329.

HAMPTON, Wade, American soldier and politician, was born at Columbia, S. C., in 1818. With the secession of his state from the union, he entered enthusiastically into the movement for the establishment of the confederacy, and raised and equipped from his private means the command which, under the name of "Hampton's Legion," did good service for the confederate cause throughout the war. He was engaged in opposing the advance of Sheridan in the Shenandoah Valley in 1864, where he showed such high qualities as a cavalry commander that he was in August of that year commissioned lieutenant-general and placed in command of all Lee's cavalry. Later he commanded the cavalry in Johnson's army, which opposed Sherman's advance from Savannah in 1865. In 1876 he was elected governor, and served until 1878, when he was elected to the United States sen-



ate. There he served by reëlection until 1891. From 1893 to 1897 he was United States commissioner of railroads, to which office he was appointed by President Cleveland. He died in 1902.

HANCOCK, John, American patriot of the revolutionary period, was born at Quincy, Mass., in 1737. In 1774 Hancock was president of the provincial congress, and from 1775 to 1777 of the general congress at Philadelphia, where he was the first to sign the declaration of independence. Returning to Massachusetts, he assisted in framing its constitution, and in 1780 was chosen first governor. He was annually elected to this dignity till 1785, and again from 1787 to 1793, sitting as an ordinary member of the legislature in the interval. He died in 1793.

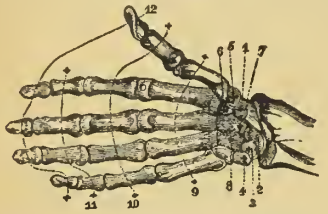
HANCOCK, Winfield Scott, distinguished American soldier, was born in Pennsylvania, in 1824, graduated from West Point in 1844, and served as lieutenant in the Mexican war. He was

Winfield Scott Hancock, 1824-1886.

appointed brigadier-general of volunteers in 1861, fought at Antietam and Fredericksburg, and commanded a corps at Gettysburg, where he was severely wounded. At Spotsylvania, May 12, 1864, he captured 4,000 prisoners and many cannon. After the war he rose to be major-general (1866), and held several department commands, the last being that of the department of the east, with headquarters at New York. In 1880 he was made the democratic nominee for the presidency, but was defeated by General Garfield. He died Feb. 9, 1886.

HAND, the part of the body which terminates the arm, consisting of the palm and fingers, connected with the arm at the wrist; the principal organ of touch and prehension. The human hand is composed of twenty-seven bones, namely eight bones of the carpus or wrist arranged in two rows of four each, the row next the fore-arm containing the scaphoid, the semilunar, the cuneiform, and the pisiform, and that next the metacarpus, the trapezium, the trapezoid, the os magnum, and the unciform. The metacarpus consists of the five bones which form the palm, the first being that of the thumb, the others that of the fingers in succession. Lastly, the fingers proper contain fourteen bones called phalanges, of which the thumb has but two, all the other digits having three each. These bones are jointed so as to admit of a variety of movements, the more peculiar being those by which the hand is flexed backward, forward, and sideway, and by which the thumb and fingers are moved in different ways. The chief muscles which determine these movements are the flexors, which pass down the fore-

arm, are attached by tendons to the phalanges of the fingers, and serve to flex or bend the fingers; and the extensors for extending the fingers. There are two muscles which flex all the fingers except the thumb. The thumb has a separate long and short flexor. There is a common extensor for the fingers which passes down the back of the fore-arm and divides at the wrist into four ten-



Skeleton of Human Hand and Wrist.

1. Scaphoid bone. 2, Semilunar bone. 3, Cuneiform bone. 4, Pisiform bone. 5, Os trapezium. 6, Os trapezoides. 7, Os magnum. 8, Unciform bone. 9, Metacarpal bones of thumb and fingers. 10, First row of phalanges of thumb and fingers. 11, Second row of phalanges of fingers. 12, Third row of phalanges of thumb and fingers.

dons, one for each finger, each being attached to all three phalanges. The forefinger and little finger have, in addition, each an extensor of its own, and the thumb has both a short and a long extensor. The tendons of the muscles of the hand are interlaced and bound together by bands and aponeurotic fibers, and from this results a more or less complete unity of action. It is sometimes difficult to make a movement with a single finger without the others taking part in it, as in executing instrumental music, for instance; but practice gives to these movements perfect independence. Of all the movements of the hand the opposition of the thumb to the other fingers, alone or united, especially characterizes the human hand. This action of the thumb results from its length, from the first metacarpal bone not being placed on the same plane as the other four, as is the case in the monkey, and from the action of a muscle —the long flexor of the thumb—peculiar to the human hand. This muscle completes the action of the other motor of the thumb, and permits man to hold a pen, a graver, or a needle; it gives to his hand the dexterity necessary in the execution of the most delicate work. Properly speaking then, the hand, with its highly specialized muscles, belong to man alone. It cannot be considered, as in the ape, as a normal organ of locomotion. It is essentially the organs of touch and prehension. It moulds itself to a body to ascertain its form; it comes to the aid of the eye in completing or rectifying its impressions. The functions of touch devolve principally upon its anterior or palmar face, the nervous papillæ abounding specially at the ends of the fingers. A layer of adipose tissue, very close in texture, protects, without lessening its power or its delicacy, the network of muscles, vessels, and nerves, with which this remarkable organ is equipped.

HANDBALL, a variety of "Fives" practiced in the United States chiefly on account of its physical benefits in training for contests of endurance, though it is also one of the sports under the regulations of the Amateur Athletic union. In its simplest form it consists of scoring the ball against a single back wall, with a lined-out space in front; but in its home, Ireland, the court or "alley" on which it is played has also side walls extending the length of the court (60 feet). The floor is 60 x 28 feet, and about the center of it, parallel with the end wall, a line is drawn called the "short line." Sixty feet from the end wall another line is drawn, called the "over line," and every service coming off the wall must fall between these two lines to be in play. The game is started by one player "tossing" out the ball on to the ground and hitting it on the rebound, with his hand, against the end wall. It it falls inside the short line, and the other player fails to return it, it counts an "ace" to the server. Should it be returned and the original server fail to return it, it is a "hand out." Then the service changes, and the game goes on alternately. The game is won by the player who first gets 15 or 20 aces, as agreed.

HANDCUFFS, an instrument formed of two iron rings connected by a short chain or fixed on a hinge on the ends of a very short iron bar, which, being locked over the wrists of a malefactor, prevents his using his hands.

HANDEL (properly Haendel), George Frederick, a great German composer born at Halle on the Saale, February 23, 1685. In 1696 he was sent to Berlin, where he heard the music of Bononcini and Ariosti, then at the head of the

George Frederick Handel.

Berlin Opera House. He returned to Halle, but soon felt to visit Hanover and Hamburg. At Hamburg he played second violin in the orchestra, and brought out in 1704 his first work, an oratorio on the Passion, and his first opera, Almira, followed in February by his Nero, and subsequently by his Florinda and Daphne. In 1706 he went to Italy, visiting Florence, Venice, Naples, and Rome. On his return to Germany he entered the service of the Elector of Hanover, afterward George I. of England, as musical director. He visited England twice, and ultimately having received a pension from Queen Anne, settled down there. Among the operas which he had composed up to this date (1735) are: Dadamisto, Ottone, Giulio Cesare, Flavio, Tamerlano, Scipio, Ricardo I., Orlando, Ariadne, etc. His last opera was performed in 1740. By this time he had begun to devote himself chiefly to music of a serious nature, especially the oratorio. The approval which his first works of this kind (Esther 1731; Deborah, 1732; Athalia, 1733) had met with encouraged him to new efforts; and he produced in succession Israel in Egypt, L'Allegro and Il Penseroso, Saul, and The Messiah. The last-mentioned, which is his chief work, was brought out in 1741, for the benefit of the Foundling hospital. In 1742 the Samson appeared, in 1746 the Judas Maccabæus, in 1748 the Solomon, and in 1752 the Jephthah. In 1752 he became blind, but did not lose his spirits, continuing to perform in public and even to compose. He died at London, 13th April, 1759.

HANDICAPPING, in horse-racing and various other games and sports, a system of equalizing the chances of victory in favor of each of the competitors by allowing certain advantages to an inferior competitor, as, in horse-racing, the making of the best horses carry heavier weights proportionably to the racing qualities, or, in chess-playing, the stronger player giving up one or more of his men at the beginning of the game.

HANDS, Laying on of. This rite, as a token of blessing, or the communication of spiritual gifts, or of something else which could not be literally delivered into the hands of another, has been in use from the earliest times. It occurs in Scripture as a patriarchal usage, appropriate and becoming perhaps rather than strictly religious, but later assumes more of the character of a formal rite, as in the ritual of animal sacrifice among the Jews, when the officer was required to lay his hands on the victim while still alive, except in the case of the paschal lamb. In the early church this rite was used in benediction, absolution, the unction of the sick, and the reconciliation of penitents as well as in ordination and confirmation. The rite is still retained by most western churches in the ceremony of ordination, and in the Roman Catholic, Anglican, and Lutheran churches both in confirmation and ordination.

HANG-CHOW, or **HANG-CHOO,** a Chinese treaty port, capital of the province of Chekiang, on the estuary of the Tsien-tang-kiang. It is one of the handsomest cities of China, with many magnificent temples, monuments, and triumphal arches. It has extensive manufactures in silks, furs, gold and silver ornaments, tapestries, lacquered ware, fans, etc., and a large trade. The larger portion of the inhabitants live without the walls in the beautiful suburbs and in boats on the river. It is also a great center of literary and ecclesiastical life. Pop. estimated at 800,000.

HANGING-BUTTRESS, in arch., a buttress not standing solid on a foundation, but supported on a corbel. It is applied chiefly as a decoration.

HANKOW' ("Mouth of the Han"), a town and river port in China, in the province of Hupeh, at the junction of the Han with the Yang-tse-kiang; Hanyang being on the opposite bank of the Han,

and Wuchang on the other side of the Yang-tse. The port was opened to foreign trade in 1862, and has become the chief emporium for the great tea districts in the central provinces, which formerly sent their produce for export to Canton. Large steamers ascend to the town. In

Hanging-buttress.

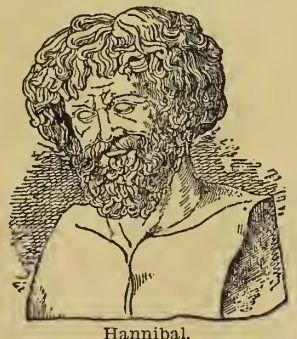
1857 Hankow fell into the hands of the Taiping rebels, and was almost completely demolished by them. Pop. 750,000.

HAN'LEY, a municipal, parl., and county borough of North Staffordshire, England, pleasantly situated on rising ground near the Trent, 18 miles north by west of the county town of Stafford. Pop. of co. bor., 61,524; parl., bor. 100,290.

HAN'NA, Marcus Alonzo, American manufacturer and politician, born in 1837 at Lisbon, Columbiana co., Ohio. In 1896 he suddenly acquired national prominence by the part he took in securing the nomination of William McKinley for the presidency at the republican national convention at Saint Louis. Immediately after the convention he became chairman of the republican national committee. In March, 1897, he was appointed United States senator from Ohio. In the senate he did not take a prominent part either as a debater or a legislator; but up to the death of President McKinley he was recognized as one of the most influential advisers of the administration. He died in 1906.

HAN'NIBAL, or **AN'NIBAL,** one of the greatest generals of antiquity, born B.C. 247, was the son of Hamilcar Barca, also a general and leader of the popular party among the Carthaginians. He was but nine years of age when his father made him swear at the altar eternal hatred to the Romans. He grew up in his father's camp in Spain (see Hamilcar), but returned to Carthage when his father fell in battle, in 229 B.C. At the age of twenty-two he returned to the army in Spain, then commanded by his brother-in-law Hasdrubal, and three years after, on the murder of Hasdrubal, received the chief command by acclamation. Hannibal now prepared to carry out his great designs against Rome. His siege and capture of Saguntum, a city in alliance with Rome, led to a declaration of war from the Romans, who made preparations to carry on the war in Spain. But Hannibal, judging that Rome could be overthrown only in Italy, undertook his great march on Rome across the Pyrenees, the Rhône, and the Alps. He set out with 90,000 foot-soldiers, 40 elephants, and 12,000 horsemen. When he reached the northern foot of the Alps he had still 50,000 foot-soldiers, 9000 horse, and 37 elephants. When he arrived at the southern foot, after 15 days of incredible toils, his force had diminished to 20,000 foot-soldiers and 6000 horse. The point at which he crossed is generally believed to have been the Little St. Bernard. On the banks of the Ticino he first encountered a Roman army under Publius Scipio, and defeated it mainly by the superiority of his Numidian cavalry, 218 B.C.

Shortly after another Roman army, under Sempronius, was totally routed on the Trebia. After wintering in Cisalpine Gaul, Hannibal opened next year's campaign (217) by defeating the Roman general Flaminius, whom he enticed into an ambush at Lake Thrasymenus. In this battle half the Roman army perished, and the rest were taken prisoners. Hannibal now marched into Apulia, spreading terror wherever he approached. Rome, in consternation, proclaimed Fabius Maximus dictator, who sagaciously resolved to hazard no more open battles, but exhaust the strength of the Carthaginians by delay. But for sometime the wisdom of this policy was not understood by his countrymen, who, dissatisfied with his inactivity, appointed Minutius Felix his colleague. The result was that the latter was drawn into a battle by Hannibal, and would have perished but for the aid of Fabius. After this the Roman generals avoided engagements, and Hannibal at this



Hannibal.

critical period saw his army wasting away in inactivity. Next year (216), however, the rashness of the new consul Terentius Varro gave Hannibal the last of his great victories. The battle was fought at Cannæ, the Romans under L. Æmilius Paulus and Varro numbering more than 80,000 men, the Carthaginians about 50,000, and ended in a total defeat of the Romans, 40,000 or 50,000 of whom were slain and the rest scattered. Instead of marching on Rome, Hannibal now sought quarters in Capua, where luxurious living undermined the discipline and health of his troops. The campaigns of 215, 214, and 213 were comparatively unimportant. While Hannibal was seizing Tarentum (212), Capua was invested by two Roman armies. To relieve Capua Hannibal marched on Rome, and actually appeared before its gates (211), but the diversion remained fruitless, and Capua fell. In 207 a reinforcement tardily sent by the Carthaginians to Hannibal, under command of his brother Hasdrubal, was intercepted by the Romans and destroyed at the Metaurus. Hannibal now retired to Bruttium (the toe of Italy), where he still maintained the contest against overwhelming odds, till, in 203, he was recalled to defend his country, invaded by Scipio. In Africa he was defeated by the Romans at Zama (202 B.C.), and the second Punic war ended, after a bloody contest of eighteen years, in Carthage having to accept the most humiliating conditions of peace. Hannibal now devoted himself as civil magistrate to restoring the resources of Carthage, and was working at reforms of administration and finance when the jealous Romans sent ambassadors to demand his surrender. He fled to the court of Antiochus of Syria, and offered his services for the war then commencing against the Romans. They were accepted, but Hannibal's advice for the conduct of the war was not followed, and he himself as commander of the Syrian fleet failed in an expedition against the Rhodians. In 190 B.C. Antiochus was forced to conclude a disgraceful peace with the Romans, one of the terms of which was that Hannibal should be delivered up. Hannibal, again obliged to flee, took refuge with Prusias, king of Bithynia, and is said to have gained several victories for Prusias against Eumenes, king of Pergamus, an ally of the Romans. But the Roman senate once more sent to demand the surrender of their inveterate enemy, and Hannibal, finding that Prusias could not protect him, took poison rather than fall into the hands of the Romans. He died in B.C. 183.

HANNIBAL, a town in Marion co., Mo., on the right bank of the Mississippi, 150 miles above St. Louis. It has tobacco factories, machine-shops, foundries, pork-packing establishments, saw and flour mills, and an extensive trade in lumber. Pop. 15,267.

HANOI', or **KESH'O,** capital of Tonquin, on the river Song-ka, in a fruitful plain. Gold and silver filagree, lacquered wares, silks, mat and basket weaving are its principal industries. Although the river is navigable only for small vessels to the trade of Hanoi is considerable, chiefly with the southern provinces of China. Pop. variously estimated from 80,000 to 150, 000.

HAN'OVER, formerly a kingdom in the north-west of Germany, now a province of Prussia. The total area is 14,857 sq. miles. For administrative purposes it is divided into six districts—Hanover, Hildesheim, Lüneburg, Stade, Osnabrück, Aurich. The surface in the south is covered by the Hartz mountains, but the rest of the country is a low, monotonous flat, with a gentle slope to the North Sea.

HANOVER, capital of the Prussian province of Hanover, situated in an extensive plain on the Leine, which here

receives the Ihme and becomes navigable. There are fine promenades, and a large wood with beautiful walks, the Eilenriede, lies on the eastern side of the city. Among the principal buildings are the Market Church, the old town-house, the theater, one of the finest in Germany, the royal palace, the museum of art and science, the royal library, containing 175,000 volumes, the central railway station, the Waterloo monument, etc About a mile to the n.w. is Schloss Herrenhausen, the favorite residences of George I., George II., and George V. Nearer the town is the colossal Gelfenschloss, or palace of the Guelphs, now fitted up as a polytechnic school. Hanover is a manufacturing town of some importance, has cotton-spinning machine-works, iron-foundries, chemical works, tobacco and cigar factories, etc. Hanover is first mentioned in 1163. It joined the Hanseatic league in 1481. It became the residence of the dukes of Brunswick-Lüneburg, and capital of the principality in 1636. Pop. 235,666.

HANSOM-CAB, a two-wheeled hackney-carriage or cabriolet and named after the inventor. It holds two persons besides the driver, who sits on an elevated seat behind the body of the carriage, the reins being brought over the top.

HAR'AKIRI, or **SEP'PUKU,** a mode of inflicting death upon themselves allowed in Japan to criminals of the Samurai or two-sworded class as more honorable than public execution. It consists in cutting open the body so as to disembowel it by means of a wound made with one sword perpendicularly down the front and another with the other sword horizontally. It is (or was) frequently resorted to to save dishonor or exposure.

HARAR, a town of Northeastern Africa, included in the Abyssinian territories, about 150 miles from the coast of the Gulf of Aden, now reached by a railway from the French port of Jibouti. The inhabitants are strict Mohammedans. Pop. estimated at from 35,000 to 40,000.

HARBOR, a general name given to any bay, creek, or inlet of the sea affording accommodation for ships and protection against the wind and sea. The great requisites of a good harbor are accessibility, adequate depth of water, and shelter from violence of wind and water. Harbors are either natural or artificial, the latter being made wholly or partly by the construction of moles or breakwaters. In connection with the more important harbors there are usually docks, in which the water is kept as nearly as possible at the same level, thus giving facility in loading and unloading. See Breakwater and Docks.

HARCOURT, Sir William George Granville Venables Vernon, lawyer and politician, was born in 1827. Was called to the bar in 1854, became queen's counsel in 1866; was returned for Oxford city in 1869 in the liberal interest; distinguished himself by his powers of satire and ridicule in debate; was made solicitor-general in Mr. Gladstone's ministry, Nov. 1873; home secretary in 1880, when he lost his seat for Oxford but was returned for Derby. In Feb., 1886, he became chancellor of the exchequer under Mr. Gladstone, and he held the same office under the same leader and subsequently under Lord Rosebery in 1892-95, when a change of government took place. He died in 1904.

HARDICANUTE, or **HARTHCANUT,** King of England and Denmark, was the only legitimate son of Canute. At the time of his father's death, in 1036, he was in Denmark, where he was immediately recognized as king. His half-brother Harold, however, who happened to be in England at the time, laid claim to the throne of that part of their father's dominions, and succeeded in getting possession of Mercia, Northumbria, and Wessex, but died in 1040, when Hardicanute peacefully succeeded him. He reigned till 1042, leaving the government almost entirely in the hands of his mother and the powerful Earl Godwin, while he gave himself up to feasts and carousals.

HARDINGE (hâr'ding), Henry, Viscount, English commander, was born in 1785. He was gazetted ensign in 1798, and was present at all the great battles and sieges in the Peninsula. He lost his

Viscount Hardinge.

left hand at the battle of Ligny. He became M. P. for Durham in 1820, was made secretary-at-war, secretary for Ireland, and in 1844 succeeded Lord Ellenborough as governor-general of India. Being forced into war by an invasion of Sikhs he took a command under Lord Gough, and after the great battles of Mudki, Ferozeshah, and Sobraon dictated a peace in the Sikh capital of Lahore. In reward of his services he was created Viscount Hardinge. In 1852, on the death of the Duke of Wellington, he succeeded to the post of commander-in-chief. In 1855 he was made a field-marshal, and he died in 1856.

HARD LABOR, a form of criminal punishment that is comparatively modern. It was introduced in England as an alternative to transportation and penal servitude. It is the creation of statute law both in Great Britain and in this country. A court has no right to sentence a convicted criminal to hard labor, in addition to other punishment, unless a statute gives authority therefor. Hard labor is generally authorized by federal as well as state legislation, however, in most cases where the convicted criminal is subject to imprisonment in a state prison or penitentiary. The kind and amount of labor required of the sentenced criminal are regulated by statute or by prison rules.

HARDNESS, the quality of bodies which enables them to resist abrasion of their surfaces. In mineralogy a scale is used in which a set of standard bodies are arranged and numbered, and other bodies are referred to this scale with respect to hardness. The following is the scale given by F. Mohs:—talc. 1, rock-salt 2, calc spar 3, fluor spar 4, apatite 5, felspar 6, quartz or rock-crystal 7, topaz 8, corundum 9, diamond 10. Materials, according to this arrangement, which are scratched by rock-crystal and are not scratched by felspar are said to have a hardness between 6 and 7.

HARDPAN, the hard stratum of earth beneath the layer of surface soil, especially noticeable in alkali soils. Sometimes this is produced in arable lands by the pressing of the plow and the trampling of the team; but it may be prevented or destroyed when formed, by plowing at varying depths.

HARDWARE, the name usually given to the commoner articles made of iron, brass, and copper.

HARDWOODED TREES, are usually trees of slow growth, such as the oak, beach, witch-elm, ash, service-tree, walnut, chestnut, acacia, etc. They are distinguished from soft-wooded trees such as the willow, poplar, etc., and resinous trees such as the pine, fir, cedar, larch, etc.

HARDY, Thomas, novelist, born in Dorsetshire, England, 1840. He served an apprenticeship as an ecclesiastical architect; published his first novel, Desperate Remedies, in 1872, and has since continued a series of favorite fictions. Among his best-known works are Far from the Madding Crowd, The Hand of Ethelberta, The Trumpet Major, The Woodlanders, The Return of the Native, The Mayor of Casterbridge, Tess of the D'Urbervilles, Jude the Obscure, etc.

HARE, the common name of the rodent quadrupeds with long ears, long hind limbs, a short tail, soft hair, and a divided upper lip; its dental formula is: incisors $\frac{4}{2}$, canines $\frac{0}{0}$, molars $\frac{6}{6} - \frac{6}{6} = 28$; the two fore-feet have five and the hinder four toes. They run by a kind of leaping pace. The females produce litters of three to six about four times a

American varying hare.

year. The young leverets have their eyes open at birth. The common hare is found throughout Europe and some parts of Asia. It is tawny red on the back and white on the belly, and is about 2 feet long The mountain hare or varying hare confined to Northern Europe and the mountainous regions of the south, is smaller than the common hare,

and becomes white in winter. The American hare is not much larger than a rabbit, is found in most parts of North America. In North America there are also the polar hare, a variety of the varying hare, but of superior size and purer color; and the prairie hare, one of the species known as jackass hares or Jack-rabbits, from their size and length of limb. The hare, which has no courage and little cunning, is protected from its enemies mainly by the acuteness of its sight and hearing and its extraordinary swiftness of foot. Its voice is never heard except when seized or wounded when it utters a sharp loud cry, not very unlike that of a child. Its flesh is rather dry, but is much prized for its peculiar flavor.

HAREBELL, the Scotch Bluebell, a plant common on dry and hilly pastures, etc., with a bell-shaped blue (sometimes white) flower. The radical leaves are cordate or reniform, the stem-leaves partly ovate or lanceolate, partly linear. Its slender steam is from 4 to 6 inches high, and bears sometimes a single flower, but more commonly more than one, in a panicle.

HARE-LIP, a malformation consisting in a fissure or vertical division of the upper lip, sometimes extending also to the palate. Children are frequently born with this malformation, and the cleft is occasionally double The name is given from the imagined resemblance which the part has to the upper lip of a hare. The cure of hare-lip is performed by cutting off quite smoothly the opposite edges of the fissure, and then bringing them together and maintaining them in accurate apposition till they have firmly united.

HA'REM, Hareem', is used by Musselmans to signify the women's apartments in a household establishment, forbidden to every man except the husband and near relations. The women of the harem may consist simply of a wife and her attendants, or there may be several wives and an indefinite number of concubines or female slaves, with black eunuchs, etc. The greatest harem is that of the Sultan of Turkey. The women of the imperial harem are all slaves, generally Circassians or Georgians Their life is spent in bathing, dressing, walking in the gardens, witnessing the voluptuous dances performed by their slaves, etc. The women of other Turks enjoy the society of their friends at the baths or in each other's houses, and appear in public accompanied by slaves and eunuchs; but the women of the sultan's harem have none of these privileges. It is of course only the richer Moslems who can maintain harems; the poorer classes have generally but one wife.

HARGREAVES (hâr'grēvz), James, English inventor, author of two important improvements in the art of cotton-spinning, was born near Blackburn about 1720, died 1778 In 1760 he invented a machine for carding, and some years after the spinning-jenny, by which he was able to spin with several spindles at once. Suspecting that he employed machinery, his neighbors broke into his dwelling and destroyed his machine; and on the repetition of this kind of persecution Hargreaves removed in 1768 to Nottingham. In 1770 he obtained a patent for his invention, but it was after all declared invalid on the ground that he had sold several of the machines before taking out the patent. For the rest of his life he carried on business as a manufacturer.

HAR'ICOT, a general term for various species of kidney-bean. They constitute a palatable and nutritious article of diet.

HARLAN, John Marshall, American jurist, was born in Kentucky in 1833. He served in the federal army from 1861 to 1863 as colonel in the 10th Kentucky infantry. In 1877 he was appointed an associate justice of the United States supreme court, which position he still holds. He was one of the American arbitrators on the Bering Sea tribunal which met in Paris in 1893.

HARLEQUIN, a character of the Italian comedy introduced on the stage of other countries. On the Italian stage he is a comic character, full of drolleries, tricks and knaveries, and somewhat resembles the English clown. The harlequin of British pantomimes is quite different. He is supposed to be the lover of the columbine, and possesses a wonder-working wand, with which he protects his mistress against the clown and pantaloon, who pursue and endeavor to capture her, until the pursuit is brought to a termination by a good fairy. The harlequin wears a tight dress of bright colors, and glittering with spangles.

HARLEQUIN DUCK, a species of duck, so called on account of its parti-colored plumage of white, gray, and

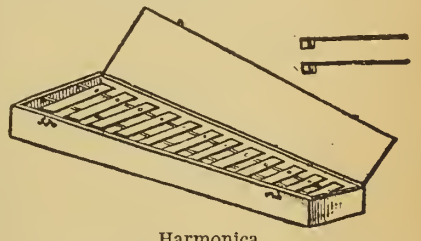
Harlequin duck.

black. It inhabits the Arctic regions, and on rare occasions it visits the British Islands in winter. In length it is about 17 inches.

HARLEY, Robert, Earl of Oxford, English minister, born 1661, died 1724. After the accession of Anne he and his colleague St. John, afterward Lord Bolingbroke, became leaders of the Tories. Harley was chosen leader of the House of Commons in 1702 under Rochester, and in 1704 was appointed chief secretary of state, but resigned in 1708. After the fall of Marlborough Harley became chancellor of the exchequer in 1710, and next year was created Earl of Oxford He and Bolingbroke secured the Treaty of Utrecht (1713). He made a valuable collection of books and MSS. which latter are preserved in the British Museum, where they form the Bibliotheca Harleiana. Those which have been printed constitute the Harleian Miscellany.

Robert Harley, Earl of Oxford.

HARMON'ICA, Franklin's name for a musical instrument constructed with glasses of different sizes, revolving by means of mechanism worked by the foot, and played upon by touching the



Harmonica.

rim of the glasses with the moistened finger. It constituted the "musical glasses" of Goldsmith's era. The name is now usually applied to an instrument consisting of a series of glass keys played by two small hammers.

HARMON'ICS, the accessory sounds accompanying the predominant and apparently simple tone of any string, pipe, or other sonorous body. No purely simple sound, i.e. no sound whose vibrations are all in the same period, is producible in nature. When a sound is produced by the vibration of an open string, the whole string vibrates as a unity, giving rise to a tone called the fundamental. The string, however, further divides into various sections, which vibrate separately and more rapidly, and produce sounds differing from the fundamental, but bearing certain fixed proportions to it. The first harmonic of the fundamental note of any string is that produced by half the string, and is the octave of the first; the second harmonic is given by the third of the string, and is the fifth or dominant of the fundamental note, and so on, the complete series of harmonics containing all the notes of the musical scale. But, while harmonics enter into the composition of any musical sound from any vibrating body whatsoever, the different structure of different instruments suppresses now some, now others, of the succession of harmonics, and a different body of tone is thus produced, distinguishing a note in one instrument from the same note in another. These differences are called in English quality, in French timbre, in German klangfarbe.

HAR'MONISTS, a religious sect founded at Würtemberg about the year 1788 by two brothers called George and Frederick Rapp. George Rapp died in 1847, but the community still exists.

HARMO'NIUM, a musical instrument of modern invention, producing sounds somewhat resembling those of the organ, resulting from the pressure of wind on a series of vibrating metallic reeds. By the action of bellows, to which the feet communicate a more or less rapid movement, the air is made to impinge against thin tongues of metal (here termed reeds), and to set them vibrating. These metal tongues are fitted into a slit in the top of a small box or sonorous cavity, called a wind-box, and are enabled to vibrate by being fixed only at one end. The discovery that the form of the wind-boxes determines the quality of the sound produced by the vibration of these metallic tongues contributed very much to the development of the harmonium, as it enabled the player to imitate the sound of the oboe, flute, etc. The instrument has a keyboard like that of a piano, and when one of the keys is pressed down a valve is opened, which allows the wind from the bellows to rush through one of the wind-boxes and act on the vibrator. There are several stops, by means of which the performer can direct the stream of wind into the wind-boxes which produce a flute, clarionet, or any other sound. There is also a knee action, which either serves as an expression stop, or brings all the stops of the instrument into play at once, and what is called the percussion action, which consists in the application of a small hammer, which strikes the vibrator as soon as the key is pressed down, and thus aids the action of the wind. The better class of harmoniums have now usually two or more extra rows of vibrators, which, acted upon by separate stops, add so many octaves to the compass.

HARNESS, the various articles which are required to yoke a horse or another animal to any vehicle, or to control and suit them for any kind of work. See Bit, Bridle, Collar, Saddle, etc.

HAROLD (or Harald) **I.,** King of Norway, one of the greatest monarchs of that country, succeeded his father in 863. He brought all the Norwegian jarls under his power, and completely subjected the country, allowing his hair to remain uncut for twenty years until he attained this object (885). He fixed his residence at Trondhjem, and died there in 933.

HAROLD III., King of Norway, the son of Sigurd, a descendant of Harold Haarfager. In his youth he went to Constantinople, joined the Varangian Guard, and took part in the expedition to Italy and Sicily against the African pirates. About 1042 he returned to Norway, after having, on his way through Russia, married the daughter of the Grand-duke Jaroslav. In 1047 he succeeded his nephew, Magnus the Good, as sole king of Norway. In 1066 he joined Tostig, the brother of Harold II. of England, in an invasion of that country, but was defeated and slain at the battle of Stamford Bridge.

HAROLD I., surnamed Harefoot, Danish king of England, succeeded his father Canute in 1035 as king of the provinces north of the Thames, and became king of all England in 1037. After a reign of four years Harold died, in 1040.

HAROLD II., King of England, born about 1022, was the second son of Godwin, earl of Kent. On the death of Edward the Confessor, Jan. 5, 1066, he stepped without opposition into the vacant throne, without attending to the claim of Edgar Atheling, or the asserted bequest of Edward in favor of the Duke of Normandy. He was killed in battle Oct. 14, 1066, and the crown of England passed to William.

HARP, a stringed instrument of great antiquity, found among the Assyrians, Egyptians, Hebrews, Greeks, Irish, Welsh, and other nations. Its variety of form and construction was only equalled by its universality. The modern instrument is well known: its form is nearly

Ancient Harps.
1, 2, Egyptian. 3, Assyrian. 4, Anglo-Saxon.

triangular, and the strings distended from the upper part to one of the sides. It stands erect, and is played with both hands, the strings being struck or pulled with both fingers and thumbs. The instrument in its ancient forms was very defective. Egyptian harps are represented with four, seven, ten, twenty, or more strings, but we have little idea of the scale to which they were tuned. The frames are depicted as being curved in various forms, and the front pillars are wanting. The harps of the Hebrews were probably similar to the Egyptian instruments. It is probable that the various Celtic harps were derived from some oriental pattern. Among the Anglo-Saxons the harp was a favorite instrument. The modern harp was by no means an efficient instrument, until pedals were invented, an invention finally perfected by Sebastian Erard, whose patent was taken out in 1795. In 1810 he patented a double-action harp with seven pedals, each effecting two changes in the pitch of the strings. The harp thus constructed contains forty-three strings tuned according to the diatonic scale, every eighth string being a replicate in another octave of the one counted from.

HARPER, William Rainey, American educator, was born in New Concord, Ohio, in 1856. He graduated at Muskingum college in 1870, and in 1875 received the doctor's degree from Yale. In 1879 he became professor of Hebrew in the Baptist Union theological seminary in Chicago. While here he perfected a system of teaching Hebrew by correspondence. In 1886 he was elected professor of Semitic languages in the graduate faculty of Yale, and in 1889 also professor of biblical literature. In 1891 he was elected to the presidency of the newly founded University of Chicago, which he held until his death in 1906. His published works include: Elements of Hebrew; Hebrew Vocabularies; Hebrew Method and Manual; Elements of Hebrew Syntax. Died, 1906.

HARPER'S FERRY, a village, United States, West Virginia, on the Potomac, at its junction with the Shenandoah, and formerly a United States depôt of military stores. It is famous as the scene of the unsuccessful rising headed by John Brown with a view to destroy slavery (Oct. 16, 1859). The rising was suppressed, and Brown was executed. Harper's Ferry is the seat of Stover college for colored students. Pop. 764.

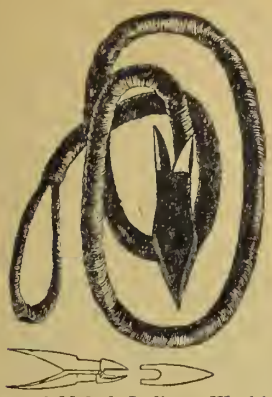
HARPIES, the ancient Greek goddesses of storms. Their parentage, ages, appearance, names, and number are very differently given by the poets. In the Homeric poems they are merely storm-winds. Hesiod represents them as two

Harpy, from an antique gem.

young virgins of great beauty called Aëllo and Ocypete. The later poets and artists vied with each other in depicting them under the most hideous forms, covered with filth and polluting every thing in contact with them. They are often represented as having female faces.

HARPOON, a hunting weapon universally used to catch whales or large fish. The harpoon is generally thrown by hand, but often it is fired from a gun. The modern harpoon is a development from an ancient form such as is now used by savages, and was common not long ago among the North American Indians. Explosive harpoons are sometimes used by modern whalers, and with this weapon the animal is killed. The non-explosive weapon is a triangular, arrow-shaped instrument with strong barbs and a shank about three feet long. This is thrown by means of a long rope and the whale thus snared is played until exhausted, when it is easily drawn up to the boat and lanced to death. In recent times a modified form of weapon with only one barb is used. The harpoon outfit of

a whaling boat consists of six weapons, in the use of which whalers become



Harpoon of Makah Indians, Washington.

exceedingly expert. The modern explosive harpoon, which has a bomb

Group of North American Indian harpoons.

in its head and kills the animal, is not a harpoon in the real meaning of the word.

HARP'SICHORD, a keyed, stringed instrument formerly in use, in appearance and construction similar to a grand pianoforte. In the front the keys were disposed, the long ones being the naturals, and the short ones the sharps and flats. These keys being pressed by the fingers, their inclosed extremities raised little, upright, oblong slips of wood called jacks, furnished with crow-quill plectrums which struck the wires, instead of the hammers of the modern pianoforte.

HARPY-EAGLE, a rapacious bird which inhabits tropical America from Southern Mexico to Southern Brazil. It is an extremely powerful bird, and in total length slightly in excess of the golden eagle. It has, however, a somewhat shorter expanse of wing. Its shoulder muscles possess enormous strength. Its bill is powerful and

Harpy-eagle.

crooked, and its claws are extremely strong and sharp. The harpy-eagle feeds on birds, sloths, fawns, raccoons, etc., as well as on fish, water-snakes, and the eggs of the tortoise.

HARRIS, Joel Chandler, American journalist and author, was born at Eatonton, Ga., in 1848. In 1876 he joined the staff of the Atlanta Constitution and became its editor in 1890. His successful contributions to this paper collected and issued in 1880 under the

title of Uncle Remus, His Songs and His Sayings have become classic. Among his other well known books are Nights with Uncle Remus, Mingo, and other sketches, etc. He died in 1908.

HARRISBURG, the capital of Pennsylvania, 110 miles north of Washington, on the Susquehanna, over which there are three railway bridges besides a bridge for ordinary traffic. It occupies an elevated and commanding site, and has important industries connected with iron and steel and goods manufactured from them, various other industries, and an active trade. Pop. 1909, 80,000.

HARRISON, Benjamin, American revolutionary patriot, one of the signers of the declaration of independence, was born at Berkeley, Va., in 1740. From 1774 to 1777 he was one of Virginia's representatives in the continental congress. From 1782 to 1785 he was governor of the state. In 1788 he was a member of the Virginia convention which ratified the federal constitution. He died in 1791.

HARRISON, Benjamin, the twenty-third president of the United States, was born in North Bend, Ohio, in 1833. He entered the Union army as lieu-

Benjamin Harrison.

tenant, was promoted to colonel and organized the Seventeenth Indiana volunteers. He fought in the Atlanta campaign and at the close of the war held the rank of brigadier-general. In 1876 he was nominated by the republican party for governor of Indiana, but was defeated at the polls. He was elected United States senator in 1881, serving six years. He was nominated for president of the United States in 1888 by the republican national convention at Chicago, and was elected, receiving 233 electoral votes to 168 for Grover Cleveland. Some of the important measures adopted during his presidency were the McKinley tariff bill, the suspension of the Louisiana lottery, the establishment of the reciprocity policy, the extension of the navy, the settlement of troubles in Chile, and the Bering Sea fisheries arbitration. Mr. Harrison was nominated for a second term in 1892 by the republicans but was defeated by Cleveland. He returned to Indianapolis, Ind., and resumed the practice of law. He was one of the counselors for Venezuela in the boundary dispute with Great Britain in 1899 He died March 13, 1901.

HARRISON, Carter Henry, American politician, was born near Lexington, Ky., in 1825, and, was a descendant of the Virginia Harrisons. In 1855 he removed to Chicago. In 1871 he was elected county commissioner of Cook co., and from 1874 to 1878 was a democratic member of congress. In 1879 he was chosen mayor of Chicago, and was reëlected for biennial terms in 1881, 1883, and 1885. In 1884 he was the democratic candidate for governor of Illinois, but was defeated by Governor Oglesby. In 1893 the year of the World's Fair when an able, high-minded admin-

istration was deemed necessary, he was again elected mayor. He was assassinated on October 29th following, one of the closing days of the great exposition.

His son, Carter Henry, was born in Chicago in 1860. He was elected mayor of Chicago in 1897, 1899, 1901, and 1903.

HARRISON, William Henry, ninth president of the United States, was born in Charles City co., Va., in 1773. His father, Benjamin Harrison, was one of the signers of the declaration of inde-

W H Harrison

pendence. He showed great gallantry at the battle on the Miami (1794). He represented the northwest territory as a delegate in congress in 1799–1800. When Indiana territory was formed (1800), including the present states of Indiana, Illinois, Michigan, and Wisconsin, besides parts of Minnesota and Ohio, he was appointed its governor. He endeavored to avert war with the Indians, but was compelled to quell Tecumseh's outbreak, and beat off a fierce and treacherous attack, ending in an important battle at Tippecanoe (Nov. 7, 1811). In the war of 1812–14 he was appointed to the chief command in the northwest, repulsed the British force under Proctor, and by the victory of Perry on Lake Erie was enabled to pursue the invaders into Canada where, on Oct. 5, 1813, he totally routed them in the battle of the Thames. In 1816 he was elected to congress, and in 1824 became a United States senator. In 1828 he went as minister to Colombia, but was recalled in 1829, and for twelve years was clerk of a county court in Ohio. He received 73 electoral votes for the presidency of the United States in 1836 against Van Buren's 170; but four years later the Whig party having united, they defeated Van Buren, obtaining 234 electoral votes to the latter's 60. Harrison died a month after his inauguration in 1841.

HARRISON, a city in Hudson co., N. J., on the Passaic river and on the Pennsylvania, the Lackawana and the Erie railroads. It is a suburb of New York and is the seat of the State soldier's home. Pop. 12,460.

HARROW, an agricultural implement, employed for smoothing land which has been plowed. It consists of a frame of woodwork, or of iron, in which are fixed rows of iron teeth. There are several varieties of this implement, such as the "brake" for breaking down rough land; the "drill harrow" for pul-

Set of iron harrows.

verizing between furrows of green crops, the "grubber" for pulverizing land before the deposition of seed.

HARTE, Francis Bret, American novelist and poet, born at Albany, N. Y., 1839. He went to California in 1854, and figured as a coal-dealer, a teacher, and a type-setter on the Golden Era, in which appeared some of his earliest literary efforts. He next became editor of the Californian, and in 1864 secretary to the United States Mint at San Francisco. In 1868 he became editor of the Overland Monthly, in which appeared, in 1869, the humorous poem of The Heathen Chinee. In 1878 he became

Bret Harte

United States consul at Crefeld, whence he was transferred to Glasgow in 1880, and remained there until 1885. Among his best-known works are The Luck of Roaring Camp; The Outcasts of Poker Flat; The Argonauts of '49; Two Men of Sandy Bar; Gabriel Conroy; Mrs. Skagg's Husbands; In the Carquinez Woods; Maruja; Crusade of the Excelsior; A Waif of the Plains; Clarence; etc. He died in 1902.

HARTFORD, the capital of Connecticut, on the Connecticut river, 50 miles above its mouth. It is pleasantly situated, is built with great regularity, and has among its edifices the state-house (built at a cost of 2½ million dollars), city-hall, deaf and dumb and lunatic asylums, Trinity College (Episcopal), R. C. Cathedral, the Wadsworth Athenæum, etc. Both manufactures and trade are of large extent, the former embracing carpets, linen, silk, edge-tools, etc., and it is the seat of the Colt Firearms co. It is a great center of the insurance business. The American asylum for the education and instruction of the deaf

New state capitol, Hartford, Conn.

and dumb at Hartford was started in 1817. Hartford was settled in 1635 by colonists from Massachusetts. Pop. 1909, estimated at 105,000.

HARTINGTON, Right Hon. Spencer Compton Cavendish, Marquis of, born 1833, eldest surviving son of the seventh Duke of Devonshire. He strenuously opposed Mr. Gladstone's Home Rule scheme of 1886, and became the leader of the liberal-unionist party. In 1891 he succeeded to the dukedom. In 1895 he joined the cabinet of Lord Salisbury as president of the council

HARTLEY, David, an English physician, principally celebrated as a writer on metaphysics and morals, born 1705, died 1757. He became a fellow of Jesus College, Cambridge, and finally practiced medicine at Newark, Bury St. Edmund's, and in London, and ended his days at Bath. In his Observations on Man (1749, two vols.) he formulates his hypothesis of nervous vibration and of the association of ideas.

HARTSHORN, in pharmacy, the horn of the common stag, from which substances deemed of high medicinal value were formerly prepared by distillation, such as spirits of hartshorn, oil of hartshorn, and salt of hartshorn The active ingredient of these was ammonia, which is now obtained from gas-liquor and other sources.

HARUN AL RASHID (hȧ rön' ȧl-rashēd), a celebrated caliph of the Saracens, 786–809. The popular fame of this caliph is evinced by the Arabian Nights' Entertainments, in which Harun, his wife Zobeide, his vizier Giaffer, and his chief eunuch Mesrur are conspicuous characters

HAR'VARD, John, English clergyman in New England, the principal founder of Harvard College, was born in Southwark, London, in 1607. In 1637 he removed to New England and settled at Charlestown, on Massachusetts Bay. His health soon gave way, however, and he died of consumption on September 18, 1638, after a residence in the Colony of little more than a year. By his will he left his library of 260 volumes and a sum of about $2000 to the college at "New Towne," later Cambridge. A year after the young clergyman's death, in commemorat on of his benefaction, the

name of Harvard was conferred upon the institution.

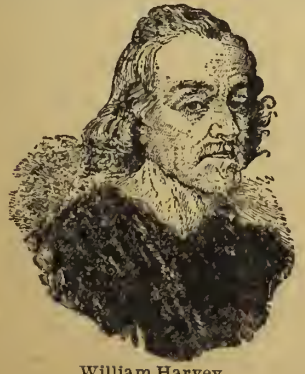
HARVARD UNIVERSITY, the oldest university in the United States, situated in Cambridge, Massachusetts. The principal college buildings number twenty-five, and include several halls, such as University Hall, Harvard Hall, etc. The libraries contain about 450,000 volumes. There are about 80 professors, exclusive of assistants, and the number of students is over 3000. An entrance examination is required in one of two sets of subjects, of which classics predominate in the one, mathematics and science in the other. After the first year's course, which embraces a prescribed series of studies, the student has a large number of different courses to select from in order to qualify for the degree of Bachelor of Arts, the course of study extending to four years. Among the departments connected with the university are: 1. The Law School; 2. The Lawrence Scientific School; 3. The Divinity School; 4. The Medical School; 5. The Dental School; 6 The Bussey Institution of Agriculture; 7. The Veterinary School. We was also mention the Museum of Comparative Zoology (the Agassiz Museum), the Botanical Garden, the Peabody Museum of American Archæology and Ethnology, and the Radcliffe College for women.

HARVEST-MOON, a name which denotes a peculiarity in the apparent motion of the full moon, by which in high latitudes generally it rises about the same time in the harvest season (or about the autumnal equinox in September) for several successive evenings. In southern latitudes this phenomenon occurs in March. It is owing to the fact that the moon is then traveling in that part of her orbit at which it makes the least possible angle with the ecliptic.

HARVEST-MOUSE, the smallest British quadruped, first made known to science by White of Selborne. It builds a globular nest usually suspended among stalks of wheat, etc.

HARVEST SPIDER, a British spider abounding in autumn, and possessing legs of unusual length. When irritated it has the peculiar property of throwing off one or more of its legs.

HARVEY, William, an English physician, the discoverer of the true theory



William Harvey.

of the circulation of the blood, was born at Folkestone 1573, died 1657. He entered Caius College, Cambridge, in 1593, and about 1599 proceeded to Padua, then the most celebrated school of medicine in Europe, and attended lectures on anatomy, surgery, and other branches of medical science. He took the degree of M.D., and returned to England in 1602. He settled in London, was admitted Fellow of the College of Physicians, elected physician of St. Bartholomew's Hospital, and in 1615 was chosen Lumleian lecturer. His views on the circulation of the blood were formally given to the world in his Exercitatio Anatomica de Motu Cordis et Sanguinis in Animalibus (On the Movement of the Heart and Blood in Animals) published at Amsterdam in 1628, in which he claims to have expounded and demonstrated them for upward of nine years. Harvey's theory was attacked by several foreign physicians; but from the commencement his views were widely received. In 1623 he was appointed physician extraordinary to James I. and in 1632 he became physician in ordinary to Charles I. He was present at the battle of Edgehill, and afterward accompanied Charles to Oxford. Here he received the degree of M.D., and was elected Master of Merton College, an office which he lost on the surrender of Oxford to the parliament. He returned to London in 1646, and spent the remainder of his life in retirement. Of Harvey's works, the next in importance to the De Motu is his Exercitationes de Generatione Animalium (On the Generation of Animals; 1651).

HARZ, or **HARTZ** (hârts), the Hercynia Silva of the Romans, the most northerthly mountain chain of Germany, from which an extensive plain stretches to the North Sea and the Baltic. It extends from southeast to northwest, and comprises an extent of about 60 miles in length and nearly 20 in breadth, embracing the towns of Klausthal, Goslar, Blankenburg, Wernigerode, etc. The Brocken, its highest summit, is 3742 feet high. That part of the Harz which includes the Brocken, with the neighboring high summits, is called the Upper Harz, and consists entirely of granite. The southeast portion is called the Lower Harz. The Harz abounds in woods and fine pastures; and is rich in minerals, including silver, iron, lead, copper, zinc, arsenic, manganese, granite, porphyry, slate, marble, alabaster, etc.

HASH'ISH, an intoxicating preparation made in eastern countries from common hemp or rather from the Indian variety of it; also a name for this plant itself or for its tender shoots. The juice of the plant has powerful narcotic properties, and is variously made use of. A resin which the plant gives out is often gathered and kneaded and formed into small balls called churrus, and from this a narcotic is prepared. It has the appearance of a tenacious ointment of a greenish-yellow color, with an acrid savor and a nauseous smell. Hashish produces a kind of intoxication, accompanied with ecstasies and hallucinations. When dried and smoked as tobacco the plant is called bhang; or this name is given to a drink prepared from the leaves and shoots. Ganja or Gunja is the dried shoots of the female plant with the resin on them. Hashish in several forms is employed in medicine.

HASTINGS (hās'tingz), a parl., co., and mun. bor., and market town of England, county of Sussex, one of the Cinque Ports, pleasantly situated on the sea-coast, and including the suburb of St. Leonards-on-Sea. Pop. of parliamentary and municipal borough respectively, in 1901, 62,913 and 65,528.

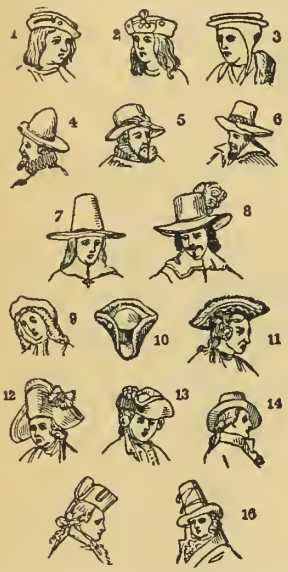
HASTINGS, Warren, first governor-general of India, was born at Daylesford in Worcestershire 1732, and died there 1818. He was grandson of the rector of Daylesford. He was educated at Westminster school, and in 1750 he set out for

Warren Hastings.

Bengal in the capacity of a writer in the service of the East India company. When stationed at Cossimbazar he was taken prisoner by Surajah Dowlah on the capture of the place (1756). Having made his escape, he served as a volunteer under Clive in 1757. He was representative of the company at Moorshedabad from 1758 to 1761. In the latter year he removed to Calcutta, having obtained a seat in the Bengal council, but returned to England in 1764. He left India in 1785, and was impeached by Burke in 1786, being charged with acts of injustice and oppression, with maladministration, receiving of bribes, etc. This celebrated trial, in which Burke, Fox, and Sheridan thundered against him, began in 1788, and terminated in 1795 with his acquittal, but cost him his fortune.

HAT, an outdoor covering for the head of various shapes and materials (as felt, silk, wool, straw), but having a brim as its most distinctive and general feature. Hats are of ancient origin. Among the Greeks, for instance, the petasos was worn, which had a brim, and was similar to the round felt now worn. The shape of the hat has varied extremely in Europe at different periods. The dress hat or silk hat with a smooth nap outside is the most important form of this article at present, though felt hats are perhaps in more general wear. (See Felt). The silk hat was invented at Florence about 1760 The manufacture, however, did not make much progress till 1828. Up to and ever after this time beaver fur was the chief material for hats. A silk hat is composed of a skeleton, to which the silk plush is glued. The skeleton, consisting of three parts, the cylindrical part or body, the crown, and the brim, is usually made of linen, covered with gum-lac, and to the cylindrical part of the crown is gummed

The cylindrical part is made by gumming together the edges of a piece of cloth shaped on a cylinder. The brim is composed of superposed layers of stiffer cloth, and made with a flat projecting surface round its inner edge, which is gummed to the skeleton. For covering the hat a sort of hood of silk plush is made, cut across in an oblique line. This



Forms of hats in 16th, 17th, and 18th centuries.
1, 2, Time of Henry VIII. 3, Time of Mary. 4, Time of Elizabeth. 5, 6, Time of James and Charles 1. 7, 8, Time of commonwealth. 9, 10, Time of William III. 11-16, Eighteenth century.

cover is drawn over the skeleton on the block, and fitted exactly to it by the application of a hot iron. The heat of the iron melts the gum-lac, which on cooling cements the covering to the skeleton. The edges of the oblique cut are also coated with gum-lac. The hat is finally shaped on the block or form, and the plush damped and polished, while the hat revolves on a turning-lathe. In the manufacture of straw hats the straw commonly used is that of wheat or barley. The best comes from Italy, and particularly from Tuscany, but straw hats are largely made in England. Palm-leaf hats are imported from China and Manila, and are also machine-made in the United States.

HATCHWAY, a square or oblong opening in the deck of a ship, affording a passage from one deck to another, or into the hold. The after-hatchway is placed near the stern, the fore-hatchway toward the bows, the main-hatchway is placed near the mainmast.

HAUBERK, a kind of coat of mail, comprising the small and the large hauberk, the former consisting of a jacket in scales descending to the hips, with loose sleeves not reaching to the elbow; the latter with a camail or hood, reached to the knee, the sleeves extending a little below the elbow.

HAVAN'A, an important maritime city, capital of Cuba, on the northwest side of the island, with an extensive and excellent natural harbor. Havana is the see of a bishop, and the seat of the governor. The cathedral long contained the ashes of Columbus, which were brought hither from San Domingo in 1796. Among the other buildings are the governor's house, the admiralty, the university, the exchange, the opera-house, etc. The staple manufacture is that of its celebrated cigars. The other manufactures, consisting chiefly of chocolate, straw-hats, and woolen fabrics, are not of much consequence. The trade is extensive, the most important articles

of export being sugar and tobacco, unmanufactured or in the form of cigars and cigarettes; other exports are molasses coffee, wax, honey, rum. The United States have the principal share of the trade, and Spain and England rank next. Several railways start from Havana. The town was founded in 1511, but was only fairly begun in 1519. For a long time Spain derived the chief part of her fleet from the building-yards of Havana. Pop. 235,981.

HAVELOCK (hav'lok), Sir Henry, K. C. B., major-general in the British army, was born at Bishop-Wearmouth, near Sunderland, on 5th April, 1795.

Sir Henry Havelock.

Having entered the army, he served with distinction in the Burmese war (1824—26). On the outbreak of the Indian mutiny he was despatched to Allahabad in order to support Sir H. Lawrence at Lucknow and Sir H. Wheeler at Cawnpore. On his march to Cawnpore he defeated the rebels at Fattihpur, Aong, Pandunadi, and Maharajpur. He died of dysentery at Dilkusha on Nov. 24, 1857. He was raised to the rank of major-general, made a K. C. B., and (before his death was known) created a baronet.

HAV'ERHILL, a town in Massachusetts, on the Merrimac, with extensive manufactures of boots and shoes. Pop. estimated in 1909 at 42,000.

HAV'ERSACK, a bag of strong cloth with a strap fitting over the shoulder, worn by soldiers in marching order, for carrying their provisions.

HAVRE (à-vr), Le, a seaport of Northern France, dep. Seine-Inférieure, on the north side of the estuary of the Seine, 108 miles northwest of Paris, built of brick or stone in straight, wide streets. The importance of Havre dates from the early part of the 16th century. Pop. 129,014.

HAWAII, or the **SANDWICH ISLANDS,** a cluster of islands, thirteen in number, situated in the North Pacific; total area, 6677 square miles, annexed to the United States in 1898. Five of them are mere islets; all the other eight are inhabited, but only four are of considerable size. They are generally of volcanic origin, and mountainous, with many lofty summits of which Mauna-Kea on Hawaii is 13,953 feet high. Mauna-Loa (13,760 feet), another peak on the same island, is a volcano still active; the last eruption took place in 1881. The surface of the islands is generally rugged, but there are many fertile valleys. The coasts are for the most part precipitous and lofty, and have few good harbors. Hawaii, the largest island, has an area of 4372 square miles, with 46,843 inhabitants. The second largest is Maui, consisting of two peninsulas connected by a low isthmus; area, 488 square miles; pop. 25,416. The chief island is Oahu, area, 647 square miles, pop. 58,504. Honolulu, the capital and chief port of the islands, is situated on Oahu. The remaining large islands are Kauai and Niihau, with an area of 657 square miles, and 20,734 inhabitants. The island of Molokai is a leper colony. The inhabitants of the group belong to the light-colored Oceanic stock, and have been civilized and converted to Christianity. The islands were officially designated as the "Kingdom of the Hawaiian Islands." A new constitution was proclaimed by King Kalakaua I. July 6th, 1887. There are several high-class and numerous elementary schools. All religions are tolerated; protestantism predominating. Railways have been built on Hawaii, Oahu, and Maui. Honolulu, the capital, has become an important entrepôt, and in it almost the whole trade of the islands is centered. The chief exports are sugar, rice, coffee, bananas, tallow, and hides; the imports are chiefly manufactured goods, provisions, grain, and timber. The currency is mostly that of the United States. The islands were discovered by Cook in 1778, who afterward lost his life on Hawaii. Population, 154,001. King Kalakaua died in 1891. Jan. 14, 1893, Queen Liliuokalani was deposed and a provisional government formed. Overtures for annexation were made to the United States. On July 4, 1894, the Hawaiian Republic was proclaimed and the provisional government went out of existence, President Sanford B. Dole becoming president of the new republic. July, 1898, by a resolution of congress and the concurrence of the president, Hawaii was annexed to the United States and the Philadelphia dispatched to take formal possession. United States domestic postal rates are in force.

HAWFINCH, a species of grossbeak, so called from the belief that it subsisted principally on the fruit of the hawthorn.

It is one of the largest of the finches. It resembles the chaffinch in color, but is distinguished from it by its enormous

Hawfinch.

beak, larger size, and bill-hook formation of some of its wing-feathers. It feeds on all kinds of berries.

HAWK, a name often applied to all birds of prey except the eagles, vultures, and owls. It thus includes the falcons as well as the hawks proper, the latter being distinguished from the former chiefly by their shorter wings, which do not reach the extremity of the tail, and have the fourth quill longest and the first short; their beaks also are less robust, and want the tooth-like notch of the former.

HAWK-MOTH, one of the sphinx moths, so called from its hovering mo-

Hawk-moth.

tion, which resembles that of a hawk looking for its prey.

HAWLEY, Joseph Roswell, American politician and legislator was born in Stewartsville, N. C., in 1826, and in 1837 removed with his father to Connecticut. In 1861 he recruited the first company of volunteers raised in the state. In 1864 he was made brigadier-general of volunteers and was in 1866 mustered out of service. with the rank of major-general. In the same year he was elected governor of Connecticut, He was elected to fill a vacancy in congress in 1872 and re-elected for the full term of the 43rd congress in 1873. He was again elected to congress in 1878 and at the expiration of his term was elected to the United States senate to which he was re-elected in 1887, 1893, and 1899. In 1884 he was a candidate for the presidential nomination before the republican national convention. He died in 1905.

HAWSE, that part of a vessel's bow where holes called the hawse-holes are cut for the cables going through; also, the hole cut in the vessel's bow.

HAWSER, in ships, a small cable or a large rope, in size between a cable and a tow-line, used in warping, etc.

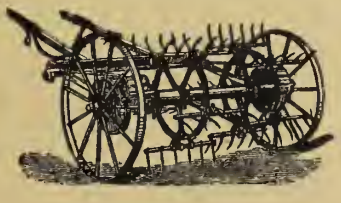
HAWTHORN, or **WHITEHORN,** a small spiny tree, rising sometimes to the height of 20 to 25 feet. The leaves are alternate, obovate, 3 to 5 lobed; the flowers are white, sometimes with a reddish tinge, disposed in corymbs, and possess an agreeable perfume; the fruit is a drupe of a red color, and is edible. The species are about fifty in number, all shrubs or small trees. When young the hawthorn springs up rapidly, and if pruned grows into a thick hedge. When it arrives at the height of a tree, however it makes wood very slowly. The timber is hard and durable, and fit for many purposes of utility. The double-flower kind is one of the most ornamental for shrubberies.

HAWTHORNE, Nathaniel, American author of remarkable originality, born at Salem, Massachusetts, 1804, died 1864. In 1837 appeared his Twicetold Tales, a collection of stories which he had contrib-

Nathaniel Hawthorne.

uted to various American periodicals. In 1838 he was appointed a weigher in the Boston custom-house, a post which he held for a few years. In 1846 he published his Mosses from an Old Manse; in 1850 The Scarlet Letter; in 1851 The House of the Seven Gables; and in 1852 The Life of President Pierce, and the Blithedale Romance. In 1853 he became American consul at Liverpool, a post which he held until 1857. He died at Plymouth, New Hampshire. Other works are his Transformation (1860), Our Old Home (1863), etc.—Julian, son of the above, born 1846, also a novelist. In addition to a biography of his father, he has written the novels of Bressant, Idolatry, Fortune's Fool, etc.

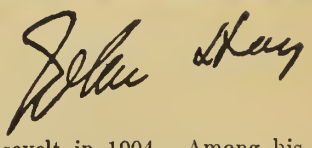
HAY, the stems and leaves of grasses and other plants cut for fodder, dried in the sun, and stored usually in stacks. The time most suitable for mowing grass intended for hay is that in which the saccharine matter is most abundant in the plants, viz., when the grass is in full flow-



Hay-tedder.

er. For the operation of mowing, dry weather, and, if possible, that in which sunshine prevails, is chosen. The making of the grass into hay generally takes three or four days to get it ready for stacking. This period is principally occupied in alternately tedding (i. e. shaking out the grass loosely) and gathering it up into cocks or small heaps, previous to stacking. Care must be taken to avoid haymaking either under a scorching sun or during the prevalence of rain, and the cocks should never be opened in the morning until the disappearance of the dew. In stacking the great object is to preserve the freshness of the herbage, and to induce a slight degree of fermentation. If the weather has been wet a few layers of straw may be inserted at intervals. Salting is also recommended. On large farms the tedding is performed by a tedding or haymaking machine drawn by a horse.

HAY, John, distinguished American statesman and author was born in Salem, Ind., in 1838. He studied law in Springfield, Ill., where he became acquainted with Abraham Lincoln and was taken into his office. He accompanied Lincoln to Washington and served as his private secretary until his assassination. He served as secretary of legation at Paris from 1865 to 1867 and was then chargé d'affaires at Vienna and at Madrid. From 1879 to 1881 he was first assistant secretary of state under President Hayes and in 1897 was appointed ambassador to Great Britain by President McKinley. In 1898 he was appointed secretary of state, and on the death of McKinley was reappointed by President Roosevelt, and reappointed by



Roosevelt in 1904. Among his diplomatic triumphs was the maintenance of the "open door" policy in China, the settlement of the Samoan dispute by which the United States secured Tutuila with an excellent harbor in the Pacific; the settlement of the Alaskan boundary dispute, the negotiation of recipocity treaties with Argentina, France, Germany, Cuba, and the British West Indies and the negotiation of a treaty with Great Britain relative to the construction of an outer oceanic canal (See Hay Pauncefote Treaty) new treaties with Spain and one with Denmark for the cession of the Danish West Indies. His Pike County Ballads brought him literary disinction. With John G. Hay,

he wrote an authoritative life of Lincoln. The anonymous novel, The Bread Winners, is generally attributed to him. He died in 1905.

HAYDN (hī'dn) Joseph, a celebrated German musical composer, born at Rohrau, on the borders of Hungary and Austria, 1732, died 1809. Haydn's principal merit consists in his opening up a new development of instrumental composition, of which his 125 orchestral symphonies furnish abundant proof. In 1798 he published his oratorio of the Creation, and in 1800 that of the Seasons. He may be said to be the originator of the symphony and of the stringed quartette.

HAYES, Isaac Israel, American Arctic explorer, born 1832, died 1881. He was a member of the expedition of 1853–55 under Dr. Kane, and himself commanded an expedition in 1860–61. He served as an army doctor during the war, and in 1869 he visited Greenland. He wrote The Open Polar Sea, and The Land of Desolation.

HAYES, Rutherford B., nineteenth president of the United States, was born in Delaware, Ohio, in 1822. At the outbreak of the civil war, he was made a

Rutherford B. Hayes.

major of volunteers. His conduct on the field was marked by conspicuous gallantry, and he attained the rank of brevet-major-general. In 1865 he was elected a member of congress, where he won the reputation of a working member. In 1867, 1869, and 1875 he was elected governor of Ohio. In 1876 he was nominated for the presidency. An electoral commission, appointed by congress, was required to decide the result of the election, which declared in favor of Mr. Hayes. His administration was conciliatory toward the South, and earnest in its efforts for the reform of the civil service. After his retirement from the presidency his life was spent in the cause of temperance and prison reform. He was a member of the Peabody education board for the instruction of freedmen. He died in 1893.

HAY-FEVER, or **HAY-ASTHMA,** a complaint caused by the odors of flowering grasses, of a stable, or of certain drugs such as ipecacuanha. The disease varies from the symptons of a severe cold up to those of spasmodic asthma. The patient is tormented with headaches, his eyes are suffused, he sneezes violently, and there is an acrid discharge from the nose, with harassing cough. Removal from the cause of the disease is beneficial, so are the smoking of tobacco, the inhalation of vapor of creosote, etc. Helmholtz has discovered vibriones in the mucus of patients afflicted with hay-fever.

HAYNE, Paul Hamilton, American poet, was born in Charleston, S. C., 1831. He published several volumes of poems which won for him a genuine reputation as a poet. Among his later productions are Legends and Lyrics and The Mountain Lovers. He died in 1886.

HAYNE, Robert Young, American political leader, was born in South Carolina in 1791. In the war of 1812 he was captain of the Third South Carolina regiment. In 1823 he was elected as a states rights democrat to the United States senate. He is best known for his great debate with Daniel Webster covering the question of the relation of the states to the federal government. He was one of the committee of 21 that reported the ordinance of nullification. In 1832 he was elected governor of South Carolina. He died in 1839.

HAY-PAUNCEFOTE TREATY, the treaty negotiated in 1901 by John Hay on the part of the United States, and Lord Pauncefote on the part of Great Britain, which superseded the Clayton-Bulwer treaty and declared the policy which would control the United States in the construction and maintenance of an isthmian canal between the Atlantic and Pacific oceans. The treaty transmitted to the United States senate by President McKinley provided: (1) For the construction of the canal by or under the auspices of the United States government; (2) for its neutralization on the same basis as the Suez canal; and (3) for an invitation to other powers to join in guaranteeing such neutrality. The treaty was ratified by the senate with three amendments, the first of which provided that the restrictions contained in the second article, based on the Suez convention, should not apply to such measures as the United States might find it necessary to take for their own defense and the maintenance of public order; the second explicitly stated that the Clayton-Bulwer treaty was thereby suspended; and the third struck out the provision in regard to the guarantee to be asked of other non-constructing powers. In its amended shape Great Britain refused to ratify the convention, and it expired by limitation on March 5, 1901. A new treaty was transmitted to the senate by President Roosevelt and ratified by that body. The principal differences between the first and final treaties were three in number: (1) No guarantees of the canal's neutrality were to be asked either of Great Britain or any other power; (2) the Clayton-Bulwer treaty was specifically abrogated, although the general principle of neutrality contained therein was retained; (3) certain undefined rights of control were to be allowed to the United States in time of war, the exact nature and extent of which was not specified, but there was no requirement that the canal should be kept 'open and free in time of war as in time of peace, nor was there a prohibition of the erection of fortifications commanding the canal or its adjacent waters.

HAYTI, HAITI, or **SAN DOMINGO,** (originally Española; Latin, Hispaniola), one of the West Indies, after Cuba the largest and one of the most fertile of these islands. It lies southeast from Cuba, and is separated from it by the Windward passage, 50 miles broad. Its length is 400, and breadth 150 miles; area, about 28,000 sq. miles, or nearly as large as Scotland.

Hayti was discovered by Columbus in 1492. It was then inhabited by perhaps 2,000,000 natives, but so ruthlessly did the Spaniards deal with the aborigines that within a century they practically exterminated them, having introduced negro slaves in their place. In 1630 the French settled in the western part of the island, and in 1697 the western portion was ceded to them, while the eastern remained Spanish. It now comprises the Republic of Hayti on the west side of the island, and the Dominican Republic on the east. Port-au-Prince is the capital of Hayti, and the population of the republic is roughly estimated at 960,000, consisting of negroes and mulattoes. San Domingo is the capital of the Dominican Republic, and the population of the latter state is estimated at 500,000, consisting also of negroes and mulattoes, with a considerable admixture of whites. In Hayti French is the prevailing dialect; in the Dominican Republic, Spanish. The area of the former comprises 10,204 sq. miles; that of the latter, 18,045 sq. miles. The state of society in Hayti is represented as deplorable, cannibalism being said to be common.

HAZ'ARD, a game at dice played for money. The player is called the caster, and his opponent, who bets with him, is called the setter. The former calls a main, i. e. any number from 5 to 9 inclusive. He then throws with two dice, and wins if he "nicks." Five is a nick to 5; 6 and 12 are nicks to 6; 7 and 11 to 7, etc. The caster loses or "throws out" if he throws aces, or deuce ace (called crabs). Hazard is a game involving nice calculations.

HAZEL, a genus of shrubs or small trees indigenous to Europe, North Africa, Asia and North America. The leaves are roundish-cordate, alternate, and shortly petiolate. The European hazel produces the nuts called filberts, and grows best in a tolerably dry soil. It bears male and female flowers, the former composing cylindrical catkins. The hazel-nut oil is little inferior in flavor to that of almonds. Hazel branches form excellent walking-sticks, fishing-rods, etc., and the wood produces good charcoal, often employed by painters. The American hazel very much resembles the European. The roots are used by cabinet-makers for veneering; and in Italy the chips are sometimes put into turbid wine for the purpose of fining it.

HA'ZELINE, an alcoholic liquid distilled from the fresh leaves of the witch hazel, native of the United States. It is exceedingly useful as an application to wounds, staunching the bleeding and promoting healing. It is equally useful for bruises, inflammatory swellings, sprains, and the like. It is applied on a pledget of lint to bleeding piles. In internal bleeding, whether from the lungs, stomach, or bowels, it gives very satis-

factory results. There are several official preparations of the witch-hazel, a fluid extract and a tincture, the dose of the former being 15 to 60 drops, and of the latter 2 to 5. Hazeline is the name ivegn to a clear colorless liquid preparcd by certain chemists, but not officinal, of which a tea-spoonful may be given. The American patent medicine, Pond's Extract, is the same as is also Witch Hazel, used for its cooling and soothing effect.

HAZELTON (hā'z'l-tun), a city in Luzerne co., Pa., on the Penn. and the Lehigh Val. Railways; 80 miles n.n.w. of Philadelphia. It has valuable anthracite coal-mining interests, is principally engaged in mining and hatting. Pop. 17,140.

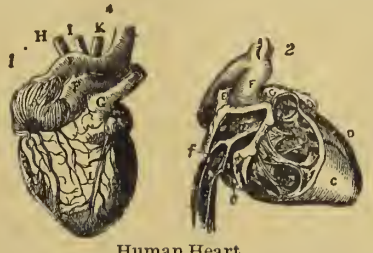
HEAD, the term applied to the anterior part of the body of an animal when marked off by a difference in size, or by a constriction (neck). A gradual increase of complexity in the structure of the head is observable as we ascend from the lowest to the highest forms of life. In the Protozoa, Infusoria, and Cœlenterates nothing that can be regarded as a head is found, and it is not until we ascend to the worms proper, the articulated animals (crustaceans, myriapods, spiders, and insects), the land and freshwater gasteropods (snails and whelks), and the cuttle-fishes, that a head proper is found. The cuttle-fishes have a remarkable cartilaginous box, which, like a skull, protects their anterior nervous ganglia and gives support to the muscles. The head of the vertebrated animals presents a regular series of increasing complexity from the lancelet upward, and as the anterior nervous mass enlarges, and its ganglia increase in complexity, so do the anterior vertebræ change their character; as the brain becomes specialized, so does the brain-case or skull, attaining its highest development in man. In man, and in the higher vertebrates, the head consists of an upper chamber, lodging the brain, the eyes, and other sense organs, and a lower, lodging the first portion of the alimentary canal. In proportion as the vertebrates become developed, the brain increases in size, and its position advances anteriorly, until, in man, it comes to overhang the face. The head is the seat of intelligence and of consciousness, as it contains the brain and the organs of sense, touch being the only sense not ilmited to it.

HEADACHE, arises from a variety of causes. The principal forms it assumes are: (1) Congestive Headache, arising from over-fulness of blood. It may be cured by purgatives, while reduction of the diet and saline medicines are beneficial. (2) Anæmic Headache, which arises from a deficiency of blood, and occurs in persons badly fed or in weak girls. Good food and iron tonic, with application of cold to the head, are often of service in such cases. (3) Nervous Headache, which often attacks the studious, and which is relieved by nerve tonics. and especially by phosphorus pills. (4) Neuralgic Headache, which is often due to exposure to cold. What is called Hemicrania or Megrim, which is the limitation of the headache to one-half or less of the head, is often treated with bromide of potassium. In cases in which headache arises from disease of the liver, nausea results, and this characterizes bilious headache. Impurity of blood and gouty affections, as well as disease of the kidneys, are frequent sources of headache.

HEALTH, is that condition of the living body in which all the bodily functions are performed easily and perfectly, and unattended with pain. The most perfect state of health is generally connected with a certain condition of the bodily organs, and well marked by certain external signs. See Sanitary Science.

HEARSE. See Herse.

HEART, a hollow muscular organ, the function of which is to maintain the circulation of the blood, the organs of circulation being the heart, the arteries, the veins, and the capillary vessels. The heart in men, quadrupeds, birds, and some reptiles is composed of four cavities, two auricles and two ventricles. It is enveloped in a membrane called the pericardium, and is situated toward the left of the cavity of the chest, between the lungs. With each beat the apex of the heart strikes against the wall of the chest



Human Heart.

Fig. 1, Exterior. A, Right auricle. B, Left auricle. C, Right ventricle. D, Left ventricle. E, Vena cava superior. F, Aorta. G, Pulmonary artery. H, Brachiocephalic trunk. I, Left primitive carotid artery. K, Left subclavian artery. L, Left coronary artery.

Fig. 2, Section, right side. C, D, E, F, G as in Fig. 1. *a*, Cavity of right auricle. *b*, Inferior vena cava. *c*, Coronary valve. *d*, Entrance of the auriculo-ventricular opening. *e*, Valve of the pulmonary artery. *f*, Fossa ovalis.

in the space between the 5th and 6th ribs, a little below and to the right of the left nipple. The right auricle communicates with the right ventricle, besides which there are in it three openings, that of the vena cava inferior, that of the vena cava superior, and that of the coronary vein. The communication between this auricle and ventricle is closed by a valve when the ventricle contracts. The right ventricle communicates with the pulmonary artery, the opening into the artery being guarded by a valve formed of three flaps. When these are brought together they interrupt the communication between the ventricle, and the artery. The left auricle communicates through a valved opening with the left ventricle, and contains the orifices of the four pulmonary veins. The left ventricle, besides the communication with the left auricle, contains the orifice of the aorta, also provided with a valve similar to that of the pulmonary artery. The auricles and ventricle of one side are separated from those of the other by a complete muscular partition, the septum cordis. The valves at the openings of the arteries are called semilunar, that at the orifice of the right auricle tricuspid, that at the orifice of the left auricle mitral, and that at the orifice of the vena cava inferior the Eustachian valve. The heart is formed of a firm thick muscular tissue, composed of fibers interlacing so as to form a figure of eight. It also contains nerves and vessels. The arteries carry the blood from the heart to all parts of the body. They terminate in the capillary vessels, a series of extremely minute tubes which pass over into the veins. The veins are the channels by which the blood passes back from the body to the right auricle of the heart. The blood which is returned from the veins is purplish red, from excess of carbonic acid gas and deficiency in oxygen, and is called venous; that which leaves the heart is bright red, being oxygenated, and is called arterial. The venous blood parts with its excess of carbonic acid and receives new supplies of oxygen in the capillary system of the lungs, flows into the pulmonary veins, thence into the left cavities of the heart, thence it passes into the aorta, and is transmitted to all parts of the body, returning to the veins by the capillary system. It is now become venous, passes through the veins from the extrimities toward the heart, receiving the chyle and the lymph, and is emptied into the right cavities of that organ, which returns it through the pulmonary artery to the capillary vessels of the lungs, where it is subjected to the influence of the air, resumes the qualities of red or arterial blood, and is ready for a new course.

The mechanism of the circulation is as follows:—The blood contained in the two venæ cavæ is poured into the right auricle, which contracts, and thus forces the fluid to escape; but the venæ cavæ oppose to its backward passage the column of blood which they contain, and it must therefore pass into the right ventricle. The ventricle then contracts, and the tricuspid valve closing the passage through which the liquid entered, it is forced into the pulmonary artery, along which it must flow (return to the ventricle being prevented by the semilunar valve) into the capillary system of the lungs, whence it passes into the pulmonary veins, which pour it into the left auricle by four orifices. The contraction of the auricle impels it into the left ventricle, by which it is driven forward into the aorta (the mitral valve preventing its return into the auricle), and thence into the general circulation. The two auricles contract and relax simultaneously with each other, as do also the two ventricles. The relaxation is called diastole; the contractian systole. The quantity of blood projected at each systole is generally estimated at six ounces. The causes of the alternate contraction and relaxation are entirely involuntary and dependent on the nervous system to a large extent. The systole of the ventricles is the cause of the motion of the blood in the arteries, which dilate with each wave driven into them.

The heart is the seat of various and generally dangerous diseases. One of these is pericarditis or inflammation of the pericardium, the double lining membrane or bag enveloping the heart. The

cause of this disease may be exposure to cold, or an injury, or it may be complicated with other diseases. Inflammation of the inner lining is termed endocarditis. Valvular disease is a common affection, of the heart, the valves becoming thickened, contracted, rigid, or otherwise affected, so that they cannot properly perform their duty. The mitral valve, for instance, may become too narrow and contracted, and the result is that all the blood does not pass into the aorta. In other cases of valvular disease, the same result follows, viz., imperfect depletion of the ventricles and auricles, the return of blood being termed regurgitation. The heart consequentlv becomes weakened, while the entire system suffers. Overgrowth or hypertrophy and dilation are frequent results of valvular disease. In such cases the avoidance of violent exercises and emotions is necessary. The use of digitalis is often successful in strengthening and soothing the heart. Certain diseases produce atrophy, in which the heart becomes feeble in action, while fatty degeneration occurs, when the muscular fibers are replaced by oleaginous particles. This renders the heart peculiarly liable to rupture under any strain or violent emotion, hence such should be carefully avoided by patients. Among other organic diseases of the heart are angina pectoris (the cause of which is uncertain), distinguished by a sense of strangling or suffocation in the breast. Neuralgia of the heart is similar in symptons to angina. A very common heart ailment is palpitation, often caused by indigestion, and the excessive use of tea and tobacco. Syncope or fainting results from the sudden cessation of the heart's action, and may be caused by excitement, emotion or shock of some kind. Some of the above forms of heart disease can be discovered only by auscultation or percussion; others are very evident to non-professional observers.

HEAT, the name given to a peculiar sensation, and also to the agent which produces it, this being now believed to be a certain motion in the minute molecules of which all bodies are composed.

One of the most obvious effects of heat is to alter the temperature of bodies. In almost all cases when heat is supplied to a body, the temperature of the body rises, and when heat is removed the temperature of the body falls. If the increase of temperature is evident, and such as may be noted by the thermometer, the heat is then termed sensible; if not, as in the case of ice immediately melted, it is termed latent. Temperature is, in fact, the tendency that a body has to impart heat to other bodies. If two bodies impart no heat to each other when in contact, they are said to have the same temperature. When the one possesses more heat than the other there is an impartation of heat from the former until the temperature is equalized. Different bodies require very different amounts of heat in order to raise their temperature through the same number of degrees. Thus it requires about thirty times as much heat to raise the temperature of 1 lb. of water 1° as to raise the temperature of 1 lb. of mercury by the same amount. The terms capacity for heat and specific heat are used in relation to this property of bodies. The capacity for heat of a body is the quantity of heat required to raise its temperature 1° from some fixed point, as from 0° C., or from 32° Fah. The specific heat of a substance is the ratio between the quantity of heat required to raise the temperature of the substance 1° from some fixed point and the quantity of heat required to raise the temperature of an equal mass of distilled water 1° from O° C.

Heat changes the dimensions of bodies. Increase of volume is the normal effect, although the reverse is observed in water between O° C. and 4° C., and in iron and bismuth. Between moderate limits bodies expand nearly regularly with the temperature, but this does not hold good of the more extreme limits. (See Expansion.) Addition of heat liquefies solid bodies, and converts liquids into gases. During the conversion of a solid into a liquid, or a liquid into a gas, a considerable quantity of heat is absorbed, and in the reverse process heat is given out; but this is one of the cases in which, though heat is taken in or given out, the temperature is not altered. Hence the heat is said to be made latent. Heat also alters the power of bodies for conducting electricity. In solids the conductivity is diminished to a great extent by an increase of a few degrees in the temperature. In liquids, on the other hand, increase of temperature increases the conductivity. The magnetic properties of bodies are also changed by heat. For example, an iron bar that has been magnetized suddenly loses the whole of its magnetism at a particular temperature. Heat possesses the power of altering the chemical properties of bodies. In some cases it breaks up chemical compounds, but in general it favors chemical combination.

In measuring quantities of heat various units may be adopted, as, for instance, the quantity necessary to melt a pound of ice. But the unit quantity of heat now generally fixed on (the Centigrade thermometer and metrical system being employed) is the quantity of heat which will raise the temperature of 1 gramme of distilled water from O° C. to 1° C.; or 1 lb. of water may be used instead of 1 gramme, and one degree Fahrenheit instead of one degree Centigrade. Calorimetry is the technical name given to the part of the subject that deals with the practical measurement of quantities of heat.

When heat is applied to one end of a bar of iron it is propagated through the substance of the bar, producing a rise of temperature which is first perceptible at near, and afterward at remote portions. This transmission of heat is called conductivity. The best conductors are metals, but all bodies conduct more or less. The best conductor is silver, next follow in order of their conductivity copper, gold, brass, zinc, tin, steel, iron, lead. With the exception of mercury and other melted metals, liquids are exceedingly bad conductors of heat. This can be shown by heating the upper part of a column of liquid and observing the variations of temperature below. These will be found to be scarcely perceptible and to be very slowly produced. If the heat were applied below we should have the process called the convection of heat; the lower layers of liquid would rise to the surface, and be replaced by others which would rise in their turn, thus producing a circulation and a general heating of the liquid. When the heat is applied above the expanded layers remain in their place, and the rest of the liquid can be heated by conduction and radiation only.

Radiation of heat consists in the propagation of heat from a hotter body to a colder one through an intervening medium which is not heated during the process. The heat is transmitted by the same medium that transmits light from a luminous body. Radiant heat and light are, in fact, the same thing, namely vibrations of an elastic medium, the luminiferous ether, supposed to fill all space, and they obey the same laws of reflection, refraction, interference, and polarization. They also obey the general laws of wave-motion. A luminous body excites in the ether waves or undulations of a great many different wave-lengths, some of them capable of affecting the eye as light, and others not. Heat rays need not be at all luminous; they may have no light-giving power, but may be what are known as rays of dark heat, capable of being detected by the thermometer, but not perceptible to the eye. Other rays are purely chemical in their effect (as in photography), and are called actinic rays. The general effect of radiation is to equalize the temperature of any system of bodies so placed as to be capable of radiating one to the other. Every body of the system is constantly sending forth heat-rays in all directions, and receiving the heat radiated from the other bodies. But the hotter bodies emit more than they receive, while the colder bodies receive more than they emit, and the temperature of the system is thus gradually equalized. The rapidity or otherwise of radiation differs much in different bodies. The radiation depends on the nature of the surface of the body, and the power of a body to radiate heat is intimately connected with its power of absorbing heat radiated to it, and with its power of reflecting heat. Surfaces that are good radiators are good absorbers, and surfaces that absorb heat readily reflect it badly. Thus, a kettle covered with soot loses, when filled with hot water, heat more rapidly than one with a brightly polished surface. The best absorber of all is a surface covered with a thin coating of lamp-black. Brightly polished metals are the worst absorbers among bodies that are not transparent to radiant heat.

The transmission of radiant heat through various substances is a subject of great importance. In this connection the terms diathermanous and athermanous correspond to transparent and opaque in the case of light. One of the chief diathermanous bodies is rock-salt. Common white glass transmits rays of high refrangibility, stopping those of low refrangibility. Hence its use as a fire-screen. For the greater part of the heat of a common fire is of the dark kind, and is nearly all stopped by the glass; but glass does not screen from the heat of the sun, a great part of which consists of heat of high refrangibility. On

the other hand, smoked rock-salt transmits very little of the heat of high refrangibility, though it is almost perfectly diathermanous to dark heat.

The nature of heat was long a subject of active controversy. The common theory during the 18th century, and in the early part of the 19th was the materialistic, or that by which heat was regarded as an imponderable fluid (caloric), which could permeate all matter, and which, uniting with the particles of bodies, produced the phenomena associated with heat. The materialistic theory was held by Black and Lavoisier, but it was exploded by the experiments of Rumford and Davy. Among the contributions of Davy to the science was his celebrated experiment of rubbing together two pieces of ice, while surrounded by an ice-cold atmosphere, until they melted away completely. He concluded that "the immediate cause of the phenomenon of heat is motion, and the laws of its communication are precisely the same as the laws of the communication of motion." Between 1840 and 1843 Joule conclusively established the truth of this theory—the dynamical theory of heat—by measuring the amount of energy required to produce a definite heating effect, and by showing that the quantity of heat obtained by expending a definite amount of energy in friction is the same whatever is the nature of the body in which the friction takes place. The conclusions arrived at by him are thus given:—

1st. The quantity of heat produced by the friction of bodies, whether solid or liquid, is always proportional to the quantity of work expended.

2d. The quantity of heat capable of increasing the temperature of 1 lb. of water by 1° Fah. requires for its evolution the expenditure of mechanical energy represented by the fall of 772 lbs. through 1 foot. This amount of energy or work, equal to 772 foot-pounds, is called the dynamical equivalent of heat.

HEAT SPECTRUM, the part of the spectrum from an incandescent body that contains invisible heat rays. To produce to the heat spectrum properly lenses and prisms of rock-salt must be employed. When the spectrum from the sun is examined it is found that the maximum heat intensity is in the dark-heat spectrum at a considerable distance from the place where light ceases to be perceptible.

HEAVEN (probably signifying that which is heaved up or elevated), in a physical sense, the azure vault which spreads above us like a hollow hemisphere, and appears to rest on the earth at the horizon. It is in reality merely the appearance presented to us by the immeasurable space in which the heavenly bodies move. According to some its azure color is due to the light of the celestial bodies reflected from the earth to the air, and thence back again. According to others the reflection is not from the air, but from its contained vapors. A theory recently broached assigns the azure color to the presence of particles of dust in the air. In theology, this word denotes a region of the universe where God's presence is especially manifested, in contrast with the earth. According to the Hebrew scriptures heaven consisted of three regions:—(1) That of the clouds, or air; (2) that of the stars; and (3) the abode of God. They also divide it into two parts, "The Heaven". and the "Heaven of Heavens." Among the Greeks the gods were supposed to reside on Olympus, and the classic poets placed the abode of the just in the Elysian fields. The heaven of Islam is a scene of sensuous enjoyment, while that of the Buddhist consists in Nirvana, regarded by some as meaning the absorption of individual existence in the great ocean of being. The ancient German had his Walhalla, and the American Indian has his happy hunting grounds. Among Christians the general opinion is that heaven is the residence of the Most High, the holy angels, and the spirits of just men made perfect, that this abode is eternal, and its joys intensely spiritual.

HEAVES, or BROKEN WIND, a disease or unsoundness of the respiratory organs of the horse.

A broken-winded horse is lean, and has a dependent belly, the muscles of which are usually active as expiratory muscles. The symptoms are best observed when the horse is exercised. The breathing becomes labored, the nostrils dilated, the eyes bloodshot. On watching the chest and flank, the ribs are observed very actively moved, and after collapsing, when the air is expelled from the lungs, are further depressed by a spasmodic jerk brought about by the abdominal muscles. It has a hollow cough and when the animal is oppressed by fast work, or by dragging a load up a hill, the pulse is excessively rapid, a symptom regarded by some as indicating disease of the heart, and by others an affected diaphragm. It is a dietetic disease, due to the irritation in the stomach caused by indigestible food. On post-mortem examination the stomach is found to be much distended with food of a dry nature, and to have thinner walls than is normal. The lungs are lighter in color, and float much more buoyantly than in health; little or no blood is seen in them, but they contain a large quantity of air, which makes them crackle when pressed.

The treatment of heaves is very unsatisfactory, and a palliation of the symptoms by keeping the alimentary canal in proper order, administering occasional purgatives, and feeding on a proper quantity of the best oats, which should always be bruised, are all that can be recommended as remedies; but turning out to pasture, or feeding on cornstalks or other laxative food, sometimes produced a cure in mild cases. Only the best quality of hay should be fed, and that in small quantities.

HEBE, in Greek mythology, the goddess of youth, and the cupbearer to the gods, until replaced by Ganymede; a daughter of Zeus and Hera, who gave her as a wife to Heracles. In the arts she is represented with the cup in which she presents the nectar, under the figure of a charming young girl, her dress adorned with roses, and wearing a wreath of flowers.

HEBER, Reginald, D.D., an English poet and bishop, was born 1783, died 1826. In addition to his hymns, his best known productions are Palestine; an edition of the works of Jeremy Taylor (with Life); Poems and Translations.

Hēbē, statue by Canova.

HEBERT (ā-bār), Jacques René, notorious during the French revolution, was born at Alencon in 1757, executed 1794. Having denounced Danton, the latter, in conjunction with Robespierre, secured his destruction by the guillotine in 1794.

HEBREW LANGUAGE AND LITERATURE, the language and literature of the Jews, Israelites, or Hebrews, especially at that period when they formed a compact nation inhabiting Canaan or Palestine. (For a sketch of the history of the people see Jews.) The Hebrew language forms a branch of the Semitic family of languages, being akin to the Aramaic (Chaldee and Syriac), Arabic, Ethiopic, and Assyrian. In the antiquity of its extant literary remains Hebrew far surpasses the other Semitic idioms, and in richness and development is only inferior to the Arabic. The language is deficient in grammatical technicalities, specially in moods and tenses of the verb, in the absence of the neuter gender, etc. Its roots are triliteral (consisting of three consonants), and words are derived from them by the reduplication of the letters of the root, and by the addition of formative elements before and after the roots. The alphabet is composed of twenty-two consonants, the vowels being expressed by marks above or below these letters. The accents and marks of punctuation amount to about forty. The writing is from right to left. There are three kinds of Hebrew alphabet now in use—the square or Assyrian (properly called the Babylonian), the most common; the rabbinical, or mediæval; and the cursive, or alphabet used in ordinary writing.

HEBREWS, Epistle to the, one of the books of the New Testament, the canonicity and authorship of which have been much discussed. The immediate successors of the apostles (Clement of Rome, Justin Martyr, etc.) seem to have considered it as of canonical authority. Its canonicity was also maintained by St. Jerome, by the almost universal consent of the Latin and Greek churches, and by Ambrose of Milan; while in 416 a decretal of Innocent III. was issued in favor of this view. As to the authorship, the early Roman church denied its Pauline origin.

HEB'RIDES, or WESTERN ISLANDS (the Heboudai of Ptolemy, and Hebudes of Pliny, the r being an erroneous inser-

tion), a series of islands and islets off the west coast of Scotland, usually divided into the Outer Hebrides (popularly called the Long Island), of which the principal are Lewis and Harris, North Uist, Bengecula, South Uist, and Barra; and the Inner Hebrides—Skye, Mull, Islay, Jura, Coll, Rum, Tiree, Colonsay, etc. The islands within the Firth of Clyde (Arran, Bute, the Cumbraes, etc.) are not now considered as part of the Hebrides. They number upward of 400 in all, but only about 90 are inhabited; area, about 2800 sq. miles; pop. 79,159.

HEC'ATOMB, an ancient Greek worship literally a sacrifice of a hundred oxen, but applied generally to the sacrifice of any large number. It was necessary that the victims should be without blemish. Only parts such as the thighs, legs, or hide were burned, the rest furnishing the festive meal at the close of the sacrifice.

HECLA, or **HEKLA,** a volcano of Iceland, about 20 miles from its southwest coast, about 5000 feet in height, and having several craters. It is composed chiefly of basalt and lava, and is always covered with snow. Many eruptions are on record. One of the most tremendous occurred in 1783, after which the volcano remained quiescent till September, 1845, when it again became active, and continued with little intermission till November, 1846, to discharge ashes, some masses of pumice-stone, and a torrent of lava. The last outbreak was in 1878.

HECTOR, the son of Priam and Hecuba, the bravest of the Trojans, whose forces he commanded. His wife was Andromache. His exploits are celebrated in the Iliad. Having slain Patroclus, the friend of Achilles, the latter sought revenge, and Hector was slain by him. The body of Hector was dragged at the chariot wheels of the conqueror; but afterward it was delivered to Priam for a ransom, who gave it a solemn burial. Hector is the most attractive warrior in Homer's Iliad, in which one of the finest episodes is his parting from Andromache before his last combat.

HEC'UBA, of Phrygia, in Greek legend the second wife of Priam, king of Troy, to whom she bore Hector, Paris, Cassandra, Troilus, and other children. After the fall of Troy she was given as a slave to Odysseus, and, according to one form of the legend, in despair leaped into the Hellespont.

HEDGEHOG, an insectivorous animal, covered with spines in lieu of hair.

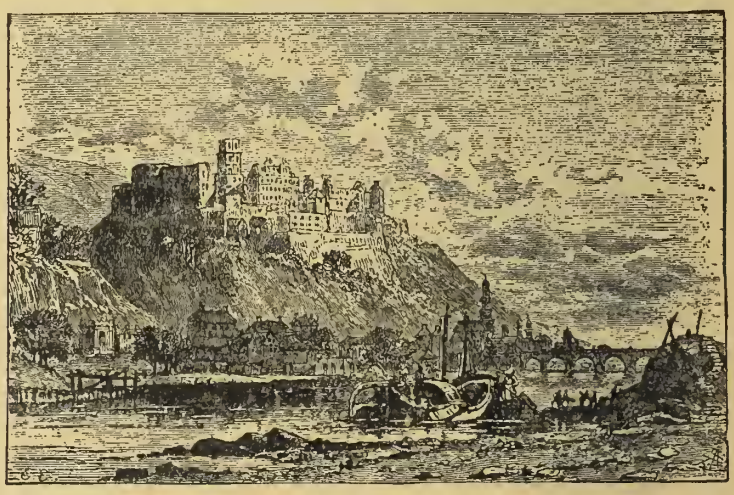
Hedgehog.

By means of a special muscle it is able to roll itself into a ball, and in this form can defy most of its enemies. It has a rudimentary tail, elongated nose, short ears, with a cranium comparatively broad. The hind feet have five toes, and strong coarse hair covers some parts of the body. The teeth are numerous. Including the tail, it attains a length of 11 inches. It usually resides in small thickets, and feeds on fruits, roots, and insects. It is fond of raw or roasted flesh, and devours cockroaches in large numbers when kept in houses. It hibernates in winter. The female bears four to eight young at a birth, the young soon becoming covered with prickles.

HEDGE-WARBLER, or **HEDGE-SPARROW,** a bird common in the British Islands and all the temperate parts of Europe. The song of the male is short and plaintive. The length of the bird is about 5½ inches.

HEGEL (hā'gl), Georg Wilhelm Friedrich, a celebrated German metaphysician, born at Stuttgart 1770, died 1831. Among his works the most important are his Phänomenologie des Geistes (1807), Wissenschaft der Logik (1812-16), Encyclopädie der Philosophischen Wissenschaften (1817), and Grundlinien der Philosophie des Rechts oder Naturrecht und Staatswissenschaft (1821).

HEIDELBERG (hī'dl-berg), a town of Baden, beautifully situated on the left bank of the Neckar, here crossed by two bridges, in one of the loveliest districts of Germany. The principal buildings are: the church of St. Peter; the church of the Holy Ghost; the castle, anciently the residence of the Electors Palatine; the university founded in 1386, and now possessed of a library of 500,000 volumes and attended by about 1000 students; the town-house, etc. The castle, begun in the end of the 13th century, and exhibiting elaborate examples of early and late renaissance architecture, is the most remarkable edifice in Heidelberg. It is now an ivy-clad ruin, but is carefully preserved from further decay. The principal industry is brewing. One of the greatest curiosities of the place is the Heidelberg tun, kept in a cellar under the castle. It is 36 feet in length, 26 in diameter, and capable of holding 800 hogsheads. Pop. 40,121.



Castle and town of Heidelberg.

HEIGHTS, Measurement of, or Hypsometry, is that department of geodesy which treats of the measurements of the absolute or relative heights of various points on the earth's surface. In all cases in which great accuracy is essential, trigonometrical methods must be employed, but in other cases sufficiently accurate results may be obtained by levelling, by the use of the barometer, or by the boiling-point of water as given by the thermometer. The trigonometrical method is often the only one available, as the height to be measured may be quite inaccessible. The barometric method is based on the fact that as the mercurial column is supported by the atmospheric pressure, it must fall when conveyed from a lower to a higher level, as in the latter case the pressure is diminished. Were the atmosphere uniform in density throughout, nothing could be simpler than the measurement of heights by the barometer, but gases being very compressible, the lower strata of the atmosphere are denser than the upper strata, being exposed to greater pressure. Thus a column of air 100 feet high, has far greater weight at the sea-level than a similar column at the top of a mountain 4000 feet high; and the effect on the barometric column of rising 100 feet from sea-level is corresponding greater than the effect of rising 100 feet from a height of 4000 feet above the level of the sea. Moreover, increase of temperature affects the density of the mercury in the barometer, and also that of the air, and further complicates the problem. Hence for the greatest accuracy in determining the difference of levels two mercurial barometers and four thermometers are required. Two of the thermometers are used for determining the temperature of the air at the stations, and two are attached to the barometers for determining the temperature of the mercury. The observations are made simultaneously. The aneroid barometer is in some respects more suitable than the mercurial, being much more portable, and requiring two thermometers only. After the necessary observations are made the

required height may be calculated by the use of certain logarithmic formulæ, or by the rough method stated under Barometer. Tables obviating the use of logarithms are often supplied by instrument makers along with aneroid barometers. The method in which use is made of the principle that water boils at the temperature of 212° under the full pressure of the atmosphere but at a lower temperature with a smaller atmospheric pressure, such as is given by an elevated position, is simple and sufficiently accurate for many purposes. It has been found that if water at the sea-level boils at 212° on rising 510 feet it will boil at 211°, and so on.

HEINE (hī'nė), Heinrich, a German poet and author, was born of Jewish parents at Düsseldorf, 13th December, 1799, and died at Paris 17th Feb., 1856. Of the numerous literary works of Heine may be mentioned in particular Gedichte (Poems); Reisebilder (Pictures of Travel); Buch der Lieder (Book of Songs); Deutschland Ein Wintermärchen (Germany, a Winter Tale); Shakespeare's Mädchen und Frauen (Maidens and Wives); Die Romantische Schule; Letzte Gedichte und Gedanken (Last Poems and Thoughts); Atta Troll; Romanzero, etc.

HEIR-APPARENT, the person who necessarily succeeds to the ancestor if he survives him, because no other person can ever gain precedence over him, as an eldest son. Compare Heir-presumptive.

HEIR-PRESUMPTIVE, is one who, if the ancestor should die immediately, would, under existing circumstances, be his heir, but whose right of inheritance may be defeated by some nearer heir being born, as an only daughter, who is displaced by the birth of a son. Compare Heir-apparent.

HEJRA, HEJIRA, or **HEGIRA,** an Arabic word signifying emigration. The Mohammedans designate by it the flight of Mohammed their prophet from Mecca to Medina. From this flight, which happened on the 13th of September, 622 A.D., but which they fix on the 16th of July, of the same year, they begin their computation of time.

HELEN, or **HEL'ENA,** in ancient Greek legend, the most beautiful woman of her age, daughter of Zeus by Leda. By advice of Ulysses her numerous suitors were bound by oath to respect her choice of a husband, and to maintain it even by arms. She chose Menelaus, but was afterward carried off to Troy by Paris, the Trojan war arising from the claim made by Menelaus for the fulfilment of the oath. After the death of Paris she married his brother Deiphobus. On the fall of Troy she returned to Sparta with Menelaus, but at his death was driven from the country, and was murdered at Rhodes by the queen of the island.

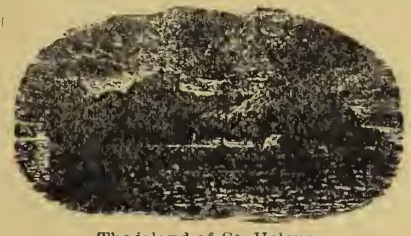
HEL'ENA, the name of several saints, of whom the chief was the mother of the Emperor Constantine the Great, a woman of humble origin, and a native either of Bithynia or of Britain.

HELENA, the capital of Montana, on the w. side of the valley of Prickly Pear, and Ten Mile creeks, at the foot of the Rocky Mountains, 15 miles w. of Missouri river, and 110 miles n. of Virginia City. It is chiefly supported by the rich quartz and placer gold mines in the

State capitol, Helena, Mont.

vicinity. In the vicinity are hot medicinal springs. Pop. 16,464.

HELE'NA, St., an island in the South Atlantic, belonging to Britain, about 850 miles southeast of the island of Ascension, 1150 miles west from the west coast of South Africa, and 2000 miles from the east coast of Brazil; greatest length, 10½ miles; greatest breadth, 7 miles; area, about 47 sq. miles. Its position, in the ocean thoroughfare from Europe to the East, has made it a place of call for vessels, while it has acquired special celebrity as the place of



The island of St. Helena.

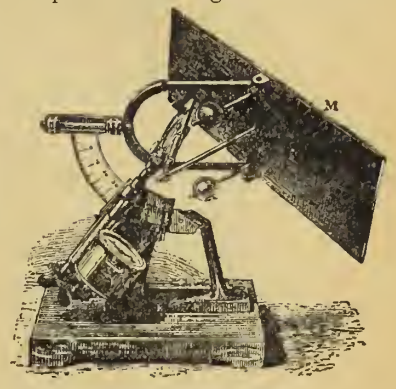
Napoleon's banishment, and where he resided from 1816 till his death in 1821. It has precipitous and almost inaccessible coasts, particularly on the north, where almost perpendicular cliffs rise to from 600 to 1200 feet. The only town on the island is James' Town, which has a fine natural harbor, and affords excellent anchorage in 12 fathoms. Pop. 5195.

HEL'ICON, a mountain range of Greece, in the west of Bœotia, in some sense a continuation of the range of Parnassus. It was the favorite seat of the Muses, who, with Apollo, had temples here. In it also were the fountains of Aganippe and Hippocrene. The highest summit, now called Paleovuni, is barely 5000 feet high.

HELIGOLAND, an island belonging to Germany, in the North Sea, about 40 miles from the mouth of the Elbe; 1¼ mile long and ½ mile broad; highest point, 200 feet. Pop. 2307.

HELIODO'RUS, a Greek romance writer, born at Emesa, in Syria, in the 4th century.

HE'LIOGRAPH, or **HELIOSTAT,** a name given to various contrivances for reflecting the sun's light either temporarily or continuously to an observer at a distance. The simplest heliostat is a mirror hung up at a distant station so as to reflect a flash to the observer whose station may be many miles from it. This mirror is generally so adjusted that the flash occurs exactly at some prearranged hour, and by being in readiness the observer can get an observation with precision as regards time. Some



Heliostat. *M*, mirror.

heliostats are visible for 80 miles. By being fitted with an adjustment of clockwork, the mirror can be made to revolve with the sun, and so to reflect a beam of sunlight steadily in one direction, being then called also heliotrope. The heliostat has been used for signalling in war.

HELIOGRAVURE, or **PHOTOGRAVURE,** is a photo-mechanical printing process. A photograph of any object, as a painting, etc., is taken, and from the negative so obtained a positive print is made on gelatinized paper. This print is transferred upon a highly polished copper plate, and a solution of terchloride of iron is poured upon it, which penetrates through the gelatine and etches the picture upon the copper. The final result is the production, of a photo-etched copper-plate, from which a large number of impressions can be taken.

HELIOM'ETER, an instrument for measuring small distances on the sky, particularly the apparent diameters of the sun and of the moon. It was invented by Bouguer in 1747, and improved by Dollond and Fraunhofer.

HELIOP'OLIS, the On, Rameses, or Beth-shemesh of the Hebrew Scriptures; now called Matarieh; situated a little north of Memphis, and one of the most ancient and extensive cities of Egypt under the Pharaohs. It had a magnificent temple dedicated to Re; and communicated with the Nile by lakes and canals. During the flourishing ages of the Egyptian monarchy the priests taught within the precincts of its temples, and both Eudoxus and Plato visited its famous schools. Here Joseph and Mary are said to have rested with the infant Christ. Near the village stands the Pillar of On, supposed to be the oldest Egyptian obelisk, 67½ feet high, and 6 feet broad at base. The Turks were defeated here by the French in 1800.

HE'LIOS, the god of the sun (Latin, Sol) in the Greek mythology; son of Hyperion and Theia, and brother of Eos (Aurora, the dawn) and Selēnē (Luna, the moon). He dwells with Eos in the ocean behind Colchis, from which he

issues in the morning, and to which he returns at night. His worship was extensively diffused, and he had temples in Corinth, Argos, Trœzene, Elis, but particularly in Rhodes, the Colossus of which was representation of Helios.

HE'LIOSCOPE, a telescope fitted for viewing the sun without distressing the eyes, as when the image of the sun is received upon mirrors formed simply of surfaces of transparent glass which reflect only a small portion of the light.

HE'LIOSTAT. See Heliograph.

HE'LIOTROPE, a genus of plants, natural order Boraiginaceæ. The species are herbs or undershrubs, mostly natives of the warmer parts of the world, and

Heliotrope.

have alternate leaves and small flower usually disposed in scorpioid cymes. The common heliotrope, is indigenous in the south and west of Europe, and has small white or pale red flowers with a fruit of four drupes under a thin fleshy covering.

HELIOTROPE, the bloodstone, a variety of quartz, partaking of the character of jasper or of chalcedony. It is of a deep green color, and covered with red spots. It is hard, and is used for burnishers; the more finely-marked stones are prized for seals, signet-rings, etc. It is found in Tartary, Persia, Siberia; in the island of Rum, Scotland, and elsewhere. It received the name heliotrope, or elitropia, because it was said that if the mineral were put into water in a basin rubbed with the juice of the plant heliotrope, and were exposed to the sun, the water would appear red and the sun blood-like, as if it were eclipsed. The stone rubbed with the juice of the plant was said to render its wearer invisible.

HE'LIOTYPE, a photographic process by which pictures can be printed in the same manner as lithographs, depending on the fact that a dried film of gelatine and bichromate of potash, when exposed to light, is afterward insoluble in water, while the portion not so exposed swells when steeped. A mixture of gelatine, bichromate of potash, chrome alum, and water is poured on a plate of glass, where it shortly settles into a film. When dried the film contracts and separates from the glass. A picture is then printed on it from a negative, after which it is attached to a plate of zinc, and copies are taken from it by inking it with lithographic ink exactly as in the ordinary lithographic process. The films are technically called "skins." Sometimes a gutta-percha mould is prepared from the film, and copper deposited on it by the electrotype process, the plate thus produced being printed from in the ordinary way.

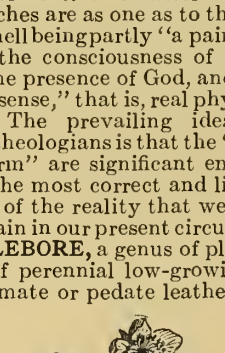
HELIX, (1) a spiral line as of wire in a coil, or such a curve as is described by every point of a screw that is turned round in a fixed nut. (2) In arch. a small

Helices of corinthian capital.

volute or twist under the abacus of the Corinthian capital, of which in every perfect capital there are sixteen, two at each angle, and two meeting under the middle of each face of the abacus.

HELL, signifies originally the covered or invisible place. In the English Bible the word is used to translate the Hebrew Sheol (grave or pit) and Gehenna (properly the valley of Hinnom), as well as the Greek Hades (the unseen). In the Revised Version of the New Testament, however, hell is used only to translate Gehenna, Hades being left where it stands in the Greek. In common usage hell signfies the place of punishment of the wicked after death, its earlier meaning being lost. The distinctive Scripture term for the place of future punishment of the wicked is Gehenna, which, unlike Sheol and Hades, never has an intermediate signification; and Christ adopting on this point the current language of the time gave the sanction of his authority to the leading ideas involved in it. Gehenna, or hell, is with him the place of final torment. The Eastern and Western churches are as one as to the punishment of hell being partly "a pain of loss," that is, the consciousness of being debarred the presence of God, and partly a "pain of sense," that is, real physical suffering. The prevailing idea among modern theologians is that the "fire" and the "worm" are significant emblems to give us the most correct and living conceptions of the reality that we can possibly attain in our present circumstances.

HEL'LEBORE, a genus of plants, consisting of perennial low-growing plants with palmate or pedate leathery leaves,



Black hellebore or Christmas-rose.

yellowish, greenish, or white flowers, having five conspicuous persistent sepals, eight to ten small tubular petals, and several many-seeded carpels.

HELL GATE, a formerly dangerous pass in East river, the strait which connects New York bay with Long Island sound. Rocks here used to form an obstruction much dreaded by mariners, but by extensive submarine mining operations and the use of the most powerful explosives, the passage has been practically cleared.

HELM, the contrivance by which a vessel is steered, usually composed of three parts, viz., the rudder, the tiller, and the wheel, except in small vessels, where the wheel is unnecessary. See Steering.

HELMET, an article of armor for the protection of the head, composed of leather or of metals. Some of Homer's heroes are represented as wearing brazen helmets, with towering crests. Among the Romans the cassis was a metallic helmet; the galea, a leathern one. The earlier Greek and Roman helmets did not protect the face. During the middle ages helmets were made of steel, frequently inlaid with gold, and provided with bars and flaps to cover the face in battle and to allow of being opened at other times. The full-barred helmet entirely covered the head, face, and neck, having in front perforations for the admission of air, and slits through which the wearer might see the objects around him. The open helmet covered only the head, ears, and neck, leaving the face unguarded. Some open helmets had a bar or bars from the forehead to the chin, to

Full-barred helmet,

Open helmet.

guard against the transverse cut of a broadsword. The modern military helmets afford no protection for the face. Firemen wear a heavy headpiece of leather and brass, or other materials, to protect them as far as possible from falling ruins at conflagrations. Helmets of white felt, with folds of linen wrapped round them, are worn in India and other hot climates as a protection against the sun. The name helmet is also given to a kind of hat worn by policemen. In heraldry the helmet is borne over a coat of arms, and the form and position of it vary according to the quality or dignity of the bearer. See Heraldry.

HELMHOLTZ, Hermann-Ludwig Ferdinand, German physiologist and physicist, born 1821 at Potsdam, and educated at Berlin. His work has been chiefly in those departments of physics which are in closest relation with physiology, notably in acoustics and optics. Of his many publications the best known are: The Conservation of Force (1847), Manual of Optics (1856–66), Popular Lectures on Scientific Subjects (London, 1873 and 1881), and Sensations of Tone as a Physiological Basis for the Theory of Music (1862, London 1875). He was ennobled by the German emperor in 1883. He died in 1894.

HELMONT, John Baptist Van, born in 1577 at Brussels; in his seventeenth year gave public lectures on surgery at Louvain. He was probably the first to introduce the term gas into science, and was also first to observe the acid re-

action of the gastric juice. He died in 1864.

HELOISE, Eloise (el-o-ēz), celebrated for her beauty and wit, but still more on account of her love for Abelard; was born in Paris in 1101. After the mutilation of her lover she was persuaded by him to take the veil at Argenteuil, and ulimately became prioress of the convent there until 1129, when she entered, with some of her nuns, the oratory of the Paraclete, built by Abelard at Nogent-on-the-Seine, where she lived in exemplary piety. She died in 1164. Contemporary writers speak in high terms of her genius. She understood Latin, Greek, Hebrew, was familiar with the ancients, and well read in philosophy and theology.

HE'LOTS, slaves in ancient Sparta. They were the property of the state, which alone had the disposal of their life and freedom, and which assigned them to certain citizens, by whom they were employed in private labors. They several times rose against their masters, but were always and finally reduced.

HELSINGFORS, a seaport of Russia, capital of Finland, on a peninsula in the gulf of that name, 180 miles w. n. w. St. Petersburg. Pop. 88,711.

HELVETIUS, Claude Adrien, French philosophical writer, born in 1715. In 1758 he published his one important book, De l'Esprit (On the Mind), the materialism of which drew upon him many attacks. It was condemned by the Sorbonne, and publicly burned by decree of the parliament of Paris. He died in 1771 in Paris. He also wrote a work, De l'Homme, and an allegorical poem, Le Bonheur.

HE'MANS, Felicia Dorothea, English poetess, born at Liverpool in 1793; maiden name Brown. Her death took place in 1835. Her poetry is essentially lyrical and descriptive, and is always sweet, natural, and pleasing. In her earlier pieces she was imitative, but she ultimately asserted her independence, and produced many short poems of great beauty and pathos, and evidently destined to live.

HEM'ATINE, or **HÆMATINE,** the red coloring matter of the blood occurring in solution in the interior of the blood corpuscles or cells. It is the only structure of the body, except hair, which contains iron.

HEM'ATITE, a name applied to two ores of iron, red hematite and brown hematite. They are both of a fibrous structure, and the fibers, though sometimes nearly parallel, usually diverge or even radiate from a center. They rarely occur amorphous, but almost always in concretions, reniform, globular, botryoidal, stalactitic, etc. The red hematite is a variety of the red oxide, and is one of the most important iron-ores. The brown hematite is a variety of the brown oxide or hydrate; its streak and powder are always of a brownish yellow. See Iron.

HEM'ISPHERE, half a sphere, especially one of the halves into which the earth may be supposed to be divided. It is common to speak of the eastern hemisphere and the western hemisphere, the former, also called the Old World, comprising Europe, Asia, Africa, Australia, etc.; the latter, North and South America, etc. The boundary between the two is quite arbitrary, and a more natural division of the earth is into the northern and the southern hemisphere, the equator forming the dividing line.

HEMLOCK, a poisonous plant, supposed to be identical with the plant kōneion of the Greeks. It is a tall, erect, branching biennial, with a smooth, shining, hollow stem, usually marked with purplish spots, elegant, much-divided leaves, which when bruised emit a nauseous odor, and white flowers in compound umbels of ten or more rays, surrounded by a general involucre of three to seven leaflets. It is found in Britain and throughout Europe and temperate Asia in waste places, banks, and under walls. It is said to be fatal to cows when they eat it, but that horses, goats, and sheep may feed upon it without danger. In the human subject it causes paralysis, convulsions, and death. The poison administered to Socrates is supposed to have been a decoction of it, though others are of opinion that the potion was obtained from water-hemlock (Cicūta virōsa). Hemlock is a powerful sedative, and is used medicinally. The extract is considered the best preparation. It is often serviceable as a substitute for, or an accompaniment to opium. It has been found very useful in chronic rheumatism and in whooping-cough, allaying the pain of irritable sores and cancerous ulcers. The virtues of hemlock reside in an alkaline principle termed conia or coniine.

Hemlock.

HEMLOCK, or **HEMLOCK SPRUCE,** a name given to an American fir from its branches resembling in tenuity and position the common hemlock.

HEM'ORRHAGE, a flux of blood from the vessels containing it whether from a rupture or any other cause. A hemorrhage from the lungs is called hemoptysis; from the urinary organs, hematuria; from the stomach, hematemesis; from the nose, epistaxis; the treatment of course varying with the cause and seat of the mischief.

HEM'ORRHOIDS, signifying an affection of the rectum, otherwise called piles. In general, hemorrhoids manifest themselves between the period of puberty and old age, although infants and aged people are not entirely exempt from attacks. In some cases they appear to be the effect of a certain hereditary disposition, but any circumstance which produces a tendency or stagnation of the blood at the extremity of the rectum is to be reckoned among the local causes. The accumulation of fecal matter in the intestines, efforts to expel urine, the obstruction of any of the viscera, especially of the liver, the frequent use of hot bathing, of drastic purges, long continuance in a sitting posture, riding on horseback, pregnancy—such are some of the ordinary causes of hemorrhoids. They are distinguished into several sorts, as external, when apparent at the anus; internal, when concealed within the orifice; blind or open, regular or irregular, active or passive, periodical or anomalous, etc. The best mode of treatment is to recur to hygienic rather than medicinal influences. The subject should avoid violent exercise; the food should not be too stimulating or nutritious. Traveling, or an active life, should succeed to sedentary habits. Constipation should be remedied by laxatives or gentle purgatives. Any thing which may be productive of a local heat should be avoided; as warm seats, soft beds, too much sleep. If the pain is considerable recourse should be had to sedatives, gentle bleeding, leeches. The use of suppositories containnig drugs, such as tannic acid or extract of witch-hazel (hazeline), will be found very useful; in mild cases iodoform suppositories may be curative. If the disease appears under a more severe form a surgical operation may become necessary.

HEMP, an annual herbaceous plant. The hemp fiber is tough and strong, and peculiarly adapted for weaving into coarse fabrics such as sail-cloth, and for twisting into ropes and cables. Immense quantities are exported from Russia. The finer sorts are used for shirtings, sheetings, etc., which, though coarser than that made from flax, are very much stronger and equally susceptible of being bleached. The hemp of England is very superior, but the plant does not pay the farmer, and very little of it is grown. In some of the United States it is a crop of considerable importance. The seed must be sown thin, not more than 1 to 2 bushels to an acre. Small paths are often left open along the field lengthwise, at about 7 feet distant from each other, to allow the plucking of the male plants first, as the female require to remain standing a month longer to admit of the seed becoming ripe. But in some parts the whole crop is cut at once, plants for seed being separately cultivated. The plant being stripped of its leaves, and dried in the open air, may be stored, but when steeped green it turns out of a better color. The steeping takes from four to eleven days, and the operation is known to be completed by the inner reed or woody fiber separating easily from the fibers of the outer bark. When thoroughl

Hemp.

steeped it is taken out of the water and spread out in rows on the grass to bleach. This takes three weeks or more, during which period it requires constant turning with a light, long pole. After drying it is scutched or broken by breaks and scutching-stocks, resembling those employed for flax. Beating is the next operation, which separates the "boon" from the fiber. The hemp is now ready for being heckled, after which it may be spun. Hemp-seed is much used as food for cage-birds, and also yields an oil. Sisal hemp or "henequen" and Manila hemp are not true hemps.

HENBANE, a plant of Europe and Northern Asia. It is a coarse erect biennial herb, found in waste ground and loose dry soil, having soft, clammy, hairy foliage of disagreeable odor, pale yellowish-brown flowers streaked with purple

Henbane.

veins, and a five-toothed calyx. The expressed juice of the leaves and seeds is often used as a sedative, antispasmodic, and narcotic, having in many cases the great advantage over laudanum of not producing constipation. When taken in considerable quantity it proves quickly fatal to man and most animals, particularly to domestic fowls, whence the name. Called also Stinking Nightshade.

HENDERSON, the county seat of Henderson co., Ky., on the Ohio river, and the Lv. and N., the Lv., St. L. and Tex., and the Ohio Val. railways; 143 miles w. s. w. of Louisville. It has large tobacco-stemming interests, a cotton-mill, woolen-mill, whisky distilleries, foundry, carriage and wagon factories. Pop. 12,120.

HENDERSON, David Bremner, American statesman, born at Old Deer, Aberdeenshire, Scotland, in 1840. He went to Illinois in 1846, to Iowa in 1849, graduated at Upper Iowa university, studied law in an office at Dubuque, and was admitted to the bar in 1865. In 1861 he enlisted as a private in the Twelfth Regiment Iowa volunteer infantry, was elected and commissioned first lieutenant of Company C, and served until discharged, February 26, 1863, owing to the loss of a leg at the battle of Corinth. He was elected to the Federal house of representatives in 1882, as a republican from the Third Iowa district, was chairman of the committee on judiciary, and a member of committee on rules in the fifty-fourth and fifty-fifth congresses, and in 1899, at the organization of the fifty-sixth congress, was elected speaker of the house. He was also chairman of the Iowa delegation at three national republican conventions. Died 1906.

HEN'DRICKS, Thomas Andrews, American politician, was born near Zanesville, Ohio, in 1819, was a member of the Indiana legislature and the state constitutional convention of 1851; was a member of congress from 1851 to 1855. United States senator from 1863 to 1869, and in 1868 was a candidate for the democratic nomination for president. He was governor of Indiana from 1873 to 1877. He ran for vice-president of the United States on the ticket with Samuel J. Tilden in 1876, and was elected vice-president in 1884 on the ticket with Grover Cleveland. He died in 1885.

HEN-HAWK, the species commonly called hen-hawks include two birds, the red-tailed and the red-shouldered hawk. The redtail is one of the largest, most numerous, and most widely distributed of North American buzzard-hawks. It is from 19 to 25 inches long, and its spread of wings is from 49 to 58 inches. In maturity the upper surface is blackish-brown, variegated with whitish and dull rust-color, the last tint growing brighter on the upper surface of the tail, which has a blackish cross-band near the end. The under surface of the body is buffy white, the belly marked with dark streaks. The majority of them leave the northern states in winter, and migrate in large flocks. They build their nests in tall trees. Their food includes all the mammals from size of a squirrel downward, and all sorts of birds from grouse and rails to sparrows; but this larger game is far outnumbered by the smaller gophers, mice, frogs, insects, and carrion upon which they principally subsist.

The red-shouldered hawk, is a species rather less in size than the redtail, and generally more reddish in plumage, especially bright on the shoulders, while the lower parts (whitish in the young) are everywhere rusty in color, transversely barred with a darker tint. The tail is black, covered by about six bands of white. It is a rather heavy, sluggish bird, and lives throughout the year south of the Great Lakes, frequenting lowlands and marshes, except in the spring, when it retires to the woods for breeding purposes. It preys principally on mice, and never attacks poultry, so that its reputation as a hen-hawk is undeserved.

HENNA, a shrub, bearing opposite entire leaves and numerous small white fragrant flowers disposed in terminal panicles. It grows in moist situations throughout North Africa, Arabia, Persia and the East Indies, and has acquired celebrity from being used by the inhabitants of those countries to dye yellow the nails of their fingers and the manes, hoofs, etc., of their horses. It is cultivated extensively in Egypt and the powdered leaves form a large article of export to Persia and the Turkish possessions. It may be used for dyeing woolens, not only yellow, but brown, when alum and sulphate of iron are employed.

Henna plant.

HENRIETTA MARIA, queen of Charles I. of England; youngest child of Henry IV. of France, by his second wife, Maria

Henrietta Maria.

de' Medici; born is Paris 1609. Her bigotry, and despotic ideas as to divine right did much to bring Charles I. to the block. She died in 1669.

HENRY I., of Germany, was born in 876; the son of Otho the Illustrious, duke of Saxony. Henry, on the death of his father, became Duke of Saxony and Thuringia. He was elected emperor of Germany in 919, and was the true founder of the empire. By his prudence and activity Suabia and Bavaria were forced to tender allegiance, and Lorraine was reunited to the German Empire in 925. Besides his military reforms he diminished the feudal privileges, and granted to the cities of the empire their first municipal charters. He died in 936.

HENRY II., the saint, emperor of Germany, born 972, was a son of Henry the Quarreler of Bavaria, and great-grandson of the Emperor Henry I. He inherited Bavaria in 995, and on the death of Otho III. in 1002 laid claim and was elected to the empire. He died in 1024.

HENRY III., Emperor of Germany, the second belonging to the house of the Salian Franks, son of the Emperor Conrad II.; born in 1017; chosen king in 1026; succeeded his father in the imperial dignity 1039. He died in 1055. His first wife was a daughter of Canute the Great of England.

HENRY IV., German emperor, son of Henry III., was born in 1050, and at the death of his father was only five years old. His whole life was a series of troubles, partly of his own causing. His severe treatment of the Saxons led to a rising which was cruelly punished. His treatment of the conquered people was such that they complained to the pope, and Gregory VII. (Hildebrand), accordingly summoned Henry, in 1076, to ap-

pear before him at Rome and answer the charges, at the same time forbidding the sale of ecclesiastical dignities. Henry not only disregarded the threat, but instigated the bishops, assembled by his order at Worms, to renounce their obedience to the pope. Gregory, however, pronounced sentence of excommunication against him, and Henry, finding himself deserted, was obliged to go to Italy and make his submission to the pope (1077). Henry IV. ended his life and his sorrows in neglect at Liége in 1106.

HENRY V., Emperor of Germany, the son and successor of Henry IV. (see above), was born in 1081. On his ascension the question of investiture distracted the empire anew. Pope Pascal would only confer the imperial crown upon condition that the rights claimed by Gregory should be formally conceded. Henry therefore seized the pope at the altar and imprisoned him until he yielded two months later, and crowned Henry in April, 1811. He died at Utrecht in 1125 and was the last of the Salic or Frankish family of emperors, which was succeeded by the Suabian house. He married Matilda, a daughter of Henry I. of England.

HENRY VI., German emperor, son of Frederick I. and Beatrice of Burgundy, the third emperor of the house of Hohenstaufen, born in 1165, crowned king in 1169, succeeded his father as emperor in 1190. He kept Richard Cœur de Lion in prison, and obtained a large ransom for him. He died in 1197.

HENRY VII., Emperor of Germany, born in 1262, was chosen emperor in 1308. Among the first acts of his reign were recognition of the independence of the Swiss cantons of Schwyz, Uri, and Unterwalden, and the granting of the kingdom of Bohemia to his son John. He compelled the Milanese to give him the iron crown of Lombardy, suppressed by force the revolt which then broke out in Upper Italy, captured part of Rome, which was in the hands of Neapolitan troops, and was crowned Roman Emperor by two cardinals. He died suddenly in 1313.

HENRY II., King of France, born in 1519, succeeded his father, Francis I., in 1547. Throughout his reign his mistress, Diana of Poitiers, exercised an important influence over king and court. Henry was mortally wounded by a splinter from the lance of Lord Montgomery, captain of the Scottish guard. He was succeeded in 1559 by his eldest son, Francis II.

HENRY III., King of France, third son of Henry II. and Catherine de Medici, born in 1551; succeeded his brother, Charles IX., in 1574. He was the last of the branch of Orléans-Angoulême of the stock of the Valois, and was succeeded by Henry of Navarre, the first of the house of Bourbon.

HENRY IV., King of France was son of Anthony of Bourbon, duke of Vendôme, and of Jeanne d'Albret, daughter of Henry, king of Navarre, and herself afterward queen of Navarre. In 1572 he married Margaret of Valois, sister of Charles IX., and after the massacre of St. Bartholomew, which took place during the marriage festivities, was forced to adopt the Catholic creed. In 1576 he escaped from Paris, retracted at Tours his enforced abjuration of Calvanism, put himself at the head of the Huguenots, and took a leading part in all the subsequent religious wars. He was obliged, however, to raise the siege of Paris; and convinced that a peaceful occupation of the throne was impossible without his professing the Catholic faith, he became nominally a Catholic in 1593. After his formal coronation in 1594 only three provinces held out against him—Burgundy, reduced by the victory of Fontaine-Française in 1595; Picardy, reduced by the capture of Amiens in 1596; and Brittany, which came into his hands by the submission of the Duke of Mercœur in the spring of 1598. The war against Spain was concluded in 1598 by the Peace of Vervins to the advantage of France. The same year was signalized by the granting of the edict of Nantes, which secured to the Protestants entire religious liberty. He made use of the tranquility which followed to restore the internal prosperity of his kingdom, and particularly the wasted finances, in which he was successful with the aid of his prime-minister Sully. At the instance of Sully Henry divorced Margaret of Valois, and in 1600 married Maria de' Medici, niece of the Grank-duke of Tuscany, mother of Louis XIII. She was crowned at St. Denis in 1610, but on the following day Henry was stabbed by a fanatic named Ravaillac, while examining the preparations for the queen's entry into Paris. The great benefits which Henry IV. bestowed upon France entitle him to the designation which he himself assumed at an assembly of the Notables at Rouen in 1596, the Regenator of France (Restaurateur de la France).

HENRY I., King of England, surnamed Beauclerc ("fine scholar") youngest son of William the Conqueror, was born at Selby in Yorkshire, in 1068. He was hunting with William Rufus when that prince was killed, in 1100, and instantly riding to London, caused himself to be proclaimed king, to the prejudice of his elder brother Robert, then absent as a crusader. Henry died at Rouen in 1135, and was succeeded by Stephen.

HENRY II., King of England, first of the Plantagenet line, born in Normandy in 1133, was son of Geoffrey, count of Anjou, and Matilda, daughter of Henry I. He was invested with the Duchy of Normandy, by the consent of his mother, in 1150; in 1151 he succeeded to Anjou and Maine, and by a marriage with Eleanor of Guienne gained Guienne and Poitou. In 1152 he invaded England, but a compromise was effected, by which Stephen was to retain the crown, and Henry to succeed at his death, which took place in 1154. He died at Chinon in 1189. He ranks among the greatest English kings both in soldiership and statescraft. He partitioned England into four judiciary districts, and appointed itinerant justices to make regular excursions through them; revived trial by jury, discouraged that by combat, and demolished all the newly elected castles as "dens of thieves."

HENRY III., King of England, son of John by Isabel of Angoulême; born at Winchester in 1207; succeeded his father in 1216. He died in 1272. His son Edward I. succeeded him.

Henry II., King of England. From his tomb.

HENRY IV., King of England, first king of the house of Lancaster; born in 1366; was eldest son of John of Gaunt, duke of Lancaster, third son of Henry III. by the heiress of Edmund, earl of Lancaster, second son of Henry III. In the reign of Richard II. he was made earl of Derby and Duke of Hereford, but having in 1398 preferred a charge of treason against Mowbray, duke of Norfolk, he was banished with his adversary. On the death of John of Gaunt in 1399 Richard withheld Henry's inheritance, and Henry, landing in England, gained possession of Richard's person. The deposition of Richard by parliament, and the election of Henry, was followed by the murder of the late king. Henry died in 1413, and was succeeded by Henry V.

HENRY V., King of England, born at Monmouth in 1388. On succeeding his father, Henry IV., in 1413, he showed a wisdom in marked contrast to a somewhat reckless youth. He restored their estates to the Percies, and liberated the earl of March, but in other respects based his internal administration upon that of his father. The persecution of the Lollards is the chief blot upon the early part of his reign. The struggle in France between the factions of the dukes of Orleans and Burgundy afforded Henry a tempting opportunity for revivin g the claims of his predecessors to the French crown. He returned in triumph to England, but on the defeat of his brother, the duke of Clarence, in Normandy by the earl of Buchan, he again set out for France, drove back the army of the dauphin, and entered Paris. A son was at this time born to him, and all his great projects seemed about to be realized, when he died of fever at Vincennes in August, 1422, at the age of thirty-four, and in the tenth year of his reign. He was succeeded by his son Henry VI.

HENRY VI., King of England, born at Windsor in 1421, was crowned at

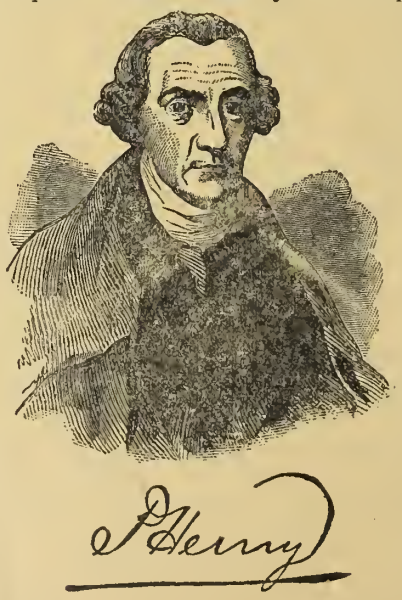
Westminster in 1429, at Paris in 1430. As he was an infant not nine months old at the death of his father Henry V., his uncle John, duke of Bedford, was appointed regent of France; and his uncle Humphrey, duke of Gloucester, made protector of the realm of England. He was a gentle, pious, well-intentioned, hopelessly incompetent king, whose best reputation is that of founder of Eton college and King's college, Cambridge.

HENRY VII., King of England, first sovereign of the race of Tudor, born in 1456. He was the son of Edmund, earl of Richmond, son of Owen Tudor and Catherine of France, widow of Henry V. In 1486 he married Elizabeth, daughter of Edward IV. and heiress of the house of York, and thus united the claims of the rival houses of York and Lancaster. The reign of Henry VII. was troubled by repeated insurrections, of which the chief were that headed by Lord Lovel and the Staffords (1486), and the impostures of Lambert Simnel (1487) and Perkin Warbeck (1496-99). Henry died at Richmond in 1509.

HENRY VIII., King of England, son of the preceding, born in 1491, succeeded his father in 1509. From 1515 until 1529 the government was practically in the hands of Wolsey, no parliament being summoned in that period until 1523. After the election of Charles V. to the German Empire, both Charles and the French king, Francis I., sought the alliance of England. A friendly meeting took place between Henry and Francis at the Field of the Cloth of Gold (1520), but the interest of Charles preponderated, and Henry declared war against France, though with no important results. Now came the determination of the king to divorce his wife Catherine. Wolsey, for his own ends, had at first been active in promoting the divorce, but drew back and procrastinated when it became apparent that Anne Boleyn would be Catherine's successor. This delay cost Wolsey his power and the papacy its authority in England. Henry in disgust eagerly caught at the advice of Thomas Cranmer, afterward Archbishop of Canterbury, to refer the case to the universities, from which he soon got the decision that he desired. In 1533 his marriage with Catherine was declared null and an anticipatory private marriage with Anne Boleyn declared lawful; and as these decisions were not recognized by the pope, two acts of parliament were obtained, one in 1534 setting aside the authority of the chief pontiff in England, the other in 1535 declaring Henry the supreme head of the church. Finding that the monks and friars in England were the most direct advocates of the papal authority, and a constant source of disaffection, he suppressed the monasteries by act of parliament, and thereby inflicted an incurable wound upon the Catholic religion in England. The fall of Anne Boleyn was, however, unfavorable for a time to the reformers. Henry then married Jane Seymour, and the birth of Prince Edward in 1537 fulfilled his wish for a male heir The death of the queen was followed in 1540 by Henry's marriage with Anne of Cleves, the negotiations of which were conducted by Cromwell. The king's dislike to his wife, which resulted in another divorce, became extended to the minister who had proposed the union, and Cromwell's disgrace and death soon followed. A marriage with Catherine Howard in 1541 proved no happier, and in 1542 she was executed on a charge of infidelity. In 1543 he married his sixth wife, Catherine Parr, a lady secretly inclined to the Reformation, who survived the king. In the meantime Scotland and France had renewed their alliance, and England became again involved in war. James V. ravaged the borders, but was defeated at Solway Moss in 1542, and in 1544 Boulogne was captured, Henry having again allied himself with Charles V. Charles, however, soon withdrew, and Henry maintained the war alone until 1546. Disease now so much aggravated the natural violence of Henry that his oldest friends fell victims to his tyranny. The duke of Norfolk was committed to the Tower, and his son the earl of Surrey was executed. Henry died on Jan. 28, 1547, and was succeeded by his son, Edward VI.

HENRY, Joseph, American physicist, was born at Albany, N. Y., in 1799. He was a great experimenter and did much toward the development of the science of electricity. In 1831 he sent a current through a mile of copper wire and caused the armature of the electro magnet to be attracted and strike a bell which was the first electro-magnet telegraph and he is to be regarded as the inventor of the principle now applied in modern practice. In 1846 he was chosen secretary of the Smithsonian Institution, a position that he held until his death in 1878.

HENRY, Patrick, American orator and patriot, was born in Hanover co., Va., in 1736. In 1764 having been employed to plead the cause of the people against an unpopular tax, his great eloquence seemed suddenly to develop



itself and he was at once placed in the front rank of American orators, and his later speeches advanced him to their head. From amid the sullen murmurs and remonstrances that the passage of the stamp act evoked, his voice it was that first rose in a clear, bold call to resistance. A storm of opposition followed his resolutions, setting forth that the governor had the exclusive right to lay taxes and imports upon the people of the colony. In the debate he startled all by his historic outburst "Caesar had his Brutus, Charles the First his Cromwell, and George the Third—" (here he was interrupted with cries of treason! treason!) "may profit by their example," calmly said the orator, completing the sentence, adding, "If this be treason make the most of it." Throughout the war of independence he was a zealous patriot. He was a delegate to the first Continental congress, which met at Philadelphia in 1774, and delivered the first speech in that assembly—a speech that for fiery eloquence and lofty tone was worthy of so momentous a meeting. In 1776 he carried the vote of the Virginia convention for independence; and in the same year he became governor of the new state. He was afterward four times re-elected. In 1791 he retired from public life, and returned to his practice; in 1795 he declined the secretaryship of state offered him by Washington. Henry was an able administrator, a wise and far-seeing legislator; but it is as their greatest orator that his memory lives in the minds of Americans. He died in 1799.

HENRY THE LION, Duke of Saxony, the most remarkable prince of Germany in the 12th century, was born in 1129. He succeeded his father, Henry the Proud, in 1139, assuming the government of Saxony himself in 1146. At the diet of princes in Frankfort (1147) he demanded restitution of Bavaria, taken from his father by Conrad VII.; but was worsted in the war which followed. It was restored to him, however, in 1154, after the death of Conrad, by the Emperor Frederick, Henry's cousin. His possessions then extended from the Baltic and the North Sea to the Adriatic, and he was successful in opposing the league formed against him at Merseburg in 1166. Henry died at Brunswick 1195. He was much in advance of his age in fostering industry, science, commerce, and the arts.

HENRY, THE NAVIGATOR, fourth son of King John I. of Portugal, born in 1394. From time to time he sent vessels on voyages to the coasts of Barbary and Guinea; resulting in the discovery of the islands of Puerto Santo and Madeira, and some years later of the Azores. In 1433 Gilianez, one of his navigators, safely doubled Cape Bojador, and other adventurers, pushing still further south, discovered Cape Blanco in 1441 and Cape Verd in 1445. A profitable commerce with the natives of West Africa was soon developed, and the Senegal and Gambia partially explored. After acting as general against the Moors in 1458 Henry died at Sagres on the 13th of November, 1458. His efforts not only laid the foundations of the commerce and colonial possessions of Portugal, but gave a new direction to navigation and commerical enterprise.

HEN'SON, Josiah, American clergyman and lecturer, born a slave in Port

Tobacco, Md., in 1787. His early career is remarkable for the hardships he was forced to endure. He escaped into Canada in 1828, and became a Methodist preacher at Dresden. Mrs. Harriet Beecher Stowe met him, and drew from the story of his life her character of Uncle Tom. Henson lectured throughout the United States, and made three trips to England during the last years of his life. While upon his final tour in 1876 he was entertained at Windsor Castle by Queen Victoria. He died in 1883.

HEPHÆS'TUS, a god of the ancient Greeks, identified by the Romans with their Vulcanus. He presided over fire, and was the patron of all artists who worked in iron and metals.

HEP'TATEUCH, a name sometimes given to the five books of Moses or Pentateuch, together with the books of Joshua and Judges.

HERA, an ancient Greek goddess, identified by the Romans with their Juno, the sister and wife of Zeus (Jupiter), and daughter of Kronos (Saturn, and Rhea. The poets represent Zeus as an unfaithful husband, and Hera as an

Hera.—Antique statue.

obstinate and jealous wife, the result of which is frequent strife between them. She was worshiped in all Greece, but her principal seats were at Argos and at Samos. The companions af Hera were the Nymphs, Graces, and Hours. Iris was her particular servant.

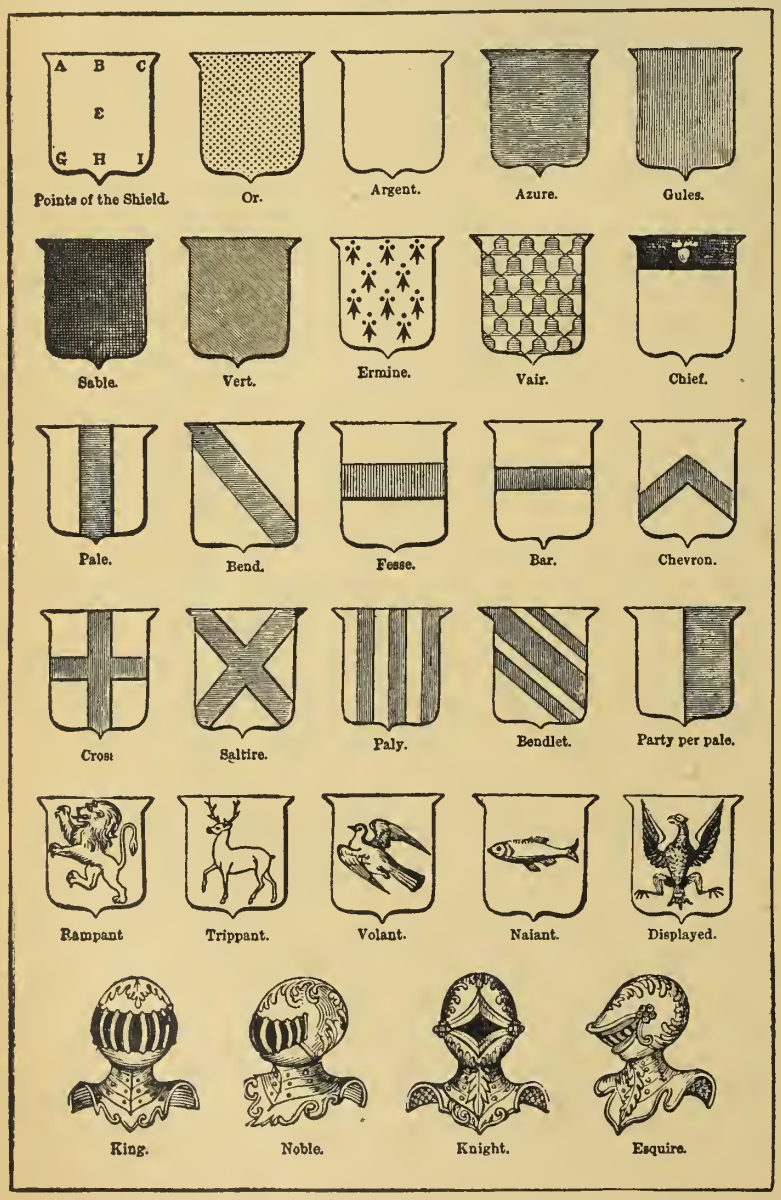
HER'ACLES, called by the Romans Hercules, the most celebrated hero or semi-divine personage of Greek mythology, was the son of Zeus (Jupiter) by Alcmena, the wife of Amphitryon. He was brought up at Thebes, and before he had completed his eighth month strangled two snakes sent by the jealous Hera (Juno) to devour him. In youth he had several distinguished instructors, among them the Centaur Cherion. Early in life he had, at the command of Zeus, to subject himself for twelve years to the will of Eurystheus, on the understanding that after he had acquitted himself of this duty he should be reckoned in the number of the gods. He became the husband of Dejanira, who unwittingly brought about his death by giving him a tunic poisoned with the blood of the Centaur Nessus, which she innocently believed would retain for her Heracles love. The poison took effect whenever the garment was put on, and as the distemper was incurable, Hercales placed himself on a burning pile on the top of Mount Œta, was received up into heaven, and being there reconciled to Hera, received her daughter Hebe in marriage. In ancient works of art Hercales is generally represented naked, with strong and well proportioned limbs; he is sometimes covered with the skin of the Nemæan lion, and holds a knotted club in his hand, on which he often leans. The principal ancient statue of him which remains is the Farnese Hercules at Rome, a work of the Athenian Glycon. The myth of Hercules is believed by many writers to represent the course of the sun through the twelve signs of the zodiac. His marriage with Hebe was explained even by the ancients as symbolic of the renewing of the sun's course after its completion.

HERACLI'US, Roman emperor of the East, born in Cappadocia about 575 A.D.; the son of Heraclius, exarch of Africa. He died in 641, and was succeeded by his son, Constantine III.

HER'ALD, an officer whose functions originally were to carry messages of courtesy or defiance between sovereigns or persons of knightly rank, to superintend and register the results of trial by battle, tournaments, and other chivalric exercises, to record the valiant deeds of combatants, proclaim war or peace, marshal processions and public ceremonials, and especially, in later times, to regulate and determine all matters connected with the use of armorial bearings. Heralds began to appear about the 12th century, and assumed the functions which ultimately belonged to their office gradually.

HER'ALDRY, the whole science of a herald's duties, or more commonly the knowledge of the forms, terms, and laws which pertain to the use of armorial bearings or coats of arms. Badges and emblems on shields, helms, banners, etc., naturally occurred in the earliest times, and the symbols were sometimes hereditary. The origin of heraldic arms, properly so called, is, however, to be attributed to the necessity which arose during the crusades of distinguishing the leaders of the numerous and motly bands of warriors which constituted the Christian armies. One of the oldest specimens of heraldic bearings extant is the shield at Mans of Geoffrey Plantagenet, who died in 1150. Rolls of arms in England are extant from the reigns of Henry III., Edward I., and Edward II. The use of arms on the Great Seal of England was introduced by Richard I. The bearing of coat-armor by private persons was prohibited by proclamation in the reign of Henry V. The chief courts of jurisdiction in questions of heraldry are the Herald's college in England, and the Lyon court in Scotland. (See Herald.) The rules of heraldry now practiced at the Heralds' college are comparatively modern, and differ in some respects from those of other European courts. A coat of arms consists of the figure of a shield marked and colored in a vast variety of ways, so as to be distinctive of an individual, a family, or a community. The shield or escutcheon represents the original shield used in war, and on which arms were anciently borne. The surface of the escutcheon is termed the field, and the several parts or points of it have particular names, so that the figures which the field contains may be precisely located. In the accompanying illustration A B C marks the part of the shield called the chief, which is the highest and most honorable part of the shield. A is the dexter chief or upper right-hand side of the shield; B, the middle chief; and C, the sinister chief, or upper left-hand side of the shield; E, the center or fesse point; G H I, the base, that is, G, the dexter or right-hand base; H, the middle base; and I, the sinister of left-hand base. Color is given in the coat of arms by means of tinctures, two of which are metals—or and argent, that is, gold and silver—the rest colors proper. These colors are, in heraldic terminology: azure, blue; gules, red; sable, black; vert, green; purpure, purple; tenney, orange; sanguine, blood-color. The two last are comparatively uncommon. An object represented in its natural colors is said to be proper. When not given in colors or by actual gilding the tinctures are represented by points and lines in black and white. Or is distinguished by small dots covering the part; argent is represented by leaving the space blank; azure is shown by horizontal lines; gules, by perpendicular lines; sable, by perpendicular and horizontal lines crossing each other; vert, by diagonal lines running from the dexter chief to the sinister base; purpure by diagonal lines running from the sinister chief to the dexter base. Another class of tinctures are the furs, of which the two principal are ermine and vair, and which have also their special method of representation. The figures borne on the shield may be either purely artificial and conventional, or may represent real objects, animals, plants, etc. Of the former the most common are known as ordinaries, and have the folfowing names: Chief, Pale, Bend, Fesse, Bar, Chevron, Cross, and Saltire. The chief is a portion of the shield at the top marked off by a horizontal line, and covers the upper third part of the field. The pale occupies the middle third part of the field perpendicularly. The bend is drawn diagonally from the dexter chief to the sinister base in the form of a belt, and also occupies the third of the field. A dimunutive of the bend is the bendlet. The fesse occupies the middle third of the field horizontally. The bar is formed after the manner of a fesse, but occupies only a fifth of the field, and is not confined to any particular part of it, except when there is only one bar, when it is put in the place of a fesse. Bars are mostly two in a field, sometimes three or more. A diminutive is the barrulet. The chevron may be regarded as made of a bend dexter and sinister issuing from the right and left base points of the escutcheon and meeting like two rafters. The cross is the ordinary cross of St. George. The saltire is the equally well-known cross of St. Andrew. The shield is often divided by lines running similarly to the ordinaries; hence when divided by a perpendicular line it is said to be party per pale, when by a horizontal

line party per fesse, when by a diagonal line party per bend. Similarly, when it seems to bear several pales or bends or bars, it is said to be paly, bendy, or barry of so many pieces, "paly of six argent and gules" for instance, as in illustration. Charges are the figures of natural and artificial things, and include animals and plants, implements and objects of all sorts, and various imaginary monsters, being drawn either on the field or on one of the ordinaries. It is a rule in heraldry that metal must not be put on metal nor color on color; hence, if the field say is argent, it cannot have a charge or an ordinary tinctured or directly upon it. Various technical terms describe the position of animals; thus, a lion is rampant when he is erect standing on one of his hind legs; sejant, when sitting; couchant, when lying at rest, with the head erect; passant, in a walking position; gardant, looking full-faced; rampant gardant, erect and full-faced; salient, in a leaping posture. So trippant is said of the stag when trotting; lodged, of the stag when at rest on the ground; volant, of birds in general in a flying posture; rising, of a bird that is preparing to fly; displayed, of birds seen frontwise with outspread wings; naiant, of fishes when swimming; and so on. The teeth and claws of lions and other ravenous beasts are called their arms; and when these have a special tincture the animal is said to be armed of such a tincture; similarly if their tongue be of a special tincture, they are said to be be languaged of this tincture. Often two or more coats of arms are united together on one shield, so that the whole may be a very complicated affair. The art of arranging arms in this way is known as marshalling, and when the shield is divided up into squares for the reception of different coats, it is said to be quartered. There are also certain exterior ornaments of the shield or escutcheon, namely, the helmet, mantling, crest, wreath, motto, and supporters. The helmet, which is placed on the top of the escutcheon, varies both in form and materials. Those of sovereign princes are of gold, those of the nobility of silver, and those of gentlemen of polished steel. The full-faced helmet, with six bars, is for the king and princes of the blood; the side-long helmet, with five bars, is for dukes and marquises, etc.; the full-faced helmet of steel, with its beaver or visor open, is for knights; and the sidelong helmet, with the visor shut, for the esquire. The mantling or mantle was anciently fixed to the helmet to which it served as a covering. Mantlings are now used like cloaks, to cover the whole achievement. The crest is placed above the helmet, with the wreath serving as a kind of support; the latter is composed of two colors wreathed or twisted together. The motto consists of the word or phrase carried in a scroll under or above the arms. Supporters were originally only ancient devices or badges, which by custom came to embellish armorial ensigns. They are called supporters because they hold the shield, as the lion and the unicorn in the well-known royal arms of England. The present royal arms of Britain exhibit the arms of England, Scotland, and Ireland in the four quarters of the shiefd; that is: Quarterly, 1 and 4, England; 2, Scotland; 3, Ireland. The arms of England are: Gules, three lions passant gardant in pale or; Scotland, Or, a lion rampant within a double tressure flory counter-flory gules; Ireland, Azure, a harp or, stringed argent.



HERAT', a city in the northwest of Afghanistan, about 370 miles west of Cabul. The most important manufactures are carpets, sword-blades, shoes, cloaks, and sheepskin caps. Herat was long the capital of the empire founded by Tamerlane. Pop. about 45,000.

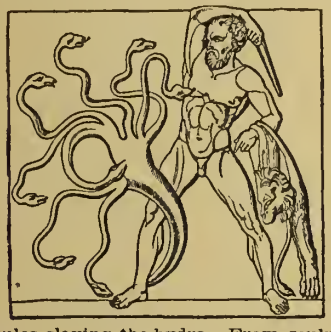
HERAULT (ā-rō), a department of France, on the Mediterranean coast; area, 2393 sq. miles. In the northwest it is covered by the Cevennes, but it descends rapidly towards the coast, which is lined by lagoons. Capital Montpellier. Pop. 441,527.

HERCULA'NEUM, an ancient city about 5 miles s.e. from Naples, completely buried with Pompeii, Stabiæ, etc., by lava and ashes during an eruption of Vesuvius in the reign of Titus, A.D. 79. The site had been long sought in vain, when in 1713 three statues were found in digging a well at the village of Portici. In 1738 the well was dug deeper, and traces of buildings were found. The theater was then discovered, but though the excavations were continued for many years it is now the only building to be seen underground, as the successive excavations were immediately filled up with rubbish from a new digging. A number of public buildings and private dwellings were laid bare, and many objects of great value discovered, such as statues, busts, beautiful mosaics, wall paintings, charred papyrus manuscripts, etc. One of the houses discovered contained a quantity of provisions, consisting of fruits, corn, oil, pease, lentils, pies, and hams. Few

skeletons have been found either in Pompeii or Herculaneum, so that it is probable most of the inhabitants had time to save themselves by flight. Among the most interesting objects discovered here were the papyri, over 1750 of which are now in the Naples Museum but hardly a third have yet been unrolled, the process presenting great difficulties from the tendency of the MSS. to crumble. The knowledge of ancient art has, however, gained more by the discoveries made here than literature.

HERCULES. See Heracles.

HERCULES, one of Ptolemy's northern constellations, including 113 stars. The point to which the sun, with its



Hercules slaying the hydra.—From sculpture at Florence.

accompanying system of planets, is traveling at present is situated in this constellation, which includes some remarkable star groups and nebulæ.

HERCULES, Pillars of, the ancient name of the two promontories, Calpe (Gibralter) and Abyla (Ceuta), at the entrance to the Mediterranean.

HERDER, Johann Gottfried von, German author, born in poor circumstances in 1744. His greatest work is his Ideen zur Philosophie der Geschichte der Menschheit (Ideas on the Philosophy of the History of Man; 1785 et seq.). He is the author of some pleasing songs, and of an epic entitled The Cid. He died in 1803.

HEREDITARY DISEASES. See Diseases.

HERED'ITY, the transmission from parent to offspring of physical and intellectual characters. This has been at all times believed in, but it is only in recent times that the conviction has, in the hands of Darwin, Herbert Spencer, and Wallace, been methodized so as to embody an important zoological doctrine. The modern view of evolution in biology rests upon the belief that acquired peculiarities, or differences which may arise between parent and offspring, can be transmitted with some probability of permanence, especially if the variation presented by the young is determined by external conditions, or if it is such as to adapt the possessor more thoroughly to the conditions under which it is placed. On the other hand, while variations may be thus permanently transmitted by heredity, yet this very tendency of the young to repeat the characters of the parent is also a check on variability, or the tendency of structure and attributes to change with the environment. It may be noted that while the strong tendency to hereditary transmission works in the majority of cases so as to perpetuate those most fitted to survive, it secures the same result in other cases by a converse action. The descent of disease in families tends ultimately to purify the race by accumulating incapacities which end in the extinction of the enfeebled strain.

HEREFORD (he're-ford), a city and parliamentary borough of England, capital of county of same name, on the left bank of the Wye. Pop. 21,382.—The county, which is entirely inland, and borders on Wales, has an area of 532,898 acres, of which about 500,000 are arable, meadow, and pasture. Wheat is the principal crop, but barley, oats, beans, pease, hops, and turnips are also extensively cultivated. Orchards are numerous, and a large quantity of excellent cider is made. Pop. 114,401.

HERETIC, one who embraces a heresy, that is, one who holds some theological doctrine which conflicts with the beliefs of the Catholic or universal church, but who, at the same time, calls himself a Christian. As early as 385 Priscillian was condemned to death as a heretic by the Spanish bishops at the council of Trèves; but the persecutions of heretics, properly so called, began in the pontificate of Gregory VII., in the 11th century. Spain, Italy, and France, from the 13th century, suffered much from these persecutions, but the states of Germany showed greater moderation. In England the burning of heretics was practiced before 1200, and long continued. Heresy is now left entirely to the cognizance of the ecclesiastical courts.

HERMAPH'RODITE, an animal in which the characteristics of both sexes are either really or apparently combined, especially an animal having the parts of generation both of male and female, so that reproduction can take place without the union of two individuals. Hermaphrodites are divided into true and spurious, the first exhibiting a real combination of the characteristic of the two sexes; while in the second the combination is only apparent. The animals in which the organs of the two sexes are normally combined in the same individual are confined to the invertebrate division of the animal kingdom, as for example certain groups of the inferior worms, molluscs, barnacles, etc. There are no real hermaphrodites in the human species.

HERMES, called by the Romans Mercurius, in Greek mythology the son of Zeus and Maia, the daughter of Atlas. He was born in Arcadia, and soon after his birth left his cradle and invented the lyre by stringing the shell of a tortoise with three or seven strings. The lyre, however, he resigned to Apollo, with whom it was ever after identified. Hermēs also invented the Pandean pipe. The ancients represent Hermēs as the herald and messengers of the gods. He conducted the souls of the departed to the lower world. He was the ideal embodiment of grace, dignity, and persuasiveness, but also of prudence, cunning, fraud, perjury, theft, and robbery. His cunning was frequently of service both to the gods and the heroes, and even to Zeus himself. Later writers ascribe to him the invention of dice, music, geometry, letters, etc. He was worshiped in all the cities of Greece, but Arcadia was the chief place of his worship, his festivals being called Hermæa. In the monuments he is rep-

Hermes.—Wall painting, Pompeii.

resented as in the flower of youth, or in the full power of early manhood. He often appears with small wings attached to his head and to his ankles. Among his symbols are the cock, the tortoise, a purse, etc., and especially his winged rod, the caduceus.

HERMES TRISMEGIS'TUS, a mythical personage, the reputed author of a great variety of works, probably written by Egyptian Neo-Platonists, who ascribed the authorship of the highest attainments of the human mind to Thoth, the Egyptian Hermes; regarding him as the source of all knowledge and inventions, the Logos incarnate, thrice greatest (Gr. tris megistos).

HERMETIC SEALING, the term used to denote a very old process in which a glass vessel, such as a tube or flask, has its neck so fused together that no part of the contained matter can escape, and nothing foreign can get in.

HERMIT-CRAB, a name common to a family of well-known decapod crustaceans. These crabs take possession of and occupy the cast-off univalve shells of various molluscs, carrying this habitation about with them, and changing it for a larger one as they increase in size.

HERMON, a mountain of Syria, belonging to the Anti-Lebanon, about 9400 feet high.

HERNANDIA, a genus of large East Indian trees. They have alternate entire leaves and flowers arranged in axillary or terminal spikes or corymbs. H. Sonora, or Jack-in-the-box, is so called from the noise made by the wind whistling through its persistent involucels. The fibrous roots chewed and applied to wounds caused by the Macassar poison form an effectual cure, and the juice of the leaves is a powerful depilatory.

HERNIA, in surgery, a tumor formed by the displacement of a soft part, which protrudes by a natural or accidental opening from the cavity in which it is contained. The brain, the heart, the lungs, and most of the abdominal viscera may become totally or partially displaced, and thus give rise to the formation of hernial tumors. But the term is ordinarily applied to abdominal hernia.

Every part of the abdomen may become the seat of hernia, but it most commonly appears in the anterior and inferior region, which, being destitute in a great measure of muscular fibers, and containing the natural openings, offers less resistance to the displacement of the viscera. Most of the viscera, when displaced, push the peritoneum forward

Hernandia Sonora (Jack-in-the-box).

before them: this membrane thus formed an envelope of the hernia, which is called the hernial sac. The hernia itself is usually a loop of the small bowel, and though it has been pushed through the wall of the abdomen, forming a tumor under the skin, the fæces still pass along it. If the hernia can be returned to the abdomen, it is said to be reducible; if, from its size or other cause, it cannot be replaced, it is irreducible. A hernia is said to be strangulated when it is not only irreducible, but also subjected to a continual constriction, which interferes with the circulation through the blood-vessels of the part and the passage of the fæces. It may be rapidly fatal. Constriction may be produced by different causes, but generally occurs at the margins of the opening through which the hernia protrudes. As soon as a patient perceives that he is affected with a hernia he should have recourse to medical advice, for the disease is then in its most favorable state for treatment. The hernia when it is reduced must be prevented from recurring by the constant pressure of a pad or truss. An irreducible hernia must be supported with great care. All violent exercises, and excess in diet, must be avoided. The strangulated hernia requires prompt relief, and may necessitate an operation.

HERO, a Greek priestess of Aphroditē at Sestos, on the coast of Thrace, for love of whom Leander, a youth of Abydos, swam every night across the Hellespont, guided by a torch from her tower. He was at length drowned in the attempt and his body washed ashore, when Hero, overcome with anguish, threw herself from the tower on the corpse of her lover, and perished. There is a Greek poem by Musæus on this subject.

HER'OD, called the Great, King of the Jews, was a native of Ascalon, in Judea, where he was born about 74 B.C. The birth of Jesus Christ is said to have taken place in the last year of the reign of Herod, viz. B.C. 4, the year also signalized by the massacre of the children of Bethlehem. Herod's policy and influence gave a great temporary splendor to the Jewish nation, but he was also the first to shake the foundation of the Jewish government, by dissolving the national council, and appointing the high-priests and removing them at pleasure, without regard to the laws of succession.

HEROD AGRIPPA I., son of Aristobulus by Bernice, daughter of Herod the Great. From his attachment to Caligula he was imprisoned by Tiberius, but on the accession of Caligula (A.D. 37) he received the government of part of Palestine, and latterly all the dominions of Herod the Great. To please the Jews, with whom his rule was very popular, he caused St. James to be put to death, and imprisoned St. Peter. He died in the circumstances related in Acts xii., in A.D. 44.

HEROD AGRIPPA II., son of the preceding, and last of the Herodian line. He is supposed to have died in Rome, A.D. 94.

HEROD AN'TIPAS, son of Herod the Great by his fifth wife, Cleopatra, was appointed tetrarch of Galilee on his death (B.C. 4). This was the Herod who put to death St. John the Baptist, in compliment to his wife Herodias in revenge for his reproaches of their incestuous union. Having visited Rome he was accused of having been concerned in the conspiracy of Sejanus, and was stripped of his dominions, and sent (A.D. 39) with his wife into exile at Lugdunum (Lyons), or, as some say, to Spain, where he died.

HEROD'OTUS, the oldest Greek historian whose works have come down to us, the "father of history," born at Halicarnassus in Asia Minor about B.C. 484. Before writing his history he traveled extensively, visiting the shores of the Hellespont and the Euxine, Scythia, Syria, Palestine, Babylon and Ecbatana, Egypt as far as Elephantine and other parts of northern Africa, everywhere investigating the manners, customs, and religion of the people, the history of the country, productions of the soil, etc. On returning home he found that Lygdamis had usurped the supreme authority in Halicarnassus, and put to death the noblest citizens, among others his uncle, the epic poet Panyasis, and Herodotus was forced to seek an asylum in the island of Samos. Having formed a conspiracy with several exiles he returned to Halicarnassus and drove out the usurper, but the nobles who had acted with him immediately formed an aristocracy more oppressive than the government of the banished tyrant, and Herodotus withdrew to the recently founded colony of Thurii, in Italy, where he seems to have spent most of his remaining life. Here, at an advanced age, we are told by Pliny, he wrote his immortal work, a statement strengthened by the fact that events are noticed in the body of the book which occurred so late as 409 B.C., while its abrupt ending proves almost beyond question that he was prevented by death from completing it. The history is divided into nine books, each bearing the name of a muse, and is written in the Ionic dialect.

HEROES, a name applied by the Greeks to mythical personages who formed an intermediate link between men and gods. There were six great heroic races, descended respectively from Prometheus and Deucalion, Inachus, Agenor, Danaus, Pelops or Tantalus, and Cecrops. Individual families as, for instance, the Æacidæ, Atridæ, Heraclidæ, belong to one or another of these races.

HERON, the name common of birds constituting with the bitterns type of what is now commonly regarded as a separate order of birds, the Herodiones. The herons are very numerous, and al-

Common heron.

most universally spread over the globe. They are distinguished by having a long bill cleft beneath the eyes, a compressed body, long slender legs naked above the tarsal joint, three toes in front, the two outer united by a membrane, and by moderate wings. The tail is short, rounded, and composed of ten or twelve feathers. The common heron is about 3 feet in length from the point of the bill to the end of the tail, builds its nest in high trees, many being sometimes on one tree.

HERRICK, Robert, an English poet, born in London, 1591, died in Oct., 1674. His compositions were published in 1648, under the title of Hesperides, or the Works, both Humane and Divine, of Robert Herrick. It is a delightful collection of love lyrics, epigrams, sketches of rural scenery, etc.

HERRING, the general name of the common herring. It is of wide distribution in the North Atlantic, 45° n. lat. being about the southern limit. It measures from 10 to 12 inches in length, with blue-green back and brilliant silvery white under parts. It has small teeth in both jaws, and is of an elegant shape, the body being much compressed. It was formerly supposed that the herrings migrated in two great shoals every summer from the Polar Seas to the coasts of Britain and France, returning in the winter, but the migration is probably only from a deeper part of the ocean to a shallower. The feeding ground of the herring is probably the mud deposits found in the deeper parts of the sea, and it seems to be a fact that during their visits to the shallower waters of the coast for the purpose of spawning they do not feed, or feed very little. In summer the herring leaves the deep water where it has passed the winter and spring months, and seeks the coast where it may deposit its ova, and where they may be exposed to the influence of oxygen, heat, and sun-light, which are essential to their development. They are generally followed by multitudes of hakes, dog-fishes, etc., and gulls and other sea-birds hover over the shoals. They swim near the surface, and are therefore easily taken by net. So great is their fecundity that the enormous number taken appears to produce no

diminution of their abundance, as many as 68,000 eggs having been counted in the roe of one female.

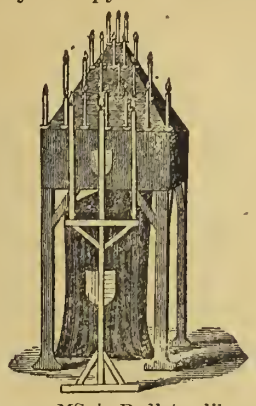
HERSCHEL, Sir John Frederick William, only son of Sir William Herschel, was born in 1792 at Slough, near Windsor, died in 1871. In 1834 he established at his own expense, an observatory at Feldhuysen, near Cape Town, his object being to discover whether the distribution of the stars in the southern hemisphere correspond with the results of his father's labors in the north. He returned to England in 1838, and in 1847 was published Results of Astronomical Observations made during 1834–38 at the Cape of Good Hope, being the Completion of a Telescopic Survey of the Whole Surface of the Visible Heavens.

HERSCHEL, Sir William, astronomer, son of a musician of Hanover, born 1738, died 1822. He came to England in 1757, and was employed in the formation of a military band, and in conduct-

Sir William Herschel.

ing, while organist at Bath, several concerts, oratorios, etc. Although enthusiastically fond of music, he had for some time devoted his leisure hours to the study of mathematics and astronomy; and being dissatisfied with the only telescopes within his reach, he set about constructing instruments for himself. Late in 1779 he began a regular survey of the heavens, star by star, with a 7-foot reflector, and discovered, March 13, 1781, a new primary planet, named by him the Georgium Sidus, but now known as Urānus. This discovery extended his fame throughout the world, and brought him a pension of $2,000 a year, with the title of private astronomer to the king. Assiduously continuing his observations, he measured the rotation of Saturn, discovered two of his satellites, and observed the phenomena of its rings. He also discovered the satellites of Uranus, and observed the volcanic structure of the lunar mountains. At Slough, near Windsor, he erected a telescope of 40 feet length, and completed it in 1787. Herschel received much assistance in making and recording observations from his sister Caroline; and latterly his brother, a skilful optical instrument maker, lent him valuable aid. In 1802 he laid before the Royal Society a catalogue of 5000 nebulæ and clusters of stars which he had discovered. He was made D.C.L. by the University of Oxford, and in 1816 was knighted.

HERSE, Hearse, a framework whereon lighted candles were placed at the obsequies of distinguished persons. The funeral herse of the middle ages was a temporary canopy covered with wax-



Herse.—MS. in Bodleian library.

lights, and set up in the church; the coffin was placed under the herse during the funeral ceremonies. Sometimes it was a very elaborate structure. The name has been transferred to the modern carriage for bearing a dead body to the grave.

HERTFORD, town and former parl. borough of England, capital of the county of same name, on the Lea, 19 miles north of London. Pop. 9322.—The county of Hertford is bounded by Cambridgeshire, Essex, Middlesex, Buckingham, and Bedford; area, 405,141 acres, of which about five-sixths are arable, meadow, and pasture. The general aspect of the county is pleasing, being diversified by hill and valley, pasture lands, arable farms, and picturesque parks and woods. The principal rivers are the Lea and Colne, both of which have numerous tributaries. Agriculture employs a large number of the inhabitants. Pop. 250,350.

HERZEGOVINA (hert-se-go-vē'nà), a province of the Balkan peninsula, now under the Austrian sway, bounded on the n. by Croatia and Bosnia, on the e. by Novibazar, on the s.e. by Montenegro, and on the s. and w. by Dalmatia; area, 700 sq. miles. The surface is generally mountainous, but contains many fertile valleys. Pop. about 220,000.

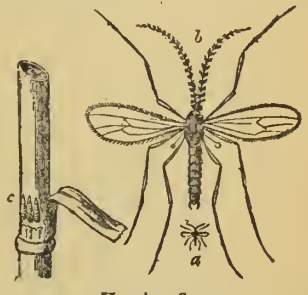
HESPER'IDES (-dēz), in Greek mythology, certain nymphs who lived in gardens, of rather uncertain locality, as guardians of the golden apples that grew there, being assisted in the charge by a dragon.

HES'PERUS, among the ancient Greeks, a name of the evening star (the planet Venus).

HESSE, or **HESSEN,** Grand-duchy of, formerly known as Hessen-Darmstadt, an independent state of South Germany, consisting of sundry distinct portions. Area of whole grand-duchy, 2964 sq. miles. About two-thirds of the inhabitants are protestants. Pop. 1,119,893.

HESSE-NASSAU, or **HESSEN-NASSAU,** a province of Prussia, formed out of the former Principality of Hesse-Cassel, the Duchy of Nassau, the Landgraviate of Hesse-Homburg, the territory and town of Frankfort, etc. It borders on the Prussian provinces of Westphalia, Hanover, Saxony, and the Rhineland, the Kingdom of Bavaria, etc., and incloses Upper Hesse. The boundary is partly formed by the Rhine, Main, Weser, and Werra. Other rivers are the Lahn and Eulda. The greater part of this province belongs to the central German plateau, and has a rugged surface, partly covered by branches of the Harz. Still, about 40 per cent of the whole is arable, while about the same is under wood. The chief mineral is iron. Mineral springs are numerous. The manufactures consist chiefly of woolens, cottons, and linen. The principal towns are Cassell, the capital, Wiesbaden, and Frankfort. Pop. 1,897,981.

HESSIAN FLY, a fly, the larva of which is very destructive to wheat, barley, and rye crops (it does not attack oats). It is so named from the unfounded belief, prevalent in America, where it is specially destructive, that it was brought over to that country in the baggage of the Hessian mercenaries employed against the Americans in the war of independence. The female fly is about the eighth of an inch in length,



Hessian-fly.
a, Male (natural size). *b*, Male (magnified) *c*, Pupæ fixed on the joint of the wheat-stalk.

with a wing expanse of about a quarter of an inch. Its body is brown, with the upper parts, the thorax, and the head of a darker shade, approaching to black. The wings are of a dusky gray, and are surrounded with fringes. The male is somewhat smaller than the female and has longer antennæ. The female flies usually lay their eggs on the young plants twice in the year, in May and September, out of which eggs the maggots hatch in from four to fourteen days. These work themselves in between the leaf-sheath and the steam, and fix themselves near the lowest joints, often near the root, and suck the juices of the stem, so that the ear falls down at a sharp angle. These maggots turn to pupæ, from which the flies develop in about ten days.

HETMAN, or **ATAMAN,** the title of the head (general) of the Cossacks. This dignity was abolished among the Cossacks of the Ukraine by Catharine the Great, and although the Cossacks of the Don still retain their hetman, the former freedom of election is gone, and the title of chief hetman is now held by the Russian heir-apparent to the crown.

HEWITT (hū'ĭt), Abram Stevens, American manufacturer and politician, was born in 1822 at Haverstraw, N. Y. He studied law and was admitted to the bar in 1844. He served in congress in 1871–79 and 1881–86, and was chairman of the national democratic com-

mittee which directed the Tilden campaign in 1876. In 1886 he was elected mayor of New York City, defeating Henry George and Theodore Roosevelt. He was chosen chairman of the trustees of the Carnegie institution at its organization in 1901. He died in 1903.

HEXAM'ETER, a verse of six feet, the heroic or epic measure of the Greeks and Romans. The sixth foot is always a spondee (two long syllables) or a trochee (a long and a short). The five first may be all dactyls (two short syllables and one long), or all spondees, or a mixture of both. The scheme of this verse then is—

⏑⏑ | ⏑⏑ | ⏑⏑ | ⏑⏑ | ⏑⏑ | – ⏑
or, – – | – – | – – | – – | – – | – ⏑

with all the varieties which the mingling of the two kinds of feet affords. In modern poetry the hexameters has been frequently used. In English hexameters accent is almost entirely substituted for length, and trochees generally take the place of spondees. Longfellow in his Evangeline, Kingsley in his Andromeda, and Clough in his Bothie have adopted this form of verse. The following lines are specimens of Clough's English hexameters:

O let us | try, he | answered, the | waters them | selves will sup | port us, |
Yea very | ripples and | waves will | form to a | boat under | neath us.

HEX'ASTYLE, in architecture, a term

Hexastyle front of the ancient Roman temple called the Maison Carrée, at Nimes, France.

applied to a portico or temple which has six columns in front.

HEYSE (hī'zĕ), Paul Johann Ludwig, German novelist and dramatist, born at Berlin 1830, settled at Munich in 1854. He has written many plays, and short stories for newspapers and magazines, but his fame rests on his great novels, Die Kinder der Welt (The Children of the World), 1872; and Im Paradiese (The Paradise Club), 1875; generally recognized as among the most powerful and artistic works of modern German fiction.

HEZEKI'AH, the twelfth, and one of the best of the kings of Judah. He succeeded Ahaz about 717 B.C., and died about 698 B.C.

HIBERNATION. See Dormant State.

HIBER'NIA, the ancient name of Ireland, applied to it first by Julius Cæsar. Aristotle mentions this island by the name of Ierne; Pomponius Mela calls it Iverna; Ptolemy, Iuvernia.

HIBERNIANS, Ancient Order of, a society instituted originally for the protection of the Catholic priesthood and religion in Ireland, but it has now as its main object "the advancement of the principles of Irish nationality." According to some authorities the order was first instituted in 1642, following the great uprising in the north; according to others, in 1651, when Cromwell had proclaimed nearly the whole native population outlawed, and had put a price upon the head of every priest and made it death to attend a Catholic service. The founder was Rory Og O'Moo, and the society was at first known as The Defenders. On the establishment of Catholic emancipation, in 1829, the society was reorganized under its present name as a beneficial and nationalist organization. It was introduced into the United States in 1836. Its membership is restricted to persons of Irish birth or descent and of Catholic faith. Military drill is a prominent feature in some of the branches. The order is an active supporter of the present Gaelic movement, having endowed a Celtic chair at the Catholic University of America, and contributed generously toward the support of Gaelic organizers in Ireland.

HIBIS'CUS, an extensive genus of plants, chiefly natives of tropical climates. They have large showy flowers, borne singly upon stalks toward the ends of the branches, these flowers having an outer calyx of numerous leaves in addition to the true five-lobed persistent calyx. They are chiefly shrubs, one or two being herbs, and a few attaining the dimensions of trees. The species are remarkable for abounding in mucilage and for the tenacity of the fiber of their bark, whence several are employed for many economical purposes in the different countries where they are indigenous.

Hibiscus.
a, Flower cut longitudinally. *b*, Stamen. *c*, Fruit. *d*, Embryo.

HICCUP, or **HICCOUGH,** is a convulsive catch of the respiratory muscles, with sonorous inspiration, repeated at short intervals. Though generally a trivial and transient inconvenience, its occurrence in the last stages of acute disease is a grave, and often a fatal symptom. The frequent swallowing of small pieces of ice, or small doses of anti-spasmodic medicines, usually relieves a severe fit.

HICK'ORY, the name given to several species of timber-trees. They are natives of North America, and are remarkable for stateliness and general beauty. The wood is heavy, strong, and tenacious, and is used for making carriage-shafts, screws, whip-handles, cogged wheels, etc. The shag-bark yields the hickory-nut of commerce, and its wood is very valuable.

Flowering branch and fruit of hickory.
a, Male flower, *b*, Female flower.

HIDALGO, a Spanish nobleman of the lower class. There were hidalgos de naturaleza, of noble birth, and hidalgos de privilegio, that is, those on whom the king had conferred nobility, and those who purchased nobility. The title is now obsolete.

HIDES, the skins of animals, either raw or dressed; but the name is more commonly given to the undressed skins of the larger domestic animals, as oxen, horses, etc., the smaller being called skins. The hide trade is now an important one.

HI'ERARCHY, sacred government, sometimes the church, sometimes the rule which the ecclesiastical governing body exercised as at once priests and civil magistrates. In the former sense the hierarchy arose with the establishment of the Christian church as an independent society. In the middle ages the papal hierarchy gathered great strength, and the pope became a spiritual monarch, ruling western Christendom with power but feebly limited by princes and councils. A reactionary movement began in the 14th century, and the general tendency of subsequent events has always been to make the civil and hierarchical power more and more independent of each other. The term hierarchy as used to denote the governing and ministering body in the church, according to its several gradations, can strictly be applied only to those churches which are ruled by bishops, such as the Roman Catholic Church and the Anglican Church, which also holds the theory of a hierarchical gradation of rank and authority. Both these churches comprise the three orders of bishops, priests, and deacons.

HIEROGLYPHICS, a term originally applied to the inscriptions sculptured on buildings in Egypt, in the belief that the writing was confined to sacred subjects, and legible only to the priests. The term has also been applied to picture-writing in general, such as that of the Mexicans and the still ruder pictures of the North American Indians. Three different modes of writing were used by the ancient Egyptians, the Hieroglyphic, the Hieratic, and the Demotic. Pure hieroglyphic writing is the earliest, and con-

sists of figures of material objects from every sphere of nature and art, with certain mathematical and arbitrary symbols. Next was developed the hieratic or priestly writing, the form in which most Egyptian literature is written, and in which the symbols almost cease to be recognizable as figures of objects. Hieratic writings of the third millennium B.C. are extant. In the demotic or enchorial writing, derived directly from the hieratic, the symbols are still more obscured. The demotic was first used in the 9th century B.C., and was chiefly employed in social and commercial intercourse. Down to the end of the 18th century scholars failed to find a clue to the hieroglyphic writings. In 1799, however, M. Bouchard, a French captain of engineers, discovered at Rosetta the celebrated stone which afforded European scholars a key to the language and writing of the ancient Egyptians. It contained a trilingual inscription in hieroglyphics, demotic characters, and Greek, which turned out to be a decree of the priests in honor of Ptolemy V., issued in 195 B.C. The last paragraph of the Greek inscription stated that two translations, one in the sacred and the other in the popular Egyptian language, would be found adjacent to it. The discovery of an alphabet was the first task. The demotic part of the inscription was first examined by De Sacy and Akerblad, and the signification of a number of the symbols ascertained. The hieroglyphic part was next carefully examined and compared with the demotic and Greek. At last after much study Champollion and Dr. Thomas Young, independently of each other, discovered the method of reading the characters (1822), and thus provided a clue to the decipherment of the ancient Egyptian writing.

Cartouche of Cleopatra.

Hieroglyphic characters are either ideographic, i.e. using well-known objects as symbols of conceptions, or phonetic, i. e. representing words by symbols standing for their sounds. The phonetic signs are again divided into alphabetical signs and syllabic signs. Many of the ideographic characters are simple enough; thus the figure of a man, a woman, a calf, indicate simply those objects. Others, however, are less simple, and convey their meaning figuratively or symbolically. Water was expressed by three zigzag lines, one above the other, to represent waves or ripples of running water, milk by a milk-jar, oil by an oil-jar, fishing by a pelican seizing a fish; i.e. fishing; seeing and sight by an eye; and so on. The nature of the phonetic hieroglyphs, which represent simply sounds, will be understood from an explanation of the accompanying cuts.

1. The first hieroglyph in the name of Kleopatra is a knee, which is kne or kle in Coptic, and represents the K of Kleopatra. K does not occur in the name Ptolemaios. 2. The second hieroglyph in Kleopatra is a lion couchant, which is laboi in Coptic, and labu in the old Egyptian, and represents the L of both names. In Kleopatra it occupies the second place, and in Ptolemaios the fourth. 3. The third hieroglyph in Kleopatra is a reed, which is aké in Coptic and aak in the old Egyptian, and represents the E of Kleopatra. The reed is doubled in Ptolemaios and occupies the sixth and seventh places, where it represents the diphthong ai of Ptolemaios. 4. The fourth hieroglyph in Kleopatra is a noose, which represents the O of both names, and occurs in the third place of Ptolemaios. 5. The fifth hieroglyph in Kleopatra is a mat, which represents the P of both names, and is the initial of Ptolemaios. 6. The sixth hieroglyph in Kleopatra is an eagle, which is akhoom in Coptic, and represents the A, which is found twice in the name Kleopatra, but does not occur in the name Ptolemaios, although the diphthong ai occurs as described above, No. 3. 7. The seventh hieroglyph in Kleopatra is a hand, which is toot in Coptic, and represents the T of Kleopatra, but does not occur in Ptolemaios, where it might be expected to occupy the second place. The second place of Ptolemaios is occupied by a semicircle, which is found at the end of feminine proper names, and is the Coptic feminine article T. The researches of Champollion satisfied him

Cartouche of Ptolemy.

of the existence of homophones, or characters having the same phonetic value and which might be interchanged in writing proper names. 8. The eighth hieroglyph in Kleopatra is a mouth, which is ro in Coptic, and represents the R of Kleopatra. 9. The ninth hieroglyphic in Kleopatra is the eagle, which is explained in No. 6 above. 10. The semicircle is the T of Ptolemaios, which with 11, the egg found at the end of proper names of women, is a feminine affix. In the name of Ptolemaios there is still the M and the S to account for. The fifth hieroglyph in the cartouche of Ptolemaios is a geometrical figure, consisting of three sides of (probably?) a parallelogram, but now called a hole, because the Coptic mu has that signification, and represents the M. The hook represents the S of the word Ptolemaios. Vowels were only regarded by the Egyptians as they were needed to avoid ambiguous writing.

There are groups of hieroglyphs of which one element is an ideographicl sign, to which a phonetic complement is added to indicate the pronunciation of the ideographic sign. The words of a text could be written in hieroglyphs in three ways—1. By phonetic hieroglyphs; 2. By idcographic hieroglyphs; and 3. By a combination of both. According to Ebers, in the perfected system of hieroglyphics the symbols for sounds and syllables are to be regarded as the foundation of the writing, while symbols for ideas are interspersed with them, partly to render the meaning more intelligible, and partly for ornamental purposes, or with a view to keep up the mystic character of the hieroglyphics.

HIGGINS, CHARLES; editor; born in Brooklyn, N. Y., 1860; began his career as editor in Toronto, Canada; removed to Chicago in 1878, managing editor of Americanized Encyclopædia; editor World's History and its Makers.

HIGH CHURCH, a term applied to a party in the Church of England. It was applied first to a party among the younger clergy during the latter part of the reign of Elizabeth who asserted that Calvanism was inconsistent with the ancient doctrine and constitution of the primitive church, and who claimed a divine right for episcopacy. Bishop Andrewes was the chief writer of this party, and Laud became its most active leader. The term now generally refers to those who exalt the authority and jurisdiction of the church, and attach great value to ecclesiastical dignities

HIGH GERMAN, originally the Teutonic dialect spoken in the southern and elevated parts of Germany, as distinguished from Platt Deutsch or Low German, spoken in the northern and more lowland portions of Germany. See Germany.

HIGHLANDS OF SCOTLAND, a somewhat vague and indefinite geographical division of Scotland, n. and w. of a line running n.e. from Dumbarton on the Clyde through the counties of Dumbarton, Stirling, Perth, Forfar, Kincardine; then n.w. through Aberdeen, Banff, Moray, and Nairn to the shores of the Moray Firth. The Highlands are generally subdivided into two parts, the West Highlands and the North Highlands; the former of which contains the shires of Argyll and Bute, the Southern Hebrides, and part of Perth and Dumbarton.

HIGH PLACES, in scripture, eminences or mounds on which sacrifices were offered. Altars and places of worship were erected from early times on high places, for the worship of Jehovah. Latterly such a practice, as leading to idolatrous observances, was strictly forbidden among the Jews. High places are frequently mentioned in conjunction with groves.

HIGH-PRIEST, the head of the Jewish priesthood. In the books of Moses the holder of this dignity is simply designated the priest; the epithet high occurs on one or two occasions, but as a distinctive epithet it appears to have been added subsequently. The formal consecration of Aaron, the brother of Moses, together with his sons, to a hereditary priesthood, is recorded in Exod. xxviii. The high-priesthood continued in the tine of Aaron, sometimes in one, and sometimes in another branch of it, until the coming of Christ. From B.C. 153 till the time of Herod the Great the regal and priestly authority were united in members of the Asmonæan family (the

Maccabees). After the subjugation of the Jews the high-priesthood was often arbitrarily conferred by the foreign masters. In the time of our Saviour it appears to have been held by several priests alternately.

HIGH-SEAS, the open sea or ocean. The claims of various nations to exclusive rights and superiority over extensive tracts of the ocean-highway have been settled after much controversy by a general international law. The principle now accepted is that the jurisdiction of maritime states extends only for 3 miles, or within cannon range of their own coasts; the remainder of the seas being high-seas, accessible on equal terms to all nations. Inland seas and estuaries, of course, are excepted.

HIL'DRETH, Richard, American historian, was born at Deerfield, Mass., in 1807. He graduated at Harvard college in 1826, studied law, and began to practice in Boston in 1830. In 1832, however, he abandoned his profession to become editor of the Boston Atlas. In 1840 appeared his Despotism in America, a work on the political, economical, and social aspects of slavery. The work however, for which he is most remembered is his History of the United States, in six volumes (1849–56), in which he presents the founders of the republic in their true character, without trying to heighten their virtues or disguise their mistakes and faults. In 1855 Hildreth published Japan as It Was and Is, and in 1856 Atrocious Judges, based on Campbell's Lives. For several years, ending with the inauguration of Lincoln as president, he was engaged on the staff of the New York Tribune. He went abroad in the summer of 1861 as United States consul at Triest, and died in Florence in 1865.

HILL, Ambrose Powell, American soldier, was born in Culpepper co., Va., in 1825. He graduated at the United States military academy in 1847, entered the first artillery, and was made second lieutenant. He served in the Mexican war and afterward on the frontier and in Florida. Later he was promoted to captain. At the outbreak of the civil war he entered the confederate service, was appointed colonel of the thirteenth regiment Virginia volunteers, and ordered to Harper's Ferry. He fought at the first battle of Bull Run, and at Chancellorville it was his troops who, on being moved to the front, mistook Jackson's escort for federals and fired the fatal volley that caused Jackson's death. On the reorganization of his army in 1863 Lee gave one corps to Hill and at the same time made him lieutenant-general. He was killed in 1865 at Petersburg while reconnoitering.

HILL, Daniel Harvey, American soldier and educator, was born in South Carolina in 1821. He served in the Mexican war and was brevetted major. In 1861 he entered the confederate service and commanded at the battle of Big Bethel, and was soon afterward promoted to brigadier-general. He was appointed lieutenant-general in 1863 and was placed in command of a corps in General Bragg's army. From 1877 until 1884 he was president of the Arkansas industrial university, and from 1885 until his death of the Middle Georgia military and agricultural college. He died in 1889.

HILL, David Bennett, American politician, was born in Havana, N. Y., in 1843. He was admitted to the bar in 1864, and in 1870–71 served in the state legislature. In 1882 he was elected mayor of Elmira; in November of the same year, lieutenant-governor of New York state, and in 1884, when Grover Cleveland resigned the position of governor, Mr. Hill took his place. In 1885 he was elected governor for the term expiring in 1888, and was re-elected in that year. He was a prominent candidate for the presidency on the democratic ticket in 1892. He became United States senator for New York state, but failed of re-election because the state legislature elected in 1896 was republican.

HILL, James J., American railway promoter, was born near Guelph, Ont., in 1838. In 1870 he formed the Red River transportation company, which was the first to open communication between Saint Paul and Winnipeg. Eight years afterward he helped to form the syndicate which, under another name, ultimately built the Canadian Pacific railway. From 1883 to 1893 he interested himself in the building of the Great Northern railway, extending from Lake Superior to Puget Sound, with northern and southern branches and a direct steamship connection with China and Japan.

HILL, Sir Rowland, K.C.B., English postal reformer, born at Kidderminster 1795, died 1879. In 1837 he published a pamphlet recommending the adoption of a low and uniform rate of postage throughout the United Kingdom. The scheme was approved by a committee of the House of Commons, which examined its details in 1838, and early in 1840 the penny postage system was carried into effect with the assistance of Mr. Hill, who, for this purpose, received an appointment in the treasury. In 1846 he received a public testimonial of the value of upward of $65,000. In 1846, he was made secretary to the postmaster-general, and in 1854 chief secretary to the post office. In 1860 he became K.C.B. He retired from the post office four years later with a pension of $10,000, besides a grant of $100,000 voted by parliament.

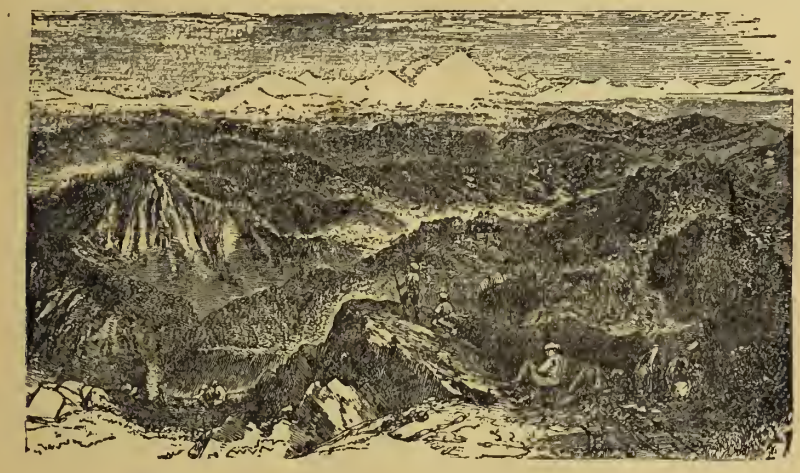
HILL, Rowland (Viscount Hill), British general, born 1772, died 1842. He entered the army in his sixteenth year, obtained the rank of captain in 1793, and became colonel of the 90th Regiment in 1800. He took part in the Egyptian campaign, and in 1806 was made major-general. In 1809 he became lieutenant-general; in 1812 he was made a K.B.; and in 1814, a peer by the title of Baron of Almarez, and of Hawkstone. At Waterloo he commanded the right wing of the British, and he was personally thanked by Wellington for his services. In 1828 he was appointed general commanding-in-chief of the British army, a post which he held till 1842, when he retired and was made a viscount.

HILLEL, Jewish rabbi, born at Babylon about B.C. 112. He came to Jerusalem, it is said, at about forty years of age, became president of the Sanhedrim and founder of the school of Hillel. Shammai, another member of the Sanhedrim, became the head of a rival and hostile school. Hillel's party was the more liberal of the two, and became the dominant one.

Viscount Hill.

HIMALAYA, a chain of snowy mountains in Asia, the most elevated on the earth, which separates the Indian Peninsula from the plateau of Tibet, between the 72d and 96th degrees of e. lon., or between the Indus on the west and the Brahmaputra on the east; length about 1500 miles, average breadth about 180 miles. The great plains of India, south of the Himalaya, has a general elevation of 1000 feet above the sea. The general height of the Himalayas is double that of the Alps; the passes over the former ordinarily exceed, often by half a mile, the elevation of Mont Blanc. The Ibi-Gamin pass in Garhwal, the highest of all, is 20,457 feet, the Mustagh 19,019 feet, the Parangla 18,500 feet, the Kronbrung 18,313 feet, and the Dura Ghat 17,750 feet high. There are several summits in the Himalaya which approach closely to double the absolute elevation of the highest of the Alps, and 120 of them are stated to be above 20,000 feet. The rivers of the Punjab ("Five Waters") spring from a portion of the great chain which may be considered a distinct group under the title of the northwestern Himalaya. Some of the peaks here rise to a height of 24,000 to 25,000 feet; or to 28,278 feet if the Karakorum is regarded as part of the Himalayas. In the Central or Middle Himalaya rise the sources of the Ganges and Jumna, in a region regarded by the Hindus as holy ground. Farther eastward, in Nepal, is the highest part of the Himalya, as far as it is known and measured. Dhawalagiri has an elevation of 26,826 feet, the Gaurisankar or Mount Everest, the highest known mountain in the world, is 29,002 feet; the Yassa group rises to the height of 26,680 feet, the Ibjibia group to 26,306. Going farther east, in Sikkim, or on its borders, we find Kanchinjinga, the western peak of which is 28,156 feet high, the eastern, 27,815 feet, while the Kabru ridge rises to 24,015 feet. Sikkim forms a comparatively narrow but interesting territory, walled in on three sides by stupendous mountains from 17,000 to 28,000 feet high. Here ter-

minates the region of the Middle Himalaya, most of the streams from which unite in the Ganges. The eastern Himalaya, which extends from Sikkim east to the Brahmaputra and completes the chain, sends all its waters to the last-named river, and is all comprised in Bhutan. A little to the east of Sikkim, Chamalari attains the height of 23,944 feet. About 250 miles further east a conspicuous group has been observed with two peaks, named the Gemini or Twins, 21,500 feet high. Thence toward the east the mountains sink rapidly, but the range may be traced beyond the right bank of the Brahmaputra. This stream, as well as the Indus, rises on the little-known north side of the Himalaya, their sources not being far apart. The snowy ridge of the Himalayas, as far as examined, consists everywhere of granite, with which are immediately associated gneiss and mica-slate, followed, in descending, by metamorphic and secondary rocks till we arrive at the more recent alluvial deposits. Earthquakes are still frequent within this region; and hot springs gush forth in abundance, even from beneath the snow. The limit of perpetual snow in the middle division (lon. 78° e.) is stated to be about 15,500 feet on the south side and 18,500 feet on the northern. In Sikkim the snow-line descends on the south side to 14,500 feet, while on the north it rises to a level of 19,600 feet. Immense glaciers exist at various parts. The vegetation of the Himalayas is very rich, there being forests of pine, spruce, silver-fir, and deodar cedar at suitable elevations, with rhododendrons in profusion. Among the more characteristic animals are the yak, musk-deer, wild sheep, etc.



The snowy range of Himalayas, from Marma.

HINDUS, or **HINDOOS.** See India.

HINDUSTAN', the name commonly given to the whole Indian empire, but which properly applies only to the Punjab and the valley of the Ganges. See India.

HINDUSTA'NI, one of the chief languages of India, having various forms or dialects. When written in the Persian character, and containing many Persian words and phrases, it is known as Urdu; another form of it is Hindi.

HIP-JOINT, the joint of the hip, a ball-and-socket joint formed by the reception of the globular head of the femur or thigh-bone into the socket or acetabulum of the os innominatum. For flexion, extension, rotation, and strength combined it is the most perfect joint in the body.

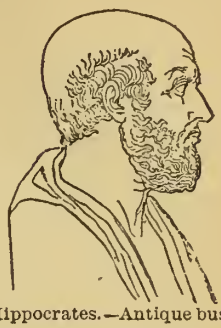
HIPPAR'CHUS, ancient Greek astronomer, was born at Nicæa in Bithynia, and lived about B.C. 160–125. He resided for some time at Rhodes, but afterward went to Alexandria, then the great school of science. A commentary on Aratus is the only work of his extant. He first ascertained the true length of the year, discovered the precession of the equinoxes, determined the revolutions and mean motions of the planets, prepared a catalogue of the fixed stars, etc.

HIP'PIAS, ruler of Athens, son of Pisistratus, after whose death (B.C. 527) he assumed the government, in conjunction with his brother Hipparchus. His tyranny became at last unbearable, and he was expelled from the city B.C. 510.

HIPPOCAM'PUS, a genus of fishes, closely allied to the pipe-fishes, of singular construction and peculiar habits; the upper parts have some resemblance to the head and neck of a horse in minature, which has suggested the name. When swimming they maintain a vertical position; their general length is from 6 to 10 inches, and they occur in the Mediterranean and Atlantic.

Hippocampus.

HIPPOC'RATES, the most famous among the Greek physicians, the father of medicine, born in the island of Cos B.C. 460. Besides practicing and teaching his profession at home he traveled on the continent of Greece, and died at an advanced age B.C. 357, at Larissa, in Thessaly.



Hippocrates.—Antique bust.

HIP'PODROME, the Greek name for the public place where the horse and chariot races were held. In Byzantine times the hippodrome at Constantinople acquired great renown, and factions originating in the hippodrome caused perpetual confusion in all departments of the public service. The name is sometimes applied to a modern circus.

HIPPOGRIFF, a fabulous animal or monster, half-horse, and half-griffin.

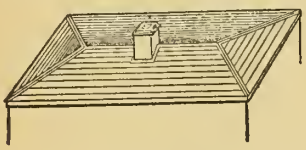
HIPPOL'YTUS, in Greek mythology, son of Theseus, whose stepmother, Phædra, fell in love with him, and accused him to his father in order to avenge herself for his indifference. He was put to death, but his innocence being afterward established, Phædra destroyed herself. See Phædra.

HIPPOPOT'AMUS, the typical genus of a family of Ungulates, of which two living species are known. One species is of large size, and is common throughout the greater part of Africa; the other, is not only smaller, but has other important differences, and is found only in the African west coast rivers, and those flowing into Lake Tchad. The former species has a thick and square head, a very large muzzle, small eyes and ears, thick and heavy body, short legs terminated by four toes, a short tail, two ventral teats, skin about 2 inches thick on the back and sides, and without hair, except at the extremity of the tail. The incisors and canines of the lower jaw are of great strength and size, the canines or tusks being long and curved forward. These tusks sometimes reach the length of 2 feet and more, and weigh upward of 6 lbs. The animal is killed by the natives partly as food, but also on account of the tusks and teeth, their hardness being superior to that of ivory, and less liable to turn yellow. The hippopotamus has been found of the length of 17 feet, and stands about 5 feet high. It delights in water, living

Hippopotamus.

in lakes, rivers, and estuaries, and feeding on water-plants or on the herbage growing near the water. It is an excellent swimmer and diver, and can remain under water a considerable time. The behemoth of Job is considered by commentators to be the hippopotamus, as the description of his size, manners, food, and haunts it not unlike those of the latter animal. Among the ancient Egyptians it was revered as a divinity, as it is among the negroes in some localities. Several extinct species are found in old-world tertiary and diluvial formations.

HIP-ROOF, a roof, the ends of which slope so as to have the same inclination



Hip-roof.

to the horizon as its other two sides, being thus of a triangular form.

HISPANIA. See Spain.

HISPANIO'LA. See Hayti.

HISSAR', a town of Hindustan, in the Punjab, administrative headquarters of district of the same name, on the western Jumma canal, 102 miles w. of Delhi. Pop. 17,000. The district has an area of 5163 sq. miles. Pop. 776,006.

HISTOL'OGY, the study of the tissues which enter into the formation of animals and plants, and their various organs, by means of the microscope and chemical and physical reagents. It may be described as a kind of minute anatomy. It comprehends the structure and mode of development of the various tissues, and is divided into animal histology and vegetable histology.

HISTORY, is used by Herodotus in the sense which it has since retained, of a narrative of events and circumstances relating to man in his social or civic condition. A record of bare facts by themselves does not constitute history. Such a record (forming a chronicle or annals) is chronologically valuable; but to attain the dignity of history we must have social events and evolution detailed with considerable fulness, and the growth and movements of society, from one phase to another, distinctly traced and recorded. The modern school of historians devote much attention to the social life of the people; their method being further characterized by the utmost accuracy, of research the extreme importance assigned to contemporary documentary evidence, and careful weighing of data.

HITCHCOCK, Edward, American geologist, born 1793, died 1864. He was connected with the state survey of Massachusetts, Vermont, and part of New York, valuable reports on which he published. He was author of various other works, some geological and some of miscellaneous character. These include Geology of the Connecticut Valley, a highly popular work on Elementary Geology, Illustrations of Surface Geology, Religion of Geology and its Connected Sciences, and Reminiscences, published shortly before his death.

HITCHCOCK, Roswell Dwight, D.D., LL.D., American theologian, born 1817, died 1887. He entered Andover theological seminary in 1838, and was successively professor of natural and revealed religion in Bowdoin, of church history at New York, president of the American Palestine exploration society, and president of Union theological seminary.

HITTITES, a Canaanitish nation first mentioned in connection with Abraham, who bought the field and cave of Machpelah from them. There are notices of them in Palestine during and after the captivity. Egyptian and Assyrian inscriptions seem to indicate that the nation consisted of a confederacy ruled by a number of chiefs, and at one time there was a Hittite empire extending over a large area in Asia Minor and Syria. Their chief territory was in the Orontes Valley.

HOANG-HO, or **YELLOW RIVER,** a large river in China, the sources of which are in mountains in the Koko-Nor territory, north from Tibet. After a winding course of several hundred miles, it proceeds nearly due north to about lat. 41°; then east for nearly 200 miles, when it suddenly bends round, and flows directly south for about another 200 miles; then turns abruptly east, and flows in that direction till it reaches Lung-men-kau, when it diverges to the north-east, and falls into the Gulf of Peche-le about lat. 37° 30′, and lon. 118° 30′. From the 13th century till 1853 the Hoang-Ho entered the sea in lat. 34°, south of the peninsula of Shan-tung, but at the latter date it took its present course. Since then vast sums have been spent in watching and strengthening the banks of the river, which is constantly overflowing at some point. In the autumn of 1887 the whole body of the river burst its banks about 300 miles from its mouth, and flooded about one-sixth of the province of Ho-nan, destroying towns and villages and causing a loss of life, the lowest estimate of which is one million. Its length is estimated at about 2600 miles. It derives its name from the vast quantities of yellow earth held in a state of solution by its waters.

HOAR, George Frisbie, American legislator, was born at Concord, Mass., in 1826. He was elected to congress in 1869 and was a member until 1877, when he was chosen senator and continuously re-elected until his death in 1904. Though he supported President McKinley for re-election, he strongly opposed his policy in the Philippines, which he considered subversive of American ideals.

HOARSENESS, an affection of the throat causing harshnesss and roughness of voice, due to irregular and imperfect bringing together of the vocal chords, most frequently from swelling of the mucous membrane of the chords, and excessive secretion of mucus in their neighborhood. It arises from a variety of causes, the most common of which is catarrh or cold. Simple hoarseness is treated with soothing remedies, the inhalation of the steam of boiling water, warm poultices to the neck, etc.

HOBART, Garret Augustus, American lawyer and politician, was born at Long Branch, N. J., in 1844. He was a member of the state assembly from 1873 to 1878 and of the state senate from 1879 to 1885. He was successively delegate at large for five times to the republican national convention. He was nominated at St. Louis in 1896 for vice-president on with McKinley and was elected to that office. He died in 1899.

HOBBES, Thomas, English moral and political philosopher, born 1588 at Malmesbury, died 1679. The most remarkable of his works is his Leviathan, or the Matter, Form, and Power of a Commonwealth (1651). Other works are De Cive (1642), De Corpore Politico (1650), De Libertate, Necessitate et Casu (1654), and Behemoth, a history of the civil war, published after his death. He also published a metrical version of the Iliad and Odyssey.

HO'BOKEN, a city in New Jersey, on the Hudson river, and close to Jersey City, which stretches immediately to the south. It lies opposite New York, with which it is connected by steam ferries. It has various manufactories, and among the public institutions is the Steven's institute of technology, with library and valuable scientific apparatus. Pop. 1909, about 75,000.

HOBSON, Richard Pearson, an American naval constructor, was born in 1870 in Greensboro, Ala. He entered the Southern university in 1882, but three years afterward accepted an appointment to the United States naval academy, where he graduated in 1889. During the war with Spain he was present at the bombardment of Matanzas, and took part in the expedition against San Juan de Puerto Rico; but his great achievement was the sinking of the collier Merrimac across the entrance to Santiago harbor before daylight, on June 3, 1898, in order to "bottle up" Cervera's fleet. After the war he raised and refitted several of the Spanish warships which had been sunk. He resigned from the navy in 1903. Among his publications are The Disappearing Gun Afloat, and the Sinking of the Merrimac. In 1906 he was elected to the United States Congress.

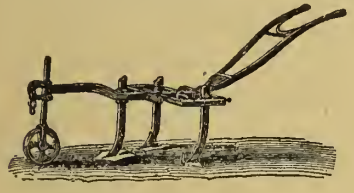
HOCHE, (ōsh), Lazare, general in the French revolutionary war, born 1768. He took service in the French guards when sixteen years old, and at the revolution joined the popular party. He greatly distinguished himself at the siege of Thionville and the defense of Dunkirk, and shortly afterward, when scarcely twenty-five years of age, received the command of the army on the Moselle. In 1793 he drove the Austrians out of Alsace, and soon after was arrested by the Jacobins and imprisoned at Paris. In 1794 he was released, and appointed commander of the army destined to quell the rising in the west, and afterward to that in La Vendée. In 1796 he conceived the plan of attacking Britain, by making a descent on Ireland. He accordingly set sail in December from Brest, but the expedition utterly failed, and he was obliged to return without having even effected a landing. After his return he received the command of the army of the Sambre and Meuse. He opened the campaign of 1797 by a bold passage over the Rhine, and had defeated the Austrians

in several engagements, when he was stopped in the path of victory by the news of the armistice concluded in Italy. He died suddenly in September same year (1797).

HOCK, the name given to the German wines grown in the Hochheim district (see Hochheim). It is a white still wine, but is sometimes rendered sparkling. The name is also loosely applied to all the Rhenish wines.

HOCKEY, a game at ball known as shinty in Scotland, and hurling in Ireland. It is played with a club curved at the lower end, by a number of persons divided into two parties or sides; and the object of each side is to drive the ball into that part of the field marked off as their opponents' goal.

HOE, an instrument for cutting up weeds and loosening the earth in fields and gardens, in shape something like an adze, being a plate of iron, with an eye for a handle, which is set at a convenient



Horse-hoe.

angle with the plate. The Dutch hoe differs from the common hand hoe in having the cutting blade set like the blade of a spade. A horse-hoe is a frame wheel-mounted, and furnished with ranges of shares spaced so as to work in the intervals between the rows of turnips, potatoes, etc. It is used on farms for the same purpose as the hand hoe, and worked by horse-power.

HOG, a general name for the ungulate or hoofed animals, or swine. The head is prolonged into a pointed or truncated snout; the feet have four toes, two of which reach the ground; and the skin is very thick, and mostly covered with stiff bristles. The common hog in a tame state, is almost universal, except in very high latitudes. The prevailing color of the domestic animal is a dull yellowish white, sometimes marked irregularly with black, and sometimes totally black. It is omnivorous in its habits, devouring almost any vegetable or animal substance. It is also very prolific, has usually two litters in a year, a litter consisting of from ten to even twenty. The wild-boar, from which most of our domesticated varieties are derived, is found in most parts of Europe and Asia. In size the wild animal considerably exceeds the domesticated hog, the legs are longer and more muscular, and the back therefore much higher. Hunting this animal has always been a favorite amusement, and can still be practiced in various parts of Europe.

HO'GARTH, William, painter and satirical artist, born in London, 1697, died 1764. In 1729 he married the daughter of Sir James Thornhill, the painter, against her father's wishes, who is said, however, to have been mollified when Hogarth produced his celebrated series of pictures called the Harlot's Progress, a work which brought his great powers fairly before the public. The engravings of these, which became exceedingly popular, were published in 1734. This was followed by the Rake's Progress and Marriage à la Mode, two similar series of paintings and engravings, Industry and Idleness, Beer Street and

William Hogarth.

Gin Lane, The Election, The Enraged Musician, The Country-Inn Yard, The March to Finchley, Strolling Actresses Dressing in a Barn, Four Stages of Cruelty, and a host of other engravings, which all evinced his extraordinary powers of satire, wit, and imagination. The best edition of his works is that published by Boydell (London, 1790), the plates of which, retouched by Heath and others, have been repeatedly published since.

HOGSHEAD, an obsolete measure of capacity containing 63 old wine gallons, or 52½ imperial gallons. For beer it was 54 gallons, for rum 45 to 50 gallons, for brandy 45 to 60 gallons. In the United States the measure is still in use, being equivalent to 63 American gallons or 52.485 imperial gallons; for tobacco it varies from 750 lbs. in some states to 1200 lbs. in others.

HOHENZOLLERN (hō-en-tsol'ėrn), a small territory of Germany, since 1852 administrative division of Prussia. It consists of a long, narrow, irregular strip of country, entirely surrounded by Würtemberg and Baden. Area, 450 sq. miles. Pop. 66,720. The princely family of Hohenzollern dates from Thassilo, Count of Zollern, who died about 800 A.D. There have been several lines and branches, the main one being represented by the present imperial family of Germany.

HOLBACH (hol'bah), Paul Heinrich Dietrich, Baron von, philosopher, born at Heidelsheim, in the Palatinate, in 1723. He was educated in Paris, where he passed the greater part of his life, and died in 1789. He contributed many papers on natural history, politics and philosophy to the Encyclopédie. His principal work was the System of Nature. According to Holbach matter is one form of existence and everything is the effect of a blind necessity.

HOLBEIN (hol'bīn), Hans, an eminent German painter, born at Augsburg in 1497. He studied under his father, Hans Holbein the elder, a painter of considerable merit (1450–1526), and at an early age settled at Basel, where he exercised his art till about 1526. He then came to England, where letters from his friend Arasmus, whose Panegyric on Folly he had illustrated by a series of drawings, procured him the patronage of the chancellor Sir Thomas More. He was appointed court painter by Henry VIII.; and in the Windsor collection has left portraits of all the eminent Englishmen of the time. The most celebrated of his pictures are the Madonna at Darmstadt (better known through the replica at Dresden), representing the Burgomaster Meyer and his wives kneeling to the Virgin; and the Solothurn Madonna. His famous Dance of Death has only been preserved in the engraving of Lützelburger. There are a considerable number of engravings on wood and copper from Holbein's designs. He died at Whitehall of the plague in 1543.

HOLBERG, Ludwig, Baron, the father of modern Danish literature, was born at Bergen, in Norway, then part of the Danish dominions, in 1684; died at Copenhagen January 27, 1754. His works may be divided into four classes—poems, stage pieces, philosophical treatises, and historical works. His poems are

Hans Holbein, the younger.

chiefly of a satirical nature. The most celebrated is Peder Paars, a comic heroic poem in fourteen cantos, which is still regarded throughout the Scandinavian countries as a masterpiece. Almost equally famous is his Nicolas Klimm's Subterraneous Travels, a satirical romance in prose.

HOLD, the whole interior cavity or belly of a ship, or all that part of her inside which is comprehended between the floor and the lower deck throughout her length.

HOLIBUT. See Halibut.

HOLIDAY, any day set apart as a religious or national festival; in a general sense a day or a number of days during which a person is released from his every day labors.

HOLLAND, a fine and close kind of linen, so called from its being first manufactured in Holland; also a coarser linen fabric, unbleached or dyed brown, used for covering furniture, books, carpets, etc., or for making window-blinds or the like.

HOLLAND, North, and Holland, South, two provinces of the Netherlands. The greater part of the former consists of a peninsula, bounded by the North Sea on the w. and the Zuider-Zee on the e. Area, 1051 sq. miles. It lies

very low, some portions of it being at least partially below the level of the sea, and it is generally fertile. A broad margin of downs or sand-hills protects it from the sea on the west. Besides rivers (Vecht, Amstel, Zaan, etc.), it is intersected by the Great North Holland canal. The chief towns are Amsterdam, Alkmaar, Haarlem, Helder, and Zaandam. Pop. 968,105.—South Holland, the most populous province of the Netherlands, is bounded on the north by North Holland, on the west by the German Ocean. The southern part of the province is broken up into several islands. Area, 1155 sq. miles. Like North Holland, it is a flat and depressed tract, and it also is protected from the sea on the west by a margin of downs or sand-hills. The chief river is the Rhine, with its numerous branches. The lakes were formerly numerous, but most of them are now drained. The soil is fertile and well cultivated. The principal towns are Delft, Dort, Gorkum, Gouda, Leyden, Rotterdam, Schiedam, 's Gravenhage (the Hague). Pop. 1,114,401.

HOLLY, a genus of plants embracing a number of evergreen trees or shrubs. The common holly is common in Britain and the Continent of Europe. It is a handsome, conical evergreen tree, growing to the height of 20 or 30 feet. Its leaves are dark-green, shining, and leathery, abundantly armed with prickles on the lower branches, but free from

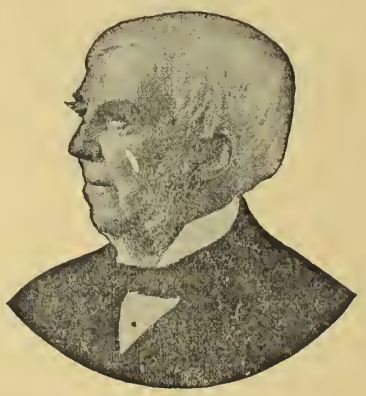
American holly.
a b, Female and male flowers.

them on the upper, or on very old trees. The flowers are white, appearing in May; the fruit is red, ripening in September, and remaining on the tree all the winter. A good many varieties are known ,distinguished by the shape and color of the leaves, which are sometimes spotted or edged with yellow, etc. It is excellently adapted for hedges and fences, as it bears clipping. The wood is hard and white, and is employed for turnery work, knife handles, etc. The bark yields a mucilaginous substance, from which birdlime is made. Among the Romans it was customary to send boughs of holly to friends, with new-year's gifts, as emblematical of good wishes; and it is used to decorate houses at Christmas. The American holly is widely diffused throughout the United States. It sometimes attains the height of 80 feet, with a trunk 4 feet in diameter.

HOLLYHOCK, a biennial plant, a native of China, and is a frequent ornament of gardens. There are many varieties, with single and double flowers, characterized by the tints of yellow, red, purple, and dark purple approaching to black.

HOLMES, Mary Jane, American novelist, was born in Brookfield, Mass., 1839. Her first novel, Tempest and Sunshine (1854), was followed by a book almost every year, and the circulation of her books has exceeded two millions. Died 1907.

HOLMES (hōmz), Oliver Wendell, M.D., LL.D., American writer born at Cambridge, Mass., 1809, and educated at Harvard university. He began the study of law, but in a short time relinquished it for that of medicine. In 1839



Oliver Wendell Holmes.

he became professor of anatomy and physiology in Dartmouth college, N. H., but resigned after two years' service in order to devote himself to practice in Boston. In 1847 he was appointed to the chair of anatomy at Harvard, a position which he filled till 1882. He was a voluminous writer both in prose and verse, and shone as a prominent figure in the famous group associated with the Atlantic Monthly. His chief works, besides several volumes of poems, and treatises on medicine, are The Autocrat of the Breakfast Table, The Professor at the Breakfast Table, and The Poet at The Breakfast Table; Elsie Venner, The Guardian Angel, A Mortal Antipathy, and Memoirs of Motley and Emerson. A visit to Europe in 1886 produced a charming record: A Hundred Days in Europe. He died in 1894.

HOLY ALLIANCE, a league concluded at Paris, Sept. 26, 1815, between Alexander I., emperor of Russia, Francis, of Austria, and Frederick William III. of Prussia, and signed with their own hands, and without the countersign of a minister. It consisted of a declaration, that, in accordance with the precepts of the gospel of Jesus Christ, the principles of justice, charity, and peace should be the basis of their internal administration, and of their international relations, and that the happiness and religious welfare of their subjects should be their great object. Its real aim, however, was to maintain the power and influence of the existing dynasties. It was offered for signature to all the European powers except the pope and the sultan of Turkey, and accepted by all except Britain. The events of 1848 broke up the Holy Alliance.

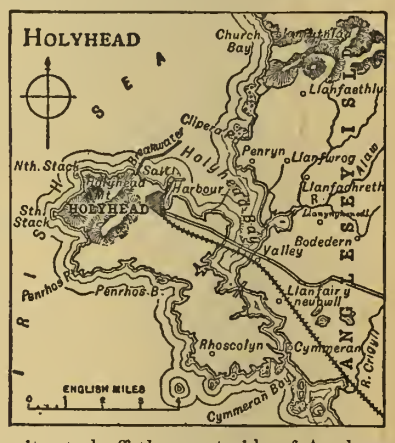
HOLY COAT OF TREVES, a relic preserved in the cathedral of Treves, and said to be the identical seamless coat worn by our Saviour at his crucifixion, and for which the soldiers cast lots. It was the gift of the Empress Helena, by whom it was discovered in her visit to Palestine in the 4th century. It has been exhibited to vast numbers of pilgrims at irregular intervals. The same claim is made for several coats kept in other places.

HOLY FAMILY, in art, representations of the infant Saviour and his mother, accompanied by one or more members of his family.

HOLY GHOST, according to Trinitarians, the third person in the Holy Trinity; according to the Socinians, a Biblical metaphor, to designate the divine influence. The doctrine of the Athanasian creed adopted by Roman Catholics, Lutherans, and Calvinists alike, is that the Holy Ghost proceeded from both Son and Father, and is coeternal and equal with both. The Eastern Church, however, following the Council of Alexandria held in 362, asserts that the Holy Ghost proceeds from the Father alone.

HOLY GHOST, Order of, an order of male and female hospitallers, founded by Guy, son of William, Count of Montpellier, toward the end of the 12th century, for the relief of the poor, infirm and foundlings.

HOLYHEAD, an island and seaport town of North Wales, in the county of Anglesey. The island is about 7 miles long and 5 miles broad at the widest part,



is situated off the west side of Anglesey, and is connected with the mainland by a causeway. The town is on the northeast side of the island, and owes its prosperity to the railway and steamboat traffic between England and Dublin. The harbor of refuge (Victoria harbor), opened in 1873, is formed by a breakwater which is 7860 feet in length, the whole cost, including some minor works, being $7,500,000. Pop. 11,414.

HOLY LAND. See Palestine.

HOLYOKE, a city in Hampden co., Mass., on the w. bank of the Connecticut river. It has manufactures of paper, cotton, wool, wire, machine works, etc. Pop. 1909, about 54,000.

HOLY PLACES OF JERUSALEM, a term meant to apply more particularly to that group of localities of which the Church of the Holy Sepulcher is the

center, some of the other more celebrated objects being the Garden of Gethsemane, the Church of the Ascension, the Tomb of the Virgin, etc., all connected with the life and passion of our Saviour. The guardianship of the holy places has been a cause of much contention between the Greek and Latin churches. They were formerly under the control of the latter, but since 1757 they have been committed to the care of the Greek Church by imperial ordinance of the Porte. Demands made respecting the holy places and the protection of Greek Christians in Turkey, led to the Crimean war of 1854–76.

HOLY ROMAN EMPIRE, a title which the German Empire received in 962 when Otho I. was crowned at Rome by Pope John XII. It came to an end when Francis II. became hereditary emperor of Austria in 1804.

HOLYROOD, Palace and Abbey of, in Edinburgh, at the eastern extremity of the old town. The abbey church, founded in 1128 by David I., containing the royal vault, with the ashes of numerous members of the Scottish royal race, is now mostly in ruin.

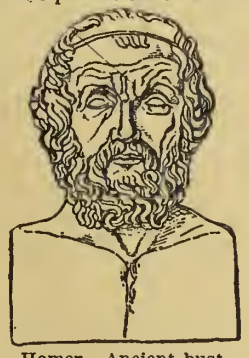
HOLY SEPULCHER, Knights of the, an order of knighthood founded by Godfrey of Bouillon, 1099, for the guardianship of the Holy Sepulcher at Jerusalem, and for the protection of pilgrims. It was revived by Pope Alexander VI., 1496, and reorganized in 1847 and 1868.

HOLY WATER, in the Greek and Roman Catholic Church, salted water which has been consecrated by prayers, exorcism, and other ceremonies, to sprinkle the faithful and things used for the church. It is placed at the door of churches, so that worshipers may sprinkle themselves with it as they enter, and it is used in nearly every blessing which the church gives. Sprinkling the people with holy water seems to date from the 9th century, and it is considered efficacious not from any virtue of its own, but from the effect of the church's prayers at the time of using.

HOLY WEEK, or **PASSION WEEK,** is that which immediately precedes Easter, and is devoted especially to commemorate the passion of our Lord. The days more especially solemnized during it are Spy Wednesday, Maundy Thursday, Good Friday, and Holy Saturday. It is an institution of very early origin, and is known as Great Week, Silent Week, Penitent Week, etc. Spy Wednesday was a name given in allusion to the betrayal of Christ by Judas Iscariot. Maundy or Holy Thursday specially commemorates the institution of the Eucharist.

HOMAGE, in feudal law, a formal acknowledgment made by a feudal tenant to and in presence of his lord on receiving the investiture of a fief or coming to it by succession, that he was his vassal. The tenant, being ungirt and uncovered, kneeled and held up both his hands between those of the Lord, who sat before him, and there professed that "he did become his man, from that day forth, of life and limb, and earthly honor," and then received a kiss from his lord.

HOMER, an ancient Greek epic poet, of whom nothing is known with certainty, some even doubting whether he ever existed. The most probable opinion is that he was a native of some locality on the sea-board of Asia Minor, and that he flourished between 950 and 850 B.C. The earliest mention of the name of Homer is found in Xenophanes (6th century B.C.). The common statement that he was blind may safely be discarded. The poems that have been gen-



Homer.—Ancient bust.

erally attributed to Homer are the Iliad and Odyssey. The Batrachomyomachia, of Battle of the Frogs and Mice, and certain hymns to the gods also passed under his name, though belonging to a later period. The Iliad in its present form consists of twenty-four books, and tells the story of the siege of Troy from the quarrel of Achilles with Agamemnon to the burial of Hector, with subordinate episodes. The Odyssey is also in twenty-four books, and records the adventures of Odysseus (Ulysses) on his return voyage to his home in Ithaca after the fall of Troy. Even as early as the beginning of the Christian era, certain Greek critics (the Separatists) maintained that the two poems were the work of different poets, but the general belief continued to be that there was one author for both. The entire system of Homeric criticism, however, was revolutionized in 1795 by F. A. Wolf in his Prolegomena to Homer. He asserted that the Iliad and Odyssey were not originally committed to writing, and were not two complete and independent poems, but originally a series of songs of different poets (Homer and others), celebrating single exploits of heroes and first connected as wholes by Pisistratus, about 540 B.C. Some of Wolf's arguments have been proved erroneous, but since his time the old views in regard to the Iliad and Odyssey have been held by comparatively few of the ablest scholars, though what theory is now the most common is difficult to say. Among the most conservative theories is that which assigns to Homer a central or basal portion of both Iliad and Odyssey, to which additions by other poets were gradually united; but generally the Odyssey is regarded as of somewhat later date than the Iliad, and not by the poet who produced the Iliad in its original form.

HOME RULE, in British politics, a measure which has been more especially advocated in regard to Ireland. The leading feature of the Irish home rule party seems to be the establishment of a native parliament in Ireland to conduct all local and internal legislation, leaving the general political government of the empire to an imperial parliament. The movement originated in the formation of the Home Government association at Dublin, in 1870, under the presidency of Mr. Isaac Butt. At the general election of 1874 the party succeeded in sending 60 home rule members to parliament for Irish constituencies. The elections of 1885 and 1886 still further strengthened the party, 86 members following the lead of Mr. Parnell (which see). The original scheme has been materially modified since Butt's time, and there are not wanting Irishmen who declare openly for absolute independence, which many believe to be the ultimate aim of the whole party. The conversion of Mr. Gladstone and many members of the liberal party to home rule principles has added immense strength to the movement. Similar schemes for Scotland and Wales have been agitated.

HOME-SICKNESS, in medicine, Nostalgia, a disease arising from an intense and uncontrolled feeling of grief at a separation from one's home or native land. It is most frequent among persons who leave mountainous and go to flat countries, as the Scotch Highlanders and Swiss, or among those who change from the country to the town. It commences by a deep melancholy, is sometimes accompanied by low, nervous, hectic fever, or occasionally changes into phthisis, and may terminate fatally.

HOMESTEAD, a city in Allegheny co., Pa., on the Monongahela river, and the Penn. and the Pitts. and Lake Erie railways; 8 miles s.e. of Pittsburg. It contains one of the largest steel-manufacturing plants in the United States. It also has manufacturers of glass and firebrick. Pop. 14,974.

HOMESTEAD LAWS, the laws of the United States give to every citizen who is the head of a family, or who has arrived at the age of twenty-one years, the right to a homestead of 160 acres, to be selected at will from any of the surveyed and otherwise unappropriated public lands, without cost, except entry fees. The tract thus taken as a homestead must be located in a compact body, upon land which is agricultural in character, and must conform to the legal subdivisions established by the official survey. To obtain a homestead the applicant must make an affidavit that he is over the age of twenty-one years, or the head of a family; that he is a citizen of the United States, or has declared his intention to become such; and that the entry is made for his exclusive use and benefit, and for actual settlement and cultivation. Where homestead entries are made by soldiers and sailors who served ninety days or more in the United States army or navy during the war of the rebellion, the period of their service, or, if they were discharged on account of wounds or disability incurred in the line of duty, the entire term of enlistment, not to exceed four years, is deducted from the five years' residence required by law. But no one can receive a title to his homestead under any circumstances without having lived upon it at least one year.

HOMICI'DAL MANIA, a species of mania in which a sudden irresistible im-

pulse to destroy life seizes the patient. It is independent of hatred toward the victim, or of any appreciable motive, and its causes are obscure.

HOMICIDE, the killing of one man or human being by another. In law, homicide is of three kinds—justifiable, excusable, and felonious; justifiable, when it proceeds from unavoidable necessity, as where the proper officer inflicts capital punishment, where an officer of justice kills an offender who assaults or resists him and who cannot otherwise be captured, or where persons are killed in the dispersion of rebellious or riotous assemblies; excusable, when it happens from misadventure, as where a man in doing a lawful act by accident kills another, or in self-defense, as where a man kills another in defense of the life of himself, his wife, children, parent, servant, etc.; felonious, when it proceeds from malice, or is done in the prosecution of some unlawful act, or in a sudden passion. Self-murder also is felonious homicide. Felonious homicide comprehends murder and manslaughter.

HOMILET'ICS, the art of preaching; that branch of practical theology which teaches the principles of adapting the discourses of the pulpit to the spiritual benefit of the hearers, and the best methods which ministers of the gospel should pursue for instructing their hearers by their doctrines and example.

HOMILY, a discourse or sermon read or pronounced to an audience on some subject of religion; a discourse pronounced in the church by the minister to the congregation. The ancient homily was sometimes simply a conversation, the prelate talking to the people and interrogating them, and they in turn talking to and interrogating him.

HOMŒOP'ATHY, the name of a system of medicine introduced by Samuel Hahnemann of Leipzic (died 1843). It is a system founded upon the belief that drugs have the power of curing morbid conditions similar to those they have the power to excite, an old belief long ago expressed in the Latin phrase "similia similibus curantur" (like is cured by like). In contradistinction to this system the more common method of treating diseases has been termed heteropathy or allopathy. In practice homœopathy is associated with the system of administering infinitesimal doses.

HONAN', a once populous city of China, in the province of same name, on an affluent of the Hoang-ho. The province has an area of 65,104 square miles. It is generally level, and is watered by the Hoang-ho and its affluents. The soil is fertile and carefully cultivated; the forests in the west supply timber; and mines yield tutenag or Chinese copper, cinnabar, mica, etc. Honan suffered severely from the inundation of the Hoang-ho in 1887; capital, Kai-fung. Pop. 22,117,036.

HONDO, the name given by the Japanese to the chief island in their empire. In many geographical works Nippon or Niphon is the distinctive appellation of this island, but by the Japanese themselves that name is applied to the whole country. The area of the island is 87,425 sq. miles, and the pop. 33,327,935. See Japan.

HONDU'RAS, a republican state of Central America; area, 39,600 sq. miles. Its surface is hilly with numerous fertile valleys. Its mineral wealth is very considerable, and includes gold, silver, lead, and copper. The chief rivers are the Chamelicon, Ulua, and Aguan, flowing to the Caribbean Sea, and the Choluteca, an affluent of the Pacific. There are extensive forests abounding in fine timber. The principal cultivated productions are corn, beans, some wheat, rice, plantains, and tobacco. Since 1880 the capital has been Tegucigalpa, the principal ports are Truxillo on the Caribbean Sea, and Port San Lorenzo, in the Pacific. The constitution of the state gives the legislature power to a congress of deputies composed of thirty-seven members. The executive authority is in the hands of the president. The resources of the country are undeveloped, and the finances are in a very disordered state. Pop. 590,000.

HONDURAS, BRITISH, or **BELIZE,** a British colony of Central America, having north and west, Yucatan; west and south, Guatemala; and east, the Bay of Honduras. Area, 7562 sq. miles. Pop. 32,899 including about 400 whites.

HONE, the name given to several varieties of slaty stones employed in whetting knives, razors, or other edge-tools. They are usually pieces of hard close-grained clay-slate, containing minute particles of quartz, with a uniform consistence. The best-known varieties are the Ayr stone, so called from being found in the river Ayr, in Scotland; the Charnley Forest stone, found in Charnwood Forest, Leicestershire; the German hone, the Canada oil-stone, Turkey oil-stone, etc.

HONEY, a vegetable product, with saccharine properties, collected by bees from the blossoms of flowers, and deposited in the cells of their combs. The best is clear and transparent, and solidifies when kept for some time into a granular, white mass. Some varieties of it are dark yellow or brownish in color. Spring honey is more esteemed than summer honey; and the latter more than that of autumn. Virgin honey is taken from hives in which the bees have never swarmed, and it is of a white color. Yellow honey is extracted from all sorts of combs. The flavor of honey largely depends on the plants from which it is collected. Honey is obtained in large quantities in many countries, partly from wild bees, but chiefly from those kept in hives. In addition to its ordinary domestic uses, it is employed medicinally as a promoter of expectoration, to sweeten certain medicines, to make a gargle with vinegar, etc. It is also used in making mead. The ancients used it as we do sugar, and made of it and wine a mixture very much liked.

HONEY-ANT, inhabiting Mexico, and living in communities in subterranean galleries. In summer a certain number of these insects secrete a kind of honey in their abdomens which become so distended as to appear like small pellucid grapes. Later in the season when food is scarce these ants are devoured by the others, and they are also dug up and eaten by the inhabitants of the country.

HONEY-COMB, a waxen cellular structure framed by the bees to deposit their honey and eggs in. The wax is secreted by the insect in the form of small and thin oval scales in the folds of the abdomen. The comb is composed of a number of cells, most of them exactly hexagonal and arranged in two layers placed end to end, the openings of the layers being in opposite directions. The comb is placed vertically, the cells being therefore horizontal. The sides of the cells are very thin, and yet the whole structure is of considerable strength. Some cells are destined for the exclusive reception of honey; others for the reception of larvæ.

HONEY-DEW, a sweet saccharine substance found on the leaves of trees and other plants in small drops like dew. There are two kinds; one secreted from the plants, and the other deposited by aphides. Different kinds of manna are the dried honey-dew or saccharine exudations of certain plants.

HONEY-EATER, the name given to a number of insessorial birds forming the family Meliphagidæ, of the tribe Tenuirostres. They form a numerous group, feeding principally on honey and the

Wattled honey-eater.

nectar of flowers. They are natives of Australia and the adjacent islands. They have long curved sharp bills, with tongues terminating in a pencil of delicate filaments, to enable them the better to extract the juice of flowers.

HONEY-LOCUST, SWEET LOCUST, or **BLACK LOCUST,** a forest tree belonging to the United States. The leaves are pinnated, divided into numerous small leaflets and the foliage has a light and elegant appearance; the flowers are greenish, and are succeeded by long, often twisted pods, containing large brown seeds, enveloped in a sweet pulp. This tree is especially remarkable for its formidable thorns, on which account it has been recommended for hedges.

HONEYSUCKLE, or **WOODBINE,** the common honeysuckle of Britain, a twining shrub, with distinct leaves and red berries, is indigenous in Great Britain; but two others have been naturalized. The honeysuckle family is represented in North America by nine different species.

HONG-KONG, an island off the s.e. coast of China, belonging to the British, at the mouth of the estuary that leads to Canton, from which it is distant 75 miles. It is about 10 miles in extreme length, and 7½ miles in extreme breadth, separated from the mainland by a narrow strait, and with Cowloon on the mainland forms a crown colony, area 32 sq.

miles. Hong-Kong is a great entrepôt for the foreign commerce of China, and is a free port without customs' dues. It is also a station of the British fleet. The revenue of the government is derived from the land rents, licenses to sell opium, spirits, etc., taxes, postages, fines, fees of office, etc. Hong-Kong was ceded to Britain in 1842; some 200 sq. miles additional were leased in 1898. Pop. about 246,000; more than nine-tenths being Chinese, and 11,000 whites.

HONOLU'LU, the capital of the Sandwich Islands, south side of the island of Oahu. Its most notable edifices are the royal palace, the Roman Catholic cathedral, the treasury, the parliament house, etc. There is a fine natural harbor. Honolulu is a rapidly improving place. Pop. 45,670.

HONOR, Knights and Ladies of, a fraternal benevolent society organized in Kentucky in 1877 for social and beneficial purposes. The central authority is the supreme lodge, and the chief officer has the title of supreme protector. The order has sixteen grand lodges and 1160 subordinate lodges, representing a total membership of 63,000.

HONOR, Maids of, ladies in the service of European queens, who attend their mistress when she appears in public. In England they are eight in number.

HONORABLE, Right Honorable and Most Honorable, titles given in the United Kingdom to peers, their families, and certain public functionaries. (See Address, Forms of.) In America the governors of states, judges, members of congress, and others holding offices of dignity and trust, are styled honorable.

HONORS, Military, compliments or salutes paid by troops to royalty, officers of rank, etc., or given at funerals to all grades of the army.

HOOBLY, or Hubli, a town of India in Dhârwâr district, Bombay Presidency, a great centre of the cotton trade. Pop. 60,214.

HOOD, John Bell, American soldier, was born in Owingsville, Ky., in 1831. In 1861 he entered the confederate army and during the first years of the war took part in the Virginia campaigns. He lost a leg at Chicamauga and in the following spring he again took the field and was made lieutenant-general. After being repeatedly defeated and repulsed by both Sherman and Thomas, and after his army had been driven in utter rout by Thomas, Hood was relieved of his command at his own request. He died in 1879.

HOOD, Robin, a celebrated outlaw, who, according to the popular account, with his followers, inhabited Sherwood Forest, in Nottinghamshire, and also the woodlands of Barnsdale in the adjoining West Riding. What basis of fact there is for the story of Robin Hood is doubtful. Grimm maintained that he was one with the Teutonic god Woden. Other theories suppose him to have been a rebel yeoman in Lancaster's rebellion under Edward II.; a Saxon chief who defied the Normans; and a fugutive follower of Sir Simon de Montfort after the battle of Evesham.

HOOD, Samuel, Viscount, a British admiral, born 1724, died 1816. He joined the navy as a midshipman in 1740, and attained the rank of post-captain in 1759. Having become rear-admiral, he preserved the island of St. Christopher's from being taken by De Grasse, assisted in the defeat of De Grasse by Rodney in 1782, and was rewarded with the title of Baron Hood of Catherington in the Irish peerage. In 1793 he commanded against the French in the Mediterranean, and captured Toulon and Corsica. In 1796 he was made an English peer, with the title of Viscount Hood.

HOOD, Thomas, an English poet and humorist, of Scotch extraction, born at London, 1799, died 1845. It was during his last illness that he contributed to Punch The Song of a Shirt, The Bridge of Sighs, and The Lay of a Laborer. Hood is unrivaled as a punster, and he possesses a singular power of combining the humorous with the pathetic. He had the satisfaction of knowing that the pension of $500 conferred upon him on his last illness by Sir Robert Peel was to be transferred to his wife.

HOOD, MOUNT, a peak of the Cascade range on the western border of Wasco co., Ore. It is 50 miles east by south of Portland. It has an altitude of 11,934 feet and there are no formidable obstacles to its ascent. The summit commands an extensive and magnificent view.

HOODED SEAL, a species of seal, the male of which possesses a movable, inflatable muscular bag, stretching from the muzzle to about five inches behind the eyes. The prevailing color is bluish black—the head and limbs being uniformly black. Its usual range extends in America southward to Newfoundland, and in Europe to Southern Norway.

HOODED SNAKE. See Cobra de Capello.

HOOFS, the horny tissues which constitute the external part of the feet of certain animals, mostly herbivorous. They may be regarded as homologues of the toe-nails of other animals. They are composed of epithelium cells, agglutinated and dried, and of intercellular substance and cell contents. Chemically they consist of keratin.

HOOKER, Joseph, American soldier, was born at Hadley, Mass., in 1814. He served against the Seminoles and in the Mexican war. He accompanied the army from Vera Cruz to Mexico City and was brevetted major. At Chapultepec he was brevetted lieutenant-colonel. He was engaged at the siege of Yorktown, and on the day after its evacuation was appointed a major-general of volunteers. Later he became division commander in the army of Gen. Pope, Virginia. On the failure of Gen. Pope to advance against the enemy, the army of the Potomac was again led by Gen. McClellan, and Gen. Hooker took command of the first corps. He was shot through the foot, and soon afterward was appointed brigadier-general in the regular army. He was placed on the retired list in 1868, with the full rank of major-general. He died in 1879.

HOOKER, MOUNT, one of the loftiest peaks of the Rocky Mountains. It has an estimated elevation of 15,700 feet.

HOOPER, John, an English reformer, born 1495, burnt 1555. His works consist chiefly of a Godly Confession and Protestation of the Christian Faith, Lectures on the Creed, Sermons on the Book of Jonah, Annotations on the Thirteenth Chapter of the Romans, and expositions of several psalms.

HOOPING-COUGH, or **WHOOPING-COUGH,** a disease known by a rapid series of coughs ending in a long-drawn breath, during which a shrill whistling sound, the hoop, is produced. Two or three such fits of coughing follow one another, until some phlegm is expelled, and vomiting may occur. During a severe spasm the face becomes swollen and purplish, as if suffocation were threatened. It is evidently due to a poison acting as an irritant on the pneumogastric nerve. It is contagious, and most commonly attacks children, and generally only once in their lives. The whooping-cough usually comes on with a difficulty of breathing, and other slight febrile symptoms, which are succeeded by a hoarseness, cough, and difficulty of expectoration. After a fortnight or more the cough becomes convulsive, and is attended by the hoop. After four or five weeks the expectoration becomes loose, and the fits of coughing gradually diminish in frequency and duration. Hooping-cough is seldom fatal to adults, but is the most fatal disease in the first year of childhood. Bronchitis and pneumonia are the most serious complications.

HOOPOE, a bird forming the type of a family generally classed with the bee-eaters or the honey-eaters, but also with with hornbills. The European hoopoe (U. epops) is about 12 inches long; it has

Hoopoe.

a fine crest of pale cinnamon-red feathers tipped with black; upper surface on the whole ashy-brown; wings black, the coverts having white bars; throat and breast pale fawn; abdomen white, with black streaks and dashes. It has a very wide range, from Burmah to the British Islands and Africa. It is a ground-feeder, preying chiefly on insects, and seems to delight in filth; it nests in cavities of trees or walls, and its eggs vary from four to seven. The hoopoe utters a loud double or treble hoop, whence its name.

HOOSAC TUNNEL, the longest railway tunnel in America, in the western part of Massachusetts, on the railway from Boston to Troy, N. Y. It pierces the Hoosac Mountain, the summit range extending southward through Massachusetts from the Green Mountains of Vermont. It is 4¾ miles long, and has a double line of rails.

HOP, a plant of Europe, and of the United States, where it occurs wild. The root is perennial, giving out several herbaceous, rough, twining stems, with large lobed leaves; the fertile flowers are green; the fruit is a catkin, and the plant is cultivated for the sake of the catkins, which are employed to communicate to beer its aromatic bitter. The young shoots are sometimes boiled and eaten

Hop.

like asparagus; the fibers of the old stems make good cords. The cultivation of the hop is more carefully attended to in England than in any other country, Kent being the chief county in which it is grown; but the plant is also extensively reared in other parts of Europe, as also in North America, Australia, New Zealand, etc. The use of the hop catkins depends upon a peculiar bitter substance which they contain, called lupulin which is a yellow powder, containing a bitter principle and a volatile oil. The lupulin constitutes from 10 to 12 per cent by weight of the catkin, and the bitter principle forms from 8 to 12 per cent of the lupulin. Having tonic, stomachic, and narcotic properties hops are often used medicinally. Pillows stuffed with hops are used to induce sleep.

HOP-FLY, a species of plant-louse very destructive to the hop. The winged female is green with a black head and bands and spots of black on the body; the legs and wings are long. A few winged females make their first appearance about the middle of May, and wingless myriads by the middle of June. The insects suck the under side of the upper leaflets, and there deposit their young on the most suculent part of the plant. Myriads perish by means of ladybirds and other insects, as well as by their extreme susceptibility to atmospheric changes.

HOPKINS, Johns, American financier and philanthropist, was born in Anne Arundel co., Md., in 1795. In addition to minor gifts to individuals and charities, he founded and endowed two great institutions which perpetuate his name —the Johns Hopkins university and Johns Hopkins hospital, whose activities are united in the Johns Hopkins medical school. He died in 1873.

HORACE. See Horatius Flaccus.

HORÆ, in classical mythology, the goddesses of the seasons and the order of nature. Their number was indefinite; in Athens two only were worshipped. They are represented as blooming maidens carrying the different products of the seasons.

HORATII, three Roman brothers, who, according to tradition, in the reign of Tullus Hostilius engaged three Alban brothers (the Curiatii), in order to decide the supremacy between Rome and Alba. Victory went to Rome, and the sole surviving Horatius was triumphantly conducted back to the city. But his sister had been bethrothed to one of the Curiatii, and her demonstrative grief so enraged Horatius that he stabbed her. For this he was condemned to death, but his father and the people begged him off.

HORATIUS COCLES, a hero of ancient Rome. The Tarquins having, after their banishment, sought refuge with the Etrurian king Porsenna, the latter advanced against Rome (B.C. 507) to restore them. According to tradition Horatius Cocles, along with two companions, held the Sublician bridge against the enemy, while the Romans broke it down behind them. When this was nearly finished he sent back his two companions, and as the bridge fell he plunged into the Tiber with his armor and safely reached the opposite bank.

HORATIUS FLACCUS, Quintus, commonly known as Horace, the greatest of Latin lyric poets, was born near Venusia, in southern Italy, B.C. 65. His father was a freedman, a collector of taxes, and had purchased the farm at which his son was born. His poems procured him the friendship of Virgil and Varius, and to them he was indebted for his first acquaintance with Mæcenas, who was the friend and confident of Augustus Cæsar, and who expended his wealth for the encouragement of literature and the arts. His works consist of four books of odes; a book of epodes or short poems; two books of satires; and two books of epistles, one of which is often cited as a separate work, under the title of Ars Poetica.

HOREHOUND, a labiate plant, with whitish, downy leaves and stem; flowers small, nearly white, in crowded whorls, possessing an aromatic smell and bitter

Horehound.

flavor. It is a popular remedy for coughs and colds, usually as an infusion. Black horehound, also a labiate plant, is a malodorous and unattractive weed.

HORI'ZON, in ordinary speech the line where earth and sky seem to meet, or the circle which bounds that part of the earth's surface visible to a spectator from a given point. This is termed the sensible, visible, or apparent horizon, as distinguished from the rational or celestial horizon, an imaginary great circle parallel to the sensible horizon, whose plane passes through the earth's center, whose poles are the zenith and the nadir, and which divides the sphere into two equal hemispheres. In observations with the sextant at sea, when the real horizon is invisible a small basin containing mercury may serve as an artificial horizon. The observation that is then made is the angle between the sun or star and the image of the sun or star in the basin of mercury, and it is easily seen that half this angle is the altitude of the object above the real horizon. In geology, the term is applied to any well-marked formation which suffices as a starting point from which to study the rest.

HORN, a general term applied to all hard and pointed appendages of the head, as in deer, cattle, etc., but as a a term denoting a particular kind of substance nothing should be called horn which is not derived from the epidermis or outer, layer of the integument, whether on the trunk, hoofs, or head. Horn is a tough, flexible, semi-transparent substance, most liberally developed in the horns of bovine animals, but also found in connection with the "shell" of the tortoise, the nails, claws, and hoofs of animals, the beak of bird and turtle, etc. Horn is softened very completely by heat, so as to become readily flexible, and to adhere to other pieces similarly softened. True horn consists principally of an albuminoid principle, keratin, with a small portion of gelatine and a little phosphate of lime. In some species of animals the males only have horns, as for instance the stag. In cattle both male and female have horns, though there are also horn-less cattle. Horns differ widely in the case of different animals. Thus the horns of deer consist of bone, and are deciduous; those of the giraffe are independent bones, with a covering of hairy skin; those of oxen, sheep, and antelopes consist of a hony core covered by a horny sheath. The horns of the rhinoceros alone consist exclusively of horny matter. The horns of oxen, sheep, goats, antelopes are never shod, except in the case of the prong-horned antelope. The number never normally exceeds four, and in the case of deer the horns are branched.

The various kinds of horns are employed for many purposes. The principal used in the arts are those of the ox, buffalo, sheep, and goat. Deer horns are almost exclusively employed for the handles of knives and of sticks and umbrellas. Those which furnish true horn can be softened by heat (usually in boiling water), cut into sheets of various thickness, which sheets may be soldered or welded together at the edges so as to form plates of large dimensions, and polished and dyed so as to imitate the much more expensive tortoise-shell. The clippings of horn may be welded together in the same manner, and made into snuff-boxes, powder horns, handles for umbrellas, knives, forks, etc. As horn has the valuable property of taking on and retaining a sharp impression from a die, many highly ornamental articles may be turned out. Combs for the hair are made from the flattened sheets, and out of the solid parts of buffalo horns beautiful carvings are made.

HORN, a musical instrument, originally formed, as the name denotes, from the horn of an animal. The name includes a large family of wind-instruments, many of which have fallen into disuse. The French horn, or simply the horn, consists of a metalic tube of about

10 feet in length, very narrow at top, bent into rings, and gradually widening toward the end whence the sound issues, called the bell. It is blown through a cup-shaped mouthpiece of brass or silver and the sounds are regulated by the player's lips, the pressure of his breath, and by the insertion of the hand in the

1, Coaching-horn. 2, French or orchestral horn. 3, Flügelhorn, or keyed bugle. 4, Post-horn. 5, Hunting-horn.

bell of the instrument. As a simple tube, unprovided with holes, the horn yields only the generating note, and of course would be confined to one key; but by means of crooks the tube can be lengthened, and transposed into any key. By inserting the hand into the bell, which flattens a note, the sounds awanting are produced. The compass of the instrument is three octaves. Music for the horn is always written in the key of C, an octave higher than it is played, with the key of composition marked at the beginning of each movement; thus "corni (or horns) in D" directs the performer which crook he must use to play the notes in the key indicated. The bugle, cornet-a-piston, and sax-horn are allied instruments.

HORNBILLS, a remarkable group of birds confined to Southern Asia and Africa, akin to the kingfishers and the

Rhinoceros hornbill.

toucans, remarkable for the very large size of the bill, and for an extraordinary horny protuberance by which it is surmounted, nearly as large as the bill itself, and of cellular structure within. The rhinoceros hornbill is almost the size of a turkey, of a black color, except on the lower part of the belly and tip of the tail, which are white. It has a sharp-pointed, slightly-curved bill, about 10 inches long and furnished at the base of the upper mandible with an immense appendage in the form of an inverted horn. The skeleton though bulky is very light, being permeated with air to an unusual degree. During incubation the female is plastered up in the hollow of a tree and fed by the male through a small aperture left for the purpose. The hornbills are of arboreal habit, and feed on fruits; but in captivity they take small reptiles, and the Abyssinian species even attack snakes.

HORNBLENDE (-blend), or Amphibole, one of the most abundant and widely diffused of minerals, remarkable on account of the various forms and compositions of its crystals and crystalline particles, and of its exceedingly diversified colors, thus giving rise to almost numberless varieties, many of which have obtained distinct appellations. It is sometimes in regular distinct crystals, more generally the result of confused crystallization, appearing in masses composed of laminæ, acicular crystals, or fibers, variously aggregated. It enters largely into the composition and forms a constituent part of several of the trap-rocks, and is an important constituent of several species of metamorphic rocks, as gneiss and granite. In color hornblende exhibits various shades of green, often inclining to brown, white, and black, with every intermediate shade; it is nearly transparent in some varieties, in others opaque; hardness about the same with felspar; specific gravity, 3.00. Its chief constituents are silica, magnesia, and alumina. The principal varieties are hornblende proper, divided into three sub-varities, basaltic hornblende, common hornblende, and hornblende slate; tremolite, actinolite, nephrite, pargasite, and asbestos.

HORNBOOK, in former times the first book of children, or that in which they learned their letters; so called from

Hornbook.

the transparent horn covering placed over the single page of which it usually consisted, the whole being fixed to a wooden frame with a handle. It generally contained the alphabet in Roman and small letters, several rows of monosyllables, and the Lord's Prayer. The alphabet was usually prefaced with a cross, or was printed in the form of a cross; hence the term Christ-cross row, corrupted into criss-cross row, applied to the alphabet, and by extension to the hornbook.

HORNED-TOAD, a name given to a genus of lizards of toad-like appearance, found in America, west of the Mississippi. There are nine different species, all more or less covered with spine-like scales.

HORNELLSVILLE, a city in Steuben co., N. Y., on the Canisteo river and the Cent. N. Y. and W. and the N. Y., L. E. and W. railways; 58 miles s. of Rochester. The N. Y., L. E. and W. railway has extensive shops here. Pop. 13,218.

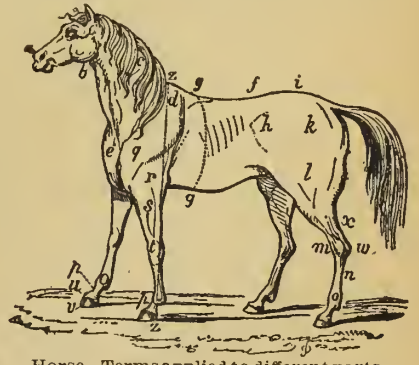
HORNET, an insect much larger and stronger than the ordinary wasp. It is very voracious, feeding on fruit, honey, etc., and preying on other insects. They form their nest of a kind of paper-work in hollow trees and walls, and are able with their sting to inflict a painful wound, usually accompanied with considerable swelling.

HOROL'OGY, the construction of clocks and watches, or branch of knowledge dealing with such.

HO'ROSCOPE, in astrology, a scheme or figure of the twelve houses, or twelve signs of the zodiac, in which is marked the disposition of the heavens at a given time and place, and by which astrologers formerly told the fortunes of persons, according to the position of the stars at the time of their birth. To each of the houses was assigned a particular virtue or influence. The ascendant was that part of the heavens which was rising in the east at the moment; this was the first and most important house, or house of life, and contained the five degrees above the horizon and the twenty-five beneath it. Other houses were those of riches, marriage, death, etc.

HORR, Roswell G., American politician, was born in Vermont in 1830. He was elected in 1872 from Michigan to the United States congress and was re-elected in 1880 and 1882. He was one of the best known campaign speakers in the republican party and in the presidential campaigns of 1884, 1888, 1892, and 1896, toured the country from Maine to California. He died in 1896.

HORSE, a well-known quadruped belonging to the family Equidæ, order Ungalata (hoofed animals); character-



Horse—Terms applied to different parts.

a, Muzzle. *b*, Gullet. *c*, Crest. *d*, Withers. *e*, Chest. *f*, Loins. *gg*, Girth. *h*, Hip or ilium. *i*, Croup. *k*, Haunch or quarters. *l*, Thigh. *m*, Hock. *n*, Shank or cannon. *o*, Fetlock. *p*, Pastern. *q*, Shoulder-bone or scapula. *r*, Elbow. *s*, Fore thigh or arm. *t*, Knee. *u*, Coronet. *v*, Hoof. *w*, Point of hock. *x*, Hamstring. *zz*, Height.

ized by an undivided hoof formed by the third toe and its enlarged horny nail, a simple stomach, a mane on the neck, and by six incisor teeth in each jaw, seven molars on either side of both jaws, and by two small canine teeth in the upper jaw of the male, rarely in the female. The family includes also the asses and zebras, and original types appear to have been at one time common in both the Old World and the American continent. No horses existed in America

when it was discovered by Columbus, those now found in a wild state there, being descendants of those introduced by the Spaniards. But a number of fossil species have been described from America—one of them standing only two and a half feet in height. The descent of the present horse can be traced through several fossil forms back to an animal only about the size of a fox, and having four separate digits or toes on the feet. Subsequent forms show how the third toe developed at the expense of the others till latterly a form identical with the common horse appeared. It is doubtful whether the horse is now anywhere to be found in its native state, the wild horses of the steppes of Tartary and other regions of the Old World being possibly descendants of animals escaped from domestication. The horse was probably first domesticated in Asia, and it varies much in form, size, and character with the climate and nature of the district it inhabits. Arabia produces perhaps the most beautiful breed, which is also swift, courageous, endurant, and persevering. As bred in America the horse has attained high perfection. Two breeds—namely, the large, powerful, black breed of Flanders, and the Arabian—have contributed more than all others to develop the present varieties from the original, comparatively light-limbed, wiry race. The former laid the foundation of size, strength, and vigor for draught-horses and for those anciently used in war, while the latter conferred speed and endurance. The ladies' palfrey is largely derived from the Spanish genet, a small, beautiful, fleet variety of the Moorish barb. The hunter, characterized by speed, strength, and endurance, represents the old English, Flanders, and Arabian breeds. The race-horse has less of Flemish and more of Arabian blood. Carriage, riding, and other horses combine the above breeds in varying degrees, as speed, strength, size, etc., are required. Horses are said to have "blood" or "breeding" in proportion as they have a greater or less strain of Arab blood. At the age of two years the horse is in a condition to propogate. The mare carries her young eleven months and some days, continues to breed till the age of sixteen or eighteen years, and lives on an average between twenty and thirty years. The various species of the horse family have been artificially crossed by man, and are found to be fertile with each other; the offspring, however, are generally sterile. The horse is, strictly speaking, an herbivorous animal, and is more scrupulous in the choice of his food than most other domestic quadrupeds. The staple diet on which horses are kept is oats and hay, with beans added for horses subjected to heavy work. As a substitute for, or an addition to the regular food, bran, linseed, and carrots are used. The age of a horse can be told by the marks on its teeth, which change a little yearly until the animal is about nine years old, after which period it is difficult to determine the age by mark. In some countries the flesh of the horse is used as food; the hide is made into leather; and the hair of the mane and tail is used for making haircloth, for upholsterers' stuffing, etc.

HORSE-CHESTNUT, a handsome genus of trees or shrubs having large opposite digitate leaves, and terminal panicles of showy white, yellow, or red flowers. The common horse-chestnut is familiar to every one. The seeds are large and farinaceous, and have been used as food for animals; they are bitter, and the bark also is bitter, astringent, and febrifugal. The tree is said to have been brought from Constantinople to England in the beginning of the 16th century, and is supposed to be a native of Northern Asia. Three other species are found in North America, where they are popularly known under the name of Buck-eye.

HORSE-POWER, the power of a horse or its equivalent; the force with which a horse acts when drawing. The mode of ascertaining a horse's power is to find what weight he can raise and to what height in a given time, the horse being supposed to pull horizontally. From a variety of experiments of this sort it is found that a horse, at an average, can raise 160 lbs. weight at the velocity of 2½ miles per hour. The power of a horse exerted in this way is made the standard for estimating the power of a steam-engine. Thus we speak of an engine of 60 or 80 horse-power, each horse-power being estimated as equivalent to 33,000 lbs. raised one foot high per minute. Engineers differ widely in their estimate of the work a horse is able to execute. That given above is the estimate of Boulton and Watt based on the work of London dray-horses, but it is considered much too high, 17,400 foot-pounds per minute being generally considered nearer the truth. As it matters little, however, what standard be assumed, provided it be uniformly used, that of Watt has been generally adopted. The general rule for estimating the power of a steam-engine in terms of this unit is to multiply together the pressure in pounds on a square inch of the piston, the area of the piston in inches, the length of the stroke in feet, and the number of strokes per minute, the result divided by 33,000 will give the horse-power, deducting one-tenth for friction. As a horse can exert its full force only for about six hours a day, one horse-power of machinery is equal to that of 4.4 horses. Nominal or calculated horse-power is a term still used, but of little real value, from its being calculated on steam at a pressure much below the real power exerted. Sometimes the real, actual, or indicated horse-power exceeds the nominal by as much as three to one.

HORSE-RACING, a sport of ancient origin, having been practiced among the Greeks and Romans. The institution of horse-races in England belongs to a very remote period. The first regular horse-races, however, did not take place till the reign of James I. The prize then consisted of a gold or silver bell, whence we have the expression "to bear away the bell." The successors of James I. down to Queen Anne were all more or less attached to the sport. Under George I. horse-racing became more and more flourishing, and the sport continued to grow in importance during the remainder of the century. The two most celebrated horses of that period were Flying Childers (foaled in 1715) and Eclipse (foaled in 1764), which long had the reputation of being the fleetest horses that ever ran. The former ran four miles in 6 min. 48 sec., carrying 9 st. 2 lbs. The latter was never beaten. None of the English sovereigns was more devoted to horse-racing than George IV. Between 1784 and 1792, while yet Prince of Wales, he gained 185 prizes, including the Derby of 1788. Horse-racing was introduced into France from England, and during the reign of Louis XIV., and still more during that of Louis XV., was pursued with the utmost enthusiasm. The revolution put an end to it for a time, but the sport was revived by Napoleon. Horse-races, mostly upon the English model, have also been introduced into various other countries. The principal varieties of horse-racing are flat-racing, or racing on level ground; steeple-chasing, or racing over ground not specially prepared for the purpose; hurdle-racing, in which the horses have to leap over obstacles purposely placed in the way; and match trotting. This last kind of race is a very favorite one in America, where the best trotting horses are to be found, but in England it is not much practiced. Steeple-chases and hurdle-races take place in the winter months, the chief English event of the season being the Grand National steeple chase, run over a course of 4 miles 1000 yards at Aintree, near Liverpool. Formerly all races were what is called weight-for-age races, that is, a specified difference in weight was conceded by the older horses. But it was found that when races were conducted on this plan the best horses came to be known, and the inferior ones withdrew, not venturing to compete with them, so that the race resulted in a walk-over. Hence arose the practice of handicapping, that is, of adjusting as nearly as possible the weight to be carried to the previously ascertained powers of the horse, so as to reduce the chances of all the horses entered to an exact equality. Since the introduction of this practice handicap races have become a very favorite sport. The breeding of thoroughbred horses is often a very profitable business. The pedigrees of all thoroughbred horses are registered in the stud-book, so that if any particular animal is omitted in that register the inference is that its pedigree is not without some blemish more or less remote.

In the United States horse-racing is now a national sport. Morris Park, in Westchester Co., N. Y., and Brighton Beach fairgrounds at Coney Island furnish good race-courses. The trotting-horse of America is really a distinct variety of the equine race. The best American trotters are descended from an imported English horse, Messenger. Remarkable running time, one mile in one minute 35¼ seconds, was made by "Salvator," Monmouth Park, in 1890; in heat racing one mile was made by "Guido." in one minute 41¼ seconds, Washington Park, Chicago, in 1891; at Memphis in 1905 "Lou Dillon" trotted a mile in one minute and 58½ seconds; the

best pacing time for one mile at St. Paul, Minn., by "Dan Patch" in one minute and 55 seconds.

HORSE-RADISH, a plant inhabiting the temperate parts of America in moist situations. The root is cylindrical, whitish in color, and forms a well-known condiment, possessing a pungent taste and odor. It is also employed medicinally, as a stomachic, diaphoretic, and diuretic, and externally as a rubefacient.

HORSE-SHOE, a shoe for horses, consisting commonly of a narrow plate of iron bent into a form somewhat resembling the letter U, so as to accommodate itself to the shape of the horse's foot. Horse-shoes do not appear to have been known to the ancients. Xenophon, Vegetius, and others mention various processes for hardening the hoofs so as to make them stronger, but say nothing of any protection like the horse-shoe. Iron horse-shoes are mentioned as being in use in Europe in the 9th century of our era, They seem to have been introduced into England by the Normans.

HORSE-TAIL, among the Turks and other Eastern nations, the tail of a horse mounted on a lance, and used as a standard of rank and honor. The three

Horse-tail standard of Pasha.

grades of pashas are distinguished by the number of tails borne on their standards, three being allotted to the highest dignitaries or viziers, two to the governors of the more important provinces, and one to those of less important districts.

HORTENSE, Eugenie de Beauharnais. See under Beauharnais.

HORTENSIUS, Quintus, Roman orator, born of an equestrian family, B.C. 114, died B.C. 50. His speeches are all lost.

HORTICULTURE, or **GARDENING,** includes, in its most extensive signification, the cultivation of esculent vegetables, fruits, and ornamental plants. In large gardens there are genera ly separate departments for flowers, fruits, and vegetables; but in small gardens they are usually more or less combined. A garden should be either on a level, but admitting of effectual drainage, or on a gentle slope, preferably on the lower portion of a slope facing the sun. It should be wel sheltered, either naturally from situation, or artistically by means of plantations, walls, etc. The character of the soil is of much importance. A good loam, or a sandy loam mixed with humus, is the best. The former is better fitted for fruit-trees, but for early crops the sandy loam is desirable. While the greater part of a garden should consist of such soil, either naturally or artificially formed, it is useful to have a portion stronger and another much lighter in order to suit the requirements of different plants. The nature of the subsoil is also important. The best is a dry bed of clay overlying sandstone. Digging, plowing, and pulverizing the soil, and exposing the surface to the action of the summer sun and the winter's frost are highly useful operations, by which the tenacity of stiff soils is overcome, weeds and insects are destroyed, and a quantity of air is admitted into the ground. Nutritive matter is frequently supplied to plants in the form of manure, either organic or inorganic. After the soil is properly dry and pulverized, the seeds are deposited, and this should always be done in dry weather, for a dry soil is especially requisite for covering in the seeds. Watering is often necessary as a means of nourishment to growing plants, especially as a support to newly transplanted vegetables, and for cleaning the leaves and destroying insects. The methods of propogating plants are various. For an account of the processes of budding and grafting see these articles. Another mode of propagation is that by means of cuttings, or shoots cut off and planted in the soil, where they take root. This process is exceedingly simple and easy in the case of many trees, as the willows and poplars; but requires some management in the heaths, myrtles, and other shrubs. In growing ornamental plants and flowers and exotic fruits, plant-houses of various kinds are necessary. These comprise the numerous forms of conservatory, plant-stove, green-house, pits, and frames. Horticultural tools, instruments, implements, and machinery are very various.

HORUS, the Latinized form of Har, the day, or the sun's path, an Egyptian divinity. Two gods were latterly recognized under the name. The elder Horus was the son of Seb (identified by the Greeks with Kronos) and Nu (Rhea) and brother of Osiris. The other Horus was the son of Osiris and Isis, and is supposed to have come into the world soon after the birth of his parents. On the death of Osiris he was his avenger, defeating the serpent Typho, and enabling Isis to thwart his wicked designs. Both the elder and younger Horus were regarded as symbols of the sun.

HO'SEA, the first in order among the minor prophets of the Old Testament, but probably the third in order of time, flourishing about 750 B.C. Nothing is known of his life, except that he was the son of Beeri, and that his ministry belonged to the reigns of Uzziah, Jotham, Ahaz and Hezekiah, kings of Judah. The nation generally and the ten tribes in particular are reproved, exhorted, and threatened in his prophecy. He predicts the approaching exile of his countrymen, and the consoling promise of the final return of an improved people

HOSHANGABAD, chief town and headquarters of district of the same name, Central Provinces of India, on the Nerbudda. It is a chief seat of the British piece-goods trade, and does business in cotton, grain, etc Pop. 13,500. The district has an area of 4437 sq. miles, and a pop. of 529,945.

HOSHIARPUR, chief town and seat of administration of district of same name, Punjab, India. Pop. 21,552. The district has an area of 2244 sq. miles, and a pop. of 1,011,659.

HOSIERY, a general term for all kinds of knitted articles, including drawers, petticoats, night-dresses, etc., and fancy articles such as head-dresses, hoods, shawls, neckerchiefs, watch-guards, cravats, etc. The materials used for the purpose are cotton, linen, and wool, the last of which is sometimes mixed with cotton or silk. Silk is also frequently used alone. Nearly all articles of hosiery, except some fancy articles, are now made by a knitting-frame of some kind or other.

HOSPICE, signifies either a little convent belonging to a religious order, occupied by a few monks, and destined to receive and entertain traveling monks; or houses of refuge and entertainment for travelers on some difficult road or pass, as the Hospice of the Great St. Bernard.

HOSPITAL, any building appropriated for the reception of any class of persons who are unable to supply their own wants, and are more or less dependent upon public help to have those wants supplied. Hence hospitals are of various kinds, according to the nature of the wants they supply and the class of persons for whom they are intended. A large number of hospitals are medical; others are for the reception of incurables; others for the aged and infirm; others for the education of children of people in reduced circumstances; others for the reception of the wounded in battle; and so on. The first establishments of this nature are believed to belong to the 4th century after Christ. Their primary object was to afford a shelter to strangers and travelers, and it was only occasionally that the sick and infirm were admitted. One of the earliest hospitals of which we have any satisfactory information was that established by the emperor Valens at Cæsarea about the end of the 4th century, and which was conducted on a very large scale. The Arabs in Spain, at an early period of their occupation of that country, founded a magnificent hospital at Cordova, where physicians were trained, who did a vast deal to advance the study of medicine. The Arabs have also the credit of having founded the first lunatic asylum in Europe, which was erected in the city of Granada. The majority of hospitals everywhere are medical, often called infirmaries. These may be divided into general and special hospitals, the former class admitting cases of all kinds; the latter class admitting only patients suffering from some special trouble. Thus there are lying-in hosiptals, cancer, consumption, ophthalmic, lock (for venereal diseases), fever, and small-pox hospitals. There are also hospitals for children, and for persons suffering from incurable diseases. Such institutions serve a double purpose, inasmuch as they not only afford the best medical

advice and treatment to the poor, who would otherwise be unable to obtain it, but also supply the best means of giving instruction in medicine and surgery, as in them students have the opportunity of witnessing cases of nearly every variety of disease, and observing how they are treated by the most skilled physicians and surgeons. For this reason a good infirmary or medical hospital is an indispensable adjunct to every school of medicine and surgery. Hospitals for the sick and hurt are usually divided into wards, each containing a larger or smaller number of beds. Medical and surgical wards are usually kept separate, and all contagious diseases are treated by themselves in distinct buildings. Each hospital has a matron, house surgeon, and apothecary resident within its walls. The duties of the matron consist in regulating the night and day nurses, and the washing and laundry department, as well as the purchase of the necessary supplies of provisions, and keeping a general superintendence over the kitchen and messes of the sick. The house surgeon takes care of all casualties and accidents in the absence of the principal surgeons. The apothecary takes care of the pharmacy and prepares all the medicines prescribed from time to time by the surgeons and physicians. There is a well-lighted room set apart for the performance of operations, and a mortuary for the reception of corpses previous to interment. The nurses relieve each other day and night in a regular manner. Particular wards are set aside for the reception of persons laboring under various and peculiar denominations of disease.

Military and Naval Hospitals, or establishments for the reception and care of sick and wounded soldiers and seamen, have been in existence in all civilized countries for a long period. Military hospitals are either permanent or temporary establishments.

HOSPITAL FEVER, a malignant form of typhus fever, so called from its being most frequently met with in military and other large hospitals. See Typhus Fever.

HOSPITALLERS, charitable brotherhoods who devote themselves to tend the sick in hospitals. The name is specially applied to an order of knights, the Knights of St. John. See John, Knights of St.

HOST, a term used for the bread (or wafer) and wine in the eucharist, as containing the body and blood of Christ. As the wafer alone is given to laymen in the Roman Catholic church, as containing both the body and blood of the Redeemer, the term host is usually applied to the consecrated wafer. See Elevation, Mass.

HOSTAGE a person left as a pledge or surety for the performance of the articles or conditions of a treaty. The taking or giving of hostages is now scarcely known in the relations of modern communities, but was formerly almost universal, and many questions in the law of nations arose out of the practice. If the stipulated terms were observed the hostages were returned on each side, but if the terms were violated or evaded the hostages might be put to death.

HOT-BED, in gardening, a bed of earth heated by fermenting substances, such as fresh stable dung, tanners' bark, leaves of trees, etc., and covered with glass to defend it from the cold air, intended for raising early plants, or for nourishing exotic plants of warm climates, which will not thrive in cool or temperate air.

HOTCH'KISS, Benjamin Berkely, American inventor, born in Watertown, Conn., in 1826. During the civil war he was engaged in the manufacture of ordnance in New York, and later invented the Hotchkiss magazine gun, used by the United States troops in the west and the United States marine corps. This was followed in 1882 by the Hotchkiss machine gun, for use in the fighting tops of war-vessels. He was also the inventor of several important improvements in projectiles and heavy ordnance. His guns were in general use throughout the armies and navies of the world until displaced in the more advanced nations by later inventions. He died in 1885.

HOTHOUSE, a building for the cultivation of plants too delicate to grow in the open air. It is built chiefly of glass, and resembles a greenhouse in its structure, and arrangements except that artificial heat is kept up all the year round. Some are heated by steam, others by hot water in tubes, and others by the introduction of hot air.

HOT SPRINGS, the county-seat of Garland co., Ark., 50 miles west by south of Little Rock. It is widely noted for the hot waters that flow from 72 springs, including a space of 10 acres on the west side of Hot Springs Mountain. The waters of these springs range in temperature from 76° to 157° Fahr., and are beneficial in a multitude of diseases. In 1832 four sections of land, the thermal springs being in the center of the district, were set off by congress as a government reservation. Since then the government has established on the mountain the Army and Navy general hospital, and expended large sums in improving and developing the reservation. It has over 100,000 visitors annually. Pop. 11,800.

HOT'TENTOTS, peculiar African race, supposed to be the aboriginal occupants of the south end of that continent, at and near the Cape of Good Hope. Their limits may be said to have been the river Orange on the north and northeast, and the Kei on the east. When young they are of remarkable symmetry; but their faces are ugly, and this ugliness increases with age. The complexion is a pale olive, the cheek-bones project, the chin is narrow and pointed, and the face consequently is triangular. The lips are thick, the nose flat, the nostrils wide, the hair woolly, and the beard scanty. When the Dutch first settled at the Cape in the middle of the 17th century the Hottentots were a numerous nation, of pastoral and partially nomadic habits, and occupied a territory of 100,000 square miles. At the present day this race is nearly extinct within the wide territory which formerly belonged to it, having been entirely hunted out and dispersed by the Boers.

HOUND, a name given generally to hunting dogs; but restricted by scientific writers to such as hunt by scent, a definition which excludes the greyhound. Among the varieties are the bloodhound,

Deer-hound.

deerhound, foxhound, harrier, and beagle. Hounds are distinguished not only by their fineness of scent, but by docility and sagacity. Of the rough-haired and smooth-haired varieties the former manifest the greatest affection for man.

HOU-PE, HU-PEH, or **HOO-PE,** (North of the Lakes), a central province of China. It is intersected by the Han-kiang and the Yang-tse-kiang, and is considered one of the most fertile parts of the empire. Pop. 33,365,005.

HOUR, the twenty-fourth part of a day. In most countries the hours are counted from midnight to mid-day, and twelve hours are twice reckoned. But in some parts of Italy twenty-four hours are counted, beginning with sunset, so that noon and midnight are every day at different hours. Each hour is divided into sixty minutes, and each minute into sixty seconds.

HOUR-GLASS, an instrument for measuring time, consisting usually of two hollow bulbs placed one above the other, and having a narrow neck of communication through which a certain quantity of dry sand, water or mercury is allowed to run from the upper to the lower bulb, the quantity of sand being adjusted so as to occupy an hour in passing from one bulb to the other. The hour-glass was commonly used in churches during the 16th and 17th centuries to regulate the length of the sermon.

HOURIS (hou'riz or hö'riz), the "black-eyed" nymphs of Paradise, whose company, according to the Koran, is to be one of the rewards of the faithful. They are described as most beautiful virgins, endowed with perpetual youth, and subject to no impurity. They dwell in beautiful gardens, by flowing streams, and the very meanest of the faithful will have at least seventy-two of them.

HOUSE, in point of law the common expression, "an Englishman's house is his castle," is in most instances true. Except where there has been a criminal offense, an Englishman can hold his house against all comers. No bailiff can break open his door to arrest him, or seize his goods for debt, nor can any court give him this power; but if a bailiff is once permitted to enter he cannot be expelled. The same conditions govern in the United States.

HOUSE-BREAKING. See Burglary.

HOUSE-FLY. See Fly.

HOUSEHOLD GODS, among the Romans, deities known as the Lares and Penates, and presiding over the fortunes of the house or family.

HOUSEMAID'S KNEE, an acute inflammation of the bursa or sac between the kneepan and the skin, so called because it is common among housemaids from their kneeling on hard damp stones. It is treated like other local inflammations by fomentations, and if necessary leeches. Mild purgatives are also useful, and the limb ought to have complete rest.

HOUSE OF COMMONS. See Britain—section Parliament.

HOUSE OF CORRECTION, a prison for idle and disorderly persons, and certain classes of criminals, such as prisoners convicted of felony or misdemeanor, vagrancy, etc., or committed on charge of such. Originally vagrants, trespassers, and convicted persons were detained in these houses that they might be compelled to work. They are sometimes called bridewells.

HOUSE OF LORDS. See Britain; also Parliament.

HOUSTON, a town in Texas, capital of Harris co., at the head of steamboat navigation on Buffalo bayou, 48 miles northwest of the important seaport of

Galveston, and the great railway center of the state. It stands in an excellent grazing district, and contains iron-foundries, cotton-presses, machine-shops and other industrial establishments. It is a great shipping port for cotton. Pop. 1909, estimated at about 90,000.

HOUSTON, Samuel, American general and president of the Republic of Texas, was born in Lexington, Va., in 1793. When quite young he moved to Tennessee. A part of his youth was spent among the Cherokee Indians, by whom he was named "Colonel." In 1813 he enlisted in the United States army, and while serving under General Jackson, was wounded in an engagement with the Creek Indians. He studied law in Nashville, Tenn., and served his state in congress from 1823–1827, when he became governor of the state. His marriage in 1829 was unfortunate; he separated from his wife, and went to live among the Arkansas Indians, and was sent to Washington to represent their interests. He visited Texas in 1832, and accepted the invitation to take up his residence there, and to become leader of the colonists in the struggle for their rights. The Texans sought union with the United States, but were denied. Santa Anna demanded that they surrender their arms, which they refused to do. Houston became commander-in-chief of the army organized to oppose the demand of Mexico. Santa Anna was captured in the battle of San Jacinto, April, 1836, and the independence of Texas secured. General Houston was the first president of the Republic of Texas. On the admission of Texas to the union, Houston represented the state as senator for twelve years. When the civil war broke out, he opposed secession and was compelled to leave Texas. He was of fine presence and a natural orator. He died in 1863.

HOWARD, Oliver Otis, American soldier, was born in Leeds, Maine in 1830. In 1861 he became colonel of the Third Maine volunteers, and commanded a brigade in the first battle of Bull Run. He took a prominent part in the battle of Antietam; was promoted to be major-general of volunteers in November; and was engaged in the battle of Fredericksburg. In April, 1863, he was placed in command of the Eleventh army corps, and as such took a conspicuous part in the battles of Chancellorsville and Gettysburg. In December, 1864, he was appointed brigadier-general in the regular army, and in March, 1865, was brevetted major-general for services at Ezra Church and during the Atlanta campaign. In 1874 Howard was placed in command of the Department of the Columbia, and in this capacity conducted the operations against the Nez Percés Indians in 1877, and against the Bannocks in 1878. In 1886 he was appointed major-general in the regular army, and in November, 1894, retired from the service.

HOWE, Elias, an American inventor, was born in Spencer, Massachusetts, in 1819, died at Brooklyn in 1867. He constructed a sewing-machine in 1846, and was for several years involved in expensive and harassing lawsuits to establish his right to reap the benefits of his own ingenuity. Immense numbers of the Howe sewing-machine are now manufactured and sold in America, Great Britain, and elsewhere.

HOWE, Julia Ward, American poet and sociological writer, was born in New York in 1819. She edited with her husband, Dr. S. G. Howe, the Boston Commonwealth, an anti-slavery journal. After the war she became a noted advocate of female suffrage. She is best known by her immensely popular Battle Hymn of the Republic, which was written in 1861.

HOWE, Richard, Earl Howe, English admiral, was the second son of Emanuel Scrope, second Viscount Howe, and was born in 1725, died 1799. In 1783 he accepted the post of first lord of the admiralty, which, with a partial intermission, he continued to hold until 1793, when, on the breaking out of the war with France, he took the command of the British fleet, and bringing the enemy to an action on June 1, 1794, he obtained over them a decisive victory, for which he received the thanks of parliament and other honors. In 1797 Lord Howe exerted himself with great success to quell the mutiny among the seamen at Portsmouth.

Lord Howe.

HOWE, Samuel Gridley, American philanthropist, was born in Boston in 1801. He served with the Greeks in their struggle for freedom and took part in the July revolution in Paris. He then became interested in the education of the blind, the subject which his name will be longest connected, and the Perkins institute in Boston became the greatest school of its kind in the world. He was the inventor of many improvements in method as well as in the processes of printing books in raised types. At the Perkins institute his most remarkable achievement was in the education of Laura Bridgman. During the civil war he was one of the directors of the sanitary commission. He was the originator of the state board of charities of Massachusetts in 1863, the first board of the sort in America. He died in 1876.

HOWE, Sir William, British soldier, was born in 1729. He was a younger brother of Richard, Earl Howe, whom he succeeded as fifth Viscount Howe in 1799. In 1757, he was placed in command of the Fifty-eighth Foot, and sent with it to America, where he took part in the siege and capture of Louisburg and accompanied Wolfe on his expedition to Quebec. He commanded the reënforcements sent to General Gage at Boston in March, 1775. He commanded the British in the battle of Bunker Hill,

General Sir William Howe.

on June 17th following. He succeeded Gage in command of all the troops in America outside of Canada, with the local rank of general. Besieged in Boston by Washington during the winter of 1775–76, and, being compelled to abandon the city, he withdrew his troops to Halifax, and afterward transferred his command to Staten Island, whence he moved on New York, winning the battle of Long Island on August 27, 1776, and occupying the city on September 15th. On October 28th he defeated Washington at White Plains, and

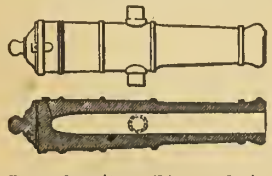
afterward captured Forts Washington and Lee. He defeated Washington at the Brandywine on September 11th, and on September 27th occupied Philadelphia. Howe sent in his resignation shortly after taking Philadelphia, and Sir Henry Clinton was appointed to succeed him. In 1782 he became lieutenant-general of ordnance, and attained the rank of full general in the following year. He died in 1814.

HOWELLS, William Dean, an American novelist, born at Martinsville, Ohio, in 1837. He learned the printer's trade with his father; was afterward assistant editor on the Ohio State Journal; published a life of Abraham Lincoln and a

W. D. Howells

volume of poems; was appointed in 1861 United States consul at Venice. On his return to America in 1865 he joined the staff of the Nation, became afterward editor of the Atlantic Monthly (1871–81), but made himself known chiefly as a writer of novels. Among his works are Venetian Life, Italian Journeys, A Chance Acquaintance, A Foregone Conclusion, The Lady of the Aroostook, Dr. Breen's Practice, A Modern Instance, The Rise of Silas Lapham, Indian Summer, The Flight of Pony Baker, The Kentons, ets.

HOWITZER, a short piece of ordnance, usually having a chamber for the powder narrower than the bore, specially designed for the horizontal firing of



Brass howitzer (24 pounder).

shells with small charges, combining in some degree the accuracy of the cannon with the caliber of the mortar, but much lighter than any gun of the same capacity. The rifled gun, throwing a shell of the same capacity from a smaller bore, and with much greater power, has superseded the howitzer for general purposes.

HOWLER MONKEY, a genus of South American monkeys, characterized by a remarkable loudness of voice, which is

Howler.

due to the presence of a large chamber within the hyoid bone and the enlargement of the ventricles of the larynx. In the tropical forests of America their hideous howls, probably a kind of amorous concert, may be heard during the night more than a mile away. They are prehensile-tailed, large, and heavy of body, with a high pyramidal head flattened on the summit.

HOWRAH, a town of India, on the right bank of the Hugli, opposite Calcutta, of which it is practically a suburb, and with which it communicates by a floating bridge. It has large dockyards, jute and saw mills, and various manufactories. Pop. 157,594.

HUCKLEBERRY, an American name for the whortleberry, which see.

HUDDERSFIELD, a flourishing manufacturing town, in the West Riding of Yorkshire, England, 16½ miles southwest of Leeds, The plan of the town is very regular, and the houses are well though somewhat uniformly built. Some of the public buildings are elegant structures. Among its institutions are two colleges for higher education, a technical school, etc. The town is the chief center of the fancy woolen trade. Broadcloths, doeskins, trouserings are also manufactured, and there are manufactories of steam-engines, machinery, etc. Pop. 95,056.

HUDSON, a town and port, in the state of and 116 miles north of New York, on the left bank of the Hudson. It is regularly built, and has large iron-smelting works, foundries, breweries, etc. Pop. 13,374.

HUDSON, Henry, English navigator date of birth unknown. He sailed from London in the year 1607 in a small vessel with only ten men and a boy, to discover the Northeast Passage, and proceeded beyond the 80th degree of latitude. In a second voyage he landed at Nova Zembla, but could get no further eastward. In 1609 he sailed for North America, and discovered the Hudson river, which he ascended about 50 leagues. In 1610 he sailed in an English ship named the Discovery, and discovered Hudson Strait and Hudson's Bay, where he wintered; but his crew, after suffering many hardships, mutinied and set him adrift in a boat along with his son John and seven of the most infirm of the crew, none of whom were ever again heard of. Hudson published Divers Voyages and Northern Discoveries (1607), and a Second Voyage (1608).

HUDSON BAY, or **HUDSON'S BAY,** an extensive bay, or rather an inland sea, Dominion of Canada, extending between lat. 51° and 64° n., and lon. 77° and 95° w.; length, north to south, about 800 miles; greatest breadth, about 600 miles. Hudson bay is navigable for 4½ months in summer (from middle of June to end of October), being obstructed by drift-ice during the rest of the year. There are many islands, reefs, and sandbanks. The shores on the east are high and bold; but those on the west, especially toward the south, are low and level, and much of the land here is favorable for stock and dairy farming. The white whale is found in its waters, and there is a considerable summer fishery.

HUDSON RIVER, a river in the United States. It rises, by two branches, in the northern part of the state of New York, in the Adirondack mountains, about lat. 44° n. Two small streams unite to form the river, which is afterward joined by the Schroon and Sacondaga. At Glen's Falls it has a fall of 50 feet, after which it runs almost due south to its mouth in New York bay. Its whole course is over 300 miles; it is navigable as far as Hudson, 118 miles, for the largest vessels. The banks of the Upper Hudson are high and rocky; and the scenery very picturesque.

HUDSON'S BAY COMPANY, an English trading company, chartered May 2,1670. It had long a monopoly of the trade throughout the whole territory of North America whose streams flow into Hudson's Bay, and at one time as far westward as the Pacific, with rights of governing and making war. In 1870 its authority was transferred by act of paliament to the crown, and its territories incorporated in the Dominion of Canada. Its trade in furs is still very large.

HUE AND CRY, in English law, the pursuit of a felon or offender, with loud outcries or clamor to give an alarm. This procedure is taken by a person robbed, or otherwise injured, to pursue and get possession of the culprit's person. At common law, a private person who has been robbed, or who knows that a felony is committed, is bound to raise a hue and cry under pain of fine and imprisonment. This is generally done by informing the nearest constable; and this process is still recognized by the law of England as a means of arresting felons without the warrant of a justice of the peace. The same name is also applied to a paper circulated by the secretary of state for the home department announcing the perpetration of offenses.

HUELVA, a seaport town of Southwestern Spain, capital of the province of same name in Andalusia. It has wide and well-built streets. There are manufactures of matting, ropes, sails, etc., a large trade in the exportation of copper ore; also in fruits and wine. The fisheries, mainly sardine and tunny, are of considerable value. Pop. 19,686.—The

province of Huelva is mountainous and well wooded in the north, and contains celebrated copper mines. In the south

it is comparatively level, and has a rich alluvial soil. Pop. 253,970.

HUG'GINS, Sir William, English astronomer, was born in London in 1824. In 1856 he built an observatory in which he mounted a telescope of eight-inch aperture, and made careful drawings of Mars, Jupiter, and Saturn. His attention was engaged in observations of spectrum analysis. His first discovery in this line was presented to the Royal society in a paper on the Lines of Some of the Fixed Stars.

He introduced photography into astronomy, which, enabled the astronomer by long exposure to obtain good pictures of celestial objects, too faint to be seen even with the most powerful telescope. Huggins also invented a spectroscopic method for studying the red prominences of the sun, and proved, through a laboratory experiment, the existence of calcium in the solar prominences and chromosphere. He was president of the Royal astronomical society from 1876 to 1878, of the British association for the advancement of science in 1891. He was chosen president of the royal society in 1900, and has at different times received the Royal, the Copley and Rumford medals.

HUGHES, CHARLES EVANS, born Apr. 11, 1862, Glen Falls, N. Y., where his father was Baptist pastor. He graduated from Brown Univ. and Columbia Law School; was prof. of law Cornell Univ. 1891-3, lecturer 1893-95, and of N. Y. Law School from 1893; was counsel on the legislative investigations of life-insurance companies 1905, elected Governor of New York State 1906.

HUGHES, Thomas, an English barrister, author, and philanthropist, born, at Uffington, Berkshire, in 1823. He is widely known by his novel, Tom Brown's School-days, a picture of school life at Rugby, published in 1856. It was followed by Tom Brown at Oxford (1861), A Layman's Faith (1868), Alfred the Great (1869), The Manliness of Christ, and other writings. He was one who devoted much time to the social elevation of the working-class, encouraging in particular the co-operative system. In 1865–68 he was member of parliament for Lambeth, and in 1868–74 for Frome. He was latterly a county-court judge. In 1880 he took a prominent part in the socialistic settlement at Rugby, Tenn. He died in 1896.

HUGLI, or **HOOGHLY** (hög'lī), a river of Hindustan, in Bengal, formed by the junction of the Bhagirathi and the Jalangi at Nadija, about 55 miles above Calcutta. Ships drawing 26 feet ascend as far as Calcutta.

HUGO (ü-gō), Victor Marie, a French poet and novelist, born February 26, 1802, at Besançon, where his father, then Major Hugo, was stationed in command of a brigade. At the age of twelve he was already writing verses, and in 1823 his first novel, Han d'Islande, appeared, followed in 1825 by Bug Jargal. In 1828 a complete edition of his Odes et Ballades appeared. After the coup d'état, December 2, 1851, he was one of those who kept up the struggle in the streets against Napoleon to the last. He then fled to Brussels, where he published the first of his bitter satires on the founder of the second empire, Napoléon le Petit. In the following year (1853) the second, the famous volume of Les Châtiments, a wonderful mixture of satirical invective, lyrical passion and pathos appeared. Hugo now went to live in Jersey, was expelled along with the

Victor Hugo.

other French exiles in 1855 by the English government, and finally settled in Guernsey. It was in the comparative solitude and quietness of the Channel islands that he wrote most of the great works of his later years, Les Contemplations (1856), La Légende des Siècles, 1st series (1859), Chansons des Rues et des Bois (1865), and his celebrated series of social novels, Les Misérables (1862) Les Travailleurs de la Mer (1866), L'Homme qui Rit (1869). In 1870, after the fall of the empire, Victor Hugo returned to Paris, where he spent the remaining years of a remarkably vigorous old age in occasional attendances at the senate, and in adding to the already long list of his literary works. Among these latest productions we may mention Quatre-vingt-treize (1872), L'Art d'Etre Grand-père (1877), L'Histoire d'un Crime (1877), Le Pape (1878), La Pitie Suprême (1879), Religions et Religion (1880), Les Quatre Vents de l'Esprit (1881), La Légende des Siècles (last series 1883), Torquemada (1882). He died on May 2, 1885.

HUGUENOT SOCIETY OF AMERICA, The, an hereditary patriotic society, organized in New York City on April 12, 1883, and incorporated on June 12, 1885. Its objects are to perpetuate the memory and to foster and promote the principles and virtues of the Huguenots; to publicly commemorate at stated times the principal events in the history of the Huguenots; and to collect and preserve all existing documents, monuments etc., relating to the genealogy or history of the Huguenots of America. Membership is extended to descendants of Huguenot families which emigrated to America or to other countries prior to the promulgation of the Edict of Toleration, November 28, 1787, as well as to writers who have made the history of the Huguenots a special subject of study.

HUGUENOTS (hū'ge-nots), a term of unknown origin, applied by the Roman Catholics to the Protestants of France during the religious struggles of the 16th and 17th centuries. During the early part of the 16th century the doctrines of Calvin, notwithstanding the opposition of Francis I., spread widely in France. Under his successor Henry II., 1547–59, the Protestant party grew strong, and under Francis II. became a political force headed by the Bourbon family, especially the King of Navarre and the Prince of Condé. At the head of the Catholic party stood the Guises, and through their influence with the weak, young king, a fanatical persecution of the Huguenots commenced. The result was that a Huguenot conspiracy, headed by Prince Louis of Condé, was formed for the purpose of compelling the king to dismiss the Guises and accept the Prince of Condé as regent of the realm. But the plot was betrayed and many of the Huguenots were executed or imprisoned. In 1560 Francis died, and during the minority of the next king, Charles IX., it was the policy of the queen mother, Catharine de Medici, to encourage the Protestants in the free exercise of their religion in order to curb the Guises. But in 1562 an attack on a Protestant meeting made by the followers of the Duke of Guise commenced a series of religious wars which desolated France almost to the end of the century. Catherine, however, began to fear that Protestantism might become a permanent power in the country, and suddenly making an alliance with the Guises between them they projected and carried out the massacre of St. Bartholomew's (August 25, 1572). The Protestants fled to their fortified towns and carried on a war with varying success. On the death of Charles IX., Henry III., a feeble sovereign, found himself compelled to unite with the King of Navarre, head of the house of Bourbon and heir-apparent of the French crown, against the ambitious Guises, who openly aimed at the throne, and had excited the people against him to such a degree that he was on the point of losing the crown. After the assassination of Henry III. the King of Navarre was obliged to maintain a severe struggle for the vacant throne; and not until he had, by the advice of Sully, embraced the Catholic religion (1593), did he enjoy quiet possession of the kingdom as

Henry IV. Five years afterward he secured to the Huguenots their civil rights by the Edict of Nantes, which confirmed to them the free exercise of their religion, and gave them equal claims with the Catholics to all offices and diginities. The Edict of Nantes was revoked in 1685, and by this act more than 500,000 Protestant subjects were driven out to carry their industry, wealth, and skill to other countries. In the reign of Louis XV. a new edict was issued repressive of Protestantism, but so many voices were raised in favor of toleration that it had to be revoked. The revolution first put the Protestants on an equality with their Catholic neighbors.

HULK, the name applied to old ships laid by as unfit for further sea-going service, and used as depôts for coals, sailors, etc. The hulks formerly often heard of in England consisted of old ships to which convicts were sent previously to their transportation.

HULL, Isaac, American marine officer, was born at Derby, Conn., in 1773. While on his way from Annapolis to New York, by masterly seamanship he escaped from a squadron of five British men of war that pursued him for several days. His celebrated victory over the Guerriere, a slightly weaker British frigate, which was forced to surrender, was the first victory obtained by the Americans over the British in the war and aroused great enthusiasm. He is regarded as the ablest single ship commander on either side during the war of 1812. He died in 1843.

HULL, or **KINGSTON-ON-HULL,** a river port, municipal and parliamentary borough of England, and a county of itself, locally situated in the East Riding of York at the influx of the Hull into the estuary of the Humber. Pop. 240,618.

HUMANE ASSOCIATION, American federation of societies of the United States for the prevention of cruelty to animals and children, was formed at Cleveland, Ohio, in 1877. It investigated the abuses which prevailed on lines of railways transporting cattle, and offered a prize of $5000 for the best model of a cattle-car that would make possible the feeding, watering, and resting of cattle in transit, the result of which was that many improved cars were brought into use.

HUMANITA'RIANS, a term sometimes applied to the various classes of anti-trinitarians, who regard Christ as a mere man. Their opinions must not be confounded with Arianism, which admits the pre-existence of Christ, and his pre-eminence among God's creatures. The term is also applied to the followers of St. Simon, who maintained the perfectibility of human nature without the aid of supernatural grace.

HUMANITIES, a term for humane or polite literature, including the study of the ancient classics, in opposition to philosophy and science. In the Scotch universities humanity is applied to the study of the Latin language and literature alone.

HUMBER, a large river, or rather estuary, on the east side of England, between the counties of York and Lincoln.

HUMBERT I., Umberto, King of Italy, born March 14, 1844, eldest son of Victor Emmanuel. In the war of 1866, in which Italy joined Prussia against Austria, he took the field in command of a division, and distinguished himself by his bravery in the disastrous battle of Custozza. In 1868 he married his cousin, Margherita, daughter of Duke Ferdinand of Genoa. He succeeded his father on January 9, 1878, and was assassinated in July, 1900.

HUMBOLDT (hum'bolt), Friedrich Heinrich Alexander, Baron von, a German traveler and naturalist, was born September 14, 1769, at Berlin. In 1797 he resolved to make a scientific journey in the tropical zones along with a friend, Aimé Bonpland. They landed at Cumana, in South America, in July, 1799, and spent five years in exploring scientifically the region of the Orinoco and the upper part of the Rio Negro, the district between Quito and Lima, the city of Mexico, and the surrounding country, and the island of Cuba. In 1829, under the patronage of the Czar Nicholas, he made an expedition to Siberia and Central Asia, which resulted in some valuable discoveries, published in his Asie Centrale. Humboldt died in 1859.

HUME, David, an eminent historian and philosopher, was born at Edinburgh on the 26th April, 1711. We was destined for the law, but was drawn away

David Hume.

by his love of literature and philosophy; and retired to France, where during three years of quiet and studious life he composed his Treatise upon Human Nature. The work was published at London in 1738, but, in his own words, "fell dead-born from the press." His next work, Essays, Moral, Political, and Literary (Edinburgh, 1742), met with a better reception. In 1745 he became companion to the insane Marquis of Annandale; and he accompanied General Sinclair in 1746 and 1747 in his expedition against France and in a military embassy to Vienna and Turin. He now published a recasting of his Treatise upon Human Nature, under the title of an Inquiry Concerning the Human Understanding (1747). In 1752 he published his Political Discourses, which were well received, and his Inquiry Concerning the Principles of Morals. The same year he obtained the appointment of librarian of the Advocates' library at Edinburgh, and began to write his History of England, of which the first volume appeared in 1754. In 1767 he was appointed under-secretary of state, a post which he held till 1769, when he retired to Edinburgh. Here he lived till his death on August 25, 1776.

HUMMING-BIRDS, the name given to a family of minute and beautiful birds, so called from the sound of their wings in flight. The beak is slender, generally long, sometimes straight and sometimes

Tufted-necked humming-bird.

curved; the tongue is long, filiform, bified at the point, and capable of being protruded to a considerable distance. In size humming-birds vary from that of a wren to that of a bumble-bee. They never light to take food, but feed while on the wing, hovering before a flower, supported by a rapid vibratory movement of the wings which produces the humming noise. Insects form a great proportion of their food. These beautiful birds are peculiar to America, and almost exclusively tropical. One species the ruby-throated humming-bird, is pretty common in the northeast of the United States. The only note of the humming-bird is a single chirp, not louder than that of a cricket. It is very fearless and irascible, two males scarcely ever meeting without a contest. Among the more remarkable of these birds is the tufted-necked humming-bird of Guiana and Northern Brazil. In this species the crest, outer tail-feathers, and neck-plumes are reddish chestnut, the latter tipped with green, the throat and upper part of the breast are emerald green, the back bronze green. Perhaps four hundred species of humming-birds are now known.

HUNGARY (Hungarian name, Magyar-Orszag, Land of the Magyars), a kingdom in the southeast of Europe, forming, together with Austria, the Austro-Hungarian monarchy. It includes Hungary Proper, with Transylvania, Slavonia, Croatia, the Croato-Slavonian Military Frontiers, etc.; total area, 124,400 sq. miles, with a pop. of 19,203,531. Hungary Proper (including Transylvania), with an area of 108,000 sq. miles and a pop. of 16,653,332, may be considered as a large basin surrounded by mountains on every side except the south. Of these the principal are the Carpathians, which cover the northern and eastern parts of the country with their ramifications. The Danube and the Theiss, with their affluents, are the chief rivers. Hungary is one of the healthiest countries in Europe, and generally has a fertile soil. All kinds of grain, especially wheat, wines, fruits,

tobacco, hemp, flax, hops, saffron, woad, madder, sumach, cotton, are among the products of Hungary. Horses, cattle, sheep, hogs, game (in the north bears), poultry, fish (especially the sturgeon and salmon), bees, and silk-worms are among the productions of the animal kingdom. Among the minerals are gold, silver, copper, iron, lead, zinc, cobalt, antimony, sulphur, arsenic, salt, etc., with coals and peat. The situation of Hungary, which occupies an area where the various races of Europe meet and interlace, accounts for the variety of nationalities it contains. These comprise, besides the Hungarians or Magyars (over 7,000,000 in number), Roumanians, Slavocks, Germans, Servians, Ruthenians, etc. The Magyars, who are the dominant race, are located for the most part compactly in the center of the kingdom. They are brave, high-spirited, and sincere, in many respects resembling their kinsmen the Turks. A decided majority are Roman Catholics, the rest Protestants, chiefly Calvinists, with a few Greek Catholics. The Germans have settled all over the country, and there is scarcely a town of Hungary which is not at least partly inhabited by Germans, while some are essentially German. Science, literature, the press, trade and industry, are for the greater part in their hands. The Hungarian has a natural inclination to agriculture and the breeding of cattle, and the fertility of the soil making up for some deficiencies in methods has made Hungary one of the chief corn-growing countries of Europe. It is also celebrated for its wines, the finest variety of which is the Tokay. There are few extensive manufactures in Hungary. Iron and steel works, potteries, glass manufactories, sugar-refineries, soap and tallow works, are amongst the principal. The production of coal and iron is increasing and the annual value of the mining products is about $12,500,000. With regard to popular education Hungary is behind the Austrian part of the empire, but education was made compulsory in 1868. There are universities at Budapest, Klausenburg, and Agram. The Hungarian language is nearly allied to the Turkish and Finnish, but not to any other tongue spoken in Europe. It has latterly been carefully cultivated, and Hungarians have distinguished themselves in all branches of literature. Among modern names we can only mention those of Andrew Horvath, Eötvös, A. and C. Kisfaludy, Garay, Vörösmarty, Petöfi, Kerény, Arany, Josika, and Jokay. Beside its representation in the controlling body of delegations (see Austria) Hungary since 1867 has an independent diet, consisting of an upper and lower house the first composed of hereditary and life peers, church dignitaries and state dignitaries; the second of representatives elected by vote. The Austrian emperor is only king of Hungary Croatia and Slavonia have a common diet of their own for the management of internal affairs.

The Magyars, an Asiatic people of Turanian race, allied to the Finns and the Turks, dwelt in what is now Southern Russia before they descended under Arpad into the plain of the Danube, toward the end of the 9th century, and conquered the whole of Hungary and Transylvania. During the first half of the 10th century their invasions and incursions spread terror throughout Germany, France, and Italy; but at length their total defeat by Otho I. of Germany put an end to their maraudings, and under their native dynasty of Arpads they settled down to learn agriculture and the arts of peace. Stephen I. (997–1030) was the first who was successful in extending Christianity generally among the Hungarians, and was rewarded by a crown from Pope Sylvester II. and with the title of apostolic king (1000). In 1089 King Ladislaus extended the boundaries of Hungary by the conquest of Croatia and Slavonia, and King Coloman by that of Dalmatia in 1102. About the middle of the 13th century King Bela induced many Germans to settle in the country which had been depopulated by the Mongol invasions. With Andrew III. (1290–1301) the male line of the Arpad dynasty became extinct, and the royal dignity now became purely elective. Charles Robert of Anjou was the first elected (1309). Louis I. (1342–82) added Poland, Red Russia, Moldavia, and a part of Servia, to his kindgom. The reign of Sigismund (1387–1437), who was elected emperor of Germany, is interesting from the invasion of Hungary by the Turks (1391), and the war with the Hussites. Matthias Corvinus (1458–90), combining the talents of a diplomatist and general, is even yet remembered by the popular mind as the ideal of a just and firm ruler. During the reigns of Ladislaus II. (1490–1516) and Louis II. (1516–26) the rapacity of the magnates and domestic troubles brought the power of Hungary low, and the battle of Mohacs (1526) made a great part of the country a Turkish province for 160 years. The rest was left in dispute between Ferdinand of Austria and John Zapolya; but eventually by the help of the Protestants passed to the former, and has since remained under the scepter of the Hapsburgs. In 1686 Leopold I. took Buda and recovered most of Hungary and Transylvania. In 1724 Charles VI. secured by the Pragmatic Sanction the Hungarian crown to the female descendants of the House of Hapsburg, and the loyalty of the Hungarians to his daughter, Maria Theresa, saved the dynasty from ruin. Maria Theresa did much for the improvement of Hungary by the promulgation of the rural code called Urbarium, and by the formation of village schools. On the advent of the French revolution, and during the wars which ensued, the Hungarians once more played a prominent part in support of the Hapsburg crown. Napoleon fell, but the revolution had given an impetus to ideas of national and popular rights which the Hungarians, long stifled under the Germanic traditions and tendencies of their rulers, were among the first to feel. For a time Francis I. and Metternich stood stiffly out against all concessions, and tried to govern by pure absolutism, but ended by summoning in 1825 a new diet. The diet distinguished itself by adopting the Magyar language in its debates instead of the Latin to which it had been accustomed. Succeeding diets in 1830 and 1832 made new demands in the direction of religious equality, a popular suffrage, and abrogation of the privileges of the nobles. The Austrian government attempted to repress the Hungarian national movement by imprisoning Deak, Kossuth, and others of the leaders. The struggle continued till 1848, when the French revolution of that year gave the impulse for a similar rising in Vienna. Prince Metternich fled to London, and the Viennese court made a formal concession of all important demands; but these had no sooner been granted than the government began secretly to work against their being put in operation. The dependencies of the Hungarian crown, the Croats and the Wallachians of Transylvania were privately encouraged to revolt, and in December of the same year an Austrian army took the field with the avowed object of annihilating the independence of Hungary; but a series of pitched battles resulted on the whole so much in favor of the Hungarians that Austria was obliged to call in the aid of Russia, which was at once granted. After a heroic struggle the Hungarians had to succumb. The nation was reduced to the position of a province, and some of the greatest statesmen and soldiers of Hungary perished on the scaffold. But the struggle was continued by the Hungarians in the form of a constitutional agitation, and at last, when the battle of Sadowa in 1866 separated Austria from Germany, Austria, left face to face with a nation almost as powerful and numerous as itself, felt compelled to submit. In 1867 a separate constitution and administration for Hungary was decreed, and on 8th June the emperor and empress were crowned king and queen of Hungary with the utmost pomp, according to the ancient ceremonies of a Hungarian coronation. The dualism of the Austrian empire was thus finally constituted. It was indeed but the partial recognition of the fact that the empire was a heterogeneous assemblage of communities differing widely in race, language, social habits and customs, and bound together only by the accident of having fallen to the house of Hapsburg.

HUNGER, a craving for food. It is a sensation partly arising in the stomach, since it may be relieved temporarily by the introduction into the stomach of material which is incapable of yielding any nutriment to the body. It may be due to a condition of fulness of the vessels of the stomach, relieved by any stimulus which, acting on the lining membrane, induces a flow of fluid from the glands. But it also arises from a condition of the system since the introduction of nutriment into the blood, apart altogether from the stomach, will relieve it. This is also evident from the fact that hunger may be experienced even when the stomach is full of food, and when food is supplied in abundance, if some disease prevents the absorption of the nourishment, or quickly drains it from the blood. Hunger may be partially allayed by sleep or by the use of narcotics, tobacco, and alcohol, all of

which tend to diminish the disintegration of tissue.

HUNS, a nomadic and warlike people of Asia, of Mongolian race, part of whom entered Europe, probably in the 4th century after Christ, conquered the Alans, and drove the Goths out of Dacia. They continued to extend their dominion along the Danube till the time of Attila (434 A.D.), who, uniting the whole Hunnish power in one hand became the most powerful prince of his time. His defeat near Chalons was the commencement of the decline of the power of the Huns, and within a generation after his death in 453, the great Hunnish empire had completely disappeared, and the race been absorbed among other barbarous peoples. The term Huns was used by ancient and mediæval writers in a very vague way to indicate barbarous hordes invading Europe from the northeast. The Huns are described as a race of dark complexion with small black eyes, flat noses, and broad shoulders.

HUNT, James Henry Leigh, an English poet and essayist, born in 1784. Among his works may be mentioned, A Legend of Florence, a play represented with some success at Covent Garden in 1840; Stories from the Italian Poets (two vols. 1846); Men, Women, and Books (1847); A Jar of Honey from Mount Hybla (1847); the Town, its Memorable Characters and Events (1848); Autobiography (three vols. 1850); Table Talk (1850). In 1842 Mrs. Shelley settled an annuity of $600 upon Leigh Hunt, and in 1847 a government pension of $1,000 a year was bestowed on him. He died in 1859.

HUNT, Richard Morris, American architect, was born at Brattleboro, Vt., in 1828. He was the architect of the capitol extension at Washington, the Lenox library, the Tribune building, New York, the United States naval observatory at Washington, the Divinity college building at Yale, the administration building for the World's Fair, Chicago, and the Yorktown monument. Among private houses by him are: W. K. Vanderbilt's, New York; the country house of George Vanderbilt, Biltmore, N. C.; and several beautiful summer houses at Newport, R. I., including the "Marble House" and the "Breakers." He was one of the founders, and in 1888 became president of, the Institute of Architects. He was a knight of the Legion of Honor and a foreign associate of the Institute of France. He died in 1895.

HUNT, William Holman, an English painter, born in 1827 at London. In 1853 his Claudio and Isabella first attracted public attention, followed next year by the Light of the World (Christ teaching in the temple). Outside of Biblical subjects Mr. Hunt has painted some notable pictures: Isabella and the Pot of Basil, The After-Glow, The Festival of St. Swithin, etc.

HUNTER, John, surgeon and physiologist, was born at Long Calderwood, Lanarkshire, in 1728. He died in 1793. Hunter contributed greatly to the high development of English surgery, as well as to the advance of anatomy.

HUNTER, Robert Mercer Taliaferro, American politician, born in Essex co., Va., in 1809. He was elected to the state legislature in 1833 and to congress in 1837, and was re-elected with the exception of the twenty-eighth congress (1843–45) until 1847, when he took his seat in the senate. He was expelled from the senate in 1861 after the secession of Virginia. From July, 1861, to February, 1862, he was secretary of state in Jefferson Davis' cabinet. He also represented Virginia in the Richmond senate 1862–65. He died in 1887.

W. Holman Hunt.

HUNTING DOG, this animal which inhabits all the more open parts of Africa south of the Sahara and Abyssinia, is an aberrant species of dog, distinguished from the typical Canis by having four toes on each foot, and other structural peculiarities. It is about as tall as a grayhound, its legs being relatively long and slender, and adapted to the swift and enduring speed upon which it must depend for a livelihood. The head is broad and flat, with a short muzzle armed with massive teeth, rather large upstanding furry ears, and a suggestion of the hyena in the physiognomy; hence it is sometimes called "hyena-dog," though the likeness is wholly superficial. The fur is short, thick, and smooth, and grows more shaggy about the cheeks and throat; and the tail is long and wolf-like. In general color this dog is yellowish gray, but it is marked most irregularly with a variety of colors, such as a combination of red, white, yellow, and black spots, so that the hyena-dog may be regarded as the most parti-colored of all mammalia.

HUNTINGDON (contracted Hunts), a small inland county of England, surrounded by the counties of Northampton, Cambridge and Bedford; area, 229,515 acres. Pop. 57,772.

HUNTINGTON, the county seat of Huntington co., Ind., on the Little river, the Wabash and Erie canal, and the Wabash and the Erie railroads; 24 miles s.w. of Fort Wayne, 118 s.w. of Toledo. It is the commercial center of the Upper Wabash valley, and the place of manufacture of the famous Huntington white lime. The shops and division headquarters of the Erie railway are here. Pop. 11,291.

HUNTINGTON, village; Suffolk co., N. Y., on Huntington Bay, which opens into Long Island Sound, and on the Long Island railroad; 38 miles e. of New York. The town of the same name include Lloyd's Neck and several villages. Pop. 11,260.

HUNTINGTON, the county seat of Cabell co., West Va., on the Ohio river, and the Ches. and O., the Newport News and Miss. Val., and the Ohio river rails ways; 52 miles w. of Charleston, the state capital. Pop. 14,323.

HURA, a genus of tropical American plants, the sand-box tree, is remarkable for the loud report with which its seed-

Sand-box tree.

vessel bursts. It is a large branching tree with glossy poplar-like leaves, inconspicuous dicœcious flowers, and large, furrowed, roundish fruits of the size of an orange.

HURDLES, frames formed of perpendicular stakes with horizontal bars, and braced with diagonal pieces for the purpose of forming temporary fences. In fortification the name is given to a collection of twigs or sticks closely interwoven and sustained by long stakes, and serving to render works firm, or to cover traverses and lodgments for the defense of workmen against fireworks or stones.

HURDY-GURDY, a stringed instrument, played by turning a handle. Its tones are produced by the friction of a wheel acting the part of a bow against

Hurdy-gurdy.

four strings, two of which are pressed by the fingers or by keys. The other two strings are tuned a fifth apart to produce a drone bass, and are not stopped by the fingers or keys.

HURON, Lake, one of the five great lakes on the frontiers of the United States and Canada. It is the third in size, being 218 miles long north and south, and (including Georgian Bay) 180 miles broad at its widest part, with an area of about 21,000 miles. It lies 578 feet above sea-level. The lake contains several thousand islands, varying in size from a few square feet to huge islands like the Great Manitoulin, which is about

107 miles long and from 4 to 25 miles wide, and is the only one inhabited. The waters are very clear and pure, abound in fish, and have a depth averaging from 800 to 1000 feet.

HURONIAN-ROCKS, in geology, a term applied to certain rocks on the banks of Lake Huron, consisting of quartzite, with masses of chloritic schist. They occupy the same relative position as the upper parts of the Archæan rocks of Britain.

HUSBAND AND WIFE, recent legislation in most countries has been in the direction of putting husband and wife on an equality, whereas formerly the wife to a great extent lost her separate status on marriage. Thus, for instance, by the English common law her personal property passed at once to her husband on marriage, though this might be obviated by special settlements, etc. But the law no longer stands so, especially since the act of 1882. By this statute a married woman can acquire, hold, and dispose by will or otherwise, of property as if she were an unmarried woman, and may enter into any contract, and sue or be sued without the participation of her husband. A woman carrying on a business separately from her husband is subject to the bankruptcy laws as if she were unmarried. Every married woman has, even against her husband, the same civil remedies, and also the same remedies by way of criminal proceedings for the protection and security of her own property as if she were unmarried; but she cannot take criminal proceedings against her husband while they are living together. Generally a husband is not bound by the contracts of his wife unless they are made by his express or implied authority. See also Marriage, Divorce, Adultery, etc.

HUSS, or **HUS,** John, Bohemian religious reformer, born about 1373. He studied at the University of Prague, took the degree of Master of Arts in 1396, and in 1398 began to lecture on theology and philosophy. In 1401 he was made dean of the faculty of philosophy, became the leader of the Bohemian in opposition to the German professors and academicians, and after the withdrawal of the latter to Leipzig, was made rector of the university (1409). Since 1391 he had been acquainted with the writings of Wickliffe, and his denunciation of the papal indulgences, of masses for the dead, of auricular confession, etc., alarmed Archbishop Sbynko of Prague, who had 200 volumes of Wickliffe's writings burned (1410) in the archiepiscopal palace, and the preaching in Bohemian prohibited. He was sentenced to death on July 6, 1415, and burned alive the same day, and his ashes thrown into the Rhine.

HUSSARS', originally the name of the Hungarian cavalry, raised by Matthias I. in 1458. Every twenty houses were obliged to furnish a man, and thus from the Hungarian word husz (twenty) was formed the name Huszar, Hussar, afterwards applied generally to light cavalry, similarly dressed and armed, of other European armies.

HUSSITES, the followers of John Huss. After the death of Huss, his adherents took up arms for the defense of their principles, and under the leadership of Johann Ziska, captured Prague, fortified Mount Tabor, and repeatedly defeated the troops sent against them by the Emperor Sigismund, who had succeeded to the crown of Bohemia. Ziska died in 1424, and was succeeded by Procopius, who also distinguished himself by many victories.

HUSTINGS, (1) a name given to a court formerly held in many cities of England, as York, Winchester, Lincoln, but especially applied to the county court of the city of London held before the lord-mayor, recorder, and sheriffs. (2) The platform from which candidates for political preferment address their constituents.

HUTCHINSON, the county seat of Reno co., Kan., on the Arkansas river, here spanned by four bridges, and the Atch., Top. and S. Fé, the Chi., R. Is. and Pac., the Hutch. S., and the Mo. Pac. railways; 168 miles w. by s. of Topeka. It contains the largest and purest deposit of rock salt in the United States. It is the seat of the state reformatory. Pop. 11,189.

HUTTON, James, Scottish geologist, born at Edinburgh in 1726. Among his numerous works are an Investigation of the Principles of Knowledge, Theory of Rain, Theory of the Earth, with Proofs and Illustrations (1795). He died in 1797.

HUXLEY, Thomas Henry, English naturalist, born May 4, 1825. He graduated M. B. at the University of London in 1845, and entered the royal navy as assistant-surgeon in 1846. He

Thomas Henry Huxley.

sailed with H.M.S. Rattlesnake on a surveying expedition to Australasia, during which he sent a number of valuable papers to the Royal Society. After being professor of natural history in the School of Mines, Fullerian professor of physiology to the Royal Institution, Hunterian professor in the Royal College of Surgeons, president of the British Association meeting held at Liverpool in 1870, lord-rector of Aberdeen University in 1872, secretary of the Royal Society, substitute professor of natural history for Professor Wyville Thompson at Edinburgh in 1875 and 1876, a member of various royal commissions on fisheries vivisection, universities, etc., and inspector of salmon fisheries, he resigned this and almost all his other offices in 1885 on account of ill health. Among his works are The Oceanic Hydrozoa (1857), On the Theory of the Vertebrate Skull, Man's Place in Nature (1863), On Our Knowledge of the Causes of the Phenomena of Organic Nature, a series of lectures to working-men delivered in 1862, Elements of Comparative Anatomy (1864), Elementary Physiology (1866), Introduction to the Classification of Animals (1869), Lay Sermons, Addresses, and Reviews (1870), Critiques and Addresses (1873), American Addresses (1877), Physiography (1877), Anatomy of Invertebrate Animals (1877), The Crayfish (1879), Science and Culture (1882), etc. He died at Eastbourne, June 29, 1894.

HUYGENS (hoi'gens), Christian, Dutch mathematician and physicist, born in 1629. He died at the Hague in 1695. Among his most important contributions to science are his investigations on the oscillations of the pendulum and his System of Saturn, in which he first proved that the ring completely surrounds the planet, and determined the inclination of its plane to that of the ecliptic. In 1690 he published important treatises on light and on weight. His Traité de la Lumiére was founded on the undulation theory, but in consequence of the prevalence of the Newtonian theory it was long neglected till later researches established its credit.

HY'ACINTH, a genus of liliaceous bulbous plants, including about thirty species, among which the garden hyacinth is celebrated for the immense varieties which culture has produced from it. It is a native of the Levant, and was first cultivated as a garden flower by the Dutch about the beginning of the 16th century.

HY'ACINTH, or **JACINTH,** a variety of the mineral zircon, whose crystals, when distinct, have the form of a four-sided prism, terminated by four rhombic planes, which stand on the lateral edges. Its prevailing color is a red, more or less tinged with yellow or brown. The name hyacinth is also given to varieties of the garnet or cinnamon stone, the sapphire, and topaz.

HY'ADES, a cluster of five stars in the constellation Taurus, supposed by the ancients to indicate the approach of rainy weather when they rose with the sun.

HYBRID, the produce of a female animal or plant which has been impregnated by a male of a different but nearly allied species or genus. Much uncertainty prevails respecting the productive crossing of species, but it seems to be established that while the crossing of different genera may result in offspring, that of different orders will not. Hybrids are obtained among fishes from different species of carp; among birds, from the goldfinch and canary, the swan and the goose, etc.; among mammals, from the horse and the zebra, the horse and the ass, the produce of the last two being the mule proper; from the lion and tiger, the dog and wolf, the dog and fox, the goat and ibex. Instances of hybrids between animals of different genera have been furnished by the union of the goat and the antelope, and of the stag and the cow. It used formerly to be considered that the propagative power of hybrids was either

absolutely null, or that they propagated only with an individual of the pure breed; but the experiments of Mr. Darwin and other recent researches have shown that although infertility to some degree generally attends sexual intercourse between different species, yet in such intercourse every degree of difference from absolute sterility up to complete fertility is found. The results hitherto obtained may be summarized as follows: The crossing of species of different families is in almost every case infertile; allied species are capable of producing offspring, and this capability is in indefinite ratio to the degree of their likeness; hybrids are frequently fertile with their parents, but more rarely among themselves; there is no fixed relation between the degree of fertility manifested by the parent species when crossed and that which is manifested by their hybrid progeny. In many cases two pure species can be crossed with unusual facility, while the resulting hybrids are remarkably sterile; and, on the other hand, there are species which can only be crossed with extreme difficulty, though the hybrids when produced are very fertile.

HYCSOS, or HYKSHOS, or Shepherd Kings, wandering tribes of Semitic descent, who conquered the whole of Egypt about 2100 B.C., and were driven out some five hundred years afterward. The only detailed account of them in any ancient writer is a passage of a lost work of Manetho, cited by Josephus. Their epoch covers the 13th to the 17th dynasties.

HYDERABAD, or **HAIDARABAD,** a state of Hindustan, which comprehends the greater part of that central plateau of Southern India known as the Deccan, and is in possession of a Mohammedan prince, the Nizam; area, 80,000 sq. miles, exclusive of the Berar or Hyderabad Assigned Districts under British administration. The chief products are rice, wheat, maize, sugar-cane, tobacco, cotton, indigo, fruits, and timber Pop. 11,357,040. The ruler of Hyderabad belongs to a dynasty founded by Asaf Jah, a distinguished soldier, whom the Emperor Aurungzeb made rank the first Mohammedan ruler in India, with a regular army of about 15,000, besides numerous irregulars.—Hyderabad, the capital is situated on the river Musi, at an elevation of 1672 feet above the sea. There are manufactures of silks, trinkets, and turbans. Pop. of city and suburbs, 448,466.

HYDERABAD, or **HAIDARABAD,** a town of Hindustan, capital of Hyderabad, District Sind. It is situated on a rocky eminence about 3 miles from the eastern bank of the Indus. The principal manufactures are arms, silks, cottons, and lacquered ware. Pop. 69,378.—The district has an area of 9030 sq. miles; the pop. is 918,646.

HYDER ALI, a distinguished Indian prince, born in 1728, son of a general in the service of the Rajah of Mysore. By his military talents he became the actual ruler of Mysore, and in 1762 deposed Kandih Rao, and had himself chosen Rajah. In 1780 he formed an alliance with the Mahrattas against the English, took Arcot, but was defeated by Sir Eyre Coote, June 1, 1781. The Mahrattas now joining in a league against him, he carried on a disadvantageous

Hyder Ali.

war, during the continuance of which he died, in 1782. He was succeeded by his son, Tippoo Saib.

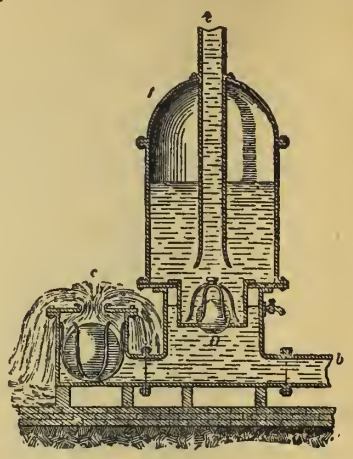
HYDRA, in Greek mythology, a celebrated monster, which infested the neighborhood of Lake Lerna in the Peloponnesus. Some accounts give it a hundred heads, others fifty, others nine. As soon as one of these heads was cut off two immediately grew up if the wound was not stopped by fire. It was one of the labors of Heracles to destroy this monster, and this he effected with the assistance of Iolaus, who applied a burning iron to the wounds as soon as one head was cut off.

HYDRANGEA (hī-dran'jē-a), a genus of shrubs containing about thirty-three species, natives of Asia and America. The garden hydrangea is a native of China. It is a favorite for the beauty and size of its flowers.

HYDRAULIC CRANE, a crane wrought by the pressure of water applied on the principle of the hydraulic or hydrostatic press. The mechanism consists of one or more such presses, with sheaves or pulleys and chains for the purpose of obtaining an extended motion in the chain from a comparatively short stroke of the piston. The power is applied not only for lifting the load, but also for swinging the jib, which latter object is effected by means of a rack or chain operating on the base of the movable part of the crane, and connected either with a cylinder and piston having alternate motion, like that of a steam-engine, or with two presses applied to produce the same effect by alternate action.

HYDRAULIC PRESS, known also as Hydrostatic Press or Bramah's Press. See Hydrostatic Press.

HYDRAUL'IC RAM, a machine for raising water, and depending for its action on the impulse of flowing water. The water falling from a reservoir passes into a pipe or chamber (b), at the end of which there is a ball valve (c). The rush of supply water at first closes this, and the water finding no exit there acquires pressure enough to open another valve (d) and pass into an air-vessel placed over it (f). The cessation of pressure at valve c allows it to fall again; an outrush of water takes place there, relieving valve d, which again closes. The pressure of the flowing water upon valve c once more closes this valve, and valve d again opens, and an additional quantity of water is forced into the air-vessel



Hydraulic ram.

and so on by a series of pulsations which send the water along the service pipe, and, in properly arranged machines, raises it to a very considerable height, although the impulse is derived only from the fall of a few feet.

HYDRAUL'ICS, that part of mechanical science which has to do with conducting, raising, and confining water, or of applying it as a motive power. It thus has to do with the flow of water in pipes or channels, and with the various machines in which water is utilized, such as water-wheels, pumps, turbines, the archimedean screw, the Barker's mill, the hydraulic ram, the hydraulic crane, the hydraulic or hydrostatic press, etc.

HYDROCARBONS, in chem., a series of compounds which consist of carbon and hydrogen only. They are produced chiefly by the decomposition of organic substances, either slowly by natural causes, or by artificial means, as in the case of the destructive distillation of coal for the purpose of making gas. Certain of the hydrocarbons are also found in the gums which exude from trees. Among the best known are paraffin benzine, turpentine.

HYDROCELE, a collection of serous fluid in some of the coverings of the testicle or spermatic cord, or in the areolar texture of the scrotum. It is generally the result of a strain or an inflammation of the testes. A large tumor is formed, filled with fluid, which has often to be drawn off three or four times a year. A radical cure may be effected by setting up an inflammation which brings the opposite surfaces of the sac into adhesion, and thus obliterates the cavity.

HYDROCEPH'ALUS, an accumulation of fluid within the cavity of the cranium; dropsy of the brain.

HYDROCHLORIC ACID, or **MURIATIC ACID,** a gaseous compound of equal volumes of hydrogen and chlorine. It is evolved during volcanic eruptions, and is found in the water which collects in the crevices of mountains, as well as in rivers which take their rise in volcanic

formations, especially in South America. It may be produced by decomposing common salt with sulphuric acid, or by bringing equal volumes of chlorine and hydrogen together and exposing the mixture to diffused daylight without condensation. It explodes in direct sunlight. Hydrochloric acid is colorless, has a pungent odor, and an acid taste. It is quite irrespirable, extinguishes flame, and dissolves very readily in water. The chief use of hydrochloric acid in the arts is to supply chlorine to the bleaching-powder manufacturer. It is also used in the preparation of glue, phosphorus, carbonic acid, artificial waters, etc. In medicine it is used diluted as a tonic and astringent. In a concentrated form it is a powerful caustic.

HYDROCYANIC ACID. Same as Prussic Acid.

HYDRODYNAM'ICS, a branch of the general science of dynamics, treating specially of the laws of force as applied to fluids. It is divided into hydrostatics, which is concerned with forces applied to fluids at rest, and hydrokinetics, which treats of the application of forces so as to produce motion in fluids. The term hydrodynamics is, however, very often used in the latter sense, being thus opposed to hydrostatics. The name Hydraulics is given to the subject when considered with respect to its practical bearing on engineering science.

HYDRO-ELECTRIC MACHINE, a machine in which electricity is generated by the friction of steam against the sides of orifices through which it is allowed to escape under high pressure.

HYDROFLUOR'IC ACID, or **FLUOHYDRIC ACID,** an acid which may be obtained either in the liquid form or in the anhydrous form, as a colorless gas. Both the dry and the liquid form act upon the skin with great virulence. Hydrofluoric acid is used chiefly for etching upon glass. The glass is covered with a thin coating of etching wax, and the design is traced through the wax down to the glass with a fine-pointed instrument. The plate is then treated either with an aqueous solution of the acid or is exposed to the gas itself. After a sufficient length of time the wax is dissolved away and the design becomes visible. In chemistry hydrofluoric acid is used to decompose and dissolve silicates in mineral analysis.

HY'DROGEN, an important elementary substance, one of the elements of water and a component of all vegetable and animal products. It may be obtained by passing the vapor of water over red-hot iron filings, or by submitting water to the action of an electric current, whereby it is decomposed into its elements hydrogen and oxygen. Pure hydrogen is a colorless, tasteless, inodorous gas; it is very inflammable, burning with a pale, very slightly luminous, but intensely hot flame; it is a powerful refractor of light; the least dense and the most rapidly diffusible of all the gases and the lightest body in nature, being about 14½ times lighter than atmospheric air, with a specific gravity of .0693. In consequence of its extreme lightness it is the recognized standard of unity in referring to the atomic weight of bodies, and it has also been assumed as the unit in speaking of the specific gravity of gases, although common air is the more generally received standard. Hydrogen cannot support respiration, but is not directly poisonous, death ensuing from mere absense of oxygen. Two volumes of hydrogen with six of air form an explosive mixture. The most intense heat that can be produced is caused by the burning of hydrogen in oxygen gas, and this principle has been applied to increase the temperature of blast-furnaces in iron-works by making the gases pass separately through heated tubes to the furnace. Hydrogen is only slightly soluble in water, nor is there any other liquid which is capable of dissolving it in great quantity. Hydrogen gas can be liquefied by exposure to 650 atmospheres pressure, and 140° c., but remains liquid at 320 atmospheres pressure, the temperature remaining the same. It unites with all other elementary gaseous bodies, and forms with them compounds, not only of great curiosity, but of vast importance and utility: with nitrogen it forms ammonia; with chlorine, hydrochloric acid; with fluorine, hydrofluoric acid, etc.

HYDROG'RAPHY, that branch of geographical science which has for its object the description and natural phenomena of the water on the surface of the globe, whether in seas, lakes, or rivers. It may deal with the rivers, watersheds, lakes, etc., of a particular country; and it also embraces the determination of winds, currents, and other departments of marine-surveying. In Britain, France, the United States, etc., there are hydrographic departments kept up by government, which publish accurate charts of coasts, issue sailing directions, etc.

HYDROKINET'ICS, that branch of hydrodynamics which treats of the application of forces producing motion in fluids, having thus to do with the flow of liquids in pipes, its issue from orifices under certain pressures, etc.

HYDROM'ETER, an instrument primarily for determining the specific gravity of fluids, though some of them can also determine the specific gravity of solids. The hydrostatic principle on

Hydrometer.

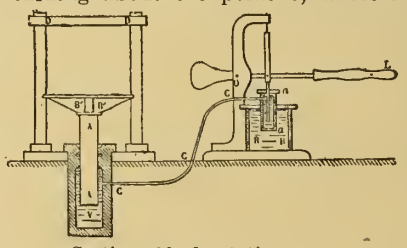
which the use of the hydrometer depends is the well-known one that when a solid body floats in a liquid, and thus displaces a quantity of the liquid, the weight of the solid body is equal to the weight of the liquid that it displaces. The density of the liquid is determined either by observing the depths to which the hydrometer sinks in the liquid (the hydrometer of variable immersion) or the weights required to make it sink to a given depth (the hydrometer of constant immersion). Of the second kind of hydrometer Nicholson's is a good example. It consists of a hollow cylinder of metal, surmounted with a very fine metallic stem, to the top of which there is attached a plate or pan for weights. From the bottom of the metallic cylinder hangs a kind of cup or basket. The whole instrument is weighted so as to float upright. On the fine metallic stem there is a marked point: and by putting weights on the upper pan the hydrometer is always made to sink precisely to this point. Thus the volume immersed is always the same. From what was said above, it is seen at once that different weights are required to sink it to the marked point in different liquids, the denser the liquid the greater being the weight required: and if the weight of the instrument itself is known, and also the standard weight, or weight required to sink it to the marked point in distilled water, the calculation of the specific gravity of any liquid from an observation with the instrument is very easy. But the specific gravity of solids can also be found by means of Nicholson's hydrometer, for which purpose the instrument is placed in distilled water and the solid body is put on the upper pan. Weights are then added till the hydrometer sinks to the marked point. But the standard weight of the instrument being known, it is plain that the difference between it and the weights that must be added on the upper pan to the weight of the body whose specific gravity is to be determined must be the weight in air of that body. The body is now transferred to the basket below the instrument, and the additional weights which must now be placed in the dish represent the weight of water displaced by the solid; and the weight of the solid itself divided by this weight is the specific gravity required. Hydrometers of variable immersion are usually made of glass. Each of them has a large hollow bulb, below which there is a smaller bulb weighted with mercury to make the instrument float upright. The stem is cylindrical and is graduated, the divisions being frequently marked on a piece of paper inclosed within the stem. The depth to which the hydrometer sinks in the liquid gives the density.

HYDROP'ATHY, a method of treating diseases by the use of pure water both internally and externally. The system was originated by Vincent Priessnitz, a Silesian peasant, who in 1829 established at his native village of Gräfenberg an institution for the hydropathic treatment of diseases, and invented a variety of forms in which the water cure might be applied, such as the wet-sheet pack, the dry blanket or sweating pack, the sitz, douche, plunge, wave, etc., baths.

HYDROPHO'BIA, a specific disease arising from the bite of a rabid animal. The animals most liable to be afflicted with madness are dogs; but cats, wolves, foxes, etc., are also subject to it. The early symptoms of rabies in the dog are such as restlessness and general uneasiness, irritability. sullenness, an inclination for indigestible and unnatural food, and often a propensity to lap its own

urine. As the disease proceeds the eyes become red, bright, and fierce, with some degree of strabismus or squinting; twitchings occur round the eye, and gradually spread over the whole face. After the second day the dog usually begins to lose perfect control over the voluntary muscles. He catches at his food, and either bolts it almost unchewed, or, in the attempt to chew it, suffers it to drop from his mouth. This want of power over the muscles of the jaw, tongue, and throat increases until the lower jaw becomes dependent, the tongue protrudes from the mouth, and is of a dark, and almost black color. A peculiar kind of delirium also comes on, and the animal snaps at imaginary objects. His thirst is excessive, although there is occasionally a want of power to lap. His desire to do mischief depends much on his previous disposition and habits. He utters also a peculiar howl, and his bark is altogether dissimilar from his usual tone. In the latter stages of the disease a viscid saliva flows from his mouth, and his breathing is attended with a harsh, grating sound. The loss of power over the voluntary muscles extends after the third day, throughout his whole frame, he staggers in his gait, and frequently falls. On the fourth or fifth day of the disease the dog dies, sometimes in convulsions, but more frequently without a struggle. In regard to man the rabid virus seems to be more violent when it proceeds from wolves than from dogs. It appears to be contained solely in the saliva of the animal, and does not produce any effect on the healthy skin. But if the skin is deprived of the epidermis, or if the virus is applied to a wound, the innoculation will take effect. The development of the rabid symptoms is rarely immediate; it seldom takes place before the fortieth or after the sixtieth day, but in some cases has occurred after six months or even longer. It begins with a slight pain in the scar of the bite, sometimes attended with a chill; the pain extends and reaches the base of the breast, if the bite was on the lower limbs, or the throat, if on the upper extremities. The patient becomes dejected, morose, and taciturn; He prefers solitude, and avoids bright light; frightful dreams disturb his sleep; the eyes become brilliant; pains in the neck and throat ensue. These symptoms precede the rabid symptoms two or three days, They are followed by a general shuddering at the approach of any liquid or smooth body, attended with a sensation of oppression, deep sighs and convulsive starts, in which the muscular strength is much increased. A foamy, viscid slaver is discharged from the mouth; the deglutition of solid matters is difficult; the respiration hard; the skin warm, burning, and afterward covered with sweat; the pulse strong; the fit is often followed by a syncope; the fits return at first every few hours, then at shorter intervals, and death takes place generally on the second or third day. No means have yet been found of arresting the progress of the poisonous virus after it has once developed in the system. The treatment, therefore, consists in preventing its development, which may be effected by applying a ligature, where possible, to impede the circulation from the wound, by sucking it, and thoroughly cauterizing it either with nitrate of silver or with iron heated to a white heat, the pain of cautery being less as the temperature is greater. If these means are not available any burning substance and most acids may be used. Within a quite recent period M. Pasteur put forward a method of preventing the development of the disease by a system of successive inoculations with rabid virus of greater and greater intensity; the inoculation being made the first day with marrow which has been extracted from the rabid animal, 12, 10, and 8 days; then the second day with marrow extracted 6, 4, and 2 days; the third day with one day's marrow, etc. M. Pasteur's method has been favorably reported on by an English commission but there is perhaps some room for doubts regarding the number of cures really performed. As a sharp critic of the Pasteur system has remarked, every one who is bitten and inoculated is counted in the list of cures, though there is nothing to prove that he ever contracted the rabies.

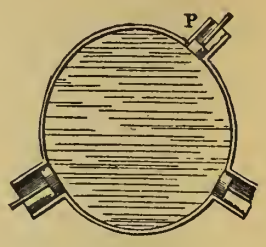
HYDROSTAT'IC PRESS, or BRAMAH'S PRESS, a hydrostatic apparatus which in its practical application was invented by Bramah in 1796. It will be understood from the accompanying figure. By means of a suction and force pump a a, worked by the lever or handle l turning about the point o, water is



Section of hydrostatic press.

drawn from the reservoir b′ b′ and forced along the tube c c into the cistern v through the top of which a heavy metal plunger a a works. On the upper end of the plunger is a large plate b b upon which the goods to be pressed are placed. When water is pumped from the reservoir b b into the cistern v, the pressure exerted by the plunger of the pump is transmitted according to the well-known hydrostatic principle to the bottom of the plunger a, which accordingly rises and carries the objects placed on plate b′ b′ up against the top of a fixed frame d d. It was the invention by Bramah of a water-tight leather collar surrounding the piston that made the use of the press practicable; before his invention not much power could be developed from the escape of the water round the piston. The collar consists of a leather ring bent so as to have a semi-circular section, so that the water passing between the piston and cylinder fills the concavity of the collar, and by pressure produces a packing which fits the tighter as the pressure on the piston increases. The hydrostatic press may be constructed to give pressures of two or three hundred tons, and is extensively employed where very great force is required, as in testing anchors or raising very heavy weights.

HYDROSTATICS', is that part of the general science of hydrodynamics that treats of the application of forces to fluids at rest. Among the chief princi-



Pascal's principle.

ples of hydrostatics may be mentioned the following: (1) The intensity of pressure at any point of a fluid is the same in all directions; it is the same whether the surface that receives the pressure faces upward, downward, horizontally or obliquely. (2) When a fluid is confined, if the intensity of pressure in one part be increased, as by forcing in a piston or by any other means, an equal increase will be produced in the intensity of pressure at all other parts: in other words, pressure applied to any one part is transmitted without any change in its intensity to all other parts. The diagram will aid in the understanding of this. If pressure is applied to p it will be transmitted in all directions through the liquid. If other openings are made, and if they are fitted with pistons, the pressure that must be applied to any piston equal in area to the area of p is equal to the pressure on p; and if the area of one of the other pistons is greater or less than the area of p, the pressure required to keep it in its place is proportionately greater than or less than the pressure that is applied to p. This principle, which is known as Pascal's principle from being distinctly formulated by him, is the most important in hydrostatics, and finds a practical application in the Hydrostatic, or Bramah's Press (see above). (3) Not only is pressure transmitted out to the surface or envelope of the liquid, but within the fluid itself the particles are all pressed together. When a solid is immersed in the liquid it is pressed at every point of its surface in the direction perpendicular to the surface at that point.

HYDROSULPHU'RIC ACID, or sulphuretted hydrogen or hydrothionic acid is a colorless imflammable gas produced by the putrefaction of sulphurous organic matters. Many mineral waters contain it naturally. It may be artificially produced by burning sulphur vapor in hydrogen, or by passing hydrogen through sulphur. It has a sweet taste but a very nauseous odor as of rotten eggs. It has poisonous effects when breathed, and experiments have shown that birds perished in air which contained $\frac{1}{1500}$th part of the gas.

HYE'NA, a genus of digitigrade carnivorous quadrupeds, constituting a family which unites the skull characters of the Felidæ (cats) with the skeleton

and gregarious habits of the Canidæ (dogs). The characters of this genus are five molars above, and five or four below, on each side, the three anterior molars being conical, smooth, and remarkably large, adapted for breaking the bones of their prey; the tongue is rough; the legs are each terminated by

Striped hyena.

four claws; the forelegs are longer than than the hind legs; the eyes large and prominent; the ears long and acute; the jaws are remarkable for the strength of their muscles, and can crush the hardest and most massive bones with ease. The genus is confined to Africa and Asia. There are three species known—the striped, the spotted, and the brown hyena. They are nocturnal animals, extremely voracious, feeding chiefly on carrion, and thus being of great utility in the countires where they live; to obtain dead bodies they will even dig up graves.

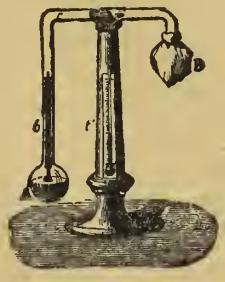
HYGIEIA (hī-ji-ē′ ya), the Greek goddess of health, daughter of Asclepius, or Æsculapius. Her temple was placed near that of Æsculapius, and her statues

Hygieia, from antique statue.

were even erected in it. She is represented as a blooming maid with a bowl in her hand, from which she is feeding a snake, the symbol of health.

HYGIENE (hī′ji-ēn), the department of medicine which treats of the preservation of health, and the duration of life prolonged by a due attention to physiological or natural laws. It is usually divided into public and private hygiene, the former having to do with measures for excluding causes of disease, methods of securing cleanliness in the streets and dwellings, methods of maintaining the purity of the supply of food and drink; the latter may be considered to embrace such subjects as alimentation, clothing, exercise and muscular development, etc.

HYGROM′ETER, an instrument for measuring the degree of moisture of the atmosphere. The chief classes of hygrometers depend either upon absorption or upon condensation. Of the former kind is the hygrometer of Saussure, in which a hair, that expands and contracts in length according as the air is more or less moist, is made to move an index. Of the latter sort is Daniell's hygrometer. This instrument consists of a bent glass tube, terminating in two bulbs, the bulb a being two-thirds filled with sulphuric ether, and the bulb b being at the commencement of an experiment, empty. The latter is covered with muslin. In process of construction the tube is exhausted of air, and is thus filled with vapor of ether through its entire length. A thermometer (t) whose bulb is immersed in the ether of the lower arm, is inserted in the tube to register variation of temperature, and a second thermometer (t′) is attached to the stand of the instrument, to show the temperature of the outer air. If sulphuric ether be dropped on the bulb b, as it evaporates the bulb is cooled, and the vapor of



Daniell's hygrometer.

ether is condensed within it from the bulb a; while owing to the evaporation from a into b the temperature of the former gradually falls. The operation is carried on till the temperature of a is so far reduced that dew from the surrounding air just begins to condense upon it. By means of the thermometer contained in a the temperature is read off at the instant at which vapor begins to condense, and the dew-point is thus obtained. The hygrometric condition, that is, the ratio between the quantity of moisture that the air actually contains and the quantity which it is capable of containing at the existing temperature, is then easily deduced. Regnault's hygrometer is a modification of the principle of Daniell's instrument, the ether being evaporated by forcing air through it.

HYKSHOS. See Hycsos.

HY′MEN, Hymenæus, the god of marriage in Grecian mythology. No marriage took place without his being invoked to sanction it. He is described as having around his brows the flowers of majoram, in his left hand the flame-colored nuptial veil, in his right the nuptial torch, and on his feet golden sandals. He is a taller and more serious Eros, and is accompanied by song and dance.

HYMENOP′TERA, an extensive order of insects, comprising bees, wasps, ants, ichneumon-flies, gall-flies, saw-flies and allied insects. They are characterized by four membranous naked wings which have comparatively few veins. The second pair of wings is always smaller than the first. The mouth parts are provided with biting jaws and a suctorial organ. The head is freely movable, and besides the lateral compound eyes, there are usually three ocelli on the top of the head. The Hymenoptera undergo complete metamorphosis. Females have the extremity of the abdomen furnished either with an ovipositor, forming a boring organ, or a

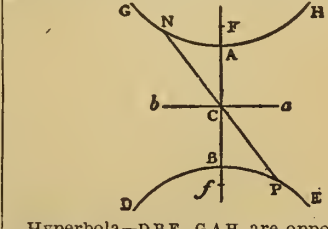
Hymenoptera. *o*, Ovipositor of female.

sting. Hence the two sub-orders into which Hymenoptera are divided are that comprising the saw-flies, gall-flies, ichneumon-flies, etc., and that which include the bees, wasps, ants, hornets, etc.

HYMN, originally a song of praise sung in honor of gods and heroes on festivals, with the accompaniments of music and dancing. Among the Hindus the hymns of the Rig-Veda, among the Hebrews the psalms, and among the Greeks the so-called Orphic and Homeric hymns are good examples. The early Christian hymns are full of devotional feeling. Their use dates from the first days of the church. The use of hymns was sanctioned by the fourth council, at Toledo, in 633. Several of them have names derived from the words with which they begin, as the Te Deum, Adeste Fideles, etc

HYPA′TIA, a Greek female philosopher of the eclectic school, the daughter of Theon, a celebrated astronomer and mathematician of Alexandria toward the close of the 4th century after Christ, at which period she was born. The Rev. C. Kingsley has chosen the story of Hypatia as the subject of a romance.

HYPER′BOLA, in geometry, a curve formed by cutting a cone in a direction parallel to its axis, or so that the cutting



Hyperbola—D B E, G A H, are opposite hyperbolas; F, *f*, foci; C, center; A B, transverse axis; *a b*, conjugate axis; N C P, diameter.

plane makes a greater angle with the base than the sides of the cone makes and when produced cuts also the opposite cone, or the cone which is the continuation of the former, on the opposite side of the vortex, thus producing another hyperbola, which is called the opposite hyperbola to the former.

HYPER′BOLE (-bo-lē), a rhetorical figure, in which an idea is expressed with a fanciful exaggeration of phrase which is not to be taken too literally, but only as representing a certain warmth of admiration or emphasis.

"His fame reaches to the stars" is an example of hyperbole.

HYPERI'DES, an Athenian orator, the pupil of Plato and Isocrates, born about 400 B.C. We was murdered at Ægina by the emissaries of Antipater in 322 B.C. Of his orations one has reached us nearly entire; the others only in fragments.

HYPERION (hī-pēr-ī'on or hī-pē'ri-on), in the most ancient mythology of Greece, the god of the sun, afterward identified with Apollo; also one of the Titans.

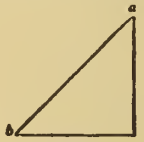
HYPOCHOND'RIA, a disorder arising from a disturbance of the functions of the nervous system. It is a form of melancholia. The sufferer lives under the generally groundless apprehensions of different diseases. Uninterruptedly occupied with the state of his body he takes notice of every feeling, and wishes to have every trifling pain explained, considering every one as a symptom of a serious disease. For everything he wants physic. Hypochondria is, physically considered, not a dangerous disease, although it makes the life of the sufferer a torment to himself and his friends. It is occasioned mainly by too great mental exertion, by too sedentary a life, by sexual indulgence or excess in exciting liquors; and also by want of exercise of the physical and mental powers producing ennui. It can be cured, but slowly, by the avoidance of the habits likely to occasion it, by the adoption of a steady and regular life, with moderate exercise for the mind and body, and the help of cheerful society.

HYPODER'MIC INJECTIONS, injections of some substance beneath the skin; a method adopted in medicine when the condition of the stomach or other organs renders the use of drugs by the mouth objectionable, or when rapidity of action is desired. The medicine is introduced by a small glass syringe fitted with a long, hollow, needle shaped point of steel.

HYPOPHOS'PHITES, salts of hypophosphorous acid, especially certain medicinal salts, chiefly the hypophosphites of potassium, sodium, and calcium. They have been used with considerable advantage in disorders of the blood and the digestive organs, and have also been found of benefit in consumption, although failing to effect a cure.

HYPOSUL'PHITES, salts of hyposulphurous acid. Among the most important are the hyposulphites of sodium and calcium, the former of which is used in medicine as an external remedy in paracitic skin disorders and an internal one in checking fermentation in zymotic diseases. It is variously used in bleaching, photography, and other arts as an antichlore, a dissolvent of bromide and iodide of silver, etc.

HYPOT'ENUSE, in geometry, the longest side in a right-angled triangle, namely that one which subtends or is opposite to the right angle. One of the most important propositions of Euclid's



a b, Hypotenuse.

Elements is the forty-seventh of the first book, discovered by Pythagoras, which proves that the square described on the hypotenuse is equal to the sum of the squares described on the other two sides.

HYPOTHECATION, the act of assigning something in security without giving up the possession of it.

HYPOTH'ESIS, etymologically a supposition, is popularly used to denote something not proved, but assumed for the sake of argument. In scientific and philosophical usage it denotes either a probable theory of phenomena not yet fully explained, or a strictly scientific theory which accounts for all the known facts of the case, and which only needs the verification of subsequent observations and deductions to become a certainty. Thus the conjecture of Newton that the force of gravity, as exemplified on the earth, might extend to the moon, was in its first stage a probable hypothesis; but when it was found to account for all the facts, it became a scientific hypothesis or theory.

HYSSOP, a perennial shrubby plant rising to the height of 2 feet, a native of Siberia and the mountainous parts of Austria. It flowers from June to September. The leaves have an agreeable aromatic odor, and a slightly bitter and somewhat warm taste. Its was once esteemed as a medicine, but has now fallen into disuse.

Hyssop.

HYSTE'RIA, a nervous affection to which women are subject, generally occurring in paroxysms, characterized by alternate fits of laughing and crying, convulsive struggling alternately remitting and exacerbating, sense of suffocation, palpitation of the heart, the sensation of a ball ascending from the pit of the stomach, occasioning a feeling of strangulation (globus hystericus), etc. Women of a delicate habit, and whose nervous system is extremely sensitive are the most subject to hysterical affections; and the habit which predisposes to these attacks is acquired by inactivity and a sedentary life, grief, anxiety, and various physical disorders. They are readily excited, in those who are subject to them, by strong emotions, especially if sudden. Hysterical complaints are best prevented by a judicious care of the moral and physical education of girls. Men are sometimes, but rarely, subject to disorders not essentially different.

I

I, the ninth letter and the third vowel of the English alphabet, in which it represents not only several vowel sounds but also the consonantal sound of y. The two principal sounds represented by it in English are the short sound as in pit, pin, fin, and the long as in pine, fine, wine, the latter being really a diphthongal sound. It has also three other sounds, viz., that heard in first, dirk (ė, the neutral vowel); that heard in machine, intrigue (which, however, can scarcely be considered a modern English sound); and the consonant sound heard in many words when it precedes a vowel, as in million, opinion, trunnion. I and J were formerly regarded as one character.

IAM'BUS, in prosody, a foot of two syllables, a short and a long one (⏑ —), or an unaccented syllable followed by an accented one. The iambic meter is the fundamental rhythm of many English verses. The verse of five iambic feet is a favorite meter, being the heroic verse of English, German, and Italian poetry.

Ibex.

IB'ADAN, a town of Western Africa, in the colony of Lagos, 122 miles from Lagos by railway. Pop. 100,000.

I'BEX, a name of two or three species of goats. The horns of the male are flattened, have two longitudinal ridges at the sides, and are crossed by numerous transverse knots. The horns of the female are short, more erect, with three or four knots in front. The best-known varieties are of the Alps and Apennines, the steinbock of the Alps, and the Pyrenean steinbock. Another species inhabits the lofty rocky peaks of Mount Caucasus.

I'BIS, a genus of birds allied to the storks, the most remarkable species being the sacred ibis. This is found throughout Africa. It is about the size

of a common fowl, with head and neck bare, and white plumage, the primaries of the wings being tipped with black and the secondaries being bright black, glossed with green and violet. It was reared in the temples of ancient Egypt

Sacred ibis of Egypt.

with a degree of respect bordering on adoration, and after death was preserved in a mummified condition The cause of its being deemed sacred was no doubt because it appeared in Egypt with the rise of the Nile; but it is now rare in that country, living farther south.

IB'SEN, Henrik, Norwegian dramatist and lyric poet, born in 1828. His first play, Catilina, was produced in Christiania in 1850. He was successively director of the theater at Bergen and of the Norske theater at Christiania, which he managed in 1857–62. In 1864 he left his native country and up till 1892 he resided chiefly abroad. On his seventieth birthday Ibsen received gifts and greetings from all parts of the world. His dramas are partly in prose, partly in verse, and include historical plays and satirical comedies of modern life. His works include The Pretender, Peer Gynt, The Pillars of Society, A Doll's House, Hedda Gabler, When We Dead Awaken, etc. He died in 1906.

ICE, water frozen into a solid mass. Water freezes when its temperature is reduced below a certain point, which is by universal consent made a fixed point on thermometers. That point is called zero on the Centigrade and Réaumur scales, and 32° on the Fahrenheit scale. Water near the freezing-point presents the curious anomaly of expanding instead of contracting as the cooling process goes on. At 4°.1 Centigrade (39°. Fahr.) water has its maximum density-point. At temperatures below 4°.1 the volume of the water increases as the temperature falls, and decreases as the temperature rises; and at the moment of solidifying the volume of the mass suddenly increases to a very considerable extent, so that ice at the temperature of freezing is one-ninth greater in volume than the water from which it is formed is at 4°.1. It is on this account that water freezes at the top first, and that ice when frozen floats at the top of the water. The temperature at which pure water becomes ice is very nearly constant under ordinary circumstances; and it is this fact, along with the ease of procuring water at the freezing temperature, or rather ice at the point of liquefaction, that has caused this temperature to be adopted as one of the fixed points in thermometers. The freezing-point is, however, slightly influenced by pressure. Increase of pressure lowers it, and the removal of pressure raises it. Salt water requires a lower temperature to freeze it than fresh water, and in the process a large part of the salt is rejected. Hence water obtained from the melting of sea-ice is nearly fresh. If water is kept perfectly at rest it may be reduced in temperature far below the freezing-point without turning into ice; but particles of solid matter such as dust must also be kept from falling into it. The expansion of water on its conversion into ice often gives rise to the exhibition of very great force, and produces very remarkable effects in nature. Much of the disintegration observed in rocks and stones during or immediately after frost is due to it, water having entered into their pores and cavities and burst off particles by its expansion. Ice, though it is very brittle, possesses the property of plasticity to a very remarkable degree, and can be moulded into any form by the application of pressure.

ICEBERGS, large masses of ice which have become detached from the shores of the arctic regions, and float about in the ocean at the mercy of the winds and currents. They are in fact pieces of glaciers detached from the parent mass by the action of the sea and by their own accumulating weight. They present the strangest and most picturesque forms, are sometimes miles in length, and rise to a height of perhaps 250 or 300 feet above the sea, the portion above water being calculated at about an eighth of the whole.

ICELAND, an island belonging to Denmark, situated between the North Atlantic and the Arctic Oceans, 250 miles from Greenland and about 600 miles west of Norway; greatest length, east to west, 300 miles; central breadth, about 200 miles; area with adjacent isles, 40,000 sq. miles. The interior has generally a very wild and desolate appearance, being covered by lofty mountain masses of volcanic origin, many of them crowned with perpetual snow and ice, which, stretching down their sides into the intervening valleys, form immense glaciers. Among the volcanoes the most celebrated is Mount Hecla, in the south, about 5000 feet high. Numerous hot springs or geysers are scattered throughout the island, but are found more especially in the southwest, to the northeast of Reikjavik. The most valuable mineral product is sulphur, of which the supply appears to be inexhaustible; the other minerals deserving of notice are chalcedonies, rock crystals, and the well-known double-refracting spar, for which the island has long been famous. In the southern parts the longest day is twenty hours, and the shortest four, but in the most northern extremity the sun at midsummer continues above the horizon a whole week, and of course during a corresponding period in winter never rises. There are various flowering plants, among which saxifrages, sedums, thrift or sea-pink, etc., are common. Heath and bilberry cover large stretches. Among mosses or lichens are the edible Iceland-moss. Cole, potatoes, turnips, radishes, and similar roots thrive tolerably well. But by far the most valuable crop is grass, on which considerable numbers of live stock (sheep, cattle, ponies) are fed. The reindeer, though not introduced before 1770, has multiplied greatly and forms large herds in the interior; but they are of little importance economically. Wild-fowl, including the eider-duck whose down forms an important article of commerce, are abundant; the streams are well supplied with salmon, and on the coasts valuable fisheries of cod and herrings are carried on. Manufactures are entirely domestic, and consist chiefly of coarse woolens, mittens, stockings, etc. The exports are wool, oil, fish, horses, feathers, worsted stockings and mittens, sulphur, and Iceland-moss.

The inhabitants are of Scandinavian origin, and speak a Scandinavian dialect, which still represents the old Norse or Norwegian in great purity. They are of the protestant religion. Iceland has a constitution and administration of its own dating from 1874. There is an althing or parliament, which meets twice a year at Reikjavik, the capital, and consists of 36 members, of whom 30 are chosen by popular suffrage, and 6 nominated by the king. A minister for Iceland, nominated by the king, is at the head of the administration, but the highest local authority is vested in the governor. Pop. 78,470.

ICELAND-MOSS, a species of lichen found in the arctic regions, and on the upper parts of lofty mountains, as for instance in Scotland. It is used in

Iceland-moss.

medicine as a mucilaginous bitter, and in Iceland is collected as a nutritious article of diet. When boiled with milk or water it forms a jelly. Its bitterness may be removed by steeping.

ICELAND-SPAR, the transparent variety of calc-spar, a mineral noted for its property of exhibiting in a remarkable degree the double refraction of light.

ICE-PLANT, a plant which has received the above appellation from the transparent vesicles which cover its whole surface, and have the appearance of granules of ice. It is a native of South Africa and the Canaries, and is also found in Greece.

ICH DIEN (ēh dēn; German, "I serve"), motto of the Prince of Wales, assumed from that of the King of Bohemia, slain at the battle of Cressy, in which he served as a volunteer in the French army.

ICHNEU'MON, a genus of digitigrade carnivorous animals belonging to the civet family. They have a long slender body, a sharp and pointed muzzle, and

short legs. The most celebrated species inhabits Egypt, where it is called Pharaoh's rat. It was adored by the ancient Egyptians on account of its antipathy to crocodiles, whose eggs it digs out of the sand and sucks. It is expert in seiz-

Egytian ichneumon.

ing serpents by the neck so as to avoid any injury to itself. It is domesticated in Egypt, and more useful than a cat in destroying rats and mice. Their disadvantage, as domestic animals, is their predilection for poultry. The mungoos, or Indian ichneumon, is another species, not so large as the Egyptian, which it resembles in habits, being kept in many families as a useful domestic animal.

ICHNEUMON-FLIES, a large family of hymenopterous insects, which all agree in one particular, that they deposit their

Ichneumon-fly.

eggs either in or on the bodies, eggs, or larvæ of other insects. These apparently insignificant creatures confer inestimable benefits on man, as they destroy hosts of insects injurious to crops.

ICHTHYOL'OGY, that branch of zoology which treats of fishes. Fishes form the lowest of the five classes into which the great sub-kingdom Vertabrata is divided. They may be shortly described as vertebrate animals living in water and respiring the air therein contained by means of gills or branchiæ, having cold red blood, and a heart consisting of one auricle and one ventricle and having those organs which take the form of limbs in the higher vertebrata represented by fins. Their bodies are generally covered with scales overlapping each other, and their usual form (though with much diversity) is lengthened, compressed laterally, and tapering toward both extremities. The scales of fishes assume various forms, which have been classed under the four types of cycloid, ctenoid, ganoid, and placoid. Cycloid scales are of a rounded form, and are those met with in the most familiar fishes. Ctenoid scales, like those of the perch, have spinous projections from their posterior margin. Ganoid scales are in the form of thick bony plates covered with a superficial layer of enamel. Placoid scales form detached masses of various shapes often provided with spines. The skeleton presents great variations, from the amphioxus, in which vertebræ are only foreshadowed, to the well-ossified skeleton of teleostean fishes. The vertebræ are biconcave or "amphicœlous," the opposed surfaces forming cups, and they vary in number from seventeen to more than 200. The spinal column is prolonged into the tail, which is two-lobed, the lobes either being equal (a homocercal tail) or unequal (heterocercal). The skull varies greatly; it may be ossified throughout as in the cod-fish, or the cartilaginous cranium may persist, as in the lamprey, sharks, and rays. The skull is small compared to the size of the animals themselves. The limbs, when present, are four in number. The anterior or first part are called the pectoral fins. The ventral fins, or second pair of limbs, are variable in position, and not always present; they may be beneath the pectorals, when they are jugular; behind the pectorals, when they are thoracic; or farther back, abdominal. The pelvis is represented by two triangular bones, which have no relation to the spinal column, and to which the fin-rays are directly attached. The median or vertical fins, that is, those situated on the back, are characteristic of fishes, and they may extend nearly from the head continuously to the anal aperture, as in eels; they may be broken up into several dorsals, caudal, and one or more anals, as in the cod; or the number of dorsals may be increased greatly, as in the mackerel. The fins may be wholly soft and flexible, or they may be in part rigid spines; or a series of soft fin-rays may be preceded by rigid and often formidable spines, which sometimes have a beautiful mechanism for elevation and depression. The teeth of fishes are generally very numerous, and may be placed on any part of the interior of the mouth, sometimes on the tongue. They are quite different in character from the mammalian teeth. The muscular pharynx and œsophagus lead into a stomach usually well defined, but sometimes only slightly differing in caliber from the intestine. The liver is proportionally large, and has usually a gall-bladder. The heart consists of a single auricle and ventricle, which is continued forward by a dilated vessel called the arterial bulb (bulbus arteriosus). From this vessel the blood is sent right and left along the gills, which are the organs of respiration, and from the gills the aerated blood goes to the body. The gills or branchiæ are either free on one margin, as in ordinary fishes, or attached at both extremities. In the lepidosiren another structure appears, namely, lungs, which stretch through great part of the body and open on the posterior wall of the pharynx. A peculiar feature of fishes is the air-sac or swim-bladder, called also the sound. Anatomically its origin is identical with that of a lung; but it does not perform the functions of a lung. Its function is probably to serve as an aid in rising and sinking; but in some fishes it is prolonged so as to approach or even come in contact with the internal organs of hearing, perhaps as an organ of resonance. Reproduction is by ova or eggs, which in a few cases are retained in the body of the female till hatched. But the ova are usually fertilized outside the body, and the hatching process is usually left to take place without aid. The eggs are, in most cases, in enormous numbers, as in the roe of the herring and salmon. Among the sharks the number is much less, and each ovum acquires, before exclusion, a horny sheath of various shape, but usually provided with cirri, by which it moors itself to some fixed object. In the pipe-fishes the male has a marsupium or pouch formed by folds of the abdominal integument, and in this pouch the eggs, transferred thither on exclusion, are hatched. The nervous system of fishes presents considerable variety. The amphioxus has no enlargement of the nervous trunk comparable to a brain; but in all the others the division into fore, mid, and hind brain is clearly marked. The olfactory organs are, in most cases, pits or sacs, on whose walls the olfactory filaments are spread out. The sense of taste seems less provided for, the tongue and palate being mostly firm, and often set with teeth. There is no external ear, and the internal apparatus is not wholly inclosed in bone, as in the higher vertebrates, but is partly free in the cavity of the skull. The eye is, in most cases, relatively large and flattened externally, the sight being keen. Special organs of touch are wanting for the most part, though the labial filaments, seen in the cod, whiting, mullet, and sturgeon, are of this nature. Among the most curious appliances with which fishes are provided, are the electrical apparatus that appear in some species, as in the torpedo or electric ray and the electric eel, both of which posses batteries capable of giving a shock of considerable power. Some fishes inhabit exclusively either fresh or salt water; others, as the salmon, migrate periodically from the one to the other.

ICHTHYOR'NIS, a fossil genus of carnivorous and probably aquatic birds, one of the earliest known American

Fig. 1, Ichthyornis dispar, restored. Fig. 2, Right jaw, inner view; half natural size.

forms. It is so named from the character of the vertebræ, which, even in the cervical region, have their articular faces biconcave as in fishes. It is also characterized by having teeth set in distinct sockets. Its wings were well developed, and the scapular arch and bones of the legs conformed closely to the true bird type.

ICON'OCLASTS, image-breakers, the party in the early Christian Church that would not tolerate images, much less the adoration of them. At first images of martyrs and bishops were placed in the churches merely to keep their memory fresh, but latterly (in the 6th century) they began to be worshiped, lights being burned before them and incense offered in their honor. The eastern emperor Leo III. issued an edict in 726 ordering the people to abstain from the worship of such images, and soon after he decreed their destruction. This caused great commotion, and there arose two parties in the church, the image-worshipers and the iconoclasts or image-breakers, who each in turn persecuted the other. In 754 a council at Constantinople condemned image-worship; in 787 the second council of Nice (Nicæa) asserted and defined the doctrine. The controversy lasted over a century, coming to an end when, under the Empress Theodora, a council held at Constantinople (842) declared in favor of the worship of images among the Greeks, a decision which was confirmed by a second council, held 869–870, in the same place. In the western empire also images were at first retained only to preserve the memory of pious men, but the decision of the pope, which allowed the worship of images, finally prevailed in the western church.

I'DAHO, one of the United States on the western slope of the Rocky mountains, having Montana and Wyoming on the east, and Washington and Oregon on the west, Utah and Nevada on the south, and British Columbia on the north; area, 84,800 sq. miles. Idaho owes its rise and importance to its rich gold-fields, previous to the discovery of which, in 1860 and subsequently, it was inhabited only by Indians. The surface is largely mountainous, the highest summits rising to 12,000 and 13,000 feet. In the center of the state are the Salmon River mountains, to which belongs the picturesque and lofty Saw-tooth range. The chief rivers are the Lewis or Snake river and the Salmon river, the latter a tributary of the former, which again joins the Columbia. Along the course of the Snake river in the s.e. and s. is a desert tract 400 miles long by 40 to 60 broad. The climate is severe in the more elevated parts. The rainfall in the south is light but it increases toward the north and east where the elevated ranges arrest the moist winds. Agriculture is limited to the mountain valleys and to the basins of the large rivers. The mining industry has created a market for farm produce sufficient to justify irrigation and extensive farming. The soil being very fertile when sufficiently watered the yield of all crops is very large. Hay and forage is the most valuable crop, while that of alfalfa is very large. Wheat, oats, barley, and flaxseed are the most important cereals. Apples and prunes are the chief varieties of orchard fruit. There are 7,000,000 acres of timber land situated almost wholly in the northern part of the state; the Alpine fir, yellow pine and the red fir are the principal varieties. There are 25,000,000 acres of pasture land in the state and therefore grazing has been more extensively utilized than farming. Sheep, cattle, horses, and swine are raised. The Union Pacific passes through the southern part of the state and the Great Northern and Northern Pacific through the northern portion.

There are valuable forests, but they extend only over a small area. The scenery along the Salmon river in some places is grand, the stream flowing between perpendicular walls of rock from 500 to 2000 feet high. Gold has been found in many places, and there are also valuable silver mines. Coal, copper, iron, and salt are likewise found in many localities. The wild animals include the grizzly bear. The first white explorers of Idaho were Lewis and Clark. Early in the 19th century, a mission was established in 1842 at Cœur d'Alêne. In 1863 Idaho was organized as a territory with an area three times as large as at present including Montana and nearly all of Wyoming. In 1882 gold was discovered at Cœur d' Alêne which was followed by a large immigration. In 1889 a new constitution was adopted and in 1890 Idaho was admitted into the Union. At the head of the institutions of higher education is the University of Idaho at Moscow, the normal schools at Albion, and Lewiston and the agricultural and mechanical college at Idaho falls. In national elections Idaho has been carried by the democrats or the democrats and populists in fusion. In 1904 and 1908 it was carried by the Republicans. The mineral and other resources of the state has induced a rapid growth in population. Boise is the capital. Pop. 350,000.

IDAHO, University of, at Moscow, was founded in 1889, and opened for the reception of students in 1892. It offers free instruction to students of both sexes. It comprises a course of letters and science, schools of agriculture and applied science, and a preparatory school. It maintains an agricultural experiment station. Military drill is required of preparatory students, and of freshmen and sophomores in the university. The degrees of B.A., B.S., B.M., B.E.M., B.E.E., and B.C.E. are conferred.

IDEA, as a term in mental philosophy, has been used in various senses. Plato regarded ideas as the archetypes or original models of things, as existing from eternity and constituting the patterns according to which the deity fashioned the various things of which we become cognizant by our senses. According to Plato, ideas were independent of matter, and it was they that were the only objects of true knowledge. Aristotle opposed Plato's doctrine of independent ideas, but held the doctrine of ideas being types or patterns accompanying material things. By Descartes and many modern philosophers the word is employed to signify all our mental representations, all the notions which the mind frames of things. See also Idealism.

IDE'ALISM, the philosophical term which, in contradistinction to realism, expresses the view that subjective or ideal existence is not only the original but the only true being, and according to which there is allowed to sensible objects merely a phenomenal existence dependent upon the mind of a thinking subject. In modern times idealism has been maintained by Descartes, Berkeley, Kant, Fichte, Schelling, and Hegel.

IDEN'TITY, a person in point of law must often be proved in legal proceedings, as in proving a thief, etc. The usual proof is the oath of one who was cognizant of the facts at the time referred to. A common defense of persons accused of crime is that it is a case of mistaken identity, in which case the prisoner must usually prove an alibi—i.e. that he was in some other place at the time specified.

IDES, Latin Idus, with the Romans, the 15th day of March, May, July, and October. In the other months the 13th was the ides. The ides of March, on account of Cæsar's assassination having taken place on that day, was an ater dies or black day, and the senate was not allowed to sit. See Calendar.

IDIOM, a term used to denote a phrase or form of words approved by the general usage of a language, while in many cases it will admit of neither grammatical nor logical analysis. In a broader sense, it denotes the genius or peculiar cast of a language; hence it is often applied to a peculiar form or variation of a language, a dialect.

IDIOSYN'CRASY, a distinctive peculiarity of the mental or bodily constitution of any person, or that constitution or temperament which is peculiar to any person.

ID'IOT, a person who, from original defect, is almost destitute of intelligence, or in whom the intellect seems to be almost wholly wanting. In some cases the intellectual development is so low that there appears to be little more than a vegetative life. Others not quite so low in the intellectual scale recognize the persons with whom they live, are capable of being affected by certain emotions, understand a few questions, articulate a few words, and are able to take their own food, but are quite unable to do any kind of work. Those endowed with a little more intelligence may sometimes be employed in some kinds of labor which present no complicity or difficulty, but they are incapable of performing any intricate calculation or going through any long train of reasoning. The brain of idiots is sometimes sufficiently regular in its conformation, although in the great majority of cases there is something abnormal. The forehead is often depressed, receding, and flattened; sometimes the back parts of the head disproportionately large. The majority of idiots are of small stature and of weak constitution, rarely living beyond forty years. The causes of idiocy are not well known. It may be hereditary.

IDOL'ATRY, the worship of an image, object, or symbol as having in itself some divine or supernatural power, and being able in some way to respond to the worship paid to it, such images or objects being called idols; or the adoration of something merely natural as something supernatural and divine. Many have regarded idolatry as a declension from the one true God, and have seen in the various forms of heathen worship only more or less complete de-

gradations of an original revelation. Others see in idolatry an innate searching after God, and regard it as the first stage of human development, the necessary beginning of a knowledge of God. Idolatry may assume various forms; it may consist in a worship of the powers of nature, or of the heavenly bodies, or in animal worship, or in the worship of images representing mere fanciful and imaginary deities, or in the still lower fetichism.

IGNATIEFF, Nicholas Paulovitch, Russian soldier and diplomatist, born in St. Petersburg 1828. He served in the Crimean war, and was made a colonel 1856. In 1858 he was sent on a special mission to Bokhara and Khiva, and afterward as ambassador to Peking 1860. He was appointed minister at Constantinople 1864, and was envoy extraordinary 1867–78. He represented the party in favor of war, in opposition to Prince Gortschakoff. He was subsequently made governor-general of Irkutsk.

IGNEOUS ROCKS, in geology, rocks which are seen to owe their special character or structure to their materials having been once in a state of fusion, as lava, basalt, granite, etc. Such rocks are not stratified, and may occur in connection with sedimentary rocks of any age, having usually been forced up from below.

IGNIS FAT'UUS, a luminous appearance seen floating over marshy places at night, and sometimes, it is said, in churchyards. It is probably due to some gaseous mixture capable of igniting spontaneously, but it has never been satisfactorily explained. Other names are Will-o'-the-wisp and Jack-a-lantern.

IGUAN'A, a genus of lizards, the type of the family Iguanidæ, a native of Brazil, Guiana, and neighboring localities. It has an average length of about

Common iguana.

4 feet. Its food consists almost entirely of fruits, fungi, and other vegetable substances. Its head is large, the mouth wide Along the whole length of the back to the tip of the tail there is a crest of elevated, compressed, pointed scales; the lower part of the head and neck is furnished with a dew-lap or throat-pouch. The toes are furnished wth sharp claws, which enable it to climb trees with ease, while a rapid serpentine movement of its tail propels it swiftly through the water. Its usual color is dark olive-green. Its flesh is considered a delicacy, being tender and delicately-flavored, resembling that of a chicken. The eggs, of which the female lays from four to six dozen, are also eaten, having an excellent flavor. They are about the size of those of a pigeon, are laid in the sand, and hatched by the heat of the sun.

IGUAN'IDÆ, a family of lizards of which the iguana is the type. They have the body rounded, sometimes laterally compressed and furnished with a ridge or serrated crest along the middle line of the back from snout to tip of tail, sometimes a throat-pouch or dew-lap present.

ILLE-ET-VILAINE, a maritime department in the n.w. of France, lying between the English channel and the department of Loire-Inférieure. Rennes is the capital; St. Malo the chief seaport. Pop. 615,480.

ILLEGITIMACY, according to the civil and statute law as found in many states the status of children born out of wedlock. In New York the children of a man and woman cohabiting professedly as husband and wife have been held as legitimate. In most of the states upon complaint of the mother an inquiry may be had as to the identity of the putative father, and upon sufficient proof an order of affiliation made whereby the father is adjudged to pay for the support of the child. Under common law, an illegitimate child cannot inherit or transmit property. The legitimation of children born out of wedlock follows upon the intermarriage of the parents and acknowledgment of the children in most of the states.

IL'LINOIS (il'i-noi or -nois), one of the United States, bounded on the north by Wisconsin, east by Lake Michigan and Indiana, southeast by Kentucky, from which it is separated by the Ohio, and west by the Mississippi, separating it from Missouri and Iowa; greatest length, 370 miles; greatest breadth, 160; area, 56,650 sq. miles. The surface is somewhat hilly near the Ohio, and undulating toward the west; and a range of bluffs runs for a considerable distance along the margin of the Mississippi; but with these exceptions the state is one continuous plain, with a gentle inclination toward the southwest, and with the exception of Louisiana and Delaware is the most level state of the Union. It has a greater proportion of arable land than any other state. The only part of the state thickly wooded is the extreme south portion. The chief rivers are the Illinois, which traverses the state diagonally northeast to southwest, Rock, Kaskaskia, and Wabash. Indian corn and wheat are the chief objects of cultivation, but rye, oats buckwheat, potatoes, turnips, cotton, hemp, flax, tobacco, castor-beans, etc., are also produced, and the cultivation of the vine is making considerable progress. The common domestic animals are abundant, and immense numbers of swine are reared on the mast of the forests. Lead is found in vast quantities, and the ore (argentiferous galena) contains a considerable percentage of silver; the metal is found chiefly near the Wisconsin frontier, Galena being the center of the mining district. Bituminous coal abounds, and is raised in considerable quantities, and several valuable salt springs are found in the east and south. The rocks mostly are limestone, gypsum, and sandstone. The climate, although somewhat humid, is generally healthy; the winters being severe owing to the northerly winds which have an unobstructed sweep over the prairies. Illinois is the most important manufacturing state west of the Alleghany mountains and is surpassed by only two states in the Union; New York and Pennsylvania. It is the collecting and distributing center for the west and northwest. Chicago produces 70 per cent of the total manufactured product of the state. It is the most important stock market and

Seal of Illinois.

is the greatest slaughtering and meat packing center of the world. Only two states exceed Illinois in the manufacture of steel and iron and the value of its agricultural implements is more than three times that of any other state. Pennsylvania alone exceeds Illinois in the manufacture of cars and other railroad supplies. The railroads are more numerous and have a greater extent of track than any other state. The state has water communication with the Mississippi valley and a southern outlet to the Atlantic. Lake Michigan, which touches the state at the northeast corner gives water communication with Canada and an eastern outlet to the Atlantic. The Illinois and Michigan canal connects Lake Michigan at Chicago with the Illinois at LaSalle (distance 96 miles), and enables vessels of some size to pass from the Gulf of Mexico to the St. Lawrence. There is a well-organized school system. At the head of the institutions of higher education are the University of Chicago, which has attracted attention by its original features and the eminence of the scholars who have been called to fill its chairs: the University of Illinois at Urbana, the Northwestern university, the Armour school of technology, Rush medical college, all situated at Chicago, Knox college at Galesburg, Illinois and Wesleyan university at Bloomington. Father Marquette in 1673 ascended the Illinois river and LaSalle entered the river in 1679 and named it from the tribe of Indians inhabiting the region. French traders established themselves at Kaskaskia, Cahokia, and other Indian villages between 1683 and 1690. There were six important settlements by 1751. In 1778–79 a force of Virginians, under George Rogers Clark, captured Kaskaskia and subdued the province. Virginia ceded its claims to the southern part of the region in 1784, Massachusetts and Connecticut in the following year, and in 1787 the region became part of the northwest territory. In 1800 Ohio, in 1802, Indiana and in 1805 Michigan were set apart and the remainder was organized in 1809 as the Illinois territory. In 1812 the garrison at Fort Dearborn (Chicago) was massacred. In 1818 the first constitution was adopted and Illinois was admitted to the Union. The

Illinois and Michigan canal was begun in 1834 and was built with the proceeds of the sale of public lands. In 1850 congress made an extensive cession of public lands to aid in the construction of the Illinois Central railroad, an enterprise which added greatly to the development of the state. In 1858 the great contest for the United States senatorship took place between Stephen A. Douglas and Abraham Lincoln. The state furnished 260,000 men as its quota of troops during the civil war. In 1871 a large part of Chicago was laid waste by fire and over 100,000 people were made homeless. The loss was estimated at $300,000,000. In 1885–6 owing to a general feeling of unrest bitter and bloody strikes took place; in Chicago an anarchist crowd attacked the police with dynamite, killing and wounding a large number. In 1892 the Chicago drainage canal for the removal of Chicago's sewage was started. In 1893 the Columbian World's Fair was held in Chicago. In 1894 a strike of the Pullman palace car company participated a general strike of railway employees. Interference with the United States mails led to the intervention of the Federal government. In national politics Illinois was democratic before 1860 and since that year with the exception of 1892, when it voted for Grover Cleveland, it has been consistently republican. Springfield is the capital. Pop. 5,391,370.

IL'LINOIS, a river in the United States, formed by the union of the Kankakee and Desplaines, in the n.e. part of the state of Illinois. It flows thence s.w., and falls into the Mississippi about 20 miles above the mouth of the Missouri. It is 500 miles long, half of it being navigable. A canal connects the river with Chicago. See above article.

ILLINOIS, University of, the State University of Illinois, between the cities of Urbana and Champaign, was chartered in 1867 as the Illinois industrial university, and assumed its present name in 1885. The university is divided into six colleges: literature and arts, science, engineering, agriculture, law and medicine, including schools of library and science, art and design, music, military science, and pedagogy, and preparatory and graduate departments. The state laboratory of natural history and the United States agricultural experiment station for Illinois are departments of the university, but have separate financial support. The schools of pharmacy, medicine, and dentistry are situated in Chicago.

ILLITERACY, the condition of one who cannot read and write his own language. As used in the United States census, the term includes all those who can read but not write.

The report of the United States commissioner of education for 1900 contains the following table for the different countries:

	Per cent.		Per cent.
Germany	0.11	Hungary	28.10
Switzerland	0.30	Greece	30.00
Scotland	3.57	Italy	38.30
Holland	4.00	Russia	61.70
France	4.90	Spain	68.10
England	5.80	Portugal	79.00
United States	10.70	Servia	86.00
Belgium	12.80	Rumania	89.00
Ireland	17.00	Austria	23.80

ILLYR'IA, Illyr'icum, a name formerly rather loosely applied to a large tract of country on the east side of the Adriatic, the ancient Illyrians being the ancestors of the modern Albanians.

ILOCOS NORTE (ē-lō'kōs nōr'tā), a Philippine province occupying the northwestern corner of the island of Luzon. Its area is 1873 sq. miles. The principal river being the Pagsan or Laoag, and the valleys are very fertile, producing grains and fruits, a fine quality of rice, good cotton and tobacco, and sugar. Iron ore is abundant. Pop. 156,700.

ILOCOS SUR, (soor), a Philippine province, situated in the northwestern part of the island of Luzon. It is crossed by the large river Agra, and a number of smaller streams; the soil is very fertile, producing indigo, sugar, and cocoanuts, Pop. 172,836. The capital is Bigan.

ILOILO (ē'lō-ē'lō), a province comprising the southern half of the island of Panay in the Philippines and about thirty, mostly small, outlying islands, one of which, however, Guimaras, is 30 miles long by 10 miles wide. The area of the province is 2600 sq. miles, and its population 472,798. The level lands, which constitute the greater part of the area of the province, are very productive all kinds of tropical fruits flourishing; but the inhabitants are chiefly given to the cultivation of sugar and tobacco.

ILOILO, the capital of the province of Iloilo, situated on the southeastern shore of the island of Panay, on the strait separating Guimaras island from the mainland. It has an excellent harbor, and is, next to Manila, the chief commercial center of the Philippines. Its chief exports are sugar, tobacco, rice, coffee, and dyewoods. Pop. 10,400.

ILO'RIN, a town in West Africa, Nigeria, about 150 miles n.e. of the Bight of Benin in Nupe, a great center of trade; pop. 150,000, mostly Mohammedans.

IMAGE, in optics, the spectrum or appearance of an object made by reflection or refraction. It is by means of optical images that vision is effected, or that the telescope and microscope are of use. See the articles Optics, Eye, etc.

IMAGINATION, literally that faculty of the mind by which we can form mental images of things. Besides the power of preserving and recalling such conceptions, the imagination has the power to combine different conceptions, and thus create new images or mental pictures. It is this faculty which is more strictly termed imagination. In the creation of new images, or more properly in the combining of images which have previously been derived from objects of perception, the imagination operates according to the laws of the association of ideas. Its operations are nevertheless not wholly independent of the will, for by directing the attention to some leading thought, the will can determine the limits within which the laws of association are to act. Such free and yet regulated action of the imagination alone can give birth to the productions of the fine arts.

IMBECILITY, weakness of mind, such as puts a person considerably below the general run of mankind, but is not so great as to be called actual lunacy or idiocy, nor so well marked perhaps as to be classed under any one of the forms of insanity. Imbeciles sometimes display a considerable amount of intelligence in certain directions, and are often very cunning. They may be interesting, amusing, and even useful members of a community. In the United States there are no special legal provisions in regard to imbeciles. As a general rule the court is ready to support the obligation of any contract that a person of weak mind has entered into, unless it is of such a nature that a person of sound mind would not have agreed to it, or unless there is suspicion of fraud. An imbecile person may be summoned as a witness, but the degree of credulity attaching to his evidence naturally depends very much on the amount of intelligence he displays, and on the nature of the circumstances regarding which his evidence is offered.

IMMACULATE CONCEPTION. See Conception (Immaculate).

IMMERSION, in astronomy, the disappearance of one heavenly body behind another or into its shadow. Immersion occurs at the beginning, and emergence at the end of an occultation or an eclipse.

IMMORTALITY, exemption from death; the state of everlasting life. The dogma of the immortality of the soul is very ancient. It is connected with almost all religions, though under an infinite variety of conceptions. By the immortality of the soul we understand the endless continuation of our personality, our consciousness, and will. There are so many reasons to render immortality probable, that with most nations the belief is as clear and firm as the belief in a god; in fact the two dogmas are intimately connected in the minds of most men. The hope of immortality must be considered a religious conviction. Reason and religion command man to strive for continued perfection. This duty man cannot relinquish without abandoning at the same time his whole dignity as a reasonable being and a free agent. He must, therefore, expect that a continuation of his better part, as the necessary condition of his progress in perfection, will not be denied to him. Hence the belief in immortality becomes intimately connected with our belief in the existence and goodness of God. Among rude peoples the life after death is usually regarded as a state of being not essentially different from the present —one in which the hunter shall renew his chase, and his corporeal senses shall have their accustomed gratifications. Among the ancient Greeks and Romans the spirits of the dead were believed to live in the other world as a sort of shadows, and the life after death was also considered as a shadow of the present. Among some peoples the imagination attributes changes of condition to the future life, and the doctrine of transmigration, or the progress of the mind or soul in different stages, is developed. Connected with the belief in the immortality of the soul is the belief in a state where souls are purified after death, as existing among the Egyptians and many Christians. See Purgatory, Soul.

IMMORTELLES, a name for flowers, also known as everlasting flowers, and often made into wreaths for adorning graves.

IMPALEMENT, the putting to death by thrusting a stake through the body. This manner of inflicting death was known to the Romans, though not practiced by them. It is still practiced in some half-civilized countries.

IMPAN'EL, to form a jury by entering the names on the roll or impanel. See Jury.

IMPEACHMENT, an accusation and prosecution for a crime or misdemeanor, in which the House of Commons are the prosecutors and the House of Lords the judges. The necessity of some tribunal distinct from the ordinary courts, for the trial of certain offenses, or for any high misdemeanor in certain officers, is apparent, since the judges of the highest courts cannot in all cases safely be intrusted with the trial of each other. Impeachment is, however, seldom used, the last instance being that of Lord Melville in 1805. After sentence, the crown may pardon the offender. The question of guilty or not guilty is decided by a majority of votes.—In the United States the procedure is similar to that of England, the house of representatives being the accusers and the votes of two-thirds of the senate being necessary for a conviction.

IMPENETRABIL'ITY, in physics, that property of matter which prevents two bodies from occupying the same space at the same time; or that property of matter by which it excludes all other matter from the space it occupies.

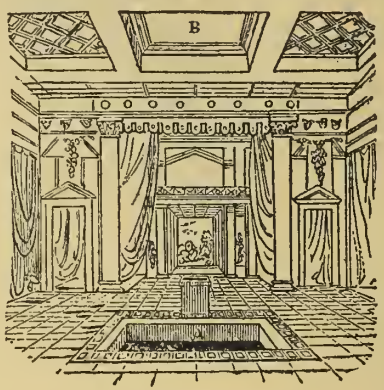
IMPERA'TOR, among the ancient Romans, a term originally applied to a military commander, one who held the imperium, or military power. In later times no one received this title who had not defeated a hostile force of at least 10,000 men. After the overthrow of the republic imperator became the highest title of the supreme ruler, and acquired the signification which we attach to the word emperor. It was still given, however, to triumphant generals, and, in this case, has its old signification. The emperors appear to have used it because they were considered as superior to all the generals. See Emperor.

IMPERIAL, pertaining to an emperor or empire; thus, the imperial parliament is that of the United Kingdom. A size of paper 30 in. by 22, is called imperial.

IMPERIALISM, a term given to that form of government known as an empire and connoting absolute power in the hands of a single ruler. The term lately has been used to describe the policy of various nations of establishing world powers through the extension of their rule over other and especially inferior races. In the United States at the close of the Spanish American war a group of citizens who vigorously opposed the acquistion of the Philippines and Porto Rico became known as anti-imperialists.

IMPEY PHEASANT, a bird of the pheasant family remarkable for its splendid plumage. It is found in the higher regions of the Himalayas, and is of the size of a small turkey. Lady Impey attempted (unsuccessfully) to introduce the bird into Europe, hence the name.

IMPLU'VIUM, in ancient architecture a term which denoted, in the houses of the ancient Romans, a basin in the



Roman atrium.
A, Impluvium; B, Compluvium.

middle of the atrium or entrance-hall, below the compluvium or open space in the roof, to receive the rain. See Atrium.

IM'POST, (1) a tax, tribute, or duty, particularly a duty or tax laid by government on goods imported. (2) In architecture, the point of junction between an arch and the column, pier, or wall on which it rests. It is often marked by horizontal mouldings, though these may be absent. Imposts have received various names, according to their

Imposts.
1, Continuous. 2, Discontinuous. 3, Shafted.

character. Thus, a continuous impost is where the mouldings are carried down a pier; a discontinuous impost where there are no mouldings, but the pier is of a different section from the arch; shafted imposts are where the arch mouldings spring from a capital and differ from those of the pier.

IMPOUNDING CATTLE. See Pound.

IMPRESSMENT OF SEAMEN, the act of compelling persons, especially seafaring men, to serve in the English navy. The power of impressing seamen, though still existing, has fallen into abeyance since the conclusion of the general war of 1815. Impressment was of ancient date, and uniformly practiced throughout a long series of years. It is also recognized in many statutes, such, for instance, as exempted certain persons from impressment, though the power of impressing is not expressly granted in any acts of parliament.

IMPRIMA'TUR (Latin, "let it be printed"), the word by which the licenser allows a book to be printed in countries where the censorship of books is exercised in its rigor

IMPRISONMENT, the restraint of a person's liberty, whether in a prison, the stocks, or by merely keeping in custody. It is usually inflicted by way of punishment, the power of sentencing to imprisonment being conferred on certain courts or magistrates, and stricty limited by law. A person may be imprisoned, however, who is merely accused of a crime, in which case he can demand to be released on bail. Imprisonment for ordinary debt is now practically abolished.

IMPUTA'TION, as a term in Christian theology, is used to signify, on the one hand, the reckoning of the sins of man to Christ, and, on the other hand, the reckoning of the righteousness of Christ to believers.

INCA, or **YNCA,** a word signifying "chief," which the natives of Peru gave to their kings and princes of the blood before the Spanish conquest. See Peru.

INCANTATION, a certain formula of words, supposed to have some magical effect, especially if uttered with the accompaniment of certain ceremonies. Incantations are still common as a part of popular medicine among the negroes and Indians of this country and also among the uneducated of all countries and among barbarous peoples generally.

INCARNATION, a word used to express the manifestation of the deity in the flesh under the human form; thus we speak of the incarnation of Christ. The Hindus believe in innumerable incarnations of their deities. The most celebrated are the nine incarnations of Vishnu.

IN'CENSE, aromatic substances burned in religious rites on account of the sweet odor they emit. The custom of burning incense is ancient and widely spread. Among the Jews the practice was enjoined as part of the worship of the sanctuary (Ex. xxx. 27), the ingredients of the incense also being laid down, and it was to be burned on a special altar called the altar of incense. This altar was made of acacia (shittim) wood, and was overlaid with gold, hence it was also called the golden altar, as distinguished from the altar of burnt-offering, which was made of brass. The incense was burned daily—morning and evening. In ancient Egypt, Assyria, Babylonia, India, Greece, and Rome incense-burning was part of the worship of the gods, and it is still employed as part of the Buddhist ceremonial. Both the Greek and the Latin churches use incense in worship, but the practice cannot be shown to have existed among Christians till after the first four centuries. Among Catholics it is used at every high mass, at consecrations of churches, in processions, funerals, etc. In the English Church it is only employed by the high ritualistic section, but its use has never been prohibited.

IN'CEST, sexual intercourse within the prohibited degrees founded on the Levitical code, and include degrees both of consanguinity and of affinity. (See Leviticus, chap. xviii.) In England incest is an ecclesiastical offense, and is left to the jurisdiction of the spiritual courts. In Scotland and some of the United States it is a criminal offense.

INCLINATION, Magnetic, or Magnetic Dip. See Dipping Needle.

INCLINATION COMPASS, same as Dipping Needle.

INCLINED PLANE, a plane forming with the horizontal plane any angle whatever excepting a right angle. It is one of the mechanical powers by which a small force under certain conditions is used to overcome a greater force. When a body lies on an inclined plane part of its weight is supported, so that if a cord be fastened to it and pulled, a force less than the weight of the body acting in a direction parallel to the plane will prevent it from sliding, or will move it up the plane. Thus a heavy wagon is raised on an inclined road by a horse which would be quite unable to exert a pull equal to a quarter of the weight of the wagon. Neglecting friction, the force parallel to the plane necessary to raise the body is equal to the weight of the body multiplied by the vertical height through which it is lifted, divided by the distance it is moved along the plane.

INCOMBUSTIBLE CLOTH, cloth rendered uninflammable by artificial means. This may be done by steeping the fabric in borax, phosphate of soda or ammonia, alum or sal-ammoniac; but these salts are not suitable for fine fabrics, and that which has been found to answer the purpose most effectually is tungstate of soda. A solution containing 20 per cent of this salt, along with 3 per cent of phosphate of soda, renders a fabric perfectly non-inflammable, and does not interfere with the ironing.

INCOME TAX, a tax levied directly from income of every description, whether derived from land, capital, or industry.

INCOMMEN'SURABLE, in mathematics, a term applied to two magnitudes when they cannot both be measured by the same quantity, that is, when they do not contain it one or more times exactly. The diagonal and side of a square are an example.

INCUBATION (pathology), the period between the introduction of the morbific principle and the outbreak of the disease. It is then gathering head in the system, and indicated only by such general symptoms as loss of appetite or sleep, etc. In epidemic and contagious diseases the period of incubation is well defined.

INCUBATION, the mode in which birds commonly bring forth their young, that of sitting on the eggs till they are hatched by the natural heat of the body. In general it is the female which undergoes the labor of incubation, but among some species, chiefly of monogamous birds, the male relieves the female while she seeks her nourishment; in others the male feeds her. Some birds, like the cuckoo, abandon their eggs to be hatched by others. In a state of nature birds generally commence to sit in spring. The time of incubation varies with different species, but is always the same with the same species. In the hummingbirds it is 12 to 14 days; in the swallow and lark 15; the canary, from 15 to 18; crow, 20; common hen, 21; pheasant, partridge, etc., 22; peacock and turkey, 30; swan, 40–45; cassowary, 62.

INDEM'NITY, a term frequently employed in politics and jurisprudence. It is used in various significations, but is usually applied to an act of the legislature passed for the purpose of relieving individuals, especially in an official position, from the penalties to which they may have rendered themselves liable by some violation of the law whether by act or omission or in case of members of government in consequence of exceeding the limits of their strict constitutional powers.

INDEPENDENCE, Declaration of, See Declaration of Independence.

INDEPENDENCE DAY, fourth day of July, the United States national holiday.

INDEPENDENCE HALL, a brick building in Philadelphia, built in 1729–34. In it the continental congress met, Washington was made commander-in-chief of the American army in 1775, and the declaration of independence was adopted on July 4, 1776, and read to the people assembled in the street. It is now a museum of revolutionary and historical relics.

INDETERMINATE, in mathematics, having an indefinite number of values or solutions. Indeterminate analysis is a branch of algebra in which there are always given a greater number of unknown quantities than there are independent equations, by which means the number of solutions is indefinite.

INDEX LIBRORUM PROHIBITORUM ("list of prohibited books"), in the Roman Catholic Church, a title used to designate the catalogue or list of books prohibited by ecclesiastical authority, [illegible]ccount of the heretical opinions supposed to be contained in them, or maintained by the authors or editors of them: when the list or catalogue is of books allowed to be read after correction or alteration, agreeably to the orders of the papal authorities, it is termed Index Expurgatorius. Such prohibitory catalogues have been in use from a very early period in the history of the church, commencing with a list of prohibited books drawn up by a council held at Rome in 494, or even earlier with the proscription of the writings of Arius. These prohibitions, in fact, were often issued by other than the papal authorities. In 1408 a synod at London prohibited the reading of the books of Wickliffe. The most important editions are those of Alexander VII. in 1664, and of Benedict XIV. in 1758. The latest edition appeared in 1881, with a supplement in 1884.

INDIA, a name properly applicable to the whole of the British Indian Empire, which includes Burmah, but popularly restricted to the great central peninsula of Southern Asia. Its length north and south, and its greatest breadth, east and west, are both about 1900 miles. Within these borders is an area of about 1,300,000 sq. miles, with a population of about 295,000,000. India may be regarded as consisting of three separate regions, well defined by differences of soil, climate, productions, and population. The first is the region of the Himalayas. Immediately south of the Himalayas lies the vast North Indian plain, containing the most fertile and densely-populated portions of the empire. South of the northern plain rises the third region of India, the triangular plateau of the Deccan, which has a general elevation of from 2000 to 3000 feet. Its northern scarp is formed by a number of hill ranges known as the Vindhya mountains. The other two sides of the Deccan are formed by the Eastern and Western Ghâts, which stretch southward along the eastern and western coasts of India, the latter rising in the Nilghiris or Neilgherries to the height of 8760 feet. The vast North Indian plain is watered by three distinct river systems, which collect the drainage of both the northern and southern slopes of the Himalayas. The Ganges for thousands of years has occupied a prominent place in Indian civilization, and was the sole channel of traffic between Upper India and the seaboard until the opening of the railway system in 1855. The Indian rivers in the lower portions of their courses afford a natural system of irrigation, but in the higher parts an extensive system of canal irrigation is required. The Ganges and Jumna canals alone irrigate an aggregate area of about three million acres. The coasts of India have very few indentations, and consequently few good natural harbors. There are no lakes of any extent, Chilka and Kolair on the east coast being the largest.

In Southern India the climate, of course, is tropical, and generally the heat is very great. Among the highest elevations of the Himalayas an Alpine climate prevails. The Indian plains are, especially in summer, sultry, unhealthy, and partly barren. The Deccan and the slopes of the Himalayas enjoy a temperate climate. The climate of the Nilghiris is healthy and pleasant, and several sanatoria for Europeans have been established there, as well as on the Himalayas. Throughout the entire country there are only two annual seasons, the dry season and the rainy season. The rainfall depends upon the monsoons. On the western coast the rainy season begins with the southwest monsoon, and lasts from May till November; on the east coast the rainy season, following the southeast monsoon, lasts from November till March. The rainfall, however, is distributed with great irregularity.

The flora of India offers nothing very distinctive. Many plants of temperate climates, such as wheat, barley, European vegetables, etc., are grown in the northwestern and other parts, while various products of warmer regions are also cultivated, such as cotton, rice, indigo, oil-seeds, jute, tobacco, sugarcane, cocoanut, date, and other palms, spices, etc. Coffee, tea, and cinchona are now extensively cultivated, the first particularly on the slopes of the western Ghâts and in the Nilghiris. The tea-plant is also grown in the south, but especially in Assam and along the lower slopes of the Himalayas. European fruits abound, and among cultivated fruits may be mentioned the mango, plantain, pomegranate, citron, orange, lime, melon, fig, almond, pineapple, guava, jack, and tamarind. Among trees the teak forests under the protection of the government are of most economic value. The bamboo, the

banyan, the sappan, the saul, etc., are all characteristic of Indian forest scenery. Opium is cultivated in Bahar, Benares, and Malwa. The vast forests of India are tenanted by great numbers of wild animals, birds, and reptiles. Large herds of elephants are still met with in Nepaul, Eastern Bengal, and the Nilghiris; the bear, the wild boar, and rhinoceros chiefly in the woods of the Eastern Himalayas; the tiger is found in every part of the country; the lion is now almost extinct. Other carnivorous mammals are the leopard or panther, cheetah, wolf, fox, jackal, and hyena. Several antelopes and deer, wild sheep and goats, the wild ass, the great gaur ox or "bison," the wild buffalo, are among the fauna. Snakes and reptiles in all varieties are very numerous, and the cobra and other snakes cause numerous deaths. Among domestic animals are oxen, camels, horses, mules, sheep, and goats. Of birds, eagles, vultures, the peacock, parrakeets, the adjutant-bird, etc., are characteristic species. Fish are plentiful and in great variety.

India is richly endowed with minerals; hardly a single metal seems to be wanting; but they are not worked to any extent. Coal, iron, gold, and salt receive most attention.

In 1858 the administration of the British possessions in India was transferred from the East India company to the crown, and in 1877 the British queen assumed the title of Empress of India. The country has long been divided into the three presidencies of Bengal, Madras, and Bombay; but the first of these was latterly subdivided into several provinces, and its name has now little or no administrative significance. The lieutenant-governors, chief-commissioners, and other officers at the head of the various divisions are subordinate to the governor-general or viceroy, representing and appointed by the crown, but each has a large measure of independence. The governor-general in council has power to make laws for all persons within the Indian territories under British rule, and for all subjects of the crown within the allied native states. He acts under the orders of the secretary of state for India, who is assisted by a council of fifteen and is always a member of the British cabinet. In India the supreme executive and legislative authority is vested in the governor-general, the capital being Calcutta. There are also a number of native or feudatory states, the relations of which to British rule are somewhat varied. Their area is 679,393 sq. miles, and their population 62,461,549. Among the most important of such native states are Haidarabad, Cashmere, Mysore, Travancore, Baroda, Gwalior, Indor, Jeypore, and Jodhpore.

The total European and native army numbers 220,000, the native army (146,000) being officered by Europeans. The armies of the feudatory or independent states of India number 350,000 men.

The chief source of revenue is the land-tax, which yields from $90,000,000 to $100,000,000 annually. About 70 per cent of the population are engaged in cultivating the soil, while only about 3 per cent reside in towns of over 50,000 inhabitants. Opium, which forms a government monopoly, and salt, on which a considerable duty is levied, are the other two important sources of revenue. The chief money denomination is the rupee, which is divided into 16 annas, the anna again being equivalent to 4 pice. The primary standard of weight, called the ser, is equal to the French kilogramme, or 2.205 lbs. A weight in common use is the maund, in Bengal 82 lbs., in Bombay 28 lbs., in Madras 25 lbs. By an act passed in 1889 the imperial yard is made the standard measure of length.

Some of the irrigation canals as well as the rivers supply means of internal navigation, but the construction of railways has been the most important step taken to render the internal communications of India permanently efficient. The total railway mileage open for traffic in 1900 was nearly 23,000 miles. There is an extensive system of posts and telegraphs, the length of telegraph lines being 45,000 miles.

The early history of India is obscurely written in the myths of Sanskrit literature, but the first fact of any certainty is that about the year 2000 B.C., or even earlier, an Aryan people of comparatively high civilization descended from the mountain regions of the northwest into the plains of India and subdued the original inhabitants there. The expedition of Alexander the Great to the Indus in B.C. 326 gives us a momentary glimpse of that part of India; but between his invasion and the Mohammedan conquest there is little authentic political history of India. In the 3rd century B.C. Buddhism was established throughout India, but it afterward entirely gave way to Brahmanism. The first six centuries of the Christian era were occupied by struggles between the native dynasties and invaders from the northwest. In the 8th century the tide of Mohammedan conquest began with Kasim's advance into Sind (711 A.D.). But the Mohammedans were again driven out in 828, and for more than 150 years afterward the strong feudal and tribal organizations of the northern Hindu kingdoms were a barrier to the Musselman advance. At length in the year 1001 Mahmud of Ghazni reduced the Punjab to a province of Ghazni, and the Mohammedan power was gradually extended into Southern India. In 1398 Timur or Tamerlane led a great Mogul (or Mongol) invasion of India, and after sacking Delhi retired into Central Asia. In 1526 Sultan Baber, a descendant of Tamerlane, founded the Mogul Empire in India. His grandson Akbar reigned from 1556 to 1607, and extended his power over most of the peninsula, being distinguished by his justice and his tolerance in matters of religion. His son Jehanghir received an ambassador from James I. in 1615. During the reign of his successor, Shah Jehan, famous for his architectural magnificence, the Mahrattas began to be formidable in Southern India. Shah Jehan was deposed in 1658 by his youngest son Aurengzebe, who made war successfully with the Afghans, the Rajputana tribes, and the rising power of the Mahrattas. The Sikhs, a Hindu sect, formed a religious and military commonwealth in the Punjab in 1675. On the death of Aurengzebe in 1707 the Mogul empire began to decline.

The English early came into collision with the French in India, whose first settlements were founded in 1604. The first conflict with the French took place in 1746, when the English lost Madras, which was, however, restored by the treaty of Aix-la-Chapelle. In 1751 Dupleix, the French governor at Pondicherry, was powerful enough to place creatures of his own on the thrones of the Deccan and the Carnatic. The English supported rival candidates, and the result was a second war, which left English influence predominant in the Carnatic, though the French still controlled the Deccan. The most memorable incident in this war was Clive's capture of Arcot. About this time important events took place in Bengal, then a subordinate presidency to that of Madras. The Nawab of Bengal, Siraj-ud-Daula (Surajah Dowlah), attacked the English settlement at Calcutta with a large army, forced it to capitulate, and thrust the prisoners, to the number of 146, into the Black Hole or common prison of the garrison, a room 18 feet square, with two small windows. After a night of unparalleled suffering only twenty-three were found alive in the morning. Clive was at once sent with an armament from Madras, recovered Calcutta, attacked and took the French settlement at Chandernagore, routed the Nawab's army at the battle of Plassey (23d June, 1757), and placed Mir Jaffier on the vice-regal throne, with consent of the Mogul court. In the south the English were equally victorious. A force despatched by Clive took Masulipatam, and the victory gained by Coote at Wandawash on 22d January, 1760, completed the destruction of the French power in India.

The system of double government established by Clive was abolished in 1772 by Warren Hastings, who appointed English officers to collect the revenues and preside in the courts, and thus laid the foundations of the present system of British administration in India. In 1774 Hastings was made governor-general of India. In 1786 Lord Cornwallis succeeded Hastings as governor. His rule is memorable chiefly for the war with Tippoo Sultan of Mysore, which terminated in the sultan having to surrender one-half of his dominions to the British and their allies. Sir John Shore succeeded as governor-general in 1793. He was followed by the Marquis of Wellesley, who arrived in 1798, and whose policy eventually made the British power paramount from the Himalayas to Cape Comorin. Under him Tippoo of Mysore was completely overthrown (1799) and the second Mahratta war successfully concluded, Sir Arthur Wellesley (latterly Duke of Wellington) having won the victory of Assaye (23d Sept. 1803), and General Lake that of Laswaree (1st Nov. 1803). In 1838 the Afghan war broke out, and terminated in the disastrous British retreat. (See Afghanistan.) In 1849, the Punjab was annexed to the British

dominions. This was immediately followed by the Burmese war, ending in the annexation of Pegu, 20th June, 1853. The Indian states of Sattara, Jhansi, and Nagpur were, on the failure of the native succession, annexed to the British possessions, 1852–56, and Oudh also brought directly under British rule.

The administration of Viscount Canning (1856–61) was distinguished by a short war with Persia, and especially by the great Sepoy mutiny. Several outbreaks among the native soldiers took place during March, 1857. The first formidable revolt, however, was at Meerut on 10th May, where the Sepoys of the 3d light cavalry, assisted by the 11th and 20th regiments of infantry, rose and massacred the Europeans. At Cawnpore the revolted Sepoys were headed by Nana Sahib, the heir of the last Peshwa of the Mahrattas. After a heroic but fruitless attempt to defend themselves, the Europeans capitulated on the sworn promise of Nana Sahib to allow them to retire to Allahabad. On the 27th the survivors, about 450 in number, were embarking when they were attacked by the Nana's troops, and the men indiscriminately massacred. The women and children, 125 in number, were carried back to Cawnpore and kept till the 15th of July, when they were all cut to pieces on the approach of Havelock's army. Cawnpore was stormed the day following.

In 1858 the direct sovereignty of India, and the powers of government hitherto vested in the East Indian company, were vested in the British crown. In 1877 Queen Victoria was proclaimed Empress of India at Delhi. In 1877–78 another disastrous famine occurred, and despite the most strenuous efforts of the government over five million persons are said to have perished. In 1878 the intrigues of Shir Ali, amir of Afghanistan, with Russia, led to a declaration of war on the part of the British. After two campaigns Abdurrahman Khan was established on the Afghan throne by British arms. In 1880 Lord Ripon succeeded as viceroy; being followed in 1884 by Lord Dufferin, under whose rule took place the annexation of

Insignia of the Order of the Star of India.

Upper Burmah on January 1, 1866. He was followed by the Marquis of Lansdowne, the Earl of Elgin, the Viscount Curzon, and the Earl of Minto.

INDIA, Orders of Knighthood in, consist of The Most Exalted Order of the Star of India, instituted in 1861, and comprising the Viceroy of India as Grand Master, and a number of Knights Grand Commanders (G.C.S.I.), Knights Commanders (K.C.S.I.), and Companions (C. S. I.); The Most Eminent Order of the Indian Empire, instituted 1st Jan. 1878, and comprising the Viceroy of India as Grand Master, a number of Knights Grand Commanders (G.C.I.E.), Knights Commanders (K.C.I.E.), and Companions (C.I.E.); and The Imperial Order of the Crown of India, instituted 1st Jan., 1878, and comprising the Princess of Wales and the princesses of the royal-blood, and other British and Indian ladies.

INDIANA, one of the United States, is bounded on the east by the state of Ohio, on the south by the Ohio river; on the west by Illinois; on the north by the state of Michigan and Lake Michigan. The extreme length of the state is 276

Seal of Indiana.

miles, with an average breadth of 145 miles; and the area is 33,809 sq. miles.

Indiana occupies a table-land, gently undulating, except along the Ohio. There are no mountains or mountain ranges. With the exception of a small portion, the whole state inclines toward the southwest. The mean altitude of the state is estimated at 735 feet above sea-level. It is well watered. The Wabash is the largest river, and, with its branches, it drains three-fourths of the surface. The country south of the Wabash was originally covered with heavy forests of oak, beech, maple, walnut, ash and other hard woods; north of that river was principally prairie, interspersed with small lakes.

The coal-measures occupy over 7000 sq. miles in the western and southwestern parts, furnishing workable seams, at a depth of 50 to 220 feet; the seams vary in thickness from two and a half to eleven feet; an area of 600 sq. miles in this field yields a superior "block" or splint coal. This is used in blast furnaces without coking, and is well adapted for the preparation of Bessemer steel. Natural gas has been discovered and utilized as a fuel and illuminating agent in various portions of the state and the supply is apparently very great.

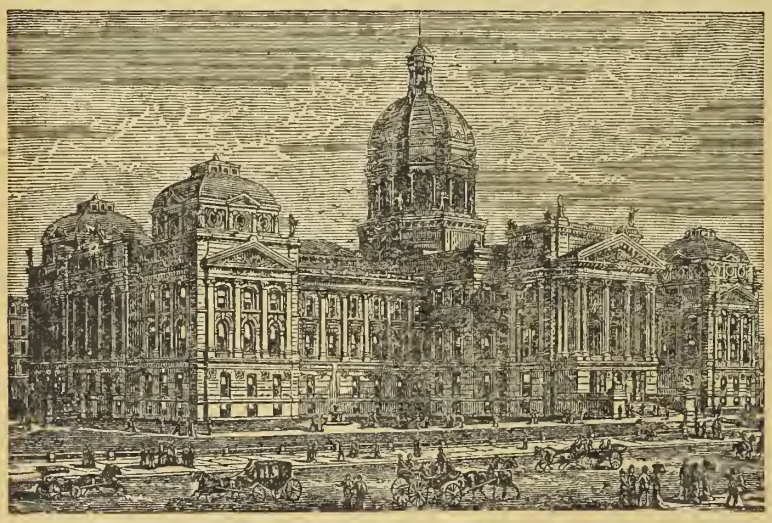
Inexhaustible beds of fireclay, potter's clay, kaolin, lime and paving and building stone are found in the southern parts of the state. The climate is equable and healthy. The mean height of the barometer is 30.010 inches. The prevailing winds are from the south and west in summer, veering round to the north in winter. The temperature has not as great a range as some of the neighboring states, averaging 20° in winter and 95° in summer. Indian corn, wheat, oats, barley, tobacco, and potatoes are the chief agricultural products. Molasses, cider, wine, honey, cheese, milk, are also plentifully produced. Immense herds of cattle and swine are reared. Woolens, cottons, lumber, agricultural implements, manufactures of iron, paper, and leather, are leading industries. The Ohio, White river, Wabash, and the Miami are the principal rivers. A canal 467 miles in length, from Evansville to Toledo, unites the Ohio, the Wabash, and Lake Erie.

So completely does the railway system cover the state that one can go from the capital to almost any county and return the same day. The geographical position of the state is such that all the main railroad through-lines between the east and west have to cross Indiana.

At the head of the institutions of higher education is the state university at Bloomington. Perdue university, at Lafayette, is the state agricultural college. There are a number of colleges, mainly under the control of religious societies, chief among which are Asbury university (Methodist) at Greencastle, Wabash college (Presbyterian) at Crawfordsville, Butler university (Christian) at Irvington (near Indianapolis), Notre Dame (Catholic) at South Bend, and Earlham college (Friends) at Richmond.

Indiana originally constituted a part of New France. It was visited by the Jesuits as early as 1672. At the beginning of the 18th century the French opened a line of communication between the lakes and the Mississippi by way of the Maumee, Wabash, and Ohio rivers. Trading posts for barter with the natives were established at the head of the Maumee, where is now the city of Fort Wayne; at Ouantenon, on the Wea Prairie, near the city of Lafayette; and at Vincennes on the Wabash. Missionary stations were also established by the Jesuit fathers, in their endeavor to convert the Indians. At the close of the French war in 1763–4, the territory east of the Mississippi and north of the Ohio passed under British dominion. Pending the war between Great Britain and the American colonies, Col. George Rogers Clark of Virginia, with an armed force, took possession of the territory, raising the American flag at Vincennes in 1778. By the treaty of 1783 between England and the United States this territory was recognized as belonging to the latter; inasmuch as Virginia had fitted out Clark's expedition, she was entitled by the law of conquest to claim this vast dominion. During the colonial war congress recommended the several states to cede their claims to unappropriated lands in the western country to the general government for the common benefit of the Union. Virginia, in pursuance of this request, yielded up her claims to the territory northwest of the Ohio. The deed of cession, executed on March 1, 1784, was signed by Thomas Jefferson, James Monroe, Arthur Lee, and Samuel Hardy. In 1787 congress

passed an ordinance for the government of the northwest territory, which provided, among other things, that not more than five states should ever be formed therefrom, prohibiting slavery, and declaring that "religion, morality, and knowledge being necessary to good government and the happiness of mankind, schools and the means of education shall forever be encouraged." This territory was subsequently divided into the states of Ohio, Indiana, Illinois, Michigan, and Wisconsin. The capital was moved from Vincennes to Corydon in 1813, and to Indianapolis in 1825 In 1811 Gen. William H. Harrison crushed the Indian tribes under Tecumseh at the battle of Tippecanoe. Indiana was admitted into the Union as a state by congress on April 19, 1816, being the sixth state received after the formation of the government by the thirteen original states and the adoption in 1787 of the present constitution. Its prosperity since the civil war has been largely due to the discovery of extensive coal, iron and gas fields and valuable deposits of building stone in different parts of the state, and to the construction of the Wabash and Erie canals.



State capitol, Indianapolis, Ind.

In national elections the state was democratic up to 1860 with the exception of the years 1836 and 1840, when it cast its vote for the whig candidate, William H. Harrison. It was republican from 1860 to 1872, democratic in 1876–1884 and 1892 and republican again in 1880-1888-1896-1900-1904 and 1908. The principal towns are Indianapolis (the capital), Evansville, Fort Wayne, Terre Haute, New Albany, Lafayette, South Bend, Madison, etc. Pop. 2,775,000.

INDIANAPOLIS, the largest city in and the capital of Indiana, the county seat of Marion county on the White river near the center of the state, mostly situated on a plain. It is 111 miles northwest of Cincinnati and 183 miles southeast of Chicago. It is the center of numerous railroads and is surrounded by rich agricultural and mineral regions. It is a place of great trade and its manufacturing interests are large. It is also an important market for grain, live stock, timber, etc., and carries on pork packing, the production of iron goods of various kinds, agricultural implements, woolens, flour, etc. The city is noted for the beauty of its streets which range from 40 to 120 feet wide. In the heart of the city is a circular plaza known as Monument place from which radiate four avenues to the four corners of the city. The most notable structure in the city is the soldiers and sailors monument. The notable buildings are the capitol 492 by 185 feet, built of Indiana limestone, manual training high school, the Claypole hotel, and the public library. The park system comprises 1250 acres and includes Riverside, Garfield, Brookside, Saint Clair and University parks. Educational and benevolent institutions are numerous, the former including the University of Indiana. Pop. 1909, 243,000.

INDIANA UNIVERSITY, a co-educational institution of learning, situated at Bloomington, Ind. The university is part of the state public school system and admits pupils from high schools without examination. It maintains a professional school of law, and confers the degrees of bachelor of arts, bachelor of laws, master of arts, and doctor of philosophy. The summer school, formerly privately conducted, is now a part of the university.

INDIAN CORN. See Maize.

INDIAN INK, a practically indelible writing ink of which there are two principal kinds—one prepared in Italy, Turkey, and Asia from certain cuttlefishes, the other in China by mixing fine lamp-black with glue or size and a little camphor. The former when submitted to the action of an alkali becomes brown sepia.

INDIAN MUTINY. See India (History).

INDIAN OCEAN, that great body of water which has Asia on the north, the Sunda isles and Australia on the east, Africa on the west, and the Antarctic ocean on the south. The Cape of Good Hope and the southern extremity of Tasmania may be considered its extreme southern limits on the west and east. Its length from north to south somewhat exceeds 6500 miles, its breadth varies from 6000 to 4000 miles. It is traversed by the equatorial current flowing east to west, and its navigation by sailing vessels is more or less modified by the periodic trade-winds and monsoons. Its greatest known depth is 3393 fathoms. Its chief arms are the Bay of Bengal on the east of India, and the Arabian sea on the west, extensions of the latter being the Persian gulf and Red sea. Madagascar, Ceylon, Mauritius etc., are among the islands.

INDIANS, American, the collective name given to the tribes inhabiting the continent at the time of the discovery by Columbus, and to such of their descendants as still survive. The name of Indians was first given to these races from the notion that the newly-discovered continent formed part of India The Esquimos or Innuit, the most northerly of the American tribes, are not usually classed among the Indians. Next below them are the allied Kenai and Athabascan groups, the former represented chiefly by the Yellow Knife or Atna tribe on the Yukon river. The Athabascans are chiefly found between Hudson's bay and the Rocky mountains, but includes besides the Chippeways, Coppermine, Dogrib, and Beaver Indians; the Tlatskanai, Unkwa, and Hoopah Indians of the Oregon coast; the Navaho tribe of the Highlands of New Mexico; the Apaches, ranging from the western Colorado to Chihuahua and Coahuila; and the Lipani, north of the mouth of the Rio Grande del Norte. Canada and the United States east of the Misissippi were formerly inhabited by the Algonquin-Lenappe and the Iroquois, generally at war with each other. The extreme west of the Algonquin region was occupied by the Blackfeet Indians; the Ojibeways held the shores of Lake Superior; south and west of Hudson's bay were the Crees. The Leni-Lenappe section of the Algonquin-Lenappe group comprised the five nations of the Delawares, including the Mohicans. The Iroquois included the Senecas, Cayugas, Onondagas, Oneidas, and Mohawks, who formed a league of five nations, afterward joined by the Tuscaroras. The Hurons were of the Iroquois group. The Dacotah or Sioux group occupied the plains between the Rocky mountains and the Mississippi as far south as Arkansas, and included the Assiniboins, Winnepegs, Iowas, Omahas, Osages, Kansas, Arkansas, Menitarees, Crows, and Mandans. West of the Mississippi also were the Pawnees and Riccaras about the Nebraska or Platte river, and to the southeast were the Choctaws and Chickasaws. In the Rocky mountain regions were the Shoshone or Snake Indians, including the Comanches and others. The Cherokee tribes, which inhabited South and North Carolina, formed a detached group, and the Texas Indians were comprised in many small and diverse tribes. Below these, in New Mexico, a more advanced and distinct family is found called Moquis or Pueblo Indians. Of the

numerous families occupying Mexico the Nahuatls or Aztecs were the most powerful and civilized. The Otomis, speaking a peculiar language, were also a numerous people in Mexico. In Central America the predominating family was the Maya, including the Quichés, Kachiquels, etc. Portions of the Aztec tribes were also found in Central America. In South America the leading and more advanced families were those that made up the Peruvian Empire, among which the Inca race and the Aymaras were the chief. The Araucanians, to the south of these, in Chili, had a considerable resemblance to the Algonquins and Iroquois of North America. The remaining portions of the continent, including the great alluvial tracts of the Atlantic slope, were principally occupied by the Guaranis; but along its northern coast were found the Caribs, who spread also over the Antilles and most of the West Indian Islands. In the extreme southern part of the continent live the tall Patagonians or Tehuelches, and squalid families in some respects resembling the more debasedAustralians.

By some ethnologists the American Indians are considered an aboriginal and single stock; by others a mixture of Mongolian, Polynesian, and Caucasian types; and by others as derived from the grafting of Old World races on a true American race. They are generally characterized as having long, black, and straight hair, scanty beard, heavy brows receding forehead, dull and sleepy eyes, a salient and dilated nose, full and compressed lips, and the face broad across the cheeks, which are prominent, but less angular than in the Mongolian. The facial angle is about 75° (about 5° less than the European average); the hands and feet are small and well proportioned. The complexion varies from dark-brown to almost white; a somewhat reddish tint is common. The North American Indian is described as of haughty demeanor, taciturn and stoical; cunning, brave, and often ferocious in war; his temperament poetic and imaginative, and his simple eloquence of great dignity and beauty. The Mexico-Peruvians worshiped the sun with human sacrifices and the grossest rites. Those of the United States and Canada believe in the two antagonistic principles of good and evil, and have a general belief in manitous, or spiritual beings, one of them being spoken of as the Gitche Manitou, or Great Spirit. They believe in the transmigration of the soul into other men and into animals, and in demons, witchcraft, and magic. They believe in life after death, where the spirit is surrounded with the pleasures of the "happy hunting grounds," though they have no idea that the acts of their present life can have any connection with their future happiness. They adopt a totem or symbol of the name of the progenitor of the family; this is generally some animal (the turtle, bear, and wolf being favorites), which is the mark of families even when expanded into tribes. No marriage rite is necessary beyond the consent of the parties and their parents; but the wife may be dismissed for trifling causes, and polygamy is allowed. In ancient times the body was covered with furs and skins according to the seasons, but now the white man's clothes and blanket have generally superseded the native dress; though the moccasin of deer or moose hide, and in the wilder tribes the ornamental leggings and headdresses, are largely retained. Their dwellings are made of bark, skins, and mattings of their own making, stretched on poles fixed in the ground. Their arms consist of the bow and arrow, the spear, tomahawk, and club, to which have been added the gun and knife of the whites. Canoes are made of logs hollowed out, or of birch bark stretched over a light frame, skilfully fastened with deers' sinews, and rendered watertight by pitch. The antiquities found in Mexico and Peru, and the ruins of elaborate buildings in Central America, prove that the semi-civilized races there existing had made considerable progress in sculpture and architecture.

INDIAN, AMERICAN, THE. The annual reports of the agents of the United States Bureau of Indian Affairs in 1905 show that the Indian population was 284,079, distributed in the several states as follows:

Arizona	38,725
California	15,519
Colorado	887
Florida	358
Idaho	3,560
Indian Ter	93,333
Iowa	342
Kansas	1,182
Michigan	6,333
Minnesota	9,164
Montana	10,324
Nebraska	3,639
Nevada	5,437
New Mexico	18,129
New York	5,290
North Carolina	1,455
North Dakota	7,741
Oklahoma	13,562
Oregon	5,913
South Dakota	19,601
Utah	1,953
Washington	9,798
Wisconsin	10,957
Wyoming	1,694
Miscellaneous	1,183
Total	284,079

Of the 274,706 Indian population in 1907, 116,333 wore citizens' dress and 43,602 wore a mixture of Indian and civilized clothing. Those who could read numbered 63,147 and 69,209 could carry on an ordinary converastion in English.

The total Indian population of the United States, exclusive of Alaska, numbered 284,079 in 1907. The expenditures of the United States on account of the Indians in the fiscal year ended June 30, 1906, were $14,236,078.71; in the fiscal year ended June 30, 1907, they were $12,746,859. The expenditures from 1789 to 1907, inclusive, have been $450,282,361.

The appropriation made by congress for Indian schools for the fiscal year ending June 30, 1907, was $9,405,199,98. The government supports 115 boarding schools, and 146 day schools. Indians incidentally under the Indian office and self-supporting:

The five civilized tribes, Indians and colored — Cherokees, 36,782; Chickasaws, 10,767; Choctaws, 25,116; Creeks, 15,923; Seminoles, 3,049. Total Indians, 71,018; total colored, 20,619; grand total	91,637
Pueblos of New Mexico	8,874
Six Nations, Saint Regis, and other Indians of New York	5,295
Eastern Cherokees of North Carolina	1,455
Indians under control of the War Department, prisoners of war (Apaches at Ft. Sill, Okla.)	298

INDIAN SUMMER, the name given to a period of mild summer weather which generally occurs toward the end of autumn in North America.

INDIAN TERRITORY, a tract of country allotted for the residence of certain of the Indian tribes who were partly removed from the southeast states of the Union. It is bounded mainly by Kansas, Texas, Oklahoma, and Arkansas, the southern boundary being formed by the Red river; area, 31,400 sq. miles. The chief rivers are the Arkansas and its tributaries (Canadian river Neosho, etc.) and the Red river and its tributaries. The greater portion is fertile and suited for stock-rearing. The Indian tribes or "nations" among which this territory has been apportioned are the Cherokees, Creeks, Seminoles, Choctaws, and Chickasaws, all of whom have made considerable advances in civilization, having schools, churches, newspapers, etc. The white inhabitants are increasing since the opening of coal-mines and the construction of railways. The territory possesses a coal-field of 20,000 sq. miles. Cultivation is now rapidly extending. The Indian Territory was formerly more than double its present size, but was reduced in 1889 and subsequently, by the loss of Oklahoma. The Indians of the territory, though not full citizens of the republic, are subject to the revenue laws and pay taxes. The Indian territory was part of the French possessions which the United States procured by the Louisiana purchase in 1803. The first Indians to settle here were the Creeks, Cherokees, Chickasaws, and Choctaws in 1834. The various tribes hold their reservations in common and govern themselves in accordance with their established customs, each nation having its own governor, legislature, judicial system, etc. With the great increase of the number of whites who have come into the territory, this plan of government has become inadequate, and gradually the tribal governments are being displaced by a general government. In 1893 a commission, known as the "Dawes Commission," to the five civilized tribes was appointed and has accomplished the following general results: The partial abolition of the Indian tribes and local governments (this is to be extended to total abolition), a survey of the lands; the enrollment of all Indians with a view to making an allotment of land to each one who is entitled to it; the establishment of a judicial system for the whole territory; the founding of a system of public schools, etc. In 1898 a bill "for the protection of the people of the Indian Territory," known as the Curtis bill was passed by congress. This act provides that the control of tribal funds is placed in the hands of the United States officers and also that white residents of the territory may incorporate towns within the Indian nations. As soon as the survey and enrollment are finished lands will be allotted and citizenship granted to each Indian in the territory and a general territorial government will be formed. On the 1st of January, 1898, the jurisdiction of the United States courts was established in the territory over the five civilized tribes. This had

the effect practically of abolishing the tribal court and in reality the substance of their individual governments.

Differences of conditions have prevented a uniform application of the policy. An agreement with the Seminoles permits the continuance of the Seminole government in a limited way and an agreement with the Choctaws and Chickasaws, until March 4, 1906. Pop. 450,000, With Oklahoma, Indian Territory was incorporated into the State of Oklahoma in 1907. See Oklahoma.

INDIA-RUBBER, a peculiar elastic substance composed of carbon and hydrogen, found in suspension in the milky juice of many different families of plants. The crude rubber is usually prepared where the juice is collected, by drying the juice over a fire or in the sun on moulds of clay, paddles, or lasts; by evaporating the juice in the sun and removing the successive pellicles formed on the surface; or by coagulating the juice, as in Nicaragua, by an application of the juice of the bejuca vine, and kneading and rolling the coagulated mass. Most of the rubber of commerce is derived from South America, from Para, Central America, Mexico, Carthagena, etc.; smaller quantities from Java, Penang, Singapore, Assam, and South Africa. The purest comes from Para in large bottles and thick plates. When combined with a small quantity of sulphur, etc., it is used for the manufacture of overshoes, boots, gloves, life-preservers, gas-bags, steam and water packing, belting, fire-hose, tubing, springs, tires, artificial sponges, etc. With a larger proportion of sulphur, and cured or vulcanized by exposure to a high temperature, it is used for the manufacture of combs, pen and pencil holders, rulers, inkstands, buttons, canes, syringes, jewelry, and, when colored with vermilion, for mountings for artificial teeth, etc. In combination with asphalts, oils, and sulphur, etc., and vulcanized (kerite) it is used for covering telegraph wires.

INDIC'ATIVE, that mood of the verb in which something is said positively; hence it has also been called the positive mood, as distinguished from the subjunctive and potential.

IN'DICATOR, (1) an instrument for ascertaining and recording the pressure of steam in the cylinder of a steam-engine, in contradistinction to the steam-gauge, which shows the pressure of the steam in the boiler. (2) An apparatus or appliance in a telegraph for giving signals or on which messages are recorded, as the dial and index hand of the alphabetic telegraph. (3) A genus of African birds, the honey-guides or honey-guide cuckoos.

INDICTMENT (in-dīt'ment), in law, a written accusation of one or more persons for a crime or misdemeanor, preferred to and presented upon oath by a grand-jury to a court.

INDIGESTION. See Dyspepsia.

IN'DIGO, a blue vegetable dye, extensively employed in dyeing and calico-printing; an important commercial product in the East and West Indies, Mexico, Brazil, Egpyt, etc. It is chiefly obtained from various leguminous plants, herbaceous or shrubby plants, with pinnate leaves, and small, blue, purple, or white pea-shaped flowers disposed in axillary racemes. They are very numerous in the equatorial regions of the globe. The greater part of the indigo used at the present day comes from India, especially from the provinces of

Indigo-plant.

Bengal, Oude and Madras. The color varies from light-blue to blackish-blue; when rubbed with the nail a copper-colored streak is formed on the surface of the mass. Indigo is insoluble in water, but when exposed to the action of certain deoxidizing agents it becomes soluble in alkaline solutions, losing its blue color and forming a green solution from which it is precipitated by acids white, but it instantly becomes blue on exposure to the air. Commercial indigo contains about 50 to 60 per cent of pure indigo blue, the remainder consisting of substances called indigo gluten, indigo yellow, indigo red, etc.

IN'DIUM, a metal discovered by Reich and Richter in 1863 by means of spectroscopic analysis in the zinc-blende of Freiburg. It has been isolated in small quantities, and is of a silver-white color, soft, and marks paper like lead; specific gravity, 7.421 at 16°.8. The metal is related to cadmium and zinc, and its spectrum exhibits two characteristic lines, one violet and another blue.

INDO-CHINA, a name sometimes given to the southeastern peninsula of Asia, comprising Burmah, Siam, Cambodia, Cochin-China, Tonquin, Anam, etc.

INDO-EUROPEAN LANGUAGES, also called Aryan or Indo-Germanic, the most important of the great families into which human speech has been divided, spoken by various peoples in Asia and Europe. The chief branches of this family are the Teutonic or Germanic, including English, German, Dutch, Danish, Swedish, Icelandic, and the extinct Gothic; the Slavonic (Polish, Russian, Bohemian); the Lithuanian; the Celtic (Welsh, Irish, Gaelic, Breton); the Latin or Italic, and the Romance tongues descended from it (French, Italian, Spanish, Portuguese); the Greek, the Armenian, the Persian, and the Sanskrit. All these tongues are regarded as being descended from a common ancestral tongue or parent speech, spoken at some remote period in Central Asia, whence the ancestors of the modern peoples speaking these tongues spread into India, Western Asia, and Europe. See Philology.

INDORE, or **INDOR,** a protected native state of Hindustan, connected with Central India, and consisting of several detached portions, the largest being bisected by the Narbada; total area, 8400 sq. miles. Pop. 86,686.

INDORSEMENT, or **ENDORSEMENT,** See Bill.

INDRA, a Hindu deity, originally representing the sky or heavens, and worshiped in the Verdic period as the supreme god, though he afterward assumed a subordinate place in the Pantheon. He is commonly represented

Indra—Coleman's Hindu mythology.

with four arms and hands riding on an elephant. When painted he is covered with eyes. He is at once beneficent as giving rain and shade, and awful and powerful in the storm as wielding the thunderbolt. In one aspect he is lord of Swarga, the beautiful paradise where the inferior gods and pious men dwell in full and uninterrupted sensuous felicity.

INDRE (andr), a department of Central France; area, 2622 sq. miles. Châteauroux is the capital. Pop. 288,788.

INDRE-ET-LOIRE (andr-ē-lwär), a department of Central France; area, 2362 sq. miles. Tours is the capital. Pop. 335,541.

INDUCED CURRENT, the current of electricity which is produced or excited in a conductor when the magnetic field in which it is placed is altered in any way; that is, 1st, when the strength of the current in a neighboring conductor is altered; or 2d, when a neighboring conductor in which a current flows is altered in position; or 3d, when a neighboring magnet is moved; or 4th, when the magnetization of a neighboring magnet is altered. Thus if there is a closed circuit, say a coil of wire with its ends joined, through which no current is passing, the motion of a magnet in its neighborhood will induce a current in it, the direction of this current being always such as to oppose the motion.

INDUCTION, in logic, is that process of reasoning by which we rise from the particular to the general, and is the counter-process to deduction. In induction particulars are not only raised into generals, but these into still higher generalities. In following this method we proceed from the known to the unknown, and obtain a conclusion much wider than the premises. Thus a person who has had any experience easily arrives by induction at the conclusion that fire burns wood, and when any piece of wood whatever is presented to him he will have no hesitation in saying that fire will burn it. As it is impossible that all particulars can be observed, there is always a certain risk of error, and the inductive method must be worked with extreme caution; but science properly so called would be impossible if we did not presuppose a faculty of arriving from experience at the knowledge of truths not contained in that experience. Hence the ground

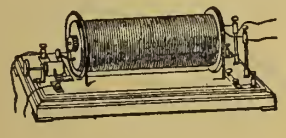
of induction is the established fact that nature is uniform.

INDUCTION, Electromagnetic, the action by which a current of electricity is produced in a conductor when the magnetic field in which it is placed is altered inany way. See Induced Current.

INDUCTION, Electrostatic, the action by which the distribution of a charge of electricity on a conductor is altered by the approach of an electrificd body. When a body charged with one kind of electricity is approached toward an insulated conductor which originally had no charge, a charge similar to that of the influencing body is produced on the remote side, and an equal charge of the opposite kind on the near side of the insulated conductor. It is to the mutual induction between the two coatings, one charged positively and the other negatively, that the Leyden-jar is indebted for its large electrical capacity.

INDUCTION, Magnetic, the action by which iron and other substances become magnetic when in a magnetic field, that is, when in the neighborhood of magnets or currents of electricity. See Electromagnetism, Magnetism.

INDUCTION-COIL, an instrument invented by Ruhmkorff, in which rapid breaking and making of the current of electricity in a primary short coil of wire gives rise to a succession of induced cur-



Induction-coil.

rents (see Induced Current) of very great electromotive force in a long secondary coil. In the figure the secondary coil is the one shown wound up in a cylindrical form. Such a coil often consists of a copper wire many miles in length, and a succession of powerful sparks passes between its terminals when the primary current is rapidly made and broken.

INDULGENCE, in the Roman Catholic system, is the remission granted by the church to a repentant sinner of the temporal punishment due to his sin, whether this punishment be the pains of purgatory, or penance which the church has the right to impose according to the gravity of the sin. It must be understood that the indulgence is never to be considered as constituting a remission of the sin itself. The principle of indulgences rests on that of good works. Many saints and pious men have done more good works and sufferecl more than was required for the remission of their sins; these are known as works of supererogation, and the sum of this surplus constitutes a treasure for the church, of which the pope has the keys, and is authorized to distribute as much or little as he pleases in exchange for pious works or gifts. Indulgences are of two kinds: plenary, when considered an equivalent substitute for all penance; and partial, when only a portion of penitential works is relaxed. Local indulgences are attached to particular places, real indulgences to crucifixes, medals, etc. The historical origin of indulgences is traced to the public penances and the canonical punishments which the early Christian church imposed on offenders, especially on those who were guilty of any grievous crime, such as apostasy, murder, and adultery. When ecclesiastical discipline became milder it was allowed to commute these punishments into fines for the benefit of the church. The abuse of the system of granting indulgences inflamed the zeal of Luther, and the Protestant theologians have always found indulgences one of the most vulnerable points of the Roman Catholic system.

INDUS, the chief river of the northwest of Hindustan, It has a length of about 1800 miles, drains an area of about 370,000 sq. miles, and rises in Tibet on the north of the Himalaya mountains.

INDUSTRIAL EXHIBITION. See Exhibition.

INDUSTRIAL SCHOOLS, a class of schools, of a philanthropic, reformatory, or experimental nature, in which industrial work is taught to boys and girls. The primary purpose of the industrial instruction varies from the mere desire to keep boys off the streets to the serious effort to teach a trade. Broom and brush making, chair-seating, or basketry, are prominent in such schools.

INEBRI'ETY, habitual or chronic drunkenness. See Drunkenness, Delirium Tremens, Intoxication, Dipsomania.

INERTIA, the passiveness of matter, or its indifference to rest or motion. Newton's first law treats of this property in virtue of which a body at rest will remain at rest, and a body in motion will continue to move in a straight line and with a uniform velocity unless some force acts upon it.

INFALLIBILITY, exemption from the possibility of error in regard to matters of religion and morals—a claim made by the Roman Catholic Church both on its own behalf and on that of the pope when speaking ex cathedra, or in his official capacity. The infallibility of the church is of two kinds, active, and passive; the former signifying the function of the church of permanently teaching the truths of God, and of authoritatively settling doctrinal disputes; and the latter that property inherent in the church in virtue of which she can never receive or embrace erroneous doctrine. The infallibility of the pope, long taught, was only settled as an article of faith in the Vatican Council of 1870.

INFANT, a term in the English and American law for persons who have not attained their majority, that is, the age of twenty-one years, and are under guardianship. In general, contracts made by infants are not binding, except for necessaries suited to their station in life. Being an infant is no bar to criminal proceedings; but young persons are not punished for offenses if they have not knowledge and discretion to distinguish them to be such. Infants require the consent of parents or guardians to marry. The jurisdiction in respect to infants is generally vested in either probate or orphans' courts. These courts appoint guardians to take charge of the property of infants, and, in case of the decease of the father, to take charge of their persons; but during the life of the father he has the guardianship and control of the persons of his children until they are twenty-one years of age.

INFANTE (in-fän-tā) or infant, the title given in Spain and Portugal to the princes of the royal house. The princesses are called infanta.

INFAN'TICIDE, the murder of an infant, a crime that is especially common in the case of illegitimate children, the main cause being shame; but infanticide is sometimes the result of puerperal insanity. In trial for infanticide it must be proved that the child was fully born alive. Infanticide was prevalent in Greece and Rome. In modern times many barbarous nations are guilty of wholesale child-murder. Among the South Sea Islanders and aboriginal Australians the destruction of infant life is systematized. The Hindus destroy female children without compunction, and abortion is common among the Mohammedans. In China, also, infanticide is supposed to be frightfully common.

IN'FANTRY, foot-soldiers collectively. Except among semi-barbarous nations, and during the prevalence of the institutions of chivalry, infantry has always been considered the most important military arm, and this has been peculiarly the case since the formation of standing armies, and since war has become a science. Infantry may be divided into various classes, and most commonly into light infantry and infantry of the line, to which should also be added mounted infantry, a force which from its mobility has proved itself of immense value in special circumstances. Under equal conditions well-trained infantry is almost universally successful against any other kind of troops.

INFANT SCHOOLS, schools, the object of which is to amuse, interest, and instruct children from their third to their sixth year. Jean Frédéric Oberlin, Protestant pastor of Waldbach, in Alsace, is regarded as their founder. In 1812 Robert Owen established one at New Lanark, in Scotland, the first attempt of the kind in Great Britain. A second was set on foot in Westminster in 1819, of which Samuel Wilderspin (1792–1866) was one of the first teachers. In England infant schools are more popular, and proportionally more numerous, than in Scotland. In Germany there are numerous Kleinkinderschulen, or Kindergärten; in France, under the name of "Asylums," they are wide-spread; and the kindergärten system (founded about 1840) is acquiring high credit both in Great Britain and in the United States. In dealing with infants of tender years a frequent mistake of teachers is to attempt too much. Physical more than intellectual development should be aimed at; the moral faculties should be trained by an enlightened, judicious, and sympathetic teacher. The school should be a playground, and elementary instruction should be simple, pleasing, and as much as possible imparted by means of models, pictures, and simultaneous singing.

INFECTION, a term sometimes used to signify the communication of disease through the atmosphere, as contrasted with contagion (con, and tango, to touch), communication of disease through

the medium of touch. In many cases Infection and Contagion are used as synonimous.

INFECTIOUS DISEASES. See Contagion.

INFERIOR PLANET, a planet whose orbit lies within that of the earth. Mercury and Venus are the inferior planets.

INFINITES'IMAL, in mathematics, an infinitely small quantity, or one which is so small as to be incomparable with any finite quantity whatever, or which is less than any assignable quantity. The infinitesimal calculus is a department of the higher mathematics which embraces both the differential and the integral calculus.

INFIN'ITIVE, the indefinite mood of a verb, or that in which the verb is represented without a subject; the mere name form of the verb. As the verb expresses an action, or a state, it generally belongs to a subject whose action or state is expressed; but if we wish to express the mere idea of this action or state we use the infinitive, which, therefore, in many languages is employed without further change as a substantive—for instance, the Greek and German—only preceded by the neuter article. The infinitive may be regarded as the point of transition from a verb to a substantive, and is often used as the subject of a proposition.

INFIRMARY. See Hospital.

INFLAMMA'TION, a vague term for a morbid process, of which the most obvious phenomena are pain, swelling of the affected part, perceptible increase of heat to the patient, and redness beyond the natural degree, often followed by febrile symptoms. Inflammations may arise from external injuries, or may be brought on by morbid or poisonous matters in the system, sudden changes of temperature, etc. The three commonly described terminations of inflammation are resolution, suppuration, and mortification or sloughing. Resolution is that recovery from the disorder which is effected without the intervention of any disorganizing process and when the vessels return to their normal condition on the exciting cause of the disorder being withdrawn, and this is the most favorable mode of termination. If inflammation cannot be resolved it must go on to suppuration, when the skin is either divided by the knife or breaks of itself, and there is an escape of a yellow cream-like fluid, after which the symptoms rapidly abate. The tendency to suppuration is marked by the pain becoming full and throbbing, while the pulse becomes more full without being less frequent. Mortification is accompanied by the sudden cessation of pain, and there is the actual death of the part affected. When the circumstances are favorable this dead part sloughs off by a vital process known as ulcerations, and the cavity gradually fills up and heals. In many cases inflammation may rather be considered as a salutary process than as a disease, for it frequently prevents evils which would occasion either serious or fatal consequences. The most important remedy in cases of severe inflammation is hot fomentations, blisters, bloodletting, the warm bath, combined with low diet and perfect quietude. As to inflammation of the intestines, see Enteritis; of the eye, see Iritis; of the bowels see Peritonitis; of the brain, see Meningitis; of the lungs, see Pneumonia.

INFLORES'CENCE, in botany, the mode of flowering of any species of plant, that is, the manner in which its blossoms

Varieties of inflorescence.

1, Spike. 2, Amentum or catkin. 3, Raceme. 4, Panicle. 5, Whorl. 6, Umbel—*a*, simple, *b*, compound. 7, Cyme. 8, Corymb. 9, Thyrsus. 10, Head or capitulum. 11, Fasciculus or fascicle. 12, Spadix. 13, Anthodium.

are grouped together, and in some cases in which they successively open. The principal forms of inflorescence are the amentum, corymb, cyme, head or capitulum, fascicle, raceme, panicle, thyrsus, spike, whorl (see those terms); centrifugal and centripetal are also terms applied to two kinds of inflorescence.

INFLUEN'ZA (Italian influence), a term used to denote an epidemic catarrh of a rather severe character, the symptoms of which are those of what is usually called a cold, with others such as lassitude and general depression, loss of sleep, feverishness, nausea, loss of appetite, sometimes vomiting, often an inflammatory state of the throat and pharynx, bronchitis, or other complications. It is not usually fatal, the patient generally recovering in a week or ten days, but it sometimes leaves behind chronic bronchitis or consumption. It has at various times spread more rapidly and extensively than any other disorder.

INFRINGEMENT, any violation of a law or invasion of a legal right which gives rise to a cause of action, in law or equity, in favor of the person injured thereby. The term is commonly employed in a technical sense to describe an unlawful appropriation of ideas, principles, or rights when protected by copyrights, patents or trademarks, The remedy for an invasion of these statutory rights is an action at law for the damages sustained; or a court of equity will, upon application, enjoin the infringement, thus securing an absolute enjoyment or monopoly of the principles or ideas embraced in the work or device so protected.

The manufacture, use, or sale of a thing, the subject matter of which is the principle or novelty of a patented invention, constitutes an infringement of the latter. To prove that an alleged new device incorporates the substance of an invention so protected, it is necessary to establish that the same result is accomplished, the same functions performed, and that the mode of operation is substantially the same. If these characteristics are present a mere change in the form or in the location of the parts of a patented article will not save the device thus constructed from being an infringement of the patentee's rights.

The unlawful use of a mark or device which another has registered to provide a means of identification of his goods for the general public is an infringement of a trademark. Any device which is so similar to a registered trademark as to deceive or mislead the public constitutes an infringement thereof, even though it would not be difficult to distinguish the two when placed together. The remedy for such infringement is by injunction.

INFUSION, a solution of some vegetable substance in hot or cold water, such as are often used for medicinal purposes. The water employed may be at boiling heat, but if the substance is itself boiled the result is a decoction. In preparing certain infusions cold water is preferable, a sbringing out the constituent desired. The process of making an infusion is much the same as that of making tea.

INFUSORIA, a class of minute, mostly microscopic, animals, so named from being frequently developed in organic infusions, provisionally regarded as the highest class of the Protozoa. They are provided with a mouth, are destitute of pseudopodia, but are furnished with vibratile cilia. Most are free-swimming but some form colonies by budding, and are fixed to a solid object in their adult condition. The body consists of an outer

Magnified drop of water, showing infusoria, etc.

1, Volvox globator (a plant, a low form of Algæ). 2, Stentor polymorphus. 3, Urceolaris scyphina. 4, Stylonychia mytilus. 5, Zoospermos ferussaci. 6, Trichoda carinum. 7, Monas termo. 8, Pandorina morum. 9, Bursaria truncatella. 10, Vaginicola crystallina. 11, Cercaria gibba. 12, Zoospermos decumanus. 13, Amphileptus fasciola. 14, Vorticella convallaria. 15, Euptotes truncatus. 16, Trachelocerca olor.

transparent cuticle, a layer of firm sarcode called the cortical layer, and a central mass of semiliquid sarcode which acts as a stomach. A nucleus, which is supposed to be an ovary, having attached to its outside a spherical particle called the nucleolus, and supposed to be a spermatic gland, is imbedded in the cortical layer. Contractions of the body are effected by sarcode fibers. The cilia, with which most are furnished, are not only organs of locomotion, but form currents by which food is carried into the mouth. Reproduction takes place variously. They are divided into three orders, Ciliata, Suctoria, and Flagellata, in accordance with the character of their

cilia or contractile filaments. Many of the organisms included by the older zoologists among infusoria are now generally regarded as vegetable.

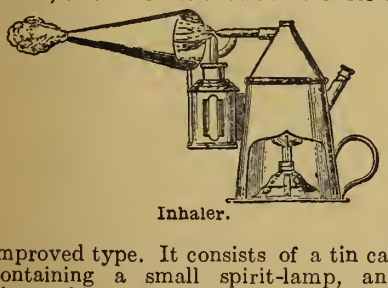
INGALLS, (in'galz), John James, American politician, born at Middletown, Conn., in 1833. In 1858 he removed to Atchison, Kansas, and began the practice of law. After the admission of Kansas to the Union in 1861 he became secretary of the new state senate, and in 1862 was a member of the senate. In 1873 he was elected to the United States senate, and was re-elected in 1879 and 1885. He died in 1900.

INGELOW, (in'je-lō), Jean, English poetess, was born in 1820. In 1863 she published a volume of poems, which ran through fourteen editions in five years, and her popularity has since increased both through her prose writings and her poetry. In prose she has written novels and tales for children, including Mopsa the Fairy, Studies for Stories, Off the Skelligs, Sarah de Berenger, Don John, etc. She died in 1897.

INGERSOLL, Robert Green, American lawyer and lecturer, was born at Dresden, N. Y., in 1833. He removed with his family to Illinois in 1845. In 1862 he went to the war as colonel of the Eleventh Illinois cavalry. In 1868 he was appointed attorney-general of Illinois. In 1876 a speech in favor of the candidacy of James G. Blaine at the republican presidential convention won for him a national reputation and from this time he was recognized as one of the foremost orators of the day. He soon after entered the lecture field, adopting religious topics as his subjects, attacked the Bible, the personal nature of the deity and the existence of hell. He died in 1899.

INGOT (ing'got), a small bar of metal made of a certain form and size by casting it in moulds. The term is chiefly applied to the small masses or bars of gold and silver intended either for coining or exportation to foreign countries.

INHALER, an apparatus for inhaling vapors, and volatile substances, as steam of hot water, vapor of chloroform, iodine, etc. The cut shows an inhaler of



Inhaler.

improved type. It consists of a tin can containing a small spirit-lamp, and above this a small kettle for hot water, the steam of which is driven out with some force when the apparatus is used. Attached to the can is a receptacle for receiving a small phial containing the substance whose vapor is to be inhaled, this being drawn off and forced through the funnel by the steam.

INHERITANCE. See Descent.

INHERITANCE TAX LAWS, a law taxing the right to inherit personal property by will or interstate law was passed by congress July 6, 1797. The rate was 25 cents on amounts from $50 to $100, 50 cents on amounts from $100 to $500, "and for every further sum of $500, the additional sum of one dollar." This act continued in force until June 30, 1802, when it was repealed. A national legacy tax law was again enacted July 1, 1862, amended in 1864, and again in 1866, and repealed in 1870, five years after the close of the civil war.

Again, June 13, 1898, congress enacted a legacy tax law which was amended in 1901 and continued in force until repealed July 1, 1902. Under the acts of 1898 and 1901, the sum of $21,603,699.02 was collected and paid into the national treasury up to June 30, 1904.

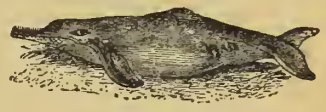
Pennsylvania enacted a legacy tax law April 6, 1826, which law as amended from time to time, is still in force. Legacy tax laws were enacted in Maryland in 1844, and Delaware in 1869. They were enacted in North Carolina in 1846, and repealed in 1883. They were enacted in Virginia in 1844, repealed in 1855, re-enacted in 1863, and again repealed in 1874. Since 1885 legacy tax laws have been enacted in twenty-nine different states, namely: Arkansas, California, Colorado, Connecticut, Illinois, Iowa, Louisiana, Kentucky (1906), Maine, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, New Hampshire (1905), New Jersey, New York, North Dakota, Ohio (repealed 1906). Oregon, Tennessee, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin and Wyoming.

The following table shows the amount of legacy tax collected from the estates of some of the prominent and wealthy decedents, some of whom were of national reputation:

*George Smith, resident of England (paid in New York)	$1,934,753.07
Collis P. Huntington, New York	665,000.00
Jay Gould, New York	600,000.00
Cornelius Vanderbilt, New York	450,052.90
Cornelia M. Stewart, New York	300,410.32
Winfield S. Stratton, Denver, Colo.	300,000.00
Wilson G. Hunt, New York	285,000.00
Joshua Jones, New York	284,937.56
Emma A. Schley, New York	261,490.67
Henrietta A. Lenox, New York	234,635.70
William Whitewright, New York	223,141.52
Robert G. Dun, New York	178,730.68
Catherine L. Wolfe, New York	159,599.38
Daniel B. Fayerweather, New York	158,296.19
George M. Pullman, Illinois	158,282.04
John Knower, New York	152,319.72
Daniel Edgar Crouse, Syracuse, New York	150,882.48
Timothy B. Blackstone, New York and Illinois	150,661.01
Henry B. Plant, New York	140,000.00
Ezra G. Benedict, Albany, N. Y.	131,122.99
Mary J. Walker, New York	119,223.83
Joseph C. Hoagland, New York	119,211.80
Gustav W. Swift, Illinois	113,885.27
Jonathan Scoville, New York	112,758.08
Mary J. Winthrop, New York	110,169.55
Leonard Lewisohn, New York	107,634.36
William Astor, New York	106,536.97
William H. Vanderbilt, New York	103,612.59
Mary Eichler, New York	102,866.94
W. W. Kimball, Illinois	86,700.24
A. M. Billings, Illinois	85,724.75
Potter Palmer, New York and Illinois	78,063.99
Ernest J. Lehman, Illinois	71,097.16
Silas B. Cobb, Illinois	63,298.32
Levi Z. Leiter, Illinois	48,295.83
Sidney Kent, Illinois	38,070.09
Peter Fahrney, Illinois	37,982.88
Jacob Rosenberg, Illinois	37,667.32
Charles W. Fullerton, Illinois	36,461.02
Catherine M. White, Illinois	25,236.38
Columbus R. Cummings, Illinois	21,864.40
Joseph Medill, Illinois	16,048.46
Phillip D. Armour, Illinois	15,786.91
Lucius B. Otis, Illinois	15,699.41

*The transfer of all property, real, personal, or mixed, within the jurisdiction of the state at date of death is subject to the tax, whether the decedent was a resident or non-resident. The tax is not a tax on property, but the right which the state grants to the legatee to inherit property.

INIA, a genus of Cetacea belonging to the dolphin family, containing only one known species, remarkable for the distance at which it is found from the sea,



Inia boliviensis.

frequenting the remote tributaries of the river Amazon, and even some of the elevated lakes of Peru. It has bristly hairs on its snout, and is from 7 to 12 or 14 feet long.

INJECTIONS, in surgery, fluids, different, according to the different effects desired to be produced, thrown by means of a small syringe into the natural cavities of the body, or those occasioned by disease. Wounds and sores are usually cleansed in this way when they extend far below the skin. In diseases of the nose, the ears, the bladder, and urethra, the uterus, etc., injections are often used. Pure warm water is injected with the highest success for the removal of pus, blood, or even foreign bodies. Sometimes astringent medicines, to restrain excessive evacuations, sometimes stimulating ones, sometimes soothing medicaments, to mitigate pain, etc., are added to the water.

INJECTOR, an apparatus for supplying the boilers of steam-engines, especially locomotive-engines, with water. It works equally well whether the engine is running or at rest.

INJUNCTION, in law, a prohibitory writ, restraining a person from doing some act which appears to be against equity, and the commission of which is not punishable by criminal law. It is either provisional, until the coming in of the defendant's answer, or perpetual, that is, perpetually restraining the defendant from the commission of an act contrary to equity. Disobedience to an injunction constitutes contempt of court, and is punishable accordingly.

INK, a liquid or pigment used for writing or printing. All ordinary writing inks owe their properties to the presence of gallate or tannate of iron held in suspension by means of gum. Gall-nuts contain gallotannic acid, which gives a black precipitate with persalts of iron; they also contain pectose, which converts gallotannic acid, when exposed to the air, into gallic acid. This latter acid colors ferric salts a much deeper black than the former acid. The essential points in the preparation of a good writing ink are therefore the presence of an iron salt, an infusion of gall-nuts and gum, and the allowing the mixture to remain for some time exposed to the air. All other substances which are added to ordinary ink as coloring matters in the place of gall-nuts only impair its quality. As ink is liable to become moldy it is customary to add a small quantity of such substances as essential oils, carbolic

acid, crushed cloves, or sometimes corrosive sublimate, in order to prevent this result. For copying ink a little sugar is added, which prevents its drying rapidly and perfectly. Colored writing-inks, as red, blue, etc., are simply solutions of some coloring materials, cochineal and Brazil-wood being used for red, Prussian blue for blue, etc. Gold and silver inks consist of a fine powder of the metals suspended in a solution of gum-arabic.—Marking ink usually consists of a solution of silver nitrate thickened with gum and sometimes colored by means of sap-green.—Printing-ink may be made by boiling linseed-oil and burning it about a minute, and mixing it with lamp black, with an addition of soap and resin. If it be wished to obtain colored printing inks, this may be done by adding the necessary pigments to the oil while it is being heated. Vermilion is used to give a red color, ultra-marine for blues, and lead chromate for yellows.—Lithographic ink used in printing from the stone, is usually composed of virgin wax, dry white soap, tallow or lard, shellac, mastic, and lamp or Paris black.—Sympathetic inks have been sometimes used in secret correspondence. They are of various kinds. For instance, characters written in solutions of cobalt, lemon juice, and dilute sulphuric acid make no appearance on the paper, but become visible when treated with some other solution or exposed to the action of heat. See also Indian Ink.

INLAND REVENUE, that department of the revenue which includes the branches of excise, taxes, and stamps.

INLAYING is the art of ornamenting flat surfaces of one substance by inserting into cavities cut in them pieces of some other substance. Various kinds of metal or wood, or pearl, ivory, etc., are employed in this process.

INN, a house where travelers are furnished for the profit of the provider, with everything they have occasion for while on their journey. They may be set up without license by any person, provided he refrains from selling excisable liquors, which of course require a license. Public-houses, taverns, victualling-houses, and coffee-houses are all inns when the keepers of them make it their business to furnish travelers with food and lodging; otherwise they are not. Innkeepers are bound to take in all travelers and wayfaring persons, and to entertain them if they have accommodations for them (and they are only bound to give such accommodation as they have), at reasonable charges, provided they behave themselves properly.

INNATE IDEAS, certain primary notions or impressions, supposed by some philosophers to be given to the mind of man when it first receives its being, and to be brought into the world with it. Descartes distinguished ideas into innate, adventitious, and factitious. An innate idea he described as not one that presents itself always to our thought, for there could be no such idea; but one that we have within ourselves the faculty of producing. He did not enumerate such ideas, however. What the followers of Descartes designate innate ideas, those of Cousin term universal, necessary, and absolute.

INNESS (in ĕs), George, American landscape painter, was born at Newburgh, N. Y., in 1825. Innes is considered the greatest of American landscape painters. His subjects included sunrise, high noon, sunset, and evening. A notable exhibition of his paintings numbering two hundred and forty was held in New York in 1894. Among his most important works are: Under the Greenwood, Close of a Stormy Day, An Autumn Morning, Moonrise, Winter Morning. He died in 1894.

INNOCENT, the name of thirteen popes, of whom only the following need be particularly dealt with:—Innocent I. succeeded Anastasius I. as Bishop of Rome in 402. He supported St. Chrysostom, and renounced the communion with the Eastern churches on account of their treatment of that eminent man. In 409 he was sent to obtain terms of peace from Alaric, but without success. He died in 417, and is one of the most distinguished saints, his day being July 28.—Innocent II., a Roman of noble birth, elected pope in 1130 by a part of the cardinals, while the others elected Peter of Leon, who took the name of Anacletus. Innocent fled to France, where he was acknowledged by Louis VI. and by Henry II. of England; also by the Emperor Lothaire, who conducted him in 1133 to Rome, where Anacletus also maintained his claims as pope. Innocent was obliged to retire, and though reinstated in 1137 Anacletus maintained himself until his death in 1138. Innocent in 1139 held the second Œcumenical Council in the Lateran, which condemned the opinions of Arnold of Brescia, and declared the decrees of Anacletus null. Innocent died in 1143.—Innocent III., Lothario, Count of Segni, born in 1161, was unanimously elected pope at the age of thirty-seven. He displayed great energy, and much enhanced the papal power. He excommunicated Philip Augustus, king of France, and laid his kingdom under an interdict in 1200 because Philip had repudiated his wife, and obliged the king to submit. He extorted a similar submission from John, king of England, who refused to confirm the election of Langton as Archbishop of Canterbury, by laying the kingdom under an interdict, and in 1212 formally deposing him. Almost all christendom was now subject to the pope, two crusades were undertaken at his order, and his influence extended even to Constantinople. The cruel persecution of the Albigenses and the establishment in 1198 of the inquisitorial tribunals, from which the inquisition itself originated, were noteworthy events of his pontificate. In 1215 he held a council by which transubstantiation and auricular confession were established as dogmas, and the Franciscan and Dominican orders were confirmed. Innocent died in 1216. He left various works on legal and theological subjects; and the Stabat Mater, Veni Sancte Spiritus, and other sacred hymns, are said to have been written by him.—Innocent XI., Benedetto Odescalchi, born in 1611, served in his youth as a soldier, took orders at a later period, and rose through many important posts, until he was elected pope in 1676, on the death of Clement X. He was eminent for probity and austerity. Though hostile to the Jesuits, whose opinions he attacked in the decree Super quibusdam axiomatis moralibus, yet he was obliged to condemn Molinus and the Quietists. Being involved in a dispute with Louis XIV., the authority of the pope in France and elsewhere received a severe blow in the IV. Propositiones Cleri Gallicani (Four propositions of the Gallican clergy, 1682). These disputes were highly favorable to the English revolution, as it induced the pope in 1689 to unite with the allies against James II., in order to lower the influence of Louis XIV. He died in 1689, and was succeeded by Alexander VIII.

INNS OF COURT, four very ancient societies in London exclusively invested with the right to call to the English bar; also the buildings belonging to these societies, in which the members dine and barristers have chambers. The gentlemen belonging to these societies may be divided into benchers, outer barristers, inner barristers, and students. The benchers are the highest in rank, being usually queen's counsel; and it is they who have the right of granting or refusing a call to the bar, or of disbarring persons unfit to practice. The four inns of court are the Inner temple and Middle temple (formerly the dwelling of the knights templars, and purchased by some professors of law more than three centuries since); Lincoln's inn and Gray's inn (anciently belonging to the earls of Lincoln and Gray).

INOCULATION, in medicine, the introduction, by a surgical operation, of a minute portion of infective matter into contact with the true skin, for the purpose of exciting artificially a milder form of some contagious disease, and thereby protecting the human system against similar attacks in future; keeping in mind, however, that such a process can be only of efficacy in regard to diseases which attack us only once in the course of our lives, such, for instance, as small-pox. The term is chiefly used in connection with small-pox. The practice of inoculation with the matter of small-pox, although long followed in some parts of Wales, seems to have been scarcely known throughout England till the early 18th century, and its adoption was chiefly due to the exertions of Lady Mary Wortley Montagu, who became acquainted with it in Turkey. For many years the practice met with the greatest opposition, both from the medical profession and the clergy; but latterly it came extensively into vogue, the small-pox thus induced being of a milder and much less often fatal type than ordinary small-pox. The great objection to it was that it tended to spread this serious disease, inoculated small-pox being equally infectious with the other kind. After the discovery of vaccination by Jenner in 1798 inoculation was gradually superseded, and the British legislature even prohibited the latter, while vaccination is compulsory. See Small-pox and Vaccination.

INQUEST. See Coroner.

INQUISITION, in the Roman Catholic Church, a court or tribunal established for the examination and punishment of herctics. The institution was founded in the 12th century by Father Dominic, who was charged by Pope Innocent III. with orders to incite Catholic princes and people to extirpate heretics. Pope Gregory IX. in 1233 completed the design of his predecessors, and the inquisition was successively introduced into several parts of Italy, and, with certain limitations, into some provinces of France. The tribunals of faith were admitted into Spain in the middle of the 13th century; it became firmly established toward the end of the 15th century, under Ferdinand and Isabella, who used it as a weapon to break the strength of the nobles, and to render the royal authority absolute. In the assembly of the states held at Toledo, 1480, the erection of the new tribunal was urged by the cardinal, and after some opposition established under the name of the general or supreme inquisition. The new court was opened in Seville in 1481. Torquemada, prior of the Dominican convent at Segovia, and father-confessor to the Cardinal Mendoza, had already been appointed by Ferdinand and Isabella the first grand inquisitor in 1478. The Dominican monastery at Seville soon became insufficient to contain the numerous prisoners, and more than 2000 persons are said to have been burned alive in the first year or two. The pope, however, opposed the establishment of the Spanish inquisition as the conversion of an ecclesiastical into a secular tribunal, and repeatedly summoned the inquisitor-general to Rome. Torquemada, instead of obeying, sent a friend to defend his cause, and in 1483 Sixtus IV. was obliged to yield and acknowledge Torquemada as inquisitor-general of Castile and Leon, and a later bull subjected Aragon, Valencia, and Sicily to the inquisitor-general of Castile. It is computed that there were in Spain above 20,000 officers of the inquisition, called familiars, who served as spies and informers. These posts were sought even by persons of rank, on account of the great privileges connected with them. The supreme tribunal, under the inquisitor-general, sat at Madrid. He was assisted by a council of six or seven, and there were various officials belonging to the court, the one specially appointed to carry on prosecutions being called the fiscal. As soon as an accuser appeared, and the fiscal had called upon the court to exercise their authority, an order was issued to seize the accused. If he did not appear at the third summons he was excommunicated. From the moment that the prisoner was in the power of the court he was cut off from the world. The advocate who was appointed to defend him could not speak to him except in the presence of the inquisitors. The accused was not confronted with the accuser nor the witnesses before the court, neither were they made known to him; and he was often subjected to the torture to extort a confession, or to explain circumstances which had not been fully explained by the witnesses. Imprisonment, often for life, scourging, and the loss of property, were the punishments to which the penitent was subjected. When sentence of death was pronounced against the accused the auto da fe, or ceremony of burning the heretic in public, was ordered. This usually took place on Sunday, between Trinity Sunday and Advent As "the church never pollutes herself with blood," a servant of the inquisition, at the close of the procession and ecclesiastical ceremonial preceding the execution of the sentence, gave each of those who had been sentenced a blow with the hand, to signify that the inquisition had no longer any power over them, and that the victims were abandoned (relaxados) to the secular arm. A civil officer, "who was affectionately charged to treat them kindly and mercifully," now received the condemned, bound them with chains, and led them to the place of execution. They were then asked in what faith they would die. Those who answered the Catholic were first strangled; the rest were burned alive. The powers of the inquisition latterly became more limited, however, by various restrictions and at last, under Joseph Bonaparte, it was abolished altogether in 1808. It was re-established in 1814 by Ferdinand VII., but on the adoption of the constitution of the Cortes in 1820 it was again abolished. According to the estimate of its historian, Llorente, the number of victims of the Spanish Inquisition from 1481 to 1808 amounted to 341,021. Of these nearly 32,000 were burned.

INSANITY, a general term comprising every form of intellectual disorder, whether consisting in a total want or alienation of understanding, as in idiocy, or in the diseased state of one or several of the faculties. Medical writers have adopted different systems of classification in their treatment of this subject; but perhaps the most convenient is that which comprises all mental diseases under the four heads of mania, melancholy, dementia or fatuity, and idiocy. Idiocy is either a congenital or an acquired defect of the intellectual faculties. Congenital idiocy may originate from a malformation of the cranium, or of the brain itself. Acquired idiocy proceeds from mechanical injury of the cranium, or from injury or disease of the brain from excess in sexual indulgences, etc. (See Idiot.) Dementia is marked confusion of thoughts, loss of memory, childishness, a diminution or loss of the powers of volition, and general weak-mindedness; it differs from idiocy in being curable. Cretinism, sometimes given as a separate category, is a form of idiocy associated with a characteristic malformation of the body. Mania is a species of mental derangement characterized by the disorder of one or several of the faculties, or by a blind impulse to acts of fury. Adults are the principal subjects. Females are more exposed to it than males. Violent emotions, a dissipated life, excess in any indulgence, sometimes produce it. It is sometimes cured, but sometimes remains stationary, and sometimes is converted into dementia. Melancholy is a species of mental disorder consisting in a depression of spirits. Some dark or mournful idea occupies the mind exclusively, so that by degrees it becomes unable to judge rightly of existing circumstances, and the faculties are disturbed in their functions. Several kinds of melancholy are distinguished; the distinctions are founded, however, mostly on the causes of the disease, among the more important of which are love, religious views, repeated failures to reach an earnestly desired end, a sudden nervous shock, and the like. The course of the disease is various; sometimes it lasts a series of years; sometimes it ceases of itself, or is cured by medical aid. Very frequently melancholic patients commit suicide, a tendency that is not to be overlooked. In it also bodily health is likely to be neglected, thus leading to certain other diseases. See Lunatic Asylum, Lunacy, Non compos mentis, etc.

INSECTIV'ORA, an order of mammals living to a great extent on insects. They are plantigrade, and have a well-developed cavicle, a discoidal placenta, incisor teeth larger than the canine, and molar teeth set with sharp conical cusps. They are usually of small size, and many of them live underground, hibernating for some months. They are found throughout the world, with the exception of Australia and South America. The chief insectivorous families are the Talidæ ormoles, the Soricidæ or shrew-mice and the Erinaceidæ or hedgehogs.

INSECTIVOROUS PLANTS, plants which derive nourishment directly from the bodies of insects entrapped by them in various ways. See Dionæa, Sun-dew, Pitcher-plant.

INSECT POWDER, a brownish yellow powder obtained by grinding the dried flower heads of two species of chrysanthemum. The volatile oil then obtained acts upon the insects by asphyxiation; upon man and other animals it has no serious effect.

INSECTS. See Entomology.

INSESSO'RES, in ornithology, the perchers or passerine birds, an extensive order of birds comprehending all those which live habitually among trees, with the exception of the birds of prey and the climbing birds. The toes, which are three before and one behind, are specially adapted for perching and nest-building. These birds live in pairs, build in trees, and generally display great art in the construction of their nests. In them the organ of the voice attains its utmost complexity, and all our singing birds belong to the order. The form of the beak varies widely, and this has led to the establishment of four important subordinate groups. (1) The Conirostres, or "conical beaked" Insessores; (2) The Dentirostres or "tooth-beaked" perchers; (3) The Tenuirostres, or slender-beaked perchers; (4) The Fissirostres or cleft-beaks (swallows, swifts, goat-suckers, etc.). In modern classification the Fissirostres are generally excluded from the order, which is also divided otherwise. Two main divisions, the Acromyodi or singing-birds and the Mesomyodi or songless birds, are now generally recognized, the distinctive characters being based on the structure of the larynx. The former, again, are divided into the Turdiformes, or thrush-like birds; the Fringilliformes, or finch-like birds; and the Sturniformes, or starling-like birds. See also Ornithology.

INSOMNIA, or **SLEEPLESSNESS,** caused by mental or physical exhaustion, toxic conditions (as from alcohol or from disordered digestion), grief, etc. It is best treated by attacking and removing the cause, if this can be ascertained. Hygienic measures, as hot baths, massage, ingesting hot food, applying heat to the extremities, ventilating he sleeping apartment, etc., should be tried before resorting to drugs, to overcome the condition.

INSPIRATION, in theology, is the infusion of ideas into the human mind by the Holy Spirit. By the inspiration of the scriptures is meant the influence of the Holy Spirit exercised on the understandings, imaginations, memories, and other mental faculties of the writers, by means of which they were qualified for communicating to the world divine revelation, or the knowledge of the will of God.

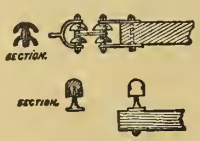
INSTINCT, the power by which, independently of all instruction or experience, and without deliberation, animals are directed to do spontaneously whatever is necessary for the preservation of the individual, or the continuation of the kind. Three main theories have been held with regard to instinctive actions: —(1) That these various impulses and faculties were bestowed by the Creator upon each species as its necessary and characteristic outfit. (2) That instinct is the accumulated results of individual experience, fixed by repetition, and transmitted as an inheritance to succeeding races. In this view instinct is intelligent in its origin, an organized experience, a "lapsed intelligence." (3) That the greater number of complex instincts arise through the natural selection of variations of simpler instinctive actions—variations arising from unknown causes The last theory is that of Darwin.

INSTITUTE OF FRANCE, the principal philosophical and literary society of France, organized after the first storm of the French Revolution in 1795, to replace the Académie Française, the Académie des Sciences, and the Académie des Belles Lettres et Inscriptions, its object being the advancement of the arts and sciences. The Institute now embraces five distinct divisions or académies, each having a separate field of knowledge or thought (1) The Académie Française, originally established early in the 17th century. Its department is the French language and literature, and its ordinary members number 40. (2) The Académie des Inscriptions et Belles Lettres; ordinary members, 40. (3) The Académie des Sciences; ordinary members, 65. (4) The Académie des Beaux Arts; ordinary members, 40. (5) The Academie des Sciences, Morales, et Politiques; ordinary members, 40. Each academy has an independent organization and a free disposition of the funds committed to it. Members are elected for life by ballot, and have an annual salary of 1500 francs. To each academy are attached a certain number of honorary members and foreign associates. Admission into the Académie Française is a great object of ambition with most French literary men. The name of this distinguished body was changed in 1848 to Institut de France having previously been called National, Imperial, and Royal at different times.

INSTRUMENT, in music, any mechanical contrivance for the production of musical sound. Musical instruments are divided into three kinds—wind-instruments, stringed instruments, and instruments of percussion. The chief modern stringed instruments are the violin, viola, violoncello, and double bass, the harp, mandolin, guitar, and piano: the chief wind-instruments, the flute, oboe, bassoon, clarinet, basset-horn, serpent horn, trumpet, trombone, ophicleide, and organ; the chief percussion instruments, the drum, tambourine, cymbals, and triangle.

INSTRUMENTAL MUSIC, music produced by instruments, as contradistinguished from vocal music. Instrumentation is quite a modern art, and may be said to have been first cultivated to any purpose among the Italians, who up till the middle of last century, however, used only instruments of the viol kind, and who even yet are sparing in their use of wind-instruments. In Italy, Leo, Durante, Jomelli, and Majo; in France, Rameau; in Germany, Haydn and Mozart, deserve the credit of carrying the art to a perfection up to their time undreamed of. Further developments of an important character are due to Berlioz and Wagner.

IN'SULATOR, a body used to separate an electrified conductor from other bodies, and which offers very great resistance to the passage of electricity.



Insulator

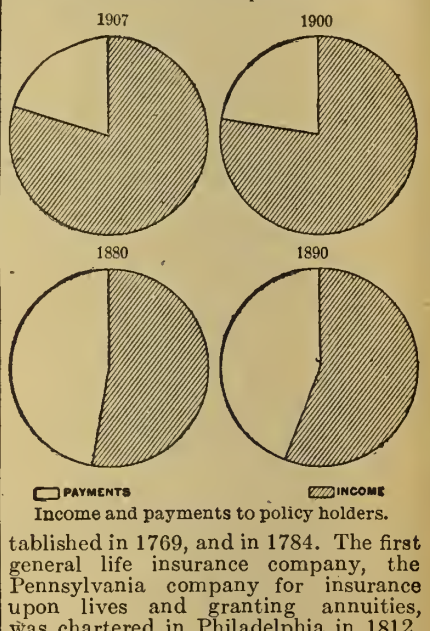
Glass, shellac, resins, sulphur, ebonite, gutta-percha, silk, and baked wood are notable insulating materials. The cut shows the usual forms of insulators in telegraph lines to support the wires on the posts. They are usually made of porcelain or glass.

INSU'RANCE, a contract by which an association, copartnership, or corporation engages for the payment of so much money, to insure the loser against loss of property by disaster at sea, earthquake, fire, or flood, against accident, or against ill-health. Life insurance is a contract under which the party insured receives either an annuity or a specified sum of money after the payment of annual premiums for a certain specified term of years; or under which his estate or any person he may name as his beneficiary will receive a specified sum after his death.

Insurance in the modern meaning of the word is divided into several classes, viz.: Marine, fire, accident, health, and life. Each of these subdivisions has been built up along certain generally recognized financial laws.

Life Insurance has been a recognized factor in social economy for more than 300 years. The first life insurance policy of which there is any record was issued in London in 1583, insuring the life of one William Gybbons for a period of twelves months, at the rate of $80 per $1,000. This policy was underwritten by thirteen persons acting individually. It was not until 1699, however, that a life insurance company was formed. In that year the members of the Mercers company, of London, formed a mutual association for the payment of benefits to widows and orphans of the members of the company. In 1706 the Amicable Society for a perpetual insurance was founded in London, and this company continued in existence until 1867, a period of 161 years. The London assurance corporation and the Royal exchange assurance corporation began business in London in 1721 and still survives.

The first life insurance company to be established in the United States was founded in Philadelphia in 1759. It was called the Presbyterian Annuity & Life Insurance company, and under the name of the Presbyterian Ministers' Fund Life Insurance company it still exists. Other ministerial companies were es-



Income and payments to policy holders.

tablished in 1769, and in 1784. The first general life insurance company, the Pennsylvania company for insurance upon lives and granting annuities, was chartered in Philadelphia in 1812. The Massachusetts Hospital Life Insurance company was chartered at Boston in 1818. Beginning with the year 1840 some of the now existing life insurance companies were chartered, including: Mutual Life of New York, 1842; State Mutual of Worcester, Mass., 1844; Nautilus insurance company (now the New York Life), 1845; Connecticut Mutual of Hartford, 1846; Pennsylvania Mutual of Philadelphia, 1847.

From these beginnings the business of life insurance has made such enormous strides in the United States that already it overshadows all other financial interests. There are eighty life insurance companies in the United States. On Dec. 31, 1906, they had outstanding policies representing $13,706,797,784. Their aggregate annual premium receipts were $6?2,446,618.

Life insurance, from a crude beginning has been developed into one of the most exacting sciences known in the realm of finance. In fact, it is a science in itself. It is a science based on natural laws gov-

erning the mortality of the human race, by which may be computed the average lifetime, and the premium to be paid on the policy. Included in the science of life insurance are mortality tables, the calculation of premiums, the loading of premiums, the medical examination, termination of policies, lapses and surrenders, surplus, reserve, nonforfeiture laws, tontines and surrender privileges.

Mortality Tables—As a result of a systematic study of mortality records, life insurance companies have incorporated the results of their computations into what are called mortality tables.

AMERICAN EXPERIENCE TABLE OF MORTALITY.

Completed Age.	Number Surviving at Each Age.	Deaths in Each Year.	Number of Years Expectation.	Number Dying Annually Out of Each 1,000.	Completed Age.	Number Surviving at Each Age.	Deaths in Each Year.	Number of Years Expectation.	Number Dying Annually Out of Each 1,000.
10	100,000	749	48.7	7.49	55	64,563	1,199	17.4	18.57
11	99,251	746	48.1	7.52	56	63,364	1,260	16.7	19.89
12	98,505	743	47.4	7.54	57	62,104	1,325	16.1	21.34
13	97,762	740	46.8	7.57	58	60,779	1,394	15.4	22.94
14	97,022	737	46.2	7.60	59	59,385	1,468	14.7	24.72
15	96,285	735	45.5	7.63	60	57,917	1,546	14.1	26.69
16	95,550	732	44.9	7.66	61	56,371	1,628	13.5	28.88
17	94,818	729	44.2	7.69	62	54,743	1,713	12.9	31.29
18	94,089	727	43 5	7.73	63	53,030	1,800	12.3	33.94
19	93,362	725	42.9	7.77	64	51,230	1,889	11.7	36.87
20	92,637	723	42.2	7.81	65	49,341	1,980	11.1	40.13
21	91,914	722	41.5	7.86	66	47,361	2,070	10.5	43.71
22	91,192	721	40.9	7.91	67	45,291	2,158	10.0	47.65
23	90,471	720	40.2	7.96	68	43,133	2,243	9.5	52.00
24	89,751	719	39.5	8.01	69	40,890	2,321	9.0	56.78
25	89,032	718	38.8	8.07	70	38,569	2,391	8.5	61.99
26	88,314	718	38.1	8.13	71	36,178	2,448	8.0	67.67
27	87,596	718	37.4	8.20	72	33,730	2,487	7.6	73.73
28	86,878	718	36.7	8.26	73	31,243	2,505	7.1	80.18
29	86,160	719	36.0	8.35	74	28,738	2,501	6.7	87.03
30	85,441	720	35.3	8.43	75	26,237	2,476	6.3	94.37
31	84,721	721	34.6	8.51	76	23,761	2,431	5.9	102.31
32	84,000	723	33.9	8.61	77	21,330	2,369	5.5	111.06
33	83,277	726	33.2	8.72	78	18,961	2,291	5.1	120.83
34	82,551	729	32.5	8.83	79	16,670	2,196	4.8	131.73
35	81,822	732	31.8	8.95	80	14,474	2,091	4.4	144.47
36	81,090	737	31.1	9.09	81	12,383	1,964	4.1	158.61
37	80,353	747	30.4	9.23	82	10,419	1,816	3.7	174.30
38	79,611	749	29.6	9.41	83	8,603	1,648	3.4	191.56
39	78,862	756	28.9	9.59	84	6,955	1,479	3.1	211.36
40	78,106	765	28.2	9.79	85	5,485	1,292	2.8	235.55
41	77,341	774	27.5	10.01	86	4,193	1,114	2.5	265.68
42	76,567	785	26.7	10.25	87	3,079	933	2.2	303.02
43	75,782	797	26.0	10.52	88	2,146	744	1.9	346.69
44	74,985	812	25.3	10.83	89	1,402	555	1.7	395.86
45	74,173	828	24.5	11.16	90	847	385	1.4	454.55
46	73,345	848	23.8	11.56	91	462	246	1.2	532.47
47	72,497	870	23.1	12.00	92	216	137	1.0	634.26
48	71,627	896	22.4	12.51	93	79	58	.8	734.18
49	70,731	927	21.6	13.11	94	21	18	.6	857.14
50	69,804	962	20.9	13.78	95	3	3	.5	1,000.00
51	68,842	1,001	20.2	14.54					
52	67,841	1,044	19.5	15.39					
53	66,797	1,091	18.8	16.33					
54	65,706	1,143	18.1	17.40					

These tables reveal at a glance the inexorable wordings of natural laws governing the length of human life. They show how many in any large number of persons born will live to reach the age of 30, how many to 36, to 40, to 60, in fact, to any reasonable age. They also show the number that will die at each age, and the average lifetime remaining to those who live.

By means of these mortuary tables all the other problems pertaining to life insurance are worked out. The mortuary tables, therefore, form the foundations of the life insurance business. The mortality table commonly in use in the United States is known as the American Experience Table of Mortality. The English companies use what is known as the Actuaries, or Combined, Experience Tables.

The Policy—There are many forms and varieties of policies, many companies having policies containing special features. The principal forms of policies in general use, however, may be designated as follows:

(a) Straight life, or limited life, in which the amount is paid to the estate of the insured at his death.

(b) Ten, fifteen, or twenty payment in which the insured receives the full amount of his policy at the end of 10, 15, or 20 years, if living, or his estate receives it upon his death at any time previous to the specified term.

(c) Endowment, another name for ten, fifteen, or twenty payment policies.

The Premium is the amount of money the insured pays to the company annually. It is computed by means of the mortality tables and is fixed at an amount designed to cover the mortality losses of the company, the expenses, etc. The premium is composed of two parts, viz., the net premium, and the loading, both constituting what is known technically as the gross premium. The net premium is the amount which is mathematically necessary for the creation of a fund large enough to enable the company to pay the policy in full at maturity. The loading is the amount added to the net premium to provide not only for the easily ascertained expenses, such as salaries for officers and commissions for agents, but to provide for all contingencies, such as a mortality in excess of the tabular rate, depreciation in the value of securities, and loss of invested funds.

The Reserve in life insurance is simply the insurance or mortality fund of the company from which all losses are paid. It is made up of the net annual premium and the money these premiums will earn at 2½ per cent compound interest. The reserve can be used for no other purpose than the payment of death claims. The legal reserve is the amount the law requires the company to hold in order ot be solvent.

Medical Examination—Life insurance companies depend largely upon medical examinations to protect the mortality tables from deviation which might be caused by the admission of applicants whose average expectation of life might be lessened by unfavorable physical conditions. Among the facts elicited by medical examination are: Occupation, hereditary influence, existence of pulmonary tuberculosis or insanity, and evident tendency to disease.

Lapses and Surrenders—A policy is said to lapse when the insured fails to pay a premium when it becomes due. A policy is surrendered when the insured gives formal notice of his desire to terminate the policy and receive its surrender value. Down to 1860 a policy holder who permitted his policy to lapse lost both surplus and reserve. Since 1861 legislation and competition protects the policy against such loss. Most, if not all, companies guarantee the policy holder his share of the reserve or the surrender value of his policy after three premiums have been paid.

INSURANCE, FIRE. See Fire Insurance.

INSURANCE SCANDALS, the revelations of extravagance and mismanagement in the conduct of the big life insurance companies of the United States during the years 1905–6 led to drastic reorganization, and changes in methods. The disclosures began in February, 1905, in a struggle between two factions for the control of the Equitable life assurance society, of New York James W. Alexander, president of the company, led the faction of the stock and policy holders which demanded that the company be mutualized so that the policy holders could be represented on the board of directors. This demand was resisted by a faction led by James Hazen Hyde, vice-president of the company, and son of its founder.

The struggle brought to public light a scandalous state of affairs, showing that funds had been used to further stock jobbing schemes in Wall street and for other questionable transactions. As a result, Alexander and Hyde both were forced out of the company. Hyde, who owned a majority of the stock, sold it to Thomas F. Ryan, a New York capitalist, who placed it in the hands of three trustees, Grover Cleveland, Morgan T. O'Brien, and George Westinghouse. Paul Morton was elected president of the company on July 26. He reorganized its methods and instituted many reforms.

On Sept. 6, 1905, a New York legislative committee, known as the Armstrong committee, with Charles E. Hughes, a New York attorney, as chief counsel, began a general investigation of all the big life insurance companies chartered by the state of New York.

The principal companies subjected to a searching investigation were the Equitable, the Mutual and the New York Life. The disclosures startled the whole country. It was shown that the New York Life had contributed $150,000 to political campaign funds; that it had permitted one Andrew Hamilton to expend $1,347,382 for work in "influencing" legislation. The revelations involved John H. McCall, president of the company. He sold everything he had in the world, repaid $235,000 and died a broken-hearted, penniless man.

It was shown that President Richard A. McCurdy, of the Mutual was drawing a salary of $150,000 per annum and that the funds of the company were being used by banks and trust companies con-

trolled by McCurdy. His son Robert and his son-in-law, L. A. Thebaud, had been paid millions in "commissions." As a result the McCurdy family was ousted from the Mutual. Charles A. Peabody was elected president.

The Armstrong committee made an exhaustive report and recommended the passage of nine laws to prevent a recurrence of the scandals. The laws are now on the New York statute books.

INTAGLIO (in-tal'yō), a stone or gem on which a figure is hollowed out so that the impression from it may be in relief; the opposite of cameo.

IN'TEGRAL CALCULUS. See Calculus.

INTELLECT, the name for the thinking portion of our mental constitution. Mind contains three elementary constituents,—emotion or feeling, volition or the will, and intelligence or thought. The intellectual powers are explained in part by their contrast with feeling and will. When we enjoy pleasure or suffer pain, we are said to feel; when we act to procure one or avoid the other, we put forth voluntary energy; when we remember, compare, reason, our intelligence is exerted. The powers of the intellect have been variously classified. Among the commonly recognized designations for them, me may mention memory, reason, and imagination, which imply three very distinct applications of our mental forces. Reid classified them as follows: Perception by the senses, memory, conception, abstraction, judgment, reasoning. Stewart added consciousness, to denote the power of recognizing our mental states, as sensation and perception make us cognizant of the outer world; likewise attention (a purely voluntary function, although exerted in the domain of intelligence), imagination, and the association of ideas.

INTEMPERANCE. See Temperance.

INTERCESSION, DOCTRINE OF.— Scripture, in many places, represents Christ, after having finished his redemptive work on earth, and ascended into his state of glory and exaltation, as ever pleading with God on behalf of those whom he has redeemed by the shedding of his blood (Rom. viii, 34; Heb. vii, 25; I. John ii, 1). Theologians say, however, that we are not to suppose that God needs to be interceded with, as if he were still reluctant to forgive men, or that Christ's intercession makes him more merciful than before. They tell us, that since it is evident from the whole tenor of the New Testament, as well as from a multitude of special passages, that the penal sacrifice of Christ on Calvary reconciled God to man, we must regard the intercessory work of Christ rather as serving to illustrate the eternal holiness of God and the changeless love of the Savior, and as intended to keep continually in view the sacrifice of atonement on which it is founded. The doctrine of the intercession of Christ is held both by Protestants and Roman Catholics; but the latter, in addition, believe in the efficacy of the intercession of the Virgin and the saints, who, however, do not directly intercede for men with God, but with the Savior, the sinless One, who alone has the ear of the King of the universe.

IN'TERDICT, an ecclesiastical censure in the Roman Catholic Church, the effect of which, taken in its most extended sense, is, that no kind of divine service is celebrated in the place or country under the sentence; the sacraments are not administered, the dead not buried with the rites of the church. This interdict is called real or local, whilst the personal interdict regards only one or more persons. Gregory VII., though not the inventor of this engine of ecclesiastical power, used it oftener and more tyrannically than any of his predecessors. The 11th century was pre-eminently the century of interdicts, but they gradually lost power; and when Paul V. laid Venice under an interdict in 1606 the churches were not closed nor divine service interrupted, and only a minority of the bishops acknowledged it. The interdict must be announced, like the excommunication, in writing, with the causes, and is not to be imposed until after three admonitions. The penalty of disobedience to an interdict is excommunication. Writers of the Gallican Church say that the pope has no right to lay France under an interdict, and the parliaments refused to register them. Interdicts are not to be confounded with the simple cessatio a divinis, or the disuse of religious ceremonies, which takes place when a church has been polluted, for example, by a murder committed in it.

INTEREST, is the allowance made for the loan or retention of a sum of money which is lent for, or becomes due at, a certain time; this allowance being generally estimated at so much per cent per annum. The money lent is called the principal; the sum paid for the use of it, the interest. The interest of $100 for one year is called the rate per cent, and the sum of any principal and its interest together, the amount. Interest is either simple or compound. Simple interest is that which is allowed upon the principal only, for the whole time of the loan. Compound interest is that which arises from any sum or principal in a given time by increasing the principal, at fixed periods, by the interest then due, and hence obtaining interest upon both interest and principal. The rate of interest supposing the security for the principal to be equal, depends obviously upon what may be made by the employment of money in various industrious undertakings, or on the rate of profit. Where profits are high, interest is high, and vice versa; in fact, the rate of interest is simply the net profit on capital. Besides this, however, the interest on each particular loan must further vary according to the supposed risk of the lender, the supposed solvency of the borrower, etc.

INTERFE'RENCE, in physics, the mutual action of waves of any kind (whether those in water, or sound, heat, or light waves) upon each other, by which, in certain circumstances, the vibrations and their effects are increased, diminished, or neutralized. When two minute pencils of light, radiating from two different luminous points, and making a small angle with each other, fall upon the same spot of a screen or a piece of paper, it is found that in some cases they illuminate the paper or screen more strongly than either would have done singly, and sometimes they destroy each other's effects and produce a black spot or fringe. Such phenomena have been explained in accordance with the undulatory theory of light, and furnish a strong argument in favor of that theory. The interference of waves of sound is a phenomenon which may be frequently observed in the beat of the tone of the heavier organ pipes. Again, to a person situated in the middle of a bell the sound waves from the vibrating segments of the bell interfere and produce only a moderate loudness, whereas to a person at a short distance outside the edge the loudness is intolerable.

INTERIOR, Department of the, one of the ten executive departments of the United States government, whose chiefs constitute the president's cabinet. It was organized in 1849. It has supervision of Indian affairs; of the public lands, including mines; of pensions; of patents; of the census, when directed by law; of the geological survey; of education; of the custody and distribution of public documents; of railroads which have received subsidies from the United States; of the territories; of national parks and reservations; of some charitable and penal institutions in the District of Columbia; of the returns office in which are filed returns of contracts made by the secretary of war, the secretary of the navy, and the secretary of the interior, and of some other miscellaneous business.

INTERMARRIAGE, the intermarriage of near relations has been universally believed to result in degeneration upon the offspring. The gradual deterioration of the slave population of America have been attributed to consanguineous alliances. The same is true of deaf-mutism or idiocy; of 235 deaf and dumb children whose parentage could be traced 30 per cent were the offspring of the intermarriage of blood-relations. Insanity follows consanguineous marriages where the contracting parties inherit the same tendencies of a neurotic nature.

INTER'MENT. See Burial.

INTERMITTENT FEVER. See Ague.

INTERNATIONAL LAW, the law of nations; those rules or maxims which independent political societies or states observe, or ought to observe, in their conduct toward one another. International law is divisible into two heads, the one which regulates the rights, intercourse, and obligations of nations, as such, with each other; the other, which regulates the rights and obligations more immediately belonging to their respective subjects. Thus the rights and duties of ambassadors belong to that head which respects the nation in its sovereign capacity; and the rights of the subjects of one nation to property situated within the territory of another nation, belong to the latter head. Some of the maxims regarding the rights and duties of nations during a state of peace are:—(1) Every nation is bound to abstain from all interference with the domains of other nations. (2) All nations have equal and common rights on the high seas, and they are not bound to admit any superiority there. The sea which washes the coast of a nation, to the

extent of three miles, is now deemed to be a part of the territory of the nation, over which it may exercise an exclusive jurisdiction. And, in respect to persons subjected to its laws, every nation now claims a right to exercise jurisdiction on the high seas, for the purpose of enforcing both international law and its own municipal regulations. (3) No nation has a right to persue any criminal or fugitive from justice in a foreign country; its claim, if any, is a mere right to demand him from the nation in which he has taken refuge. (4) Every nation has a right to regulate its own intercourse and commerce with other nations. (5) Foreigners are bound to obey the laws of a country as long as they reside within it, and under its protection; and the property held by foreigners within a country ought to be protected in the same manner as that of natives. (6) Every nation has a right to send and to receive ambassadors and other public ministers; and this right of embassy has always been deemed peculiarly sacred. Their persons are held sacred and inviolable. Their property and servants, and retinue enjoy a like privilege. (See Ambassador.) (7) It is through the medium of ambassadors and other public ministers that treaties, conventions, and other compacts between nations are usually negotiated, thus forming a positive code for the regulation of their mutual rights, duties, and interests. In the modern practice of nations such treaties and compacts are not generally deemed final and conclusive until they have been ratified by the respective governments to which the negotiators belong.

War introduces an entirely new order of rules. The right of declaring war results from the right of a nation to preserve its own existence, its own liberties, and its own essential interests. In a state of nature men have a right to employ force in self-defense; and when they enter into society this right is transferred to the government, and is an incident to sovereignty. What are just causes for entering into a war is a question which has been much discussed by publicists. Defensive wars are necessarily justifiable from the fact that they involve the existence or safety of the nation and its interests. But offensive wars are of a very different character, and can be justified only in case of aggravated wrongs or vital injuries. The first effect of a declaration of war is to put all the subjects of each of the nations in a state of hostility to each other. All the property belonging to each is deemed hostile. If it be personal property it may be captured as prize; if lands, it may be seized and confiscated at the pleasure of the sovereign; if it be merely in debts or stock it may, in the extreme exercise of the laws of war, be equally liable to confiscation. As soon as a battle is over the conquerors are bound to treat the wounded with kindness, and the prisoners with a decent humanity. And there are some things which seem positively prohibited from their cruelty and brutal barbarity; such are the violation of female captives, the torturing of prisoners, the poisoning of wells, the use of inhuman instruments of war. In time of war there is occasionally an intercourse between the belligerents which should always be held sacred. Thus the interchange of prisoners by cartels; the temporary suspension of hostilities by truces; the passage of flags of truce; the engaging in treaties of capitulation. When any conquest of territory is made the inhabitants pass under the dominion of the conqueror, and are subject to such laws as he chooses to impose upon them. There are also certain rights which war confers on the belligerents in respect to neutrals. Thus they have a right to blockade the ports or besiege the cities of their enemies, and to interdict all trade by neutrals with them. But no blockade is to be recognized unless "the besieging force can apply its power to every point in the blockaded state." They have a right also to insist that neutrals shall conduct themselves with good faith, and abstain from all interference in the contest by supplying their enemy with things contraband of war. And hence arises the incidental right of search of ships on the high seas for the detection of contraband goods. A neutral nation is bound to observe entire impartiality between the belligerents. Neutral nations are, strictly speaking, bound to compel their subjects to abstain from every interference in the war, as by carrying contraband goods, serving in the hostile army, furnishing supplies, etc. Subject to the exceptions above referred to, a neutral has a right to insist upon carrying on its ordinary commerce with each of the belligerents in the same manner as in times of peace. See Neutrality.

INTERNATIONAL PEACE CONFERENCE, a conference of one hundred and one delegates representing twenty-six countries of the world, held at The Hague from May 18 to July 29, 1899, in response of an invitation by the Czar of Russia to the governments of the principal states of the world for the purpose of concerted action with regard to international questions of peace and war, and to secure, if possible, a gradual reduction of the military and naval armaments of the states represented. See Hague Conference.

INTERNATIONAL PRISON CONGRESS, the first prison conference held in 1845 at Frankfort, the second in 1857. In 1870 the first American prison congress was held, and President Grant appointed Dr. Wines commissioner to arrange an international conference. The congress met in London in 1872. Meetings are now held at intervals of five years. The programmes are arranged by a permanent committee, the International penitentiary commission. Papers by experts are printed in advance, and form the bases of the discussions. The congresses have been held in various capitals, and have been productive of great good.

INTES'TACY, in law, the condition of a person who dies without having left any will at all, or having left one not legally valid, or such a will that nobody becomes heir under it. The general principle in Britain and the United States is that the law provides an heir or next of kin if the owner himself has not done so. In the case of a person dying partially intestate, the property not included in the settlement goes to the heir-at-law or next of kin according as it is real or personal estate.

INTES'TINE, the name given to the convoluted membranous tube which extends from the right or pyloric orifice of the stomach to the anus, and which receives the ingested food from the stomach, retains it for a longer or

Human stomach and intestinal tube.
a, Stomach.—*b* to *d*, Small intestine. *b*, Duodenum. *c*, Jejunum with convolutions. *d*, Ileum, with do. —*e* to *g*, Large intestine. *e*, Cœcum, *f f*, Colon. *g*, Rectum.

shorter period, mixes it with the bile, pancreatic juice, and intestinal secretions, gives origin to the lacteal or absorbent vessels which take up the chyle and convey it into the current of the blood, and which, lastly, conveys the fæcal or indigestible products from the system. In man it is usually divided into the small intestine, which comprehends the duodenum, jejunum, and ileum; and the large intestine, comprehending the cœcum, colon, and rectum. Three distinct coats are to be distinguished in the structure of the small intestine; these, named from without inward, are known as the serous, muscular, and mucous coats. The innermost or mucous coat presents several interesting structures. Among these are the valvulæ conniventes, or closely folded transverse plaits of the mucous membrane, the functions of which would appear to be those of serving materially to increase the digestive surface or area of the intestine, and thoroughly mingle the ingesta with the secretions. The surface of the membrane is covered with innumerable fine projections termed villi, which give to it almost a velvety texture.

Each villus is found under the microscope to be an outstanding process of the mucous membrane, containing internally an artery giving off minute ramifications, a vein by which the venous blood is returned, and, lastly, the lacteal or absorbent vessel. The function of the villi, which are most numerous in the duodenum, is pre-eminently that of the absorption of the chyle or fluid product of digestion, as a preliminary to its transmission to the current of the blood or circulation. Four varieties of glands are also connected with the small intestine, the first three being named after their respective discoverers, Lieberkühn, Peyer, and Brünner, and the other variety occurring singly—the "solitary"

glands—and in groups—Peyer's patches. The exact functions of these bodies are not well known. The duodenum lies in the epigastric region, and makes three turnings, receiving by a common opening between its first and second flexure the bile-duct and the pancreatic-duct. The conversion of the chyme from the stomach into chyle is thus accomplished in the duodenum. The jejunum, commencing at the left side of the second lumbar vertebra, becomes insensibly and gradually continuous with the ileum, which, terminating the small intertine, becomes continuous with the large intestine in the right iliac fossa, and opens into the colon, or first portion of the large intestine, which is divided from the large intestines by the ileo-cœcal valve. Below the point at which the ileum opens into the colon we find a short blind sac continuous with the colon, and known as the cœcum; and attached to the lower extremity of the cœcum, and communicating with the cœcal cavity, we find a little closed tube, to which the name of appendix vermiformis is applied. We next find the colon to ascend in the right lumbar region, in front of the kidney. This portion is known as the ascending colon. It then crosses the abdominal cavity to the left side, and becomes the transverse colon; and finally descends as the descending colon, in front of the left kidney into the left groin, where, after making a curve like the letter S—sigmoid flexure of the colon—it terminates in the last portion of the intestinal tract. This last portion, known as the rectum, finally terminates in the anus. The large intestine measures from 5 to 6 feet in length; the small intestine measures from 16 to about 24 or 26 feet in length; so that the entire intestinal tract may be regarded as being about five or six times the length of the body itself. The three coats of the small intestine are repeated in the large intestine. The mucous or inner coat is not elevated to form villi in the large, as in the small intestine, and only two kinds of glands, the glands of Lieberkühn, and the solitary glands, are to be distinguished in the large intestine. The function of the large intestine is chiefly excretory, but a certain power of absorption is also exercised by its vessels. The food is propelled along the entire intestinal tract by the alternate contraction of the longitudinal muscular fibers, by which means it is gradually pushed along the tube with a vermicular or peristaltic movement. The ileo-cœcal valve serves to prevent regurgitation of matters into the small intestine, after they have passed into the colon. The mesentery is the term given to the fold of peritoneum by means of which the small intertines are attached to the spine. The blood-vessels supplying the intestinal tube are the superior and inferior mesenteric arteries and their branches, derived from the abdominal aorta. The veins of the intestines empty their contents into the vena portæ, which distributes itself through the liver, and from the blood of which the bile is secreted by the hepatic or liver cells. The nerves of the intestines are derived from the sympathetic or ganglionic system of nerves, and also have a connection with the eighth cranial nerve—the pneumogastric nerve of the right side.

INTOXICATION, the state produced by the excessive use of alcoholic liquids. In the first stage the circulation of the blood becomes somewhat more rapid, and all the functions of the body and mind are exercised with more freedom. In the second stage the effect on the brain is more decided. The peculiarities of character, the faults of temperament, manifest themselves without reserve; the secret thoughts are disclosed, and the sense of propriety is lost. In the next degree consciousness is still more weakened; the ideas lose their connection; vertigo, double vision and other discomforts supervene; until finally the excitement partakes of the nature of delirium, and is followed by a more or less prolonged stupor, often by dangerous coma. In cases of extreme intoxication the stomach-pump should be employed, if ordinary emetics fail to overcome the torpor of the stomach. Among the best antidotes are preparations of ammonia and strong infusions of coffee and green tea. The body should be kept warm.

INTRENCHMENT, any work that fortifies a post against the attack of an enemy. The word is generally used to denote a ditch or trench with a parapet.

INTUI'TION, in philosophy, the act by which the mind perceives the agreement or disagreement of two ideas, or the truth of propositions, immediately, or the moment they are presented, without the intervention of other ideas, or without reasoning and deduction.

INVALIDES (an-vâ-lēd), Hôtel des, a splendid hospital for disabled soldiers at Paris, in the suburb of St. Germain, erected by Louis XIV. between 1670 and 1673. A soldier must have served ten years to be received into this hospital on account of poverty or infirmity. In vaults under the dome lie the remains of Turenne and several other great French commanders, including those of Napoleon I., deposited here December 15, 1840.

INVENTION OF THE CROSS. See Cross.

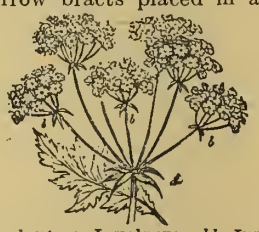
IN'VENTORY, a list containing a short description, together with the values, of goods and chattels, made on various occasions, as on the sale of goods, transfer of movables for pecuniary considerations, decease of a person, etc.

INVERNESS', a royal, parliamentary, and municipal burgh in Scotland, capital of the county of the same name, and chief town in the Highlands. Pop. 21,193.—The county is the largest in Scotland. Area, 4255 sq. miles, or 2,723,000 acres, of which only about 100,000 are under tillage. Pop. 90,182.

INVERTEBRA'TA, a collective term for the five great lower divisions or subkingdoms of the animal series, which agree in not having a vertebral column or back-bone, used in contradistinction to the highest group of the animal kingdom, to which the name Vertebrata or Vertebrate animals is given, all of which possess a vertebral column. In invertebrates no structure analogous to the vertebrate spine is found. Where hard parts exist in them they are generally placed on the outside of the body, and thus constitute an exo-skeleton, or outer skeleton—as opposed to the endo-skeleton, or internal skeleton of the vertebrata. The shell of the crab or lobster is a familiar example. The limbs or vertebrates are never more than four in number, while those of the invertebrata may be very numerous. Among vertebrates also reproducton is purely and solely sexual; but in invertebrata asexual reproduction is common, many of them reproducing their species by gemmation or budding, and by fission.

IN'VOICE, an account in writing of the particulars of merchandise transmitted to a purchaser, giving price and quantity, note of charges, and any other needful details. By sending an invoice along with goods a merchant gives official advice to his correspondent of the understood terms of a contract. If the goods are received and the invoice retained this will be held valid evidence in law of the contract.

INVOLU'CRE, in botany, a collection of bracts round a circle of flowers. In umbelliferous plants it consists of separate narrow bracts placed in a single whorl; in many composite plants these organs are imbricated in several rows. The same name is also given to the covering of the sori of ferns.



Hemlock plant—*a*, Involucre. *bb*, Involucels.

I'ODINE, a peculiar non-metallic elementary solid substance. It exists in the water of the ocean and mineral springs, in marine molluscous animals, and in sea-weeds, from the ashes of which it is chiefly procured (see Kelp). It exists also in certain land-plants and in cod-liver oil. It is found in certain minerals, the water of certain rivers, and the rain-water of several towns. At the ordinary temperature of the atmosphere it is a solid crystalline body. It unites readily with chlorine, potassium, etc., with the emission of light and great heat. It is a non-conductor of electricity, and, like oxygen and chlorine, is a negative electric. Like chlorine, it destroys vegetable colors, but with less energy. Its color is bluish black or grayish black, of a metallic lustre. It is often in scales, resembling those of micaceous iron ore; sometimes in brilliant rhomboidal plates or in elongated octahedrons. Its vapor is an exceedingly rich violet color, a character to which it owes its name. This vapor is remarkably dense. Iodine has a very acrid taste, and its odor resembles that of chlorine. It is an irritant poison; but in small doses has been of great service in certain forms of glandular disease. It is largely used in photography, in the preparation of aniline colors, and in other ways. It is very sparingly soluble in water, but dissolves copiously in alcohol and in ether, forming dark brown liquids. It possesses

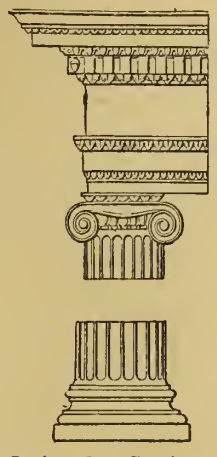
strong powers of combination, and forms, with the pure metals, and most of the simple non-metallic substances, compounds which are termed iodides. With hydrogen and oxygen it forms iodic acid; combined with hydrogen it forms hydriodic acid. This is a colorless gas, which strongly reddens litmus, and decomposes many chlorides. Starch is a characteristic test of iodine, forming with it a compound of a deep blue color. This test is so delicate that a solution of starch dropped into water containing less than a millionth part of iodine is tinged blue by it. The great consumption of iodine is in medicine; it is employed in its pure state, but much more frequently in the form of iodide of potassium, which has been found of great benefit in goitre, scrofula, disease of the liver and spleen, in syphilitic affections, rheumatism, etc., as well as in lead-poisoning. Iodide of iron is another useful medicine, being employed in chlorosis, anæmia, scrofula, and glandular affections.

IOD'OFORM, a substance analogous to chloroform in composition, but in which iodine replaces chlorine. It is in the form of small, solid yellow crystals, and is prepared by the action of alcohol and other bodies on iodine and potash. It is nearly insoluble in water, but dissolves in ether oils and alcohol. It is used in medicine as an antiseptic, and acts slightly as an anodyne; it is successfully applied to ulcers and sores of various kinds, and is used as a snuff for cold in the head. It may be prepared as an ointment.

IONIA, that part of the seaboard of Asia Minor which was inhabited by Ionian Greeks, a beautiful and fertile country opposite the islands of Samos and Chios, which also belonged to it. According to tradition the Greek colonists came over from Attica about the middle of the 11th century B. C., and founded twelve towns, which, though mutually independent, formed a confederacy for common purposes. These included Phocæa, Ephesus, Miletus, etc., and latterly Smyrna. Commerce, navigation, and agriculture early rendered them wealthy and flourishing, but the country was made tributary by Crœsus, king of Lydia, and later by Cyrus, king of Persia (557 B. C.). With an interval of independence they remained under Persia until this empire was overthrown by Alexander the Great, 334–331 B. C., when they became a part of the Macedonian Empire. Ionia, at a later period, became part of the Roman province of Asia. It was afterward totally devastated by the Saracens, so that few vestiges of its ancient civilization remain.

IONIAN ISLANDS, a number of Greek islands in the Ionian sea, extending along the western and southern shores of Greece, of which the largest are Corfu, Cephalonia, Zante, and Cerigo, others being Ithaca or Thiaki, Paxos, and Santa Maura; area, 1097 sq. miles. Pop. 252,000.

IONIC ORDER, one of the orders of classic architecture, the distinguishing characteristic of which is the volutes of its capital. In the Grecian Ionic (1) the stylobate consists of three receding equal steps the combined height of which is from four-fifths to a whole diameter; (2) the column, which includes band, shaft, and capital, is rather more than nine diameters in height, the shaft being fluted with twenty-four flutes and alternating fillets; while (3) the entablature



Ionic order—Grecian.

is rather more than two diameters in height. The volutes are connected on the flanks by a peculiar roll-moulding, called the baluster or bolster. In the Roman Ionic, a modification of the latter style, the stylobate is lofty and not graduated; the shaft diminishes one-

The Erechtheum at Athens—Ionic order.

tenth of a diameter and has twenty fillets and flutes; the capital, which is two-fifths of a diameter, has its volutes a little lower than the other, and a square abacus with moulded edges covers the whole. The chief examples of the Grecian Ionic are those of the Athenian

Ionic architecture—Temple of Wingless Victory, on the Acropolis of Athens.

Acropolis; while those of the Roman Ionic are found in the temple of Fortuna Virilis and the Coliseum at Rome.

IOU, a written acknowledgment of debt, usually made in this form:—"To Mr. A. B. I O U Ten dollars.—C. D. May 12th, 1898." An acknowledgment of debt made in this form requires no stamp. It is not negotiable. The letters IOU are of course used instead of the words "I owe you."

I'OWA, one of the central United States, bounded on the north by Minnesota; east by Wisconsin and Illinois, from which it is separated by the Mississippi; south by Missouri; and west by Nebraska and Dakota, from which it is separated by the river Missouri; area, 56,025 sq. miles. It is well watered, its streams being all affluents of the large rivers which bound it on the west and east. To the Mississippi flow the Wapsipincon, Iowa, Cedar, Skunk, and Des Moines, with a general s. e. course To the Missouri flow the Big and Little Sioux and other streams. The surface is undulating, nearly four-fifths consisting of prairies covered with a rich coat of coarse grass, forming excellent pasturage. The climate is very healthy, and winter continues from December to March; the summer heat is tempered by frequent showers. The soil is in general very good, consisting of a deep black mould, intermingled in the prairies with sand, red clay, and gravel. The eastern portion is rich in minerals.

Iowa's most valuable mineral resources are the bituminous coal beds in the south-

Seal of Iowa.

eastern quarter of the state, the lead and zinc ores in the Galena limestone of the lower Silurian formation of the northeast. Extensive deposits of gypsum are also found, and various other minerals. The limestones of the Devonian and upper Silurian formations furnish an inexhaustible supply of building-stone of the finest quality. Clays suitable for brick manufacture are abundant and are extensively ulitized. Small quantities of zinc and gypsum are mined.

The area occupied by forests and woodland is about 5,000,000 acres.

Iowa is pre-eminently an agricultural state. Of its total land area, 97.4 per cent is included in farms, and of this, 86.5 per cent is improved. The soil is well drained, producing abundantly without the aid of artificial fertilizers. The state is noted especially for its corn crops, the acreage for which amounts to over one-fourth of its total area, and contributes about one-half of the total value for all crops. Oats rank next in importance, with about one-half the acreage and one-third the value of corn. The state usually takes first place in the production of this cereal. Wheat is raised most extensively

in the northern and northwestern counties. The state ranks second in the production of barley, this crop also being most extensively grown in the northern part. Less important cereals are rye and buckwheat. The soil is well adapted to vegetables, and the state ranks second in the production of Irish potatoes. The fruit industry is rapidly developing. Over 71 per cent of the total are apple-trees. Grapes and small fruits are successfully grown.

Stock-raising holds a higher rank than the raising of crops. Texas alone rivals Iowa in the value of live stock, and is the only state which exceeds it in the number of cattle. Iowa is far in advance of all others in the number of swine, and leads also in the number of horses. Other industries include the manufacture of farm implements, flour-milling, pork-packing, machinery, smelting-works, etc. The length of railways open for traffic is over 10,000 miles. It possesses exceptional advantages for river trade, and the smaller streams supply abundant water-power. Education is well attended to. There is a state university (at Iowa City) and a flourishing state agricultural college.

Marquette and Joliet, in 1673, and Hennepin, in 1680, touched on the boarders of the state. In 1803 the region passed to the United States as a part of the Louisiana cession, and Indian titles to the land were extinguished by treaties in the years 1804, 1832, and subsequently. It formed, in turn, a part of the territories of Louisiana (organized in 1804), Missouri, Michigan, and Wisconsin. On June 12, 1838, it was organized as the Iowa territory. In 1839 the government was removed to Iowa City, and in 1844 a state constitution was framed and admission to the Union sought for. The state was admitted to the Union on December 28, 1846. In 1857 the original constitution of 1846 was revised and Des Moines was made the capital. In the civil war, Iowa, whose fundamental law prohibited slavery, took a zealous part. The two most important questions of public moment since 1870 have been railway legislation and prohibition. The development of the state was greatly accelerated by the building of railroads, of which there were, in 1900, nearly 10,000 miles, but with the rise of powerful railway corporations, there ensued a continuous conflict between the legislature and the companies in regard to the taxation of railway property and the regulation of rates. In 1872 an act taxing railway property was passed, and in 1873 a powerful agitation stirred up by the patrons of husbandry against the extortionate rates imposed by the companies led to the creation of a board of railroad comissioners for the purpose of determining a maximum rate and preventing discrimination. Radical action on the part of the commissioners caused repeated appeals to the courts, and though many concessions were wrung from the companies, the advantage in general remained with them. A prohibition amendment adopted in 1882 was promptly declared unconstitutional by the courts. A new law went into effect in 1884, and for some years proved fairly adequate. A very large part of the population, however, was opposed to sumptuary legislation, and in 1890, under the protection of the interstate commerce laws, a successful attempt was made to evade the anti-liquor regulations by the importation of alcoholic products from other states. In 1894 the courts declared the prohibitory laws unconstitutional. From 1846 to 1854 the state was Democratic both in national and state politics. Since 1854 its vote in national elections has always been cast for the republican candidate. The capital is Des Moines; the principal towns being Dubuque, Davenport, Burlington, Council Bluffs, Sioux City, Cedar Rapids, and Keokuk, Pop. 1909 2,232,000.

IOWA, a river in the state of Iowa, rising in Hancock co., near the Minnesota line, and flowing southeast into the Mississippi, 35 miles north of Burlington. It is 100 miles long and navigable to Iowa City, 800 miles from its mouth.

IOWA, State University of, an educational institution for both sexes in Iowa City, Iowa. The institution was opened in 1855 and re-organized in 1860. The work of the university is organized in a college of liberal arts, colleges of law, medicine, homeopathic medicine, dentistry and pharmacy, a graduate department, the Iowa school of political and social science, and two hospitals. The college of liberal arts confers the degrees of B.A., B.Ph., and B.S. The graduate college confers the degrees of M.A., M.S., Ph.D., civil engineer, and electrical engineer. The college of liberal arts maintains a summer session for teachers and a summer school for library training. The university provides public lectures and extension courses, and is in close touch with the educational institutions of the state through its system of accredited high schools.

IOWA CITY, a city, the capital of Johnson co., Iowa, on the river Iowa, at the head of navigation. It contains the state university, and was once the state capital. Pop. 10,000.

IOWA COLLEGE, the oldest collegiate institution in the state of Iowa, founded in 1846 by an association of congregationalists and presbyterians at Davenport, and incorporated in the following year. The college was opened in 1848, and in 1859 it was removed to its present situation in Grinnell. The institution includes three departments, the college, the academy, and the school of music, since 1857 open to both sexes. In 1895 the collegiate courses were arranged on the group system, and lead to the degrees of B.A. and B.Ph.

IOWA STATE COLLEGE OF AGRICULTURE AND MECHANIC ARTS, a co-educational institution at Ames, Iowa, established in 1858. In 1862 a grant of public lands was bestowed on the college by a general act of congress for the purpose of fostering agricultural and mechanic education. It is a college of advanced technology, and organized in divisions of agriculture, engineering, veterinary medicine and science A well stocked farm provides practical work and the Iowa experiment station gives opportunity for original investigations of agricultural problems. Tuition is free to residents of Iowa, those from other states paying an annual fee of $24 00

IPECACUAN'HA, a substance used in medicine, of a nauseous odor and repulsive bitterish taste, the dried root of several plants growing in South America. All the kinds have nearly the same in-

Ipecacuanha plant.

gredients, but differ in the amount of the active principle which they contain. The best is the annulated, yielded by a small shrubby plant, a native of Brazil, Colombia, and other parts of South America. When given in very small doses ipecacuanha improves the appetite and digestive powers; in a somewhat larger dose it may be given to increase the secretion from the mucous membrane of the air-passages; and in a still larger, from 15 to 20 grains, it occasions vomiting. It is also capable, by being combined with other substances, of producing increased perspiration, as in the well-known Dover's powder.

IPHIGENIA (if-i-je-nī'a), in Greek legend and poetry, daughter of Agamemnon and Clytemnestra. To avert the wrath of Artĕmis, whom Agamemnon had enraged by killing a consecrated hind, and who detained the Greek fleet at Aulis that had been prepared for the Trojan war, Iphigenia was to be sacrificed on the altar; but a hart was miraculously substituted for her, and she was conveyed in a cloud to Tauris. She became priestess here to Artĕmis, and saved her brother Orestes when on the point of being sacrificed.

IPSWICH (ip'sich), a parl., county, and municipal borough and river-port in England, capital of Suffolk, on the Orwell. Pop. 66,622.

IQUIQUE (i-kē'kā), a seaport of Chile, province of Tarapaca, a considerable town with an important trade, its rise being due to the extensive deposits of nitrate of soda and borax, and the silver-mines, etc., in its neighborhood. It has suffered much from earthquakes, and in 1879 was blockaded, bombarded, and finally captured by Chile.

IRADE (i-rä'de), a decree or command of the sultan of Turkey, directed to the grand vizier, whose duty it is to promulgate it to the public.

IRAK AJ'EMI, an interior province of Persia, separated from the Caspian sea by Ghilan and Mazanderan; area, about 138,000 sq. miles, a large part of which in the east is occupied by salt deserts, the rest being largely mountainous, with some valleys and rich plains. The chief towns are the capital, Teheran, and Ispahan.

IRELAND (in Irish, Erin; in Latin, Hibernia), the more western and smaller of the two principal islands of which the United Kingdom is composed, is separated from Great Britain on the east by the Irish sea, and surrounded on all

other sides by the North Atlantic ocean. The area is 32,551 sq. miles. Ireland is divided into the four provinces of Leinster, Ulster, Munster, and Connaught, and into 32 counties.

The population in 1841 was 8,175,124; in 1851, 6,552,385, the decrease being partly owing to the famine resulting from the potato disease in 1846–47, and partly to emigration. Since 1851 over 3,800,000 emigrants have left the country. Pop. in 1891, 4,704,750; in 1901, 4,458,775. The capital is Dublin; the other chief towns are Belfast, Cork, Limerick, and Londonderry.

The coast, forming a line of nearly 3000 miles, is, in general, bold and rugged, and is diversified by numerous indentations, some of which run far into the land and form excellent natural harbors. There are a considerable number of islands, chiefly on the west coast, the largest being Achill. The mountains, generally speaking, rise in isolated masses at a short distance from the coast, the interior having the form of a vast plain, in which are extensive tracts of bog. Rivers are not only numerous but are very equally distributed over the surface. The Shannon, in the west, the largest river of Ireland if not of the United Kingdom, is navigable to its source in Lough Allen, forming a waterway of 240 miles. The other rivers of most importance are the Bandon, Lee, Blackwater, Suir, and Barrow, which enter the sea on the south, the last two by the union of their streams forming the broad estuary of Waterford harbor; the Slaney, in the southeast angle, which expands into Wexford Haven; the Liffey and the Boyne, entering the sea on the east, the former having the capital at its mouth, the latter being the largest river which discharges itself into the Irish sea on the east coast; and the Bann and the Foyle, which have their mouths at no great distance from each other on the north coast. Ireland possesses a vast number of lakes, among which the lakes of Killarney, in the southwest, are pre-eminent for beauty, and attract numerous visitors.

Granite, coal, iron, lead ore, slate, alum, salt, etc., are found.

The climate is on the whole moist, mild, and equable. It is highly favorable to vegetation and allows plants to winter in the open air; some species of plants also being peculiar in Ireland alone of the British isles, as for instance the strawberry-tree or arbutus, found in the southwest.

As regards agriculture Ireland has great advantages, for though there is a great extent of moorland, there is also a vast area of arable surface, covered with a deep friable loam of remarkable richness. The rearing of live stock and dairy-farming are largely carried on. By far the largest grain crop is oats; the chief green crop is potatoes. Another staple crop, especially in the north, is flax.

Of industrial employments the linen manufacture is the chief. It has increased in a remarkable manner, and Belfast, its center, has become the second city of Ireland. The brewing of porter and distillation of whisky form important industries. The fisheries employ a considerable number of persons, but far fewer than they should. The salmon fisheries are valuable, and are increasing in value. The trade is only of a moderate bulk. The railway system has attained a total length of 3044 miles.

The prevailing religion is the Roman Catholic. The reformation never made much progress, and though the Protestant Episcopal Church was established by law it was only the church of a small minority. In 1869 an act was passed for its disestablishment. At the head of the Roman Catholic Church are four archbishops and twenty-four bishops. The whole of the Irish Roman Catholic clergy are supported solely by voluntary contributions. The number of priests is 3200, more than half being curates. There are numerous monasteries and convents. The Presbyterian Church is chiefly confined to Ulster, where it may be said, especially in the counties of Down and Antrim, to be the leading religious denomination. Its ministers are supported by voluntary contributions, seat-rents, and church funds. According to the census of 1901 there were in Ireland 3,308,661 Roman Catholics, 581,089 Episcopalians, 443,276 Presbyterians, 62,006 Methodists, and 63,743 members of other persuasions.

The principal educational institutions are Dublin university and the three Queen's colleges of Belfast, Cork and Galway. The Royal college of science, established in 1867, supplies a complete course of instruction in science applicable to the industrial arts. The Catholic University of Ireland, established in 1854, consists of University college, Dublin, St. Patrick's college, Maynooth, and several other colleges. The seminaries for the education of the Catholic priesthood are numerous, the most prominent being the College of Maynooth, founded in 1795. The General Assembly's theological college, Belfast, and the Magee college, Londonderry, are Presbyterian colleges. The chief elementary schools are those under the superintendence of the commissioners of national education, the majority of them now being free.

Ireland, by the act of union, became in 1801 an integral part of the United Kingdom, and shares in its legislation by means of twenty-eight representative peers in the House of Lords, and 103 representatives in the House of Commons. The representative peers are elected for life by the whole body of Irish peers. The lord-lieutenant, who represents the sovereign, is the head of the executive, and holds his court in Dublin castle. He is assisted by a privy-council and a chief-secretary, who takes the most active part in the administration of affairs.

The beginning of the history of Ireland is enveloped in fable. As in western Europe generally, the earliest inhabitants are believed to have been of Iberian race, and, therefore, akin to the modern Basques. They were followed by the Celts, different tribes of whom probably arrived at different times, giving rise to such names as Firbolgs, Milesians, etc. Among these the Scots were the latest, and latterly got the upper hand, so that their name became generally applied to all the inhabitants. There is no evidence that the Irish had the use of letters before the middle of the 5th century, when Christianity and Christian literature were introduced by St. Patrick. Subsequently Ireland became the seat of western learning; and its monasteries were the schools whence missionaries proceeded throughout continental Europe. Its internal condition, however, was far from satisfactory. Divided among a number of hostile kings or chiefs, it had been long torn by internal wars, and for nearly two centuries ravaged by the Danes, numbers of whom settled in the country, when, in the beginning of the 11th century, Brian Boroimhé united the greater part of the island under his scepter, restored tranquility, and subdued the northern invaders.

After the death of Brian at the close of the battle of Clontarf, 1014, gained against the Danes and their Irish allies, the island relapsed into its former state of division and anarchy. In this state of matters Henry II. of England obtained a papal bull giving him the right to subdue it. In 1172 Henry entered Ireland himself, and the clergy and the great princes acknowledged his supremacy. In 1315 Edward Bruce, brother of the Scotch king, landed at the head of a large force, and was crowned king, but was defeated by the English in 1317 near Dundalk. At the beginning of the 16th century the greater part of the island still remained unconquered by the English. The native Irish lived according to their old customs under their own chiefs, and in manners and mode of life still totally uncivilized.

In 1641 there began an attempt to shake off the English yoke, in which great atrocities were perpetrated on both sides. In 1649 Cromwell was appointed lieutenant, and energetically, but cruelly, reduced the whole country within nine months. The next struggle was that which followed the revolution, when James II. landed in 1689, and hoped to regain his crown by French and Irish aid. In the following year (1690) William III. arrived, and on the 1st of July gained a decisive victory over the forces of James on the Boyne, near Drogheda. In 1691 another victory was gained over the Irish at Aughrim in Galway, and in October Limerick, the last place that held out for James, capitulated.

The French revolution had a great effect on the minds of the Irish people, and it was partly through this influence that the Society of United Irishmen was formed, and that rebellion broke out in 1798. Great atrocities were perpetrated, but the rising was speedily crushed

The British government now resolved to unite the Irish and English parliaments, and an act providing for the legislative union of the two countries passed the Irish parliament in May, 1800, and the British parliament in July of the same year, in virtue of which the union was effected on the 1st of January, 1801. In 1829, mainly through the efforts of O'Connell, the Catholic emancipation act was passed under which Catholics could take a seat in

parliament, and were admitted to most public offices. (See Catholic Emancipation.) The Irish national party now tried to repeal the union, for which purpose O'Connell founded the repeal association. This movement collapsed in 1843, and afterward the potato famine in 1845, and again in 1846, cast all other interests into the background. To mitigate this calamity parliament granted enormous sums of money, yet thousands died from starvation, and hundreds of thousands emigrated to America.

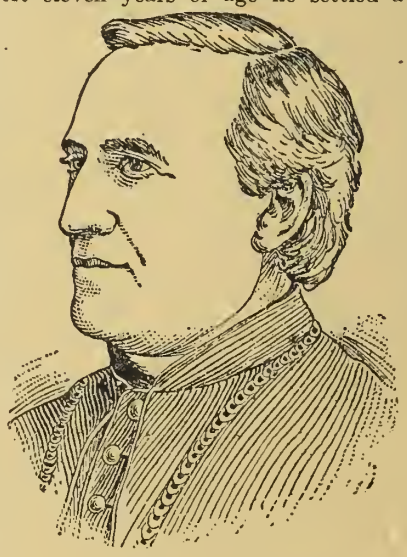
The year 1865 witnessed a new conspiracy designed to separate England and Ireland. This originated in the United States, when the numerous Irish during the civil war in that country hoped for a rupture between it and England, of which they might take advantage. This conspiracy, the members of which called themselves Fenians (see Fenians), soon spread to Ireland; but before they could take any overt action in that island their design was stifled by the British government (1865–66). The ministry resolved to render the Irish people loyal and contented; and accordingly the Irish Episcopal Church was disestablished in 1869, and another act was passed to improve the tenure of land, in 1870.

Since 1871 an agitation for what is called home rule has made itself prominent. Its chief supporters, designated "nationalists," profess not to desire the severance of Ireland from Britain; what they mainly want, is to have an Irish parliament for matters exclusively Irish. In 1880 Ireland became the scene of an agitation carried on mainly by a body known as the land league. The movement was so lawless that two special acts, a "coercion" act and a peace preservation act, were passed. Still further to redress Irish grievances a land act was also passed in 1881, the chief provisions of which have already been mentioned. The land league was suppressed, but a body called the national league was soon organized in its place. In 1885, 86 nationalist members (under the leadership of Mr. Parnell) were returned to parliament, and their pressure on the government led to Mr. Gladstone's scheme in 1886 by which Ireland was to receive a parliament of her own and the Irish members to be withdrawn from the imperial parliament. This and the accompanying scheme for the buying out of Irish landlords were rejected by parliament and the majority of the constituencies, thus bringing a conservative government under Lord Salisbury into power. A permanent act for the repression of crime was passed in 1887, and an act (Lord Ashbourne's) for the benefit of Irish tenants. A home rule bill passed the Commons but not the Lords in 1893. The local government act of 1898 established local councils similar to those in Great Britain. The land purchase act of 1903 is intended to put an end to dual ownership, by enabling tenants to buy their farms.

The Irish language belongs to the Gaelic or Gaedhelic branch of the Celtic stem of languages, being closely akin to the Gaelic of Scotland and the Manx, and more remotely allied to the British dialects (Welsh, Cornish, and Armoric). The modern dialects or varieties of Irish, which differ very much from the ancient, are spoken by the rural classes in Connaught and Munster, and parts of Ulster. Gaelic is a comparatively modern form of Irish, which, both linguistically and from the extent and antiquity of its literature, is far more important than Gaelic.

Irish literature is rather varied and extensive, including history, legendary and actual, in prose and verse, annals, genealogies, and pedigrees, mythological and imaginative tales, lyric poetry, satire, lives of saints, treatises on law, science, grammar, etc. Some of these may be as old as the 5th century of our era.

IRELAND, John, an American Roman Catholic prelate, archbishop of St. Paul. He is a native of County Kilkenny, Ireland, and was born Sept. 11, 1838. At eleven years of age he settled at



Archbishop John Ireland.

St. Paul with his parents, was educated in France, and entered the priesthood in 1861. Having served as chaplain during the civil war Dr. Ireland became coadjutor of St. Paul in 1875, was made bishop in 1884 and archbishop in 1888. He has been prominent as a liberal Roman Catholic, has interested himself in national politics as a republican and has been several times mentioned as a candidate for cardinal.

IRETON, Henry, a parliamentary general, was born in Nottinghamshire in 1610. When the civil contest commenced he joined the parliamentary army, and by the interest of Cromwell, whose daughter Bridget he married in 1646, he became commissary-general. He commanded the left wing at Naseby, which was defeated. He was an implacable enemy of the king, had a principal hand in framing the ordinance for his trial, and sat himself as one of the judges. Ireton accompanied Cromwell to Ireland in 1649, and was left by him as lord-deputy. He deduced the natives to obedience with great vigor, but cruelly. He died of the plague before the walls of Limerick, 1651, and was buried in Westminster Abbey 1652.

IRIDIUM, a metal of a whitish color, not malleable, discovered in the black scales which remain when native platinum is dissolved in aqua regia; specific gravity about 22.4, symbol Ir. It takes its name from the variety of colors it exhibits while dissolving in hydrochloric acid. It is the most infusible of metals. It forms a number of alloys, one of which, iridosmine, occurs native. The alloy with gold is malleable and much resembles gold in appearance, that with copper is very hard, pale red in color, and ductile.

I'RIS, in Greek mythology, the fleet, golden-winged messenger of the Olympian gods. Iris was originally the personification of the rainbow, though she does not appear as such in the Homeric poems. She is represented with wings attached to her shoulders and a herald's staff in her left hand, representative of her office of messenger.

IRIS, the muscular curtain stretched vertically in the anterior part of the eye, perforated by and forming the colored circle around the pupil.

IRIS, a plant that gives name to the natural order Iridaceæ, and is also called flag and fleur-de-lis. The plants of the genus Iris, some of which are medicinal and others merely ornamental, are found in many localities over Europe, Asia, and America. They usually grow in wet places, bearing flowers of various colors, but the prevailing tint is blue. Orris-root consists of the root-stock of some species, as I. florentina; and the root-stock of this and other species are cathartic or emetic.

IRISH SEA, the sea between Great Britain and Ireland, north of St. George's channel and south of the North channel, 130 miles long and about 60 miles wide. It contains the islands of Anglesey and Man.

IRI'TIS, inflammation of the iris of the eye. The symptoms of iritis are a zone of a pale pink color round the cornea, formed by vessels traversing the sclerotic; and the iris itself undergoes a remarkable change of color. The patient experiences pain in the orbit of the eye, in the forehead, and side of the head, which frequently grows more intense at night. Iritis may arise from wounds in the iris, from too prolonged continuous use of the eye, or from constitutional predisposition induced by syphilis, scrofula, etc. It may be treated according to circumstances by blood-letting, belladonna, and mercury.

IRKUTSK', a town in Southern Siberia, capital of government of same name, at the junction of the Irkut with the Angara, about 40 miles from Lake Baikal. Pop. 51,434.—The government has an area of 309,190 sq. miles, and a pop. of 540,535.

IRON, the most universally distributed and the most generally applied of all the metals. It is the most tenacious of the metals, having a breaking strain of 106,000 lbs. per sq. inch of section; and two pieces can be perfectly welded together when raised to a

white heat. It is so ductile that it can be drawn into wire as fine as the human hair. It occurs chiefly in the earth's crust in combination with oxygen, but it is also found in combination with several other elements, and sometimes, although rarely, native or in the metallic state.

It is from one or other of its ores that the iron of commerce is obtained. The ores of iron are very numerous, but the oxides, carbonates, and sulphides are the most important.

Before the ores pass into the smelter's hands they are subjected to the preliminary process of calcination or roasting. The object of this operation is to separate water, carbonic acid, sulphur, and other volatilizable substances from the ore, and at the same time to render the ore more porous. This is now generally effected by placing the ironstone over a coal-fire at the bottom of a kiln; when the ore is red-hot a fresh layer, 8 or 9 inches in depth and mixed with coal, is added, and so on until the kiln is filled. When the bottom layer is cold it can be withdrawn, and the process thus becomes continuous.

The smelting of the iron is the next process, that is, the production of the metallic iron from the ore. Until the beginning of the 17th century charcoal was exclusively used for iron-smelting, but coal and coke have now taken its place, except in those countries where forests still abound and charcoal can be procured readily and cheaply. Chief among iron-smelting appliances is the blast-furnace, and the great progress made in the production of pig-iron is largely due to better constructed furnaces.

To obtain malleable or wrought iron, it is necessary to free the pig-iron from the sulphur, phosphorus, silicon, and excess of carbon it contains, as these substances lessen the tenacity of the iron, and render it unfit for rolling into bars or plates. But a small quantity of carbon (under 1 per cent) is essential to the formation of good malleable iron; perfectly pure iron would be too soft.

By the Siemens regenerative and other similarly constructed furnaces, malleable iron and steel are now prepared directly from the ore. In recent years "malleable castings" have been introduced.

If iron is heated frequently or carelessly, it ceases to be fibrous and loses its tenacity; it is then said to be burnt. To restore it to its original condition, a fresh and very careful forging is generally needed. This may also be done by heating the piece of iron to bright redness, and plunging it into a boiling saturated solution of sea-salt until it is of the same temperature, about 230° Fahr. After this operation the metal can be easily doubled in the cold.

It is not always easy to draw the line between iron and steel, and many varieties of metal come into the market under the name of steel which in reality are alloys of iron with other metals, such as wolfram, manganese, chrome, etc. It is admitted by all metallurgists that one of the characteristics of true steel is that it hardens when heated and then suddenly cooled in water; but wolfram steel, for instance, exhibits the very opposite property. Experienced workmen can distinguish iron from steel by the musical note emitted on striking. A more certain method consists in treating the metal with diluted nitric or sulphuric acid. If the surface remains unaltered, or nearly so, when touched with a drop of either acid, the metal is iron; in the case of steel a black mark will be left, owing to the liberation of carbon.

Pure iron is a silver white metal, with a strong lustre, very tenacious, capable of receiving a high polish, and so soft as to be easily cut with a knife. It may be obtained by heating nitride of iron in a stream of hydrogen, or by electrolytic precipitation; but, according to Matthiessen, however metallic iron is obtained it always contains a trace of sulphur. In its chemical analogies iron is closely related to the metals cobalt, nickel, and chromium; it belongs to the hexad group of metals, and forms a large series of salts. The atomic weight of iron is 55.9 or 56. Iron dissolves slowly in dilute nitric acid; if not diluted, this acid rapidly oxidizes it. Dilute sulphuric acid dissolves this metal easily, but if concentrated, it has no action in the cold, whereas, on heating to ebullition, the iron is dissolved with evolution of sulphurous acid gas. Iron is also dissolved in hydrochloric acid and in aqua regia.

IRON-BARK, an Australian tree growing to the height of 100–150 feet, with heavy, strong, and durable timber, difficult to work and apt to be "shaky."

IRON-CLADS, see Navy.

IRON-CLAD VESSELS, or **ARMOR-CLAD-VESSELS,** a term applied in England to all vessels protected from the fire of heavy guns by thick plates of iron or steel, usually backed by wood. The iron-clad is comparatively a modern invention, and it was not until 1859 that Britain began to introduce such vessels

A, Iron plating. B, Teak backing. C, Ship's side.

into her navy; but since that time greater changes have taken place in the construction of war-ships than in all previous ages. Before the 19th century we have no record of vessels being fortified with iron plates, and the idea was first practically applied to some floating batteries by the French in the Crimean war. The improved shells played such havoc in the crowded 'tween decks of the line-of-battle ships then in use, that some extra protection became absolutely necessary. The first iron-clad, La Gloire, was constructed by the French in 1858, a wooden ship sheathed from end to end in 4½-in. iron plates, an armor then considered invulnerable. It was evident that Britain must not only take up the idea of the French, but also improve upon it, and this led to a period of unexampled activity in the naval yards of both countries. No sooner had France launched an iron-clad than Britain replied with another, although the former managed to keep the lead for some years. The first British iron-clad, the Warrior, was launched in the Thames in December, 1860, an iron frigate with air-tight compartments, 4½-in. iron armor and 18-in. wood backing, the two ends of the vessel unprotected. The French continued to build their vessels of wood for some years, while the British started at once with iron, which gave the advantage of extra lightness for the same strength Iron-clads may be divided into the three chief classes of broadside, turret, and barbette vessels. La Gloire and the Warrior carried their guns on the broadside like old wooden frigates, but as the number of guns carried was reduced as ordnance grew heavier, and all-round firing was found expedient, it was deemed necessary to limit the masses of armor by applying it to the most vulnerable parts only, and adopting various methods for attaining all-round firing. This brought about an entire new departure in ship-building—the construction of turret ships, or ships having a revolving covered turret or turrets rising above the deck and containing the chief guns, the turrets being of great strength, and having openings for the muzzles of the guns. The turret-ship is the invention of Ericsson in 1861–64 for the United States navy, and the advantages of his system were fully demonstrated in the successful conflict of the turret-ship Monitor with the broadside-ship Merrimac, in the American civil war. Ships on the barbette system have open towers or turrets rising above the deck, containing heavy guns which fire over the edge of the turrets (thus giving an extensive range). The manner in which the armor is distributed varies greatly in different ships. Battleships are of the first, second, or third class, according to their value as fighting-ships, which is gauged by the extent and resisting powers of their armor, the number, range, and penetrating power of their guns, their maximum speed and radius of action. It generally follows that the size of the ship is greatest in the first class and least in the third class.

IRON MASK, The man with the, unknown personage kept in various French prisons, who for a long time excited much curiosity. All that is known of him is that he was above middle height, of a fine and noble figure, and delicate brownish skin; that he had a pleasant voice was well educated, and fond of reading and guitar playing, and that he died in the Bastile 1703. The mask he wore seems to have been of black velvet, not iron Conjecture has given him many names. He was stated to be in turn the Count of Vermandois (a natural son of Louis XIV. and de la Vallière), the Duke of Beaufort, the Duke of Monmouth, the son of Anne of Austria (mother of Louis XIV.) by some favorite, and twin-brother of Louis XIV.

but all these assertions have been unable to stand the test of thorough investigation. What seems most probable is that he was Count Birolamo Matthioli, first minister of the Duke of Mantua, who had betrayed the interests of Louis XIV. by failing to secure for him, as he had pledged himself to do, in consideration of a large bribe, possession of the fortress of Cassale, which gave access to the whole of Lombardy. For this offense the court of Versailles lured him to the French frontier, secretly arrested and imprisoned him in the fortress of Pignerolo. The secret was preserved so carefully, on the supposition that Matthioli was the ill-fated prisoner, because his seizure and detention were flagrant violations of international law.

IRON MOUNTAIN, capital of Dickinson co., Mich., on the Menoninee river and the Chi. and N. W. and the Chi., Mil. and St. P. railways; 208 miles n. of Milwaukee, Wis. It has large iron-mining interests; pop. 11,140.

IRON MOUNTAIN, or **IRON MOUNT,** a famous iron mountain in St. François co., Mo.; 81 miles s.w of St. Louis. It is 228 feet high, covers 500 acres, is of mammillary shape, and consists chiefly of an iron ore which yields 55 or 60 per cent of excellent iron. The amount of ore in Iron Mountain seems to be immense, the main body having a thickness of 50 feet, and continuing indefinitely in depth.

IRONTON, capital of Lawrence co., Ohio, on the Ohio river, and the Cin., Day. and Iron., the Iron, and the Norfolk and West. railways; 50 miles s.w. of Pomeroy; 145 miles s. by e. of Cincinnati. It is in an iron and bituminous coal region. The principal manufactures are machinery, boilers, foundry products, rolled iron, nails, stoves, firebrick, and furniture Pop. 13,255.

IRONWOOD, a city in Gogebic co., Mich., on the Mil., Lake S. and W. and the Wis. Cent. railways; 39 miles e. by s. of Ashland, Wis., 150 miles w. of Marquette. It is in the celebrated Gogebic iron-mining region, and has four newspapers Pop. 11,750.

IRON-WOOD, a name given to various trees from the quality of their timber The iron-wood or hop-hornbeam of America, is a tree with a trunk not

Iron-wood.

exceeding 6 in. in diameter, with very hard wood, so heavy that it sinks in water, and foliage resembling that of birch.

I'RONY, a form of speech in which the meaning intended to be conveyed is contrary to the natural meaning of the words. Irony, as a rhetorical device, becomes a most effective weapon for ridiculing an antagonist.

IROQUOIS (i'ro-kwa), the joint name given by the French to a once powerful confederacy of six North American Indian tribes (Mohawks, Oneidas, Senecas, etc.). They formerly resided on the Mohawk river, and extended their conquests to the Mississippi, and beyond the St. Lawrence. It is probable that but for the settlement of the whites they would have secured dominion from Canada to the Gulf of Mexico. Some of the tribes are now extinct; some have made considerable advances in civilization, while others have fallen into a state of squalid misery. Part of the Canadian Indians are Iroquois.

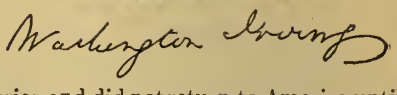
IRRADIATION, that effect on the eye through which brilliantly illuminated white surfaces and self-luminous bodies, when emitting white light, appear to the eye much larger than they really are.

IRRAWAD'DY, Irawadi, a large river traversing Lower and Upper Burmah from north to south, falling into the Indian ocean by various mouths and forming a great delta.

IRRIGATION, the art of increasing the productiveness of soils by the artificial supply of water to them. This is as old as agriculture, and references to it exist in very early records, especially in Egypt, India, and China. In countries with very small rainfall, and subject to droughts, agriculture without irrigation would be uncertain and unprofitable. For this reason the British government has promoted extensive irrigation works in India, and, although financially a loss, they are a great boon to the agricultural population, and do much to mitigate those famines which have been so common among them. In Sind 80 per cent of the cultivated area is irrigated, in the United (n.w.) provinces 32 per cent. The greatest irrigation-work is the Ganges canal, 445 miles long. In the south of Europe, particularly in Italy and Spain, irrigation works of a high order have existed from ancient times, and it is supposed that the Romans introduced similar works into Britain, where it is extensively practiced in some parts especially for the growing of grass. In California and elsewhere in the western states and territories of America it is largely employed for crops also, of various kinds. The water not only supplies the moisture so necessary to vegetation, but it fertilizes the soil by furnishing such mineral constituents as salts of potash and soda, sulphates of lime, soluble silica, etc., all of which act on the soil, especially if the water be rich in them, like a dressing of bone-manure. Sewage water is more valuable than pure water, from the large amount of putrified animal and vegetable matter it carries, and the drainage of many towns finds thus profitable application. There are various systems of distributing the water in irrigation to suit the special requirements of different surfaces, positions, and uses of land.

IRVING, Sir Henry (originally John Henry Brodribb), a celebrated English actor, born in 1838. After playing for nearly three years in Edinburgh he appeared at the Princess' theater, London, in 1859. After a short stay here, and a few months in Glasgow, he went to Manchester, where he remained for five or six years. Having returned to London in 1866 he took part in the Belle's Stratagem, Hunted Down, Uncle Dick's Darling, etc.; but his first marked success was as Digby Grant in Albery's Two Roses (in 1870), which was followed by his powerful impersonation of Mathias in The Bells (founded on Erckmann-Chatrian's Polish Jew). His next noteworthy parts were Charles I., Eugene Aram, and Richelieu, in the plays so named. In 1874, at the Lyceum theater, he sustained the part of Hamlet so successfully as to raise himself to the first place among English actors. His chief Shakespearean parts subsequently played are Macbeth, Othello, and Richard III. In 1878 he leased the Lyceum theater for himself, and has since put on the stage in excellent style Othello, The Merchant of Venice, Much Ado About Nothing, Romeo and Juliet, Twelfth Night, Faust, Macbeth, etc., playing in them the principal character along with Miss Ellen Terry. His repeated visits to the United States have been very successful. He has contributed a few papers to the magazines on subjects connected with his art, and has delivered addresses at Oxford and Harvard universities. He was knighted in 1895. He died in 1905.

IRVING, Washington, one of the best American writers, born in New York 3d April, 1783; died 28th November, 1859, at Sunnyside, on the Hudson. In 1802 his Letters of Jonathan Oldstyle appeared in the New York Morning Chronicle. Shortly afterward, he sailed for Europe, visited most continental coun-



tries, and did not return to America until March, 1806. His sketches of Dutch character, in his Knickerbocker's History of New York, which made its appearance in December, 1809, proved him possessed of quaint and genial humor to a high degree. In 1815 he visited England to follow literature as a profession, and settled in London. A series of papers entitled The Sketch Book, first published at New York, 1818, met with such success that an enlarged edition was published in London two years later. For seventeen years until 1832

Irving resided in Europe, principally in England, France, and Spain. This was a period of great literary activity, and brought forth some of his most famous works, such as Bracebridge Hall, The Tales of a Traveler, and The Life of Columbus, for which 5,000, 7,500, and 15,000 dollars respectively were paid him by the publishers. He also acted for a time as secretary to the American embassy in London, and the University of Oxford honored him in 1831 with the degree of D.C.L. Having returned to New York in the spring of 1832 he accompanied the expedition for the removal of the Indian tribes beyond the Mississippi, and collected the material for his Tour on the Prairies, published in 1835. From 1842 to 1846 he acted as United States ambassador at Madrid, and on his return in that year he retired to his country-seat at Sunnyside. His biography of Oliver Goldsmith, Mahommed and his Successors, and the Life of Washington (1855–56) occupied his last years. Other works of his are: The Conquest of Granada, Tales of the Alhambra, Legends of the Conquest of Spain, Voyages of the Companions of Columbus, Adventures of Captain Bonneville, and Astoria. His famous story of Rip van Winkle belongs to the Sketch Book.

IRWIN, May, American actress, born at Whitby, Ont., in 1862. As a star she appeared in The Widow Jones, The Belle of Bridgeport, Madge Smith, Attorney, and other light pieces.

ISAAC (Heb. "he will laugh"), one of the Hebrew patriarchs, the son of Abraham by Sarah, so called to denote the laughter and gladness occasioned by his birth. He is remarkable as the offspring of very old age, Sarah being ninety and Abraham a hundred years old at the time of his birth; for his miraculous escape from death as a burnt-offering; and for the fraud perpetrated upon him, at his wife Rebecca's instigation, by his son Jacob, to the injury of Esau. He died at Hebron 180 years old, and was buried in the cavern of Machpelah, the resting-place of Sarah and Abraham, and of Rebecca.

ISABELLA OF CASTILE, daughter of King John II. of Castile and Leon, consort of Ferdinand the Catholic, was born 1451, married 1469, and died 1504. She was a woman of great charms, courage, and sagacity, and contributed no small share to the many remarkable events of the reign of Ferdinand V., including the introduction of the inquisition, 1480, the discovery of America by Columbus, 1492, and the final expulsion of the Moors after the conquest of Granada.

ISABELLA II., ex-queen of Spain, daughter of Ferdinand III., was born in 1830, and succeeded her father three years after, her mother being appointed queen-regent. The early years of her reign were disturbed by a rising in favor of her uncle, Don Carlos, who, if the Salic law had not been set aside, would have ascended the throne instead of her; but this was finally quelled in 1839. She was declared of age in 1843, and in 1846 was married to her cousin, Don Francisco d'Assisi. Her reign was so despotic that a revolution took place in 1868, which drove her from the country. She resigned her claims to the crown in favor of her son Alfonso, who ascended the throne in 1875. She lives sometimes in Spain, sometimes in Paris.

ISAIAH, the first of the great Hebrew prophets. He began his predictions in the last years of Uzziah's reign. Of his father, Amoz, we know nothing, and of the circumstances of his life but little. We know, however, that he had great influence over the kings and people of Judah, and he is supposed to have died at a good old age at Jerusalem, at the beginning of Manasseh's reign. The first portion of the writings that pass under his name consists chiefly of declarations of sins and threatenings of judgments, while the last 27 chapters, together with some previous ones, hold out promises of a glorious future for Israel. The style throughout is clear and simple, yet dignified and sublime in the highest degree. His authorship of the last 27 chapters is denied by some eminent critics, who unite in ascribing them to a later prophet, perhaps also called Isaiah, while others believe that the name Isaiah stands for a school of prophets; but the integrity of the book has still many able defenders.

ISÈRE, a department of southeastern France; area, 3815 sq. miles. Grenoble is the capital. Pop. 568,693.

ISHMAEL, the son of Abraham by Hagar. He married an Egyptian wife, and had twelve sons and one daughter, who became the wife of Esau. He died when 137 years old. It was predicted that he was to become "a great nation," and the Arabs, especially the Bedouins, are often regarded as descendants of Ishmael.

ISHMAELITES, ISMAELITES, or **ISMAELIENS,** a Mohammedan sect originating in the 1st century of the Hegira, and deriving its name from Ishmael or Ismael, one of Ali's descendants. From the 8th to the 12th century they were powerful in the east, made many conquests, and under various chiefs and names distributed themselves over Irak, Syria, Persia, and Egypt. A small remnant of them still dwell in Syria. The Assassins (which see) were a branch of this sect.

ISH'PEMING, a city in Marquette co., Mich., on the Chi. and N. W., and the Duluth, S. Shore and Atlantic railways, 15 miles w.s.w. of Marquette. It is the center of the great Lake Superior iron-ore region, and is on the Marquette range, the most productive of the four iron ranges. Pop. 15,460.

ISINGLASS, a gelatinous substance, of which the best kind is prepared from the swimming-bladder or sound of the sturgeon, dried and cut into fine shreds, while the American article is obtained from the same part in the cod, hake, etc. It is the basis of the Russian glue, which is preferred to all other kinds for strength. A test solution is also prepared from it, by means of which tannic acid may be distinguished and separated from gallic acid, the former giving it a yellowish-white precipitate. Isinglass boiled in milk forms a nutritious jelly, and a solution in water, with a very small proportion of some balsam, spread on black silk, is the court plaster of the shops. It is also used in fining sherries and other white wines, and in making mock-pearls, stiffening linens, silks, gauzes, etc. With brandy it forms a cement for porcelain and glass.

I'SIS, the principal goddess of the Egyptians, the sister and wife of Osiris, representing the moon, as Osiris did the sun. The Egyptians believed that Isis first taught them agriculture, and as the Greeks offered the first ears gathered to Ceres, so did the Egyptians to Isis. She is represented under various forms. In

Isis.

one representation she has the form of a woman, with the horns of a cow, as the cow was sacred to her. She is also known by the attributes of the lotus on her head, and the sistrum in her hand, a musical instrument which the Egyptians used in the worship of the gods. She is often accompanied by her infant son Horus. In one celebrated Egyptian statue she was shown with her face veiled. She was particularly worshiped in Memphis, but at a later period throughout all Egypt. From Egypt her worship passed over to Greece and Rome, and the abuses which it occasioned at Rome caused its frequent prohibition there. It was, however, repeatedly revived. The Romans never considered the worship, which was introduced among them by Sulla (B.C. 86), altogether reputable, and its attendant immorality was vigorously lashed in the satire of Juvenal.

ISLAM (is-läm), that is complete resignation and submission to the will of God, is the name given in Arabic to the religion originated by Mohammed. The fundamental doctrine of Islamism, and the only one it is necessary to profess to be a Moslem, is expressed in the common formula of faith: "There is no God but Allah, and Mohammed is his prophet," to which the Shiahs or Shiites, that is the majority of Persian and Indian Moslems, add "and Ali is the vicar of God." See Mohammedanism.

ISLAND, a portion of land entirely surrounded by water, and smaller in size than the great masses of land known as continents. Islands are of all sizes, from mere dots of land or rock in the sea to a great mass like Australia, which is often spoken of as a continent. Islands are divided into two distinct classes: continental islands, lying in proximity to continents, and pelagic or oceanic, from their position in the oceans. Continental islands occur along the margin of the continents, and are generally of the same geological structure. Pelagic islands are mostly of volcanic or coral formation. A cluster

of islands, such as the West Indies, the Canaries, the Hebrides, etc., are called an archipelago.

ISLE OF MAN. See Man.

ISLE OF PINES, an island lying south of the western portion of Cuba, to which it belongs, 40 miles by 34, with good pastures and valuable timber.

ISLE OF WIGHT. See Wight.

IS'LINGTON, a mun. and parl. borough in the north of London. Pop. 334,928.

ISMAELITES, a Mohammedan sect. See Ishmaelites.

ISOBAR'IC LINES, lines drawn on a map or globe through all places where the barometer is at the same height at a certain time. Telegraphic communication enables these lines to be drawn with some accuracy.

ISOCHEIMAL LINES. See Isothermal Lines.

ISOCH'RONISM, the property by which a pendulum, or a balance-wheel, or an oscillating particle (as of air) conveying sound vibrates through longer or shorter arcs in the same time (or nearly so). Given a certain length of spring, all the vibrations, large or small, are isochronous. If the spring is shortened the large vibrations take place quicker than the short ones; if, on the contrary, the spring is lengthened, the small arcs are performed quicker than the large ones. For small oscillations a pendulum is almost exactly isochronous, but it is only with the cycloidal pendulum that perfect isochronism is obtained.

ISOCLINIC LINES. See Isogonic Lines.

ISOGON'IC LINES, lines drawn on a map through all places where the declination of the magnetic needle is the same. Isoclinic lines are drawn through places where the inclination or dip of magnetic needle is the same; the zero isoclinic line drawn through places where there is no dip) is called the magnetic equator.

ISOTHER'MAL LINES, lines drawn on a map or globe through places which have the same mean annual temperature. (See Climate.) Isotheral lines are drawn through places having the same mean temperature during the hottest month of the year. Isocheimenal or isocheimal lines are drawn through places having the same mean temperature during the coldest month in the year.

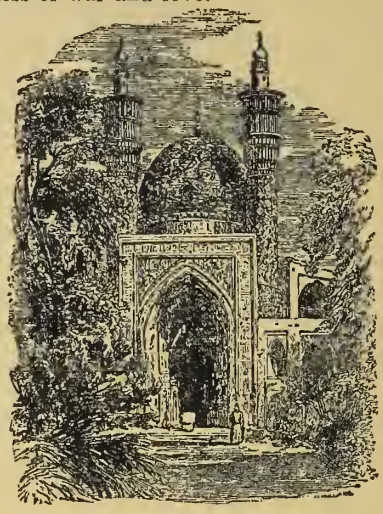
ISPAHAN (is-pȧ-hän'), or **ISFAHAN,** a very ancient city of Persia, and for centuries its capital, in the province of Irak-Ajemi, on the river Zendarud, 210 miles south of Teheran, the present Persian capital. It was once one of the most important and magnificent cities in the east, but little is now left of its former splendor, the largest part of the city being in ruins. Much opium is grown in the neighborhood, as also tobacco, madder, etc., forming important articles of trade. Ispahan is the emporium of the inland commerce of Persia. Pop. 90,000.

ISRAEL and Israelites. See Jews.

ISSUE, in law, the point or matter depending in a suit on which two parties join and put their cause to trial. It is a single, definite, and material point issuing out of the allegations of the parties, and consisting regularly of an affirmative and negative. It is either an issue in law to be determined by the court, or in fact to be ascertained by a jury.

ISTAMBOL. See Constantinople

ISTAR, the ancient Babylonian goddess of war and love.



Mosque of Sultan Hussein, Ispahan.

ISTHMUS, in geography, a neck of land by which two continents are connected, or a peninsula is united to the mainland. Such as the Isthmus of Panama, connecting North and South America

IS'TRIA, a peninsula of triangular form, projecting into the northeast corner of the Adriatic sea, part of the Austro-Hungarian dominions, area 1900 sq. miles. Pop. 344,173.

ITALY, a kingdom in Southern Europe consisting in the main of a large peninsula, having a singular resemblance to a boot in shape, stretching southward into the Mediterranean, but also including a considerable portion of the mainland and the islands of Sicily, Sardinia, Elba, Ischia, Lipari Islands, etc. It is bounded on the north and northwest by the Alps, which separate it from Austria, Switzerland, and France, and on the northeast by Austria; elsewhere it is washed by the Mediterranean, or the Adriatic, an arm of the latter. The area is about 114,000 sq. miles. For administrative purposes it is divided into sixty-nine provinces, which are grouped under sixteen departments, some of them consisting of only a single province.

From 1861, when the kingdom of Italy was constituted until 1865, Turin was the capital, Florence was then selected, and in 1871 Rome. The largest town is Naples; next in order are Rome, Milan, Turin, Palermo, Genoa, Florence, Venice Italy now possesses Massowah and other territory on the east or Red Sea coast of Africa. Pop. 32,475,263.

Among the principal physical features of Italy are the Alps on its northern frontiers, and the chain of the Apennines which run down the middle of the peninsula through its whole length to the Straits of Messina, while numerous branches are thrown off laterally, and form an endless succession of wooded hills, olive-clad slopes, and fertile valleys. In the north, inclosed between the ranges of the Alps and Apennines, is a vast and fertile plain intersected by the Po and its tributaries. Two active volcanoes belong to the kingdom, Vesuvius in South Italy and Etnain Sicily. The only river of any magnitude is the Po, which has a length of about 45 miles before it enters the Adriatic. In the peninsular part of Italy are the Arno, Tiber, Garigliano, Volturno, etc. There are a number of lakes, of which the most important are Lake Maggiore, Lugano, Como, and Garda in the Alpine region; Lakes Trasimeno, Bolsena, and Albano in the Apennine region. Italy is rich in useful minerals, but the scarcity of coal prevents the full development of mining industry. Sulphur, salt, iron, and marble are the chief, though small quantities of lead, copper, zinc, silver, and borax are also obtained.

In the south of Italy the climate resembles that of Africa, being dry and burning and subject to the sirocco. In the northern regions, the neighborhood of the Alps, and the abundance of watercourses, serve to maintain a pleasant temperature. The Riviera or coast of the Gulf of Genoa is a favorite winter resort from more northern regions.

The natural productions of the soil of Italy are various. In the Alpine regions all plants belonging to temperate climate flourish, while the southern regions possess almost a tropical flora. Agriculture forms the chief support of the population, and the land, where not mountainous, is generally productive, although the system of culture adopted is in most parts defective, and large areas remain untilled. The best cultivation, aided by an excellent system of irrigation, is found in Lombardy, Venetia, Piedmont, Tuscany, and the parts of Emilia adjoining the Po. Most kinds of cereals, including wheat, rice and corn, are cultivated. Hemp, madder, flax, tobacco, hops, saffron, and in the extreme south, cotton and sugar-cane are cultivated. Fruits are the object of attention everywhere; and in the cultivation of the olive in particular Italy surpasses all other European states. The fruits include oranges and lemons in the warm regions of the south, besides fig, peaches, apricots, almonds, etc. There is a very large production of wine, but only a few of the wines have any reputation in other countries. The rearing of live-stock is an important industry. The cheese of Italy is famous, especially the Gorgonzola and the Parmesan.

Since the consolidation of the Italian kingdom, the manufactures of the country have made considerable advances. The most important of these are the silk manufactures, Italy as regards the production of raw silk being in advance of all the other countries of Europe. Lombardy, Piedmont, and Venetia are the great centers for its preparation. The cotton manufactures are centered in Upper Italy, chiefly in Lombardy. Woolen manufactures are chiefly carried on in Upper Italy. In the iron industry the department of Lombardy stands at the head; more particularly the provinces of Brescia, Como, and Milan. Tanning, the manufacture of linen, of paper, gold and silver wares, articles in bronze, musical instruments, the making of gloves, boots and shoes, felt and silk hats

are also considerable industries. The manufacture of tobacco is a state monopoly. Of special repute are the cameos and mosaics of Rome, Naples, and Florence; the filigree and coral work of Genoa; the plaited straw and the earthenware manufactures of Italy generally.

The foreign trade is mainly with France and Algeria, Great Britain, Austria, and Germany. The chief imports are wheat, raw cotton, and cotton manufactures, coal, iron, and machinery, wool, sugar, coffee; the chief exports, raw silk, olive-oil, wine, fruits, eggs, coral, hemp, marble, rice, sulphur. The principal ports are Genoa, Leghorn, Messina, Naples, Palermo, Venice, Brindisi, and Catania. The total length of railways opened for traffic in 1903, was 9960 miles; of telegraph-lines, 24,346 miles, nearly two-thirds of the whole belonging to the government.

The constitution of the Kingdom of Italy is a limited monarchy, based upon the fundamental statute granted by King Charles Albert to his Sardinian subjects March 4, 1848. The king, who is hereditary, exercises the power of legislation only in conjunction with a national parliament, consisting of two chambers. The first chamber is called the senate, and is composed of the princes of the blood, and an indefinite number of members appointed for life by the king. The second chamber is called the chamber of deputies, and consists of 508 members, who are elected by a majority of all the citizens above twenty-one years of age who are in the enjoyment of civil and political rights. Each province has the right of independent administration, and the executive power is intrusted to a provincial council. In each province the power of the state is represented by a prefect, who is supported by a council. The executive power of the state is exercised by the king through responsible ministers.

All men capable of bearing arms are under obligation of military service from their twenty-first to the end of their thirty-ninth year. The strength of the standing army on a war footing is in all 793,113. The mobile militia number 307,696, and the territorial militia 2,222,637, giving a grand total for the whole military service of 3,323,446 men. Including vessels afloat or building, the navy numbered 14 battle-ships, several of the newest being among the fastest and most powerful yet constructed anywhere.

The Roman Catholic is the state religion, but all other creeds are tolerated and adherents of all religions have equal municipal and political rights. The pope has his seat at Rome, and his palaces of the Vatican and the Lateran, and his villa of Castel Gandolfo, are not under the jurisdiction of the state. In 1861 the law annihilating ecclesiastical jurisdiction and the privileges of the clergy was extended to the whole of the kingdom, and in 1866 a bill was passed for the suppression (with certain exceptions) of religious houses throughout the kingdom. Elementary education is nominally compulsory, and is entirely supported from the municipal rates; but the number who can neither read nor write still remains very large. For secondary instruction there are a large number of gymnasia and technical schools, and for the higher education there are no less than twenty-one universities, many of them of ancient foundation, and at one time of considerable renown.

The ancient history of Italy will be found under Rome. The modern history begins with 476 A.D., when Odoacer, chief of the Herulians, a German tribe who had invaded the country, was proclaimed king of Italy. After a reign of twelve years he and his followers were overpowered by the Ostrogoths under Theodoric the Great. The Ostrogoths were in turn subdued by Byzantine troops, and Italy came under the dominion of the eastern emperors, who ruled through an exarch residing at Ravenna. In 568 the Lombards (Langobardi), a German people originally from the Elbe, led by their king, Alboin, conquered the Po basin, and founded a kingdom which had its capital at Pavia. The kingdom of the Lombards included Upper Italy, Tuscany, and Umbria, with some outlying districts. But on the northeast coast the inhabitants of the lagoons still retained their independence, and in 697 elected their first doge, and founded the republic of Venice. (See Venice.) Ravenna, the seat of the exarch, with Romagna, Rimini, Ancona, and other maritime cities on the Adriatic and almost all the coasts of Lower Italy, remained unconquered, together with Sicily and Rome. The slight dependence of this part of Italy on the court of Byzantium disappeared almost entirely in the beginning of the 8th century. The power of the pope, though at first recognized only as a kind of paternal authority of the bishop, grew steadily in these troubled times, especially in the struggle against the Lombard kings. In consideration of the aid expected against King Astolphus, Pope Stephen III. (754) not only anointed the king of the Franks, Pepin, but appointed him patrician or governor of Rome. In return Pepin presented the exarchate of Ravenna, with the five maritime cities, to the pope, thus laying the foundation of the temporal power of the holy see. At the invitation of Pope Hadrian I. Charlemagne made war upon Desiderius, the king of the Lombards, took him prisoner in his capital, Pavia (774), and united his empire with the Frankisk monarchy. Italy, was the exception of the Duchy of Benevento and the republics of Lower Italy, thus became a constituent of part the Frankish monarchy, and the imperial crown of the west was bestowed on Charlemagne (800). On the breaking up of the Carlovingian empire Italy became a separate kingdom, and the scene of strife between Teutonic invaders. At length Otto the Great was crowned emperor at Rome (961), and the year after became emperor of what was henceforth known as the Holy Roman Empire.

During the following centuries the towns and districts of North and Middle Italy gradually made themselves independent of the empire, and either formed themselves into separate republics or fell under the power of princes bearing various titles. A large part of Middle Italy at the same time was under the dominion of the popes, including the territory granted by Pepin, which was afterward enlarged on several occasions. In South Italy there were in the time of Charlemagne several independent states. In the 9th century this part of the peninsula, as well as Sicily, was overrun by Saracens, and in the 11th century by Normans, who ultimately founded a kingdom which embraced both Lower Italy and Sicily, and which, though it more than once changed masters, continued to exist as an undivided kingdom till 1282. In that year Sicily freed herself from the oppression of the then rulers, the French, by the aid of Pedro of Aragon (see Sicilian Vespers), and remained separate till 1435. It was again separate from 1458 to 1504, when both divisions were united with the crown of Spain. With Spain the kingdom remained till 1713, when Naples and Sicily were divided by the Treaty of Utrecht, the former being given to Austria, the latter to the Duke of Savoy. In 1720 they were again united under Austria, but in 1734 were conquered from Austria and passed under the dominion of a separate dynasty belonging to the Spanish house of Bourbon. See Sicilies, Kingdom of the Two.

The history of mediæval Italy is much taken up with the party quarrels of the Guelfs and Ghibellines, and the quarrels and rivalries of the free republics of Middle and Upper Italy. In Tuscany the party of the Guelfs formed themselves into a league for the maintenance of the national freedom under the leadership of Florence: only Pisa and Arezzo remained attached to the Ghibelline cause. In Lombardy it was different. Milan, Novara, Lodi, Vercelli, Asti, and Cremona formed a Guelf confederacy, while the Ghibelline league comprised Verona, Mantua, Treviso, Parma, Placenza, Reggio, Modena, and Brescia. Commercial rivalry impelled the maritime republics to mutual wars. At Meloria the Genoese annihilated (1284) the navy of the Pisans, and completed their dominion of the sea by a victory over the Venetians at Curzola. (1298). See Popes, Genoa, Florence, etc.

Up till the time of the Napoleonic wars Italy remained subject to foreign domination, or split up into separate republics and principalities. The different states were bandied to and fro by the chances and intrigues of war and diplomacy between Austria, Spain, and the House of Savoy. During the career of Napoleon numerous changes took place in the map of Italy, and according to an act of the congress of Vienna in 1815 the country was parceled out among the following states:—(1) The Kingdom of Sardinia, consisting of the island of Sardinia, Savoy, and Piedmont, to which the Genoese territory was now added. (2) Austria, which received the provinces of Lombardy and Venetia, these having already been acquired by her either before or during the time of Napoleon. (3) The Duchy of Modena. (4) The Duchy of Parma. (5) The Grand-duchy of Tuscany. (6) The Duchy of Lucca. (7) The States of the Church. (8) The Kingdom of the Two

Sicilies. (9) The Republic of San Marino (10) The Principality of Monaco. The desire for union and independence had long existed in the hearts of the Italian people, and the governments at Naples, Rome, Lombardy, and other centers of tyranny were in continual conflict with secret political societies. The leading spirit in these agitations in the second quarter of the 19th century was Giuseppe Mazzini, who in the end contributed much to the liberation of his country. The French revolution of 1848 brought a crisis. The population of Lombardy, Venetia, Parma, and Modena took up arms and drove the Austrian troops in retreat to Verona. Charles Albert, King of Sardinia, then declared war against Austria, and was at first successful, but his forces were severely defeated at Novara (March, 1849), when Charles Albert abdicated in favor of his son Victor Emmanuel. Meanwhile the pope had been driven from Rome, and a Roman republic had been established under Mazzini and Garibaldi, the leader of the volunteer bands of Italian patriots. Rome was, however, captured by the French, who came to the aid of the pope (July, 1849), who resumed his power in April, 1850, under the protection of the French, and the old absolutism was restored. Similar attempts at revolution in Sicily and Naples were also crushed, but the secret societies of the patriots continued their operations. In 1859, after the war of the French and Sardinians against Austria, the latter power was compelled to cede Lombardy to Sardinia, and in the same year Romagna, Modena, Parma, and Piacenza were annexed to that kingdom, which was, however, obliged to cede the provinces of Savoy and Nice to France. In the south the Sicilians revolted, and supported by a thousand volunteers, with whom Garibaldi sailed from Genoa to their aid, overthrew the Bourbon government in Sicily. Garibaldi was proclaimed dictator in the name of Victor Emmanuel. In August Garibaldi crossed to Naples, defeated the royal army there, drove Francis II. to Gaeta, and entered the capital on the 7th September. Sardinia intervened and completed the revolution, when Garibaldi, handing over his conquests to the royal troops, retired to Caprera. A plebiscite confirmed the union with Piedmont, and Victor Emmanuel was proclaimed king of Italy, thus suddenly united almost in Mazzini's phrase, "from the Alps to the sea." Only the province of Venice and the Roman territory still remained outside. The former was won by Italy's alliance with Prussia in 1866 against Austria. The temporal power of the pope was still secured by French troops at Rome, till the French garrison was withdrawn at the outbreak of the Franco-German war in 1870, when Italian troops took possession of the city in name of King Victor Emmanuel. On 30th June, 1871, the seat of government was formally removed from Florence to Rome. In 1878 Victor Emmanuel died, and was succeeded by his son Humbert I. In 1900 Humbert was assassinated, and his son Victor Emmanuel III. ascended the throne. For some years Italy has been in league with Austria and Germany, an alliance intended to preserve the peace of Europe.

The Italian language is one of the Romance tongues, or tongues derived from the Latin, and is therefore a sister of French, Spanish, and Portuguese. The oldest monuments of Italian literature go little further back than the beginning of the 13th century. The great luminary of this period, and by far the greatest poetic genius which Italy has produced, was Dante (1265–1321). (See Dante.) Francesco Petrarca (Petrarch; 1304–74), another of the great lights of Italian literature, exhibits in his sonnets and canzoni a vein less profound and transcendental than Dante's, but more humanly tender and passionate. Boccaccio (1313–75), a writer of great erudition and fertility, who produced classical translations, biographies, poems, etc., is Italy's first great story-teller. His great work is the Decamerone, a collection of a hundred tales.

During the 15th century the intellectual energy of Italy was almost entirely absorbed in the study of the ancient classics. This period is known as the renaissance, or the revival of arts and letters.

During the first half of the 16th century the renaissance movement perfected itself in every kind of art. In history the most noted names are Machiacelli, (1469–1527), and Francesco Guicviardini (1482–1540). Among the great poets of the period are Lodovico Ariosto (1474–1533), author of Orlando Furioso, a romantic epic, written in continuation of the Orlando Innamorato of Boiardo, and Torquato Tasso (1544–95), whose Gerusalemme Liberata is Italy's chief heroic poem. Among the lyrists of this century we may mention Guidiccioni of Lucca, Pietro Bembo, Michelangelo Buonarroti, and Vittoria Colonna, Benvenuto Cellini (1500–70) the famous artist in metal, whose autobiography is one of the most instructive lights on the spirit and manners of the age, and Giordano Bruno (1550–1600), a bold speculator and undaunted champion of liberty of thought. Of exceptional power was Alessandro Tassoni (1565–1635), who wrote the Secchia Rapita, a burlesque epic, and unquestionably the most important poetical production in Italian of the 17th century. The most eminent names of this period are those of scientific and philosophic writers. Among the former are Galileo Galilei (1564–1642), Torricelli (1608–1647), Viviani (1622–1703); among the latter are Tommaso Campanella (1568–1639), and Giambassista Vico (1668–1744). Among historians the names of Sarpi, Davila, Bentivoglio, and Pietro Giannone deserve mention.

About the middle of the 18th century a complete revolution took place in Italian literature, which was preceded and accompanied by a general elevation of public life. The influence of English and German literature began to communicate a more healthy tone to the national literature. Toward the end of the century the writings of the publicists Gaetano Filangieri and Cesare Beccaria indicate the growth of a social science under the cover of treatises on legislation and penal laws.

From the intellectual and political ferment which arose about the beginning of the 19th century Italy in particular received a much-needed stimulus. Alessandro Manzoni (1784–1883) has given Italy a few lyrics of the first rank, but the work which has most contributed to give him the high place he holds in literature is his novel, I Promessi Sposi. An equally high, if not a higher place, is due to the poetry of Leopardi. His prose is among the best that Italy has produced. The historico-political writings of Vincenzo Gioberti (1801–52) and Giuseppe Mazzini (1805–72) contributed powerfully to stimulate the national feeling and to shape the course of events. In history proper Amari (I Vespri Siciliani), Gino Capponi (Republica di Firenze), Ricotti, Zamboni, and others are the best known names. Among later and contemporary authors we may notice the poet, critic, and essayist Giosue Carducci; and Francesco de Sanetis (1818–86), the Sainte-Beuve and Matthew Arnold of Italy. Ruggero Bonghi, a biographer and essayist of superior rank and a frequent contributor to the periodicals; Edmondo de Amicis, a descriptive writer of considerable power; Angelo de Gubernatis, a writer of literary biographies, etc., are among the best known writers of the day.

ITCH, a contagious cutaneous disease, appearing in small watery pustules on the skin, accompanied with uneasiness or irritation that inclines the patient to rub or scratch. It is occasioned by a small insect, which burrows within the epidermis; and is cured by sulphur, which should be applied externally in the form of ointment,.

ITCH-MITE, a microscopic insect of the class Arachnida, which produces itch in man. The female burrows in the skin, in which she deposits her eggs, which are hatched in about ten days, giving rise to this troublesome affection.

ITHACA, a city and county-seat of Tompkins co., N. Y., 60 miles southwest of Syracuse, at the head of Cayuga lake, and on the Laekawanna, the Lehigh Valley, and other railroads. Cornell university is situated on Cornell heights about 400 feet above the city. Ithaca is in a productive farming region. Its coal trade is extensive, and there are manufactures of castings, machinery, agricultural implements, guns, calendar clocks, salt, glass, wall-paper, etc. Pop. 16,460.

ITŌ (ē'to), Hirobumi, Marquis Japanese statesman, born in the province of Choshin in 1840. He eluded the vigilance of the Yedo spies and spent two years in England. He returned to Japan to dissuade the Choshin officers from war with the combined fleet of British, United States, French, and Dutch men-of-war at Shimonoseki. In 1871 he studied the coinage system of the United States and his report resulted in the adoption of a decimal system of money and the establishment of the mint at Osaka. As one of the Nice ambassadors he accompanied Iwakena round the world in 1872, in an effort to obtain from the powers some modification of the treaties. In 1886 the cabinet was reconstructed according to modern ideas. Ito became minister-president of state. For many years he superintended the reconstruction of law

and the formation of codes no longer based on Chinese models, but in harmony with those in Christendom. He persuaded the court to adopt foreign dress. Ito introduced a new constitution more liberal in its provisions than some European governments allow. Called to the premiership again in 1892, he carried the nation through the Chino-Japanese war of 1894–95. He was again summoned by the emperor to the premiership, and under his direction Japan joined the allies in the rescue of the legations in Peking. He visited the United States on his way to Europe in 1901, received the degree of LL D. from Yale university, and was everywhere welcomed and recognized as one of the profoundest constructive statesmen of modern times. Again called to the premiership he guided the nation through the Russian-Japanese war of 1904–5. In 1904 he was the emperor's special envoy in Korea to consummate the alliance of the two countries. He died in 1906.

I'VAN, or **IWAN,** the name of several rulers distinguished in Russian history. —Ivan III. (or I.), grand-prince of Moscow, was born 1440, ascended the throne 1462, died 1505. He greatly enlarged his hereditary possessions, and married Sophia, niece of the last Byzantine emperor, thus introducing the double-headed Byzantine eagle into the Russian coat of arms. He was the first that bore the title of Czar of Great Russia, and proclaimed the unity and the indivisibility of the Russian dominions.—Ivan IV. (or II.), grandson of the former, was born 1530, succeeded in 1534, was crowned in 1547, died 1584. His atrocities gained him the name of The Terrible. Yet he did much to civilize and improve his people, introduced learned men, artists, and mechanics into Russia, and concluded a commercial treaty with England. He killed his eldest son in a fit of rage.

IVORY, the osseous matter of the tusks of the elephant, and of the teeth or tusks of the hippopotamus, walrus, and narwhal. Ivory is esteemed for its beautiful white or cream color, its hardness, the fineness of its grain, and its susceptibility of a high polish. That of the African elephant is most esteemed by the manufacturer for its density and whiteness. The medium weight of an elephant's tusk is 60 lbs., but some are found weighing 170.

IVORY, Vegetable. See Ivory-palm.

IVORY-BLACK, a fine kind of soft black pigment, prepared from ivory dust by calcination, in the same way as bone-black.

IVORY COAST, part of the coast of West Africa, now giving name to a French colony north of the Gulf of Guinea.

IVORY-NUTS. See Ivory-palm.

IVORY-PALM, a low-growing, palm-like plant, order Pandanaceæ, native of the warmer parts of South America. It has a creeping caudex or trunk, terminal pinnatifid leaves of immense size, male and female flowers on different plants, and fruit in the form of a cluster of drupes, weighing about 25 lbs. when ripe. Each drupe contains 6 to 9 seeds, as large as a hen's egg, the albumen of which when ripe is close-grained and very hard, resembling the finest ivory in texture and color. It is therefore often wrought into buttons, knobs for doors or drawers, umbrella handles, and other articles, and is called vegetable ivory. The seeds are also known as Corozo-nuts, and are exported in considerable qualities

IVY, a climbing plant. The leaves are smooth and shining, varying much in form from oval entire to three and five lobed; and their perpetual verdure gives the plant a beautiful appearance. The flowers are greenish and inconspicuous, disposed in globose umbels, and are succeeded by deep green or almost blackish berries. The ivy attains a great age, and ultimately becomes several inches th'ck and capable of supporting its own stem.

J

J, the tenth letter in the English alphabet, and the seventh consonant. The sound of this letter coincides exactly with that of g in genius. It is therefore classed as a palatal, and is the voiced sound corresponding to the breathed sound ch (as in church). The sound does not occur in Anglo-Saxon, and was introduced through the French. As a character it was formerly used interchangeably with i, and the separation of these two letters in English dictionaries is of comparatively recent date.

American jabiru.

JABALPUR (ja-bal-pör), Jubbulpore, a town of Hindustan, capital of Jabalpur district, Central Provinces. Pop. 90,316. The district has an area of 3918 sq. miles, a pop. of 748,146. A division or commissionership of the Central Provinces has also the same name. It has an area of 19,040 sq. miles, a pop. of 2,375,642.

JAB'IRU, a name of wading birds of the crane kind, resembling the stork, and inhabiting South America, Africa, and Australia.

JACAMAR', a genus of brilliant birds nearly allied to theking fishers, differing, however, by the form of their beaks and

Jacamar.

feet. They live in damp woods, and feed on insects. Most if not all are natives of tropical America.

JAC'ANA, the common name of grallatorial or wading birds, having long toes with very long nails, so that they can stand and walk on the leaves of aquatic plants when in search of their food, which consists of worms, small fishes, and insects. They inhabit marshes in hot climates, and somewhat resemble the moorhen, to which they are very closely allied.

JAC'KAL, an animal of the dog genus resembling a dog and a fox, a native of Asia and Africa. The general color is a dirty yellow. The jackal is gregarious,

Mexican jacana.

hunting in packs, rarely attacking the larger quadrupeds. They feed chiefly on

Black-backed jackal.

carrion, and are nocturnal in habits. The jackal interbreeds with the common dog, and may be domesticated.

JACK-A-LANTERN. See Ignis Fatuus.

JACKASS, Laughing. See Laughing Jackass.

JACKDAW, a common bird of the crow family, smaller than the rook, having a comparatively short bill and whitish eyes; hinder part of the head and neck of a grayish color, back and wings glossy

Jackdaw.

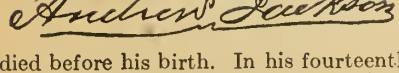
black. The average length is about 12 inches. The nests are built in towers, spires, and like elevated situations, and often in towns. The eggs, from five to six, are of a greenish color. Its food consists of worms, insects, and larvæ. Like their neighbors the rooks, they are gregarious. They are readily domesticated, and may be taught to pronounce words distinctly. Like the magpies, they have attained a notoriety for thieving.

JACKSON, a flourishing town in Michigan, 76 miles west of Detroit, an important railway center, with coal-mines, foundries, engine-works, various manufactures, and the state prison. Pop. 28,000.

JACKSON, a town in Tennessee, with a baptist university and trade in cotton. Pop. 16,400.

JACKSON, the capital of Mississippi, on the Pearl river, 45 miles east of Vicksburg, with a handsome state house. Pop. 9,100.

JACKSON, Andrew, president of the United States from 1829 to 1837, was born in South Carolina in 1767, his father, by origin a Scotchman, having



died before his birth. In his fourteenth year, on the outbreak of the American revolution, he joined a regiment of volunteers to fight in the cause of independence. After losing two brothers in the struggle, he retired from military service and devoted himself to law. He became a judge of the supreme court, representative of Tennessee in congress, and senator. When, in 1812, war was declared against England, he was made major-general of the Tennessee militia. In 1813 he defeated the Creek Indians, who were wasting the country with fire and sword, and made himself master of Pensacola. While engaged in the defense of New Orleans, he established his military reputation by his repulse of the British there in 1815. From 1817–18 he was employed against the Seminole Indians. In 1828 and again in 1832 he was elected president, and the eight years during which he held his office were marked by the rapid extension of democratic tendencies. In 1837 he retired to his estate in Tennessee, and there he died in 1845.

JACKSON, Charles Thomas, American scientist, born at Plymouth, Mass., in 1805. He spent three years studying in Paris, varied by occasional trips to Germany and Italy. He was state geologist of Maine in 1836, of Rhode Island in 1839, and of New Hampshire in 1840. He claimed to be the discoverer of the anæsthetic properties of ether, which involved him in a dispute with Dr. W. T. G. Morton. His claim was supported by many Boston physicians, and a committee appointed by the French academy of sciences to investigate the matter decided that both men were entitled to recognition. He died in 1880.

JACKSON, Helen Fiske Hunt, American poet and novelist, known by the pen-name of "H. H." was born at Amherst, Mass., in 1831. In 1870 she published a volume of "Verses by H. H.," which was widely read. From this time her pen was constantly employed. The most important of her works are the novels Mercy Philbrick's Choice, Hetty's Strange History and Ramona. She also wrote books for children. Several posthumous volumes were brought out shortly after her death among them Sonnets and Lyrics. She died in 1885.

JACKSON, Thomas Jonathan, better known as Stonewall Jackson, an American general, born in 1824 in Virginia. In 1842 he entered the military academy at West Point as cadet. Four years later he received a second-lieutenant's commission, and was engaged in the Mexican war, and for his gallantry was made a captain, and afterward raised to the rank of major. In 1852 he resigned his commission and was appointed professor of mathematics and artillery tactics in the military institute at Lexington, Virginia. On the outbreak of the civil war in 1861 he entered the southern army with the rank of brigadier-general. He commanded the reserve at Bull's Run, and acquired his cognomen of "Stonewall" by the firmness of his troops and his own coolness in the heat of the action. By the end of the year he was made major-general. In June, 1862, he was defeated by General Banks at Cross Keys, but made a masterly retreat. In August he gained the second battle of Bull's Run, and captured Harper's Ferry in September. In the same month he supported Lee at Antietam, and again at Fredericksburg in December. In 1863 he took a prominent part in the battle of Chancellorsville. On the evening of the battle he died of wounds inadvertently received from his own men, 9th May, 1863. He

"Stonewall" Jackson.

was a man of indomitable energy and deep religious feeling.

JACKSONVILLE, a town in Illinois, on a fertile prairie, near a small affluent of Illinois river. It has some elegant public buildings, and various educational and charitable institutions, including the Illinois college, and state asylums for the blind, insane, and deaf and dumb. Pop. 18,400.

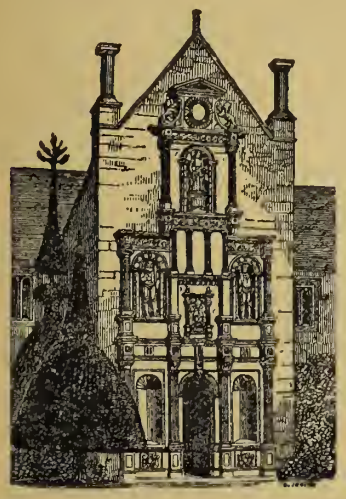
JACKSONVILLE, a town in Florida, the principal port on the river St. John, 25 miles from its mouth, with an active steamboat traffic and a large trade in lumber, cotton, etc. Pop. 1909, 62,000.

JACOB, the son of Isaac, and the grandson of Abraham, the last of the Jewish patriarchs, and the true ancestor of the Jews. Having craftily obtained from the blind and infirm Isaac the blessing of the first-born in place of his brother Esau, he was obliged to flee from the anger of his brother, and took up his abode with his uncle Laban. Here he served twenty years, and obtained Leah and Rachel as his wives. On his return to Canaan he was met by an angel, with whom he wrestled all night, and having gained the victory was thereafter named Israel, that is, the hero of God. Hence the Hebrews from him are called Israelites. A severe blow to him in his old age was the loss of his favorite son Joseph, whose brothers had sold him to Ishmaelite merchants, and led Joseph to believe that he had been devoured by wild beasts. Joseph subsequently became the highest officer at the court of Pharaoh in Egypt, and thus was the means of bringing the whole house of his father to that country. Jacob died, aged 147 years, approximately about 1860 B.C., and according to his wish was buried in the tomb of Abraham, before Mamre in Canaan.

JACO'BEAN ARCHITECTURE, a term applied to the later style of Elizabethan architecture from its prevailing in the time of James I. (L. Jacōbus, James). It differed from the pure Elizabethan chiefly in having a greater admixture of debased Italian forms.

JAC'OBINS, the most famous of the clubs of the first French revolution. When the states-general assembled at Versailles in 1789, it was formed and called the Club Bréton. On the removal of the court and national assembly to Paris it acquired importance and rapidly increased. It adopted the name of Société des Amis de la Constitution, but

as it met in a hall of the former Jacobin convent in Paris, it was called the Jacobin Club. It gradually became the controlling power of the revolution, and spread its influence over France, 1200 branch societies being established before 1791, and obeying orders from the head-



Jacobean architecture—Waterstonhall, Dorset.

quarters in Paris. In 1791 the publication of the Journal de la Société des Amis de la Constitution increased the zeal and number of the societies. The Jacobins were foremost in the insurrectionary movements of June 20 and August 10, 1792; they originated the formidable commune de Paris, and changed their former name to Les Amis de la Liberté et de l'Egalité. For a while they ruled supreme, and the convention itself was but their tool. Robespierre was their most influential member; they ruled through him during the reign of terror, and were overthrown after his downfall in 1794. In that year the convention forbade the affiliation of societies; the Jacobin club was suspended and its hall was closed. The term Jacobin is now often used to designate anyone holding extreme views in politics.

JAC'OBITES, Monophysite Christians in the east, who were united by a Syrian monk, Jacobus Bardai (578), during the reign of Justinian, into a distinct religious sect. The Jacobites, so styled from their founder, consist of about 30,000 or 40,000 families, and are governed by two patriarchs, appointed by the Turkish governors, one of whom, with the title of the Patriarch of Antioch has his seat at Diarbekir; the other resides in a monastery near Mardin, under the style of Patriarch of Jerusalem. Circumcision before baptism and the doctrine of the single nature of Christ (hence their name monophysites) are common to them with the Copts and Abyssinians; but in other respects they deviate less than the other monophysites from the discipline and liturgy of the orthodox Greek Church.

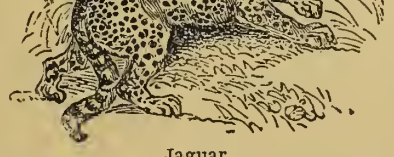
JACQUARD (zhȧk-ăr), Joseph Marie, the inventor of the famous machine for figured weaving named after him, was born at Lyons in 1752. The subsequent prosperity of Lyons is largely attributable to his invention, and a more enlightened generation erected a statue to him on the very spot where his loom was publicly destroyed. He died in 1834.

JACQUARD LOOM, a form of loom, the characteristic of which is a contrivance appended to it for weaving figured goods in various colors. See Weaving.

JAFFA (anciently Joppa), a maritime town in Palestine, 31 miles northwest of Jerusalem, picturesquely situated upon an eminence the port of Nablus and Jerusalem, with which latter it is now connected by railway. Pop. about 30,000.

JAGANNATHA (jag-an-nät'ha), often written Juggernaut, the name given to the Indian god Krishna, the eighth incarnation of Vishnu, and to a very celebrated idol of this deity in a temple specially dedicated to Jagannâtha at Puri, a town in Orissa, on the Bay of Bengal. Great numbers of pilgrims, sometimes a hundred thousand, at the time of the festivals of Jagannâtha, assemble from all quarters of India to pay their devotions at his shrine. On these occasions the idol is mounted on a huge car resting on sixteen wheels, which is drawn by the pilgrims; and formerly, it is said, people were wont to throw themselves under the wheels, to be crushed to death, believing that they would thus immediately enter heaven. This practice, however, is now of rare occurrence; and indeed competent authorities maintain that such deaths were always accidental.

JAGUAR (ja-gwär'), the American tiger, a carnivorous animal of South and Central America, sometimes equalling a tiger in size, of a yellowish or fawn color, marked with large dark spots and



Jaguar.

rings, the latter with a dark spot in the center of each. It rarely attacks man unless hard pressed by hunger or driven to bay. The skin is valuable, and the animal is hunted by the South American in various ways.

JAIPUR (jī-pör'), or Jeypore, a state in Rajputana, Hindustan, governed by a maharajah, under the political superintendence of the Jeypore Residency; area about 15,350 sq. miles. The capital Jaipur is one of the finest of modern Hindu cities. Pop. 160,167.

JAISALMER (jī-sal-mār'), or Jeysulmeer, a state of India in Rajputana, under the political superintendence of the western states agency; area, 16,447 sq. miles. Pop. 115,701. Jaisalmer, the capital, is situated on a rocky ridge.

JALANDHAR (jal-an-dhar'), a town of Hindustan, headquarters of district of same name, in the Punjab; pop. 67,735. The district, a fertile tract between the Sutlej and the Beas, has an area of 1433 sq. miles, a pop. of 907,583. A division or commissionership has also this name; area, 19,006 sq miles; pop. 4,217,670.

JAL'AP, the name given to the tuberous roots of a twining herbaceous plant, with sharply auricled leaves, and elegant salver-shaped deep pink flowers, growing naturally on the eastern declivities of the Mexican Andes, at an elevation of from 5000 to 8000 feet. The jalap of commerce consists of irregular

Jalap plant.

ovoid dark-brown roots, varying from the size of an egg to that of a hazel-nut, but occasionally as large as a man's fist. The drug jalap is one of the most common purgatives, but is apt to gripe and nauseate. It has little smell or taste, but produces a slight degree of pungency in the mouth.

JALA'UN, a town in a district of the same name in the United Provinces of India, 110 miles s.e. of Agra, in a swampy and unhealthy locality. Pop. 10,057.—The district consists of a plain west of the Jumna; area, 1469; sq. miles; pop. 418,142.

JALISCO (hȧ-lis'kō), or **GUADALAJARA,** a state of the Republic of Mexico, bounded on the west by the Pacific. It is chiefly mountainous, but well watered and wooded, and the climate is healthy. The soil is fertile, and wheat and barley are abundantly produced. The capital is Guadalajara. Pop. 1,153,891.

JALPAIGURI (jal-pī-gu-rē'), a town of Hindustan, headquarters of district of same name, in Bengal, on the Teesta; pop. 9700.—The district lies south of Bhutan and north of Kuch Behar; area, 2882 sq. miles; pop. 681,352.

JAMAICA, one of the West India Islands, 80 or 90 miles s. of Cuba, the third in extent, and the most valuable of those belonging to the British; 146 miles in length east to west, and 49 miles broad at the widest part; area, 4256 sq. miles. Among the indigenous forest trees are mahogany, lignum-vitæ, iron-wood, logwood, braziletto, etc. The native fruits are numerous, and many of them delicious; they include the plantain, guava, custard-apple pine-apple, sour-sop, sweet-sop, papaw, cashew-apple, etc. The orange, lime, lemon, mango, grape, bread-fruit tree, and cinnamon-tree have all been naturalized in the island. The chief cultivated vegetable products are sugar, coffee corn, pimento, bananas and other fruits, ginger, arrow-root. Sweet-potatoes, plantains, and bananas form the chief food of the blacks. The cinchona-tree has been introduced and is spreading. Of wild animals only the agouti and monkey are numerous. Domestic fowls thrive well, and cattle-raising has become profitable. Fish abound in the

sea and rivers. The government is vested in the governor, assisted by a privy-council, and a legislative council composed of fifteen members, nine elected, and other nominated or ex officio. Education is rapidly extending; but the general state of morality seems to be low, judging from the fact that the illegitimate births are between 50 and 60 per cent. Population, 755,730.

Jamaica was discovered by Columbus in 1494, in his second expedition to the New World. In half a century the cruelty of the Spanish conquerors exterminated the natives. It was taken by Cromwell in 1655, and ceded to England by the treaty of Madrid in 1670. Since the abolition of slavery the prosperity of Jamaica has greatly decreased. Of late many Chinese and coolies have been employed in agriculture. In 1865 a serious revolt broke out among the blacks at Morant bay, and was put down with considerable severity, by Governor Eyre. Since that time signs of disaffection have disappeared, and a greater state of comfort is said to prevail among the inhabitants generally. Politically dependent on Jamaica are the Cayman islands, and the Turks and Caicos islands.

JAMES, St., called the Greater, the son of Zebedee and the brother of John the evangelist. Christ gave the brothers the name of Boanerges, or sons of thunder. They witnessed the transfiguration, the restoration to life of Jairus' daughter, the agony in the garden of Gethsemane, and the ascension. St. James was the first of the apostles who suffered martyrdom, having been slain by Herod Agrippa A.D. 44. There is a tradition that he went to Spain, of which country he is the tutelary saint.

JAMES, St., called the Less, the brother or cousin of our Lord, who appeared to him in particular after His resurrection. He is called in scripture the Just, and is probably the apostle described as the son of Alphæus. He was the first bishop of Jerusalem, and in the first apostolic council spoke against those wishing to make the law of Moses binding upon Christians. The progress of Christianity under him alarmed the Jews, and he was put to death by Ananias, the high-priest, about A.D. 62. He was the author of the epistle which bears his name.

JAMES I., of Scotland, one of the Stuart kings, born in 1394, was the son of Robert III. by Annabella Drummond. In 1405 he was taken by an English squadron, and the prince was carried prisoner to London. Here he received an excellent education from Henry IV. Robert III. died in 1406, but James was not allowed to return to his kingdom till 1424. On his return to Scotland he caused the Duke of Albany and his son Murdoch to be executed as traitors, and proceeded to carry on vigorous reforms, and, above all, to improve his revenue and curb the ambition and lawlessness of the nobles. The nobility, exasperated by the decline of their authority, formed a plot against his life, and assassinated him at Perth in 1437.

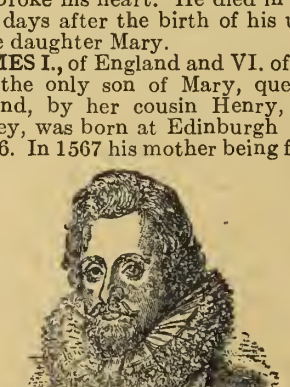
JAMES II., King of Scotland, son of James I., when his father was assassinated in 1437 was only seven years of age. James allied himself with the Douglases, but being deprived of all real power, he resolved to free himself from the galling yoke. This he did in 1452 by inducing the Earl of Douglas to come to Stirling Castle, where he stabbed him with his own hand. He then quelled a powerful insurrection headed by the next earl, whose lands were confiscated. In 1460 he infringed a truce with England by besieging the castle of Roxburgh and was killed by the bursting of a cannon in the 29th year of his age.

JAMES III., King of Scotland, son of James II., was born in 1453. A plot was formed to dethrone the king, and though many peers remained loyal to him the royal army wa defeated at Sauchie, near Stirling, in 1488, the king's son being on the side of the victorious nobles. James escaped from the field, but was murdered during his flight.

JAMES IV., King of Scotland, born 1472, son of James III. Henry VII., then king of England, tried to obtain a union with Scotland by politic measures, and in 1503 James married his daughter, Margaret. A period of peace and prosperity followed. French influence, however, and the hostility of the border chieftains led to angry negotiations, which ended in war. James invaded England with a large force, and himself and many of his nobles perished at Flodden Field in 1513.

JAMES V., of Scotland, born in 1512, succeeded in 1513, at the death of his father, James IV., though only eighteen months old. His mother, Margaret of England, governed during his childhood, Henry VIII., having broken with Rome, and eager to gain over his nephew to his views, proposed an interview at York; but James never came, and this neglect enraged Henry. A rupture took place between the two kingdoms, but James was ill supported by his people, and the disgraceful rout of his troops at Solway Moss broke his heart. He died in 1542, seven days after the birth of his unfortunate daughter Mary.

JAMES I., of England and VI. of Scotland, the only son of Mary, queen of Scotland, by her cousin Henry, Lord Darnley, was born at Edinburgh castle in 1566. In 1567 his mother being forced



James I. of England.

to resign the crown he was crowned at Stirling. When his mother's life was in danger be exerted himself in her behalf (1587); but her execution took place, and he did not venture upon war. In 1589 he married Princess Anne of Denmark. In 1603 he succeeded to the crown of England, on the death of Elizabeth, and proceeded to London. One of the early events of his reign was the Gunpowder plot. In 1606 he established episcopacy in Scotland. In 1613 his daughter Elizabeth was married to the elector palatine, an alliance which ultimately brought the present royal family to the throne. He wished to marry his son Charles, prince of Wales, to a Spanish princess, but this project failed, and war was declared against Spain. The king, however, died soon after in 1625. His name is sullied by the part he played in bringing Raleigh to the block. In his reign the authorized translation of the Bible was executed.

JAMES II., of England, second son of Charles I. and of Henrietta Maria of France, was born in 1633, and immediately declared Duke of York. At the restoration in 1660 he got the command of the fleet as lord high-admiral. He had previously married Anne, daughter of Chancellor Hyde, afterward Lord Clarendon. In 1671 she died, leaving two daughters, who became successively queens of England. He succeeded his brother as king in 1685, and at once set himself to attain absolute power He accepted a pension from Louis XIV. that he might more readily effect his purposes especially that of restoring the Roman Catholic religion. The result of this action was the revolution of 1688, and the arrival of William, prince of Orange. Soon James found himself completely deserted, and he repaired to France, where he was received with great kindness and hospitality by Louis XIV. Assisted by Louis he was enabled in 1689 to attempt the recovery of Ireland; but the battle of the Boyne, fought in 1690, compelled him to return to France. All succeeding projects for his restoration proved equally abortive, and he spent the last years of his life in acts of ascetic devotion. He died at St. Germain's in 1701.

JAMES III., the Pretender. See Stuart (James Edward Francis).

JAMES, George Payne Rainsford, English novelist, born in London in 1801. While still very young he manifested a considerable turn for literary composition, and produced, in 1822, a Life of Edward the Black Prince. Some years afterward he composed his first novel, Richelieu, which was shown in manuscript to Sir Walter Scott, and published in 1829. Its success determined him toward fiction, and a series of novels, above sixty in number, followed from his pen in rapid succession, besides several historical and other works. Latterly he accepted the office of British consul, first at Richmond, Virginia, and afterwards at Venice, where he died in 1860.

JAMES, Henry, American novelist and essayist, born in New York in 1843. He has lived much on the European continent and in England. His novels and tales which depend for their interest on the portrayal of character rather than on incident, are numerous. Among them are: Daisy Miller, A Passionate Pilgrim, Roderick Hudson, The Portrait of a Lady, Tales of Three Cities, The Bos-

tonians, Princess Casamassima. He has also written the life of Hawthorne in the English Men of Letters series, French Poets and Novelists, etc.

JAMES, Jesse W., American outlaw, born in Clay co., Mo., in 1847. During the civil war he joined Quantrills guerrillas and won a reputation for reckless daring. In 1866 he was outlawed and was constantly pursued by officers of the law. He earned a world-wide notoriety by the crimes he committed, his romantic adventures and his almost invariable success. Governor Crittenden offered a reward of $10,000 for his capture, dead or alive, and two members of his own band tempted by the bribe, killed him in his home at St. Joseph, Mo., in 1882.

JAMES RIVER, a river in Virginia, which passes the towns of Lynchburg and Richmond, and communicates, through Hampton roads and the mouth of the Chesapeake bay, with the Atlantic. Its general course is south of east, and its length is 450 miles. The first English settlement in America was formed at Jamestown, 32 miles from the mouth of this river, in 1607.

JAMES' BAY, the southern extension of Hudson's bay, called from Captain James, who wintered here in 1631–32 while trying to find the n.w. passage. It has numerous rocks and islands, and its navigation is dangerous.

JAMESTOWN, a city in Chautauqua co., N. Y., on the outlet of Chautauqua Lake, which supplies water-power, and is employed in several mills. It has manufactories of woolens, alpaca, etc. Pop. 26,890.

JAMESTOWN EXPOSITION, which opened April 26, 1907, was held to commemorate the tercentennary of the first permanent English colony in America which was made by 105 persons in 1607. The importance of this date in American colonial history made the exposition one in which historical significance was the most prominent feature and the exhibit of the national government was largely designed for that purpose, $1,500,000 being appropriated for that end. The buildings erected by the states were also for the most part replicas of historic structures, that of Pennsylvania being a duplicate of Independence hall and Kentucky of the home of Daniel Boone and so on throughout. One of the chief attractions was a naval display in which not only vessels of the American navy but of Great Britain, France, Germany, Japan, Portugal, and Italy took part. The total cost of the exposition is estimated at $10,000,000.

JANESVILLE, a city in Wisconsin, on both sides of Rock river, with active trade and manufactures. Pop. 15,460.

JAN'IZARIES (Turkish, Jeni-tcheri, new soldiers), an Ottoman infantry force somewhat analogous to the Roman prætorians, part of them forming the guard of the sultan. They were originally organized about 1330, and subsequently obtained special privileges, which in time became dangerously great. The regular janizaries once amounted to 60,000, but their numbers were afterward reduced to 25,000. The irregular troops amounted to 300,000 or 400,000. Their power became so dangerous and their insurrections so frequent that several unsuccessful attempts were made to reform or disband them. At various times sultans had been deposed, insulted and murdered by the insurgent janizaries. At last, in June, 1826, they rebelled on account of a proposal to form a new militia, when the sultan, Mahmoud II., having displayed the flag of the prophet, and being supported by their aga or commander-in-chief, defeated the rebels and burned their barracks, when 8000 of them perished in the flames. The corps was abolished, and a curse laid upon the name. As many as 15,000 were executed, and fully 20,000 were banished.

JAN'UARY, the first month of the year, consisting of 31 days. It was by the Romans held sacred to Janus, from whom the name was derived. The Roman year originally began with March, and consisted of only ten months. Numa is said to have added January and February. See Calendar.

JANUS, an ancient Latin divinity, after whom the first month of the year was named. He was held in great reverence by the Romans, and was represented with two faces, one looking forward, the other backward. All doors, passages, and beginnings were under his care. His principal festival was New Year's Day, when people gave each other presents. The temple of Janus, which was open in time of war and closed in time of peace, was shut only three times in the long space of 700 years—once in the reign of Numa, again after the first Punic war, and the third time under the reign of Augustus A.U.C. 744. Vespasian also closed it in A.D. 71.

JAPAN', an island empire in the North Pacific ocean, lying off the east coast of Asia. It comprises four large mountainous and volcanic islands; viz.: Hondo, Kiushiu, Shikoku, and Yesso, besides many other islands and islets, and in particular the Loo-choo and the Kurile groups, and latterly also Formosa. The largest island, Hondo or Niphon, is 800 miles long, and from 50 to 100 miles broad. By the Japanese Niphon or Nipon is employed to describe the whole empire. The name "Jipun," altered by Europeans to Japan, is the Chinese designation. The area of the Japanese islands (excluding Formosa) is 147,600 sq. miles (a fifth more than Britain), with a pop. of 43,760,754.

The Japanese islands form part of the line of volcanic action commencing with the Aleutian isles and terminating in the islands of southeastern Asia. The coasts of the larger islands are extremely irregular, being deeply indented with gulfs, bays, and inlets, which form magnificent harbors. The surface also is generally uneven, and in many instances rises into mountains of great elevation. The island of Hondo is traversed throughout its whole length by a chain of mountains, the highest peak being Fusi-yama (12,230 feet), a dormant volcano covered with perpetual snow. The volcanic vents are numerous in Yesso, Hondo, and Kiushiu, and earthquakes are frequent. The minerals comprise copper, lead, iron, antimony, and sulphur; gold and silver are found, though not to a great extent. Coal is mined in various parts. The rivers are of no great length; Tonegawa, the longest, is only about 172 miles. Biwa, in the south of Hondo is the principal lake, being some 50 miles in length, with an extreme breadth of 20 miles. The harbors most frequented by foreign vessels are the ports of Yokohama, Hiogo (or Kobé), Nagasaki, Hakodate, Niigata, and Osaka.

The climate ranges from an almost Arctic cold in the north to a nearly tropical heat in the south. In the island of Yesso winter begins about October and continues to April, its course being marked by severe frosts and snowstorms; while in Yokohama, again, the winter is genial, with a bright sky, and a temperature much like England. From July to September the thermometer often ranges as high as 95° in the shade.

The vegetation of Japan is very varied in consequence of its wide range of temperature. Rice of excellent quality, as also wheat, barley, sugar-cane, and millet are largely grown; while ginger, pepper, cotton, and tobacco are cultivated in considerable quantities. Tea has been extensively planted lately. The Japanese are skilful gardeners, and the fruits raised include strawberries, melons, plums, persimmons, figs, loquats, and oranges. Of flowers and flowering shrubs the camellia, azelea, hydrangea, lilies, peonies, the chrysanthemum, daphne, and wistaria are indigenous. The forests are extensive; in the south the palm, banana, and bamboo flourish; while in the north, cedar, pine, maple, camphor, and the kadsi or paper-tree are abundant. The chief domestic animals are the horse, which is small and hardy; the ox, which is used as a beast of burden; the dog, which is held sacred; and the cat, which is of a short-tailed species. Rabbits and guinea-pigs are household pets. Bantam fowls, chickens, ducks, and pigeons are reared for food. Of the wild animals, deer are numerous in the north, bears are to be found in Yesso, while boars, wolves, badgers, foxes, monkeys, and hares are not uncommon. Birds are plentiful; falcons, pheasants, ducks, geese, teal, storks, pigeons, ravens, larks, pelicans, cranes, herons, etc. Fish is one of the chief foods, the principal varieties being salmon, cod, herring, sole and mullet. There are also tortoises, lizards, scorpions, and centipedes; and of the insect tribes there are white-ants, winged grasshoppers, and several beautiful varieties of moths. A considerable number of the Japanese animals are the same as those of Britain, or little different.

The Japanese may be regarded as belonging to the great Mongolian family, though ethnologists recognize more than one element in the population. They are generally distinguished by broad skulls and high cheek-bones; small black eyes, obliquely set; long black hair, and a yellow or light-olive complexion; some are good-looking, and many are well-made, active, and nimble. They are a frugal, skilful, persevering, courageous race, who combine these characteristics with much frankness, good humor, and courtesy. A Japanese gentleman's dress

is a loose garment made of silk, gathered in at the waist by a girdle, and extending from neck to ankle; while over this is thrown a wide-sleeved jacket. In the country a short cotton gown is worn, while the lower classes generally wear but scant clothing. The hair is shaved off the front part of the head, while on the back and sides it is gathered up into a knot and fastened with long pins. As regards both clothing and hair-dressing the women very much resemble the men. They also paint and powder themselves to excess. Polygamy is not practiced, but a husband can have as many concubines as he can afford. The Japanese are a holiday-loving people, and delight in the theater. Their two principle religions are Buddhism and Shintoism. The chief observances of Shintoism are ancestral worship and sacrifice to departed heroes. Buddhism is the popular religion. The Japanese language is dual in its nature. Originally a polysyllabic Mongolian tongue, it has been greatly enriched by the addition of many Chinese words, the latter being much used by the literary and governmental classes. The literature of Japan is extensive, and includes all departments—historical scientific, biographical, but is especially copious in poetry and romance. Contact with Europe has affected literary productions; European and not native writings are now mostly read.

In native and imitative manufactures the Japanese are exceedingly ingenious. Their artistic treatment of copper, iron, bronze, silver, and gold is of the finest; while in stone carvings, mosaics, wicker, tortoise-shell, crystal, leather, and especially in wood lacquer-work, they are skilful in the highest degree. Of textile fabrics they excel in cotton-goods, crapes, camlet, brocades, but chiefly in

Japanese work-people.

figured silk. Paper is largely made, and its uses—from a house to a handkerchief—are manifold. Japanese decorative art is remarkable for patient but facile treatment of bird, beast, and flower; the absence of perspective and chiaro-oscuro seems even to add to its effect. The modern art productions, however, have been debased by imitations of bad European work. The chief export is silk, tea coming next, while the imports are mostly textile fabrics, sugar, raw cotton, etc. The standard money unit is the yen or dollar, of the value of 49 cents, divided into 100 sens. The coinage consists of gold, silver nickel, and copper pieces, from the value of 20 yens to $\frac{1}{10}$ sen. There is also a paper currency. The principal weight is the picul = 133 lbs. avoirdupois.

The government of Japan till recently was an absolute monarchy, but a new constitution was proclaimed in February, 1889, providing for the establishment of a House of Peers, partly heriditary, partly elective, partly nominated by the emperor or Mikado (as the ruler is called), and of a House of Commons of 300 members, elected by all men 25 years of age and paying taxes to the amount of 25 dollars annually. There is also a cabinet which includes the prime-minister and the statesmen at the head respectively of the foreign office, the treasury, war, navy, education, public works, religion, justice, and the imperial household. There are resident ministers in most European countries and in the United States. Railways have a length of more than 1900 miles, with nearly 10,000 miles of telegraph-line, while the postal system is excellent. Education is compulsory, the school age being from 6th to 14th year. There is a university at Tokyo, with affiliated colleges. Conscription is the rule, and the army numbers 65,000 men in peace, with a war establishment of 265,000. The navy ranks fifth in effective fighting strength among the navies of the world.

The Japanese profess to have an accurate chronology from 660 B.C., but little confidence can be placed in their annals previous to the 10th century after Christ. A long line of emperors or Mikados reigned over Japan, but for some three hundred years all real power was in the hands of the Shogun or chief minister. Japan was first made known to Europe by Marco Polo. In 1542 it was visited by Mendez Pinto, representing the Portuguese; and in 1549 the Jesuit missionary, St. Francis Xavier, arrived and converted many of the natives. From the overbearing character of the Portuguese traders on the one hand and the jealousy of the Japanese priests, an edict was issued excluding missionaries from the country, and in 1640 the Portuguese were finally expelled. The Dutch established commercial relations in 1600. In 1854 the first modern treaty was made with the United States, and in the same year another was concluded on behalf of Great Britain. A more important treaty with Britain was secured by Lord Elgin in 1858, whereby five ports were fully opened to trade. In 1868 a revolution overthrew the power and office of the Shogun, and the Mikado was restored to his ancient position. All former treaties with European powers were ratified, while the Japanese rapidly became converted to western ideas. The first line of railways was opened from Tokyo to Yokohama in 1872, and the telegraph and telephone have come into common use. Industries of the Eurpean type have been successfully started. In 1894 war broke out with China in connection with Corea. The Chinese were driven out of Corea and their country invaded by the Japanese, and when the war ended in 1895, China had to cede Formosa and pay a large war indemnity to Japan. The virtual annexation of Manchuria by Russia, and her threatened absorption of Corea, led to war between Japan and Russia in February, 1904. The Japanese soon gained command of the sea, and after a striking victory on the Yalu river isolated and invested Port Arthur, and inflicted a series of defeats on the Russians in Manchuria, altogether showing remarkable military and naval skill. (See Russia-Japanese War.)

Peace was re-established Sept. 5, 1905, Japan strengthening her position with a new treaty with Great Britain. In August, 1907, Japan, with the consent of the other powers assumed a protectorate over Corea.

JAPAN CLOVER, a perennial plant with trifoliate leaves, indigenous to China and Japan. Introduced into the United States about 1850, it now forms a valuable forage plant there.

JAPAN CURRENT. See Kuro Siwo.

JAPANNING, is the act of applying varnish to such articles as wood, metal, leather and papier-maché, in imitation of the lacquered work of Japan and China. The article to be japanned, being made thoroughly dry, is first brushed over with two or three coats of seed-lac varnish to form the priming. The next coat of varnish is mixed with the ground tint, desired and where a design is intended it is now painted with colors. The whole is then covered with additional coats of varnish, which are dried and polished as applied. Shell-lac varnish or mastic varnish is employed, unless where the fineness or durability of the work requires the use of copal dissolved in alcohol. See Lacquering.

JA'PHETH, the second son of Noah (Gen. ix. 24). His descendants, according to Gen. x. 5, peopled the isles of the Gentiles, and thus Japheth is often considered the ancestor of most European races.

JARDINIERE (zhär-dēn-yār), an ornamental stand for growing plants, used in decoration of an apartment.

JAROSLAV, a town in Russia, capital of the government of same name, on the Volga, 162 miles northeast of Moscow. Pop. 70,610.—The government has an area of 13,000 sq. miles and a population of 1,095,636.

JAS'MINE, Jas'min, the popular name of plants of the genus Jasmīnum. They

Common white jasmine.

are elegant, branched, erect or climbing shrubs, with imparipinnate, trifoliolate,

or simple leaves, and (usually cymose) white or yellow flowers, from some of which delicious perfumes are extracted. Also written Jessamine.

JASON, in Greek legend, king of Iolcos in Thessaly, celebrated for his share in the Argonautic expedition. On his return to Iolcos with Medea as his wife, he avenged the murder of his parents and his brother by putting Pelias to death. Unable to retain possession of his throne, however, he fled to Corinth, where, after some time, he married Glauce (or Creusa), daughter of the king, and put away Medea and her children. (See Medea.) Different accounts are given of his death. See Argonauts.

JASPER, an impure opaque colored quartz, less hard than flint or even than common quartz, but which gives fire with steel. It is entirely opaque, or sometimes feebly translucent at the edges, and presents almost every variety of color. It is found in metamorphic rocks, and often occurs in very large masses. It admits of an elegant polish, and is used for vases, seals, snuff-boxes, etc. There are several varieties, as red, brown, blackish, bluish, Egpytian.—Agate jasper is jasper in layers with chalcedony.—Porcelain jasper is only baked clay.

JASSY (yäsh'shi), a town of Roumania, in Moldavia, on the Bachlui, several miles from the Pruth. Pop. 90,000, 55,000 being Jews.

JAUNDICE, is not specifically a disease, but is rather the indication of bile-coloring matter in the blood, shown by a greenish-yellow color of the skin. This is caused either by disease of the liver, which prevents that organ from separating bile pigments from the blood, or is due to some obstruction in the bile ducts leading to the intestines. The accompanying symptoms are constipation, colic pains, nausea, headache, languor, and itching of the skin. The yellow color first appears on the whiter parts of the body, as the eye, the neck, the chest, etc. From being a mere tinge of yellow it deepens to a dark orange, and sometimes greenish hue. Whether these symptoms are trifling or serious depends entirely on the cause; due attention to diet, with mild laxative medicines, will often prove beneficial. Besides the milder, there is also a malignant form of jaundice which usually ends fatally.

JAUNPUR (joun-pōr'), a town of India, United Provinces, on the river Gumti, over which there is a fine bridge. Pop 42,771.—The district has an area of 1554 sq. miles; pop 1,209,663.

JAUNTING-CAR, a light car used in Ireland in which the passengers ride back to back on folding-down seats placed at right angles to the axle, the occupants having their feet near the ground. There is generally a "well" between the seats for receiving luggage, and a seat in front for the driver.

JAVA, an island in the Indian Archipelago, the chief of the Dutch colonial possessions; capital, Batavia. Area, 48,830 sq. miles. Pop. 28,745,698. Rice is the chief cereal, but coffee and sugar are the staple products; spices are also grown, and some cotton is raised. Other products are cochineal, pepper, tobacco, tea. The famed poison-tree, or upas, is a noted Javanese plant. The forests consist mainly of teak. There are about 100 kinds of mammalia inhabiting Java. These include the one-horned rhinoceros, tiger, panther, tiger-cat, wild hog, several kinds of deer, several monkeys (but not the orang-utan), and enormous bats. The ox, the buffalo, the goat, are among the domestic animals. Birds are numerous. Serpents of a venomous kind are frequent, as also are crocodiles, lizards, and the land tortoise The native population belong to the Malay race, and are brownish-yellow in complexion with long thick black hair. They are sober, patient, and industrious, but quick to avenge affront. In religion they are nominally Mohammedan. The great mass are devoted to agriculture, living in villages each governed by a native chief. A governor-general rules Java and the whole of the Dutch East Indies. The history of Java is unknown previous to the 11th century, when the Windus founded a dynasty and converted the natives to Brahmanism. This was overthrown by an invasion of the Mohammedans in 1478. Islamism was succeeded by the Portuguese, who arrived in 1511. They were followed by the Dutch in 1595, who wrested from them the supremacy.

JAV'ELIN, a short spear thrown from the hand, and in ancient warfare used by both horse and foot soldiers. The Roman javelin had a barbed iron head and a wooden shaft, the whole length being nearly 7 feet.

JAY, a genus and sub-family of birds belonging to the family of the crows. The jays have the upper mandible or bill notched or indented near its tip, and the feathers on the top of the head are erectile, and can be elevated at will, to form a kind of crest. These birds are readily domesticated, possess a harsh grating note, and are admirable mimics. They feed on fruits, seeds, worms, insects, and the eggs and young of other

The European jay.

birds, etc. The common jay is the size of an ordinary pigeon, the general color is a light brown inclining to red, whilst the larger or primary wing-feathers are of a brilliant blue, marked out by bands of black. The blue color reaches its highest brilliancy in the North American blue jay which otherwise closely imitates its European representative both in size and habits. The blue jay is exceedingly well known in the United States. Another American jay is the Canada jay or "whisky jack," a bird of rather somber coloring, but of the bold, noisy, and active habits of others of the jays.

JAY, John, American jurist and statesman, born in 1745, died in 1829. In 1768 he was admitted to the bar, and in 1774 was chosen a delegate to the first American congress, which met at Philadelphia. In 1776 he was chosen president of congress, and in 1779 he was appointed minister plenipotentiary to Spain. In 1782 he was appointed one of the commissioners to negotiate a peace with Britain, and, along with Adams

John Jay

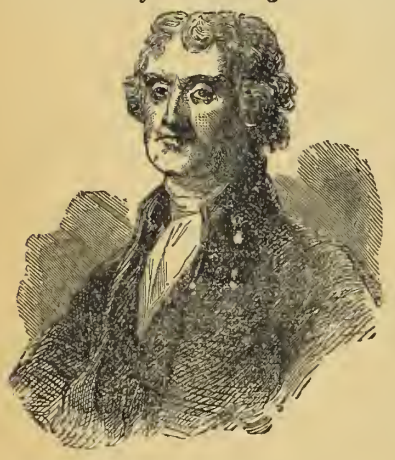
and Franklin, concluded a treaty with the British. Returning to the United States he was appointed head of foreign affairs, and afterward chief-justice. In 1794 he was sent as envoy extraordinary to Great Britain, and concluded a treaty which has been called after his name, and by which $1,000,000 was given to Americans as compensation on account of the illegal captures by British vessels, the eastern boundary of Maine was fixed, etc.

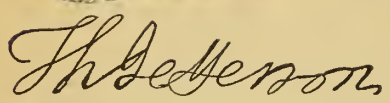
JEDDO. See Yeddo.

JEFFERSON, Joseph, American comedian, was born in Philadelphia in 1829. He appeared as Cora's child in Pizarro when only three years old. In 1856 he made his first trip to Europe. In 1857 he became a member of Laura Keene's company, playing Dr. Pangloss in The Heir at Law. In 1858 he played with E. A. Sothern in Our American Cousin, creating the part of Asa Trenchard. He played Rip Van Winkle for the first time in London in 1865, and it became his most famous role. Since then Dr. Pangloss, Bob Acres in the Rivals, and Rip Van Winkle have been the principal ones in his repertory. He died in 1905.

JEFFERSON, Thomas, the third president of the United States of America, was born April 2, 1743, at Shadwell, in Albemarle co., Virginia. He studied for two years at the college of William and Mary, Williamsburg, and then commenced the study of law. In 1760 he was elected a member of the provincial legislature, and in 1775 he took his seat for

the first time in congress. It was he who drew up the draft of the declaration of independence, which (in a slightly modified form) was signed on July 4, 1776. In 1779–81 he was governor of Virginia. In May, 1784, congress elected him minister plenipotentiary to France, in addition to Adams and Franklin; next year he was appointed sole minister, and his residence in Europe lasted about five years. On his return he was appointed secretary of state by Washington, an office which he continued to fill until the end of 1793, when he resigned. In 1797 he was elected vice-president of the United States; but he was seldom consulted by the president, and he was out of harmony with the government.





In 1800 he was elected president. One of the public acts of his administration was the purchase of Louisiana from France, thus greatly extending the boundaries of the United States. In 1809 he retired to private life at his residence of Monticello, in Virginia, where he died on the 4th of July, 1826, the fiftieth anniversary of the declaration of independence, almost at the same hour as John Adams, the second president. Jefferson was the acknowledged head of the republican party from the period of its organization. He published Notes on Virginia, and various essays on political and philosophical subjects, and a Manual of Parliamentary Practice, for the use of the senate of the United States.

JEFFERSON CITY, the capital of Missouri and county-seat of Cole co., near the geograpical center of the state and 125 miles west of St. Louis; on the south bank of the Missouri river; on the Missouri Pacific, and reached by the Chicago and Alton and the Missouri, Kansas and Texas railroads. Pop. 11,122.

JEF'FERSONVILLE, the county seat of Clark co., Ind , on the Ohio river, opposite Louisville, Ky., with which it is connected by two railroad bridges, and on the Pennsylvania, the Baltimore and Ohio Southwestern, the Cleveland, Cincinnati, Chicago and St. Louis, and other railroads. Pop. 13,124.

JEHOSH'APHAT, son of Asa, and fourth king of Judah, 915-890 B.C. He was noteworthy in his strenuous endeavors to abolish the use of idols. Jehoshaphat denotes "Jehovah's judgment."

JEHO'VAH (Heb. Yahveh), the popular pronunciation of the sacred name of God among the Hebrews, represented in the text of the Old Testament by the four consonants J (or Y), H, V, H. The Hebrews cherished the most profound awe for this name, and this sentiment led them to avoid pronouncing it, and to substitute the word Adonai, which signifies the Lord, which custom still prevails among the Jews. In some portions of the Pentateuch Jehovah is the name regularly applied to God, in others Elohim: this has led to a theory of two authors respectively for these portions. See Elohim.

JELLY, a name for such substances as are liquid when warm, but which coagulate into a gelatinous mass when cold. Animal jelly is prepared from the soft parts of animals, and even from bones when sufficiently crushed. It is a colorless, elastic, transparent substance without taste or smell, and which is soluble in warm water. Analysis shows that its constituents are carbon, hydrogen, nitrogen, with a possibility of sulphur. Vegetable jelly is prepared from the juice of unripe fruit heated in a solution of water to 40° C. This extract when boiled with sugar forms a pleasant and wholesome substance. Doctors now incline to the opinion that animal jelly is less nourishing than ordinary animal food.

JELLY-FISHES, the popular name of certain animals, found in the sea, and often familiarly called sea-blubbers and sea-nettles, from their appearance and stinging property. When in the water they present a singularly beautiful appearance, one of the most common resembling a clear crystalline bell, which swims gracefully through the water by alternately expanding and contracting its body. They are very voracious, and move upon their prey (minute animals) with great rapidity, seizing it with their long stinging tentacles. The phosphorescence of the sea is to some extent explained by the pale light which they diffuse in the darkness.

JENA (yā'nâ), a town of Germany, in the grand-duchy of Saxe-Weimar, 12 miles east of Weimar, on the Saale, a place of little importance except for its university, which was opened in 1558. It has about 60 professors or lecturers, an anatomical theater, botanical garden, zoological museum and other scientific collections, observatory, library of 200,000 volumes, and about 600 students. On 14th Oct. 1806, the Prussians (70,000 men) under Prince Hohenlohe were defeated here by the French under Napoleon (90,000 men). Pop. 20,686.

JENNER, Edward, an English physician, celebrated for having introduced the practice of vaccination as a preventive of the small-pox. He was born at Berkeley in Gloucestershire in 1749; studied at London under the celebrated anatomist John Hunter, and afterward settled in Gloucestershire as a medical practitioner. About 1776 the belief common among the peasants that casual cow-pox acquired in milking cows was a preventive of small-pox, caused him to direct his inquiries to the subject, and led to the introduction of the process of vaccination in 1796. His method at first met with great opposition from the medical profession, but was ultimately universally accepted both by his own and foreign nations. He died at Berkeley in 1823. He published an Inquiry into the Causes and Effects of Cow-pox (1798); Further Observations on Variolæ Vaccinæ or Cow-pox (1799); and a celebrated paper on the Cuckoo in the Philosophical Transactions. See Vaccination.

JEPHTHAH, one of the Hebrew judges, who defeated the Ammonites, but having rashly made a vow that if he was victorious he would sacrifice to God as a burnt-offering whatever should first come to meet him from his house, he was met on his return by his daughter, his only child, whom he sacrificed, in consequence, to the Lord (Judges xi. 29, 40). Some commentators have maintained that this meant devoting her to perpetual virginity in the tabernacle. Jephthah ruled six years as a judge and general (Judges xi., xii.). The sacrifice of Jephthah's daughter is the subject of Handel's last oratorio, and of a Latin drama by George Buchanan.

JER'BOA, a genus of small animals belonging to the order Rodentia or Gnawers, having extremely long hind limbs, which gives them an extraordinary power of leaping, so that their movements seem more like flying than running. The fore limbs are armed with short powerful claws, with which they

Jerboas.

excavate their burrows and extract the roots on which they chiefly live. They are gregarious and nocturnal in their habits, and hibernate during the colder seasons. The jerboas are found chiefly in Asia and Northern Africa. The typical species is the Egyptian form.

JEREMI'AH, the second of the great prophets of the Old Testament, flourished during the darkest period of the Kingdom of Judah, under Josiah, Jehoahaz, Jehoiakim, Jeconiah, and Zedekiah. He was called to the prophetic office about 629 B.C., in the reign of Josiah, and lived to see the capture of Jerusalem by Nebuchadnezzar in 586 B.C., who offered him a home at Babylon but he preferred to stay among the wretched remnant of the people left in Judah. He is said to have been stoned to death in Egypt by some of his countrymen, who were irritated by his re-

bukes. He wrote two Old Testament books, the prophecies of Jeremiah and the Lamentations. The text of the prophecies is in a somewhat confused state, there being no chronological order. Jeremiah wants the dignity and splendor of Isaiah, but exhibits great tenderness and elegiac beauty of sentiment. Some critics also attribute to him the book of Deuteronomy and several of the Psalms. See also Jews.

JER-FALCON. See Falcon.

JERICHO (jer'-i-kō), a considerable town of ancient Judea, on a plain about 18 miles n.e. of Jerusalem, noted, especially in Solomon's time, for its balsam-gardens and its thickets of palm-trees and roses, and carrying on a flourishing trade in balsam and spices. It was the key of Palestine, and was therefore invested by the Israelites who had passed the Jordan under Joshua to conquer this country. Its site is now occupied by the small village of Riha.

JERKED BEEF, from the Chilian word charqui, beef cut into strips of about an inch thick, and dried in the sun to preserve it. It is used in Chile and other parts of South America, and has been tried in Australia. When well prepared it will keep for a great length of time.

JERKIN-HEAD, in architecture, the end of a roof when it is formed into a shape intermediate between a gable and

Jerkin-head roof.

a hip, the gable rising about halfway to the ridge, so as to have a truncated shape, and the roof being hipped or inclined backward from this level.

JEROBO'AM, the name of two kings of Israel.—Jeroboam I., the son of Nebat, on Solomon's death (973 B.C.) was made king of the ten tribes who separated from Judah and Benjamin. He made Shechem his capital, forbade his subjects to resort to the temple at Jerusalem, and set up golden calves at the shrines of Dan and Bethel. He died in the 22d year of his reign.—Jeroboam II., the most prosperous of the kings of Israel, reigned 823–782 B.C. He repelled the Syrians, took their cities of Damascus and Hamath, and reconquered Ammon and Moab. But licentiousness and idolatry were prevalent during his reign. The authorities for the history of his time are 2 Kings, 1 Chron., Amos, and Hosea.

JER'OME, St., full name Eusebius Hieronymus Sophronius, one of the most learned fathers of the Latin Church, was born sometime between 331 and 345 in Dalmatia, of wealthy parents. Died about 420. His Latin version of the Old Testament from the original language was the foundation of the vulgate. He took an active part in many controversies, notably those regarding the doctrines of Origen and Pelagius.

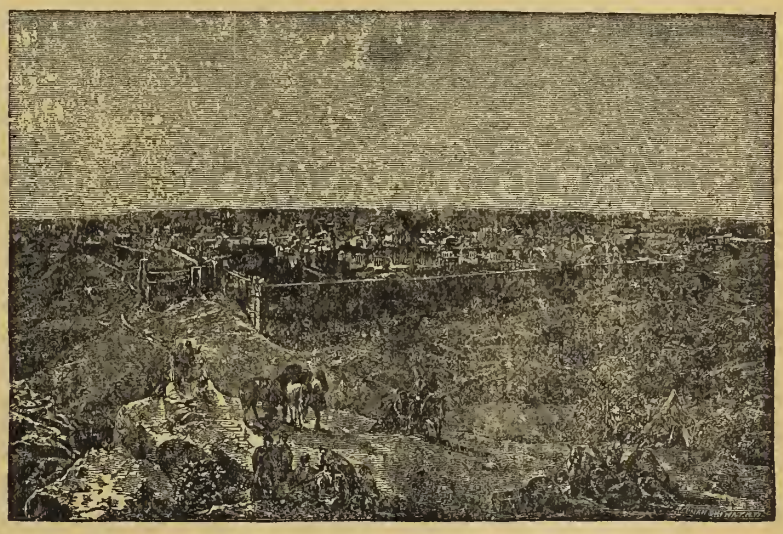
JER'ROLD, Douglas, English humorist and play-writer, born in 1803. His first play, More Frightened than Hurt (1818), was not at first successful, but his Black-eyed Susan (1822) ran for 300 successive nights at the Surrey theater. Jerrold's subsequent dramas were the Rent-day, Nell Gwynne, the Housekeeper, the Prisoner of War, Bubbles of a Day, Time Works Wonders, St. Cupid, the Catspaw, the Heart of Gold, and several others. He contributed extensively to periodical literature. To Punch he contributed his inimitable Mrs. Caudle's Curtain Lectures, Punch's Letters to his Son, etc. Though a terrible master of satire and repartee his sayings had no personal malevolence. He died in 1857.

JER'SEY, the largest and most valuable of the Channel islands, about 15 miles off the northwest coast of France; greatest length, east and west, about 12 miles; greatest breadth, 7 miles; area, 28,717 acres or 44.87 sq. miles. The island is fertile, abundantly wooded, and well cultivated. The climate is peculiarly mild and agreeable. Wheat is the principal cereal raised, and large quantities of grapes, peaches, melons, pears, and other fruits are exported, as also vegetables, and especially early potatoes for the London market. Cows of the famous Jersey or Alderney breed are reared and exported in great numbers. The lower classes speak a sort of old Norman-French dialect, while French is the language of the upper classes and the law courts. Jersey has its own legislature, known as the "States." Appeals lie to the queen in council. The island is attached to the diocese of Winchester. Principal town, St. Helier. Pop. 52,796. See Channel Islands.

JERSEY CITY, the capital of Hudson co., New Jersey, on the Hudson, opposite New York, from which it is about a mile distant and with which it is connected by ferries. The manufacturing establishments are very numerous, and comprise glass works, boiler works, foundries, steel works, breweries, sugar refineries, chemical works, watch works, tobacco works, potteries, etc. Its population is largely made up of the overflow of New York. Pop. 1909, 251,000.

JERSEY, NEW. See New Jersey.

JERUSALEM, one of the most ancient and interesting cities in the world, in Palestine, in the Turkish province of Syria. It stands on an elevated site (about 2500 feet above the sea) within the fork of two ravines, the Valley of Jehoshaphat on the east, and the Valley of Hinnom on the south and west, while a third ravine or valley—the Tyropœon—partially traverses it from south to north. On the east side of this valley is Mount Moriah, now the Mohammedan quarter of the city, where anciently stood the palace and temple of Solomon. Immediately south of this stood the mountain fortress of Zion, known as the City of David, and later as the Akra or Lower City. This part of the city is now waste. According to another view, however, the "City of David" is the Upper City on the opposite or western side of the Tyropœon Valley, and to this the name of Zion is given by current tradition. This part is where the quarter of the Armenians, the citadel, and the protestant church now are. Of the three walls which Jerusalem latterly possessed the first wall, that of David, was for the defense of this Upper City (the traditional but probably not the ancient Zion). The second wall took in a considerable area on the east and northeast, while a new town or suburb, Bezetha, which grew up on the north of this, was enclosed by a third wall, built by Agrippa I. The present limits are much the same as those indicated by the third wall, only that the old Lower City and the southern part of the old Upper City are unpopulated places outside the modern walls. Of the seven gates only five are now used. The interior of the city is much occupied by mosques, churches, and convents. The houses are substantially built of stone, and present in most cases no windows to the streets,



Jerusalem in her decay.

which accordingly—generally narrow, illpaved, and sloping to the center—are merely long lanes with dead walls on each side of them. In the northwest quarter is the Church of the Holy Sepulcher, so called because alleged to contain under its roof the very grave in which the Savior lay. This church, which was built by Helena, the mother of Constantine the Great, is remarkable for the richness of its decorations and the number of pilgrims by whom it is visited. A large area in the east of the city is occupied by the inclosure known as El Haram-Esh-Sherif (The Noble Sanctuary), which is in the form of a regular parallelogram surrounded on all sides by a lofty wall. The most conspicuous building within is the Mosque of Omar, called also Kubbet-es-Sakhrah (Dome of the Rock), a splendid structure of octagonal form which occupies the site of the Jewish temple. Among the notable convents are the Latin convent, and the still more extensive Armenian convent capable of accommodating 1000 pilgrims. The population is 41,500, of whom 10,000 are Christians, 25,000 Jews, and 6000 Mohammedans.

Jerusalem is not mentioned by name till B.C. 1500, when it was in the hands of the Jebusites. The lower part was wrested from them by Joshua, but the upper part continued in their possession till the time of David, who took up his residence in the stronghold of Zion, and made Jerusalem the capital of his kingdom. It reached the height of its glory under Solomon, after whose time it declined. In 586 Nebuchadnezzar took and destroyed the city after a long siege, and carried off those of the inhabitants whom the sword had spared as captives to Babylon. On the return from the captivity the temple was rebuilt, B.C. 515. The walls were not rebuilt till the time of Ezra and Nehemiah, 455 B.C. The city had regained a considerable degree of prosperity, when it was sacked and its walls levelled by Antiochus of Syria in 168. Under the Maccabees, Jerusalem, in common with Judea, became once more independent, 165 B.C. It next became tributary to Rome, and had been greatly beautified and enriched with a fine new temple by Herod when the Saviour appeared. In A.D. 66 Jerusalem was taken by a party of Jews who had revolted against Rome. Titus, the son of the emperor Vespasian, regained it in the year 70, after a terrible siege; the temple was burned, and the city razed to the ground. In 131 Hadrian ordered the city to be rebuilt, but it continued depressed till the beginning of the 4th century, when, Rome having become Christian, Jerusalem shared in the benefit, and assumed the appearance of a distinguished Christian city, under the fostering care of Helena, mother of Constantine the Great. This period of prosperity, prolonged by a succession of Christian emperors, was suddenly terminated in 636, by the conquest of the Mohammedans, under the Arabian Caliph Omar. In 1099 the Crusaders took Jerusalem by storm, and made it the capital of a Christian monarchy, which with difficulty maintained its existence till 1187, when it was finally overthrown by Saladin. In 1517 Jerusalem fell into the hands of the Turks, and has remained to this day a part of the Ottoman empire.

JESTER, or **COURTFOOL,** a buffoon or person maintained by the noble and wealthy to make sport by jests and merry conceits for them and their

Jester—Antiquarian club.

friends. In Britain the last jester regularly attached to the royal household seems to have been Archie Armstrong, the jester of James I. and Charles I.

JES'UITS, or **SOCIETY OF JESUS,** the most celebrated of all the Roman Catholic religious orders, founded in the 16th century by Ignatius Loyola, and established by a papal bull in 1540, the founder being the first general of the order. The members, in addition to the usual vows of poverty, chastity, and implicit obedience to their superiors, were bound by a fourth, viz. to go whithersoever the pope should send them, as missionaries for the conversion of infidels and heretics, or for the service of the church in any other way. The popes Paul III. and Julius III., seeing what a support they might have in the Jesuits against the reformation, granted to them privileges such as no body of men, in church or state, had ever before obtained. They were permitted to enjoy all the rights of the medicant and secular orders; to be exempt from all episcopal and civil jurisdiction and taxes, so that they acknowledge no authority but that of the pope and the superiors of their order; to exercise every priestly function, parochial rights notwithstanding, among all classes of men, even during an interdict; and they could absolve from all sins and ecclesiastical penalties dispense themselves from the observance of fasts and prohibition of meats, and even from the use of the breviary. Their general was invested with unlimited power over the members, the dispersion of whom throughout society, with the most entire union and subordination, was made the basis of the order. The constitution of the body was drawn up in great part by Loyola himself, but the second general, Laynez, had much to do in directing its early movements.

JESUS CHRIST, the founder of the Christian religion; born in Bethlehem according to the received chronology in the year of Rome 754, but in reality some four years earlier, that is, in 4 B.C. He was born of the Virgin Mary, of the tribe of Judah, who was betrothed to Joseph, by occupation a carpenter. Two genealogies of Joseph differing very much after the time of David are given, one by Matthew, chap. i.; the other by Luke, chap. iv. Our information concerning him is derived almost entirely from the accounts of his life written by the four evangelists Matthew, Mark, Luke and John, and incidental notices in other parts of the New Testament. Before the birth of the Holy Child, Joseph and Mary, then residing in Nazareth, went to Bethlehem to be taxed, and it was there, in a manger, the inn being full, that Jesus was born. On the night of his birth an angel announced the coming of a Saviour to shepherds tending their flocks by night in the field. On the eighth day he was circumcised according to the law of Moses. Soon after his birth he was hailed by the adoration of the Magi or wise men of the East, who were miraculously directed to the house where the young child was, and presented royal gifts. Herod, alarmed at hearing of the birth of one who was to be King of the Jews, determined to destroy all the male children of Bethlehem and its vicinity of the age of less than two years, for the purpose of effecting the death of Jesus. But Joseph, being miraculously warned of the danger, fled to Egypt with the virgin and her child, and on his return, after the death of Herod, went to reside at Nazareth in Galilee, whence Jesus was often called a Nazarene. We have no further accounts of Jesus till his twelfth year, when his parents took him with them to Jerusalem. Here after being lost for three days he was found in the temple sitting among the doctors hearing them and asking them questions. Regarding the following eighteen years of his life the evangelists are silent. He probably during this period followed his occupation as a carpenter. At the age of about thirty he appeared as a public preacher, having been baptized in the Jordan by John, who recognized him as the Messiah. He then retired to the wilderness, where he passed forty days in fasting, meditation, and prayer previous to being tempted of the devil as described by the evangelists. He then began to select his disciples, to teach publicly, and perform miracles. Among the notable incidents of his public career are, the changing water into wine at the marriage in Cana of Galilee (his first miracle); the driving of the traders out of the temple during the feast of the passover; the curing by a word a nobleman's son lying ill at Capernaum; his scornful reception as a preacher in the city of Nazareth on account of his humble parentage; the calling of the twelve apostles; the sermon on the mount; the healing of the centurion's servant and the restoration of the widow's son at Nain to life; the healing of the man at the pool of Bethesda; the miraculous feeding of 5000 persons with five loaves and two fishes; the calming of the tempest on the lake of Gennesaret; his healing the Syrophenician woman's daughter of an unclean spirit; the transfiguration on the mountain; the raising of Lazarus at Bethany; the cure of blind Bartimæus at Jericho; the entry with triumph into

Jerusalem; the fourth feast of tne passover with his disciples, known as the Last Supper; the agony in the garden of Gethsemane; the betrayal and the condemnation before the sanhedrim; the trial before Pilate, and the crucifixion on Golgotha or Mount Calvary. The body of Jesus was taken down from the cross by Joseph of Arimathea, and placed in a tomb about which the Jewish priests set a guard. But on the third day, i.e., on the day thence called the Lord's day and made first day of the week, he rose from the dead, appeared to his disciples and others, and on the fortieth day after his resurrection, while with his disciples on the Mount of Olives, was visibly taken up into heaven. These events of his public life are generally considered to have occupied three years.

JET, a solid, dry, black, inflammable fossil substance, harder than asphalt, susceptible of a good polish, and glossy in its fracture, which is conchoidal or undulating. In Great Britain it is found chiefly at Whitby in beds of the Upper Lias shale. It is the altered fossilized wood of coniferous trees. It is wrought into buttons and personal ornaments of various kinds.

JET'SAM, or **JETTISON,** goods thrown overboard from a ship in danger. See Flotsam.

JETTY, a kind of pier or artificial projection of stone, brick, wood, or other material, affording a convenient place for landing from and discharging vessels or boats, or serving as a protection from the violence of the waves; or a jetty may be built out from the bank of a stream obliquely to its course, and employed either to direct a current on an obstruction to be removed, as a bed of sand or gravel, or to deflect it from the bank which it tends to undermine or otherwise injure. In this last sense jetties have been successfully used to deepen river mouths or retard the advance of a bar, as at the mouths of the Mississippi, the Maas, the Danube, the Vistula, and other rivers. Many harbors, such as Calais, Ostend, etc., depend on jetties for their existence.

JEW, The Wandering, a legendary personage regarding whom there are several traditions. One of the most common is that he was a cobbler in Jerusalem by name Ahasuerus, at whose house Jesus, overcome with the weight of the cross, stopped to rest, but who drove him away with curses. Jesus is said to have replied, "Truly, I go away and that quickly; but tarry thou till I come." Since then, driven by fear and remorse, the Jew has wandered, according to the command of the Lord, from place to place, and has never yet been able to find a grave. The legend has been made use of by Shelley, Lewis, Croly, and Mrs. Norton in England, Schubart and Schlegel in Germany, and Sue in France.

JEWS, a Semitic race of people also known as Hebrews, and Israelites, and whose early history is identified with that of Palestine or the Holy Land. The main authority for the early history of this people is the Old Testament. But the chronology is obscure and difficult to harmonize. Jewish history may be considered as beginning with the emigration of the patriarch Abraham, ancestor of the race, from Ur of the Chaldees, probably about 2000 B.C. Abraham removed to the southeast of Palestine, where we find his descendants flourishing when they were led to emigrate to Goshen, in Egypt. The interval is filled up with the history of the patriarchs, Abraham, Isaac, and Jacob. Joseph, a son of Jacob had become viceroy of Egypt, and his father and brothers were received with high favor by the Pharaoh who then ruled in this country. But in course of time the condition of the Israelites, under the rule of the Pharaohs, changed for the worse. They were treated as bondmen, and forced labor exacted of them in an unreasonable degree. According to some authorities the Pharaoh who began to oppress the Israelites was Rameses II., and their deliverance took place under his son. It was perhaps about 1320 B.C., others say 1491, B.C., that a deliverer in the person of Moses led the Israelites out of the land of bondage, where they resided for some 400 years. By this time they formed a community of several millions, divided into twelve tribes, named respectively after Reuben, Simeon, Judah, Issachar, Zebulun, Benjamin, Dan, Naphtali, Gad and Asher, sons of Jacob, and Manasseh and Ephriam, sons of Joseph. Under his leadership they went forth into the wilderness; through him they received the law of the ten commandments on Mount Sinai, and the whole polity by which they were to be governed as a people. A ceremonial of sacrifice was instituted, and Aaron, the elder brother of Moses, and his sons consecrated as a hereditary priesthood, the priestly functions thus falling to the tribe of Levi. The nation was established as a theocracy, and this principle, however often forgotten in times of repose, continued henceforward to be the inspiring idea of national unity throughout the frequent crises of Jewish history. The emigrants first settled at Kadesh on the southern borders of Palestine, where they remained for many years, this being the period spoken of in the scriptures as the forty years' wandering in the wilderness. They now marched northward to find new settlements in Palestine, which they had to wrest by force from the Canaanites. Moses died before entering the promised land, and was succeeded as leader by Joshua, under whom the Israelites advanced to the conquest of the territories of the Canaanites west of Jordan. The former inhabitants, however, were not entirely subjugated, but retained possession of a number of cities, and the twelve tribes settled in districts which were more or less cut off from one another, and which formed an exceedingly loose union of small states under tribal chiefs, at times hard pressed by neighboring peoples. It was only long after, and by a gradual process of absorption, that the Canaanite territories and their inhabitants became amalgamated with the Israelites.

After the death of Joshua, about 1220, or according to another chronology 1427 B.C., a succession of judges or military leaders arose. Among the more remarkable of these judges were Barak, Deborrah the prophetess, Gideon, Jephthah, Samson, and Samuel. About 1070 the Philistines, who inhabited the coast and the low-lying plains west of the mountains of Judah, had defeated the Israelites and subjugated part of the country when Samuel, the "last judge in Israel," was inspired to declare to Saul, a Benjamite, his destiny to become king, and anointed him as such. Saul soon proved his fitness for the post by his successful leadership of the Israelites, and he continued to organize the forces of Israel, and to fight with varying success against their enemies till his disastrous defeat and death at Mount Gilboa, after which the power of the Philistines again predominated on the west side of Jordan. On the other side of the river the military skill of Abner still preserved a kingdom for Saul's son, Ishbosheth, and gradually reasserted with some success his authority in Ephraim and Benjamin. But in Judah, David, a native of Bethlehem, a warrior whom Saul's jealousy had driven into exile and alliance with the Philistines, and who had previously been anointed king in place of Saul, established a separate principality, the capital of which was at Hebron. For several years a hot war was waged between the two Hebrew states, and ended only with the murder of Abner and Ishbosheth, when all the tribes acknowledged David as king. David now transferred his residence from Hebron to Jebus, a fortified city which he wrested from the Canaanites, and called the city of David, afterward Jerusalem. He assailed and subdued the Philistines, Moabites, Edomites, Ammonities, and other surrounding nations, till all the country from the n.e. end of the Red Sea to Damascus acknowledged his authority. To this prosperous kingdom succeeded his son Solomon (B.C. 993, or by the long chronology 1015). His reign, owing to the warlike reputation which the nation had acquired under David, was entirely peaceful. He had no military tendencies, but he took great pains to arrange the administration of the kingdom in an orderly way, and his wisdom as a ruler and judge became proverbial. His alliances with Tyre and Egypt enabled him to carry on an extensive and lucrative commerce. He built the celebrated temple in Jerusalem, and extended and improved the city. His harem contained 700 wives that were princesses, besides 300 concubines. But with these, and with the extended commerce of the kingdom, it was inevitable that foreign elements should be introduced into the Jewish national life. Thus Solomon erected altars for the deities and the worship of the Moabites, the Ammonites the Sidonians, and other nations; and the severe simplicity of old Hebrew manners gave place to luxury and craft.

The splendor of Solomon's reign had entailed heavy exactions upon his people. When Rehoboam, Solomon's son, succeeded, they came with Jeroboam at their head and demanded that he should make their yoke lighter. Rehoboam answered scornfully, whereupon ten tribes revolted and set up Jeroboam as king of a separate kingdom of Israel, with its capital first at Sichem, later at Samaria. Judah, along with a part of Benjamin and the tribe of the Levites, remained loyal to the dynasty of David.

After an unsuccessful attempt to reconquer the kingdom of Isreal, Rehoboam was forced by an invasion of Shishak of Egypt to give up the hope of uniting the two kingdoms. In the next generation things had changed so much that Asa, king of Judah, was obliged to seek the help of Benhadad of Syria against King Baasha of Isráel. Baasha was succeeded by Elah, Elah by Zimri, and Zimri by Omri, under whom the kingdom of Israel seems to have grown powerful. Omri established the capital of the kingdom at Samaria (about 906 B.C.), and subjugated the Moabites. The son of Omri, Ahab, married Jezebel, princess of Tyre, an event which led to the extension of Phœnician idolatry in Israel. As Solomon had done before, Ahab built a temple for the Syrian Baal in his capital. In his reign and subsequently the great prophets Elijah and Elisha played an important part. Ahab was slain at Ramoth-Gilead in battle against the Syrians. He was succeeded by Ahaziah (853–851), and Joram (851–843). The latter was slain by Jehu, a captain of the army, who had been anointed king by command of Elisha. Jehu (843–815) now made a clearance in Samaria of Syrian idolatries, destroying the temple of Baal and putting the priests to death. Under Jeroboam II., fourth in the line of Jehu, the kingdom reached a high point of prosperity (790–749). After Jeroboam's death there was a quick succession of kings, Zachariah, Shallum, Menahem, Pekaniah, Pekah; none of any significance. Under Pekah the kingdom of Israel became tributary to the Assyrians. (See Assyria). Hosea, Pekah's successor, made an ineffectual attempt to free the country from the Assyrian yoke; but finally, in 722, Samaria was captured by the Assyrian king, Sargon, the kingdom of Israel virtually destroyed, and the chief inhabitants carried away and settled in Assyria and Media.

Generally while the kingdom of Israel had been flourishing, that of Judah had stood in the background. Rehoboam was succeeded by Abijam, Asa, Jehoshaphat, the last a powerful and fortunate king. In the hope of putting an end to the war with the kingdom of Israel, Jehoshaphat married his son Jehoram (848–844) to Athaliah, the daughter of Ahab of Israel. After the murder of her son Ahaziah by Jehu, Athaliah seized the supreme power in Jerusalem, and put to death her own grandchildren in order to destroy the line of David, Joash alone being miraculously rescued. Athaliah was overthrown and put to death and the young Joash raised to the throne (837–797). His successors were: Amaziah (797–792), Uzziah (792–740), Jotham, Ahaz, and Hezekiah (727–699). Under Ahaz and Hezekiah Isaiah delivered his sublime prophecies Hezekiah was one of the greatest reforming kings; his influence extended widely over the kingdom of Israel, now in extreme decline. He was miraculously delivered from an invasion of Sennacherib, king of Assyria, by the destruction of the Assyrian army. (See Assyria.) Josiah (641–610) was the last of the pious kings of Judah. He was killed in battle against Necho, king of Egypt. After him there was an uninterrupted succession of weak and incapable monarchs, till under Zedekiah (599–588) the capture of Jerusalem by Nebuchadnezzar, B.C. 588, put an end to the monarchy, Jerusalem being destroyed and many of the people being carried captive to Babylon. The prophet Jeremiah flourished from the reign of Josiah to the captivity.

In 538 Babylon was taken by Cyrus king of Persia, who restored the Jews and appointed Zerubbabel, governor of Judæa, as a Persian province. The great majority of the Jews remained in Persia, however, only about 42,000 returned, and settled chiefly in the vicinity of Jerusalem. About 458 a second return of exiles was led from Persia by Ezra. Along with Nehemiah, who had been appointed Persian governor of Judæa, Ezra promulgated the new law-book, practically identical with the Pentateuch. From the time of Nehemiah to the fall of the Persian empire the Jews continued to live in peace as Persian subjects, but enjoying their own institutions. When Alexander the Great overthrew the Persian empire the Jews readily submitted on being promised the free exercise of their religion (B.C. 332). After the division of Alexander's empire Palestine was long a possession of the Ptolemies of Egypt, under whom it enjoyed a period of tranquility. It was under the patronage of Ptolemy (II.) Philadelphus (reigned B.C. 285–247), according to tradition, that the Septaugint or Greek version of the Old Testament scriptures was made. After the death of Ptolemy Philopator Antiochus the Great of Syria became master of Palestine (B.C. 198). An Egyptian and a Syrian party now arose among the Jews, and gave occasion to civil dissentions, which led Antiochus IV. (Epiphanes) to invade Judæa (B.C. 170), when he took Jerusalem by storm and slaughtered the inhabitants without distinction of age or sex, and endeavored to compel the Jews to give up their religion. At length under the leadership of the Maccabees or Asmonæan family resistance arose, and after a struggle of nearly fourteen years was successful. In 135 B.C. John Hyracnus, son of Simon, a brother of Judas Maccabæus, completed the independence of Judæa, and extended his dominion over the ancient limits of the Hold Land. During his reign the rival sects of the Pharisees and Sadducees became established. Aristobulus I., the son of Hyrcanus, assumed the title of king, which was held by his successors. In B.C. 63 Pompey, called in to help the Pharisees, took Jerusalem, and made the Jews tributary to the Romans. Latterly Herod the Great, who entirely threw off Jewish manners and cultivated the favor of the Romans, was recognized as King of Judæa by the Roman senate. It was in B.C. 4, the last year of his reign, that the birth of Christ took place at Bethlehem. In 6 A.D. Judæa and Samaria became a Roman province under a procurator, who had his seat at Cæsarea, and was subordinate to the prefect of Syria. Pontius Pilate, under whom our Lord's public ministry and crucifixion occurred, was made procurator A.D. 26. For a time the country was again ruled by a king, Herod Agrippa, A.D. 41–44. He persecuted the Christians and put the Apostle James to death. In A.D. 65 a party of the Jews revolted from the Roman yoke and roused the whole of Palestine to insurrection. Vespasian was sent by Nero to suppress it, but before the war was finished was called to the empire and left his son Titus to conclude it. The result was the capture and destruction of Jerusalem, A.D. 70, an event that deprived the Jews of the center of unity to which their national life had hitherto clung. After an insurrection headed by Bar-Cochba, 132–135, Hadrian razed the remains of Jerusalem left by Titus to the ground, and erected in their place a Gentile city, with the title Ælia Capitolina. Jews were forbidden to enter this city on pain of death, and the name of Jerusalem was not revived till the time of Constantine.

Henceforth the Jews became more and more a scattered people, without a country they could call their own. Under the Roman emperors their treatment varied. Under the Emperor Julian they ventured to make preparations for a new temple in Jerusalem. Although this attempt failed, they derived great advantages from their sanhedrim, revived at Tiberias, and their patriarchates (presidencies of the sanhedrim), which were established—one at Tiberias for the western Jews (429); the other for the Jews beyond the Euphrates, latterly at Bagdad. These two patriarchates became points of union, and flourishing Jewish academies arose in the east to serve as seminaries for their learned rabbins. One of the works of these scholars was the collection of the traditionary expositions of the Old Testament, and additions to it, which was completed A.D. 500, and received, under the name of the Talmud, as a rule of faith by the scattered communities of Jews. In time the scattered Jews made themselves masters of the commerce of of the Old World, and, as moneylenders and brokers, were often of great importance to princes and nobles. Even during the dreadful persecutions which they underwent from the cruelty of the Christians they still continued prosperous in Christian countries. They lived more happily, however, among the Mohammedans, although they were distinguished by dishonorable badges and oppressed by heavy taxes; and during the Moorish supremacy in Spain their prosperity was great and their learning flourishing. In the cities of France, Germany, and Italy, after the 11th century, particular streets and inclosed places were assigned to them as a sort of outcast, in consequence of which, in the persecutions during the crusades, thousands often fell victims at once to the popular fury. They were generally pronounced incapable of civil rights and public offices. In Spain and Portugal during the 15th century they yielded to force, and multitudes suffered themselves to be baptized, many were put to death by the inquisition, and at last they were banished from the peninsula. It was only in the end of the 18th century that the Jews began to be put on a level with other citizens, France leading the way after the revolu-

tion, and Prussia following (1811). After repeated unsuccessful attempts to procure their admission into the British parliament, the object was at last effected in 1858. The most remarkable circumstances connected with the modern Jews is the tenacity with which they cling to their ancient religion, and the purity in which on the whole they have retained their racial characteristics in the midst of alien peoples. In modern times they have produced some of the greatest names in letters and arts, as Spinoza, Moses Mendelssohn, Heinrich Heine, Meyerbeer, etc. The total number of Jews throughout the world is estimated at 8,000,000, the greater number being in Russia and Austria-Hungary.

JEWETT, Charles Coffin, American librarian, was born in Lebanon, Me., in 1816. He became librarian at Brown university in 1841 and from 1843 to 1848 was professor of modern languages. He then became librarian of the Smithsonian institution and from 1855 to 1868 was superintendent of the Boston public library. He was the first of the modern school of librarians. At Boston he prepared the card catalogue, one of the first instances of the use of the card catalogue in public libraries. He died in 1868.

JEWETT, Sarah Orme, American author; was born in South Berwick, Me., in 1849. Her best known works are Country By-ways, A Country Doctor, Deep Haven, The King of Folly Island, and Other People. Most of her works consists of short stories noted for their sympathetic portrayal of New England life.

JEWS'-HARP, a toy musical instrument held between the teeth, which

Jews'-harp.

gives a sound by the motion of a tongue of steel, which, being struck by the hand, plays against the breath.

JHALAWAR, Indian native state in Rajputana; area, 3043 sq. miles; pop 343,601. Capital, Jhalra Patan, or Patan; pop. 12,000.

JHANG, town of Hindustan, in the Punjab, about 3 miles from the Chenab. Pop. (with adjoining Maghiana), 24,382. —Jhang district has an area of 5871 sq. miles; pop. 436,841.

JHANSI (jhän'sē), a fortified town in Hindustan, in Gwalior state, Central India. Pop. 55,724.

JIB, a triangular fore-and-aft sail extended on a stay stretching from a bowsprit or jib boom to a mast, the jib boom being a continuation of the bowsprit by a spar run out from the extremity of it.

JIG, a light quick tune or air in $\frac{3}{4}$, $\frac{3}{8}$, $\frac{6}{4}$, $\frac{6}{8}$, $\frac{9}{4}$, $\frac{9}{8}$, or $\frac{12}{8}$ time, to be found in the sonatas of suites of Corelli, Handel, and other composers till toward the middle of the 18th century. The Irish jig, played to a dance also called a jig, is a lively tune of two or three sections written in $\frac{6}{8}$ time.

JINGOISM, during the winter of 1877–78, when England was undecided to interfere forcibly in the war between Prussia and Turkey the excitement in London became intense, and the fighting spirit found vent in a doggerel:

"We don't want to fight, but by Jingo, if we do,
We've got the ships, we've got the men, we've got the money too."

The term, corresponding to "spread-eagleism" in America, has ever since been applied to the warlike advocates of British imperial sway, and has been taken up with the same meaning in the United States.

JINN, Jinnee being the singular, in Mohammedan mythology, a race of genii, angels, or demons, fabled to have been created several thousand years before Adam. They are not immortal; they are to survive mankind, but to die before the general resurrection. Some are good and obedient to the will of God; others are disobedient and malignant. They can assume the shape of the lower animals, and are visible or invisible as they please. Their chief residence is the mountain Kâf in Arabia.

JIT'OMIR, a town of Russia, capital of the government of Volbynia, on the left bank of the Teterew, 80 miles w. of Kiev. Pop. 55,875.

JOACHIM (yō'ä-kēm), Joseph, Hungarian violinist, was born at Kittsu, near Pressburg, Hungary, in 1831. When only seven years old he made his first public appearance at Budapest. In 1844 he visited England and was enthusiastically received. He was appointed concert meister in 1849 of the orchestra at Weimar. In 1854 he accepted the post of concert conductor and solo violinist at the court of Hanover. In 1868 he was appointed head of the hoch schule für ausübende tonkunst. His most important work is the Hungarian concerto in D minor. He is best known as the greatest master of style, repose and tone of his day and generation. He died in 1907.

JOAN, the female pope, according to a story long believed, but now acknowledged to be a fiction, was said to have been a native of Mainz, who, falling in love with an Englishman at Fulda, traveled with him in man's attire, studied at Athens, and visited Rome. Under the name of Johannes Anglicus, she rose by her talents from the station of a notary till she was elected to the papal chair under the name of John VIII. (854 to 856, between Leo IV. and Benedict III.). She governed well, but having become pregnant she was delivered in a solemn procession, and died on the spot.

JOAN OF ARC, the Maid of Orleans, a heroine in French and English history, was born in the village of Domrémy, Basse Lorraine, now department of the Vosges, in 1409 (some say 1412). While she was still a girl she began to be deeply affected by the woes of her country, much of which was conquered by the English, leaving only a small portion to the French king, Charles VII. In 1427 Orleans was being besieged by the English, and its fall would have ruined the cause of Charles. At this time Joan, who had been noted for her solitary meditations and pious enthusiasm, began, as she declared, to see visions and hear angelic voices, which ultimately called upon her to take up arms for Charles; to raise the siege of Orleans, and conduct Charles to Rheims to be crowned. At first she was regarded as insane, but eventually she found her way to the king and his councillors, and having persuaded them of her sincerity, received permission to hasten with Dunois to the deliverance of Orleans. In a male dress, fully armed, she bore the sword and the sacred banner, as the signal of victory, at the head of the army. The first enterprise was successful. With 10,000 men she marched from Blois, and on the 29th April, 1429, entered Orleans with supplies. By bold sallies, to which she animated the besieged, the English were forced from their entrenchments, and Suffolk abandoned the siege (May 8, 1429). Other successes followed; Charles entered Rheims in triumph; and at the anointing and coronation of the king, July 17, Joan stood at his side.

She was wounded in the attack on Paris, where Bedford repulsed the French troops, but continued to take part in the war till May 25, 1430, when she was taken prisoner by the Burgundians, and sold to the English. She was taken to Rouen, and after a long trial, accompanied with many shameful circumstances, condemned to death by the church as a sorceress. On submitting to the church, however, and declaring her revelations to be the work of Satan, her punishment was commuted to perpetual imprisonment. But pretexts were soon found to treat her as a relapsed criminal, and as such she was burned at Rouen, May 30, 1431, and her ashes were thrown into the Seine. She died with undaunted fortitude. Five years after, a court specially constituted by Pope Calixtus III. to examine the charges against the Maid of Orleans, pronounced her innocent. Voltaire, in a notorious burlesque, Southey, Schiller, and others have made her the subject of their verse. Schiller's drama still remains the worthiest monument of her fame.

JOB, the hero of an ancient Hebrew poem, which forms one of the books of the Old Testament. Job, an upright man, with a family of seven sons and three daughters, with large herds and numerous servants, is suddenly, with the permission of Jehovah and by the agency of Satan, deprived of his possessions and his children, and smitten with a sore disease, yet submits patiently to the divine will. Three friends come to console him, and a large part of the poem is occupied with the speeches of his friends, who attribute his misfortunes to wickedness and hypocrisy, and his replies to them, until near the close, when God himself is introduced answering Job out of a whirlwind. In the sequel Job is delivered from his calamities, lives 140 years, becomes richer than he had been before, and begets seven sons and three daughters. The design of the book seems to be to enlarge men's views of the providence of God. It was probably written between the 7th and the 5th centuries B.C., and is certainly not earlier than the time of David. The basis of the story was probably traditional.

JODHPUR (jōd-pör'), a town of Hindustan, capital of the state of Jodhpur. Pop. 60,437.—The state of Jodhpur or Marwar is the largest in Rajputana, having an area of 37,445 sq. miles. Pop. 2,521,727.

JOE MILLER, the name attached to a well-known collection of jests, first published in 1739. The name belonged to a comic actor, who had then a great reputation at a wit and humorist. The real compiler, however, was a John Mottley, an obscure author who died in 1750.

JOHAN'NESBURG, a town in the Transvaal, recognized as the central point of the goldfields of the district stretching southwest from Pretoria to Potchefstrom, and known as the Witwatersrand. The South African war temporarily almost ruined the place. Estimated pop. over 70,000.

JOHN, one of the apostles, often distinguished as St. John the Evangelist, the reputed author of the fourth gospel, three epistles, and the Revelation, was the son of Zebedee and Salome, and the brother of James. Previous to his call by Jesus he was a fisherman on the Sea of Galilee, together with his father, his brother, and Simon Peter and Andrew, who were his partners. John, together with Peter and James, was admitted to a more confidential intercourse with Jesus than the other apostles, and he is repeatedly spoken of as "the disciple whom Jesus loved." His gospel was written later than any of the others—according to some critics to refute particular heresies, and contains fuller details of our Lord's conversations and discourses than the other gospels, and is also more doctrinal in character. Of the three epistles the first had much resemblance to the gospel; but the other two were considerred doubtful even by the early fathers. After the death of Jesus, John continued at Jerusalem, and we afterward find him at Samaria (Acts iii. 1425). Tradition handed down by the fathers make him die at Ephesus, and if he wrote the Revelation he must have been banished to Patmos. The time of his death is unknown.

JOHN, called the Baptist, the forerunner of Christ, was born six months before Jesus (their mothers were cousins), of a Levitical family in Judæa. He lived an austere life, given up to solitary meditations, till A.D. 26, when he began to preach in the deserts of Judæa, announcing that the kingdom of heaven was at hand, and proclaiming himself the harbinger of the Messiah. He baptized many converts, and testified to the higher mission of Jesus at the time of his baptism in the Jordan. To gratify a vindictive woman Herod Antipas, tetrarch of Galilee, caused him to be beheaded in prison.

JOHN, the name of twenty three popes, among whom are the following:—John I. (St. John), pope in 523–526. Theodoric sent him to Constantinople, to induce the Emperor Justin to adopt milder measures toward the Arians, and on his returning without success Theodoric threw him into prison, where he died.—John XII. succeeded Pope Agapetus II. in 956, when only eighteen years old. He was the first pope who changed his name on his accession to the papal dignity. His life was so licentious and disorderly that the Emperor Otho had him deposed by a council in 963, and Leo VIII. elected in his stead. But on Otho's departure John returned to the city with a strong body of followers and drove out Leo. He died in 964.—John XXII., a native of Cahors, was elected pope at Lyons in 1316, after the death of Clement V. He resided at Avignon, and took an active part in the disputes of the emperors Louis of Bavaria and Frederick of Austria. He died in 1334.—John XXIII. (Balthasar Cossa), born in Naples, was a pirate in his youth, afterward studied at Bologna, and was elected pope in 1410, by the council of Pisa, after the death of Alexander V., on condition that, if Gregory XII. and Benedict XIII. would resign, he would also retire to end the schism. He summoned the council of Constance, demanded by the Emperor Sigismund, in 1415, and was deposed by this council as guilty of a long list of heinous crimes. For some years he remained in custody, but was ultimately pardoned by Pope Martin V., and made a cardinal. He died in 1419.

JOHN, King of England, born in 1166, was the youngest son of Henry II., by Eleanor of Guienne. He obtained the crown on the death of Richard in 1199, although the French provinces of Anjou, Touraine, and Maine declared for his nephew, Arthur of Brittany, who was lineally the rightful heir, then with the King of France. In 1205 his great quarrel with the pope began regarding the election to the see of Canterbury, to which the pope had nominated Stephen Langton. The result was that Innocent III. laid the whole kingdom under an interdict, and in 1211 issued a bull deposing John. Philip of France was commissioned to execute the decree, and was already preparing an expedition when John made abject submission to the pope, even agreeing to hold his kingdom as a vassal of the pope (1213). John's arbitrary proceedings led to a rising of his nobles, and he was compelled to sign the Magna Charta or Great Charter, June 15, 1215. But John did not mean to keep the agreement, and obtaining a bull from the pope annulling the charter, he raised an army of mercenaries, and commenced war. The barons, in despair, offered the crown of England to the dauphin Louis, who accordingly landed at Sandwich, 30th May, 1216, and was received as lawful sovereign. The issue was still doubtful when John was taken ill and died at Newark, October, 1216, in the forty-ninth year of his age.

JOHN II., King of France (1319–64). In 1356 he was defeated and taken prisoner by the Black Prince at the battle of Poitiers, and was detained at Bordeaux and at London, where he died in 1364.

JOHN III. (Sobieski), King of Poland, was born at Olesko, in Galicia, in 1624, served in the French army, returned to Poland to repel the Russians in 1648, and greatly distinguished himself in several campaigns against Cossacks, Tartars, and Turks, especially by his defeat of the last in the great battle of Choczim, in 1673 The year after, on the death of Michael Corybut, he was chosen king. His most celebrated achievement was the relief of Vienna, besieged by a great army of Turks, whom he decisively defeated 12th Sept. 1683. He died 17th June, 1696.

JOHN BROWN'S BODY, one of the marching songs of the war. The melody was heard in a southern colored church and fitted to the words of Say, Brothers, Will you Meet Us?

JOHN BULL, a name first used by Dr. Arbuthnot, and since popularized as a typical name suggesting a humorous or burlesque representation of the English character. He is represented as a bluff, jolly, bull-headed farmer.

JOHN, Knights of St., or Knights Hospitallers of St. John, afterward called Knights of Rhodes, and finally Knights of Malta, were a celebrated military religious order, originating in a monastery founded at Jerusalem in 1048 by some merchants from Amalfi. The monastery was dedicated to St. John the Baptist, and the monks, who were called Brothers of St. John or Hospitallers, had the duty of caring for the poor and sick, and in general of assisting pilgrims. In 1118 the order was regularly instituted as a military order, with the duty, in addition to their vows of

Knight of St. John.

chastity, obedience, and poverty, of defending the church against infidels. The brethren were divided into three classes, knights, chaplains, and serving brothers, these last having specially the duties of looking after the sick, and accompanying pilgrims. In 1291 the order was driven from Palestine by the conquests of the Saracens, and after holding Cyprus for a time they occupied Rhodes in 1309, from which they were ultimately driven by Sultan Soliman II in 1522. After that the knights retired to Candia and other places, but finally to Malta, which Charles V. granted them in 1530. In peace they wore a long black mantle and a gold cross of eight points, enameled white; in war they wore a red jacket or tabard, charged with a white cross. In 1798 Malta was unexpectedly attacked and taken by Bonaparte, and about the same time the extensive properties belonging to the order in various countries were confiscated. This may be considered the end of the order as a vital institution, although shortly after the capture of Malta, Paul I., who had been chosen grand-master, took the order under his protection, and it still exists nominally at least. After the

death of Paul the nomination of the head of the order, was vested in the pope.

JOHN OF AUSTRIA, commonly called Don John of Austria, the natural son of the emperor Charles V., was born at Ratisbon in 1545. In 1570 he conducted a campaign against the recalcitrant Moors of Granada with great vigor and relentlessness, and in the following year he commanded the allied fleet which won the great naval battle of Lepanto over the Turks (7th Oct., 1571). In 1576 he was appointed governor of the Netherlands, and had just won along with the Prince of Parma the victory of Gemblours (1578) over William the Silent, when he died, not without suspicion of having been poisoned by his jealous half-brother, Philip II.

JOHN OF GAUNT, a corruption of Ghent, where he was born in 1340, was fourth son of Edward III. and his queen Philippa, daughter of the Earl of Hainaut. He was created Duke of Lancaster, in 1362; served in the French wars, and became governor of Guienne. He assumed in right of his wife the title of King of Castile, invaded the kingdom to assert his claims, but subsequently relinquished them in favor of Prince Henry of Castile, who had become his son-in-law. His eldest son Bolingbroke became king of England as Henry IV. He died 3d February, 1399.

JOHNS HOPKINS UNIVERSITY, one of the foremost universities of the United States, in Baltimore, Maryland, endowed by Johns Hopkins, a merchant of Baltimore, with more than $3,000,000 and opened in 1876. Besides the library there are well-equipped laboratories for chemistry, biology, etc. There is an extensive teaching staff, and instruction is given to two grades of students, graduates and undergraduates. The former are such as have taken a degree here (that of B.A.) or elsewhere, and wish to carry their studies further. This university gives special attention to advanced studies of various kinds, as well as to original research. A number of periodicals are issued in connection with the university. There are, besides numerous scholarships, about twenty fellowships, each of the value of $500 annually. A hospital, also endowed by Johns Hopkins, is connected with this institution.

JOHNSON, Andrew, 17th president of the United States, born in North Carolina, 1808, died 1875. He was self-

Andrew Johnson.

educated; entered congress as a democrat in 1843, and the senate in 1857. On Lincoln's election he became vice-president, and thus became president upon the assassination of Lincoln in April, 1865. During his term of office he was in constant conflict with the senate, and was impeached by the house of representatives of high crimes and misdemeanors (Feb 1868), the trial ending in a techincal acquittal. A general amnesty to the rebels was his last presidential act.

JOHNSON, Reverdy, American jurist, born at Annapolis, Md., in 1796. In 1817 he removed to Baltimore, and was successively deputy attorney-general of Maryland and for four years a state senator. He represented his native state in the United States senate from 1845 to 1849, when he resigned his seat to enter President Taylor's cabinet as attorney-general. In 1863 he was again elected to the United States senate, but before the expiration of his term was appointed minister to England in 1868. He died in 1876.

JOHNSON, Richard Mentor, American soldier, was born in Kentucky in 1781; he entered the state legislature in 1804, and three years later was elected to congress as a republican. He sat in congress for twelve years, but during the war with Great Britain left his legislative duties to assist in the campaign. He took part in the engagement at Chatham, Ontario, and at the battle of the Thames, October 5, 1814, killed an Indian chief, and was himself severely wounded. From 1819 to 1829 Mr. Johnson served in the United States senate, and from 1829 to 1837 again in the lower house of congress. He was a candidate for vice-president on the ticket with Van Buren in 1836, failed to obtain a majority of the electoral votes, but was chosen by congress. He was a member of the legislature of Kentucky at the time of his death in 1850.

JOHNSON, Rossiter, American author, was born in Rochester, in 1840; was graduated at the University of Rochester in 1863. From 1864 until 1868 he was co-editor of the Rochester Democrat, a republican newspaper, and from 1869 until 1872 edited the Concord (N. H.) Statesman. From 1873 until 1877 he was one of the editors of the American Cyclopædia, and in 1879–80 assisted Mr. Sidney H. Gay in preparing the last two volumes of the so-called Bryant's History of the United States. In 1883–1890 he was editor of the Annual Cyclopædia. His original publications include Idler and Poet, A History of the French War, A History of the War Between the United States and Great Britain and a History of the United States.

JOHNSON, Dr. Samuel, eminent English author, was born at Lichfield 1709, died at London, 1784. Rasselas (1759), written in a week to pay for his mother's funeral, is one of the most interesting and characteristic of his works. For eighty years from 1747 Johnson's attention was chiefly engaged by his Dictionary of the English Language, a work which appeared in 1755, and is highly honorable to the author in the circumstances in which it was produced, but is of little real philological value. In 1765 appeared his long-promised edition of Shakespeare. In 1773 Johnson made a tour to the Hebrides in company with his friend Boswell, of which he gives a highly instructive account in his Journey to the Western Isles of Scotland. In 1775 he received the diploma of D.C.L. from the University of Oxford, and soon after visited France in company with the Thrales. His last literary

Samuel Johnson.

undertaking was his Lives of the Poets, which was completed in 1781. He was buried in Westminster Abbey. Boswell's Life may be said to convey a more favorable impression of Johnson's real strength, both in thought and language, than anything in the works which he wrote and published.

JOHNSTON, Albert Sidney, American soldier, was born in Kentucky in 1803. After graduating at West Point in 1826 he served for eight years in the United States army, emigrated to Texas in 1834, and entered the Texan service as private in 1836. His promotion was so rapid that in 1838 he was appointed commander-in-chief, and till 1840 acted as secretary of war. From 1840 till 1846 he lived in retirement on his farm in Texas; but in the latter year he accepted the colonelcy of a regiment of Texan volunteers to serve against Mexico. As a staff-officer he was present at the battle of Monterey in September, 1846. Texas joined the Union in 1846; and in 1849

A. S. Johnston.

Johnston received a major's commission in the United States army. After various services he won the rank of brevet brigadier-general by his skilful conduct of the expedition sent to Utah in 1857 to bring the Mormons to order. In January, 1861, he was transferred from the command of the Texas department to that of the Pacific department; but in April he was superseded, probably on account of his secessionist sympathies. He resigned his national commission in May, 1861, and accepted a command in the confederate army. While acting as commander-in-chief at the battle of Shiloh, he was killed, April 6, 1862.

JOHNSTON, Joseph Eccleston, American soldier, was born in Prince Edward co., Va., in 1807. He graduated at the

military academy at West Point in 1829, and served in various military capacities, chiefly in the topographical engineers, until the outbreak of the civil war, at which time he was made quartermaster-general, with the rank of brigadier-general. He resigned his commission April 22, 1861, and entered the confederate service as major-general. During the earlier part of the campaign of 1862 he was in command of all the confederate forces in Virginia, and was severely wounded at the battle of Fair Oaks, near Richmond, May 31st. In November, having been made lieutenant-general, he was assigned to the command of the military department of Tennessee, and in the following spring made an ineffectual effort to relieve Vicksburg, on the Mississippi, which was then besieged by General Grant.

J. E. Johnston.

After the defeat of General Bragg, at Chattanooga, November 25, 1863, Johnston was assigned to the command of all the confederate forces in the southwest, with the rank of general. In 1864 he was at the head of the forces which opposed Sherman in his famous "march to the sea." Having learned that Lee had surrendered the army of Virginia to Grant, Johnston capitulated to Sherman at Burham's station, N. C. In March, 1885, he was appointed commissioner of railroads by President Cleveland. He published a narrative of military operations conducted by him during the war between the states. He died March 21, 1891.

JOHNSTOWN, a town in Cambria co., Pennsylvania, situated on the Conemaugh river about 89 miles s.e. of Pittsburg. It is the center of a flourishing manufacturing district, and the town and neighborhood in great part belong to the Cambria Iron co., who are said to employ some 5000 people in their iron-mills. In 1889 Johnstown and district was laid waste by the bursting of Conemaugh lake and reservoir, situated about 10 miles above the town. Houses, churches, and factories were driven by the flood into a mass of ruin, which was finally piled up against the railway bridge at Johnstown, and its destruction completed by the outbreak of fire. About 9000 people perished. Pop. 40,125.

JOHORE, a native state under British protection at the s. extremity of the Malay peninsula; area, 9000 sq. miles; pop. 200,000.

JOISTS, in carpentry, are the beams of timber to which the flooring of rooms and the laths of a ceiling are nailed, and which rest on the walls or girders, and sometimes on both. They are laid horizontally, and in parallel equi-distant rows.

JOKAI (yō'kâ-i), Mor, Hungarian novelist, born at Komorn 1825. His first novel, Working Days, was published in 1845, and since then he has produced about 200 volumes of romances and novels, dramatic poems, humorous essays, etc. Died in 1904.

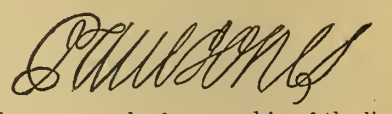
JO'LIET, capital of Will co., Illinois, 37 miles s.w. of Chicago. It has an important state prison, large limestone quarries, and steel and iron works, etc. Pop. 32,650.

JOLIET, Louis, an explorer of the Mississippi valley, was born in Quebec in 1645. In 1672 Governor Frontenac and Talon made an effort to trace the course of the Mississippi river, which was then supposed to discharge itself into the Sea of California. Joliet was intrusted with this enterprise. He descended the Wisconsin and Illinois rivers, and on June 17, 1673, entered the Mississippi. After visiting several Indian villages on its banks, he became assured that the river emptied its waters into the Gulf of Mexico, and began his return journey. He reached Lake Winnipeg at the end of September, where he spent the winter at the mission of St. Francis Xavier, and in 1674 returned to Quebec. On the way Joliet lost his map and papers by the upsetting of his canoe in the Lachine rapids of the Niagara river. He was thereafter made governor of the colony, and was married. About 1680 he was granted Anticosti Island, where he built a fort, which was destroyed by the British, and his wife taken prisoner. Later Joliet explored Labrador, and on April 30, 1697, was granted the seigniory of Joliet, near Quebec. He died in 1700.

JOLLY-BOAT, one of the smaller boats carried by a vessel, and used especially for communicating with the shore. See Boat.

JONAH, one of the minor prophets, son of Amittai, and according to 2 Kings xiv. 25, a contemporary of Jeroboam II., was born at Gath-Hepher, in Galilee. The book which bears his name is historical rather than prophetical, and the miraculous event of Jonah remaining three days and three nights in the belly of a fish has been regarded by some as an allegory. Orthodox theologians, however, are generally of opinion that the mention of it by Christ (Mat. xii. 39), obliges us to regard the event as really historical. Jonah's grave is shown at Mosul, the ancient Nineveh, and also at Gath.

JONES, John Paul, a commander in the American naval service, was born in Kirkcudbrightshire, Scotland, in 1747. His father, whose name was John Paul, was gardener to the Earl of Selkirk. He entered the merchant service, was engaged in the American and West Indian trade, and is said to have realized a handsome fortune. On the outbreak of war between the colonies and mother country he offered his services to the former, and in 1778, being then in command of the Ranger, he made a descent on Whitehaven, set fire to the shipping, and plundered the Earl of Selkirk's mansion. Next year, in command of the Bon Homme Richard (42 guns) and a small squadron, he threatened Leith, and captured the British sloop of war Serapis after a bloody engagement off Flamborough Head. Jones, upon his arrival in Paris was presented by Louis XIV. with a gold mounted sword and was decorated with the Cross of the Order of Military Merit. Congress voted him a gold metal, passed a resolution commending his "zeal," prudence, and intrepidity," assigned him to



the command of a new ship of the line then building, and proposed to create for him the rank of rear-admiral. He also received a complimentary letter from General Washington. In 1788 entered the Russian service with the rank of rear-admiral, but owing to the jealousy of Russian commanders soon retired from this service. He returned to Paris, where he died in 1792. He was given a public funeral by the National Assembly. In 1906 his remains were brought to the United States in an American warship and buried with imposing ceremonies.

JONES, John Percival, American legislator and politician, born in Herefordshire, England, in 1830. He was brought to the United States in 1831 by his parents, who settled in northern Ohio. From 1863 to 1867 he was a member of the California state senate. In 1867 he removed to Nevada, and became superintendent and part owner of the famous "Crown Point" silvermine, the subsequent development of which brought him a large fortune. In 1873 he was elected by the Nevada legislature to succeed James Nye in the United States senate, and was reëlected as a republican in 1879, 1885, and 1891, and as a "Silverite" in 1897. He favored the free coinage of silver without regard to the rest of the world, and on that issue left the republican party and supported Bryan in 1896. During the campaign of 1900 he returned to the republican party, though without giving up his free-silver theories.

JONES, Samuel Porter, commonly known as "Sam Jones," an evangelist of the Methodist Episcopal Church South. Was born in Chambers co., Ala., in 1847. He was converted in 1872 and

ordained the same year and at once began preaching. His success was remarkable and he became widely known. Many of his sermons have been published in his works, Sermons and Sayings by Sam Jones, Quit Your Meanness, Sam Jones' Own Book. He died in 1906.

JONSON, Ben or Benjamin, a celebrated English poet, the contemporary and friend of Shakespeare. We was born June 11, 1574, at Westminster. In 1599 he brought out his comedy of Every Man out of his Humor, which was followed by Cynthia's Revels (1600); the Poetaster (1602); Sejanus, a tragedy (1603). In 1605 his comedy of Volpone or the Fox appeared; in 1609 Eipcœne or The Silent Woman; in 1610 the Alchemist; in 1611 Catiline, a tragedy; and in 1614 Bartholomew Fair, a complete picture of Elizabethan low life. In 1619 he received the honorary degree of A.M.

Ben Jonson.

from Oxford University, and on the death of the poet laureate was appointed his successor, and the salary raised to the sum of $500 by Charles I. His latter days were spent, not perhaps in much pecuniary prosperity, but certainly in fame and honor, as the acknowledged chief of English literature. He died Aug. 6, 1637. He was buried in Westminster Abbey, where a monument was erected to his memory with the inscription, "O rare Ben Jonson." Jonson's best dramas are excellent in plot and development, have strongly conceived characters and excellent traits of humor.

JOPPA. See Jaffa.

JOPLIN, a city in Jasper co., Mo., on the Mo., St. L. and S. Fran., the K. C., Ft. S. and Mem., the K. C., Pitt, and Gulf, and the Mo. Pac. railways; 168 miles s. of Kansas City. It is the center of the Southwest Missouri lead and zinc district. Pop. 31,400.

JORDAN, David Starr, American educator, born at Gainesville, New York, in 1851. In 1872 he became an assistant to the United States Fish Commission, and began the study of fishes. He is one of the foremost ichthyologists in the world. From 1875 to 1879 he was professor of biology at Butler University, Indianapolis, Ind., and in the latter year was elected to the chair of zoölogy at the University of Indiana at Bloomington, of which he became president in 1885. In 1891, on the founding of Leland Stanford Junior University, he became its first president, and under his able supervision the institution was successfully organized. In 1897 he was a special United States commissioner to investigate the fur-seal fisheries in Alaska.

JORDAN, the largest river in Palestine and one of the most celebrated rivers in the world. It rises from several sources, uniting in Bahr el-Huleh, or the Waters of Merom. From this point it flows with a rapid current in a narrow rocky bed and falls after a southerly course of about 10 miles into Lake Tiberias. Shortly after leaving the south end of this lake it enters a broad valley or ghor, called in the Bible "the plain;" and continuing a southerly but singularly crooked course of about 70 miles direct distance, or 200 including windings, falls into the north end of the Dead Sea, having received the Zerka or Jabbok, also on the left, and numerous smaller affluents. The upper part of the valley of the Jordan is hilly, arid, and barren, but it becomes more level and fertile as it approaches the Zerka. The valley of the Jordan forms one of the most remarkable depressions in the world, the Dead Sea being 1312 feet below sea-level, and the total fall of the river being about 2300 feet.

JOSEF'FY, Rafael, Hungarian-American pianist, composer, and teacher, born at Miskolcz, Hungary, in 1853. He established himself in New York in 1880 and afterward came to be recognized as one of the leading teachers and concert virtuosos. He published upward of a score of piano compositions.

JOSEPH, one of the two sons of the patriarch Jacob by his favorite wife Rachel. His father's preference for him drew down the enmity of his elder brothers, who sold him to some Ishmaelitish slave-dealers, by whom he was sold to Potiphar, a distinguished officer in Egypt. The story of his elevation to the position of vice-regent of Egypt and the settlement of his father and brothers there is well known (Gen. xxxvii.–l.). Authorities still differ as to the period in Egyptian history to which Joseph's life belongs, some placing it before, others under, and others after the time of the Hyksos or shepherd kings.

JOSEPH, the husband of Mary the mother of Jesus, was a descendant of the house of David though resident at Nazareth, where he followed the trade of a carpenter. Early tradition represents him as an old man at the time of his marriage, and he seems to have died before the commencement of the public ministry of Jesus. His day in the Roman Catholic calendar is the 19th March.

JOSEPH I., Emperor of Germany, eldest son of Leopold I., born 1678; became emperor in 1705. He was a zealous member of the alliance against France in the war of the Spanish succession, in which the victories of Marlborough and Eugene won glory for the imperial arms. He died in 1711.

JOSEPH II., German emperor, son of Francis I. and Maria Theresa, was born March 13, 1741. He was elected king of the Romans in 1764, and on the death of his father, 1765, German emperor, succeeding his mother, however, in the hereditary estates of the House of Austria only in 1780. He at once commenced an extensive scheme of reforms, but the country was not prepared for such sudden changes, and he was compelled to give up most of his plans. In 1788 he visited Catherine II. at Cherson, and in league with her made war against Turkey. He died in 1790.

JOSEPHINE (zho-sā-fēn), Empress of the French, was born in Martinique June 24, 1763, being the daughter of Lieutenant Tascher de la Pagerie. She married in 1779 Vicomte Alexandre Beauharnais, by whom she had two children, Eugène and Hortense. In 1794 her husband, who had been commander of the army of the Rhine, was executed by order of the convention. She herself had a narrow escape, having been included in the list of proscription. After the fall of Robespierre she paid a visit to Napoleon to thank him for restoring the sword of her husband, and so pleased him that he soon after married her (1796). She became a beneficial element in his life, and her amiable manners won the hearts of everybody and helped to secure her husband's position. When Napoleon ascended the throne in 1804 she was crowned along with him. But the fact that the union was childless stood in the way of Napoleon's ambition to become the founder of a dynasty, and in 1809 Josephine was divorced, retiring to her beautiful seat of Malmaison, with the title of empress-queen-dowager and an annual grant of two million francs. She died May 29, 1814.

JOSE'PHUS, Flavius, the historian of the Jews, was born at Jerusalem 37 A.D., and was carefully educated. In 64 A.D. he made a journey to Rome, and was introduced to Poppæa, the wife of Nero. On his return he found his countrymen preparing to throw off the Roman yoke, and having tried in vain to persuade them of the hopelessness of such a struggle, he accepted the post of defending the province of Galilee, and actually held the fortified town of Jotapata against the whole Roman army for forty-seven days. He was captured at the fall of the city, was afterward present in the Roman army at the destruction of Jerusalem (A.D. 70), and went with Titus to Rome, where, assuming the family name of his patron, Flavius, he lived in learned leisure. Here he wrote (in Greek) The History of the Jewish War; The Antiquities of the Jews, giving a history of the Jews from the earliest times to the reign of Nero; an Autobiography, mostly relating, however, to the time of his military activity; a work on the Antiquity of the Jewish People, directed against Apion, an Alexandrian grammarian. The date of his death is uncertain. He certainly saw the end of the century.

JOSH'UA, the successor of Moses in the command of the Israelites, was the son of Nun, of the tribe of Ephriam. His name was at first Hoshea (help), but was changed by Moses into Joshua (Jehovah's help), of which Jesus is the Greek form. He was the only one, with the exception of Caleb, who brought back an encouraging report from the land of Canaan. He was nominated by Moses to succeed him in the command of the army of Israel, led the Isrealites over the Jordan, and in the course of seven years conquered the greater part of Palestine, and divided the country

among the tribes. He died at Timnath-Serah in Mount Ephraim at the age of 110. His history is contained in the canonical book which bears his name, and of which he has been usually regarded as the author; but modern critics have shown that it is a composite narrative, and contains references to many events which took place after Joshua's death.

JOSI'AH, King of Judah, succeeded his father Amon at the age of eight years (639 B.C.). He is characterized in the Scriptures as doing "that which was right in the sight of the Lord." He took an active part in the reform of public worship, and commenced the restoration of the temple, during the progress of which the high-priest Hilkiah discovered the book of the law, thought by some to be substantially the same as the book of Deuteronomy. The prescriptions it contained gave a decided direction to the reform movement which the king conducted with great vigor. In his thirty-first year, prompted probably by friendship to the King of Assyria, he marched out against Pharaoh Necho, who was on his way to attack that kingdom. The two armies met at Megiddo, where Josiah was slain.

JOSS-STICK, in China, a small reed covered with the dust of odoriferous woods, and burned before an idol.

JOUGS (jugz), an instrument of punishment formerly used in Scotland, consisting of an iron collar which surrounded the neck of the criminal, and was fastened to a wall or tree by an iron chain.

Jougs.

JOULE (jōl), James Prescott, English physicist, born in 1818. His most important achievement has been that of settling the mechanical equivalent of heat, which established that the quantity of heat capable of increasing the temperature of 1 lb. of water by one degree Fahrenheit, requires for its evolution the expenditure of mechanical energy represented by the fall of 772 lbs. through the space of one foot. He died in 1889. See Heat.

JOURDAN (zhör-dän), Jean Baptiste, Count, marshal and peer of France, born 1762, died 1833. He distinguished himself under Dumouriez, was made a general of division in 1793, defeated the Austrians at Wattignies and at Fleurus. In 1803 he became a member of the senate, and in 1804, on the establishment of the empire, obtained the rank of marshal, the title of count, and a seat in the council of state. After the restoration he was raised to the peerage.

JOURNALISM. See Newspapers.

JUAN FERNAN'DEZ, so called from the name of its discoverer, also sometimes Mas-a-Tierra, an island in the South Pacific Ocean, about 400 miles off the coast of Chile, to which it belongs. It is 12½ miles long and 5 miles broad at the broadest part, mountainous, and of rugged aspect. De Foe is said to have founded his Robinson Crusoe on the history of the solitary residence here for over four years (1704–9) of a Scotch sailor, Alexander Selkirk.

JUAREZ (hụ-à-reth'), Benito Pablo, president of the Mexican Republic, was born of pure Indian parentage in 1806, and was elected president in 1861. He declared the suspension of public payments for two years to Europeans, a step which occasioned the interference of Britain, Spain, and France. Troops were landed in Mexico, in 1862, but Britain and Spain soon retired, leaving Napoleon III. to carry out his views alone. Maximilian of Austria came on Napoleon's invitation to assume the throne, but Juarez, in spite of defeats and losses, continued to head a resistance, and when Napoleon under pressure from the American government withdrew his troops in 1866, the republicans carried all before them. Maximilian was captured and shot after a mock trial, and Juarez was re-elected to the presidency (1867), which he held till he died (1872).

JUDÆ'A, a term applied after the return of the Jews from exile to that part of Palestine bounded east by the Jordan and the Dead Sea, north by Samaria, west by the Mediterranean, and south by Arabia Petræa. See Palestine.

JUDAH, the fourth son of the patriarch Jacob by his wife Leah, the progenitor of one of the twelve tribes. See Jews.

JUDAS, surnamed Iscariot, meaning, perhaps, the man of Kerioth, a village of Judæa, was one of the twelve apostles of Jesus, and betrayed his Master into the hands of the Jewish priests for thirty pieces of silver. Remorse for his crime led him to suicide. The Cainites, Cerinthians, and some other heretics held him in great veneration, believing that he alone saw the necessity for bringing about the fulfilment of prophecy and the atonement for humanity. Others have thought that his object was to oblige his Master to use his miraculous power to defeat his enemies and establish the new earthly kingdom of the Messiah, in which Judas expected to have a high place.

JUDAS, or **JUDE,** brother of James, one of the twelve apostles. Matthew and Mark called him Thaddæus surnamed Lebbæus. Nothing is known of his life. By many he is considered the author of the epistle of Jude. See Jude, Epistle of.

JUDAS MACCABÆUS. See Maccabees.

JUDAS-TREE, natural order Leguminosæ, is a native of the Levant, Spain, south of France, Italy, etc. It grows to a height of about 20 feet with pale green leaves and beautiful purple flowers. Another, though smaller, species grows in the United States and Canada.

JUDE, Epistle of, one of the books of the New Testament. Its canonicity was questioned by the primitive church, and often since. The Asiatic churches did not make use of it till the 4th century, nor was it known in the west till toward the close of the second. Its quotation from the apocryphal book of Enoch raised a prejudice against it, but it was eventually allowed to take its place as a portion of the sacred canon. It is a passionate denunciation of heretics and false teachers, and has been supposed by some to be written by Judas, the brother of the Savior, and not by Judas the brother of James (see above).

JUDGE, a person duly invested with authority to determine causes or questions between parties according to law. The term is quite a general one, being applicable to any one appointed to sit in a court of law and try causes; but certain judges are designated by some particular title, as justice, lord-justice, etc. The judge at common law decides points of law, and enables the jury rightly to decide questions of fact, while in equity he decides both classes of questions. A judge cannot be prosecuted for the consequences of his decisions, except in the case where he may have acted without jurisdiction, nor can he officiate in a case where he has a personal interest, unless it be merely his common interest as a citizen, ratepayer, etc.

JUDGE ADVOCATE, an officer appointed to preside at the proceedings of court-martial, his duties being to summon witnesses, administer oaths, take a minute of the proceedings, advise the court on points of law, etc. In Britain (as also in the United States) there is an official called the judge advocate-general to whom the proceedings of courts-martial are transmitted. He has also to advise the commander-in-chief and secretary of state for war in legal matters. The judge advocate-general must be a member of the House of Commons and of the ministry. Under him is a deputy whose office is permanent.

JUDGES, in Hebrew history. See Jews.

JUDGES, Book of, a canonical book of the Old Testament, so called because the greater part of the narrative is occupied with the history of the judges who were raised up to deliver their countrymen from the oppressions of the neighbors. The first chapter, although formally connected with the book of Joshua by the opening sentence, evidently contains a separate portion of the history of the Israelitish invasion of Canaan, the first settlement, indeed, west of the Jordan, in which the tribes of Judah and Simeon play a distinct part in the conquest. The 6th verse of the 2d chapter again connects the work with the concluding part of the book of Joshua and in the chapters which follow the history of the nation is written from an ideal and poetic point of view, which gives it unity, the judges being represented as successive rulers, although in most cases their history and influence were merely local. The third part of the book begins at chap. xvii., and has no formal or chronological connection with what has gone before, and has sometimes been called an appendix.

JUDGMENT, in law, the judicial determination and decision of a court in an action. It is either interlocutory or final.

In the former case it is given only on some particular point or proceeding, and does not complete the action in the same way as the final judgment, upon which, unless it be appealed against, suspended, or recalled, execution may follow.

JUDGMENT-DEBT, in law, a debt secured to the creditor by a judge's order, and in respect of which he can at any time attach the debtor's goods and chattels. Such debts have the preference of being paid in full, as compared with simple contract debts.

JUDITH, widow of Manasses, a Jewish heroine of great beauty, virtue, courage, and piety, whose history is given in the apocryphal book which bears her name, the author and age of which are unknown. Judith is represented as going out to the tent of Holofernes, an Assyrian general who was besieging Bethulia, the city in which she lived, charming him with her beauty, and taking advantage of the admission to his tent, thus afforded to her, to cut off his head with his own sword, while he slept.

JUDSON, Adoniram, pioneer American missionary, was born at Malden, Mass, in 1788. In 1812 he was ordained a missionary to Burmah under the auspices of the Congregational board of Foreign Missions. Having after his arrival in India adopted Baptist views, he was appointed to labor in Burmah by the American Baptist missionary union in 1814. His translations of the Bible into Burmese appeared in 1835, and his Burmese and English dictionary in 1852. He died April 12, 1850. Both in his literary and his missionary labor he was greatly assisted by the three ladies whom he successively married, of whom, as well as of Judson, biographers have been published.

JUDY. See Punch and Judy.

JUGGERNAUT. See Jagannâtha.

JUGGLING. See Legerdemain.

JU'GULAR VEIN, one of the large trunks by which the greater part of the blood that has circulated in the head, face, and neck is returned to the heart. There are two on each side, an external or superficial, and an internal or deeper.

JU'JUBE, the popular name of a genus of spiny and deciduous shrubs or small trees. The species are numerous and of several the fruit, which is blood-red or saffron-colored with a sweet granular pulp, is wholesome and pleas-

Jujube.

ant to eat. The common jujube is a native of Syria. The fruit is dried, and forms an article of commerce. The name jujube is also given to a confection made of gum-arabic or gelatin, sweetened and flavored so as to resemble the jujube fruit.

JUJUY (hụ-hō'i), a town of the Argentine Republic. Pop. 5000.—The province has an area of 27,000 sq. miles, and a pop. of 90,000.

JULEP, a sweet drink; specifically, in medicine, a solution of sugar in aromatic water, but not so concentrated as syrup. In the United States the name is given to a drink composed of spirituous liquor as brandy or whisky, sugar, pounded ice, and a seasoning of mint. It is also called mint-julep.

JULIAN CALENDAR. See Calendar and Epoch.

JULIUS, the name of three popes.—Julius I., born in Rome, chosen pope in 337; died in 352. He summoned a council which approved his conduct in sustaining Athanasius in his contest against the Arians in 342.—Julius II. (Giuliano della Rovere), was elevated by his uncle Sixtus IV. to the rank of a bishop and cardinal, was appointed papal legate to France, in 1503 was elevated pope, and died 1513. Immediately on his elevation to the pontificate he planned the complete re-establishment of the papal sovereignty in its ancient territory, and the extinction of foreign domination and influence in Italy. Refusing to attend the Council of Pisa convened by the King of France, he in 1511 formed the "Holy League," to which Spain, England, and Switzerland were parties. In 1512 he made open war against Louis XII. The French defeated the papal army near Ravenna, but were soon after driven out of Italy. He is considered one of the most immoral of the popes, but was a far-sighted and patriotic sovereign, and a liberal and judicious patron of art and literature. To procure means for building St. Peter's he ordered the sale of indulgences, which was one of the immediate causes of the reformation.—Julius III. (Giovanni Maria Giocchi), a Roman of low birth, was made cardinal by Paul III. in 1536, took an active part in the council of Trent as papal legate, was elected pope in 1550, and in the following year reopened the council of Trent, which had been suspended for upward of two years. He endeavored to effect a union with the Nestorians, and commissioned Cardinal Pole to organize, in conjunction with Mary, the reunion of England with Rome. He died in 1555.

JULIUS CÆSAR. See Cæsar.

JULY', the seventh month in our calendar, having 31 days. In the Roman year it bore the name of Quintilis, as originally the fifth month. Its change of name to Julius was in honor of Julius Cæsar, who was born on the 12th of the month.

JUMPING-DEER, the black-tailed deer found in the United States to the west of the Mississippi.

JUMPING-HARE, a species of jerboa found in Southern Africa, and so named from its general resemblance to a hare, while its jumping mode of progression, necessitated by the elongated nature of the hind legs, have procured for it its generic and popular distinction.

JUMPING-MOUSE, is found in Labrador and North America generally, but is especially an inhabitant of the fur territories. Like the jumping-hare, it is classified by some along with the jerboas and is one of the smallest of these forms.

JUNA'GARH, a native state of India, in Gujarat, Bombay presidency; area 3283 sq. miles. Pop. 387,499.—The capital, Junagarh, is one of the most picturesque cities in India, pop. 34,251.

JUNE, the sixth month in our calendar. It consisted originally of twenty-six days, to which it is said Romulus added four, and Numa took away one. Julius Cæsar again lengthened it to thirty days, and it has ever since remained unaltered.

JUNGFRAU (yụng'frou; "Maiden"), a mountain of Switzerland. It is one of the most magnificent of the Swiss mountains, height 13,670 feet. It was first ascended in 1804; the ascent may now be made by railway.

JUNGLE (jung'gl), properly an Indian term applied to a desert and uncultivated region whether covered with wood and dense vegetation or not, but in English it is applied to land covered with forest trees, thick impenetrable brushwood, or any coarse rank vegetation.

JUNGLE-FEVER, a disease prevalent in the East Indies and other tropical regions, a severe variety of remittent fever. It is characterized by the recurrence of paroxysms and of cold and hot stages. The remissions occur usually in the morning and last from eight to twelve hours, the fever being mostly typically developed at night.

JUNIN (hö-nēn'), a department of Peru, embracing the wildest parts of the Cordilleras; area about 28,000 sq. miles; pop. 395,000.

JU'NIPER, the name of hardy exogenous evergreen trees and shrubs chiefly natives of the northern parts of the world. About twenty species are known. The berries require two years to come to

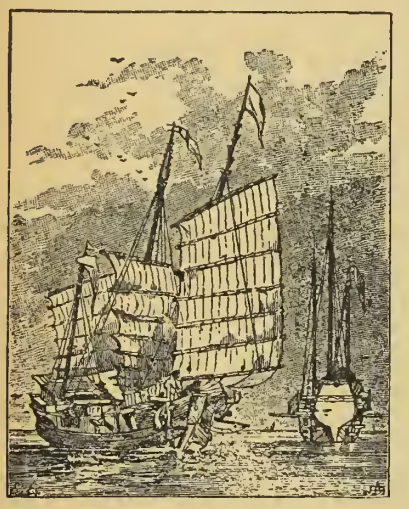
Juniper.

maturity, when they assume a bluish-black color. They are used extensively in Holland in the preparation of gin, which owes its characteristic flavor to them. They yield an essential oil, which is a powerful diuretic.

JU'NIUS, a signature attached to certain letters on public affairs which first appeared in The Public Advertiser, a London paper published by Woodfall, from which they were copied into most of the other journals of the time. The earliest bears date January 21, 1769; the last, January 21, 1772. After they were completed they were collected and published by Woodfall, with a dedication to the English nation and a preface by the author. Other letters bearing the same characteristics, but having different signatures, appeared between April 28, 1767, and May 12, 1772, and are given in the younger Woodfall's edition

as the Miscellaneous Letters. This edition was published in 1812 in three vols., and included Junius' private letters to Mr. H. S. Woodfall, and a preliminary essay by Dr. J. Mason Good. Although fully a century has elapsed since the publication of these papers, their authorship seems as far from being settled as ever.

JUNK, a flat-bottomed ship used in the waters of China and Japan, sometimes reaching 1000 tons. It has a high forecastle and poop, and ordinarily three



Chinese Junks.

masts of considerable height, each mast being in one piece, with a lug-sail, generally of bamboo splits. The bow is bluff the stern full, and there is a very large rudder.

JUNO, the most exalted divinity of the Latin races in Italy next to Jupiter, of whom she was the sister and wife. She was the queen of heaven, and under the name of Regina (queen) was worshipped in Italy at an early period. She bore the

Juno of Lanuvium.—Colossal statue in the Vatican Museum, Rome.

same relation to woman that Jupiter did to men. She was regarded as the special protectress of whatever was connected with marriage, and females from birth to death had her as a tutelary genius. She was also the guardian of the national finances, and a temple, which contained the mint, was erected to her under the name of Juno Monēta on the Capitoline.

JUNOT (zhü-nō), Andoche, Duke of Abrantes, French marshal, was born in 1771 and died 1813. At the siege of Toulon, in 1793, he became secretary to Napoleon, who afterward took him with him into Italy and Egypt in the capacity of aide-de-camp. In 1807 he was sent with an army into Portugal, and made his entry without opposition into Lisbon, his success being rewarded with the title of Duke of Abrantes. On the arrival of the British he first allowed himself to be defeated at Vimeira. Although he subsequently took part in the campaigns (1809) against Austria, (1810) against Spain, and (1812) against Russia, he failed to retrieve his reputation. In 1813 he became insane, and lost his life by leaping from a window.

JUNTA (Spanish, an assembly), in Spain, a high council of state. It was originally applied to an irregularly summoned assembly of the states, as distinguished from the Cortes or parliament regularly called together by the authority of the king.

JU'PITER, or **JUPPITER,** the supreme deity of the Latin races in ancient Italy, the same as the Greek Zeus, and the Sanskrit dyaus (which means the sky); the second part being the same as the Latin pater, father. As the supreme deity Jupiter received from the Romans the title of optimus maximus (best greatest), and as the deity presiding over the sky he was considered as the originator of all the changes that took place in the sky. From him accordingly proceeded rain, hail, and the thunderbolt, and he it was that restored serenity to the sky after it had been obscured by clouds. Hence the epithets of Pluvius (rainy), Tonans (thundering), etc., were applied to him. The most celebrated of his temples was that on the Capitoline Hill dedicated to him as Jupiter Optimus Maximus, jointly with Juno and Minerva. He was represented with a scepter as symbolical of his supreme authority. He maintained the sanctity of oaths; he was the guardian of all property; and every Roman was believed to be under his protection, and that of his consort Juno, the queen of heaven. White animals were offered up to him in sacrifice, his priests wore white caps, and his chariot was represented as drawn by four white horses.

JUPITER, is the largest planet of the solar system, and the fifth (excluding the asteroids) in order of distance from the sun. His mean diameter is about 85,000 miles; his polar diameter about 82,200; his mean distance from the sun 475,692,000 miles; his period of revolution round the sun 11 years 10⅓ months; his orbit is inclined to the ecliptic at the angle 1° 18′ 40″.3. The inclination of his axis is very small (3° 5′ 30″), so that changes in the seasons must be almost unknown; his volume is 1233 times that of the earth, but his mass is only 300.857 times. His surface shows belts of dark and light shade, which are usually, but not always parallel to each other, undergo quick changes, and seem as though they merged into one another. To account for these rapid changes in his atmosphere it seems reasonable to believe that his interior mass is intensely heated similarly to that of the sun, hence the intense light proceeding from this planet. Jupiter has four moons, Io, Europa, Ganymede, and Callisto; they were discovered by Galileo in 1610; they are at average distances of from 267,380 to 1,192,820 miles from the planet; they appear, like our moon, to make one revolution on their axis while passing once round the planet, the time of one revolution being from 1 day 18 hours 27 minutes to 16 days 16 hours 32 minutes. Europa, the smallest, has a diameter of 2099 miles; Ganymede, the largest, has

Jupiter.

a diameter of 3436 miles. The moons appear from the earth to move in nearly straight lines from one side of the planet to the other, so that the planes of their orbits are nearly the same as the ecliptic and the orbit of Jupiter; they are eclipsed in the shadow of the planet, and their own shadows may be seen passing over the planet's surface. From observation of the eclipses of Jupiter's satellites Römer discovered that the propagation of light is not instantaneous, and thus calculated its velocity.

JURA (zhü-rà), a department in the east of France, bordering on Switzerland; area, 1938 sq. miles. Pop. 261,288.

JURA, a chain of mountains in Central Europe, partly belonging to France, partly to Switzerland, between which they form a sort of natural barrier, extending from southwest to northwest, and exhibiting a number of parallel ridges.

JURISPRUDENCE, the science of law.—Medical jurisprudence, forensic medicine (which see).

JURY AND JURY TRIALS, the origin of trial by jury is not traceable to any single legislator or any particular period. It seems to have had its beginning in certain primitive customs of the northern European races, and received special developments from different nations. By the Anglo-Saxons a person who was accused of crime was permitted to summon twelve of his neighbors, called compurgators, who swore to his innocence. This was the origin of an institution which took settled and vigorous form after the Norman Conquest, gradually developing into its present form.

In criminal trials two juries act, the grand jury and the petit jury. The

grand jury may consist of any number more than eleven and less than twenty-four men, who have been summoned by a mandate from the sheriff of the county. Their names are returned on a piece of parchment which is called a panel. The oath having been administered, they are usually instructed by the presiding judge in the nature and number of the offenses about to be brought before them. They then proceed to consider in private the statement or indictment which is brought against the accused by the prosecution. Should they agree to the number of twelve, that the accusation has a basis of truth, they bring into court what is called "a true bill." If, on the contrary, they find that there is not sufficient foundation for the accusation, they ignore the bill, and require the dismissal of the accused. When a true bill is found by the grand jury it usually forms the basis of the subsequent prosecution.

Petty or petit juries consist of twelve persons, and no more, for the trial of all criminal offenses, and of all issues of fact in civil cases at the common law. If all the jurors do not appear, or any of them are justly objected to and set aside, in virtue of the right of challenge exercised by the parties to a suit, the deficiency may be supplied from among the bystanders having suitable qualifications. The jury being then sworn is placed in the jurybox, and the evidence given. No juror is at liberty to leave the box without permission of the court. Unless the case be a criminal one in which the prisoner is charged with a misdemeanor, the jury are allowed to go home on engaging not to allow themselves to be spoken to on any subject connected with the trial. When the prisoner is charged with treason or felony the jury are usually allowed to retire only in custody of the sheriff and his officers, who are sworn to keep them together, and not to speak to them with reference to the trial. When the evidence has been led it is usual for the presiding judge to instruct the jury in the points of law which apply to it. It is thus that their duties are divided—the jury dealing with the facts, and the judge with the law of the case. The jury usually form an independent judgment upon the facts and their finding is considered final. To consider their verdict they usually withdraw to a private room, where no intercourse with other persons is permitted, and where, when the session is protracted, food and other necessaries are supplied. Upon returning into court they publicly assent to such verdict as they have agreed upon. If they fail to agree among themselves the jurymen are discharged by the judge, and the cause, if it is civil, can be tried anew. When it is a criminal case no new trial is possible.

Another kind of jury is the coroner's jury, summoned to inquire into cases of sudden or violent death. The inquiry is made in presence of the body, and at the place where the death happened. The jury may consist of any number above eleven, and usually numbers twenty-three; twelve must concur in the finding. The persons found guilty are reserved for trial by a petty jury.

In the United States, in Canada, and the other British colonies, jury trials are essentially the same as in England. In France they are only applicable to criminal cases, and the verdict is returned by a majority. Trial by jury is in force in Italy, and in the German empire.

JUSTICE, a common term for a judge or legal official appointed to hold court and administer justice, especially given to judges of superior courts. Thus in England the judges in the common law and chancery divisions of the high court of justice are so called, the head of the common law division being the lord chief-justice of England. The term is similarly used in the United States.

JUSTICE, High Court of. See Supreme Court.

JUSTICE, Lord Chief. See Chief-justice.

JUSTICE, Department of, one of the ten executive departments of the United States, the head of which is the attorney-general, appointed by the president for a term of four years. The attorney-general is the chief law officer of the government, and, as a member of the cabinet, ranks fourth in the line of succession to the presidency. It is his duty to advise the president on any questions of law that may arise in the course of the administration, and also to give his opinion when requested by any of the heads of departments upon legal questions concerning matters affecting their departments. The opinions rendered by the attorney-general are from time to time published by the government, and next to the decisions of the courts they are regarded as authority on the points covered. The attorney-general is the legal representative of the government in all cases at law to which the United States is a party, and may appear in court in person or direct which one of the assistant attorney-generals shall appear, and may employ special counsel to aid in the conduct of the cases in which the government is interested.

JUSTICE OF THE PEACE, a judicial magistrate intrusted with the conservation of the peace. The first judicial proceedings are held before him in regard to arresting persons accused of grave offenses; and his jurisdiction extends to trial and adjudication for small offenses. In case of the commission of a crime or a breach of the peace a complaint is made to one of these magistrates. If he is satisfied with the evidence of a commission of some offense, he issues a warrant directed to a constable, tries the party, if the offense be within his jurisdiction, and acquits him or awards punishment. In the United States the office is held only by special appointment, and the tenure is different in different states; but the commission is usually for three or four years, or some other specific limited period. Their position is similar to that of the justices in Britain. In some of the states they have a right to celebrate marriages.

JUSTIFIABLE HOMICIDE. See Homicide.

JUSTIN, Justi'nus, the name of two emperors of the east.—Justin I., born 450, died 523 A.D., a peasant of Dacia, rose from a common soldier to be commander of the imperial guard, and on the death of Anastasius in 518 became emperor. He relegated the civil administration to the quæstor Proclus, and between them the empire was governed with a fair amount of success.—Justin II. ascended the throne on the death of his uncle Justinian I. in 565. Beset with enemies outside the empire and harassed with internal discord, he in 574 solved his difficulties by abdicating in favor of Tiberius, captain of the guard. He died in 578.

JUSTIN'IAN I., Flavius Anicius Justinianus, surnamed the Great, nephew of Justin I., emperor of the east, celebrated as a lawgiver, was born of an obscure family in 483 A.D., and died in 563. Patronized by his uncle, who, from a Thracian peasant, had become emperor, he so flattered the senate and dazzled the people that he was made consul, and took the title of Nobilissimus. On the death of his uncle, with whom he had latterly shared the imperial power, he was proclaimed emperor and married an actress named Theodora. Aided by his generals, he was able subsequently to restore to the Roman empire a part of its former possessions, as when Belisarius in 523 and 529 defeated the Persians, and achieved victories in Africa, and when Narses, another of his generals, put an end to the Ostrogoth rule in Italy. Turning his attention to the laws, Justinian commissioned ten learned civilians to draw up a new code, and the result was the Corpus Juris Civilis, or body of civil law. His reign of thirty-eight years was a great period in the empire's history, but the emperor himself was by no means great.

JUSTIN MARTYR, an early Christian writer, born in Palestine about 100 A.D., suffered for his faith about 165. Born a heathen but converted to Christianity, he went to Rome, where he wrote an Apology for Christianity, with a supplementary or second Apology, a Dialogue with Trypho the Jew, all still extant, besides other works. He is of importance in the history of Christian dogma.

JUTE, a textile fabric obtained from Corchorus capsularis, a plant belonging to the natural order Tiliaceæ (lime or

Jute.

linden). The jute plant is a native of the warmer parts of India, where its cultivation is caried on, especially in Bengal, on an extensive scale. It is an annual plant, growing to a height of 12 or 14 feet. The fiber forms the inner bark of the plant, and possesses in an eminent degree the tenacity common to the bark

of the plants of this order. The fiber is fine, and has a shining surface; it is injured by exposure to water, and hence is not well adapted for cordage and canvas, but it is in extensive use for making bags, and it serves many other useful purposes, being often mixed with hemp for cordage, and even with silk in the manufacture of cheap satins, although its principal use is in the manufacture of coarse cloth for bagging, and in making the foundation of inferior carpets, mats, etc.

JUTLAND, the peninsular and most important portion of Denmark, surrounded on three sides by the sea—the Skagerrack, the Kattegat, and the North Sea, on the south by Schleswig; area, 9755 sq. miles. Pop. 1,063,792.

K

K,[1] the eleventh letter of the English alphabet, representing a gutteral articulation, the surd consonant corresponding to the sonant g. In Anglo-Saxon this letter was only used occasionally, c being regularly used instead. So also in Latin, k, borrowed from the Greeks, was little used, its place being supplied by c. The Italians, Spaniards, and Portuguese have banished the letter entirely from their alphabet. The French use it only in a few words derived from the Greek, foreign proper names, etc. At the beginning of a word or syllable k is not pronounced when followed by n, as knife, knee, know.

KABUL. See Cabul

KAFFA, a mountainous territory to the south of Abyssinia, inhabited by one of the Galla tribes. It is supposed to be the home of the coffee-plant, which grows wild on the slopes of the Kaffa hills. The chief town is Bonga.

KAFFIR OX, the Cape buffalo. See Buffalo.

KAFFIRS, the principal race inhabiting Southeastern Africa, a branch of the great Bantu family. The name is now chiefly restricted to the tribes occupying the coast districts between Cape Colony and Delagoa Bay. They differ from the negroes in the shape of the head, it being more like that of Europeans; in the high nose, frizzled hair, and brown com-

Kaffir chief of the Zulu tribe.

plexion, which becomes lighter in shade in the tribes of the more southern districts. They are a tall, muscular race, the average height being from 5 feet 9 inches to 5 feet 11 inches, and frugal and simple in their habits. Their chief occupation is raising and tending cattle, and hunting; garden and field work is mainly performed by women. They are of a peaceful disposition, but in times of war they display considerable bravery, tactical skill, and dexterity in the handling of their assagais or spears, shields and clubs, as has been shown in their engagements with the British forces. Frequent hostilities have taken place between the British and one or other of the Kaffir tribes, beginning almost with the first acquisition by Britain of the Cape Colony. The first Kaffir war was in 1811–12, the next in 1818–19. In

The kahau, or long-nosed monkey.

1834–35 a serious Kaffir war was carried on, resulting in the expulsion of the Kaffirs beyond the Great Kei, but they were soon allowed to return. Another war (the fourth) broke out in 1846, and lasted nearly two years, with much suffering to both colonists and Kaffirs. Its result was an extension of territory in the north and east, a portion between the Cape Colony and the Kei being reserved for the natives, and called British Kaffraria. In 1850 a Kaffir outbreak took place, and a bloody war followed ending in 1853, soon after which British Kaffraria was made a crown colony. A sixth war occurred in 1877–78, owing its origin to disputes between the two tribes of the Fingoes and Gcalekas. For a subsequent war see Zululand.

KA'HAU, or **BLANDA,** the native name for a large, odd-looking monkey peculiar to Borneo, better known as the proboscis monkey from its long, pendent nose, which in old animals reaches a length of 3 or 4 inches. The face is cinnamon brown, the body reddish with conspicuous markings of white. It associates in small troops, is usually found over or near the water, and is very shy.

KAISER ((kī'zėr), the German word for emperor, from L. Cæsar.

KAISERSLAUTERN (kī'zėrz-lou-tėrn), a town in the Bavarian Palatinate, on the Lauter. Pop. 48,310.

KAISER-WILHELM CANAL. See North Sea and Baltic Canal.

KAISER-WILHELMS-LAND. See New Guinea.

KALAMAZOO', a town, county, and river of Michigan. The city is 144 miles e.n.e. of Chicago, situated in a fertile agricultural district, on the river of the same name, which supplies some of its numerous factories with water power; chief manufactures: paper, flour, furniture, and agricultural implements. Pop. 1909, estimated at about 45,000.

KALE. See Cabbage.

KALEIDOSCOPE (ka-lī'-), a well-known optical toy invented by Sir David Brewster, by which an infinite variety of symmetrical, and often beautiful, colored designs is obtained. The ordinary kaleidoscope consists of a tube containing two glass plates acting as mirrors, which extend along its whole length and make an angle of 60° with one another. One end of the tube is closed by a metal plate with a small hole at its center, to which the eye is applied; at the other end there are two plates, one of ground the other of clear glass (the latter being next the eye), with a number of pieces of colored glass or beads lying loosely between them. When the eye is applied to the aperture the mirrors produce a beautiful symmetrical figure, and when the tube is turned about or shaken, new images, always symmetrical are formed. This arrangement may be modified in various ways. The instrument has been used by designers of patterns for printed calicoes, etc.

KALENDAR. See Calendar.

KALIF. See Caliph.

KALISCH (kā'lish), or Kalisz, a town and government in Russian Poland, near the Prussian frontier. Area of government 4392 sq. miles, pop. 846,719. The town is an important trade center, and the capital of the province. Pop. 21,680.

KAL'MUCKS, a nomadic and warlike Mongol race, originally natives of the

Kalmuck.

territory of Central Asia between the Koko-Nor and Tibet, but now inhabiting not only parts of the Chinese empire, but also occupying districts of Siberia

[1] Where the reader may fail to find articles under K, he is referred to C.

and European Russia. They are intrepid soldiers, splendid horsemen, and troops of them are attached to almost every Cossack regiment. Physically the Kalmucks are small of stature, broad-shouldered, with small round heads, and the narrow oblique eyes characteristic of the Mongolian race. They number altogether perhaps 700,000, of whom more than half are under Chinese rule.

KALU'GA, a town and government of European Russia. Pop. 40,252.

KAMA, the largest tributary of the Volga, rises in the Russian government Viatka, and after a course of 1150 miles flows into the Volga, 40 miles south of Kasan. Part of it is navigable for steamers, and ordinary barges can proceed as far as Perm.

KAMA (kä'ma), the Hindu god of love corresponding, generally speaking, to the Greek Eros and Roman Cupid. He appears as a beautiful youth riding on a parrot, generally carrying a bow with a string formed of bees, and having five

Kama or Kamadeva.

arrows, each tipped with a flower that is supposed to have some amorous influence. Dancing girls or nymphs bear him company, and one carries his banner, the emblem on which is a fish or marine monster on a red ground.

KAM'ALA, a drug long known, under various names, to Indian and Arab physicians, as a specific against the tapeworm, introduced in the British Pharmacopœia in 1864 as a vermifuge, in doses of 30 grains to a quarter of an ounce in syrup or gruel. It occurs as a brick-red powder, adherent to the fruit of the Rottlĕra tinctoria, formed by minute roundish, semi-transparent granules mixed with stellate hairs, and is largely collected in the forests of Madras, where it forms an important source of revenue. The active principle of the powder lies in the 80 per cent of resin it contains, which also supply the coloring matter, called rottlerin, used as a silk dye.

KAMRUP (käm-röp'), a district of Assam, in the Brahmaputra valley; area, 3857 sq. miles. Pop. 634,249.

KAMTCHAT'KA, a large peninsula in the northeast of Asia. On the east it has the North Pacific Ocean, and on the west the Sea of Okhotsk; it is upward of 800 miles in length and 190 in average breadth; sq. miles, 85,000. The entire population is about 11,500. The capital, Petropaulovsk, has a pop. of about 1000.

KANAZA'WA, a town of Japan, near the northwest coast of the island of Hondo (Niphon), with manufactures of silks, porcelain, etc. Pop. 91,531

KANDAHAR', or **CANDAHAR,** a town of considerable commercial and strategical importance in the south of Afghanistan, on the direct route to India. The town lies 3484 feet above the sea, has a large transit trade, and a pop. of 60,000.

KANE, Elisha Kent, a surgeon, traveler, and Arctic explorer, born at Philadelphia 1820, died at Havana 1857. In 1846 he rendered important service as a volunteer in the United States army in Mexico, in 1850 by his survey of the Gulf of Mexico, and in the same year joined the Grinell expedition, as medical and scientific member, in the unsuccessful search for Sir John Franklin. His observations led him to the belief that there was a large open sea near the pole, and with a view to penetrate it he organized and commanded a second expedition, which left New York in the Advance in May, 1853. He succeeded in getting as far as 78° 43′ n. lat., where he was frozen up for twenty-one months, and being harassed by scurvy and want of provisions was obliged to abandon the vessel. A perilous journey of 1300 miles in boats and sledges brought him back to Greenland, and he again reached New York in November, 1855. Much broken in health, he sailed for Cuba to recruit, but died there. The accounts of his two expeditions added much to our knowledge of the Arctic regions.

KANGAROO, the common name of a number of animals belonging to the marsupial order of mammals, indigenous to Australia, and first made known to Europe by Captain Cook. The most noticeable feature about the kangaroo

Kangaroo.

is the disproportion between the upper and lower parts of the body. The head is small, deer-like in shape, with large ears; the forelegs small and five-toed; the hindlegs very large and powerful, with four toes only on the feet. The tail is long, thick at the base, and helps to support the animal when sitting erect, the usual posture when not feeding; it also assists the hindlegs in their long leaps (from 10 to 15 feet). The young are born very immature, and protected and nourished for about eight months in the marsupium, or pouch, into which the nipples of the mammary glands open. Kangaroos are herbivorous, and, where still plentiful, a serious pest to squatters, whose rifles have, however, considerably reduced their number. The hindquarters of the large species supply a tolerable substitute for venison, while their tails make excellent soup, and their skins good rugs and leather. The kangaroo includes many species, varying in size from a hare to a large sheep, and remains of still larger and extinct species have been found in the pleistocene deposits of Australia.

KANKAKEE, the county-seat of Kankakee co., Ill., 56 miles south of Chicago; on the Kankakee river, and on the Cleveland, Cincinnati, Chicago, and St. Louis, the Illinois Central, the Indiana, Illinois, and Iowa and other railroads. The river, broad and deep at this point, furnishes water-power, for manufacturing purposes, as well as for generating electricity for city lighting and the operation of street railways. The most important manufactures are plows, buggies, starch, and iron beds. Pop. 16,400.

KANGRA, a large district of Hindustan, in the Punjab, belonging mainly to the Himalayan chain; area, 9069 sq. miles. About a ninth is under cultivation, and large tracts are covered with forests. The inhabitants are a good-looking, fair-complexioned race, mild and peaceable, and much attached to their country. Pop. 763,030.

KAN'SAS, one of the United States, bounded n. by Nebraska, e. by Missouri, s. by Oklahoma and Indian Territory, w. by Colorado; area, 82,080, sq. miles. It ranks tenth in size among the states of the Union. It consists chiefly of undulating plains, well watered by the Kansas and Arkansas and other rivers, the Missouri forming the boundary on the northeast. Kansas is pre-eminently an agricultural state, the total farm land being over 80 per cent of its surface, of which over 60 per cent is improved. It has risen with great rapidity to the front ranks of the agricultural states. In 1900 only one state, Iowa, had a larger acreage of crops. In the last census year the rank in acreage of corn was third, wheat fourth, and hay third. Potatoes and other vegetables are also raised in large quantities. It also raises a great abundance of orchard fruits. The bright climate and pure atmosphere are ad-

mirably adapted to the growth of the apple, pear, peach, plum, grape and cherry. Creameries are numerous. Kansas ranks second in the production of broom-corn and is important in the production of castor-beans. The raising of enormous crops of corn and other stock feed has resulted in the development of a large stock raising industry, extensive areas of prairie land in the western part of the state being used for grazing grounds. Timber is abundant along the streams in the eastern section of the state but is less plentiful in the central portion and very scarce in some parts of the west. The varieties of timber embrace oak, elm, black walnut, cottonwood, mulberry, box elder, willow, hickory, sycamore, white ash and other hard and soft woods.

The climate of Kansas is in general very pleasant; the air is clear and dry, and sunny days by far predominate. The mean annual temperature ranges from 52° in the north to 58° in the south. The mean rainfall for the whole state is 26.42 inches, but it ranges from 40 inches in the east to 15 in the west.

Seal of Kansas.

With irrigation of the western lands there is very little soil in Kansas unfit for agriculture. The rich bottom-lands of the numerous rivers occupy a large area, and beyond these the prairies are everywhere extremely fertile, especially in the eastern half of the state, where it is rich and black, gradually becoming lighter and browner toward the west.

Deposits of bituminous coal probably underlie more than half of the state. Natural gas occurs in the south-eastern part. Lead and zinc ores occur in association in the limestone of the lower carboniferous in the southeast. The ores are chiefly galena and blende. Running north and south through the center of the state are extensive deposits of rock salt and gypsum. Large deposits of chalk and clay are found. Equally inexhaustible are the building-stones.

In 1541 a small force of Spaniards and Indians under Coronado traversed the region from southwest to northeast; but no results followed this expedition. The country remained unexplored till 1719 when it was visited by French-men from Louisiana. In 1803 the greater portion of what is now Kansas passed into the possession of the United States as a part of the Louisiana Purchase; the southwestern section of the state was ceded by Texas to the Federal Government in 1850. The region was explored by Lewis and Clark in 1804, Lieutenant Pike in 1806–07, and Lieutenant Long in 1819.

In the civil war Kansas sent into the field a larger number of soldiers, in proportion to its population, than any other state. The eastern part of the state lay exposed to the incursions of confederates from Missouri. On August 23, 1863, Quantrell's guerrillas raided the town of Lawrence and killed a large number of the inhabitants. The cessation of war was followed immediately by a great influx of immigrants, who swept steadily westward, unchecked by the repeated assaults of the hostile Indian tribes. Railway development began in 1868, and by 1872 there were more than 2000 miles of railway track in operation. Prohibition became an important question in politics after 1880; the movement encountered great opposition in the beginning, but by 1890 the principle was well established in the state, though in the large cities the anti-liquor laws were not zealously enforced. Education is well provided for, and there is a state university, an agricultural college, and other colleges and normal schools. It has over 5000 miles of railroad. The chief towns are Leavenworth, Lawrence, Topeka, and Atchison; Topeka being the state capital. In politics Kansas belongs to the republicans. They have carried the state with only three exceptions since the civil war; in 1882, 1892, and 1896. Pop. 1909, 1,700,000.

KANSAS CITY, the largest and most important city of Kansas, and the county seat of Wyandotte co., on both sides of the Kansas river at its confluence with the Missouri, opposite and joining Kansas City, Mo. It is an important railroad center, the Missouri Pacific, the Union Pacific, the Atchison, Topeka and Santa Fé, the Mexico and Orient and the Chicago, Rock Island and Pacific entering the city. Several bridges across the Kansas river unite the east and west sections of the city, which is closely connected also with Kansas City, Mo., by elevated, electric and cable roads. It is noted for its important live stock slaughtering and meat packing interests in all of which it is allied with the adjacent city—the stock yards and packing house plants on both sides of the Kansas-Missouri boundary forming the second largest live stock center in the United States. It is also an important grain and flour market. Pop. 60,000.

KANSAS CITY, the second city of Missouri, and an important railroad and commercial center, in Jackson co., at the junction of the Kansas and Missouri rivers; on the Kansas-Missouri boundary line, adjoining Kansas City, Kan., and 235 miles west by north of St. Louis. Many of the most prominent railroads of the country pass through or have a terminus in the city. Three great bridges have been constructed across the Missouri river, and a terminal circular railway, 30 miles in length, furnishes intercommunication among the several roads. Most of the roads use in common a large union depot.

Kansas City is highly important as a commercial center. As the distributing point for a vast agricultural region to the west and south it controls large wholesale interests, its jobbing trade in farming implements ranking among the most extensive in the United States. In the grain, live-stock, and meat-packing business, Kansas City is closely allied with Kansas City, Kan., the two municipalities forming practically one industrial and commercial community. The elevators have a storage capacity of over 6,200,000 bushels, and a handling capacity of 1,425,000 bushels. The Kansas City stock yards handle annually 125,000 cars of live stock valued at over $130,000,000, including 2,000,000 head of cattle and 3,700,000 hogs, besides large numbers of sheep, calves, horses and mules. The mills have a total output of over 1,825,000 barrels of flour (1,430,000 barrels), oatmeal, and cornmeal.

The first permanent settlement at Kansas City was made in 1821 by a small company of French fur traders, headed by François Chomteau. In 1838 a town was laid out, and in 1853 it was incorporated as a city. It was the starting-point of the first railroad across the plains, and received its first commercial impetus in 1865, when the Missouri Pacific railroad reached it. After this date its growth was exceedingly rapid. Pop. 1909, estimated at 300,000.

KANSAS STATE AGRICULTURAL COLLEGE, a coeducational institution of learning at Manhattan, Kan. The college owns 323 acres of land, valued at $39,700, and leases 221 acres in addition, the greater part of these grounds being used for experimental work. The courses embrace English, general and domestic science, mechanical and electrical engineering, and agriculture, leading to the degree of bachelor of science, a preparatory department, a musical department, and apprentice courses, designed for those who wish to learn a trade.

KANSAS, UNIVERSITY OF, a coeducational state institution at Lawrence, Kan., established by act of the legislature in 1864 and opened in 1866. The university comprises a graduate school; school of arts, law, medicine, pharmacy, engineering and fine arts; and the university geological survey It confers the bachelor's degree in arts, science, law, medicine, music and painting; the master's degree in arts and science, the doctor's degree in philosophy; and the degree of civil and electrical engineer Tuition is free to residents of Kansas.

KANSAS RIVER, a river of Kansas, formed by the junction of the Solomon and Smoky Hill (the latter rising in the Rocky Mountains), traverses the state in an easterly direction, and falls into the Missouri near Kansas City.

KANSOO', or **KANSU,** an inland province in the north of China; area, 86,608 sq. miles. Pop. 5,411,188.

KANT, Immanuel, a celebrated German philosopher, the founder of the "critical" or Kantian philosophy, born at Königsberg, Prussia, 1724, died at the same place 1804. It is impossible within our space to give anything like an exposition of the philosophy of Kant, which has profoundly influenced all sub-

sequent philosophical speculations. Dissatisfied with the dogmatisms of Wolff and the scepticism of Hume, he set himself to investigate the field of metaphysics for himself, and in the first place proceeded to the examination of the origin, extent, and limits of human knowledge. According to him, part of our knowledge is knowledge a priori, or original, transcendental, and independent of experience; part of it is a posteriori, or based on experience. What he calls the "pure reason" has to do with the former. His great work named the Critique of Pure Reason (first edition, Riga, 1781), contains the foundation for his whole system of philosophy. In the preface to a later work, the Critique of the Power of Judgment (Berlin, 1790), he defines "pure reason" thus: Pure reason is the faculty to understand by a priori principles; and the discussion of the possibility of these principles, and the delimitation of this faculty, constitutes the critique of pure reason. In the first rank of such ideas as we do not derive from experience are space and time. Kant shows that all our perceptions are submitted to these two forms, hence he concludes that they are within us, and not in the objects; they are necessary and pure intuitions of the internal sense. The three original faculties, through the medium of which we acquire knowledge, are sense, understanding, reason. Sense,

Immanuel Kant.

a passive and receptive faculty, has, as already stated, for its forms or conditions space and time. Understanding is an active or spontaneous faculty, and consists in the power of forming conceptions according to such categories as unity, plurality, casuality, etc., which categories are applied to objects of experience through the medium of the two forms of perception, space and time. Reason is the third or highest degree of mental spontaneity, and consists in the power of forming ideas. As it is the province of the understanding to form the intuitions of sense into conceptions, so it is the business of reason to form conceptions into ideas. Far from rejecting experience, Kant considers the work of all our life but the action of our innate faculties on the conceptions which come to us from without. He proceeds in a similar way with morality; the idea of good and bad is a necessary condition, an original basis of morals, which is supposed in every one of our moral reflections, and not obtained by experience. He treats this part of his philosophy in his Critique of Practical Reason (1788).

KA'OLIN, a name first given by the Chinese to a pure white clay used by them in the manufacture of porcelain. Kaolin is the result of the decomposition of granitic rock, containing felspar, mica, and quartz. Similar clays, differing slightly in color and in the percentage of constituents, are found at Schneeberg in Saxony, furnishing the material of Dresden china; at Limoges, in France, employed for Limoges ware; and at St. Austell, in Cornwall, the source of supply for the British potteries. It is also found in Nebraska and some of the eastern states. In its natural state kaolin somewhat resembles mortar; by sorting and repeated filtration it is freed from all coarse ingredients, then dried in pans and sheds, and sent into the market cut into blocks.

KAPURTHALA (ka-pört'ha-la), native state of India, province Punjab; area 598 sq. miles; pop. 299,690. The capital, Kapurthala. Pop. 17,000.

KARAM'SIN, Nicolai Michailovitch, imperial Russian historiographer, born in a village of the government of Orenburg in 1765, died at St. Petersburg 1826. His title to fame rests on his History of the Russian Empire (12 vols., St. Petersburg, 1816–24), a work written in fine style, with impartiality and penetration, and translated into several other languages, including an English edition.

KARAULI', a town of India. Pop. 23,124.—The state, which is under the superintendence of the Bhurtpore and Karauli agency, has an area of 1208 sq. miles, and a population of 148,670.

KARLSBAD. See Carlsbad.

KARNAK. See Thebes.

KARNAL (kar-näl'), an Indian town and district, in the Punjab; area of district, 2396 sq. miles; pop. 683,718. Karnal, the headquarters of the district, trades largely with Delhi and Umballa. Pop. 23,559.

KARNUL', or **KARNOOL',** a town in India, in the presidency of Madras, situated in the fork formed by the junction of the Hundri with the Tungabhadra, with a dismantled fort. Pop. 25,376.—The district has an area of 7514 sq. miles; a pop. of 817,811.

KARS, a town on the Russo-Turkish frontier in Asia. Captured and annexed by the Russians in November, 1878, it has become the capital of a Russian province of the same name; area, 7175 sq. miles, pop. 292,498. It has since been connected with Batoum and Tiflis by military roads, and the fortifications have been much enlarged and strengthened. Pop. 20,891.

KASHGAR', a Chinese town of Central Asia, in Eastern Turkestan on a river of the same name, with considerable manufactures of cotton, linen, gold and silver cloths, carpets, etc., and an extensive trade, its position at the junction of several great routes making it the emporium of much of the commerce of Central Asia. Pop. estimated at from 40,000 to 80,000.

KAS'SON, John Adam, an American diplomat, born in 1822 at Charlotte, Vt., of Irish ancestry. In 1857 he removed to Iowa, where he entered politics, and in 1860, as chairman of the republican state committee, managed the Lincoln campaign, and was appointed first assistant postmaster-general. In 1863 he was sent as United States commissioner to the first international postal congress at Paris. From 1863 to 1867 he was a republican member of congress from Iowa. From 1873 to 1877 again sat in congress. In 1877 appointed minister to Austria-Hungary by President Hayes. He returned to America in 1881, was again sent to congress, was reëlected in 1883. President Arthur, in 1884, appointed him minister to Germany, where he served also as the United States representative at the international Congo conference at Berlin. In 1887 he was president of the international constitutional centennial commission at Philadelphia, and in 1889 was chairman of the United States commission to the international Samoan conference at Berlin. In 1897 he was appointed commissioner plenipotentiary to negotiate reciprocity treaties with foreign powers under the provisions of the Dingley act. In 1898 he was a member of the American-Canadian joint high commission.

KA'TYDID, a species of grasshopper of a pale green color, body about an inch long, found in some parts of North America, and so named from the sound of its note. This is produced by the friction of the taborets in the triangular overlapping portion of each wing-cover against the other, and is strengthened by the escape of air from the sacs of the body, so as to be heard on a quiet night at a quarter of a mile distance. The females are noiseless.

KAULBACH (koul'bâh), Wilhelm von, one of the greatest of modern German painters, born at Arolsen, Waldeck, in 1805; died at Munich of cholera in 1874. The desire of King Ludwig of Bavaria to make Munich the center of German art afforded free scope for his genius, and he was long engaged in the decoration of

W. von Kaulbach.

the Hofgarten, the Odeon, the palaces of Maximilian and Ludwig, and the new Pinacothek, for which he did the series of designs of contemporary groups of artists, architects, etc., executed in fresco on the exterior. His most ambitious pictures, with the exception of the Madhouse (1828), are to be found in a series (utilized in the decoration of the Berlin Museum) seeking to depict the progress of the human race in typical scenes from the great historic periods and comprising the Tower of Babel, Age of Homer, Destruction of Jerusalem, Battle of the Huns and Romans, the Crusades, and the Reformation (1834–63). Besides these, however, he left a large number of portraits, designs,

and illustrations of books, including the Reineke Fuchs, the Gospels, and the works of Shakespeare, Goethe, and Schiller.

KAZAN', a city of European Russia, capital of the gov. of same name, situated on the Kasanka, about 4 miles above its junction with the Volga. Pop. 140,726.—The gov. is surrounded by the governments of Viatka, Orenburg, Nijni-Novgorod, and Simbirsk; area, 24,601, pop. 1,992,985.

KEAN, Charles John, actor, son of the celebrated Edmund Kean, born at Waterford 1811, died at London 1868. He was educated at Eton, but being thrown on his own resources in 1827 he took to the stage, and made his début at Drury Lane as Young Norval. He married the accomplished actress Ellen Tree in 1842, and in 1851 became sole lessee of the Princess' Theater, London, where he put some of Shakespeare's plays on the stage with a splendor never before attempted. He inherited little of his father's genius, and his success was largely due to effective staging.

KEAN, Edmund, the most brilliant tragic actor of his age, was born in London in 1787, died at Richmond 1833. His parents were poor and connected in a low capacity with the theatrical profession. At two years of age he was placed in a pantomime, at seven he went to school, but ran away, and for a short time he was a cabin-boy in a vessel. Returning to the boards he ultimately obtained an engagement at one of the minor London theaters. When not yet thirteen years of age he managed to please his country audiences as Hamlet, Cato, etc., and in Windsor he gained the applause of the royal family in Richard III. He married Miss Chambers, an actress in his company, in 1808. In 1814 he appeared at Drury Lane first as Shylock and then as Richard III. His success was sudden and unexampled, and was equally great in other parts, including Othello, Hamlet, Macbeth, Iago, Lear, etc. Visits to the provinces, to Paris, and the United States brought him fresh fame and profit.

KEARNEY, Denis, American labor agitator, was born in Oakmont, Ireland, in 1847. In 1877 he began to incite the laboring men of San Francisco against the wealthier classes; great meetings were held on the "Sand Lots" near the city, where Kearney ruled supreme, and soon attracted attention by his savage attacks upon capital, Chinese labor, and various other alleged grievances. His influence rapidly increased, until his adherents were strong enough to pack a constitutional convention and force the adoption of a new state constitution which was largely in their own interest and was most detrimental to capital and vested interests generally. His followers, however, gradually drew away from him and he himself soon relapsed into insignificance. He died in 1907.

KEARNY, (kär'ni), a town in Hudson co., N. J., on the Possaic river, opposite Newark, and on the Erie and other railroads. It is a residential suburb of Newark and New York. Pop. 12,302.

KEARNY, Phillip, American soldier, was born in New York City in 1815. In 1837 he entered the United States army as lieutenant in the first dragoons, and two years later was one of three officers sent by the United States government to study the French cavalry service. In 1840 he was then successively aide-de-camp to General Macomb, general in chief of the United States army from 1840 to 1841 and to General Scott from 1841 to 1844. In 1859 he entered the French army as a volunteer in the Italian war and for his conspicuous bravery throughout the campaign he received the cross of the Legion of Honor. He returned to the United States and in 1862 was placed in command of the army of the Potomac. He was in the battles of Williamsburg and Seven Pines, and in 1862 was commissioned major-general of volunteers. He subsequently participated in the second battle of Bull Run and on September 1, 1862, was killed at Chantilly while reconnoitering.

KEATS, John, English poet, was born in London 31st October, 1795; died at Rome 24th February, 1821. His first volume of poems came out in 1817. Endymion, a Poetic Romance, appeared in 1818; his last volume of poetry containing Lamia, Isabella, The Eve of St. Agnes, Hyperion, and other poems

John Keats.

in 1820. Keats charms by his love of nature, his keen sensuous perception, and his sweet harmony; but his beautiful thoughts are often hidden by wild fancies, while errors of taste and faults of diction abound in his poetry. But his later works are free of many of the faults of the earlier productions, and place him in the front rank of the poets of his age.

KE'BLE, John, an English divine and poet, born 1792, died 1866. His reputation is chiefly due to his well-known volume of hymns, The Christian Year. He also wrote Lyra Innocentium, a series of poems on children, Sermons, etc. Keble College, Oxford, was established in honor of his memory.

KE'BLE COLLEGE, one of the colleges of Oxford University, built by subscription as a memorial of the Rev. John Keble, and incorporated in 1870 by royal charter.

KECSKEMET (kech'ke-met), one of the largest market towns of Hungary, 50 miles southeast of Budapest. Pop. 56,951.

KEDGE, a small anchor used to keep a ship steady and clear from her bower anchor, while she rides in a harbor or river, also in removing her from one part of a harbor to another. See Anchor.

KEEL, the bottom timber in a wooden vessel which forms the main support and connection of the whole fabric. It is generally composed of several thick pieces of timber placed lengthways, scarfed and bolted together. A piece bolted to the bottom of the keel is called the false keel, and an internal piece, also bolted to the keel, is called the keelson. In iron vessels the arrangement of parts is altogether different.

KEELEY, Leslie, American physician born in St. Lawrence co., N. Y., in 1836. In 1880 he opened a sanitarium at Dwight, Ill., for persons addicted to the immoderate use of liquor and opium. His success was so great that he opened similar institutions in different parts of the country. His cure consists of a secret preparation containing bichloride of gold, and he claimed that 95 per cent of the patients treated were permanently cured. He died in 1900.

KEELEY MOTOR, a machine claiming to furnish power at a minimum expenditure of energy. Its inventor, John W. Keeley, who was born in Philadelphia in 1837, and died there in 1898, made startling claims for the success of his motors. Various exhibitions were given with remarkable features but the promised developments never appeared and after the inventor's death the fraud was thoroughly exposed, it being shown that the force was supplied by a hidden compressed air apparatus.

KEENE, the county seat of Cheshire co., N. H., 43 miles southwest of Concord; on the Ashuelot river, and on the Boston and Maine railroad. Pop. 10,425.

KEENE, Laura, the stage name of Miss Mary Moss, an actress, born in 1820 in England. Her greatest success before coming to this country was as Pauline in The Lady of Lyons. Her most celebrated production was Our American Cousin, which she brought out in 1858, with Joseph Jefferson as Asa Trenchard and E. A. Sothern as Lord Dundreary. She afterwards toured with it, and it was during one of her presentations of this play in 1865 that President Lincoln was assassinated. She died in 1873.

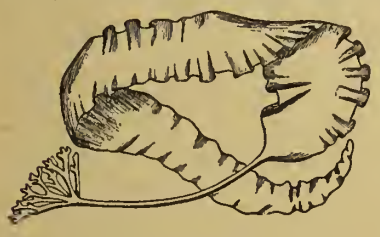
KEEWAT'IN. See Kewatin.

KELLER, Helen Adams, an American girl remarkable for her intellectual accomplishments acquired in spite of being deaf, dumb, and blind, was born in 1880 in Tuscumbia, Ala. When nineteen months old she was attacked by scarlet fever, which left her without the senses of sight and hearing. When eight years old she was placed under the care of Miss Anna Sullivan, and from that time her progress was remarkable. When she had learned to read and write and to use the finger alphabet, she determined that she would learn to speak, and so rapid was her progress that in less than a month she was able to talk intelligibly. After studying for some years she entered Radcliffe College in 1900 and graduated in 1904. She contributes to a number of magazines and is the author of The Story of My Life.

KELLY, John, American politician, was born in New York City in 1821. He became a member of the Tammany General Committee in 1849; and in 1854

was elected alderman from the fourteenth ward. He served in congress from 1855 to 1858. From 1872 to 1884 he was dictator of the Tammany organization. He was appointed comptroller by Mayor Wickham, but was subsequently removed by Mayor Cooper. In 1884 made a stubborn but unsuccessful effort to prevent the nomination of Grover Cleveland for the presidency. He died in 1886.

KELP, in commerce, the crude alkaline substance obtained by burning seaweeds. The sea-weed is gathered during the summer, dried on the shore, then stacked under shelter for some weeks until it becomes covered with a white saline efflorescence, when it is ready for burning, which is effected in a round



Kelp, or devil's apron.

brick-lined pit, or oblong kiln. As the weed softens, it is well stirred with a heated iron until it becomes a semi-fluid mass; it is then cooled and broken into pieces ready for the market. Kelp is now chiefly used for the production of iodine and chloride of potassium; a ton of kelp yields about 8 lbs. of iodine.

KELTS. See Celts.

KELUNG', a town and seaport now belonging to Japan, in the northern part of the island of Formosa. Pop. 70,000.

KELVIN, Lord. See Thomson, Sir William.

KEMBLE, Charles, English actor, born 1775, died 1854, a younger brother of John Phillip Kemble. He married the favorite actress Miss de Camp in 1806, by whom he was the father of John Mitchell Kemble, Frances Anne Kemble, and Adelaide Kemble.

KEMBLE, Frances Anne, popularly known as Fanny Kemble, writer and actress, eldest daughter of Charles Kemble, and niece of Mrs. Siddons, was born at London 1809. Her father being in financial difficulties she was induced to appear on the stage, which she did in 1829 at Covent Garden as Juliet, and her success was so great that in the course of three years she managed to relieve the fallen fortunes of the family. Her trip to America in company with her father was also a splendid triumph. She returned to London in 1847, and from that time resided alternately in America, England, and the Continent, appearing at intervals as a public reader. She died in 1893. As an actress she excelled in the characters of Portia, Beatrice, Lady Macbeth, Lady Teazle, and of Julia in the Hunchback.

KEMBLE, John Phillip, one of the most eminent tragedians of the British stage, born at Preston 1757, died at Lausanne 1823. He selected the stage as a profession, made his first appearance at Drury Lane in 1783, and became at once popular. He was afterward manager of this theater in 1788–1802. From 1801 to 1803 he made a most successful tour in France and Spain, and on his return to London purchased a share in the Covent Garden theater, and made himself a splendid reputation in the characters of Julius Cæsar, Hamlet, Macbeth, Coriolanus, etc. His statue was placed in Westminster Abbey in 1833. His acting was distinguished for dignity, precision, and studious preparation, but was wanting in fire and pathos. His sister, Sarah, was the celebrated Mrs. Siddons.

KEMPIS, Thomas A. See Thomas à Kempis.

KEN'ILWORTH, a town of England, in Warwickshire. Kenilworth Castle, now a magnificent ivy-covered ruin, was founded in the reign of Henry I. The gorgeous entertainment given here in 1575 to Queen Elizabeth by the Earl of Leicester is familiar to all from Scott's romance of Kenilworth. Pop. 4544.

KEN'NAN, George, American journalist and traveler, was born at Norwalk, Ohio, in 1845. In December of 1864 he began his travels by a journey to Kamtchatka. In 1870 he explored the eastern Caucasus, Daghestan, Chechnia, and the course of the Volga to the Caspian; again in 1885–86 he made a journey of 15,000 miles through Northern Russia and Siberia, investigating the convict, prison, and exile system, and exploring the Russian Altai. He was expelled from the Russian Empire while carrying on further social and political studies there in 1901. In 1902 he went as correspondent for a New York newspaper to the island of Martinique, after the devastating eruptions of Mont Pelée, and climbed the still active volcano, which he describes in his book The Tragedy of Pelée. In 1904 he went to Japan to describe the Russian-Japanese war.

KENNEBEC, a river of the United States, Maine, rises in Moosehead Lake, and after a course of 150 miles, mostly e.s.e., empties itself into the Atlantic 12 miles below Bath. It is navigable for ships as far as Bath, for steamers to Hallowell, 40 miles.

KENOSHA, capital of Kenosha co., Wis., on Lake Michigan, and the Chi. and N. W. railway; 34 miles s. of Milwaukee, 52 miles n. of Chicago. It has an excellent harbor. It is in a dairy and agricultural region, and manufactures carriages, wagons, furniture, and other wooden goods. Pop. 13,960.

KENT, a maritime county of England, forming the southeast extremity of the kingdom; area, 995,392 acres, of which nearly the whole is arable, meadow, or pasture. Pop. 1,351,849.

KENT, James, an eminent American jurist, born 1763, died 1847. He was educated at Yale College, studied law, and was admitted an attorney in 1785. After practicing at Poughkeepsie he settled in New York, and became professor of law at Columbia College (1794–98). He was successively appointed master in chancery, recorder, judge of the supreme court, chief justice (1804–14), and latterly chancellor of New York (1814–23). He again accepted the law professorship at Columbia College in 1824–25. His Commentaries on American Law (1826–30) at once became a standard work, while his decisions were quoted in the courts as of the highest authority.

KENTON, Simon, American pioneer, was born in Fauquier co., Va., in 1755. At the age of eighteen he came in contact with Simon Girty and other traders, hunters, and backwoodsmen, and eventually he joined Daniel Boone as a hunter and explorer. Later, he was employed by the colonial governor, Dunmore, as a spy, and among other daring exploits saved the life of Boone. In 1778 he joined Gen. George R. Clark at the falls of the Ohio, and was with him at the surprise of Kaskaskia. He was captured by the Indians during that year and taken prisoner to the British commander at Detroit, from whom he escaped. In 1782 he visited his native place, and in 1784 went back with his parents to Kentucky, settling near Maysville. Thereafter he was actively engaged in conflicts with the Indians until peace was established in 1793. Previously Kenton had been promoted major. In 1805 he became brigadier-general of Ohio militia and in 1813 fought at the battle of the Thames. In 1824 he appeared in Frankfort, Ky., before the legislature, in tattered garments, petitioning for relief, which was granted, and an annual pension of $240 procured for him from congress. He died in 1836.

KENTUCK'Y, one of the United States, bounded n. by Ohio and Indiana, n.w. by Illinois, w. by Missouri, s. by Tennessee, and e. by Virginia and West Virginia; area, 40,400 sq. miles. The surface of the state is gently undulating, excepting the southeast, which is somewhat mountainous. Few states are better provided with water communication. The Ohio forms the boundary on the north, and receives from within the state numerous tributaries, of which the most important are the Cumberland, Kentucky, and Tennessee; the Mississippi, after receiving the Ohio, forms the boundary on the west. The climate is salubrious, the soil fertile, the principal crops being wheat, Indian corn,

Seal of Kentucky.

but oats, barley, hemp, and fruit are extensively raised.

Kentucky is densely wooded, except in those places that are under cultivation; at present about two-thirds of the state is covered with virgin forest. Among the prevailing species of trees are the blue ash, black walnut, various kinds of oak, the pine, maple, tulip

tree, and sweet gum. Some cotton is raised west of the Tennessee River. Potatoes and hay are important crops. Kentucky is the principal tobacco-producing state in the Union.

It has always been a center for rearing domestic animals, and for breeding the finest grades of stock. A large percentage of the successful race horses of the United States have been bred in Kentucky. The peculiar advantages for stock raising are due in part to the excellent quality of the grass, and in part to the mild, salubrious climate, which permits the cattle to remain unhoused in the pastures during the greater part of the winter.

Kentucky is rich in coal, iron ore, and fire clay. The coal measures cover an area of more than 10,400 sq. mi. with elevation ranging from 650 to 1,400 feet, and are the result of several alternate exposures and submersions. They average at least ten good beds of coal. The eastern coal field is a prolongation of the Appalachian deposits. The western belongs to the Illinois tract. The coal is bituminous, and some excellent cannel occurs. Next in importance to coal are the iron ores, which are of excellent quality, and are found throughout a district of 20,000 sq. mi. in extent. Galena is found in some sections; valuable building stone occurs almost everywhere; and salt is obtained by boring in the coal and oil regions.

The state has a good school system and many colleges and institutions for higher education. Kentucky University, located at Lexington, was founded in 1798. There are separate schools for colored pupils.

The chief manufacturing industries comprise tobacco, cotton and woolen factories, iron-works, and tanneries. The central position of the state, and the abundant water and railway communication, have secured it a rapid commercial development.

Kentucky was originally a portion of Virginia. In 1769 Daniel Boone and five companions from the Yadkin settlements came to eastern Kentucky, but it was not until 1774 that the first effort to plant a colony was undertaken. It was located in what is now Mercer Co., and was given the name of Harrodsburg. In 1775 Daniel Boone planted a settlement to which he gave the name of Boonesborough. In 1774 a Virginian force administered a crushing defeat to the Northwestern Indians at Point Pleasant, and forced them to retire beyond the Ohio. In 1776 by act of the legislature, the country was organized under the name of Kentucky co., with Harrodsburg as the county seat, and with separate representatives in the Virginia legislature. In 1782 a desperate battle with the Indians was fought at the Blue Lick Springs, resulting in the defeat of the whites and the death of over sixty of their men, about one-tenth of the fighting population. By this time agitation for separation from Virginia and independent state government was well under way. In 1784 and 1785 conventions were held at Danville to discuss the question but it was not until 1792 that Kentucky was admitted to the union.

In April, 1792, a convention met at Danville and adopted a constitution of government; Isaac Shelby was chosen as the first governor; and, after a spirited struggle, Frankfort was chosen as the capital. In July, 1799, a new constitution was adopted which made the governor and other state officers elective by the people instead of by electors. In the war of 1812 Kentucky took a distinguished part. Seven thousand volunteers, far more than Kentucky's quota, offered their services, and her troops fought gallantly in most of the battles in the northern part of the United States and in Canada, and about one-fourth of Jackson's army at New Orleans consisted of Kentucky riflemen. In the Mexican war, as in the war of 1812, Kentucky took an honorable part. Although her quota was but 2400, more than 10,000 volunteered and Kentucky troops participated in most of the battles fought on Mexican soil. In 1850 a new constitution was adopted which made all judges and county officers elective.

Upon the outbreak of the civil war Kentucky attempted to maintain a position of neutrality, but the geographical position of the state rendered the scheme impossible. The governor rejected President Lincoln's call for troops, and when the confederate and union armies began to pour into the state from opposite directions formal demands were made for their withdrawal. The union armies soon took possession, and by 1862 the confederate forces had evacuated the state. Kentucky furnished more than 90,000 troops to the union army, and 40,000 to the confederacy. Kentucky escaped from the carpetbag and military régimes, the civil authority having been reëstablished in October, 1865. In national elections Kentucky was a democratic state from the date of its admission till the formation of parties about 1828. It voted for Clay in 1824 and for Jackson in 1828, but from this time till 1852 it was one of the strongest whig states. It cast its vote for Buchanan in 1856 and for Bell in 1860. Since that time it has been democratic with the exception of the year 1896, when it cast 12 of its electoral votes for Mr. McKinley and one for Mr. Bryan. The seat of government is Frankfort, a comparatively small place; the oldest town is Lexington; but the largest and most important is Louisville.

At the head of the higher institutions of learning are the Kentucky University at Georgetown, the Kentucky State Agricultural and Mechanical College at Lexington, and a number of denominational colleges and universities. Pop. 1909, 2,250,000.

KENTUCKY RIVER, a river of the United States, rises in the Cumberland Mountains, traverses the state of Kentucky, and after a course of 260 miles flows into the Ohio at Carrollton. By a series of improvements the lower portion has been rendered continuously navigable for steamers.

KENTUCKY STATE AGRICULTURAL AND MECHANICAL COLLEGE, a non-sectarian, coeducational institution at Lexington, Ky., established in 1865, and reorganized in 1880 under its present title. It offers preparatory, collegiate, engineering, scientific and agricultural courses leading to the bachelor's degree. Connected with the college is an agricultural experimental station, with a farm of 48 acres.

KENTUCKY UNIVERSITY, an institution of higher learning chartered in 1837 as Bacon College at Georgetown, Ky. It was removed to Harrodsburg in 1839, and in 1858 was reorganized as Kentucky University under an amended charter. It was consolidated with Transylvania University founded in 1783 and took possession of that institution's property at Lexington. The university comprises four colleges; The College of Liberal Arts, the College of the Bible, and the Commercial College, at Lexington; and the Medical Department at Louisville. Of these the Commercial and Liberal Arts departments are open to women. The Kentucky Agricultural and Mechanical College was one of the colleges of the university from 1865 until 1878, when it began an independent existence. The university is under the control of the Disciples of Christ.

KE'OKUK, a town in Iowa, at the foot of the lower rapids of the Mississippi 2 miles above the confluence of the Des Moines. It is an important business center, and has numerous flour and saw mills, foundries, pork-packing establishments, etc. Pop. 17,345.

KEPLER, Johann, a great German mathematician and astronomer, born 1571, near Weil (Würtemberg), died at Ratisbon 1630. He studied at the University of Tübingen, and in 1593 he was appointed a teacher of mathematics at Gratz (Styria). Here he devoted himself with much ardor to the study of astronomy; but in 1599 the religious persecutions commenced in Styria, and Kepler, being a Protestant, gladly accepted Tycho Brahe's invitation to Prague, to assist in the preparation of the new astronomical tables, called the

Johann Kepler.

Rodolphine Tables. Tycho died in 1601, and Kepler continued the work alone, being appointed imperial mathematician and astronomer. After twenty-five years' incessant labor the tables were published in 1627 at Ulm. Kepler had become the happy possessor of all Tycho's papers, and the mass of observations made by that astronomer during twenty years, with a precision till then unsurpassed, enabled Kepler to establish his three laws which have proved so fruitful in the development of astronomical science. He wrote much, but the

work that has rendered him immortal is his New Astronomy, or Celestial Physics delivered in Commentaries on the Motions of Mars; Prague, 1609, folio.

KEPLER'S LAWS, in astronomy, three laws discovered by Kepler on which were founded Newton's discoveries, as well as the whole modern theory of the planets:—1. Every planet describes an ellipse, the sun occupying its focus. 2. The radius vector (line joining the center of the sun with the center of the planet) of each planet sweeps over equal areas in equal times. 3. The squares of the periodic times (the periods of complete revolution round the sun) of two planets are proportional to the cubes of their mean distances from the sun. These laws enabled Newton to determine the laws of the attraction of gravitation.

KEPP'LER, Joseph, American cartoonist, was born in Vienna in 1838. In 1868 he came to the United States and went to St. Louis, where he established the German Puck, the failure of which caused him to move to New York, where he was employed as caricaturist for Frank Leslie's Illustrated Newspaper from 1872 to 1877. In 1875 he started another German Puck, in partnership with Adolph Schwartzman. The colored political cartoons of this paper became famous, and in 1877 the English edition appeared. He was the first artist to introduce colored cartoons. Died, 1894.

KERGUELEN'S LAND, Kerguelen Island (kerg'len), an uninhabited mountainous island in the Indian Ocean about midway between the Cape of Good Hope and Australia, discovered by the French navigator Kerguelen in 1772, annexed by France in 1893. It is of irregular shape, being much cut up by fjords and inlets and surrounded by islets; greatest length about 100 miles, highest summit 6166 feet. The scenery is picturesque and often magnificent; glaciers and snow-fields occupy a considerable area. The climate is wet and stormy, the temperature never very high nor very low. The island is only occasionally visited by whalers and sealers. Cook visited it in 1777, Ross in 1840, the Challenger Expedition in 1874, and in 1874–75 parties from Britain, Germany, and the United States were stationed here to observe the transit of Venus.

KERMAN', KIRMAN', or **SIRGAN,** a town in Persia, capital of a province of the same name. Pop. estimated at 40,000. The province of Kerman, in the southeast of Persia, has an area of 50,000 sq. miles and a population of 600,000.

KERN, JOHN WORTH, born at Alto, Ind., Dec. 20, 1849; elected Supreme Court Recorder in 1885; elected state senator in 1892; Democratic candidate for governor in 1900 and 1904, but defeated; nominated for vice president of the United States by Democratic National Convention at Denver in 1908.

KER'OSENE, an illuminating oil obtained by refining crude petroleum. The bulk of kerosene is supplied by the United States and Russia. America controlled the kerosene market for many years, but Baku, on the Caspian, has now become a formidable rival, not only driving American kerosene out of the Russian market, but also supplanting it in other countries. See Petroleum.

KER'RY, a martime county of Ireland, on the southwest coast, in the province of Munster; area, 1,185,918 acres, of which about one-tenth is under tillage. The coast is much indented by bays and inlets (Dingle Bay, Kenmare river, etc.); the interior presents much fine scenery, including the picturesque lakes of Killarney. Iron ore, copper, and lead exist, and a superior kind of slate and flagstone are obtained in great quantities in the island of Valentia. Pop. 165,331.

KER'SEYMERE, or **CASSIMERE** (from the town Cashmere), the name given to a light fabric woven from the finest wools, principally in the west of England, and at Elbeuf, France. It is chiefly used for ladies' jackets and gentlemen's gaiters.

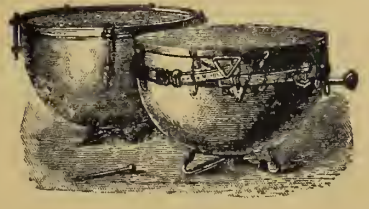
KESTREL, or **WINDHOVER,** a species of the falcon tribe, widely distributed in Europe. It is remarkable for its habit of remaining suspended in the air by means of rapid wing motion, being at this time on the look-out for mice, which

Kestrel.

are its chief food. At times it will also eat small birds, and insects frequently. It varies from 12 to 15 inches in length; it nests in trees, also in old towers and buildings, and often utilizes an old crow's nest. In winter it migrates to North Africa and India.

KETCHUP, or **CATSUP,** a pungent sauce employed as a seasoning for gravies, meat and fish. It was formerly prepared from mushrooms only, but numerous other products are now used for the same purpose. The best ketchup is obtained from mushrooms, walnuts, and tomatotes.

KETTLE-DRUM, a metallic kettle made of copper with a head of vellum lapped over an iron ring, and fitted outside of the kettle. By means of screws the head may be tightened or loosened. The drums are played by means of a



Kettle-drums.

mallet covered with felt or leather. By means of the screws the instruments can be tuned. In modern orchestras there are generally three kettle-drums, tuned in the tonic, dominant, and subdominant. The larger of the two drums is tuned in F, the smaller in B♭. By means of a pedal any interval within a perfect fifth can be obtained; so that the larger drum can produce all tones between F and c, and the smaller all tones between B♭ and f, giving the performer the possibility of producing any chromatic interval between F and f. The chief use of the kettledrum is to emphasize rhythmic figures.

KEWANEE (kē-wä'nē), a city in Henry co., Ill., 50 miles north by west of Peoria; on the Chicago, Burlington and Quincy railroad. Pop. 10,145.

KEWATIN (kē-wat'in), or **KEEWATIN,** a large Canadian territory under the jurisdiction of Manitoba, and stretching from Manitoba and Ontario to Hudson's Bay. The country is not much opened as yet; it is mostly densely wooded, and in many parts swampy, but rich in minerals, and game abounds. With a view to open up a new route via Hudson's Bay a railway through the territory has been begun.

KEW-KIANG, or **KIU-KIANG,** a town and seaport of China, province Kiangsi, on the south bank of the Yang-tse-kiang. The port was opened to foreign trade in 1862, when the population was 10,000; it is now over 50,000.

KEY, or **KEY-NOTE,** in music, the principal or fundamental note or tone, to which the whole of a movement has a certain relation, to which all its modulations are referred and accommodated, and in which it generally both begins and ends. See Music.

KEY, Francis Scott, American lawyer, was born in Frederick co., Md , 1780. During the attack of the British on Baltimore in 1814, he watched the progress of the bombardment of Fort Henry, the defense of Baltimore from the British ship, to which he had been sent on an errand under a flag of truce, during the night, and in the morning, seeing the Stars and Stripes still waving triumphantly, composed his famous song, The Star Spangled Banner. This was at once printed and became almost instantly popular, and is to-day perhaps the favorite heroic song of America. He died in 1843.

KEYBOARD, a frame containing a set of keys, placed in the front part of the pianoforte or organ. The natural keys are of wood covered with white ivory and the raised keys, touched to produce sharps and flats, are blocks of ebony or other hard black wood. The earliest keyboard of which we have record was that of the hydraulic or water organ, a Greek invention of the second century. In this the keys, eighteen in number, were all level. Strange to say, the principle of the balanced key, which had to be rediscovered in the 17th century, was then well known. Our modern chromatic keyboard was in use as early as 1361, though the keys were so large that they had to be struck with the fist. Their width was, however, gradually lessened, and in the spinet made by Pasi, of Modena, in 1490, and in the organ of Saint Blaise at Brunswick (1499), the compass was approximately that of our present keyboard. In most of the early instruments the natural notes are black and the sharps and flats white. The principal objection to all rearrangement

is the fact that there is a mass of beautiful music, written for the modern pianoforte, which could not be adapted to an improved instrument.

KEY-STONE, in architecture, the last put in stone of an arch or vault, which locks or keys the whole together, whence the name. See Arch.

KEY WEST, a small, low-lying coral island south of Flordia, 60 miles s.w. of Cape Sable, and commanding the entrance to the Florida Passage and the Gulf of Mexico.

KEY WEST CITY, a port of entry and military station of the United States, has a safe and accessible harbor defended by a fort. Pop. 20,406.

KHAN, a title given by Tartars, Persians, and other eastern nations to princes, chieftains, commanders, and governors, but now generally reserved for governors of cities and provinces, these provinces being called khanates. Khan is also another term for caravansary, of which there are two kinds; one for pilgrims and travelers, with gratuitous entry, another, more commodious and with locked apartments, for traders, subject to a nominal charge.

KHANDESH (khän-dāsh′), a district of British India, Bombay presidency; area, 10,907 sq. miles; pop. 1,460,851.

KHARKOFF (hȧr-kof′), or **CHARKOV,** a government of the south of Russia; area, 21,041 sq.miles; pop. 2,243,643. The capital, Kharkoff, has a considerable trade in cattle, grain, etc. and manufactures beet-sugar, soap, candles, and leather. A bed of coal of immense extent in its vicinity is doing much to foster industries. The University of Kharkoff is an important educational center. Pop. 195,000.

KHARTOUM (hȧr-töm), a town in the eastern Soudan, on the left bank of the Blue Nile, near its junction with the White Nile. Having sprung up since 1830, it became the capital and largest town in the Egyptian Soudan, and a great emporium of trade. It was the scene of Gordon's heroic defense and death in fight against the Mahdists in 1885. Latterly the adjacent Omdurman supplanted it, but it is again reviving, and has become the seat of the Gordon College, for the Soudanese.

KHASI AND JAINTIA HILLS, an administrative district of Assam; area, 6157 sq. miles; pop. 197,904.

KHAT. See Catha.

KHATMANDU (khȧt-mȧn-dö′), capital of the Kingdom of Nepál, in Northern India. Pop. about 50,000.

KHEDIVE (ke-dēv′), a word signifying lord, the title of the rulers of Egypt, originally granted by a firman from the sultan in 1866 to Ismail Pasha, then Vali or viceroy of Egypt.

KHERSON (her′son), or **CHERSON,** a maritime government of Southern Russia; area, 27,523 sq.miles; pop. 2,732,832.

KHIVA (hē′vȧ), or **CHIVA,** semi-independent khanate of Central Asia, forming part of Turkestan. The total population is about 500,000.—The capital, Khiva, lies on an alluvial flat at the junction of two canals, 50 miles west of the west bank of the Amu. Pop. about 20,000.

KHOKAND, or **KOKAND,** formerly independent khanate of Central Asia, but since 1876 forming the province of Ferghâna in Russian Turkestan. Its present area is 29,650 sq. miles. The capital, Khokand, is situated on both sides of the Sir. Pop. 82,054.

KHORASAN (ho-rȧ-sän′), a province of Persia, bordering on Afghanistan; area, 140,000 sq. miles; pop. 860,000.

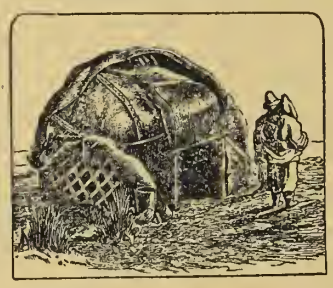
KHUZISTAN (hụ-zis-tän′), or **ARABISTAN,** a province of Persia; area, 38,600 sq. miles, pop. 500,000.

KHYBER (khī′bėr), a famous mountain pass between India and Afghanistan, the chief gate to the latter country from Peshawur, by means of which India has been invaded from time to time, and the scene of severe conflicts in the recent Afghan war. Its position renders it of the greatest importance to British India, and it is now under the jurisdiction of the lieut.-governor of the Punjab. It is 3373 feet above sea-level, about 50 miles long, and inclosed on each side by precipices from 600 to 1200 feet high.

KIANG-SI, one of the central provinces of China; area, 72,176 sq. miles; pop. 24,534,118.

KIANG-SU, the richest of the central provs. of China; area, 44,500 sq. miles; pop. 20,905,171. The chief port is Nanking.

KIBIT′KA, a tent of the nomad tribes of the Kirghiz Tartars. The frame consists of twelve stakes, each 5½ feet high, set up in a circle 12 feet in diameter, on which is laid a wheel-shaped roof-frame, consisting also of twelve stakes, united at one extremity but free at the other, so that the stakes radiate like spokes.



Kibitka or Kirghiz tent.

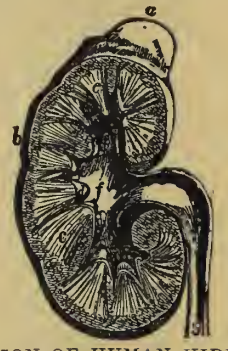
The whole is covered with thick cloth, made of sheep's wool, with the exception of an aperture in the center for the escape of smoke. The door is formed by the removal of a stake.—The name is also given to a carriage generally without springs, used by all classes in Russia, and which is covered by some kind of cover to afford protection from the weather.

KIDD, William, a celebrated pirate, known as Captain Kidd, born about the middle of the 17th century, and originally a shipmaster of New York. In 1696 he was appointed captain of the ship Adventure Galley of thirty guns by William III., for the suppression of piracy. In America he collected some 150 recruits, sailed for the East Indies; took to pirating in the Indian Ocean, and returned with his booty to New York in 1698. He was arrested and arraigned in England for piracy; but the charge could not be brought home to him; he was then tried for the murder of one of his crew, sentenced and hanged, in 1701. The story that he buried immense treasure on the shores of Long Island Sound, or the banks of the Hudson river, gave rise to one of Edgar Allen Poe's tales.

KIDNAPPING, the act of getting forcible and illegal possession of the person, an offense of varied degree, but always punishable by fine or imprisonment.

KIDNEY-BEANS. See French Beans.

KIDNEYS, two of the abdominal viscera, in the form of two glands, the function of which is to secrete the urine from the blood. They are situated one on each side of the vertebral column at



SECTION OF HUMAN KIDNEY.

a, Supra-renal capsule, resting above the kidney. *b*, Cortex or cortical portion of kidney. *cc*, Medullary portion, consisting of cones. *d d*, Apices of the pyramids, projecting into their corresponding calyces *e e e*. *f*, Pelvis. *g*, Ureter.

the back part of the abdominal cavity on a level with the last dorsal and two upper lumbar vertebræ. The right kidney lies at a slightly lower level than the left. They are of the well-known "kidney-bean" shape. The concave side of each kidney is turned inward and toward the spine. The depression on the inner side is termed the hilum, and from this notch the excretory duct or ureter proceeds, while the blood-vessels of the kidney enter and leave the gland at this point. The weight of each male kidney is about 5 oz.; those of the female weigh each somewhat less. Each gland is covered by a thin sheath of fibrous tissue, which has no extension into the substance of the organ. The internal substance is divided into an outer deeper-colored cortical portion or cortex, and an inner lighter-colored or medullary portion. Both portions consist of tubes (tubuli uriniferi), which run a very tortuous course in the cortex, but continue as straight tubes in the medulla. The latter is formed into a series of conical fleshy masses, about twelve in number, called pyramids of Malpighi. These project into a cavity formed at the hilum by the expansion of the excretory duct, and called the pelvis of the kidney. Prolongations of the expanded ureter, called the calyces, invest the apices of the pyramids and dip in between them like funnel-shaped tubes. Now in the cortex the end of a tubule is dilated into a sac or capsule; into this a small branch of the renal artery enters, and then breaks up into a tuft of capillary blood vessels. This tuft is called the glomerulus, and it and its capsule form a Malpighian corpuscle

about $\frac{1}{120}$th of an inch in diameter. So that a tubule, beginning at its dilated end, runs a tortuous course in the cortex, reaching the medulla becomes straight, and finally opens into the pelvis on the apex of a pyramid. The blood vessels of the kidney consist of the renal artery, derived from the aorta, and the renal vein. The branches of the artery enter the gland at the hilum, and pass into the substance of the gland between the papillæ. Finally they reach the cortical portion, and therein subdivide into minute vessels, which form the glomeruli of the Malpighian bodies. The renal veins leave the kidney also at the hilum, and pour their contents into the great main vein of the lower parts of the body (vena cava inferior). The nervous supply of the kidney is derived from the renal plexus, and from the solar plexus or large sympathetic mass of the abdomen. The separation from the blood of the constituents of the urine is accomplished in the glomeruli, and by the uriniferous tubules, the former straining off the watery parts of the blood, while the latter remove the more solid matters. Gradually, the secreted urine passes through the tubules, into the pelvis of the kidney, thence into the ureters, which in turn open into the bladder behind its orifice or neck. The urine is constantly entering the bladder, drop by drop.

Inflammation of the kidneys is known as nephritis. Occasionally concretions of mineral substances accumulate in the kidney, and cause, in their passage from the gland and through the ureter, most excruciating pain.

KIEL (kēl), a town of Prussia, in Schleswig-Holstein, beautifully situated

on a deep bay of the Baltic, 54 miles north by east from Hamburg. The most notable buildings are the university, and the royal palace (containing the university library). As a fortified naval port of Germany, with an imperial dockyard, and as the station of the greater part of the imperial fleet, Kiel is rapidly rising in importance. Besides ship building, it has iron foundries, engineering works, oil mills, tan works, tobacco works, etc. By the great ship-canal it is now connected with the Elbe. Pop. 121,790.

KIELCE (ki-eltse), a government and town in Russian Poland; area of the former, 3897 sq. miles; pop. 763,746. The capital, Kielce, is an ancient town about 50 miles northeast of Crocow. Pop. 23,189.

KIEV (ki-ev′), or Kieff (ki-ef′), a government of s.w. Russia; area, 19,691 sq. miles; pop. 3,576,125. Kieff, the capital, is picturesquely situated on the right bank of the Dnieper, which is here navigable, and crossed by a suspension bridge half a mile in length, one of the finest in Europe. Its university is one of the most important of the empire. The connection by rail with Odessa and Kursk has done much to stimulate the trade of the town. Pop. 249,830.

KILAUEA, an active volcano in Hawaii, one of the Sandwich Islands. It has an oval crater, 9 miles in circumference, with a lake of red and boiling lava at the bottom, over 1000 feet below the crater's mouth.

KILDARE′, an inland county of Ireland, in the province of Leinster; length, 40 miles; breadth, 27 miles; area, 418,496 acres. Pop. 63,469. The town of Kildare stands on an eminence 30 miles s.w. from Dublin.

KIL′IMA-NJARO (the Great Mountain), a double-peaked, snow-clad mountain of Africa, in the territory of the German East African Company, about 100 miles inland from the port of Mombasa, on the Suaheli coast. The highest peak, estimated at 19,270 feet, is the highest known in the African continent.

KILKEN′NY, a city, parliamentary borough, and county of itself, in Ireland, locally in Kilkenny county, of which it is the capital, 73 miles s.w. from Dublin, delightfully situated on both sides of the Nore. Pop. 13,242. The county, which is in the province of Leinster, has an area of 796 sq. miles. Pop. 79,159.

KILLAR′NEY, a market town of Ireland, in the county of Kerry, in the midst of beautiful scenery, within a mile of the celebrated lakes to which it gives its name. These lakes are three in number, the lower 4½ miles long by 2 broad, the middle 1½ miles long and ½ broad, the upper 3 miles long. They are interspersed with wooded islands, and the lofty banks are also richly wooded. In summer Killarney is thronged with visitors. Pop. 5656.

KILMAR′NOCK, a parliamentary and municipal burgh of Scotland, in the county of Ayr, 19 miles s.w. from Glasgow. Pop. 34,165.

KILN, a structure of brick or stone used for drying, baking, burning, annealing and calcining various substances and articles, such as corn, hops, malt, cement, limestone, iron ore, glass, bricks, pottery, etc. The construction of kilns naturally varies with the special object for which they are designed, but the same principle is involved in all, that is, the generation of ample and regular heat with the least expenditure of fuel.

KILOGRAMME, a French weight containing 1000 grammes — 2.2 lbs. Similarly kilometer — 1000 meters or 0.621 miles. See Metrical Sytsem.

KILOGRAMMETER. a unit employed in the measurement of mechanical work; it is the mechanical work expended in raising a body whose weight is 1 kilogramme (2.2046 lbs.) through the vertical height of 1 meter (3.2809 feet), and is equal to 7.233 foot-pounds. See Foot-pound.

KIM′BERLEY, the capital of Griqualand West, Cape Colony, and the center of the South African diamond fields. It is connected by rail with Port Elizabeth and Cape Town. There are four chief mines—Kimberley, Dutoitspan, De Beer's and Bultfontein. It successfully withstood a four months' siege by the Boers in 1899–1900. Pop. 28,643.

KIN. See Descent.

KINCAR′DINESHIRE, a maritime county on the east coast of Scotland; area, 248,284 acres. Pop. 40,918.

KIN′DERGARTEN, a German word signifying "children's garden," and the name given to a system of infant education introduced by Friedrich Froebel, who was largely assisted in its propagation by the Baroness Marenholz-Bülow. The system is intended to bring out the moral and intellectual capabilities of very young children chiefly by observation; pictures, toys, tools, etc., suitable for the purpose, being introduced, so as to convert schooling into play, which according to Froebel is the child's most serious business. The first kindergarten was opened in 1840 at Blankenburg (Prussia), and like most other innovations met at first with little encouragement, and even with opposition, but it gradually gained a footing in the best educated countries, and the progress in recent years has been great and rapid. Froebel Societies for the training of teachers exist now in various countries. The system is most widely spread in the United States and Belgium, while Switzerland, France, and Austria are grafting it on their elementary schools.

KINEMAT′ICS, a branch of mathematics which treats of the motions of bodies independently of the forces which produce them.

KINET′ICS, that branch of the science of dynamics which treats of forces causing motion in bodies. See Dynamics.

KINETOSCOPE, a device for reproducing movable pictures from photographs, invented by Thomas A. Edison, in 1894. In shape it is a cabinet form, and the pictures are viewed from above through suitable lenses. The pictures come within the field of vision on a transparent film beneath which is an electric incandescent light. The result is an optical illusion, in that a series of pictures pass before the eye so rapidly that the effect is that of continuous motion. Thus a kinetoscopic view of a boxing match shows the boxers as though the observer were really looking at the originals through the small end of an opera glass.

The original protograph is taken by means of a specially arranged camera. In this camera the shutter is a slotted disk which is revolved by mechanism so as to open and shut 42 times a second. Back of the shutter is a continuous narrow film about two inches in width. This is arranged to run from one roller to another, so that one roller is giving off the film while the other is winding it up.

The roller is such that a new sensitive area is exposed at every opening of the slotted shutter. In other words, 42 fields are exposed to the light and receive the image. This film is developed, and from that negative a continuous positive is printed by the usual photographic process with the modifications necessary to enable the photographer to handle the long, ribbonlike film. In the kinetoscope proper, this film passes before the object-glass at such a speed that lifelike motions are faithfully reproduced. The modifications of the kinetoscope for use in stereopticon exhibits are the cinematograph, veriscope, and vitascope. In these devices the ribbonlike film is made to pass before a calcium or electric arc-light. A series of photographs are enlarged by means of the ordinary stereopticon lenses, and thrown upon a sheet in a theater or hall, giving lifesize, lifelike continuous pictures. Such scenes as the charge of a cavalry squadron, prize fights, stage dancing, boxing, horses running, fast express trains, etc., have been reproduced by the kinetoscope.

KING, a person invested with supreme power over a state, nation, or people, whether this power be acquired by inheritance, election, or otherwise. It is difficult to define what essentially constitutes a king, or to say in what he differs from an emperor.

KING, Charles, American soldier and novelist, was born at Albany, N. Y., in 1844. He served in the artillery and cavalry; was retired as captain for wounds received in action (1879); was inspector and instructor of the Wisconsin National Guard (1882–89), colonel (1890), adjutant-general (1895), and brigadier-general, U. S. V. (1898). He afterward served in the Philippines. Among his best known books are Famous and Decisive Battles, Campaigning with Crook, Between the Lines, The Colonel's Daughter, A War-Time Wooing, Kitty's Conquest, A Tame Surrender, Foes in Ambush, Fort Wayne, An Apache Princess, Medal of Honor.

KING, Clarence, American geologist, was born in 1842. In 1863 he started on a trip across the continent. He arrived in California and became attached as assistant to the Geological Survey. His investigations included the determination of the age of the gold-bearing rocks, surveys of Mount-Whitney and the Yosemite Valley, and the collection of evidence in support of the glaciation of the Sierras. In 1879, he was appointed the first director of the United States geological survey. The most important of his publications are the following. Mountaineering in the Sierras, On the Discovery of Actual Glaciers on the Mountains of the Pacific Slope, Systematic Geology, and The Age of the Earth. He died in 1901.

KING, Rufus, American political leader, born in 1755, at Scarborough, Maine. In 1783 he took his seat in the general court of Massachusetts. He became a member of the Continental congress in December, 1784, being re-elected in 1785 and 1786. He took a prominent part in the proceedings of the convention of 1787 which framed the federal constitution, and in the Massachusetts convention called to decide upon the adoption or rejection of that instrument he was instrumental in securing ratification. In 1786 he removed to New York City, where he was elected to the state assembly in 1789 and in the same year was elected to the United States senate, where he at once

took a high place as a leader of the federalists. King was re-elected in 1795 and in 1796 he accepted from President Washington the responsible post of Minister to England. He distinguished himself highly in the diplomatic service, in which he continued until 1803. As the federal candidate for vice-president he received fourteen votes. Again in 1808 he was the federalist candidate for the same office, receiving 47 votes. In 1813 and in 1819 he was elected to the United States senate. In 1825–26 he was again minister to England. He died in 1827.

KING, William Rufus, American statesman, was born in Sampson co., N. C., in 1786. In 1806 he was elected to the state legislature, serving until his election, as a democrat, to the United States congress in 1810. In 1818, he settled as a cotton planter in Dallas co., Ala., was a member of the convention which drew up the constitution for the proposed state in that year, and after its admission in 1819 took his seat in the United States senate as one of the first senators from Alabama. He remained in the senate by re-election until 1844, serving after 1838 as president pro tempore. In 1844 he accepted from President Tyler an appointment as minister to France. In 1846 he was returned to the senate to fill an unexpired term, was re-elected for a full term, and served until 1853, presiding over the body in the last three years as president pro tempore. In 1852 King, who had been a candidate for the democratic nomination for the vice-presidency ever since 1840, was finally named for that office on the Pierce ticket, and was elected. Before the inauguration, however, his health began to fail rapidly, and he went to Havana, Cuba, where by special act of congress he was allowed to take the oath of office on March 4, 1853. He never entered upon the duties of his office, however, but died shortly after his return to Alabama in the April following.

KING-CRAB, a peculiar genus of crabs included in the order Xiphosura (sword-tailed), of the class Crustacea. They are found on the coasts of northern and tropical America and the Antilles, in the eastern Archipelago and Japan. The head resembles a broad horse-shoe shaped shield, with two pairs of eyes upon the upper surface, the second pair being the larger and forming the true

King-crab.

visual organs. The mouth opens on the lower surface, and around it are six pairs of limbs with spinous joints attached. A second shield somewhat hexagonal in shape covers the abdominal part, and beneath it are the gills, or branchiæ, borne upon five pairs of appendages which represent the abdominal feet of the crab. The average length is about 2 feet. These crabs are destitute of swimming powers, and if placed on their backs they appear, like turtles, unable to recover their natural position. The commonest species is the Limulus polyphēmus, found chiefly on the North American coasts. The upper surface of the tail, as in other species, bears numerous spines. The Limulus moluccānus, of the Moluccas, possesses a strongly serrated tail. This latter species is largely eaten.

KINGFISHER, the name of a family of insessorial birds distinguished by the elongated stoutly formed, tetragonal bill, broad at the base, and terminating in a finely acute point; tarsi short, feet strong, toes somewhat elongated. The common kingfisher has the upper part

The European kingfisher.

of the head, the sides of the neck, and the coverts of the wings green, spotted with blue. The back is dark green in color, the lower back and rump being of a bright blue. The throat is white,

and the under surface of the body a pale-brown color. It frequents the banks of rivers, and, perched on the bough of a tree, watches for fish. When the prey is perceived it dives into the water, secures the fish with its feet, and carries it to land, where it kills the prey and swallows it entire. It is about 7 inches in length. This bird has been greatly celebrated in ancient poetic and legendary lore, and is the subject of many superstitions. The American kingfisher is of a bluish-slate color, with an iron-colored band on the breast, while the head bears a crest of feathers. The spotted kingfisher is a native of the Himalayas, where it is called the fish-tiger. A large Australian species is known as the laughing-jackass (which see).

KINGLAKE, Alexander William, an English historian, born 1811, and educated at Eton and Cambridge. The first volume of his Invasion of the Crimea appeared in 1863, and at once established his reputation as a brilliant historian; seven volumes followed at intervals, the eighth and completing volume in 1887, and they form together a magnificent record of this war. He died in 1891.

KING OF (or at) **ARMS,** in England, an officer whose business is to direct the heralds, preside at their chapters, and have the jurisdiction of arms. There are three kings of arms in England—Garter, Clarencieux, Norroy, and an officer styled Bath King of Arms, attached to the order of the Bath. There are also Lion King at Arms for Scotland, and Ulster King of Arms for Ireland.

KINGS, Books of, form two books in the English and one book in the Hebrew canon of the Old Testament. Besides their own unity the books of Kings are closely connected with first and second of Samuel, and, following these, form the third and fourth in what is known as the four books of the kingdom. From internal evidence it would seem that these were written by a series of contemporaries, with additions and glosses made by a later writer. The history, as related in the books of Kings, begins with the close of David's reign, and carries the events onward to the capture of Jerusalem and the destruction of the temple. This embraces, according to the received chronology, a period of upward of 400 years (B.C. 1015–588), and includes the history of both the kingdoms of Judah and Israel. This chronology, however, is unsatisfactory, and has been much disputed. In comparing these books with the Chronicles it is found that while the former describes the divided kingdom of Israel and Judah, the latter is occupied almost exclusively with Judah; and further, that the books of Kings seem to have been compiled under prophetic, and the Chronicles under priestly influence.

KING'S COUNTY, an inland county, Ireland, province of Leinster; area, 493,985 acres, of which 351,495 are arable. Pop. 60,129.

KINGSLEY, Rev. Charles, English clergyman, novelist and poet, born in 1819, died 1875. In 1853 was published Hypatia, and in 1855 Westward Ho, both brilliant historical novels, the former dealing with the early Christian church, the later with the South American adventurers of the Elizabethan era. Among his other well-known works are Two Years Ago, Hereward the Last of the English, Glaucus, and The Water Babies.

KINGSTON, a city of Ontario, Canada. The trade is very considerable, and the harbor is accessible to ships of large size. Kingston was founded in 1783, on the ground formerly occupied by Fort Frontenac. It was incorporated in 1838. The government penitentiary is situated here. Pop. 19,043.

KINGSTON, the capital of the island of Jamaica, on the south coast, with straight and regular streets and houses generally of brick. The principal buildings are the old parish church, town-hall, Jamaica Institute, hospital, court-house,

theater, penitentiary, barracks, and jail. The harbor, which is 6 miles long by 2 miles wide, is separated from the sea by a narrow slip of low land, and forms an excellent anchorage for vessels of any size. It is defended by several forts. Pop. 48,504. See the map.

KINGSTON, a city in New York state, 90 miles north of New York, on the Hudson, by which and by railroad and canal it carries on a large trade. It has carriage factories, iron-foundries and machine shops, cement manufactory, etc. Pop. 27,175.

KING-VULTURE, the Sarcorhampus Papa of the intertropical regions of America. It is about 2½ feet in length, and upwards of 5 feet across the expanded wings. The other vultures are said to stand quietly by until this, their monarch, has finished his repast.

KING-WOOD, a Brazilian wood from a leguminous tree. It is beautifully streaked with violet tints or West Indian ebony, and is used in turning and small cabinet-work. Called also Violet-wood.

Kinkajou.

KINK'AJOU, a plantigrade carnivorous mammal of northern South America, allied to the bear family. In habits it is omnivorous, nocturnal, and docile when captured. In shape it resembles the lemur, the legs are short, fur close and woolly, tail long and prehensile. Being fond of honey they make frequent forays upon the nests of bees.

KIOSK', a Turkish word signifying a kind of open pavilion or summer-house, supported by pillars. It has been introduced from the east into the gardens, parks, etc., of Western Europe.

KIO'TO, a large city of Japan, in the island of Hondo, formerly the residence of the Mikado, and the ecclesiastical capital of Japan. It is the center of learning and of artistic manufactures. Pop. 317,270.

KIPLING, Rudyard, English writer, born in Bombay, 1865; After an education in England he returned to India, became connected with the press, and soon became known by short stories contributed to Indian periodicals. In 1890 some of these were brought prominently before the British public, and his reputation was at once secured. Indian and Anglo-Indian life, and especially the life of the European soldier in India, are depicted by him with much graphic power and originality. Among his writings are Soldiers Three, Plain Tales from the Hills, The Light that Failed, Many Inventions, The Jungle Book, Second Jungle Book, Kim, The Days' Work, Stalky & Co., etc. He has written a good deal of verse, including Departmental Ditties, and Barrack-room Ballads.

KIRCHHOFF (kirh'hof), Robert, German physicist, born 1824, died 1887. He devoted his attention to the subjects of heat, elasticity, and magnetism. Conjointly with Bunsen he discovered the spectroscope.

KIRGHIZ, Kirghis (kir'gēz), a nomadic Mongol-Tartar race, numbering in its various branches about 3,000,000, and inhabiting the steppes that extend from the lower Volga and the Caspian Sea in the west to the Altai and Thian-Shan Mountains in the east, and from the Sea of Aral and the Syr Daria in the south to the Tobol and Irtish on the north.

KIRIN, a division or province and town of the Chinese territory Manchuria. The town, also called Kirinoola or Girin, has a pop. of 120,000.

KIRKCALDY (kir-kâ'di), known as the "Lang Toun," a royal and parliamentary burgh and seaport, Scotland, county of Fife, on the north shore of the Firth of Forth. Pop. of royal burgh, 34,063; parl. burgh, 22,346.

KIRKCUDBRIGHT (kir-kö'brī), Stewartry of, a maritime county, in the south of Scotland; bounded north by county Ayr, west by Wigtown, north and east by Dumfries, and south by the Solway Firth and Wigtown Bay; area, 582,982, acres. Pop. 39,407.—The county town is a royal burgh. Pop. 2386.

KISH'INEV, or **KISHENAU,** a town of Russia, capital of the government of Bessarabia, on the Byk, a tributary of the Dniester. Pop. about 130,000.

KISSINGEN (kis'ing-en), a watering-place of Bavaria, on the Saale, 30 miles north of Würzburg. The springs, which are cold, and all saline, contain a large quantity of carbonic acid gas, and

are used both internally and as baths.

KITCHENER, Sir Horatio Herbert, Viscount Kitchener or Khartum, British general, born 1850; educated at the Royal Military Academy, Woolwich; entered the Royal Engineers 1871; engaged in survey of Palestine 1874–78; surveyed Cyprus 1880–82; commanded the Egyptian cavalry in 1882–84, and served in the Soudan campaign of 1883–85; was adjutant-general and second in command of the Egyptian army 1888–92; and in 1892 succeeded Sir Francis Grenfell as Sirdar. As such he recovered Dongola (1896), and by the victories of the Atbara and Omdurman (1898) regained for Egypt the lost southern provinces. For these services he was created a baron, and in 1899 he became governor-general of the Egyptian Soudan. In January, 1900, he arrived in South Africa as chief of the staff to Lord Roberts in the Boer war, and in December be became commander-in-chief there. He ended the war by the treaty of Vereeniging on May 31, 1902, and for his services he was created a viscount, and presented with $250,000 by a vote of the House of Commons.

KITCHEN-MIDDENS, the name given to certain mounds, from 3 to 10 feet in height and 100 to 1000 feet in length, found in Denmark, the north of Scotland, etc., consisting chiefly of the shells of oysters, cockles, and other edible shell-fish. They are the refuse heaps of a pre-historic people unacquainted with the use of metals, all the implements found in them being of stone, bone, horn, or wood. Fragments of rude pottery occur. The bones are all those of wild animals, with the exception of those of the dog. Similar shell deposits occur on the eastern shores of the United States, formed by the Red Indians.

KITE, a raptorial bird of the falcon family, differing from the true falcons in having a somewhat long forked tail, long wings, short legs, and weak bill and talons. This last peculiarity renders it

Kite.

the least formidable of the birds of prey. The common kite, glead, or glede preys chiefly on the smaller quadrupeds, birds, young chickens, etc. It usually builds in the fork of a tree in a thick wood.

KITE, a light framework covered with paper or other light material and held by a string in such a way that the wind raises it to a greater or less height above the ground. Kites have been used for centuries by the Japanese and Chinese as a toy made in the form of birds, bats, dragons, and other creatures, the framework being covered with silk or paper having ornamental designs. Kites have recently come into quite extended use in meteorological observations and for other useful purposes, also to hold suspended in mid air banners for advertising purposes and for taking photographs.

KITTIWAKE, a species of gull found in great abundance in all the northern parts of the world wherever the coast is high and rocky.

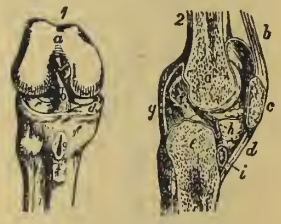
KLEPTOMA'NIA, a supposed species of insanity manifesting itself in a desire to pilfer. In admitting the plea of kleptomania great caution is needed. The best way to arrive at a judgment is to consider the previous character and personal interests of the person charged; to determine the value and usefulness of the article appropriated; the methods of the appropriation and its probable motive.

KLONDIKE, a tributary of the Yukon river. The Klondike placer mines are located in the beds and along the banks of the Bonanza, El Dorado, and other tributary streams and creeks of the Klondike river. This district is in the northwest territories of British America just east of the Alaskan border-line, 2200 miles from the mouth of the Yukon river. Gold was discovered in this district by George Carmack, a native of Illinois, in August, 1886. The gold lies all the way through a frozen bed of muck, fine and coarse gravel from 23 to 26 feet deep. The gold is free in large grains and nuggets. The precious deposit is extremely rich, and miners have panned out over $300 worth of gold per pan. The world at large learned of the rich Klondike mines in July, 1897, and before the middle of August 6,000 men were on their way to the Klondike district, and by the summer of 1898 there were over 40,000 people in the Klondike region. The richest deposits are found on the Bonanza, El Dorado, Gold Bottom, Adams, Bear, Hunker, and Too Much Gold creeks. Dawson City, N. W. T., at the junction of the Klondike and Yukon rivers, is the chief trading post of that district. The total production of the Klondike region is over one hundred and thirty-five millions. Mining operations are seriously embarrassed by the short summer period; three months is the limit of outdoor work. Miners excavate pay-dirt during the winter months and wash the dirt during summer. The discovery of gold at Cape Nome drew many miners from the Klondike in 1899 and 1900. A large number of the small streams that drain the southern side of the peninsula have been worked, including Anvil, Cripple, Eldorado, Ophir, Solomon and Kugruk creeks, each of which gives its name to a local district. The coastal plain in the vicinity of Nome is covered with a heavy growth of moss, and beneath this there are layers of gravel from 40 to 80 feet thick which carry gold. The methods employed in mining these deposits are similar to those used in working the creek gravels. Most of the excavation is done with the aid of steam for thawing the frozen gravels. The production of the Nome district from its discovery is over $40,000,000.

KLOPSTOCK, Friedrich Gottlieb, a celebrated German poet, born in 1724, died in 1803; famous as the author of the scared epic, The Messiah. He also wrote a number of odes, etc. His reputation was greater in his own day than has since been the case, but he is admitted to have done great service to German literature in assisting to free it from foreign, especially French influence.

KNAPSACK, a bag of leather or strong cloth for carrying a soldier's necessaries, and closely strapped to the back between the shoulders.

KNEE, or **KNEE-JOINT,** that joint in the lower limbs of man which corresponds to the elbow in the upper, and is formed by the articulation of the femur or thigh-bone with the tibia, or large bone of the leg. The lower end of the femur terminates in two oblong rounded masses, called the condyles of the femur, which rest in two cavities in the upper part of the tibia; interposed between the



Human knee-joint.

1, Right knee-joint laid open from the front, to show the internal ligaments. *a*, Cartilaginous surface of lower extremity of the femur, with its two condyles. *b*, Anterior crucial ligament. *c*, Posterior do. *d*, Internal semilunar fibro-cartilage. *e*, External fibro-cartilage. *f*, Part of the ligament of the patella turned down. *g*, Bursa or sac containing synovial fluid laid open.

2, Longitudinal section of the left knee-joint. *a*, Cancellus structure of lower part of femur. *b*, Tendon of extensor muscles of leg. *c*, Patella. *d* Ligament of the patella. *e*, Cancellous structure of head of tibia. *f*, Anterior crucial ligament. *g*, Posterior ligament. *h*, Mass of fat projecting into the cavity of the joint below the patella. *i*, Bursa.

two bones are the semilunar cartilages, which diminish the pressure of the femur on the tibia, and prevent the displacement of the former. In front of the knee-joint is the patella or knee-pan. The joint is capable of flexion and extension, and of a very slight rotary movement. The accompanying figures and explanations will enable the joint and its chief features to be thoroughly understood. See also Leg.

KNEIPP (knip), Sebastian, a German priest, the inventor of a special kind of "water-cure," was born in 1821 in Stefansried, Bavaria, Germany. A trifling accident led to systematic experiments in his water-cure treatment, of which one feature is that patients are compelled to walk barefooted in the snow in winter and on the wet grass in summer. Sunshine, fresh air, water, and a definite object at stated hours, are the chief factors in the Kneipp treatment. Societies bearing his name exist in different parts of the world. He died in 1897.

KNIGHT, in feudal times, a man admitted to a certain military rank, with special ceremonies. See Chivalry. In British usage one who holds from the sovereign a certain dignity entitling him to have the title Sir prefixed to his christian name, but not hereditary like a baronetcy called a knight bachelor if not a member of any order. Wives of knights have the legal designation Dame for which Lady is usually substituted. See Knighthood, orders of.

KNIGHT, Charles, English editor and publisher, born 1791, died 1873. He did a great deal of valuable work, superintending and publishing the Library of Entertaining Knowledge; the Penny Magazine and the Penny Cyclopædia, afterward remodelled as the English Cyclopædia, etc. Other publications of his were the Pictorial Bible, the Pictorial Prayer-book, the Thousand and One Nights, Shakespeare, and many others. The Shakespeare was edited by Mr. Knight himself, and has, both for its text and notes, taken a high place among the numerous editions of the great dramatist. The most important of his own writings, the Popular History of England, occupied him seven years, 1854–61. An autobiography, Passages of a Working Life During Half a Century, appeared in 1863–65.

KNIGHTHOOD, Orders of, the name given to organized and duly constituted bodies of knights. The orders of knighthood are of two classes—either they are associations or fraternities, possessing property and rights of their own as independent bodies, or they are merely honorary associations established by sovereigns within their respective dominions. To the former class belong the three celebrated religious orders founded during the Crusades—Templars, Hospitallers, and Teutonic Knights. The other class, consisting of orders merely titular, embraces most of the existing European orders, such as the order of the Golden Fleece, the order of the Holy Ghost, the order of St. Michael. The British orders are the Garter, the Thistle, St. Patrick, the Bath, St. Michael and St. George, the Star of India, the Indian Empire, and the Royal Victorian Order. The various orders have each their appropriate insignia, which generally include a badge or jewel, a collar, a ribbon of a certain color, and a star.

KNIGHTS OF LABOR, a labor organization founded at Philadelphia in 1869. Its operations are secret, but its professed object is the amelioration and protection of the laboring classes. This body comprehends the intelligences of the wage workers of the United States. Of late years the membership has largely decreased, through internal dissentions and ill-advised strikes.

KNIGHTS OF ST. JOHN. See John (Knights of St.)

KNIGHTS TEMPLARS. See Templars.

KNITTING, an industrial and ornamental art allied to weaving, but of much later origin. It consists in forming a series of loops with a single thread, through which another row of loops is passed, and so on consecutively; differing from crochet in so far as the series of loops are not thrown off and finished successively. In hand-knitting steel wires are used to form the loops on. For manufacturing purposes hand-knitting has been entirely superseded by machinery.

KNOT, a complication of a thread, cord or rope, or of two or more threads, cords, or ropes by tying, knitting, or entangling. Knots expressly made as means of fastening differ as to form, size, and name according to their uses, as overhand-knot, reef-knot, half-hitch, close-hitch, timber-hitch, fisherman's-bend, carrick-bend, sheet-bend, single-wall knot, double-wall knot, etc. The term knot is also applied on shipboard to a division of the log-line which is the same fraction of a mile as half a minute is of an hour, that is, it is the hundred and twentieth part of a nautical mile; hence, the number of knots run off the reel in half a minute shows the vessel's speed per hour in miles, so that when a ship goes 8 miles an hour, she is said to go 8 knots. Hence, the word has come to mean also a nautical mile or 6086.7 feet.

KNOUT, a kind of whip or scourge serving as an instrument of punishment in Russia. It was formerly in use in the army, but a few strokes only are now inflicted, as a disgrace, in case of dismissal. It is still sometimes used for criminals. The nobles were exempted from the knout, but the exemption was not always observed.

KNOW NOTHINGS, the popular name for the Native American party, which was formed in 1852. It aimed through naturalization laws to make politically powerless the large number of immigrants then settling in the country. It had entirely disappeared by 1860.

KNOX, John, the chief promoter of the reformation in Scotland, was born at Gifford, in East Lothian, in 1505; died at Edinburgh in 1572. He became an avowed advocate of the reformed faith about 1542. In 1546–47 he preached to the beleaguered protestants in the castle of St. Andrews, and when it was taken by the French Knox was sent to France with the other prisoners, and put to the galleys, from which he was released in 1549. He passed over to England, and, arriving in London, was licensed either by Cranmer or the Protector Somerset, and appointed preacher, first at Berwick, and afterward at Newcastle. In 1551 he was appointed chaplain to Edward VI., and preached before the king at Westminster, who recommended Cranmer to give him the living of Allhallows, in London, which Knox declined, not choosing to conform to the English liturgy. It is said that he also refused a bishopric. On the accession of Mary, in 1554, he quitted England, and sought refuge at Geneva. He ventured, in 1555, to pay a short visit to his native country. He again retired to Geneva, where he wrote the First Blast of the Trumpet against the Monstrous Regimen of Women, chiefly aimed at the cruel government of Queen Mary of England, and at the attempt of the queen regent of Scotland to rule without a parliament. A Second Blast was to have followed; but the accession of Queen Elizabeth to the throne of England, who was expected to be friendly to the Protestant cause, prevented it. In May, 1559, he returned to Scotland, and immediately joined the Lords of the Congregation. Being appointed minister of Edinburgh, he took a prominent part in the proceedings of the Protestant leaders from this time onward, and had the principal share of the work in drawing up the Confession of Faith, which was accepted in 1560 by the parliament. In 1561 the unfortunate Mary arrived in Scotland. She immediately began the regular celebration of mass in the royal chapel, which, being much frequented, excited the zeal of Knox, who openly declared from the pulpit, "that one mass was more frightful to him than 10,000 armed enemies landed in any part of the realm." He preached with equal openness against the marriage of Mary and Darnley, giving so much offense that he was called before the council and inhibited from preaching. After the death of Murray, in 1569, Knox retired for a time to St. Andrews. In 1572 his constitution was quite broken, and he received an additional shock by the news of the massacre of St. Bartholomew. He had, however, strength enough to preach against it, but soon after took to his bed, and died. He was twice married, first to Marjory Bowes in 1555, and secondly, in 1564, to Margaret Stewart, daughter of Lord Ochiltree.

KNOXVILLE, a town of the United States, capital of Knox co., Tennessee, an important commercial and manufacturing center at the head of steamboat navigation on the Holston river, 165 miles east of Nashville. It contains the East Tennessee university, the Knoxville university, the State agricultural college, and other educational and literary institutions. Pop. 32,637.

KOA'LA, a curious arboreal marsupial of Australia. It is about 2 feet in length, tailless, stoutly built, and clothed with thick, ash-gray, woolly hair. In the fore feet the first and second digits

Koala.

are opposable to the remaining three; in the hind feet the great toe is opposable. The animal is nocturnal in habit, and brings forth a single cub, which is carried for some time in the pouch and afterward on the mother's back.

KOBE, a seaport of Japan, adjoining Hiogo so closely as to form one town with it. It is of more recent origin than Hiogo, and is strictly the port opened by treaty to foreign commerce. Combined pop. 215,780.

KOCH, Robert, a German bacteriologist, and founder of the germ theory of disease. He was born at Clansthal, Hanover, in 1843, and was educated at Göttingen. He began his researches in 1872, and ten years later succeeded in isolating the bacillus of tuberculosis. His chief services in bacteriology are the methods he invented for demonstrating

Dr. Robert Koch.

the presence of germs, particularly his methods of staining bacteria so as to make them visible. In 1890, while Koch was experimenting his lymph-cure for tuberculosis a student prematurely reported it and Koch was placed in a false position as having made claims of which he had no knowledge. The value of the lymph is problematical. In 1885 Koch was made professor at Berlin.

KOCK, Charles-Paul de, French novelist, born 1794, died 1871. He wrote an immense number of novels which had a great popularity, and have yet a certain value as pictures of low and middle-class Parisian life during the first half of the 19th century. Besides his novels, he wrote some dramas, chiefly taken from them.

KOHAT', a town of India, headquarters of district of the same name in the new Northwest Frontier Province. Pop., including suburbs and cantonments, 30,762. The district has an area of 2771 sq. miles, and a pop. of 203,175.

KOH-I-NOOR. See Diamond.

Kohl-rabi.

KOHL-RABI, a cultivated variety of the cabbage, distinguished by a swelling at the neck of the root, which is eaten, and in its qualities much resembles Swedish turnip. It is valuable as a cattle food.

KO'KOMO, the county-seat of Howard co., Ind., 54 miles north of Indianapolis; on the Wildcat river, and on the Pittsburg, Cincinnati, Chicago and St. Louis, the Toledo, St. Louis and Kansas City, and the Lake Erie and Western railroads. Pop. 12,195.

KOLA, Cola, a genus of plants, a native of Western Tropical Africa. The Kola produces a fruit which consists of two, sometimes more, separate pods containing several seeds about the size of horse-chestnuts. The seeds have been found to contain caffeine, the active principle of coffee, as also the same active principle as cocoa with less fatty matter. A drink prepared from them is largely used and is said to have digestive, refreshing, and invigorating properties. The tree has been introduced into the West Indies and Brazil.

KOLA'BA, a British Indian district in the southern division of the Bombay Presidency; area, 1872 sq. miles; pop. 509,584.

KOLAPOOR'. See Kolhapur.

KOLAR', a district of the native state of Mysore, Southern India; area, 3059 sq. miles; pop. 591,030. The chief town is called Kolar. Pop. 11,172.

KOLHAPUR (kol-hä-por'), a native Indian state, Bombay Presidency; area, 2816 miles; pop. 913,131. Kolhapur is the chief town. Pop. 54,373.

KONIGSBERG (keu'nihs-berg), a fortified seaport town of Prussia, capital of the province of East Prussia. The principal public buildings are the cathedral, a Gothic structure, begun in 1333, restored in 1856, situated on the Kneiphof; the Schloss, or palace, begun in 1255, formerly the residence of the grand-masters of the Teutonic order, and now containing apartments for the royal family, government offices, etc.; the Schlosskirche, or palace church, occupying a wing of the palace; the new university, completed in 1862; the old university; the exchange, a fine modern building; the city museum, theater, etc. The university, founded in 1544 by the Margrave Albert, and has connected with it a library of 220,000 vols., a zoological museum, and other valuable collections. The manufactures of Königsberg are various. The chief trade is in grain, flax and hemp, timber, tea, etc. Pop. 187,897.

KONIGSHUTTE (keu'nihs-hüt-é), a town of Prussia, province of Silesia, 49 miles e.s.e. of Oppeln. Pop. 57,919.

KONRAD. See Conrad.

KOODOO (native name), the striped antelope, a native of South Africa, the male of which is distinguished by its fine horns, which are nearly 4 feet long, and beautifully twisted in a wide spiral. The koodoo is of a grayish-brown color, with a narrow white stripe along the back, and eight or ten similar stripes proceeding from it down either side. It is about 4 feet in height, and fully 8 in length.

KOORIA MOORIA ISLANDS, a group of five islands on the southeastern coast of Arabia, belonging to Britain. There was a considerable deposit of guano on the largest island; but it was not of very good quality, and is now exhausted.

KOPEK. See Copeck.

KO'RAN (Al-Korân, that is the Koran, which means originally "the reading, or that which is to be read"), the book containing the religious and moral code of the Mohammedans, and by which, indeed, all their transactions, civil, legal, military, etc., are regulated. According to the Mohammedan belief it was written from the beginning in golden rays on a gigantic tablet in the highest heavens, and portions were communicated by the angel Gabriel to Mohammed at intervals during twenty-three years. These were dictated by Mohammed to a scribe and kept for the use of his followers. After Mohammed's death they were collected into a volume, at the command of Mohammed's father-in-law and successor Abu Bekr. This form of the Koran, however, was considered to contain erroneous readings, and in order to remove these Caliph Othman caused a new copy to be made from the original fragments in the thirtieth year of the Hejra (652 A.D.), and then ordered all the old copies to be

Koodoo, or striped antelope.

destroyed. The leading doctrine of the Koran is the Oneness of God, clearly laid down in the symbol of the Moslem—"God is God, and Mohammed is his prophet." To Christ it assigns a place in the seventh or highest heaven, in the immediate presence of God, but he is simply regarded as one of the prophets—Adam, Noah, Abraham, Moses, Jesus and Mohammed. The doctrines of good and bad angels, and of the resurrection and final judgment, are fully set forth, as is also God's mercy, which secures entrance into heaven and not the merits or good works of a man. The joys of heaven range from music and women to the supreme joy of beholding God's face, while the pains of hell are depicted in vivid colors. Idolatry and the deification of created beings are severely condemned. Another dogma is set forth in the Koran, yet not explicitly, that of the unchangeable decrees of God. Mohammed used the doctrine of predestination with great success to infuse into his adherents undaunted courage, which elevated them above all perils. The Koran prescribes prayer, fasting, alms, and the pilgrimage to Mecca and Mount Arafat.

The great fast is that of Ramadan (which see). He prescribed prayer five times a day with the face turned toward Mecca. Purification must precede prayer and where water is unattainable dry dust or sand may be used. To give alms was always a particular trait of the Arabians, but Mohammed made it obligatory. The pilgrimage or something similar had existed with most sects before him. In respect to the civil laws relating to polygamy, divorce, inheritance, etc., Mohammed followed step for step the laws of Moses and the decisions of the rabbis, only adapting them to the customs and prejudices of his countrymen. The Koran is written in prose, but the different parts of a sentence end in ryhmes. In size it is about equal to the New Testament; it is divided into 114 surahs or chapters of unequal length, each of which begins with the phrase, "In the name of God." As the work was written at different times, in different moods, and on different occasions, there is naturally great diversity in the style of different passages. The language is considered the purest Arabic. It is, however, very different from the spoken Arabic of modern times. Commentaries on the Koran are exceedingly numerous.

KORDOFAN', a country of Africa, in the Eastern Soudan between Darfur and the Nile. Pop. estimated at 400,000. The chief town is El Obeid.

KOREA. See Corea.

KORNER (keur'nêr), Karl Theodor, German poet, born at Dresden 1791, killed 1813. He owes his fame to his celebrated patriotic lyrics, which are all national in Germany. In 1813, when Germany took up arms against Napoleon, Körner joined the famous Lützow corps of black huzzars, and was fatally wounded in a skirmish fought in the neighborbood of Gadebusch, in Mecklenburg-Schwerin. The collection of songs published soon after his death as Leyer und Schwert (Lyre and Sword) contains some of the finest war-songs in any language.

KOSCIUSKO (kos-si-us'ko, or kosh-tsyush'kō), Thaddeus, Polish patriot, was born in Lithuania of an ancient and noble family in 1746, and died at Soleure (Solothurn) 1817. He was educated in the military school at Warsaw, and was afterward sent at the expense of the state in the capacity of sub-lieutenant to complete his studies in France. On his return to Poland he became tutor to the daughter of Gosnovski, marshal of Lithuania, but having conceived a passion for his pupil, and being disappointed in his suit, he quitted his native country and betook himself to America (1777), where he attracted the notice of Washington, was appointed by him engineer, with the rank of colonel, and afterward general of brigade. He did not return to Europe till three years after the conclusion of the peace of 1783. For some years after his return he lived in retirement, but after serving in his own country under Poniatovski, he was appointed in 1794 generalissimo of the insurgent forces. He defeated the Russians at Raclavice, near Cracow, but at the battle of Maciejovice his army was defeated and he himself wounded and taken prisoner. He remained in captivity for two years, but was liberated on the accession of Paul I. of Russia in 1796. After visiting England and America, he ultimately settled at Soleure in Switzerland, where he continued to live in quiet retirement. In 1817 he issued from here a letter of emancipation to the serfs on his estate in Poland. In 1818 his body was removed at the expense of the Emperor Alexander of Russia to Cracow, where it was buried in the cathedral, and where a monument was erected to him. A mound 150 feet in height, formed of earth from all the principal battle-fields of Poland, was also raised to his memory in the vicinity of Cracow.

KOSSUTH (kosh'shut), Lajos (Louis), Hungarian patriot, born at Monok in the county of Zemplin, Hungary, 1802. He studied law, and in 1832 entered the Presburg parliament. For persisting in publishing the debates of the diet, he was condemned to four years' imprisonment. In 1841 he became editor of the Pesth Journal, and in 1844 he founded a national league in opposition to the Viennese government. In 1847 he was elected to the diet by the national party, and secured the appointment of a responsible Hungarian ministry, in which he became minister of finance. During the Hungarian war for liberty he was chosen governor or dictator, but the intervention of Russia rendered all the efforts of the Hungarians unavailing. Kossuth resigned, was succeeded by Görgey whom he accused of treachery, and was interned in Turkey. He was released through the intervention of Britain and the United States; visited these countries and met with an enthusiastic reception. He was long regarded as the leader of the irreconcilable party, but in 1884 he became reconciled to the Hapsburg rule. His chief residence in his latter years was at Turin, where he died in 1894.

KOSTROMA', an inland government of Russia, area 30,811 sq. miles. Pop. 1,429,228.—Kostroma, the capital is an ancient place, and has a fine old cathedral situated in the Kreml or former citadel. Pop. 41,268.

KOTAH, an Indian native state in Rajputána. Area, 3797 sq. miles, pop. 526,267.—Kotah, the chief town, is situated on the river Chambal, and has a pop. of 33,657.

KOUMISS, or **KUMISS,** a preparation of milk, whether cow's, mare's ass's, goat's, which is said to possess wonderful nutritive and assimilable properties. It consists essentially of milk in which alcoholic fermentation has been developed. On the Asiatic steppes, where it has been long used as a beverage, it is made of mare's milk; but koumiss of mare's milk or goat's milk has a somewhat unpleasant smell.

KOVNO, a town in Russian Poland. The population, a great part of which consists of Jews, is 73,543.—The government has an area of 15,602 sq. miles, and its population is 1,549,444.

KRAAL, a South African native village or town, usually a collection of huts surrounded by a palisade. Sometimes the term is applied to a single hut.

KRAKATO'A, a small uninhabited volcanic island situated in the Sunda straits, about equally distant from Java and Sumatra. In May of 1883 intimations of volcanic activity were observed, and on August 27th a gigantic explosion took place which actually blew away a large part of Krakotoa, and entirely altered the physical features of the island and the neighboring coasts. An immense wave swept over the shores of the neighboring islands occasioning a loss of life variously estimated at from 15,000 to 50,000. To the north two new islands appeared where the morning previous there had been from 30 to 40 fathoms of water.

KREASOTE. See Creasote.

KREFELD (krā'felt), a town in Rhenish Prussia, in the government of Düsseldorf and 12 miles northwest of the town of Düsseldorf. Pop. 109,119.

KREMENTCHUG, a town in Russia, government of Poltava. Pop. 58,648.

KREMLIN, a fortress, in Russia the citadel of a town or city specifically applied to the ancient citadel of Moscow. See Moscow.

KREUTZER, KREUZER (kroit'sêr) an old South German copper coin, equal to the sixtieth part of the gulden or florin, or about two-thirds of a cent. The Austrian current coin bearing this name is the hundredth part of a florin, or equivalent to nearly one-half of a cent.

KRISHNA, in Hindu mythology, the eighth avatar of Vishnu and the most popular deity in the Hindu pantheon. He was ostensibly the son of Vasudeva and Devaki of the royal family of the Bhoja reigning at Mathura. The reigning prince at the time of his birth was Kansa, who, to prevent the fulfilment of a prophecy, sought to destroy the young child, but his parents, assisted by divine

Krishna.

power, succeeded in baffling all his efforts. Every year of his life furnishes the subject of some legend, his story showing a remarkable resemblance to those of the Greek Heracles and Apollo. After a series of amorous and heroic exploits, detailed at length in the Puranas, he slew Kańsa, mounted the throne, and was at last killed by the arrow of a hunter, shooting unawares in a thicket.

KROPOT'KINE, Prince Peter Alexeievitch, Russian anarchist, born at

Moscow, 1842. He entered the corps of pages and then the army, traveled extensively in Siberia and Manchuria, studied some years at St. Petersburg, and wrote several esteemed books. In 1872 he joined the International Society, and began pushing his revolutionary ideas in Russia. He was arrested and imprisoned, but made his escape and took up residence in Switzerland. Expelled from Switzerland he took refuge in France, and was, in 1883, condemned to five years' imprisonment for complicity in outrages at Lyons, but was pardoned in 1886, when he went to England. He is an eloquent speaker and writer, and has made valuable contributions to several branches of knowledge.

KRUGER (krō'gẽr), Stephen John Paul, president of the South African Republic (Transvaal), was born in Cape Colony in 1825, migrated in the "great trek" of the Boers in 1837, and latterly settled in the Transvaal, where he soon became prominent in military and civil affairs. He was president from 1883 till the annexation in 1900, and died in Holland in 1904.

KRUPP (krup), Alfred, German engineer and iron manufacturer, born at Essen 1812, died 1887. He succeeded his father as proprietor of a small metal foundry at Essen, which he gradually developed to an enormous extent. He discovered a new method of casting steel in large masses, which he exhibited in 1851. This led him to the manufacture of heavy steel ordnance, and especially to the construction of heavy

Alfred Krupp.

breech-loading guns of a type invented by himself, the first of these being produced in 1864, but great improvements being subsequently effected, and the size being immensely increased. Though his name is popularly associated with the manufacture of these large guns the extensive works at Essen turn out also immense quantities of gun-carriages, shot, boiler-plates, axles, wheels, rails, screw-shafts for steamers, etc.

KUBAN, a Russian territory in the Caucasus. Area, 36,251 sq. miles; pop. 1,922,773.

KUBLAI (kō'blā) **KHAN** (more properly Khûbilai Khan), Mongol emperor founder of the 20th Chinese dynasty, that of the Mongols or Yuen; born 1214, died 1294. In 1259 he succeeded his brother as Grand Khan of the Mongols, and in 1260 he conquered the whole of Northern China, driving out the Tartar or Kin dynasty. He then ruled over the conquered territory himself, and nineteen years later added to it Southern China, driving out the Tartars from the north. Kûblia thus became sole ruler of an empire extending over a large part of Asia, as well as over those parts of Europe that had belonged to the dominions of Genghis Khan. Marco Polo, who lived at the court of this prince, describes the splendor of his court and entertainments, his palaces and hunting expeditions, his revenues, his extraordinary paper currency, his elaborate system of posts, etc. Kûblai Khan is the subject of a poetical fragment by Coleridge.

KUKU, or **KUKAWA,** a town in Western Africa. Pop. (estimate), 60,000.

KU-KLUX-KLAN, a secret society of a socio-political nature, bitterly opposed to the reconstruction measures which the government of the United States passed with reference to the rebel states of the south which had been subdued in the war of 1861–64. They numbered at one time about 550,000 members, spread over nearly all the states of the south, but especially South Carolina, Georgia, Alabama, Mississippi, Kentucky, and Tennessee. The members did not hesitate to commit any act of violence, even murder and arson. Strong measures were taken for the suppression of the society in 1871, and it soon after died away.

KUMA'ON, or **KUMA'UN,** a British district of Northern India, in the United Provinces, belonging to the Himalayas. Area, 7151 sq. miles; pop. 563,181. It forms with the districts of Garhwal and Tarai the division or commissionership of Kumaon, which has an area of 13,743 sq. miles, and a pop. of 1,181,567.

KURDISTAN (kụr-di-stän'; "Land of the Kurds"), an extensive territory of Western Asia. As it does not form a separate political division, its exact limits are not ascertained. The Kurds, to whom the territory owes its name, are not confined within its limits, but are found in considerable numbers eastward in Khorasan and over the hilly region of Mesopotamia, as far west as Aleppo and the Taurus. They are a stout, dark race, well formed, with dark hair, small eyes, wide mouth, and a fierce look. On their own mountains they live as shepherds, cultivators of the soil, and bandits. Their language is a dialect of Persian, now much mixed with Arabic and Syriac; their religion Sunnite Mohammedanism. The Kurds owe but slight allegiance to either Turkey or Persia, living in tribes under their own chiefs, who commonly exact duties on the merchandise which passes over their territory. Their numbers have been estimated at 1,800,000.

KURO SIVO, or **JAPAN CURRENT,** the gulf-stream of the Pacific, is the offspring of the great equatorial current, flows past Formosa, Japan, the Kuriles, the Aleutian Islands, and thence bends southward to California. It is much inferior to the gulf-stream both in volume and high temperature.

KURRACHEE (ka-rä'shē), or Karachi an important seaport of India, on the coast of Sind, Bombay presidency, at the northern (or western) angle of the Indus delta, situated on a large, and commodious creek or inlet, forming a good haven, perfectly safe in all winds, and out of the track of cyclones. The harbor is formed by a long narrow strip

of sand on the west, ending with a rocky promontory called Manora Head, on which is a lighthouse; and by the Island of Kiamari on the east. The town was taken possession of by the British in 1842, and its extensive commerce, fine harbor works, and numerous flourishing institutions have all sprung up since that time. Pop. 115,407.

KURSK (kụrsk), a government of southern Russia, area 18,901 sq. miles. Pop. 52,896.

KUSTENLAND (kûs'ten-länt), an administrative division of the Austrian Empire; area, 3084 sq. miles. The majority of the inhabitants are of Slavonic origin, but there is also a large proportion of Italians and a considerable number of Germans. Pop. 755,183.

KUTAIS (kụ-tä'is), a Russian town. Pop. 32,492.—The government has an area of 8039 sq. miles, and pop. of 1,075,861.

KUTA'YA, a town in Asiatic Turkey, 180 miles northeast of Smyrna, on the route between Constantinople and Konia. Estimated pop. 60,000.

KWANGSI, a province of China. Rice is largely grown, and gold, silver, and mercury are mined. Area, 78,250 sq. miles; pop. 5,151,327.

KWANGTUNG, the most southerly province of China. The capital is Canton; other ports are Swatow and Pakhoi. Area, 79,456 sq. miles; pop. 29,706,249.

KWEICHOW, a province of s.w. China. It produces rice, tobacco and timber, and has mines of copper, iron, lead, and mercury. Area, 64,554 sq. miles; pop. 7,669,181.

KYRIE ELEISON (kī'ri-ē ē-lī'son; from the Greek Kyrie eleēson, "Lord, have mercy"), a kind of invocation used in parts of the Roman Catholic Church service. It is almost the only part of the liturgy in which the Latin Church has retained the use of Greek words.

L

L, the twelfth letter of the English alphabet, is usually denominated a semivowel or a liquid. L has only one sound in English. The nearest ally of l is r, the pronunciation of which differs from that of l only in being accompanied by a vibration of the tip of the tongue. There is no letter, accordingly, with which l is more frequently interchanged, instances of the change of l into r and of r into l being both very common in various languages. In fact in the history of the Indo-European alphabet l is considered to be a later modification of r.

LA, in music, the sixth of the seven syllables—ut or do, re, mi, fa, sol, la, si—representing the seven sounds in the diatonic scale.

LAAGER (lä'gėr), in South Africa, an encampment more or less fortified. The original Boer laager is an inclosure made of the wagons of a traveling party for defense against enemies.

LAALAND (lol'lân), or **LOLLAND,** an island in Denmark. Pop. 70,596.

LA'BIALS, letters or characters representing a sound or articulation formed or uttered chiefly by the lips, as b, f, m, p, v.

LABIA'TÆ, the mint tribe, a very important and extensive natural order of exogenous plants, with a gamopetalous corolla presenting a prominent upper and lower lip, and a four-lobed ovary, changing to four seed-like monospermous fruits. This order contains about 2600 species, mostly herbs, under-shrubs or shrubs with opposite or whorled leaves, usually square stems, and a thyrsoid or whorled inflorescence. They are spread throughout the world, and abound in all temperate latitudes. Many are valued for their fragrance, as lavender and thyme; others for their stimulating qualities, as mint and peppermint; others as aromatics, as savory, basil, and marjoram; several are used as febrifuges. Betony, ground ivy, horehound, and others possess bitter tonic qualities.

LAB'ORATORY, a building or workshop designed for investigation and experiment in chemistry, physics, etc. It may be for special research and analyses, or for quite general work. To the former class belong the laboratories which are attached to dyeworks, color works, chemical, and similar works. Laboratories are also attached to mining and metallurgical schools, to mints, to arsenals, etc. A general laboratory, such as might be attached to a school or university, has to include a variety of specialties, partly because the whole science and its applications have to be taken into account and exhibited, partly because students with very different aims frequent such places.

LABOUCHERE (lab'ų-shār), Henry, English politician and writer, was born 1831. He was in the diplomatic service from 1854 to 1864; became member of parliament in the radical interest for Windsor (1865–66), Middlesex (1867–68), and Northampton since 1880. He contributed Letters of a Besieged President in Paris to the Daily News—of which he was part proprietor—during the Franco-German war. In 1877 he started Truth, a weekly society paper.

LABOULAYE (lä-bö-lā), Edouard René Lefebvre, French publicist, born 1811, died 1883. He attained a high position as a writer of historical, social, and playfully satirical works. Among his best-known writings are History of Landed Property in Europe; History of the United States; Germany, and the Slavic States; Paris in America; The New Bluebeard; The Poodle Prince; Prince Caniche, etc., etc.

LABOR. See Birth.

LABOR, American Federation of, a confederation of trades unions for the improvement in the conditions and wages of labor; the establishment of self-governing unions in every trade; the formation of public opinion by platform, press, and legislation and the furtherance of a civilization based upon industrial progress by securing a reduction in the hours of labor. Among the affiliated unions are the Brotherhood of Carpenters and Joiners, the International Typographical Union of North America, the Cigar Makers' International Union, and the Granite Cutters' National Union of the United States of America. The largest affiliated union is the United Mine Workers of America. The American Federation of Labor is growing very rapidly, and has a membership of nearly 1,500,000. It has practically taken the place of its old rival, the Knights of Labor.

LABOR AND COMMERCE, Department of, one of the nine executive departments of the federal government created by act of congress February 11, 1903. It is presided over by a secretary, who is also a member of the cabinet. The act of congress creating the new department charges it with the duty of fostering, promoting, and developing the foreign and domestic commerce of the United States, mining, manufacturing, and fishery industries, the interests of labor, improvement of transportation facilities, and the supervision of the business of insurance. The organization of the department consists of a bureau of corporations, a bureau of manufactures, the bureau of labor, the lighthouse board, the lighthouse establishment, the steamboat-inspection service, the bureau of navigation, the bureau of standards, the coast and Goedetic survey, the immigration service, including the enforcement of the Chinese exclusion acts, the bureau of statistics of the treasury department, the shipping commissioner, the bureau of foreign commerce (formerly in the department of state), the census bureau, and the fish commission, including control of the fur-seal, salmon, and other fisheries of Alaska. An entirely new feature is the bureau of corporations which is given partial jurisdiction of the control of trusts and trade combinations.

LABOR, Bureau of, the United States Department of Labor was organized in 1885 as one of the bureaus of the department of the interior. After it had been in existence three years it was changed to the department of labor with independent functions. Since 1895 a bi-monthly bulletin has been published. Thirty-one states have bureaus of labor, several of them conducting free employment agencies and the inspection of factories and mines is an important function of many of them.

LABOR DAY, a day set apart as a legal holiday in nearly all of the states and territories of the United States. In 1884, on the resolution of George R. Lloyd, one of the Knights of Labor, it was decided that all future parades should be held on the first day of September, and that the day should be known as Labor Day. Workingmen's organizations all over the country then began an agitation to induce the state legislatures to declare the day a legal holiday, and on March 15, 1887, Colorado led the way, to be quickly followed by New Jersey, New York, and Massachusetts. The great majority of the states have selected the first Monday in September as Labor Day. In 1903 the only states in which Labor Day was not a legal holiday were Mississippi, Nevada, North Dakota and Louisiana.

LAB'RADOR, a tract of land on the east coast of British North America, between Canada and the Atlantic, under the government of Newfoundland. The interior consists mostly of a table-land 2000 or more feet high. There are a number of lakes drained partly by rivers flowing toward Hudson's Strait, partly by others (such as Grand river), reaching the Atlantic in the southeast. The wild animals include the caribou or reindeer, bears, wolves, foxes, martens, and other fur-bearing animals. The climate is rigorous, there being about nine months of winter. No ordinary cereal can ripen in the climate, though barley cut green is used as fodder, and potatoes and some culinary vegetables can be grown. The population (about 8000 in all) consists of Indians, Eskimos, and half-breeds, with a few whites on the coast. In summer it is increased by some 30,000 persons, chiefly from Newfoundland and connected with the fisheries. The Moravians have a number of missions along the coast, the Church of England one or two. The Hudson's Bay company has several posts. Labrador is also the name given to the whole peninsula between the Atlantic, Hudson Strait and Hudson Bay and the St. Lawrence. See Canada, Northeast Territory, Quebec.

LAB'YRINTH, a structure having numerous intricate winding passages, which render it difficult to find the way through it. The legendary labyrinth of Crete, out of which no one could find his way, but became the prey of the Minotaur, was said to have been constructed by Dædalus. The hint of this legend was probably given by the fact that the rocks of Crete are full of winding caves. The Egyptian labyrinth was a building situated in Central Egypt, above Lake Mœris, not far from Crocodilopolis (Arsinoe), in the district now called the Fayoum. The building, half above and half below the ground, contained 3000 rooms. It was probably a place of burial.

The labyrinth at Clusium, in Italy, was elected by the Etruscans, according to Varro, for the sepulcher of King Porsenna.

LABYRINTH'ODON, a genus of fossil amphibians, whose remains are found in the carboniferous, permian, and trias formations, those of the trias being found in England, India, and Africa. They were allied to the crocodile and to

Labyrinthodon Salamandroides (restored).

the frog, and were 10 to 12 feet long. The name is derived from the labyrinthine structure of a section of the tooth, when seen under the microscope. The hypothetical cheirotherium has been identificd with the Labyrinthodon.

LAC, or **LAK,** from the Sanskrit lakshâ or laksha, that is, 100,000. In the East Indies it is applied to the computation of money. Thus, a lac of rupees is 100,000.

LACE, a delicate kind of net-work, formed of silk, flax, or cotton thread, and used for the ornamenting of female dresses. It is made either by hand or machine, the former being produced by the needle, or made on the pillow. Needle laces are called point, those made on the pillow, cushion, bobbin, or bone laces. A prominent feature in all laces is the pattern or ornament; this may be worked with or without a groundwork. Pillow lace consists of hexagonal meshes, four of the sides of each mesh being formed by twisting two threads round each other, and the other two sides by the simple crossing of two threads over each other. The pattern on parchment or vellum is attached to the pillow, and pins are stuck in the lines of the pattern, round which the threads are plaited and twisted so as to form the required design. Among the laces of this class are Honiton, Buckingham, Mechlin, Valenciennes, etc. Point laces, made entirely by the needle and single thread are known as Brussels, Alençon, Maltese, etc. Guipure lace consists of a net-work ground on which patterns are wrought in various stitches with silk, etc. It was originally a lace made in silk, thread, etc., on little strips of parchment or vellum. At Nottingham and elsewhere imitations of lace are produced by machines, called point net and warp net, from the names of the machines in which they are made. They are both a species of chain work, and the machines are varieties of the stocking-frame. The manufacture of lace appears to have existed from a considerably remote antiquity, as in the representations of Grecian female costume which have come down to us the dresses are frequently ornamented with lace of beautiful patterns. In modern times point lace originated in Italy, from which the manufacture spread to Spain and Flanders. Pillow lace was first made in the low countries.

LACHRYMAL ORGANS. See Eye.

LACQUER (lak'ẽr), a varnish usually consisting of a solution of shellac (sometimes sandarach, mastic, etc.,) in alcohol colored by arnotto, gamboge, saffron, and other coloring matters, for coating brass and some other metals, to give them a golden color, to preserve their luster, and to secure them against rust. Lacquered brass appears as if gilt, and tin is made yellow. Lacquering is also applied to the coating with varnish of goods in wood and papier-mâché. The Japanese and Chinese excel in works of this kind.

LA CROSSE, a city in Wisconsin, on the Mississippi at the mouth of the Black river and La Crosse, a great seat of the lumber trade. Pop. 32,460.

LA CROSSE, a game at ball, originating with the Indians of Canada, played somewhat on the principle of football, except that the ball is carried on an implement called the crosse, the player

Crosse.

in possession running with it toward the enemy's goal, and when on the point of being caught, passing it by tossing to one of his own side, or throwing it over his head as far in the direction of the goal as possible.

LAC'TEALS, numerous minute tubes which absorb or take up the chyle or milk-fluid from the alimentary canal, and convey it to the thoracic duct.

LACTIC ACID, an acid found in several animal liquids, and particularly in human urine. It is not only formed in milk when it becomes sour, but also in the fermentation of several vegetable juices, and in the putrefaction of some animal matters. It is a colorless, inodorous, very sour liquid, of a syrupy consistence. It coagulates milk.

LACTINE, Lactose, sugar of milk, a substance obtained by evaporating whey, filtering through animal charcoal, and crystallizing. It forms hard, white, semi-transparent trimetric crystals, which have a slightly sweet taste, and grate between the teeth. It is convertible like starch into glucose by boiling with very dilute sulphuric acid.

LACTOM'ETER, or GALACTOMETER, an instrument for ascertaining the different qualities of milk. Several instruments of this sort have been invented. One consists of a glass tube 1 foot long, graduated into 100 parts. New milk is filled into it and allowed to stand until the cream has fully separated when its relative quantity is shown by the number of parts in the 100 which it occupies.

LADRONES (la-drōnz', or la-drō'nes), or Marianne Islands, a group of sixteen islands in the North Pacific ocean, east of the Philippines and the Caroline islands. Guam is the southernmost and largest; next in importance is Rota. The islands are mostly of volcanic origin, and are very rugged, but their general aspect is picturesque, being densely wooded and covered with a perpetual verdure; the soil also is extremely fertile. The climate is humid but moderately warm and not unhealthful. The cocoanut and breadfruit trees are indigenous but sugar, corn, coffee, tobacco and indigo are cultivated. The islands were discovered by Magelhaens in 1521, and long belonged to Spain, but Guam is now American, and others German. Pop. 8000.

LADY-BIRD, the name of a number of small coleopterous insects, or beetles, common on trees and plants in gardens. More than fifty species are known. They are of great service to cultivators on account of the number of aphides or plant-lice which they destroy.

LADYSMITH, a town of Natal, about 80 miles n.n.w. Maritsburg, on a slope near Klip river, and on the railway to Johannesburg, where joined by that to Harrismith. It is famous for the long siege which it stood in the South African war of 1899–1901. Pop. 4500.

LAFAYETTE, Marie Paul Jean Roch Yves Gilbert Motier, Marquis de, was born in Auvergne 1757, died 1834. He commenced his career at the court of Louis XV., at the period when hostilities were commencing between Britain and her American colonies. In 1777 he left France for America, having fitted out a vessel for himself, and was received by Washington and his army with acclamation. He joined their ranks as a volunteer, was wounded near Philadelphia, and commanded the vanguard of the American army at the capture of New York. He returned to France on

Marquis de Lafayette.

the close of the campaign; was called to the Assembly of the Notables in 1787, and was elected a member of the States-General, which took the name of National Assembly (1789) Two days after the attack on the Bastille he was appointed (July 15) commander-in-chief of the national guards of Paris. It was through his means that the lives of the king and queen were saved from the mob that had taken possession of the palace at Versailles. In 1792 he was appointed one of the three majors-generals in the command of the French armies. He declined the dignity of senator

offered him by Bonaparte, and gave his vote against the consulate for life In 1818 he was chosen member of the chamber of deputies, and was a constant advocate of liberal measures. In 1824 he visited the United States, and was received with great enthusiasm. Congress voted him 200,000 dollars and a township of land. During the revolution of July, 1830, he was appointed general of the National Guards of Paris, and it was chiefly to Lafayette that Louis Philippe owed his elevation to the throne.

LA FAYETTE, a city in Indiana, on the Wabash river and Wabash and Erie Canal, and at the intersection of several railways, 63 miles northwest of Indianapolis. It is the seat of the state agricultural college, and has a number of miscellaneous manufactures. Pop. 21,670.

LAFAYETTE COLLEGE, a flourishing institution at Easton, Pennsylvania, chartered in 1826. It has six degree courses of four years each—three general and scientific, and three technical.

LA FOLLETTE (lȧ-fŏl-lĕt'), Robert Marion, American politician, born at Primrose, Wis., in 1855. In 1880 he was nominated by the republicans and elected district attorney of Dane county, of which Madison is the county-seat. This position he held until 1884, after which he practiced law privately until 1887, when he became a member of congress. In 1900 he was nominated and elected governor. His administration was marked by his determined effort to secure reforms for which he had become the champion, namely a primary election law, a reform of taxes on corporations and the regulation of the railroads. In 1902 he was re-elected governor and in 1905 he was elected to the United States senate.

LAFONTAINE (lȧ-foṇ-tān), Jean de, French writer, born at Château-Thierry in 1621, died 1695. The first volume of his Contes or Tales appeared in 1664, a second in 1671. They are full of fine touches of genius, but are grossly indecent. Of his Fables (in which animals are represented speaking and acting) innumerable editions have been printed, and it is through them that he is universally known.

LAGER (lä'gẽr) **BEER,** a light beer, not so intoxicating as the English pale ales, largely brewed in Germany and Austria. A similar beer is now made by British brewers, and it has for long been largely produced in the United States.

LAGOON, a name given particularly to shallow lakes connected with the sea, which are found along some low-lying coasts, as on that of the Adriatic near Venice.

LAGRANGE (lā-grāṇzh), Joseph Louis, a celebrated mathematician, was born at Turin 1736, and died at Paris 1813. When scarcely nineteen years of age Lagrange was made mathematical professor in the artillery school at Turin. In 1764 he obtained the prize of the Acamedy of Sciences in Paris for a treatise on the libration of the moon, and in 1776 for another on the theory of the satellites of Jupiter. About this time he made a visit to Paris, where he became personally acquainted with D'Alembert, Clairaut, Condorcet, and other savants. Soon after his return he received an invitation from Frederick the Great, to whom he had been recommended by D'Alembert, to go to Berlin, with the title of Director of the Academy Here he lived for twenty years, and wrote his great work La Mécanique Analytique. After Frederick's death (1786) the persuasion of Mirabeau and the offer of a pension induced him to settle in Paris. He was the first professor of geometry in the Polytechnic school, and was the first inscribed member of the Institute. In 1794 he was appointed professor in the newly-established Normal School (Ecole Normale Supérieure) at Paris (1794), as well as in the Ecole Polytechnique. The most important of his works are his Mécanique Analytique (1788); Theorie des Fonctions Analytiques (1797); Résolutions des Equations Numériques (1798); Leçons sur le Calcul des Fonctions; and Essai d'Arithmétique Politique.

LAHORE', a city of Hindustan, capital of the Punjab, on the left bank of the Ravi, 265 miles northwest of Delhi. The city proper covers an area of 640 acres, and is surrounded by a brick wall 16 feet high, flanked by bastions. Pop. 202,964.—Lahore division (commissionership) has an area of 24,872 sq. miles, and pop. 4,579,794. The Lahore district has an area of 3648 sq. miles; pop. 1,075, 379.

LAISSER-FAIRE (lā-sā-fār), in economics, a term applied to the theory that a public authority should interfere in the concerns of a community as little as possible; that wealth tends to be produced most amply and economically where a government leaves individuals free to produce and transfer on mutually arranged terms, confining itself to the protection of property and person and the enforcement of contracts. This rule in practice is limited by various exceptions, as in government interference in the matters of education and the employment of children; in the promotion of health or morality; and in the private economic interests of certain industrial classes.

LAKE, a large sheet or body of water, wholly surrounded by land, and having no direct or immediate communication with the ocean, or with any seas, or having so only by means of rivers. It differs from a pond in being larger. Lakes are divided into four classes: (1) Those which have no outlet, and receive no running water, usually very small. (2) Those which have an outlet, but receive no superficial running waters and are consequently fed by springs. (3) Those which receive and discharge streams of water (by far the most numerous class). (4) Those which receive streams, and which have no visible outlet, being generally salt, as the Caspian Sea and Lake Aral. Lakes are also divided into mountain lakes and plain or plateau lakes.

LAKE-DWELLINGS, the name given to habitations built on small artificial or partly artificial islands in lakes, or on platforms supported by piles near the shores of lakes. The use of habitations of this nature is a subject which has engaged the attention of archæologists and others very largely since the discovery of the remains of a lake-dwelling in Ireland in 1839, of similar ones in Switzerland in 1854, and subsequently of numbers of others elsewhere. The archæological interest thus attaching to these lacustrine remains has drawn attention to the fact of similar dwellings being still used in various parts of the world, in Russia, the Malay Archipelago (Borneo and New Guinea), the Caroline Islands, Lake Maracaybo in Venezuela, New Zealand, and in a modified form in some parts of Central Africa. The first who is known to have described lake-dwellings is Herodotus, who mentions certain dwellings of this kind on Lake Prasias in Thrace as being approached

Lake-dwellings (restored).

by a narrow bridge, each habitation having a trap-door in the floor, giving access to the water beneath, through which fish were caught. A great number of these pile structures have been discovered in the Swiss lakes, some belonging to the iron age, some few even to Roman times; but the greatest number appear to be divided in about equal proportions between the stone and bronze ages. The relics found in these historic buildings have thrown much light on prehistoric man, large populations having occupied these pile-buildings during extended periods of time.

LAKES, pigments consisting of a coloring matter combined with a metallic oxide. They are obtained by mixing with a solution of the coloring matter a solution of alum or of a salt of tin, tungsten, zinc, lead or other metal and then adding an alkali or alkaline carbonate. Among the pigments prepared in this way may be mentioned blue lake, consisting of cobalt, blue, indigo, or ultra marine and alumina; madder lake, of madder and alumina; orange lake, of turmeric and alumina; carmine lake, of cochineal and alumina; purple lake, of log wood and alumina; and so on. Lake pigments are used in painting, calico-printing, and in the manufacture of wall-paper.

LAKHIMPUR (lak-him-pör'), a British district of India, occupying the extreme eastern portion of Assam; area, 3724 sq. miles. Pop. 254,053.

LAMA, in zoology. See Llama.

LA'MAISM, a variety of Buddhism, dating from the 7th century after Christ, and chiefly prevailing in Tibet and Mongolia; so called from the lamas or priests belonging to it. The highest object of worship is Buddha, who is regarded as the founder of the religion, and the first in rank among the saints. The other saints comprise all those recognized in Buddhism, besides hosts of religious teachers and pious men canonized after their death. The clergy are the representatives or re-incarnations of these saints on earth, and receive the homage

due to them. Besides these saints a number of inferior gods or spirits are recognized by Lamaism, and receive a certain worship. The Lamaists have a hierarchy in some respects resembling that of the Roman Catholic Church, and they have also monasteries and nunneries, auricular confession, litanies, etc., and believe in the intercession of the saints and in the saying of masses for the dead. In the hierarchy there are two supreme heads, the Dalai-lama and the Tesho-lama in whom Buddha is supposed to be incarnate. Next in rank to these two grand-lamas are the incarnations of saints, after which follow those of patrons or founders of lamaseries, or Buddhistic monasteries, and then the lower ranks, distinguished merely by talents or learning. The Dalai-lama and

Lama of Tibet.

Tesho-lama are nominally co-equal in rank and authority; but the former from possessing a much larger territory is in reality much the more powerful. The former, whose residence is at Potala near Lassa, is the acknowledged head of the Buddhists not only in Tibet, but throughout Mongolia and China. When either of the two lamas dies, his place may be filled according to directions given by himself before his death, stating into what family he purposed transmigrating. If such directions have not been given, the other procures the names of male children born at the time of the death in order to discover where the deceased has incarnated himself. The question is decided by lot in presence of the surviving grand-lama, and the Chinese political resident and the child whose name is drawn becomes the grand-lama.

LAMAR, Lucius Q. C., American jurist, was born in Putnam co., Ga., in 1825. Was educated at Emery college. He moved to Mississippi, and was elected representative in 1856. In 1861 he resigned and joined the confederate army as colonel. He was professor of law in the University of Mississippi (1867–1872), when he was again sent to congress. In 1876 he was elected senator and was re-elected in 1882. In 1885 he became secretary of the interior in President Cleveland's cabinet, and in 1887 was appointed associate justice of the supreme court of the United States. He died in 1893.

LAMARCK, Jean Baptiste Pierre Antoine de Monet, Chevalier de, French naturalist, born in Picardy 1744, died at Paris 1829. He became botanist of the Jardin du Roi in 1788, and professor of zoology at the Museum of Natural History in 1793. Other chief works are Philosophie Zoologique, in which he promulgated a theory foreshadowing what is now known as the law of evolution; Histoire Naturelle des Animaux sans Vertebres, Tableau Encyclopédique de la Botanique, etc. He held the doctrine of spontaneous generation, and his religious beliefs have been described as a curious mixture of pantheism and deism.

LAMARTINE (là-mär-tēn), Alphonse Marie Louis Prat de, French poet and statesman, born at Mâcon 1790; died at Passy, near Paris, in 1869. By his first production, Méditations Poétiques (1820), he at once obtained a high place among the poets of the day. In 1820 he was attached to the legation at Naples, and married a rich English lady, Eliza Marianna Birch. The Nouvelles Méditations Poétiques (1823), and the Harmonies Poétiques et Religieuses (1828), established his poetic fame, and obtained for him admission into the French Academy. (1830). After the revolution of July he traveled in the east and on his return published Voyage en Orient, Souvenirs, Impressions, Pensées et Paysages (Paris, four vols. 1835). During his absence he had been elected a member of the Chamber of Deputies, and thenceforward his career was as much political as literary. In 1847 he published his Histoire des Girondins (Paris, eight vols.), in which he manifested strong republican leanings.

LAMB, Charles, English essayist and humorist, born in London 1775, died at Edmonton 1834. His first appearance as an author was in 1798, when he published a volume of poems in conjunction with his friends Coleridge and Lloyd. His love for 17th century literature bore fruit in the Tales from Shakespeare (1807) and Specimens of English Dramatic Poets who lived about the time of Shakespeare (1808). He made two attempts at the drama: John Woodvil, written in imitation of the early English dramatists; and a farce entitled Mr. H. which was performed at Drury Lane in 1806, and proved a failure. On the other hand, his tale of Rosamund Gray (Lond. 1798) was well received when it appeared, and is still a favorite. He owes his literary distinction to his delightful Essays of Elia, chiefly contributed to the London Magazine. They have been frequently republished in a collected form. Here, in a style ever happy and original, he has carried the short humorous essay to a point of excellence perhaps never before attained.—His sister Mary Anne (born 1765, died 1847) was joint author with her brother of Tales from Shakespeare, and Poetry for Children.

LAMBAYEQUE (lâm-bā-yā′kā), a town in Peru, capital of the department of the same name. Pop. 6248.—Area of department, 17,939 sq. miles; pop. 85,984.

LAMBERT, Daniel, noted for his extraordinary size, was born in Leicester 1770, died 1809. He was exhibited in London and the principal towns of England, and at the time of his death was 5 feet 11 inches in height, weighed 739 lbs. (over 52½ stones), and measured 9 feet 4 inches round the body, and 3 feet 1 inch round the leg.

LAMBERT'S PINE, a North American pine growing in California, and sometimes reaching the height of 300 feet. It yields when burned a sugary substance known as California manna. The leaves are in fives; the cones are 14 to 18 inches long, and contain edible seeds.

LAM′BETH, a mun. and parl. borough of South London, opposite to Westminster, with which it is connected by a bridge 1040 feet long. Lambeth Palace, the official residence of the archbishops of Canterbury, contains a library with 30,000 volumes and upward of 14,000 manuscripts. St. Thomas's hospital is situated on the Albert embankment, opposite the houses of parliament. Pop. 301,873.

LAMENTATIONS, the name given in the authorized version of the Scriptures to a pathetic poem made up of five distinct elegies. They appear in the Hebrew canon with no name attached, but ancient tradition, internal evidence, and a prefatory verse which appears in the Septuagint point to the authorship of Jeremiah. The first four of the dirges are alphabetical acrostics, successive verses, or in chap. iii. successive sets of three verses, beginning alphabetically. Chap. v. is not in acrostic form. According to Josephus, Jerome, and also some modern critics these poems were written on the death of King Josiah (see 2 Chron. xxxv. 25), but the contents of the book itself plainly show that a national calamity—the destruction of Jerusalem and the overthrow of the Judean state by the Chaldeans—is referred to.

LAMMERGEIER (lem′ėr-gī-ėr; German, "lamb vulture"), the bearded vulture, a bird of prey of the genus Gypaëtos, family Vulturidæ, forming a link between the vultures and the eagles. It inhabits the Swiss and German Alps, as well as the higher mountains of Asia and Africa, and is the largest European bird of prey, measuring upward of 4 feet from beak to tail, and 9 or 10 in the expanse of its wings. Besides eating carrion, it preys on living chamois, lambs, kids, hares, and such like animals, but it does not disdain when pressed rats, mice, and other small quadrupeds.

LAMONT (là-mŏnt′), Daniel Scott, American politician and cabinet officer, was born at Cortlandville, N. Y., in 1851. In 1883 he became private secretary to Grover Cleveland, then governor of New York. When Cleveland became president in 1885, Lamont accompanied him to Washington, where he remained until Harrison's inauguration. From 1889 to 1893 he engaged in various business enterprises in New York City, and in the latter year became secretary of war in President Cleveland's second cabinet. In 1897 he became vice-president of the Northern Pacific Railway. He died in 1905.

LAMP, a contrivance for producing artificial light, whether by means of an inflammable liquid, or of gas, or electricity; but usually the term applied to a vessel for containing oil or other liquid inflammable substance, to be burned by

means of a wick. Baked earth was probably the substance of which the earliest lamps were composed, but subsequently we find them of various metals—of bronze more particularly. Modern lamps vary in form and principle widely, and of late have been constructed in a variety of materials. The requisite properties of a perfect lamp are these:—1st, It must be supplied with carbonaceous matter and with oxygen; 2d, It must convert the former into a gaseous state; and 3d, It must bring the gas so produced in contact with oxygen at such a temperature that the carbon will combine with the oxygen in the fullest degree to produce the greatest quantity of flame without any smoke. Until 1784 all the lamps in use were far from meeting all these requirements. In that year an improved scientific lamp was constructed by Aimé Argand of Geneva, and called after him the Argand lamp. In this lamp defective consumption is remedied by using a circular wick, the flame of which is nourished by an internal as well as an external current of air, and by placing a glass chimney above the flame so as to increase the draught. A special arrangement ensures a uniform supply of oil. In the improved lamps that have succeeded that of Argand, the Argand burner has generally been retained, and the alterations have chiefly been made in the mode of keeping up a uniform supply of oil. For petroleum, paraffin, and other mineral oils, which have of late years come into very extensive use for illuminating purposes, a very simple kind of lamp is used. The oil-vessel is placed below the burner, which usually consists of a simple slit, down which a broad wick passes into the oil. The wick may be raised or depressed by a screw, and when the lamp is burning is kept a short distance below the opening of the slit. The oil is sucked up by the wick by the action of capillarity. A chimney is fitted on to the lamp, and creates so powerful a draft that the flame is kept perfectly steady, and the gas proceeding from the heating of the oil is completely consumed. There is an endless variety of lamps of this kind, the special features aimed at being increase of light by improved burners and immunity from explosion. Safety-lamps are used for mines (see Safety-lamp). Hydro carbon lamps are used for magic-lanterns, etc. The magnesium lamp, chiefly used by photographers is one constructed for the combustion of magnesium wire. A lantern is a form of lamp, generally a case inclosing a light and protecting it from wind and rain, sometimes portable and sometimes fixed.

LAMPBLACK, a fine soot formed by the condensation of the smoke of burning oil, pitch, or resinous substances in a chimney terminating in a cone of cloth. It is used in the manufacture of pigments, blacking, and printing inks. See Carbon.

LAM'PREY, the name of several eel-like, scaleless fishes which inhabit both fresh and salt water. The lampreys have seven spiracles or apertures on each side of the neck, and a fistula or aperture on the top of the head; they have no pectoral or ventral fins. The mouth is in the form of a sucker, lined with strong teeth and cutting plates, and the river lampreys are often seen clinging to stones by it. The marine or sea lamprey is sometimes found so large as to weigh 4 or 5 lbs. It is of a dusky brown, marbled with yellowish patches. It ascends rivers in the spring for the purpose of spawning, and was formerly

Sea Lamprey.

much valued as an article of food. The river lamprey or lampern is a smaller species, and abounds in the fresh-water lakes and rivers of northern countries. It is colored black on its upper, and of a silvery hue on its under surface. Lampreys attach themselves to other fishes and suck their blood; they also eat soft animal matter of any kind.

LAN'ARK, Lanarkshire, or Clydesdale, a southwestern county of Scotland, and the most populous in the country. It is bounded by the counties of Dumbarton, Stirling, Linlithgow, Edinburgh, Peebles, Dumfries, Ayr, and Renfrew; area, 564,284 acres, of which about one-third is under cultivation. Pop. 1,339,-327.—Lanark, the town, is a royal and parliamentary burgh. Pop. 6440.

LAN'CASHIRE, or the county palatine of Lancaster, a maritime county in the n.w. of England, bounded by Westmoreland, Cumberland, Yorkshire, Cheshire, and the Irish Sea, a part of it in the north, called Furness, being cut off from the rest by Morecambe Bay; area, 1,207,926 acres, of which over 800,000 acres are in cultivation. Lancashire is the grand seat of the cotton manufacture, not only of England, but also of the world, Manchester being the principal center. Woolen goods are also largely produced, as are also machinery of all descriptions, and a vast variety of other articles. Liverpool is the great shipping port of the county and of England. Lancaster is the county town, but there are a great many others far larger, such as Liverpool, Manchester and Salford, Oldham, Bolton, Blackburn, Preston, etc. Pop. 4,406,787.

LAN'CASTER, a municipal borough and river-port, England, the county town of Lancashire, on the left bank of the Lune, 45 miles north by east of Liverpool. Pop. 40,329.

LANCASTER, a city in Pennsylvania, capital of Pennsylvania county, 68 miles west of Philadelphia. It is a pleasant residential city; has very extensive manufacturing interests, and is a chief tobacco-leaf market. It is also the center of a rich wheat district, and carries on an extensive lumber trade. Pop. 50,000.

LANCASTER, the capital of Fairfield co., Ohio, on the Hocking river, about 32 miles s.e. of Columbus. It has iron-foundries, flouring-mills, and manufactures of machines and agricultural implements. Pop. 10,760.

LANCASTER, House of, the name given in English history to designate the line of kings—Henry IV., V. and VI., immediately descended from John of Gaunt, fourth son of Edward III. Edmund, second son of Henry III., was created Earl of Lancaster and Leicester. His son Thomas added Derby and Lincoln to his titles, became leader of the baronial opposition to Edward II., and was beheaded for treason. His grandson was advanced to the dignity of a duke, and dying without male issue, the inheritance fell to his daughter Blanche, who became the wife of John of Gaunt.

LANCASTER, John of Gaunt, Duke of. See John of Gaunt.

LANCASTER SOUND, a passage leading from the northwest of Baffin's Bay west to Barrow's Strait. It was discovered by Baffin in 1616, is about 250 miles long, with a central breadth of about 65 miles.

LANCE, a weapon consisting of a long shaft with a sharp point, much used before the invention of firearms, and still in use. It was common among the Greeks and Romans. The Macedonian phalanx was armed with it, and it was the chief weapon of the Roman infantry. The javelin, or pilum, was but secondary. The lance was the chief weapon in the middle ages, and was especially the arm of knighthood. The introduction of firearms gradually led to the disuse of the lance in the West of Europe, though it continued among the Turks, Albanians, Tartars, Cossacks, Poles, and Russians and other Slavonic tribes. Napoleon organized several regiments of Polish lancers for service in his army, and now most of the armies of Europe have regiments of Uhlans or lancers.

LANCERS. See Lance.

LAND forms an important kind of natural wealth susceptible of appropriation, and forming at the same time the principal deposit of the accumulated capital derived from the labor of preceding generations. In Britain, from various causes, among others the enormous cost of transfer, the land is in the hands of comparatively a few owners, and the properties are generally large. One-half of the land of the United Kingdom is in the hands of 7400 individuals; the other half being owned by 312,500 individuals. Barely one in a hundred of the population owns more than an acre of soil. The cultivable land is usually let out to tenant-farmers, who cultivate it at their own expense. These number upwards of 1,160,000 in Great Britain and Ireland, more than three-fourths of whom occupy farms of less than 15 acres. In the British colonies small properties rather than large is the rule. In France there are about 3,000,000 properties under 25 acres, and only 150,000 above 100 acres; 1,750,000 of the population cultivate their own land. Small holdings cultivated by the owners are common in Germany, Belgium, Switzerland, Denmark, Norway, Sweden, and other parts of Europe. In the United States the land is chiefly cultivated by small owners. There are still about 1,000,-000,000 acres undisposed of notwithstanding that over 700,000,000 acres have been withdrawn by the government from the public domain.

LAND, Tenure of. The various species of tenures and customs relating to property in land are noticed under the particular heads. See Allodium Feudal

System, Freehold, Copyhold, Entail, etc.

LAND-CRABS, crabs so called from their semi-terrestrial mode of life; their habits leading them to live on land, and away from the sea, even for considerable periods of time. The true land-crabs occur in Asia, particularly in the Eastern Archipelago; in America, and specially in the West Indian Islands; and in Australia also. The best-known species is found in the higher parts of Jamaica, which often proves very destructive to the sugar plantations. The crabs of the genus represented by the common species and inhabiting the West Indian mangrove swamps and marshes, appears to feed upon both vegetable and animal diet.

LANDES, a maritime department of France, bounded by the Bay of Biscay and by the departments of Gironde, Lot-et-Garonne, Gers, and Basses-Pyrénées. It has an area of 3599 sq. miles. Pop. 291,586.

LANDGRAVE, in Germany, originally about the 12th century, the title of district or provincial governors deputed by the emperor and given them to distinguish them from the inferior counts under their jurisdiction.

LAND LEAGUE, an organization projected by Mr. Parnell, the leader of the Irish national movement, in 1879, the ostensible object of which was to purchase the land of Ireland for the people of Ireland. Funds were largely subscribed, especially in America, but the stringent rules against landlords and tenants holding aloof from it, and the alleged complicity of its members with many terrible outrages, caused it to be suppressed in 1881.

LANDLORD AND TENANT, the landlord in relation to a tenant is the person from whom lands or tenements are taken on lease or by some other contract or agreement. The tenant is the person who holds lands or tenements of another by any kind of contract or agreement, usually for a periodical rent. In the absence of express agreement a tenant may sublet the property, but he is still liable to the landlord for the rent, unless the landlord relieves him by accepting the sub-tenant as a tenant-in-chief. Rent may be recovered by action at law, by ejectment, or by distress on the premises. The landlord is responsible for maintaining a house in a fit state of repair, and if he neglects to do so the tenant may withhold the rent or deduct the expense of repairs. The landlord has a hypothec over the furniture for rent occurring before the term of payment has arrived, and may prevent its removal but he has no lien over the goods of a sub-tenant who has paid his rent to his immediate landlord.

LANDOR, Walter Savage, an English poet and prose writer, born at Ipsley Court, Warwickshire, 1775; died 1864. His fame chiefly rests on his Imaginary Conversations, between celebrated persons of ancient and modern times, which is a model of a pure, vigorous finished English style.

LANDSCAPE, a term applied to a portion of land or territory which the eye can comprehend in a single view, and to a painting of such. See Painting.

LANDSCAPE GARDENING, is the art of laying out grounds, arranging trees, shrubbery, etc., so as to bring into harmonious combination all the varied characteristics and surroundings. It disposes flowering plants, shrubs, and trees over varying levels in such a manner as to produce the most pleasing effects, it shuts out undesirable views by means of judicious planting, and introduces rock-work, water, and other artistic embellishments where the local peculiarities of the ground permit.

LANDSEER, Sir Edwin, painter, born in London 1802, died 1873. He began to draw animals when a mere child; at thirteen he exhibited at the Academy, and the year following became a student. Henceforward he exhibited regularly at the Academy and the British Institution. In 1826 he was elected A.R.A.; in 1830 R.A.; in 1850 he was knighted, and in 1865 he declined the presidency of the Academy. He takes the very highest rank among animal painters; and though he has been blamed for introducing too human a sentiment and expression into some of his animals, the humor and pathos of animal nature has had no finer exponent.

LANDSLIP, the slipping or sliding of a considerable tract of land or earth from a higher to a lower level. Landslips are due to a variety of causes, chiefly the decay of supporting strata, or excessive saturation of the soil by rain. Among the more disastrous occurrences of this kind are the slip of the Rossberg Mountain behind the Rigi in Switzerland in 1806, burying villages and hamlets with over 800 inhabitants; and that at Naini Tal, a sanitary hill-station in the Himalayas, in 1880, when 230 lives were lost.

LAND-SURVEYING. See Surveying.

LAND-TAX, a tax levied on land. What is known as the land-tax in Britain was imposed in the reign of William III. as a substitute for escuage, talliage, fifteenths, and other contributions. It was imposed annually from 1693 to 1798 at a varying rate, oftenest $1.00 per lb. In the latter year it produced about $10,000,000, when it was replaced by a perpetual rent charge on land, with power of redemption, and a tax annually imposed on personal property, the latter tax abolished in 1833. The land-tax now produces rather more than $5,000,000 annually. In the United States land bears a large share of local taxation either under the general property tax or under a tax upon real estate. In the general property tax no distinction is made between landed property and other possessions.

LAND TORTOISE, the land tortoises are easily recognized by their feet, in which the toes are short, without webs, and the hinder ones "clubbed," while the front of the fore limbs is protected by strong horny scales, or frequently by dermal ossifications. The carapace of the shell is usually heavy and highly arched, and the plastron is firmly united to it at the sides of the body. The top of the strong shell is covered with shields, the tail is short.

LANDWEHR (länt'vār), that portion of the military force of Germany and other European nations which in time of peace follow their ordinary occupations, excepting when called out for occasional training. The landwehr in some respects resembles a militia, with this important difference, that all the soldiers of the landwehr have served in the regular army. This system has received its fullest development in Germany, in which country it adds enormously, and at comparatively little cost, to the military power of the state.

LANGLEY, Samuel Pierpont, American astronomer, born at Roxbury, Mass., in 1834. In 1867 he became professor of astronomy at the Western University of Pennsylvania and secretary of the Smithsonian Institution in 1887. His solar observations, made at Pike's Peak in 1878, at Mount Etna in 1878–79, and at Mount Whitney, Cal., in 1881, added greatly to our knowledge of the phenomena of solar heat. He invented the bolometer, a very delicate instrument for the measurement of radiant heat. In 1886 he became president of the American Association for the Advancement of Science, and in 1894 received the degree of D.C.L. from Oxford University. He is also a member of the Royal Society of London, and many other foreign societies. He has been awarded the Janssen medal of the Institute of France and the Rumford medal of the Royal Society of London. He died in 1906.

LANGTRY, Mrs. Lillie, English actress born at Le Breton in 1852. She was noted for her beauty as the Jersey Lily. She made her debut in 1881 at the Haymarket theater, London, in She Stoops to Conquer. In 1882 she made her first appearance in America with a popular success which has been repeated on subsequent occasions.

LANIER, Sidney, American poet, was born in Macon, Ga., in 1842. He served in the confederate army during the war. In 1876 he prepared an ode for the centennial exhibition at Philadelphia, and in October, 1877, settled in Baltimore, where he delivered lectures on English literature. In 1879 he was appointed lecturer on English literature at Johns Hopkins University. His two notable books are his Science of English Verse, and his Poems. He died in 1881.

LANGUAGE. See Philology.

Lanner.

LANNER, the Falco laniarius, a species of hawk, especially the female of

the species, the male being called a lanneret. It is a native of Southern Europe, North Africa, and Southwest Asia, and was much valued in falconry.

LANSDOWNE, Henry Charles Keith Fitz-Maurice, Marquis of, was born 1845, and succeeded to the marquisate in 1866. He has been a lord of the treasury and under-secretary for war and for India. Governor-general of Canada in 1883–88, of India, in 1888–93, secretary for war in 1895–1900, he became foreign secretary in 1900.

LANSING, the capital of Michigan, on Grand river, 85 miles n.w. of Detroit. It contains a large and handsome state-

State capitol, Lansing, Mich.

house, an agricultural college, etc., and is an important manufacturing center. Pop. 19,645.

LANSINGBURGH, a town, in New York, Rennselaer co., on the east bank of the Hudson, nearly opposite its confluence with the Mohawk. Pop. 14,040.

LANTERN. See Lamp.

LANTERN-FLIES, insects forming a family remarkable for the prolongation of their forehead into an empty vesicular expansion. The lantern-fly proper is a native of South America. It is more than 3 inches in length, and 5 across the wings. It has been asserted that it emits a strong light from the inflated expansion of the forehead, but the evidence of this luminosity is more than doubtful. They are in fact reported to fly only during sunlight and not to appear abroad during dark.

LAOCOON (lā-ok'o-on), in ancient Greek legend, a priest of Poseidon (Neptune), among the Trojans, who, along with his two sons, was killed by two enormous serpents sent by Apollo. The story has frequently furnished a subject to the poets, but it is chiefly interesting as having served as the subject of one of the most beautiful groups of sculpture in the whole history of ancient art. It was discovered at Rome among the ruins of the palace of Titus in 1506, and is now placed in the Vatican. It is supposed to be the group described by Pliny as the work of three sculptors of Rhodes, a father and two sons, Agesander, Polydorus, and Athenodorus, but doubts exist as to its date.

LA PAZ, or **LA PAZ DE AYACUCHO,** a town of Bolivia, capital of a department of the same name. Pop. 60,000.—The department has an area of 45,000 sq. miles and a population estimated at 365,000

LAPLACE (là-plās), Pierre Simon, Marquis de, a celebrated French mathematician and astronomer, born 1749 died 1827. At the early age of twenty-four was admitted into the Academy of Sciences. Besides his mathematical work he was associated with Lavoisier in chemical research. In 1816 he was named a member of the French Academy. Almost any one of Laplace's original researches is alone sufficient to stamp him as one of the greatest of mathematicians. The discovery of the invariability of the major axes of the planetary orbits, the explanation of the great inequality in the motions of Jupiter and Saturn, the solution of the problem of the acceleration of the mean motion of the moon, the theory of Jupiter's satellites, and other important laws are due to Laplace. The most important of his works are the Mécanique Céleste; Systéme du Monde, a resumé of all modern astronomy; Théorie analytique des Probabilités; Essai sur les Probabilités.

LAP'LAND, the land of the Lapps, an extensive territory in the north of Europe, stretching between lat. 64° and 71° n., and from the shores of Norway east to those of the White Sea; area about 130,000 sq. miles, of which more than a half belongs to Russia, and the remainder is shared, in nearly equal proportions, between Sweden and Norway. The climate for nine months of a dark winter is excessively cold; spring

Laplanders.

and autumn are short; and the summer of two months, when the sun never sets, is extremely hot. Vegetation is scanty except in the form of birch, pine, fir, and the abundant mosses which supply food for the herds of reindeer. The Lapps belong to the Finnic branch of the Turanian family. They are a small, muscular, large-headed race, with high cheek-bones, wide mouth, flat nose, and scanty beard. Many of them are nomadic, owing their subsistence to their herds of reindeer; others support themselves by fishing. They are generally ignorant, simple-hearted, and hospitable. The Norwegian Lapps belong to the Lutheran, and the Russian Lapps to the Greek Church. Their numbers do not exceed 27,000.

LA PLATA. See Argentine Republic.

LA PLATA, a city of the Argentine Republic, situated on the shores of a fine natural harbor called Ensenada, in the La Plata estuary, 40 miles below the city of Buenos Ayres, and connected with it by rail. Although recently founded as the capital of Buenos Ayres province, it has already become an important commercial center, having a palace for the legislative assembly, a cathedral, law courts, theater, public park, etc. Pop. estimated at 45,410.

LAPORTE, the capital of Laporte co., Indiana, 60 miles southeast of Chicago. The neighborhood has become a favorite resort of summer visitors on account of its beautiful lakes. Pop. 10,000.

LAPWING, a bird belonging to the family of plovers. The common lapwing

Lapwing.

is about the size of a pigeon; it is often called the peewit from its particular cry. In the breeding season these birds disperse themselves over the interior of the country, where they lay their eggs in a small depression of the ground, in cultivated fields, moors, etc. In winter they retire to the sea-coast. Their eggs are esteemed a great luxury.

LAR'AMIE, a town of Wyoming, in the southeast of the state in an elevated region, at the height of 7100 feet. Here are the Laramie plains, river, and mountains. Pop. 11,200.

LARBOARD, the left side of a ship looking toward the stem, now called the port side.

LAR'CENY, is the fraudulent appropriation of the personal property of another person without that person's consent. To constitute this crime the removal of the goods to any distance is not necessary, but it requires to be shown that the article has completely passed, for however short a time, into possession of the criminal. Concerning the kinds of things the appropriation of

which is larceny, the common law restricted them to personal property as distinguished from real estate, but this distinction has been largely abolished by recent statues. Larceny was formerly divided into two kinds, grand and petty, or the difference between articles above and below the value of a shilling, but this distinction has now been abolished. At one time the punishment for grand larceny was death; later it was restricted to transportation; now the punishment for larceny is imprisonment or penal servitude, and depends on the previous character of the prisoner.

LARCH, the common name of trees having deciduous leaves, small erect oval blunt-pointed cones, and irregularly margined scales. This genus is now usually united to Abies.

LAR'COM, Lucy, American poetess, born at Beverly, Mass., in 1826. She contributed to the Lowell Offering, a periodical which existed about 1840–45 as a literary journal for the mill operatives. Her work attracted the notice of Whittier, with whom she afterward compiled Child-Life and Songs of Three Centuries. In 1865 she became assistant editor (and from 1866 to 1874 editor) of Our Young Folks, since merged in the Saint Nicholas. She died 1893.

LARD, is obtained from the fat of swine when it is heated to boiling point and then strained. It is chiefly composed of oleine and stearine, and is now largely used in the manufacture of candles, soap, pomades, etc. The best quality is found in the fat which surrounds the kidneys, and this is employed in pharmacy for the preparation of unguents. When subjected to pressure the oleine is liberated, forming lard-oil, which is much used as a lubricant for machinery.

LAREDO (lȧ-rā'dō), the county-seat of Webb co., Texas, 153 miles southwest of San Antonio; on the Rio Grande, opposite Nuevo Laredo, with which it is connected by bridges, and on the International and Great Northern, the Mexican National, and other railroads. Pop. 15,560.

LARE'DO, the capital of Webb co., Tex., on the Rio Grande river, and the Int. and Gt. N., the Mex. Nat. and the Rio G. and Eagle Pass railways; opposite Nuevo Laredo, Mexico, with which it is connected by two steel bridges; 153 miles w. of San Antonio. It is in the Rio Grande coal region. Pop. 14,675.

LARK, the common name of birds characterized by a short, strong bill; nostrils covered with feathers; forked tongue; long, straight hind-claw; and the power to raise the feathers on the back part of the head in the form of a crest. Their distribution throughout the Old World is general, but the only species found in America is the Shore-lark. They are terrestrial in their habits, feed upon worms, larvæ, etc., nest upon the ground and bring forth a brood twice in the year. The best known is the sky-lark, which is celebrated for the prolonged beauty of its song. The wood-lark is less common than the sky-lark, and is known by its smaller size and less distinct colors. It perches upon trees, and is found chiefly in fields near the borders of woods. It sings during the night, and on this account has been mistaken for the nightingale.

LARKSPUR, sometimes called Lark's-heel, a genus of plants distinguished by its petaloid calyx, the superior sepal of which terminates in a long spur. The Upright Larkspur and the Branching Larkspur are well-known garden flowers.

LA ROCHEFOUCAULD (rōsh-fō-kō), François, duc de, Prince de Marsillac, a distinguished courtier and man of letters under Louis XIV., was born at Paris in 1613, died 1680. His Mémoires, published in 1662, and his Réflexions ou Sentences et Maximes Morales, published anonymously in 1665, were the fruits of his literary activity. For its brilliancy of style, it is still considered a French classic.

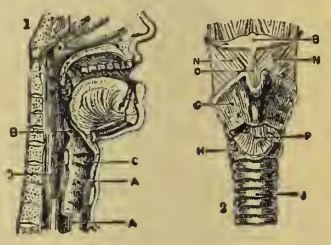
LA ROCHELLE. See Rochelle.

LARVA, the term applied in natural history to the first stage in the metamorphosis of insects, and certain other of the lower invertebrates. In insects it is equivalent to the grub or caterpillar stage. Many of the crustacea, as crabs and barnacles, and even vertebrata, as in frogs and newts, pass through larval forms. The larval crab was for long described as a distinct crustacean with the name of Zoëa. See Metamorphosis.

LARYNGI'TIS, inflammation of the mucous membrane lining the larynx. It may be acute or chronic. The first usually arises from a cold.

LARYN'GOSCOPE, a contrivance for examining the larynx and commencement of the trachea. It consists of a plane mirror introduced into the mouth, and placed at such an angle that the light thrown on it from a concave reflector, in the center of which is an aperture, is made to illuminate the larynx, the image of which is again reflected through the aperture in the reflector to the eye of the observer.

LARYNX, the organ by which the voice is produced, situated at the upper part of the trachea or windpipe. The larynx is formed mainly of two pieces of cartilage, called the thyroid and the cricoid, one placed above the other. The thyroid is formed of two extended wings meeting at the middle line in front in a ridge; above and from the sides two horns project upward, which are connected by bands to the hyoid bone, from which the larynx is suspended. The thyroid cartilage rests and is movable upon the cricoid, moving backward or forward, but not from side to side. The cricoid cartilage is shaped like a signet-ring, the narrow part of the ring being in front. The cricoid carries, perched on its upper edge behind, the arytenoid cartilages, which are of great importance in the production of the voice. These various cartilages form a framework upon which muscles and mucous membranes are disposed. The mucous membrane which lines the larynx is thrown into various folds. These folds are called the true vocal cords, and by their movements the voice is produced. They are called true, as distinct from the false vocal chords which are above them, but take no part in producing the voice. The true vocal cords projecting toward the middle form a chink, which is called the glottis. By the contraction of various muscles this chink can be so brought together that the air forced through it throws the edges of the membrane into vibration and so produce sounds. Variations in the form of the chink will affect changes in the sound. Thus the production of voice is the same as in musical instruments, the arrangements in the larynx being such as to produce (1) the vibratory sounds, (2) to regulate the sound, (3) to vary the pitch, and (4) to determine the quality of the sound. The rapid, delicate, muscular movements involved are produced by nervous stimuli reaching the muscles from the brain. Thus the voice is produced in the



Larynx internally (1) and externally (2).

larynx, and is modified by the rest of the respiratory passages. (See Voice.) In the act of swallowing, the glottis is covered by a cartilaginous plate called the epiglottis.—In the accompanying cut, fig. 1 shows C the larynx internally, B being the epiglottis situated above the glottis or entrance to the larynx, AA the trachea, and D the œsophagus or gullet. In fig. 2 J is the trachea, B the hyoid bone, NN the thyreo hyoid membrane, O the thyreo-hyoid ligament, G the thyreoid cartilage, H the cricoid cartilage, P the crico-thyreoid ligament.

LA SALLE, a thriving city, the capital of La Salle co., Illinois, on the north bank of the Illinois river, 100 miles southwest of Chicago. It has zinc smelting works and rolling-mills. There is a good supply of bituminous coal in the neighborhood. Pop. 12,446.

LA SALLE, Robert Cavelier, Sieur de, a French explorer in North America, was born at Rouen in 1643. He became a settler in Canada, and about 1669 he

La Salle.

sought to reach China by way of the Ohio, supposing, from the reports of Indians, this river to flow into the Pacific. He made explorations of the country between the Ohio and the lakes, but, when Joliet and Marquette made it evident that the main river Mississippi

emptied in the Gulf of Mexico, he conceived a vast project for extending the French power in the lower Mississippi valley. Toward the close of 1681 La Salle reached the head of Lake Michigan, at the present site of Chicago, and, making the long portage to the Illinois, descended it to the Mississippi, which he followed to its mouth, where he set up a cross and the arms of France, April 9, 1682. La Salle fell sick on his voyage up the river, and sent on intelligence of his success, which was carried to France by Father Membré, and was published in Hennepin's work in 1683. When La Salle reached France, projects were taken up by the government for an expedition against the rich mining country of northern Mexico. Plans were submitted by La Salle and by Peñalosa, a renegade Spaniard, who, while governor of New Mexico in 1662, had penetrated apparently to the Mississippi. La Salle was accordingly sent out in July, 1684, with four vessels and a small body of soldiers, ostensibly to found an establishment at the mouth of the Mississippi, but really to push on and secure a favorable base of operations, and gain the aid of the Indians against the Spaniards, while awaiting a more powerful force under Peñalosa. The design was so well masked, and subsequently misrepresented, that he is generally said to have been carried beyond the Mississippi by the treachery of Beaujeau, a naval officer commanding one of the vessels. After running along the coast, La Salle returned to Espiritu Santo Bay, Texas. There he landed his soldiers, but lost one vessel with valuable stores. He refused Beaujeau's offer to obtain aid for him from the West Indies, and when that officer, according to his orders, sailed back, La Salle put up a rude fort. Then for two years, from January, 1685, to January, 1687, he wasted the time in aimless excursions by land, never getting beyond the present limits of Texas, and making no attempt to explore the coast or reach the Mississippi with his remaining vessel. His colonists and soldiery dwindled away; no reënforcements or expedition under Peñalosa arrived; and in January, 1687, leaving part of his force at Fort St. Louis, he set out with the rest to reach Canada by way of the Mississippi to obtain relief. His harshness and arbitrary manner had provoked a bitter feeling among his followers, and he was assassinated on March 19th, near the Trinity river. Some of the survivors reached Tonty's post on the Arkansas, and returned to France by way of Canada The party left at the fort were nearly all cut off by the Indians, a few survivors having been rescued by a Spanish force sent to root out the French.

LASCAR, the name applied by Europeans to native East Indian sailors, many of whom are now employed in the mercantile marine.

LAS CASAS, Bartolomé de, a Spanish prelate, known as the Apostle of the Indians, born 1474, died 1556. He accompanied Columbus to Hispaniola in 1498, and on the conquest of Cuba received charge as priest there, and distinguished himself for his humane treatment of the natives. In his zeal for the Indians he returned to Spain several times and obtained decrees in their favor, which, however, were of little avail. In the cause of religion he visited various parts of the New World, including Mexico, Guatemala, Peru, etc. In 1542 he wrote his famous Brevissima Relacion de la Destruccion de las Indias. He died at Madrid.

LAS CASES (läs käs), Emmanuel Auguste Dieudonné Marin Joseph, Comte de, French writer, born in 1766, died in 1842. After Waterloo he shared Napoleon's imprisonment in St. Helena, where the emperor dictated part of his Memoirs to Las Cases, and took lessons from him in English. Removed to the Cape of Good Hope from St. Helena for sending out a secret letter, he was permitted to return to France after Napoleon's death, where he published the Mémorial de St. Hélène in his Atlas Historique.

LASSA, or **LHASSA,** the capital of Tibet, situated on the Kitchu, a tributary of the Brahmaputra. Pop. of city and suburbs estimated at 50,000.

LASSALLE (lä'säl-lē), Ferdinand, a notable German socialist, born at Breslau 1825, of Jewish parents; studied at Berlin university; first made himself known as a leader during the democratic troubles of 1848, and was imprisoned for a year. In 1861 he published his System of Acquired Rights. Thereafter he proceeded to organize the working-classes, which caused the government to accuse him of sedition, and he was imprisoned for four months. In May, 1863, he founded a Labor Union, and began that socialist propaganda which has since become so wide-spread in Germany. In the summer of 1864 he sought rest in Switzerland, and was there killed in a duel occasioned by a love affair.

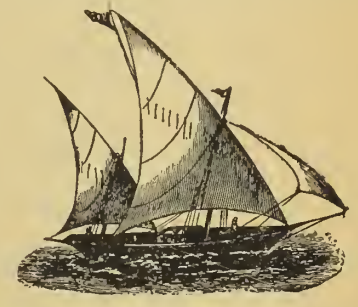
LASSO, a contrivance used in Spanish America, consisting of a long rope of plaited rawhide, at one end of which is a small metal ring. By means of this ring a noose is readily formed, and the lasso, or lariat, is then used for catching wild cattle, the rope being cast over the animal's head or leg while the hunter is in full gallop.

LAS VEGAS (läs-vā'gäs), the county-seat of San Miguel co., N. M., 83 miles (40 in a direct line) east of Santa Fé; on the Gallinas, a branch of the Pecos river, and on the Atchison, Topeka and Santa Fé railroad. It includes two parts solidly built together—an unorganized section, the old Mexican town, which is the county-seat; and, lying to the east, the modern quarter, incorporated in 1888 under the name East Las Vegas, this town in 1896 becoming the city of Las Vegas. Las Vegas is an important wool market, and the commercial center for the adjacent country, which is interested principally in farming and stock-raising. The famous Las Vegas Hot Springs, a popular health resort 6765 feet above sea level, is six miles distant. Pop. 10,121.

LATEEN' SAIL, is a triangular sail used in xebecs, feluccas, etc., in the Mediterranean, and in the dahabeahs of the Nile. It is extended by a lateen yard, which is slung across a mast so as to make an angle of about 45 degrees with it, the lower portion of the yard being about a third of the whole.

LATENT HEAT, that portion of heat which exists in any body without producing any effect upon another or upon the thermometer; termed also insensible as distinct from sensible heat. It becomes sensible during the conversion of vapors into liquids, and of liquids into solids; and on the other hand a portion of sensible heat disappears or becomes latent when a body changes its form from the solid to the liquid, or from the liquid to the gaseous state.

LATHE, a machine for turning and polishing flat, round, cylindrical, oval, and every intermediate form of body in wood, ivory, metals, etc., the object worked on receiving a rotary motion; it is also used in glass-cutting and earthenware manufacture. It may be turned by



Lateen sail.

the hand, the foot, steam-power, water, etc. A duplex lathe is one which works on two turning tools at once; Blanchard's lathe is one for turning objects of an irregular form, as lasts, gun-stocks, etc. A throw-lathe is one in which the mechanic drives the lathe with one hand, holding the cutting tool with the other.—The term is also applied to the batten or lay of a loom in which the reed is fixed, and by the movements of which the weft-threads are laid parallel to each other, shot after shot, in the process of weaving.

LA'THROP, George Parsons, American journalist and poet, born at Oahu, Sandwich Islands in 1851. He was from 1875 to 1877 assistant editor of the Atlantic Monthly; then till 1879 editor of the Boston Courier. He published: Rose and Roof Tree, poems; Study of Hawthorne; Afterglow, a novel; A Masque of Poets; an edition of Nathaniel Hawthorne's Works, with a biography; Spanish Vistas; Gold of Pleasure; Dreams and Days. He died in 1898.

LATHROP, Rose Hawthorne, American poet and philanthropist, was born at Lenox, Mass., in 1851. She married George Parsons Lathrop in 1871. She wrote many stories and sketches; a volume of poems, Along the Shore and Memories of Hawthorne, with her husband. In 1896 she established in New York City Saint Rose's Free Home for Cancer; and soon after, with the title of Mother Mary Alphonsa, she became head of a Dominican community of the Third Order and director of a charitable home in that city.

LATHS AND LATHWOOD. Small strips of wood, thin and narrow. They are of various lengths, rarely more than four feet, and are made either by splitting lathwood, which is the Norway

spruce fir, or else they are sawn from the small portions of the lumber. Laths are used for nailing to the uprights of partition walls, and to the rafters of ceilings; they are placed slightly apart to receive the plaster, which, by being pressed into the intervals between the laths, is retained, and when dry is held securely on the wall.

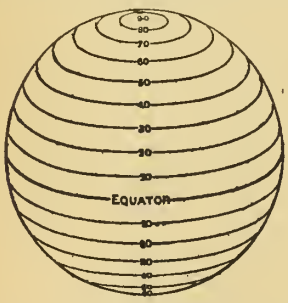
LAT'IMER, Hugh, D.D an English prelate, reformer, and martyr, born about 1490. He was made chaplain to Henry VIII. in 1530, and during the ascendency of Anne Boleyn in 1535 he was appointed bishop of Worcester. In 1538 he resigned his bishopric, not being able to accept the Six Articles, and was put in prison, but on the accession of Edward VI. he was released and became highly popular at court. This continued until Mary ascended the throne, when Latimer was cited to appear, along with Cranmer and Ridley, before a council at Oxford, and condemned. After much delay and a second trial, Latimer and Ridley were burned at the stake, Oct. 16, 1555. His preaching was popular in his own time for its pith, simplicity, and quaintness.

LATIN CHURCH, the Roman Catholic Church.

LATIN EMPIRE. See Byzantine Empire.

LATIN LANGUAGE AND LITERATURE. See Rome.

LAT'ITUDE, in geography, the distance of any place on the globe north or south of the equator measured on its



Parallels of latitude.

meridian. It is called north or south according as the place is on the north or south of the equator. The highest or greatest latitude is 90°, that is, at the poles; the lowest or smallest 0°, at the equator, between which and the poles any number of parallel circles called parallels of latitude may be supposed to be drawn. One method of finding the latitude of a place is by measuring the altitude of the pole-star. When the latitude and longitude of a place are given its position on a map is easily found. See Longitude.

LATTICE-GIRDER, a girder of which the web consists of diagonal pieces arranged like lattice-work. Lattice-bridge is the name given when the cross-framing is made to resemble lattice-work.

LATTICE-LEAF, Lattice-plant, a very remarkable aquatic plant of Madagascar noteworthy for the structure of its leaves. The blade resembles lattice-work or open needle-work, the longitunidal ribs being crossed by tendrils, and the interstices between them open.

LAUD, William, Archbishop of Canterbury in the reign of Charles I., was born at Reading in Berkshire, 1573. After the accession of Charles I. Laud was translated to the see of Bath and Wells, and in 1628 to that of London, while his influence seemed to increase. In 1630 he was elected chancellor of the University of Oxford, which he enriched with a valuable collection of manuscripts, establishing also a professorship of Arabic. In 1633 he was promoted to the see of Canterbury. In

Lattice plant.

1634 he instituted rigorous proceedings against all who would not conform to the Church of England. By means of spies he hunted out the Puritans, and sought to extinguish all forms of dissent by means of fines, imprisonment, and exile. He prosecuted Prynne, Burton, and Bastwick for libel, and to him is attributed the severe sentences which they received. When the Long Parliament met (1640) the archbishop was impeached for high treason at the bar of the House of Lords by enzil Holles and committed to the Tower. After three years he was brought to trial, but the lords deferred giving judgment. The House of Commons, however, passed a bill of attainder (January, 1644), declared him guilty of high treason, and condemned him to death. Accordingly he met his end on the scaffold at Tower Hill with great firmness. An edition of his works was published by Parker (Oxford, 1857–60).

LAU'DANUM, tincture of opium. See Opium.

LAUGHING-GAS, nitrous ovide, or nitrogen monoxide, or protoxide of nitrogen; so called because, when inhaled, it usually produces exhilaration. See Nitrogen.

LAUGHING JACKASS, or **GIANT KINGFISHER,** a bird allied to the king-

Laughing Jackass.

fisher, deriving its former title from the singularly strange character of its cry. It is an inhabitant of Australia, being found chiefly in the southeastern portion of that country. It makes no nest but deposits its eggs in the decayed hollow of a gum-tree. In length about 18 inches, it has a dark-brown crest, its back and upper surface is olive-brown, wings brown-black, and the breast and under portions white, crossed by faint bars of pale brown. The tail is longish, with a rounded extremity, tipped with white; its color is a rich chestnut, with deep black bars.

LAUGHTER, the outward expression of a certain emotion or excited condition of the nervous system, manifested chiefly in certain convulsive and partly involuntary actions of the muscles of respiration, by means of which the air, being expelled from the chest in a series of jerks, produces a succession of short abrupt sounds; certain movements of the muscles of the face, and often of other parts of the body also taking place. Laughter is generally excited by things which are of a ridiculous or ludicrous nature, the ultimate cause being usually attributed to the perception of some incongruity, though mere incongruity is not always sufficient. It may also be caused, especially in the young, by tickling; it also accompanies hysteria and sometimes extreme grief.

LAUNCH, the largest boat carried by a man of war; both steam and sail. Launches from 40 to 60 feet are carried and used for picket boats to guard against surprise by torpedo boats, by battle ships and large armored cruisers.

LAUNCHING, the process of removing a ship from the land to the water. The keel is laid upon a number of wooden blocks placed 6 or 7 feet apart and built up 3 or 4 feet from the ground, the tops of which slope downward to the water. When the ship is ready for launching, "ways" of timber and planking are laid down parallel to the keel, and at some little distance on each side of it, under the bilges of the ship; they extend into the water a considerable distance below high-water mark. A "cradle" is then built under the ship, of which the bottom is formed of smooth timbers resting upon the ways. Before launching, the under sides of these timbers and the upper sides of the ways are well greased, and the weight of the ship is transferred from the keel-blocks to the cradle and ways. Timbers, called "dog-shores," are placed so as to resist the tendency of the ship to slide down until the right moment, when the dog-shores are knocked away. Many large battle ships and some other vessels have been built in dry docks and floated out when ready, instead of being launched. This system is economical, if the dry docks are not needed for other purposes. On the Great Lakes the practice of launching ships sidewise is very common.

LAU'REATE, Poet, a designation first applied to poets who were honored by the gift of a laurel wreath. It is now the name of an official connected with the royal household of Great Britain, the patent for which appears to have been granted by Charles I. 1630, although Ben Jonson and others are said to have held the title previously. It was the chief duty of the laureate to furnish an ode on the birthday of the king or upon the occasion of a national victory, the emolument attached to the office being

$500 a year with a tierce of canary. Since the reign of George III. there have been no special duties connected with the office. From the time of Charles II. the following poets have in succession held the office of laureate:—John Dryden, Nahum Tate, Nicholas Rowe, Lawrence Eusden, Colley Cibber, William Whitehead, Thomas Warton, Henry James Pye, Robert Southey, William Wordsworth, Lord Tennyson, and Alfred Austin.

LAUREL, a plant belonging to the genus Laurus, nat. order Lauraceæ, to which it gives the name. The sweet-bay or laurel is a native of the north of Africa and south of Europe, and is cultivated in gardens not only on account of its elegant appearance, but also for the aromatic fragrance of its evergreen leaves. The fruit, which is of a purple color, and also the leaves, have long been used in medicine as stimulants and carminatives. The name is also given to other plants, as in America to the Rhododendron maximum. In ancinet times heroes and scholars were crowned with wreaths of bay leaves, whence the terms laurels in sense of honors and laureate. From the fruit of the sweet-bay or laurel several oily substances have been extracted. Thus there is the oil of laurel, a yellowish oil with an odor of laurel and a strong bitter taste; laurel fat, a yellowish-green buttery substance, used for embrocations in rheumatism, paralysis, deafness, etc. The cherry-laurel also yields a volatile poisonous oil when its leaves are distilled in water. Notwithstanding this cherry-laurel leaves are often employed in cookery for their flavoring qualities. But caution requires to be exercised in their use, as death has resulted from an oversupply in custards, puddings, etc., and it is better to use bay leaves instead. From the cherry-laurel laurel-water is produced from the leaves by distillation. See Laurel-water.

LAUREL-WATER, a fluid obtained by maceration and distillation from the leaves of the cherry-laurel, being a watery solution of the volatile oil contained in the plant. It contains prussic acid and is therefore poisonous, but is used medicinally. See above article.

LAURENTIAN, in geology, a term applied to a vast series of stratified and crystalline rocks of gneiss, mica-schist, quartzite, serpentine, and limestone, about 40,000 feet in thickness, lying northward of the St. Lawrence in Canada. The Laurentian is the lowest fossiliferous system of rocks, if its characteristic and only fossil, the Eozoon canadense, can be ranked as a fossil. (See Eozoon.) The terms Archæan and Pre-Cambrian are used in Britain for rocks occupying a similar position to the Laurentain. See Geology.

LAURENTAIN MOUNTAINS, a range in Canada extending for over 3000 miles from Labrador to the Arctic Ocean, forming the watershed between Hudson's Bay, the St. Lawrence, and the great lakes, and dividing the same bay from the sources of the Mackenzie river. The average elevation is about 1500 feet, while some of the peaks attain a height of 4000 feet.

LAVA, the general term for all rock-matter that flows, or has flowed, in a molten state from valcanoes, and which when cooled down forms varietics of tufa, trachyte, trachytic greenstone, and basalt, according to the varying proportions of felspar, hornblende, augite, etc., which enter into the composition of the mass, and according to the slowness or rapidity with which it has cooled. The more rapidly this process of cooling goes on the more compact is the rock.—Lava beds are of two kinds, namely, contemporaneous and intrusive. A contemporaneous lava bed is one which has been poured out over the surface of one deposit, and covered by subsequent deposits. Such a bed is in its natural position, and usually alters only the bed beneath it. Intrusive beds are those which have been forced up in a molten state through or between strata, altering those on both sides.

LA VALLIERE (vál-yār), Louise Françoise de la Baume le Blanc de, was born in Touraine in 1644, died 1710. The descendant of an ancient family, she was brought to court by her mother, became mistress to Louis XIV., and bore him four children. The king raised the estate of Vaujour into a duchy and a peerage in favor of her and her children. Superseded at court by Madame de Montespan she retired to a Carmelite convent in 1674, where she died.

LAV'ENDER, a delightfully fragrant shrub 3–4 feet high, a native of the south of Europe. Under favorable conditions it contains one-fourth of its own weight in camphor. It also produces a volatile oil, which is much in demand as an excellent perfume. This oil is got by distilling the flowers. It has a pale-yellow color, aromatic odor, and a hot taste. Besides being employed as a perfume, it is used in medicine as a stimulant in hysteria, colic, and other affections. Spirit of Lavender is prepared by digesting the fresh flowers in rectified spirits and distilling. Lavender-water is a solution of oil of lavender in spirit along with otto of roses, bergamot, musk, cloves, rosemary, etc. This preparation after standing for some time is strained and mixed with a certain proportion of distilled water. Enough oil is produced annually in England to make 30,000 gallons of lavender-water.

LAVOISIER (lâ-vwä-si-ā), Antoine Laurent, a celebrated French chemist, was born at Paris 1743. Conspicuous in all respects, when to be conspicuous was a crime, Lavoisier was accused before the convention as an ex-farmer-general and guillotined, 8th May, 1794. He was the first to organize the methods of chemistry and establish its terminology. His most important discoveries are to be found in his Traité de Chimie and Mémoires de Physique et de Chimie.

LAW. See Commercial Law, Canon Law, Civil Law, Common Law, International Law, etc.

LAW, John, of Lauriston, a celebrated financial projector, son of a goldsmith of Edinburgh, born 1671, died 1729. He was bred to no profession, but being skilled in accounts he made various proposals to the Scottish parliament to remedy the currency, which were rejected. Subsequently he fled from his country in consequence of a duel; visited Genoa and Venice, where he accumulated a fortune by gambling; settled in France, where he received royal patronage and started a private bank, and floated his celebrated Mississippi company. His immediate success was so great that he was made a councillor of state and comptroller-general, but the large amount of paper-money issued depreciated the shares, and led to the collapse of his schemes. Having had to flee from France, he wandered about Europe as a gambler, and died at Venice in poverty. A volume entitled Œuvres de J. Law was published at Paris in 1790, 8vo.

LAWN TENNIS is a modified development of an old English game, and is played with rackets and india-rubber balls. The players number two, four, or more, forming even sides. The ground on which the game is played is usually 78 feet long by 30 feet broad. This space is divided by a net 24 feet wide, 3 feet high at the ends, and 4 feet in the center; the extreme ends of the area are called the base lines. The space on either side of the net thus marked off is called a court. This court has two lines running through it: one of which is called the central line, and runs lengthwise; the other is known as the service line, and runs parallel to, and 30 feet distant from, the central net. The ground thus divided is called the right and left courts. The mode of playing with two is, that one is called the server or "hand-in," while the other is "hand-out." When the ball is served by "hand-in" the server must stand with one foot outside the base line of the court, beginning on the right side, and his aim is to pitch the ball across the net and into the court diagonally opposed. If the server fails to do this it is called "a fault," and he must serve again. When the ball is properly served it is the opponent's duty to return it across the net before it touches the ground a second time. Should the ball not be returned, "hand-in" scores a point; on the contrary, should the ball not be properly served, "hand-out" scores. The player who first scores fifteen wins the game, but if both players are equal at fourteen the score is called "deuce." It is here that "vantage" is introduced, and in order to score game the player must win two successive points, otherwise the score returns to "deuce."

LAW OF NATIONS. See International Law.

LAWRENCE, a town in Essex co., Massachusetts, on both sides of the Merrimac river, 26 miles north from Boston. The principal buildings are the courthouse, state university, opera house, etc. It is principally supported by its extensive cotton and woolen factories, paper-mills, and manufactures of steam-engines, etc. Pop. 1909, about 76,000.

LAWRENCE, the capital of Douglas co., Kan.; on both sides of the Kansas river, and on the Atch., Top. and S. Fé, the Kan. City, Wyo. and N. W., and the Union Pac. railways; 38 miles w. of Kansas City. It is the seat of the State University and of Haskell Institute which, next to that at Carlisle, Pa., is

the largest Indian training-school in the United States. Pop. 12,100.

LAWRENCE, ST., one of the largest rivers in the world, which rises under the name of the St. Louis, and drains the great chain of North American lakes. In different parts of its course it is known by different names. From the sea to Lake Ontario it is called St. Lawrence; between Lakes Ontario and Erie it is called Niagara river; between Lakes Erie and St. Clair, Detroit river; between Lakes St. Clair and Huron, St. Clair's river; between Lakes Huron and Superior, St. Mary's river or the Narrows, forming thus an uninterrupted waterway of upward of 2000 miles. It receives the Ottawa, its principal auxiliary, at Montreal, as also the St. Maurice, the Saguenay, and numerous other large rivers from the north. The river is navigable for Atlantic steamers to the city of Montreal, 600 miles up, and from Montreal upward by river and lake steamers. The rapids between Montreal and Lake Ontario are passed by means of canals, and Niagara Falls by the Welland Canal. The river's breadth between Montreal and Quebec is from ½ to 4 miles; the average breadth, about 2 miles. Below Quebec it gradually widens till it enters the Gulf of St. Lawrence. From the beginning of December to the middle of April the navigation is totally suspended by ice. In part of its course it forms the boundary between the United States and Canada.

LAWRENCE, ST., Gulf of, a large inlet of the North Atlantic in British North America, forming the continuation of the estuary of the river St. Lawrence, and separated from the Atlantic chiefly by the island of Newfoundland, Cape Breton, and Nova Scotia. It communicates with the ocean by the opening betwixt Newfoundland and Cape Breton, about 65 miles wide, by the Strait of Belle Isle and the Gut of Canso. It contains numerous islands, the principal of which are Anticosti, Prince Edward's, and the Magdalens.

LAWRENCE, JAMES, American naval officer, was born in Burlington, Vt., in 1781. He distinguished himself in the war with Tripoli. In 1808 he served as first lieutenant on the Constitution and then commanded successively the

Captain Lawrence.

Argus, the Vixen and the Wasp. In 1811 he was made captain of the Hornet, and in 1813 defeated the British brig-of-war Peacock Congress gave him a gold medal as a reward for this victory, and he was also given command of the Chesapeake. On June 1, 1813, he attacked the British frigate Shannon and a bloody engagement took place, the Chesapeake was captured and Lawrence mortally wounded. While being carried below he uttered the words, "Don't give up the ship," which soon became a motto in the navy.

LAWRENCE, John Laird Mair, Lord, Governor-general of India, born in Yorkshire 1811, died in London 1879. Educated at the college of Haileybury, he went to India, in 1829 where his rare administrative ability attracted attention, and caused him to receive the appointment of chief-commissioner of the Punjab in 1853, after he had served in minor posts. The entire wisdom of this appointment was demonstrated during the Indian Mutiny of 1857. By

John, Lord Lawrence.

the influence which he had gained over the Sikhs, Lawrence was able not only to keep the Punjab quiet, but to collect native forces and send them to assist in the early capture of Delhi. He was known as the savior of India, and his services were rewarded by his being made governor-general in 1863. On his return to England in 1868 he was raised to the peerage under the title of Baron Lawrence of the Punjab and of Grately.

LAWSON'S CYPRESS, a species of cypress found in the valleys of Northern California, where it grows to the height of 100 feet. The branches are numerous and are drooping, slender, and regularly disposed, forming a symmetrical columnar mass of rich green spray.

LAWTON, Henry Ware, American soldier, was born in Lucas co., Ohio, in 1843. He served in the civil war and rose to the rank of brevet-colonel. His operations against the Indians, against Geronimo especially, were successful. In the war with Spain he was commissioned brigadier-general; he was in command of the second division of the fifth corps in the operations against Santiago. After the fall of Santiago he was made major-general and given command of the department of Santiago. In 1898 he was sent to the Philippines as second in command under General Otis. He fell in battle at San Mateo, Luzon in 1899.

LAY'ARD, Sir Austin Henry, G.C.B., English traveler, archæologist, and diplomatist, was born in 1817. He was appointed attaché to the British embassy at Constantinople in 1849. In 1852 he entered parliament in the liberal interest; became under-secretary for foreign affairs in 1860, commissioner of works in 1869, and ambassador to the Porte in 1877 under Lord Beaconsfield's government, when he accomplished the annexation of Cyprus. He wrote Nineveh and its Remains, Discoveries in the Ruins of Nineveh and Babylon, and Early Adventures in Persia, etc. He died in 1894.

LAY BROTHERS are an inferior class of monks employed as servants in monasteries. Though not in holy orders they are bound by the three monastic vows of poverty, chastity, and obedience. They wear a dress somewhat different from that of the other monks. In nunneries a similar distinction prevails between the nuns proper and the lay sisters.

LAYERING, in gardening, the propagation of plants by bending the shoot of a living stem into the soil, the shoot striking root while being fed by the parent plant. The figure shows the

Layering.

branch to be layered bent down and kept in the ground by a hooked peg, the young rootlets, and a stick supporting the extremity of the shoot in an upright position.

LAY-FIGURE, a jointed human figure used by painters, made of wood or cork, which can be placed in any attitude, and serves when clothed as a model for draperies, etc.

LEAD, a metal of a bluish-gray color; when recently cut it has a strong metallic luster, but soon tarnishes by exposure to the air owing to the formation of a coating of carbonate of lead. It is soft, flexible, and inelastic. It is both malleable and ductile, possessing the former quality to a considerable extent, but in tenacity it is inferior to all ductile metals. It fuses at about 612°, and when slowly cooled forms octohedral crystals. It is an abundant and widely distributed metal. It is a constituent of a very large number of minerals, all of which could be used as sources of it if they could be obtained in sufficient quantity. In practice the metal is got from only a few of these minerals, especially from the sulphide, carbonate, and one or two others. The most important of all the ores of lead is the sulphide or lead glance, which has been described under the term Galena. The carbonate, also called cerusite, or leadspar, like all the salts of lead, is perfectly unmetallic in its appearance, and is not unfrequently rejected from among common lead ore as an earthy mineral. It occurs in veins in primitive and secondary rocks, accompanying galena, and other ores of lead. It is abundant in European countries, in Britain, in Ireland, and it has been found at different localities in the United Sates. The sulphate of lead, anglesite, or lead vitrol, was found originally at Anglesey. Chromate of lead, crocoisite, or crocoite was originally found in Siberia; it has since been met with in the Philippine Islands,

in Brazil, and in Hungary. It was in this mineral that chromium was first discovered. Phosphate of lead is found accompanying the common ores of lead, though rarely in any considerable quantity. Finely crystallized varieties are found at Leadhills in Scotland, and in Cornwall. In the ores of lead silver is a very common constituent. Of the salts formed by the action of acids on lead or on the protoxide, the carbonate or white-lead and the acetate or sugar of lead are the most important. The protoxide is also employed for glazing earthenware and porcelain. Carbonate of lead is the basis of white oil-paint and a number of other colors. The salts of lead are poisonous, but the carbonate is by far the most virulent poison. Lead is one of the most easily reducible metals, and from the native carbonate can be got by simply heating with coal or charcoal. The sulphide, however, which is the most abundant of its ores, is not so readily acted on by coal, and a reverberatory furnace, or a special variety of blast-furnace, is employed. Lead obtained in this way is usually too hard for use, and it has to be subjected to a process of purification. This is effected by roasting the lead, sometimes for several weeks, in a reverberatory furnace. By this process the antimony, which is the chief impurity, is burned off, and the dross, which consists of the oxide, of that metal with oxide of lead, is afterward reduced and utilized as a source of antimony. The lead, when judged sufficiently pure, is then cast into ingots or pigs of lead. Prepared in this way the lead retains all the silver present in the original ore, and as that is always of value it used to be extracted whenever the quantity of silver present amounted to above 10 oz. per ton. 1 part of tin and 2 of lead form an alloy fusible at 350° Fahr., which is used by tinmen under the name of soft solder. Lead also forms an imperfect alloy with copper. With antimony lead forms the important alloy called type-metal. Pewter is a hard alloy of four parts of tin and 1 of lead. In these proportions the lead is not attacked by organic acids such as the acetic. For the poisonous effects of lead see Lead-poisoning.

LEAD, an instrument used on shipboard for discovering the depth of water. It is composed of a large piece of lead shaped like an elongated clock-weight, from 7 to 11 lbs. in weight, and is attachedto a line, generally of 20 fathoms length, called the lead-line, which is marked at certain distances to ascertain the depth in fathoms. When the depth is great the deep-sea lead, weighing from 25 to 30 lbs., is used. The line, which is much longer than the former, and called the deep-sea line, is marked by knots every 10 fathoms, and by a smaller knot every 5.

LEAD-POISONING, a disease caused by the presence of lead in some quantity in the system. It may be due to lead which has been taken up by water or other beverage from lead pipes or vessels in which it has been contained. The use of lead in the arts is also a frequent cause of painful, and sometimes of fatal effects, from the metal finding its way into the system. The glazing of culinary vessels with lead; the coloring of confectionary with the chromate, chloride, or carbonate of lead; the sweetening of sour wine by litharge or oxide of lead, may all produce lead-poisoning more or less serious. But the most frequent and virulent cases occur among painters and persons engaged in white-lead factories; and four forms of disease, either simple or complicated, are apt to manifest themselves—1, Lead or painters' colic, or dry belly-ache; 2, Lead rheumatism or arthralgia; 3, Lead palsy or paralysis, more particularly of the muscles of the fore-arm; and 4, Disease of the brain, manifested by delirium, coma, or convulsions—a form, however, of rare occurrence. Opium and cathartics are the chief medicines administered.

LEADVILLE, the capital of Lake co., Colorado, 130 miles w.s.w. of Denver, situated on a plateau over 10,000 feet above sea-level. The city owes its origin to the rich argentiferous lead and silver mines in the neighborhood. The mineral output of Leadville exceeds $200,000,000. Pop. 13,700.

LEADWORT, a name for the plants typical of the order Plumbaginaceæ.

LEAF, the green deciduous part of a plant, usually shooting from the sides of the stem and branches, but sometimes from the root, by which the sap is supposed to be elaborated or fitted for the nourishment of the plant by being exposed to air and light on its extensive surface. When fully developed the leaf generally consists of two parts, an expanded part, called the blade or limb, and a stalk supporting that part, called the petiole or leaf-stalk. Frequently, however, the petiole is wanting, in which case the leaf is said to be sessile. Leaves are produced by an expansion of the bark at a node of the stem, and generally consist of vascular tissue in the veins or ribs, with cellular tissue or parenchyma filling up the interstices, and an epidermis over all. Some leaves, however, as those of the mosses, are entirely cellular. See Botany.

LEAGUE, a measure of length varying in different countries. The English land league is 3 statute miles, and the nautical league 3 equatorial miles, or 3.457875 statute miles. The French metric league is reckoned as equal to 4 kilométres or 4374 yards.

LEANING TOWER, a tower which overhangs its base on one side. The most celebrated example is the Campanile of Pisa, which has an obliquity of 13 feet in a height of 179. It is built in the Romanesque style, to correspond with the cathedral, and is surrounded by open arcades of columns. Other well-known examples are in Bologna, the Torre Asonelli, and the Torre Garisenda, both built of brick, the latter well known through a passage in Dante's Inferno. It is a disputed question as to whether the slant of these towers is accidental. That of Pisa shows an increased height in each successive story on the leaning side which has been attributed by some to attempts of the architects to rectify a sinking while the tower was being built. Others have advanced arguments to show that the slant here and elsewhere was intentional. The latter is the prevailing opinion.

LEAP-YEAR, one of the years which contain 366 days, being every fourth year, which leaps over a day more than a common year. Thus in common years, if the first day of March is on Monday the present year, it will the next year fall on Tuesday, but in leap-year it will leap to Wednesday, for leap-year contains a day more than a common year, a day being added to the month of February. Every year is a leap-year which is divisible by 4 without remainder, except the concluding years of centuries, every fourth only of which is a leap-year; thus the years 1800 and 1900 are not leap-years, but 2000 and 2400 are.

LEAR, Edward, English artist and poet, born at Holloway, in London, in 1812. Among his best known and popular works are: Book of Nonsense, Nonsense Songs, More Nonsense Songs, Laughing Lyrics. He died in 1888.

LEANDER. See Hero.

LEA'OTONG, or **SHING-KING,** a Chinese prov. in Manchuria (but now reckoned as part of China proper), stretching into the Yellow Sea between the gulfs of Leaotong and Corea. It has an area of 37,000 sq. miles, a pleasant climate, and is generally fertile. Pop. 6,000,000.

LEASE, a permission to occupy lands or tenements for life or a certain number of years, or during the pleasure of the parties making the contract. The party letting the lands or tenements is called the lessor, the party to whom they are let the lessee, and the compensation or consideration for the lease the rent. A lease for a period not exceeding three years may be by verbal contract. If, however, the term be longer than three years, the lease must be by deed. A breach of any of the covenants contained in a lease was formerly sufficient to render it void, but now any breach may be compensated by a money payment. The power to lease necessarily depends upon the extent of the lessor's estate in the land or tenement to be leased. A proprietor who has only a life-estate can of course lease his property only during his life.

LEATHER, the skins of animals dressed and prepared for use by tanning, tawing, or other processes, which preserve them from putrefaction and render them pliable and tough. The skins employed are chiefly those of cattle, though the skins of horses, asses, sheep, pigs, and goats are also converted into leather. Before subjection to the process of tanning, the cured hides require to be brought back as far as possible to the condition of fresh hides by soaking and softening in water, to which sometimes salt or carbolic acid or sulphide of sodium is added. The softening is now generally assisted by machines, which subject the skins to a kneading process. They are then unhaired by the agency of lime, the customary method of liming being to spread out the hides flat in milk of lime in large pits, the hides being "hauled" or drawn out once or twice a day, and the liquor stirred up; but there are several variations upon this method of liming. In America and on the European continent the hair is loosened by

"sweating," which induces a partial putrefaction, attacking the root-sheaths without injuring the hide substance proper. In the old method of warm sweating, the hides were simply laid in a pile and covered, if necessary, with fermenting tan; the preferable cold method consists in hanging the hides in a moist chamber at a uniform temperature of 60° or 70° F. When the hair is sufficiently loosened the hides are usually thrown into the "stocks," where the slime and most of the hair is worked out of them. Other unhairing processes consist in treatment with alkaline sulphides, especially sulphide of sodium or sulphide of arsenic. To remove the loosened hair, the hide is generally thrown over a beam and scraped with a blunt two-handled knife, but several unhairing machines have been invented. After unhairing, the loose flesh and fat are scraped, brushed, or pared from the inner side, and the hides intended for sole leather are rounded or separated into "butts" and "offal"—the latter the thinner parts, including the cheeks, shanks, and belly pieces. The butts are then suspended for from twelve to twenty-four hours in soft fresh-water, and frequently shaken in it to remove lime or dirt prior to undergoing the process of tanning (see Tanning) and currying (see Currying). The brilliant smooth surface of patent, enameled, lacquered, varnished, or japanned leather is due to the mode of finishing by stretching the tanned hides on wooden frames and applying successive coats of varnish, each coat being dried and rubbed smooth with pumice-stone. Other special kinds of leather are seal leather, Russia and Morocco leathers (which see). Tawed leathers (see Tawing) consist chiefly of the skins of sheep, lambs, kids, and goats treated with alum, or some of the simple aluminous salts, the principal tawing industries being the manufacture of calf-kid for boots and glove-kid. Shamoy, or oil-leather, is prepared by impregnating hides and skins with oil (see Shamoy). The chief markets for leather in Britain are at London, Leeds, and Bristol. Important European centers are Antwerp, Havre, Paris, Marseilles, Vienna, and Berlin; while in the United States, New York, Chicago, Boston, and Philadelphia are the chief centers.

LEATHER, Artificial, the general name of certain fabrics possessing some of the qualities, and often the appearance of leather. One of the earliest methods of fabrication consisted in applying oily pigments to cloth which was subsequently rolled and coated with a sort of enamel paint. An article of this sort, known under the name of leather-cloth, was first produced in America about 1849. Another kind consists of leather parings and shavings reduced to a pulp, and then moulded into buckets, machinery-bands, picture-frames, and other useful and ornamental objects. A so-called vegetable leather consists of caoutchouc dissolved in naphtha, spread upon a backing of linen. It is of considerable strength and durability, and is used for table-covers, carriage-aprons, soldiers' belts, harness, book-binding, etc. Various other substitutes for leather have been recently introduced, one consisting of cloth with a thin facing of leather; but the commonest material is still obtained by varnishing textiles with coatings of some resinous substance, and then painting or embossing them.

LEAVEN, dough in which fermentation has commenced, employed to ferment and render light the fresh dough with which it is mingled. Its use dates from remotest antiquity; the addition of yeast or barm being of modern date.

LEAVENWORTH (lĕv'en-wurth), the county-seat of Leavenworth co., Kan., 26 miles northwest of Kansas City. There are coal-mining interests and extensive manufactures, including vitrified and building brick, stoves, furniture, machinery, flour, wagons, etc. In the suburbs are the United States and state penitentiaries, a home for disabled volunteers and Fort Leavenworth, one of the most important military posts of the West. Pop. 22,135.

LEB'ANON, a town in Lebanon co., Pennsylvania. It is a seat of iron and other industries. Pop. 19,160.

LEB'ANON, Mountains of, two nearly parallel mountain ranges in the north of Palestine, stretching from southwest to northeast, and inclosing between them a valley about 70 miles long by 15 miles wide. In the south part of the chain the Upper Jordan has its source. The habitable districts are occupied toward the north by the Maronite Christians, and toward the south by the Druses. The forests of cedar for which Lebanon was famed have to a large extent disappeared.

LECKY, Will. Ed. Hartpole, English historical writer, born in Dublin 1838. He has written The Leaders of Public Opinion in Ireland; History of the Rise and Influence of the Spirit of Rationalism in Europe; History of European Morals from Agustus to Charlemagne; History of England in the Eighteenth Century. He died in 1903.

LEE, in nautical language, refers to the side toward which the wind is blowing, leeward and windward being opposite terms. A lee shore is one to leeward of a vessel.—A vessel's leeway is the amount that she drifts from her proper course.

LEE, Ann, founder of the Shaker sect; was born in Manchester, England, in 1736. In 1758 she joined the Manchester Society of Friends, and preached against lustful gratification. In 1770 she was imprisoned for creating religious disturbance among the lower orders, after her release was deemed by many their spiritual mother in Christ. She then claimed to have had direct revelation from Christ, declared the wrath of the Almighty against marriage, and was eventually incarcerated in a mad-house. Thereafter she declared she had a special revelation to go to the United States, and, with a number of her followers, arrived in New York City in May, 1774. After some vicissitudes she founded a settlement at Watervliet, near Albany, N. Y. Here she was accused of witchcraft, and later, on a charge of high treason, was arrested and imprisoned in Albany during the summer of 1776. In 1780 her society began to increase, and during a religious rivival at New Lebanon many persons united with her followers. In 1781, in company with several of her elders, she visited the New England states, preaching at many places, and founded a new society at Harvard, Mass. She died in 1784.

LEE, Arthur, one of the American representatives in Europe during the revolutionary war. He was born in Stratford, Westmoreland co., Va., in 1740. Upon Franklin's return to America early in 1775, Lee succeeded him as the agent of Massachusetts, and he was appointed by the committee of secret correspondence of the continental congress as its secret agent in London. He was one of the negotiators of the treaties concluded with France in February, 1778. In 1781 Prince William County sent him to the Virginia legislature, by which body, at the close of the year, he was sent to the continental congress, where he remained until 1785. On the establishment of the new national government he retired finally to private life, and died after a brief illness December 12, 1792.

LEE, Charles, soldier, was born in Dernhall, England, in 1731. In 1754 his regiment was ordered to America to take part in Braddock's western expedition. Lee served in later campaigns as captain of grenadiers, and was present at several conferences of Sir William Johnson with the Indians. His relations with the Mohawks became so friendly that he was adopted as one of their tribe. In 1775 congress appointed him second major-general in the continental army. In July, 1775, Lee joined the army at Cambridge, and was placed in command of the left wing. On October 14th Lee arrived in New York City and took command of the right wing of Washington's army, on Harlem Heights. While separated from his forces, on December 13th, General Lee was surprised and captured by a party of dragoons. In May, 1778, he was exchanged for General Prescott, and joined the American army at Valley Forge. On June 28th Lee overtook the enemy, who were retreating from Philadelphia to New York, at Monmouth, N. J. When Washington arrived for his support, he was astonished to find his division in disorderly retreat, pursued by the British. It was then the commander-in-chief lost his temper, and in round terms swore at Lee in the hearing of his soldiers. Rallying his forces, he soon repelled the enemy and sent Lee to the rear. Afterward Lee was tried for insubordination, and ordered to be suspended from command for a year. For his disrespect to Washington, he was challenged by Col. John Laurens, Washington's aide-de-camp, and in the subsequent duel was shot in the arm. Thereafter he wrote an offensive letter to congress, for which he was dismissed from the army. He retired to his estate in the Shenandoah Valley. He died in 1782.

LEE, Fitzhugh, American soldier, nephew of Robert E. Lee. He was born in Clermont, Va., in 1835. He entered the confederate army, and was adjutant-general in General Ewell's brigade. He served as colonel of a cavalry regiment in nearly all the important operations of the army of northern Virginia; was

appointed brigadier-general in 1862, and major-general in 1863; was severely wounded at Winchester, Va., 1864; and from March, 1865, until his surrender to General Meade at Farmville, was in command of all the cavalry of the army of northern Virginia. From 1886 to 1890 he was Governor of Virginia. He was appointed collector of internal revenue for the western district of Virginia in 1895, and in 1896 was sent to Cuba by President Cleveland as consul-general at Havana. In 1898 he was appointed major-general of volunteers and placed in command of the seventh army corps. In January, 1899, he became military governor of Havana, and subsequently was placed in command of the department of Missouri. He died in 1905.

LEE, Francis Lightfoot, was born in Westmoreland co., Va., in 1734. After serving in the Virginia house of burgesses from London and Richmond counties, he was, in August, 1775, elected to the continental congress, in which he served until 1779. He signed the Declaration of Independence, and assisted in drawing up the articles of confederation. He died in 1797.

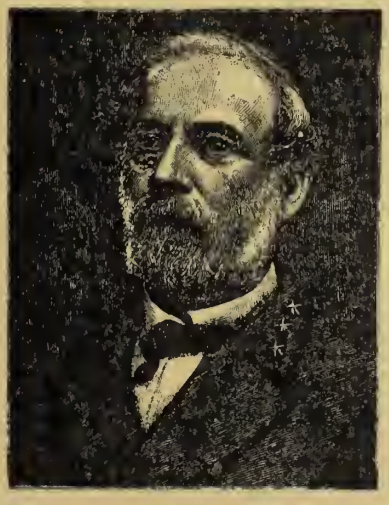
LEE, George W. C., eldest son of General Robert E. Lee, was born at Arlington, Va., in 1832. He rose to a major-general's commission, and commanded a division of the army of northern Virginia. In February, 1871, he succeeded his father as president of Washington College, Va., (now Washington and Lee University).

LEE, Henry, an American revolutionary general, born in Westmoreland co., Virginia, 1756; educated at Princeton College, and in 1776 appointed captain of a company of cavalry in Colonel Bland's Virginia regiment. In the memorable retreat of Greene before Lord Cornwallis, Lee's legion acquired fame as the rear-guard of the American army, the post of the greatest danger. At the battles of Guildford courthouse and Eutaw, and in other affairs, Lee specially distinguished himself. On the conclusion of the war he was sent to congress as a delegate from Virginia, and in 1792 was chosen governor of that state. In 1801 he retired from public life. He died in 1816.

LEE, John Doyle, Mormon official, born at Kaskaskia, Ill., in 1812. In 1837 he came under Mormon influence and moved to Davies co., Mo., where he joined the church. He was accused of having incited the massacre of the Arkansas emigrants at Mountain Meadows in 1857. On his first trial before the United States court in 1875 the jury disagreed, but on the second trial in 1876 he was found guilty. He was shot on the scene of the outrage, March 23, 1877. After his second trial he declared that he had acted under instructions from Brigham Young and other high Mormon officials, who had made him the scape-goat.

LEE, Richard Henry, a distinguished American, born 1732 at Stratford, Westmoreland co., Virginia. He received part of his education in England, and after his return to his native country was chosen a delegate to the house of Burgesses from Westmoreland county. In the opposition to unjust British claims he played throughout a most important part, and on being sent as delegate from Virginia to the first American congress at Philadelphia (1774) was at once recognized as a leader in that assembly. He drew up most of those addresses to the king and the English people which were admitted by his political opponents to be unsurpassed by any of the state papers of the time. When war became inevitable Lee was placed on the various committees appointed to organize resistance. On the 7th of June, 1776, he introduced the motion finally breaking political connection with Britain. In 1784 he was unanimously elected president of the congress, and when the federal constitution was established he entered the senate for his native state. In 1792 he retired into private life, and died in Virginia in 1794.

LEE, Robert Edmund, American general, commander-in-chief of the confederate army, and one of the most skilful tacticians who took part in the great civil war, was born in Virginia in 1808. In 1829 he left the military academy of West Point with the rank of second lieutenant of engineers. After making a tour in Europe he obtained a captaincy in 1838, and in 1847 was appointed



Robert E. Lee.

engineer-in-chief of the army for the Mexican campaign, in which his brilliant services at Cerro-Gordo, Contreras, Cherubusco, and Chapultepec (where he was wounded) speedily gained for him the rank of colonel. From 1852 to 1855 he was superintendent of military studies at West Point. In 1861 he became colonel of his regiment, but on the secession of Virginia from the union he threw up his commission, was intrusted with the command of the Virginia army, and subsequently was selected by President Davis as commander-in-chief. In June, 1862, he defeated the federal army under McClellan, and, aided by Stonewall Jackson, defeated Pope in a series of engagements commencing 20th August, and ending with the victory of Manassas Junction on the 30th. Lee now crossed the Potomac into Maryland to threaten Washington itself, but a series of checks obliged him to withdraw behind the Rappahannock. On the 13th December he routed the federalists under Burnside at Fredericksburg, and on the 2d and 3d May, 1863, gained the splendid victory of Chancellorsville over Hooker. After this Lee resolved to push on to Washington, but was beaten by Meade at Gettysburg, July 1st and 3d, and forced to retreat into Virginia. In the autumn of that year he collected all his forces, defeated Meade on Nov. 7, and in May, 1864, advanced upon Fredericksburg, while Grant at the head of a large army entered Virginia. A series of sanguinary engagements took place at Spottsylvania (5th to 10th May), in which Lee was worsted, but on June 3d he defeated Grant at Chickahominy. The federals, however, with their great superiority of men and material, gradually hemmed in the confederate forces, and on April 9th Lee and his army surrendered to Grant at Burkesville. General Lee then retired into private life, was elected president of Washington College, Lexington, Virginia, in 1865, where he died on the 12th October, 1870.

LEE, William Henry Fitzhugh, second son of Robert E. Lee, was born at Arlington, Va., in 1837. He was appointed lieutenant in 1857 and served in the Utah campaign. In 1861 he joined the confederate forces, became a brigadier-general in October, 1862, was captured and exchanged, and in April, 1864, was promoted major-general of cavalry and led his division from the Rapidan to Appomattox. In 1886 he was elected to congress and re-elected in 1888 as a democrat. He died in 1906.

LEECH, a name for those worms, the distinctive feature of which consists in the presence of one or two sucking-discs. The rings of the body are very numerous and closely set. Usually leeches breathe either by the general surface of the body or by little sac-like pouches known as the respiratory sacculi. They chiefly inhabit fresh-water ponds, though some live among moist grass, and some are marine. The familiar horse-leeches of fresh-water ponds and ditches are included in this group. The land-leeches of Ceylon are terrestrial in habits, living among damp foliage, and in like situations. They fasten on man and beast, and are a serious pest to travelers. The species generally employed for medical purposes belong to the genus Sanguisūga and are usually either the Hungarian or green leech, used in the south of Europe, or the brown-speckled or English leech, used in the north of Europe. The latter variety, however, is now rare in England, owing to the drainage of bogs and ponds. The mouth, situated in the middle of the anterior sucker, is provided with three small white teeth, serrated along the edges, and capable of inflicting a peculiar Y-shaped wound, which, like that produced by the soldier's bayonet, is difficult to close, and permits a large and continuous flow of blood. From 4 drachms to 1 oz. may be stated to be the average quantity of blood that can be drawn by a leech. After detaching themselves, leeches are made to disgorge the blood they have drawn by being placed in a weak solution of salt, or by having a little salt

sprinkled over them. Leeches appear to hybernate in winter, burying themselves in the mud at the bottom of the pools, and coming forth in the spring.

LEECH, the border or edge of a sail which is sloping or perpendicular.

LEEDS, a municipal, parliamentary, and county borough and manufacturing town of England, in the West Riding of Yorkshire, on the river Aire, which here becomes navigable, and is crossed by eight bridges; 185½ miles by railway n.n.w. from London. The Leeds and Liverpool Canal communicates with the Aire, which again gives water communication with Hull, etc. The town extends for about 7½ miles from east to west, and about 7 from north to south. Leeds has been for generations the chief seat of the woolen manufacture of Yorkshire. The other chief industries are: boot and shoe factories, the leather trade, color-printing works, tobacco manufactories, chemical and glass works, works for making drainage pipes, firebricks, terra-cotta, pottery, etc. Nearly a hundred collieries are worked in the district. Pop. 428,953.

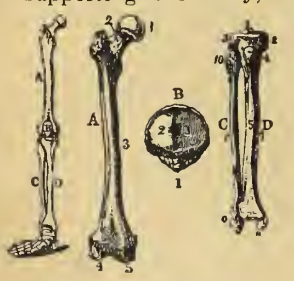
LEEK, a mild kind of onion much cultivated for culinary purposes. The stem is rather tall, and the flowers are disposed in large compact balls, supported on purple peduncles.

LEEUWENHOECK (lā'u-ven-hök), Antony van, Dutch microscopist, born 1632, died 1723. He completed Harvey's discovery of the circulation of the blood by showing that it passes from the arteries to the veins through the capillaries. He also discovered the red corpuscles of the blood, the spermatozoa, the infusorial animalcules, etc. He contributed papers to the Philosophical Transactions of the Royal Society, London.

LEEWARD, in nautical phraseology, a term that refers to the quarter toward which the wind blows. See Lee.

LEEWARD ISLANDS. See West Indies.

LEG, any limb of an animal that is used in supporting the body, and in



Bones of the human leg.

A, femur: 1, Head; 2, Neck; 3, Shaft; 4, External condyle; 5 Internal do. B, Patella: 1, Apex of the bone; 2, Surface of articulation with external condyle of the femur; 3, Do, with internal condyle. C, Fibula: 6, Shaft; 9, Lower extremity, the external malleolus; 10, Upper extremity. D, Tibia: 1, Spinous process; 2, Inner tuberosity; 3, Outer do; 4, Tubercle; 5, Shaft; 7, Internal surface of shaft; the sharp border between 5 and 7 the crest of tibia; 8, Internal malleolus.

walking and running; in a narrower sense that part of the human limb from the knee to the foot. The human leg has two bones, the inner called the tibia or shin-bone, the outer called the fibula or clasp-bone. The tibia is much the larger of the two, and above is connected with the thigh-bone to form the knee-joint, the fibula being attached to the outer side of its head. In front of the knee-joint, situated within a tendon, is the knee-cap or patella. (See Knee.) The lower-end of the tibia and of the fibula enter into the ankle-joint, the weight being conducted to the foot by the tibia. (See Foot.) In the foreleg are muscles which extend the foot, and on the back of the leg are two large muscles which form the bulk of the calf of the leg, and which unite in a thick tendon, the tendo Achillis. These muscles are used in walking, jumping, etc.

LEG'ACY, a gift of personal property by will. It is a general rule that if a legatee die in the lifetime of the testator, the legacy lapses and falls into the residue of the estate, unless when the legatee has been a child of the testator, and has left children. All legacies are postponed to the claims of creditors.

LE'GATES, persons sent by the pope as ambassadors to foreign courts. Legate a latere, the highest in rank, were sent on particularly important missions, and were taken from the college of cardinals only.

LEGATION, the body of official persons attached to an embassy. Formerly in Italy legation signified a division of the states of the church.

LEGA'TO, in music, a word used in opposition to staccato, and implying that the notes of the movement, or passage to which it is affixed, are to be performed in a close, smooth, and gliding manner, each note being held till the next note is struck.

LE'GEND, originally the title of a book containing the lessons that were to be read daily in the service of the early church. The term legend was afterward applied to collections of biographies of saints and martyrs, or of remarkable stories relating to them, because they were read at matins and in the refectories of cloisters, and were earnestly recommended to the perusal of the laity. The Roman breviaries contain histories of the lives of saints and martyrs, which were read on the days of the saints whom they commemorated. They originated in the 12th or 13th century, and they contributed much to the extinction of the old German (heathen) heroic traditions. The term is used in a general sense for any remarkable story handed down from early times, and is also applied to the motto or words engraved in a circular manner round the head or other figure upon a medal or coin.

LEGERDEMAIN (lej-êr-de-măn'), or **CONJURING,** a popular amusement or exhibition, consisting of tricks performed with such art and adroitness that the manner or art eludes observation. All the phenomena of legerdemain are referrible to sleight of hand, mechanical contrivances, confederacy, or some combination of these. In the more elaborate phases of the art the aid of optical, chemical, and other sciences is utilized.

LEGHORN, a seaport of Northern Italy, in the province of Leghorn or Livorno, on the Mediterranean, 12 miles s.s.w. of Pisa and 50 miles w.s.w. of Florence. Pop. 96,937.

LEGHORN, a kind of plait for bonnets and hats made from the straw of bearded wheat cut green and bleached; so named from being imported from Leghorn.

LEGION, in ancient Roman armies a body of infantry consisting of different numbers of men at different periods, from 3000 to above 6000, often with a complement of cavalry. Each legion was divided into ten cohorts, each cohort into three maniples, and each maniple into two centuries. Every legion had sixty centurions, and the same number of optiones or lieutenants and standard-bearers. The standard of the legion was an eagle.

LEGION OF HONOR, a French order for the recognition of military and civil merit, instituted by Napoleon while consul, May 19, 1802, and inaugurated 14th July, 1804. The decoration originally consisted of a star containing the portrait of Napoleon surrounded by a wreath of oak and laurel, with the legend, "Napoléon empereur des Français;" on the reverse was the French eagle with a thunderbolt in his talons, and the legend, "Honneur et patrie." The order has been remodeled several times, the last occasion being subsequent to the downfall of the second empire. There are now five ranks or classes: ordinary chevaliers or knights, officers, commanders, grand-officers, grand-crosses. The profuse granting of the decoration of the order latterly brought the institution into discredit, and the number of chevaliers is now restricted to 25,000, the officers to 4000, the commanders to 1000, the grand-officers to 200, and the grand-crosses to 70. The star now bears a figure emblematic of the republic, with the inscription "République Française, 1870," on the reverse two flags, with the inscription "Honneur et Patrie."

LEGUMINO'SÆ, one of the largest and most important natural orders of plants, including about seven thousand species, which are dispersed throughout the world. They are trees, shrubs, or herbs, differing widely in habit, with stipulate, alternate (rarely opposite), pinnate, digitately compound or simple leaves, and axillary or terminal one or many flowered peduncles of often showy flowers, which are succeeded by a leguminous fruit. Four sub-orders are recognized: Papilionaceæ, Swartzieæ, Cæsalpinicæ, and Mimoseæ. It contains a great variety of useful and beautiful species, as peas, beans, lentils, clover, lucern, sainfoin, vetches, indigo, logwood, and many other dyeing plants, acacias, senna, tamarinds, etc.

LEHIGH RIVER, a river of the United States, in Pennsylvania, rising in Pike county and joining the Delaware at Easton after a course of 100 miles, of which 70 are navigable.

LEHIGH UNIVERSITY, an institution of the United States, at South Bethlehem, Pa., founded and liberally endowed by Asa Packer for the instruction (without charge) of young men from any part of the country or of the world. It has fine buildings, a library of over 50,000 vols., etc. It gives instruction in the various branches of general literature and technology.

LEIBNITZ (lib'nits), Gottfried Wilhelm, Baron von, German scholar and

philosopher, born in 1646 at Leipzig. He studied law, mathematics, and philosophy at the university of his native town, where he published a philosophical dissertation, De Principio Individui, as early as 1663. This was followed by several legal treatises, for example De Conditionibus (1665), and by a remarkable philosophico-mathematical treatise, De Arte Combinatoria (1666). After holding political appointments under the elector of Mainz he went to Paris in 1672, and there applied himself particularly to mathematics. He also

Leguminosæ.

1, Papilionaceæ: *a*, Flower of the pea; *s*, Standard; *w*, Wings; *k*, Keel; *b*, Stamina, nine connected, one free; *c*, Legume, seeds fixed to the upper suture in one row. 2, Swartzieæ: *a*, Flower of *Swartzia grandiflora*, with its single petal and hypogynous stamens; *b*, Calyx; *c*, Legume. 3, Cæsalpinieæ: *a*, Flower of *Poinciāna pulcherrĭma* showing its difform interior upper petal; *b*, Calyx; *c*, Legume. 4, Mimoseæ: *a*, One flower of common sensitive plant (*Mimōsa pudīca*) showing its regular corolla; *b*, Stamina, hypogynous; *c*, Legume exterior; *d*, Legume interior; *e*, Legume of *Acacia arabĭca*. A, Curved radicle, as in Papilonaceæ. B, Straight radicle, as in Swartzieæ and Cæsalpinieæ.

went to England, where he was elected a member of the Royal Society, and made the acquaintance of Boyle and Newton. About this time he made his discovery of the differential calculus. Having assisted the elector of Brandenburg (afterward Frederick I. of Prussia) to establish the Royal Academy of Sciences at Berlin, he was made president for life (1700). He was also made a privy-councillor by the Czar Peter the Great. In 1710 he published his celebrated Essai de Théodicée, on the goodness of God, human liberty, and the origin of evil, in which he maintained the doctrines of pre-established harmony and optimism, and which was followed by his Nouveaux Essais sur l'Entendement Humain. A sketch of his philosophy was given by him in his Monadologie, 1714. His controversy with Newton concerning the discovery of the differential calculus, and the pains of the gout, embittered the close of his active life. He died in 1716. The principal metaphysical speculations of Liebnitz are contained in his Théodicée, Nouveaux Essais, Système nouveau de la Nature, De Ipsa Natura Monadologie, and in portions of his correspondence. He controverted Locke's rejection of innate ideas, holding that there are necessary truths which cannot be learned from experience, but are innate in the soul, not, indeed, actually forming objects of knowledge, but capable of being called forth by circumstances. Authorities seem generally agreed that Liebnitz discovered the differential calculus independently of any knowledge of Newton's method of fluxions, so that each of these great men in reality attained the same result for himself.

LEIDY, Joseph, American naturalist, was born in Philadelphia in 1823. He held chairs of anatomy in several Pennsylvania colleges; was an army surgeon during the civil war, and, in 1871, became professor of natural histoy in Swarthmore College. He was a member of numerous scientific societies, including the National Academy of Sciences, and was president of the Philadelphia Academy of Natural Sciences. Harvard made him LL.D. in 1886. He has written many hundred papers on biology and kindred subjects. He died in 1891.

LEICESTER, (les'tĕr) a municipal, parl., and county borough of England, county town and near the center of Leicestershire, on the right bank of the Soar. The staple manufactures are cotton and worsted hosiery, elastic webs, ironware, boots and shoes, shawls, lace, thread, etc. Pop. 211,574.—Leicestershire is bounded by Notts, Derby, Warwick, Northampton, Rutland, and Lincoln; area, 511,907 acres, almost all arable land, meadow, and pasture. Dairy farms are numerous, and the cheese known as Stilton is chiefly made in Leicestershire. Pop. 433,994.

LEICESTER, Robert Dudley, Earl of, fifth son of John Dudley, Duke of Northumberland, born 1532, died 1588. In 1549 he was married to Amy Robsart, daughter of a Devonshire gentleman, and is said to have been accessory to her murder in 1560. Elizabeth created him Earl of Leicester and privy-councillor, and bestowed titles and estates on him lavishly. Her fondness for him caused his marriage with her to be regarded as certain. He, however, excited the violent anger of the queen by his marriage with the Countess of Essex in 1578. He successfully commanded an army in the Low Countries, and when England was threatened by the Spanish Armada, in 1588, he was appointed lieutenant-general. He is characterized as an ambitious and unscrupulous courtier, combining in himself the worst qualities of both sexes.

LEIGHTON (lā'ton), Frederick, Lord Leighton, painter, president of the Royal Academy, born at Scarborough in 1830, died in 1896. In 1864 he was elected an associate of the Royal Academy, and in 1869 an Academician. In 1878 he succeeded Sir Francis Grant as president of the Academy; was knighted, and was named an officer of the Legion of Honor. In 1886 he was made a baronet, and on January 1, 1896, he was made a peer. From the long list of his works special mention may be made of his Hercules Wrestling with Death (1871), the Daphnephoria (1876), the Music Lesson (1877), Sister's Kiss (1880), Phryne (1882), Cymon and Iphigenia (1884), Captive Andromache (1888), and Ball Players (1889); and the large frescoes at the South Kensington Museum, representing the Industrial Arts applied to War, and the Arts of Peace. In addition to his pictures he has achieved a high place as a sculptor by his Athlete Strangling a Python (1876), and his Sluggard (1886). The special

Lord Leighton.

merit of his work lies in the perfection of his draughtsmanship and design, his coloring, though possessing unfailing charm of harmonious arrangement, being only thoroughly satisfactory from the decorative point of view. A fine poetic quality, conjoined with elegance in drawing and great refinement in execution, marks his whole work.

LEINSTER (lin'stĕr), a province of Ireland, divided into twelve counties—Wexford, Kilkenny, Carlow, Wicklow, Dublin, Kildare, Queen's County, King's County, Westmeath, Longford, Meath, and Louth; area, 7620 sq. miles. Leinster is the most favored of the four provinces of Ireland in the extent of its tillage and pasture lands, and its wealth in minerals. Pop. 1,152,829.

LEIPZIG (līp'zih), or **LEIPSIC,** the second city of the kingdom of Saxony, and one of the chief seats of commerce in Germany, 64 miles w.n.w. from Dresden. The university, founded in 1409, is the second in importance in Germany (that of Berlin being first), and has over 3000 students, and a library of 350,000 vols. Schools are numerous and good, the conservatory of music being of some celebrity. Besides being the center of the book and publishing trade of Germany, Leipzig possesses considerable manufactures, and has important general commerce, carried on especially through its three noted fairs at the New-year, Easter, and Michaelmas. Pop. 455,089.

LEITH (lēth), a seaport and parliamentary burgh in the county of Midlothian, Scotland, about 1½ mile from the center of Edinburgh. Pop. 77,439.

LEITRIM (lē'trim), a county of Ireland, bounded by Donegal Bay and the counties of Donegal, Fermanagh, Cavan, Longford, Roscommon, and Sligo, about 51 miles long by 21 broad; area, 392,363 acres. The surface in the north is somewhat rugged and mountainous, but elsewhere generally flat and in part

moorish. In the valleys the soil, resting generally on limestone, is fertile. The principal crops are oats and potatoes. The minerals include iron, lead, and copper, all at one time worked, and coal, still raised to some extent. It sends two members to parliament. Pop. 69,201.

LELAND, Charles Godfrey, American humorist, was born at Philadelphia in 1824. He was admitted to the bar in 1851, but soon relinquished law for literature, and contributed largely to periodicals. His works, many of which are of a humorous or burlesque character, include: The Poetry and Mystery of Dreams, Pictures of Travels, a translation of Heine's Reisebilder, Sunshine in Thought, Legends of Birds, Hans Breitmann's Ballads, The English Gipsies and Their Language, Fu-Sang; or, the Discovery of America by Chinese Buddhist Priests in the Fifth Century, English Gipsy Songs, Johnnykin and the Goblins, Pidgin-English Sing-Song, Abraham Lincoln. He is best known by his Hans Breitmann's Ballads. He died in 1903.

LELAND STANFORD JUNIOR UNIVERSITY, was founded by Leland Stanford and his wife, Jane Lathrop Stanford, in memory of their only son Leland Stanford, Jr., who died in 1884. It is 33 miles southeast of San Francisco.

The university maintains departments of Greek, Latin, Germanic languages, Romance languages, English, philosophy psychology, education, history, economics and social science, law, drawing, mathematics, phyisics, chemistry, botany, physiology and hygiene, zoölogy, geology and mining, and civil, mechanical, and electrical engineering. The Hopkins Laboratory of Natural History at Pacific Grove, on the Bay of Monterey is a branch of the biological work of the university. The degrees conferred are Bachelor of Arts, Bachelor of Laws, Master of Arts, Engineer, and Doctor of Philosophy. No honorary degrees are given. The ordinary class divisions are not recognized by the university, and degrees are conferred without regard to the time spent, whenever the requirements are met. Each student selects as his major subject the work of some one department, to which, together with the necessary minor subjects, he is required to devote about a third of his under-graduate course. All the rest of the undergraduate work is elective, but the professor in charge of the major subject acts as the student's educational advisor. These subjects include, besides those usually required for entrance examinations, Spanish, the natural sciences, physiography, mechanical and free-hand drawing, wood-working, forge work, foundry work, and machine-shop work. The university has a philological and a science association, and offers frequent public lectures on subjects of general interest. The building up and development of the university is due largely to the work of David Starr Jordan, who has been its only president.

LE'LY, Sir Peter, painter, born at Soest, in Westphalia, in 1617 or 1618. Lely or Le Lys was properly a nickname borne by his father, whose family name was Van der Faes. He was first instructed by Peter Grebber at Haarlem but came to England in 1641, and commenced portrait-painting. He finished portraits both of Charles I. and of Cromwell; but it was not until the Restoration that he rose to the height of his fame. He fell in with the voluptuous taste of the new court, and was in great favor with Charles II., who knighted him. He died in 1680. The Hampton Court collection of portraits of the ladies of the court of Charles II. contains some of his best work; the finest of his few historical works being the Susannah and the Elders, at Burleigh House.

LEMBERG, a city of Austria, capital of the kingdom of Galicia, on the Peltew, 365 miles e.n.e. from Vienna. Pop. 159,618.

Norway lemming.

LEMMING, a rodent mammal very nearly allied to the mouse and rat. There are several species, found in Norway, Lapland, Siberia, and the northern parts of America. The most noted species is the common or European lemming.

LEM'ON, the fruit of the lemon-tree, originally brought from the tropical parts of Asia, but now cultivated extensively in the south of Europe and in the United States, especially in California. It is of the same genus as the orange and citron, and differs little from the lime. It is a knotty-wooded tree of rather irregular growth, about 8 feet high; the leaves are oval, and contain scattered glands which are filled with a volatile oil. The shape of the fruit is oblong, and its internal structure is similar to that of the orange. The juice is acid and agreeable; and in addition to its use in beverages is employed by calico-printers to discharge colors. As expressed from the ripe fruit it has a specific gravity of 1.04, and contains about 1.5 per cent of citric acid. It also contains sugar, albuminous and vegetable matters, and some mineral matter, nearly half of which consists of potash. The oil of lemon is a volatile oil of yellow or greenish color got from the fresh rind of the lemon. It is used in perfumery, and in medicine as a stimulant and rubefacient; it also forms an ingredient of syrup of lemon and tincture of lemon.

LEMONADE, a drink made of water, sugar, and the juice of lemons A good recipe is: two sliced lemons, 2½ oz. of sugar, boiling water, 1½ pint; mix, cover up the vessel, let it stand, with occasional stirring, till cold, then strain off the liquid. Aerated bottled lemonade may be prepared by putting lemon syrup into a bottle, and filling up with aerated water at a bottling machine.

LEMON-KALI, a name sometimes given to the effervescing beverage formed by mixing lemon-juice with dissolved bicarbonate of potash.

LE'MUR, a name popularly given to a sub-order of monkeys. Their zoological position has been a matter of considerable debate, as they possess characteristics which distinguish them from the monkeys, and ally them with the insectivores and rodents. The simplest classification places them, however, with the lower Quadrumana. The Lemuridæ or True Lemurs are specially distinguished by the habitually four-footed or quadrupedal mode of progression. The tail (except in the short-tailed Indris) is elongated and furry, but is never prehensile. The hind limbs are longer than the fore limbs; the second toe in the hind foot being long and claw-like, and the nails of all the other toes being flat. The fourth digit of the hand and especially of the foot, is longer than the others. The thumb can always be opposed to the other fingers, and has a broad, flattened nail. The ears are small and the eyes large. The incisor teeth are generally four, the canines, two, and the molars twelve in each jaw. The true lemurs are exclusively confined to Madagascar and neighboring islands, but other members of the family are found in Africa and as far east as the Philippines. They are all arboreal in their habits, and subsist chiefly upon a vegetable diet, but also eat insects, and the smaller birds and their eggs.

Varied lemur.

LENA, a river of Siberia, one of the largest in the world, rising on the northwestern side of the mountains which skirt the western shore of Lake Baikal, about 70 miles e.n.e. of Irkutsk. It flows in a winding course, and discharges itself through several branches into the Arctic Ocean in lat. 73° n., and lon. about 128° e. Its course, windings included, is about 2770 miles.

LENNI-LENAPE, the name by which the Delaware Indians call themselves. See Delaware.

LENORMANT, François, French archæologist, born 1837. After traveling in the east he became, in 1874, professor of archæology at the Bibliothèque Nationale. He died in 1883. He was an authority on the Cuneiform inscriptions and the Accadian language.

LENS, a transparent substance, usually glass, so formed that rays of light passing through it are made to change their direction, and to magnify or diminish objects at a certain distance. Lenses are double convex, or convex on both sides; double-concave, or concave on both sides; plano-convex, or plano-concave, that is, with one side plane and the other convex or concave, or convex on one side and concave on the other. If the convexity be greater than the concavity, or if the two surfaces would meet if produced, the lens is called a meniscus; and if the concavity be greater than the convexity, the lens is termed concavo-convex. See Optics, Microscope, Telescope.

LENT, the forty days' fast in spring, beginning with Ash Wednesday and ending with Easter Sunday. In the Latin Church Lent formerly lasted but thirty-six days; in the 5th century four days were added, in imitation of the forty days' fast of the Savior, and this usage became general in the western church. The close of Lent is celebrated in Roman Catholic countries with great rejoicings, and the carnival is held just before it begins. The English Church has retained Lent and many other fasts, but gives no directions respecting abstinence from food.

LENTIL, a plant cultivated in Southern and Central Europe. It is an annual, rising with weak stalks about 18 inches, and with whitish flowers hanging from the axils of the leaves. Two varieties are cultivated—the large garden lentil

Lentil.

and the common field lentil—the former distinguished by its size and the greater quantity of mealy substance which it will afford. The straw of lentils makes good fodder. As food for man the seeds are very nutritious, and in Egypt, Syria, etc., are a chief article of diet.

LEO, the Lion, the fifth sign of the zodiac, between Cancer and Virgo. The sun enters it about July 22, and leaves it about August 23. The constellation contains 95 stars, and is noteworthy for its remarkable nebulæ. There is also a constellation of the northern hemisphere known as Leo Minor, and containing 53 stars.

LEO I., St. Leo, called the Great, pope born about 390. The Popes Celestine I. and Sixtus III. employed him in important ecclesiastical affairs, and on the death of Sixtus III. in 440 he was elevated to the papal chair. He was employed by Valentinian to intercede for peace with Attila, who, at his request, evacuated Italy. His death took place in 461. He is the first pope whose writings—sermons, letters, etc.—have been preserved. In his main ambition to establish the supremacy of the Apostolic chair over the whole Christian Church he was defeated at the council of Chalcedon (451), which affirmed the independence of the see of Constantinople.

LEO III., a Roman by birth, elected pope on the death of Adrian I. in 795. He commenced his rule by making submission to Charlemagne, so that when driven from Rome in 799 by his rival Paschal, Charlemagne re-established him on his throne, receiving from him in 800 the imperial crown. Leo died in 816.

LEO X., Giovanni de' Medici, second son of Lorenzo the Magnificent, born at Florence in 1475, received the tonsure in his seventh year, and was loaded with benefices. In 1488, when only thirteen years old, he was made a cardinal, and in 1492 took his seat as a member of the Holy College at Rome. Pope Julius II. made him governor of Perugia, and in 1511 placed him, with the title of Legate of Bologna, at the head of his forces in the holy league against France. After contributing to the re-establishment of the Medici he remained at Florence until the death of Julius II. recalled him to Rome. Although only a deacon, he was chosen to succeed Julius in 1513. In 1515 he had an interview with Francis I. at Bologna, and formed with him a concordat, which remained in force nearly three hundred years, and gave to the king the right to nominate bishops in his own dominions. To procure money, particularly for the completion of St. Peter's, he encouraged the sale of indulgences, an abuse which incidentally promoted the Reformation, in calling forth the attacks of Luther. Leo died suddenly in 1521.

LEO XIII., Pope, the 258 Roman Pontiff and 257 successor of Peter, was born at Carpineto in 1810. He was created and proclaimed a cardinal by Pius IX. in the consistory of December 19, 1853. He was a member of several of the congregations of cardinals—among them those of the Council of Rites and of Bishops and Regulars. In September, 1877, he was selected by Pope Pius IX. to fill the important office of cardinal camerlengo of the Holy Roman Church, which post had become vacant by the death of Cardinal De Angelis. In that capacity, after the death of Pius IX. (February 7, 1878), he acted as head of the church in temporal matters, made the arrangements for the last solemn obsequies of the pontiff, received the Catholic ambassadors, and superintended the preparations for the conclave. Sixty-two cardinals attended the conclave, which was closed in the Vatican on Monday, February 18, 1878, and the cardinal camerlengo was made Pope by the acclamation of all on Wednesday, February 20, 1878, and his Holiness assumed the name of Leo XIII. Leo XIII. had throughout behaved with perfect consistency. He had never quitted the Vatican, but had religiously kept up the fiction of his being held there a prisoner. He refused the income voted to him, as to his predecessor, by the Italian parliament, and has never recognized the Law of Guarantees. He has protested from time to time against "godless" schools, and against tolerated heresy in Rome. But in his relations with foreign powers he has always been moderate and dexterous. He died in 1903.

LEON, a town of Spain, capital of the province and ancient kingdom of the same name, 176 miles northwest of Madrid. Pop. 15,300.—The province has the Asturias as its northern boundary, a branch of which mountains divides it into two portions. The western portion is adapted rather for pasture than tillage, but the eastern has wide and undulating plains, on which the vine and various grain crops are successfully cultivated. Area, 6166 sq. miles. Pop. 370,000.

LEON, a town of Central America, capital of the department of Leon, state of Nicaragua, on a large and fertile plain near the Pacific coast. It is regularly built, and the public buildings which are considered among the finest in Central America, include a massive cathedral, an old episcopal palace, a new episcopal palace, and several churches. A railway connects it with the coast at Corinto. The town has suffered a good deal from the civil wars. Pop. 45,000.

LEON, a town of Mexico, state of Guanajuato, on a fertile plain more than 6000 feet above sea-level, a well-built place, with flourishing industries of various kinds, which its railway connections are helping to develop. Pop. 80,000.

LEON'IDAS, in Greek history, a king of Sparta, who ascended the throne 491 B.C. When Xerxes invaded Greece, the Greek congress assigned to Leonidas the command of the force destined to defend the pass of Thermopylæ. His force, according to Herodotus, amounted to over 5000 men, of whom 300 were Spartans. After the Persians had made several vain attempts to force the pass, a Greek named Ephialtes betrayed to them a mountain path by which Leonidas was assailed from the rear, and he and his followers fell after a desperate resistance (B.C. 480).

LEOPARD, a carnivorous mammal

Leopard.

inhabiting Africa, Persia, India, China, etc., by some regarded as identical with

the panther. The ground or general body-color of both is a yellowish fawn, which is slightly paler on the sides, and becomes white under the body. Both are also marked with black spots of various sizes, irregularly dispersed, a number of them being ring-shaped. The African animal seems to have these ring-spots chiefly on the back, and to this form some would specially assign the name of leopard. It preys upon antelopes, monkeys, and the smaller quadrupeds, rarely attacking man unless itself attacked. It can ascend trees with great ease, often using them both for refuge and ambush. It is not infrequently trapped by means of pitfalls. Besides the common leopard there is also a useful and docile Asiatic species, chetah or hunting leopard. See Chetah.

LE'OPOLD I., King of the Belgians, son of a Duke of Saxe-Coburg, was born in 1790. In 1816 he married the Princess Charlotte, heir-apparent of Great Britain, who died in 1817. In 1831 he accepted the crown of Belgium. He married a daughter of King Louis Philippe of France, by whom he became the father of Leopold II., the present Belgium sovereign. After a prosperous and uneventful reign he died in 1865.

LEOPOLD, II., Louis Philippe Marie Victor, King of the Belgians, was born in 1835. He ascended the throne on the death of his father in 1865. In 1876 he effected at Brussels the organization of the African International Association with a view of making use of the recent discoveries in Africa. He promoted this work with great energy, supplying largely from his own resources the means for Stanley's exploration of the Congo. The Congo Free State was established and the sovereignty of it was given to Leopold by the Berlin Congress in 1885.

LEPER. See Leprosy.

LEPER-HOUSES, houses for the treatment of leprosy; once very numerous in England, nearly every important town having one or more of these houses. The house of Burton Lazars in Leicestershire, built by a general subscription raised over England in the time of King Stephen, was the head of all lazar-houses in England. It was dependent on the leper-house at Jerusalem. From the Crusades until the reformation these houses flourished and multiplied. Gradually, however, as better habits and treatment began to diminish diseases of the class for which they were used, these houses declined, and were abondoned or appropriated to other objects.

LEPIDOP'TERA, the scientific name of the order of insects which includes the butterflies and moths (which see), and which is so named from the presence of innumerable small membranous scales, which come off like fine dust or powder when the wings (four in number) are touched by the finger. The scales are merely modifications of the hairs with which the wings of most other insects are covered; and from the presence of these scales the beautiful tints and colors of the lepidopterous insects are derived. The butterflies form the diurnal; while the moths, flying about chiefly at twilight or during the night, are termed nocturnal Lepidoptera.

Lepidoptera.

1, Butterfly—marbled white butterfly. 2, Hawk-moth or sphinx—humming-bird hawk-moth. 3, Moth—magpie moth. 4, Palpi and spiral mouth of butterfly. 5, Antennæ—*a*, Butterfly's; *b*, Sphinx's; *c*, Moth's. 6. Portion of wing of cabbage-butterfly, with part of the scales removed. 7, Scales of do, magnified.

LEP'ROSY, a name applied at one time to several different skin diseases characterized by roughness or scaliness. True leprosy is the elephantiasis of the Greeks, the lepra of the Arabs, whose old English name was the myckle ail or great disease. It is to be distinguished from the elephantiasis of the Arabs, which is a local overgrowth of skin and subcutaneous tissue, chiefly of the extremities and genital organs, and is non-contagious. Of true leprosy there are several well-marked types. The first is characterized by the formation of nodules or tubercles in the skin, common about the eyebrows, where they destroy the hair, and produce a frowning or leonine aspect. After a time the nodules break down, forming ulcers, which discharge for a time, and may cause extensive destruction and deformity. The tubercles may form in the nostrils, in the throat altering the voice, on the eyelids extending into and destroying the eyeball. In the second type the chief features are insensibility and numbness of parts of the skin, accompanied by deep-seated pains, causing sleeplessness and restlessness. In a third variety much mutilation occurs owing to the loss of bones, chiefly of the limbs, a portion of a limb being frequently lopped off painlessly at a joint. All these varieties begin with the appearance on the skin of blotches of a dull coppery or purplish tint, the affected part being thickened, puffy, and coarse-looking. When the redness disappears a stain is left, or a white blotch. Leprosy is now believed to be caused by a minute organism—a bacillus (see Germ Theory of Disease), and to be contagious. Though the disease is not so widespread as at one time it was, it still prevails in Norway and Iceland, the coasts of the Black Sea and Mediterranean, in Madagascar, Mauritius, Madeira, the Greek Archipelago, East and West Indies, Palestine, the Pacific Islands, etc.

LER'IDA, a town of Spain, province of Lerida, Catalonia, on the right bank of the Segre, here crossed by a handsome bridge of seven arches, 84 miles w.n.w. of Barcelona. As the key of Aragon and Catalonia it was early fortified, and still continues to be one of the most important military points in Spain. Pop. 21,337.—The province, bounded north by France, has an area of 4774 sq. miles, traversed by ramifications of the Pyrenees. Pop. 291,624.

LE SAGE, or **LESAGE** (lẽ-säzh), Alain René, French novelist and dramatic writer, born in 1668 at Sarzeau, in Brittany. He translated Avellaneda's continuation of the Adventures of Don Quixote, and a comedy of Calderon; but his first success was with his Crispin Rival de son Maître (1707). In 1715 he published the first two volumes of Gil Blas, one of the best romances in the French language, the third volume appearing in 1724, the fourth in 1735. In 1732 he published Les Adventures de Guzman d'Alfarache (based on Aleman's work); and the following year Les Adventures de Robert, dit le Chevalier de Beauchesne, containing the real history of a freebooter, from papers furnished by his widow. In 1734 appeared L' Histoire d'Estevanille Gonzales. The last of his novels was Le Bachelier de Salamanque (1738). He died in 1747. He wrote also many theatrical pieces, etc.

LESBOS, a Greek Island situated off the northwest coast of Asia Minor, now called Mitylene, from the capital. In shape it is nearly triangular; has an area of 276 sq. miles, and a population of about 40,000, and now belongs to Turkey. The island formerly contained nine cities, the chief being Mitylene.

LESGHIANS, a Tartar people of the Mohammedan religion, inhabiting the eastern Caucasus, and forming the chief portion of the inhabitants of Daghestan. They were among the most stubborn of the Caucasian peoples in their resistance to the Russians.

LESLIE, Frank, the name assumed by Henry Carter, an American publisher and journalist, born in Ipswich, England, in 1821. He showed a natural bent for art, and contributed sketches to the Illustrated London News, signing them Frank Leslie. In 1848 he came to the United States, and in 1854 began publishing the first of his many illustrated journalistic ventures, The Gazette of Fashion. The New York Journal soon followed with Frank Leslie's Illustrated Newspaper (1855), The Boy's and Girl's Weekly, The Budget of Fun, and many others. He was commissioner to the Paris exposition of 1867, and was given a prize there for his artistic services. He died in 1880, and his wife took, by legislative act, the name "Frank Leslie," and for some years conducted the business with conspicuous success.

LESLIE, Sir John, Scottish physicist and mathematician, born at Largo, Fife, in 1766. He invented the differential thermometer about the year 1800, and four years later published his Essay on the Nature and Propagation of Heat. Through one of his contrivances, his hygrometer, he arrived in 1810 at the discovery of a process of artificial congelation, which enabled him to freeze mercury. In 1809 he published his Elements of Geometry; in 1813 an Account of Experiments and Instruments depending on the relation of Air to Heat and Moisture; in 1817 his Philosophy of Arithmetic; in 1821 his Geometrical Analysis and Geometry of Curved Lines; in 1822 a volume of Elements of Natural Philosophy; and in 1828 his

Rudiments of Geometry. He died in 1832, having been knighted not long before.

LESSEPS, Ferdinand, Vicomte de, French diplomatist and engineer, born in 1805. After holding several consular and diplomatic posts he retired from the government service, and in 1854 went to Egypt, and proposed to the viceroy the cutting of a canal across the Isthmus of Suez. This great work was successfully completed in 1859–69, under his supervision, and brought him high honors of various kinds. He subsequently proposed several other grand schemes; but the only one really taken in hand was the Panama Canal (which see). He died in 1894.

LESSING, Gotthold Ephraim, German critic, dramatist, and scholar, born 1729 at Kamentz, in Upper Lusatia. In 1755 appeared Miss Sara Sampson, a tragedy dealing with English life. In 1765 he published the Laocoon, or on the Limits of Painting and Poetry, and his comedy Minna von Barnhelm. About 1767 he became director of the National theater at Hamburg. While here he wrote his Dramaturgie. Besides those mentioned, he wrote another drama, Emilia Galotti (1772). He died at Brunswick in 1781.

LESTRANGE, Sir Roger, political controversialist, journalist, and translator, born at Hunstanton Hall, Norfolk, in 1616. He died in 1704. He was the author of a great number of coarse and virulent political tracts, and translated Josephus, Cicero's Offices, Seneca's Morals, Quevedo's Visions, etc.

LETH'ARGY, an unnatural tendency to sleep, closely connected with languor and debility, and much resembling apoplexy in character. It may rise from a plethoric habit, from deficient circulation in the brain, from nervous exhaustion of that organ, from a poisoned state of the blood, or from a suppression of urine. When it is the consequence of alcoholic intoxication, or of the action of narcotics, it should be treated as apoplexy.

LETHE, the River of Oblivion, one of the streams of the lower regions celebrated in ancient mythology, whose water had the power of making those who drank of it forget the whole of their former existence. Souls before passing into Elysium drank to forget their earthly sorrows; souls returning to the upper world drank to forget the pleasure of Elysium.

LETTER OF CREDIT. See Credit.

LETTER OF MARQUE. See Marque.

LETTERS. See Alphabet, Consonant, Vowel, Writings, etc.

LETTERS-PATENT, letters of the British sovereign sealed below with the great seal, conferring on a person or a public company some special or peculiar privilege. Letters-patent are issued to protect new inventions, and from the latter procedure is derived what is called patent-right. See Patent.

LETTRES DE CACHET are really lettres closes, that is, letters sealed in such a way that they cannot be opened without breaking the seal, and which were originally always addressed to individuals in contradistinction to lettres patentes, or letters patent, beginning "know all men by these presents." Lettres closes interfering with the administration of justice or the liberty of the subject were forbidden by numerous edicts in the 14th, 15th, and 16th centuries, and the term lettres de cachet, as synonymous with lettres closes, is first found in the ordinance of Orleans in 1560. The convenience of such a means to consign one's enemies to prison was seen by Richelieu and Mazarin, who followed the Guise Government in using them frequently, despite numerous protestations on the part of the parlements, of which the most notable was when, in 1648, an ordinance was registered that no man should be kept in prison three days without interrogation. When once Louis XIV. had begun to rule, he made frequent use of lettres de cachet both for state purposes and to control and disorganize his nobility, and he boldly justified their use in an edict of 1705. But the most marked justification is to be found in the circular letter addressed to the parlements of France in reply to protests against arbitrary imprisonment in 1759, in which the king says that "he reserves arbitrary orders—in other words, lettres de cachet—for occasions wherein they may be necessary for the public good and the interests of families." It was the custom for the king to sign a number of blank lettres de cachet which his ministers gave away to whomever they pleased. Thus they often fell into hands of people who used them to gratify private hate; fathers obtained them and inserted the names of their sons, wives inserted the names of their husbands, opera dancers those of lovers who had spurned them. The evil grew to such a height that Turgot and Lamoignon de Malesherbes refused to enter the ministry of Louis XVI. unless they might see the contents of the orders they countersigned, and know the causes for which men were to be imprisoned. It is needless to say that when the cahiers of the primary assemblies were prepared, to instruct the deputies to the states-general in the wishes of their constituents, abolition of lettres de cachet were demanded in almost all the cahiers of the noblese and tiers état. The subject was mentioned in the early debates of the constituent assembly, but lettres de cachet were not formally abolished till January 15, 1790, and on March 13th of the same year all imprisoned under them were ordered to be set at liberty

LETTUCE, a smooth, herbaceous, annual plant, containing a milky juice, and in general use as a salad. The stem grows to the height of about 2 feet, and bears small pale-yellow flowers; the inferior leaves are sessile, and undulate on the margin. The young plant only is eaten, as the lettuce is narcotic and poisonous when in flower. A number of species are known from various parts of the globe. Lactucarium, or lettuce opium, the inspissated juice of the lettuce, is used medicinally as an anodyne.

LEUCO'MA, a white opacity of the cornea of the eye, the result of acute inflammation.

LEUCORRHŒ'A, in medicine, a morbid discharge of a white, yellowish, or greenish mucus from the female genital organs.

LEVANT', a term applied in the widest sense to all the regions eastward from Italy as far as the Euphrates and the Nile, and in a more contracted sense to the Asiatic coasts of the Mediterranean and the adjacent countries from Constantinople to Alexandria in Egypt.

LEV'ÉE, a morning reception held by a prince or great personage. The term is chiefly applied in Britain to the stated public occasions on which the sovereign receives visits from such persons as are entitled by rank or fortune to the honor. It is distinguished from a drawing-room in this respect, that while at the former gentlemen alone appear (with the exception of the chief ladies of the court), both ladies and gentlemen are admitted to the latter.

LEVEE, in America, an embankment on the margin of a river, to confine it within its natural channel, such as may be seen on the banks of the lower Mississippi.

LEVEL, an instrument by which to find or draw a straight line parallel to the plane of the horizon, and by this means to determine the true level or the difference of ascent or descent between several places, for various purposes in architecture, agriculture, engineering, hydraulics, surveying, etc. There is a great variety of instruments for this purpose, differently constructed and of different materials, according to the particular purposes to which they are applied, as the carpenter's level, mason's level, gunner's level, balance level, water level, mercurial level, spirit level, surveying level, etc. All such instruments, however, may be reduced to three classes: (1) Those in which the vertical line is determined by a suspended plumb line or balance weight, and the horizontal indicated by a line perpendicular to it. Such are the carpenter's and mason's levels. (2) Those which determine a horizontal line by the surface of a fluid at rest, as water and mercurial levels. (3) Those which point out the direction of a horizontal line by a bubble of air floating in a fluid contained in a glass tube. Such are spirit-levels, which are by far the most convenient and accurate. All levels depend on the same principle, namely, the action of terrestrial gravity.

LEVELLING, the art or operation of ascertaining the different elevations of objects on the surface of the earth, or of finding how much any assigned point included in a survey is higher or lower than another assigned point. It is a branch of surveying of great importance in making roads, determining the proper lines for railways, conducting water, draining low grounds, rendering rivers navigable, forming canals, and the like. In ordinary cases of leveling (for example, for canals, railways, etc.) the instruments commonly employed are a spirit-level with a telescope attached to it, and a stand for mounting them on, and a pair of leveling staves. A leveling staff is an instrument used in conjunction with a spirit-level and telescope. It is variously constructed, but consists essentially of a graduated pole with a vane sliding upon it so as to mark the height at any particular distance above

the ground. In leveling two of them are used together, and being set up at any required distance the surveyor, by means of a telescope placed between them perfectly horizontally, is enabled to compare the relative heights of the two places.

LEVER, a bar of metal, wood, or other substance turning on a support called the fulcrum or prop, and used to overcome a certain resistance (called the weight) encountered at one part of the bar by means of a force (called the power) applied at another part. It is one of the mechanical powers, and is of three kinds, viz.: (1) When the fulcrum is between the weight and the power, as in the hand-spike, crow-bar, etc. In this case the parts of the lever on each side of the fulcrum are called the arms, and these arms may either be equal as in the balance, or unequal as in the steelyard. (2) When the weight is between the power and the fulcrum, as in rowing a boat, where the fulcrum is the water. (3) When the power is between the weight and the fulcrum, as in raising a ladder from the ground by applying the hand to one of the lower rounds, the fulcrum in this case being the foot of the ladder. The law which holds in the lever is: the power multiplied by its arm is equal to the weight multiplied by its arm. It is evident that when the power has a very large arm, and the weight a very small one, a very small power will overcome a great resistance. In the lever, as in all machines when a small force overcomes a great one, the small force acts through a much greater distance than that through which the great force is overcome, or as is sometimes said, "What is gained in power is lost in time."

LE'VER, Charles James, an Irish novelist, born at Dublin in 1806. Harry Lorrequer appeared in 1837. His Charles O'Malley, Tom Burke, Jack Hinton, etc., constituted a literature entirely of its own kind, unique. His later novels were more thoughtful and artistic. He obtained a diplomatic post at Florence about 1845, was appointed vice-consul at Spezzia in 1858, and in 1867 at Trieste, where he died in 1872.

LEVERRIER, Urbain Jean Joseph, French astronomer, born at Saint-Lô (Manche) 1811, died at Paris 1877. His observations on the transit of Mercury in 1845 procured him admission into the Academy of Sciences. His great work was his investigation of the irregularities in the movements of the planet Uranus, carried on simultaneously but independently with those in the same line by John Couch Adams, which led to the discovery of the planet Neptune. He entered political life in 1849, and was made a senator by Napoleon III. He succeeded Arago as director of the observatory. His tables of suns and planet are in general use among astronomers.

LEVI, the third son of Jacob and Leah. The chief incident recorded of him, as apart from his brethren, is the part which he played in the massacre of the Shechemites. Three sons went down with him to Egypt—Gershon, Kohath, and Merari (Gen. xlvi. 2). Moses and Aaron were of this tribe.

LEVI'ATHAN, a form of the Hebrew word livyathan, meaning a long-jointed monster, applied in Job xli. and elsewhere in Scripture to an aquatic animal variously held to be the crocodile, the whale, or some species of serpent.

LEV'IRATE, the custom among the Jews of a man's marrying the widow of a brother who died without issue. The same custom or law prevails in some parts of India.

LE'VITES, the name generally employed to designate not the whole Jewish tribe that traced its descent from Levi, but a division within the tribe itself, in contradistinction to the priests, who are otherwise called the "sons of Aaron." They were the ministers of worship, specially singled out for the service of the sanctuary. Together with the priests they formed the sacerdotal tribe. A permanent organization was made for their maintenance. In place of territorial possessions they were to receive tithes of the produce of the land, and in their turn to offer a tithe to the priests. After the settlement in Canaan, to the tribe of Levi were assigned forty-eight cities, six of which were cities of refuge, thirteen of the total number being set apart for the priests. To the Levites was to belong the office of preserving, transcribing, and interpreting the law, and they were to read it every seventh year at the feast of tabernacles. Their position was much changed by the revolt of the ten tribes, and they are seldom mentioned in the New Testament where they appear as the types of formal, heartless worship.

LEVIT'ICUS, the name of the third book of the Pentateuch, as called from the first word of its contents. By the later Jews it was called the "Law of the Priests," and sometimes the "Law of Offerings." It consists of seven principal sections, but it may be generally described as containing the laws and ordinances relating to Levites, priests, and sacrifices. The integrity of the book is very generally admitted, the Elohist, or author of the original document (see Elohim), being credited with having written nearly the whole of it, and the rest being considered originally Elohistic.

LEVY, the seizure and taking possession of the property of a person, by a proper officer, under a writ or other process of law. To constitute a valid levy the officer must take actual possession of the property. In case of personal property he should retain actual custody of it, either by locking it up or putting a deputy in charge of it; in case of real property he should enter and show by open and unequivocal acts that he has taken legal possession under his process, but in most states the judgment debtor is not ejected from the property, as his possession is subject to the levy and subsequent sale.

The term levy is also applied to the seizure of property under a writ of attachment. The rules as to taking possession of the property of the person named prevailing under this writ are similar to those under an execution against property.

LEWES (lō'es), George Henry, philosophical writer and contributor to most departments of literature, born in London in 1817. His first important work was his Biographical History of Philosophy from Thales to Comte, originally published in 1845, and subsequently much extended and altered—a work written more or less from a Positivist point of view, and sufficiently proving his ability as a thinker and writer. His Life of Goethe, which won him a European reputation, was published in 1855. In 1864 he published a study on Aristotle, and in 1865 founded the Fortnightly Review. The chief work of his life, aiming at the systematic development of his philosophical views, is entitled Problems of Life and Mind (1873–77). He died in 1878. Besides the works already mentioned he wrote The Spanish drama; Lope de Vega and Calderon (1846); two novels, Ranthorpe (1847) and Rose, Blanche, and Violet (1847). His relations with George Eliot are well known. See Eliot, George.

LEWIS (lō'is), the largest of the Hebrides, separated from the mainland of Scotland by a sea 30 to 35 miles wide, called the Minch. The south portion of the island, called Harris, is in Inverness-shire, the northern and largest portion being in Ross-shire. The entire length of the island, southwest to northeast, is 52 miles; breadth, varying from 30 miles to 5 and 10 miles; area, nearly 700,000 acres. The principal town is Stornoway. Pop. of entire island, 32,160.

LEWIS, Meriwether, American explorer, born near Charlottesville, Va., in 1774. In 1801 he became President Jefferson's private secretary. When in 1803 it was decided to send an exploring expedition into the Louisiana country, for which the United States was then negotiating with France, the president accepted the promptly offered services of the secretary. Lewis chose as his companion Capt. William Clark, an old army friend. The party left the Mississippi in May, 1804, and proceeded up the Missouri to its headwaters, crossed the Great Divide, and, landing on one of the tributaries of the Columbia, followed it and then the Columbia to the Pacific. After a dreary winter on the coast they returned to the United States by much the same route, and reached St. Louis in September, 1806. (See Lewis and Clark Expedition.) He died in 1809.

LEWIS AND CLARK EXPEDITION, an expedition under the command of Meriwether Lewis and William Clark, which in 1804–06 penetrated from the Mississippi river, through territory now forming parts of Missouri, Kansas, Nebraska, South Dakota, North Dakota, Montana, Idaho, Washington, and Oregon, to the Pacific Ocean. The members of the party were the first white men to cross the continent between the Spanish possessions to the south and the British possession to the north. The expedition was sent out by President Jefferson for the purpose of exploring the Louisiana territory, immediately after its purchase from France. At times the explorers suffered terrible hardships, and were shut off from all communication from the world. Lewis and Clark collected a mass of valuable information concerning the physical characteristics, the fauna and flora, the climate, and the various Indian tribes of the territory traversed.

LEWIS RIVER, or **SNAKE RIVER,** a river of North America, which rises in the Rocky mountains, and runs northwest into the Columbia, 413 miles from its mouth; length, about 900 miles. Its course lies partly in Idaho, partly between Idaho and Oregon, and partly in Washington.

LEWISTON, a city of Maine, on the Androscoggin river, which here has a fall of 50 feet, the water power being utilized by several manufactories (chiefly of cotton and woolen goods) and extensive saw-mills. Pop. 25,170.

LEXICON. See Dictionary.

LEXINGTON, a city in Kentucky, 23 miles e.s.e. of Frankfort. It is the oldest town in the state (having been founded in 1775), and was once the capital. It is more a plaee of fashionable residence than of trade. There is here the Kentucky State university. Pop. 28,000.

LEXINGTON, a small town in Massachusetts, where the first British blood was shed in armed resistance to the mother country. On April 18, 1775, the advance of a detachment of British troops, sent from Boston to seize some provincial stores at Concord, was opposed by the Lexington militia (70 men) who were dispersed with a loss of seven killed and three wounded. Pop. 3197.

LEYDEN, a town in Holland, 22 miles southwest of Amsterdam, on both sides of the Old Rhine. The most important educational institution is the university, formerly one of the most famed in Europe. It is attended on the average by about 700 students, nearly one-half studying law. Leyden has cloth and other manufactures. The population, about 100,000 in the 17th century, is now 54,421.

LEYDEN, Jan, or John of. See article Anabaptists.

LEYDEN-JAR, an early form of electric accumulator, introduced to the scientific world by Muschenbroek of Leyden in 1746, hence its name. It consists of a glass phial or jar coated inside and outside, usually with tin-foil, to within a third of the top. A metallic rod, having a knob at the top, is fixed into the mouth of the jar, and is made to communicate with the inside coating, and when the jar is to be charged the knob of this rod is applied to the prime

Leyden-jar.

conductor of an electric machine. As the electric fluid passes to the inside of the jar an equal quantity passes from the outside, so that the two coatings are brought into opposite states, the inside being positive and the outside negative. The jar is discharged by establishing a communication between the outside coating and the knob. When a number of jars are placed in a box lined with tin-foil connected with the earth, their knobs being joined together, they form a battery; a quantity of electricity equal to the sum of the charges which would be received by each jar can be collected in such a battery, capable of melting fine metallic wires, puncturing plates of glass or card-board, killing animals, rupturing bad conductors, etc.

LEZE MAJESTY, any crime against the sovereign authority of a state; treason.

LHASSA. See Lassa.

LI, LE, or **CASH,** the only copper coin of China, with a square hole in the middle, and an inscription on one side. Ten lis make one candareen, 100 a mace, 1000 a liang or tael, the only Chinese silver coin, average value about $1.25. Li is also a Chinese measure of length equal to about ⅓ of an English mile.

LIABILITY, any obligation enforceable at law or in equity, including legal obligations to perform acts other than the payment of money. The term is generally used, however, in a narrower sense as meaning a legal obligation to pay money: either a sum certain due and owing, as in the case of a debt, or an unliquidated sum, as in case of damages due upon tort or upon breach of contract.

LIAS, in geology, the name given to that series of strata, consisting principally of thin layers of limestone imbedded in thick masses of blue argillaeeous clay, lying at the base of the Oolitic or Jurassic series, and above the Triassic or New Red Sandstone. The formation is highly fossiliferous, ammonites being found in such quantities and varieties as to be called into use in the classification of the different beds. Gryphites and belemnites are also very common molluscs. Fish remains are frequent; but of all its fossil remains by far the most important are those of the great reptiles, of which the ichthyosaurus, plesiosaurus, and enaliosaurus are representatives. Numerous remains of plants occur in the lias. See Geology.

LIBAU (lē'bou), an important seaport of Russia, government of Courland, at the mouth of the lake of the same name, on the Baltic. Its trade in corn, flax, hemp, etc., is considerable. Pop. 64,505.

LIBEL, in law, the act of publishing malicious statements with intent to expose persons or institutions to public hatred, contempt, or ridicule, and thereby provoking them to anger, causing a breach of the peace, injury to reputation, business, etc. The difference between libel and slander is, that in the former case the defamation must have been effected in writing, printing, or some other visible manner, while in the latter the offense is committed verbally. Publication is held to have taken place if the libel is seen but by one person other than the person libeled. The law distinguishes defamatory, seditious, and obscene libel. A defamatory libel may result in civil and criminal proceedings against both the publisher and the writer, but to come under this category it is essential that the libel be false, malicious (the law presuming malice in every injury done intentionally and without justification), have a tendency to provoke hatred or contempt, and that it be non-privileged. In criminal law it is a misdemeanor to publish or threaten to publish a libel; or as a means of extortion, to offer to abstain from or to prevent others from publishing a libel. A seditious libel is one directed against the head of the state, the legislature, the courts of justice, etc., and its publication constitutes also a misdemeanor. The term obscene libel comprises any obscene publication, and the publisher thereof is liable to imprisonment with hard labor. If the charges contained in the libel are true a civil action cannot be maintained, but the truth of the libelous matter is no defense at common law; at the same time it generally secures the defendant the merciful consideration of the court. In a civil action the plaintiff recovers damages, the amount of which is settled by the jury; upon an indictment, the jury has merely to acquit the defendant or to find him guilty, after which the court passes judgment, and awards punishment, generally fine or imprisonment, or both. Recent legislation and decisions in this branch of law in Breat Britain and the United States (the Ameriean laws differ but little from those of Greal Britain) have a tendency to limit liability for action to purely false, scandalous, and malicious libels. Truth, if published with good motives and for justifiable ends, is now admitted as a good defense, and even motive alone, though the statements may prove untrue.

LIBERAL ARTS. See Arts.

LIBE'RIA, a negro republic on the west coast of Africa, founded in 1820 by liberated American slaves under the auspices of the American Colonization Society, and recognized as an independent state in 1847. It lies between the rivers San Pedro and Manna, has 500 miles of seaboard, and extends some 100 miles inland; area 14,000 to 15, 000 sq. miles. The soil is fertile, well watered, and highly adapted to the cultivation of all tropical products. The chief crop is coffee, increasing quantities of which are grown from year to year and exported, other exports being palm-oil, groundnuts, caoutchouc, and ivory. The climate is very unhealthy for Europeans British weights, measures, and money are mostly in use. The English language predominates among the governing class, Protestant churches and schools are amply provided, and civilization is making rapid strides among the natives. The population consists of some 20,000 immigrants from the United States and their descendants, and about 1,000,000 natives; Monrovia is the capital. The government of the republic is on the model of the United States.

"LIBERTY," Bartholdi's statue, presented to the United States by the French people in 1885, is the largest statue ever built. Its conception is due to the great French sculptor whose name it bears. It is said to be a likeness of his mother. Eight years of time were consumed in the construction of this gigantic brazen image. Its weight is 440,000 pounds, of which 146,000 pounds are copper, the remainder iron and steel. The major part of the iron and steel are used in constructing the skeleton frame work for the inside. The mammoth electric light held in the hands of the giantess is 305 feet above tide-water. The height of the figure is 152½ feet; the pedestal 91 feet, and the foundation 52

feet and 10 inches. Forty persons can find standing-room within the mighty head, which is 14½ feet in diameter. A six-foot man standing on the lower lip could hardly reach the eyes. The index finger is eight feet in length and the nose 3¼ feet. The Colossus of Rhodes was a pigmy compared with this latter-day wonder.

LIBERTY BELL, the bell which first rang to celebrate the adoption of the Declaration of Independence, July 4, 1776. It was brought to Philadelphia from England in 1752, and was recast in April and again in June, 1753, when the words "Proclaim liberty throughout all the land, unto all the inhabitants thereof" (Lev. xxv. 10), were inscribed on it. For many years it was rung annually on the Fourth of July, but on July 8, 1835, while being tolled in memory of Chief Justice Marshall, it was broken. It now hangs in the hallway of the old state house in Philadelphia.

LIBERTY, CAP OF, a cap used as a symbol of liberty. In ancient times Roman manumitted slaves put on what was termed the Phrygian cap, in token of their freedom. In modern times the name cap of liberty was given to a red cap worn by French and other revolutionaries.

LIBERTY OF THE PRESS. See Press.

LI'BRA, the seventh sign of the zodiac. At its first point the ecliptic crosses the equator to the southern hemisphere and we have then the autumnal equinox.

LIBRARY, the name given to a collection of books, and to the building in which it is located. Libraries existed in ancient Egypt and Assyria, and Pisistratus is credited with the honor of introducing a public library at Athens about B.C. 337. Cicero and various wealthy Romans made collections of books, and several Roman emperors established libraries, partly with books obtained as spoils of war. By far the most celebrated library of antiquity was the Alexandrian. In the West libraries of any note were founded in the second half of the 8th century by the encouragement of Charlemagne. In France one of the most celebrated was that in the abbey St. Germain des Prés, near Paris. In Germany the libraries of Fulda, Corvey, and in the 11th century that of Hirschau, were valuable. In Spain, in the 12th century, the Moors had seventy public libraries, of which that of Cordova contained 250,000 volumes. In Britain and Italy libraries were also founded with great zeal, particularly in the former country, by Richard Aungerville; in the latter by Petrarch, Boccaccio, and others. After the invention of the art of printing this was done more easily and at less expense. The principal libraries of modern times are the National Library at Paris, with fully 2,500,000 of books and 100,000 MSS., and the British Museum library, London, with over 2,000,000 books and 100,000 MSS. The central court library at Munich, the imperial library at St. Petersburg, and the royal library at Berlin have each over a million volumes and thousands of MSS. Other large and valuable libraries are the imperial library at Vienna; the royal libraries at Stuttgart, Dresden, and Copenhagen; the university libraries of Genoa, Prague Göttingen, Upsal, Oxford, Cambridge, and Dublin; also the libraries of Moscow, Venice, Florence, Milan, Bologna, Naples and the Advocates', Edinburgh. The Vatican library, Rome, and the Bodleian, Oxford, are particularly valuable in rare books and MSS. The spread of education, and the consequent growing taste for knowledge, has called into existence innumerable smaller libraries, ready of access, and providing such literature as the special class of reader demand. This public library system has naturally been most developed in highly educated countries such as Germany, France, Great Britain, and the United States. The French government has established over 25,000 popular libraries in connection with primary schools. The Bureau of Education of the United States records nearly 4000 libraries with over 20 million volumes. The Congressional Library, Washington, has over a million volumes, and the public library of Boston over half a million books, while the libraries of Harvard university, Cambridge, Yale university, Newhaven, the Astor library, and the Mercantile Library Association, New York, possess each several hundred thousand volumes.

LIBRARIES, statistics of twenty leading libraries in the United States show that, of over $500,000 spent, a little more than $170,000 was devoted to books, while other expenses consumed $358,000. In the Mercantile Library of New York City it costs 14 cents to circulate a volume; in the Astor, 14½ cents are spent on each volume, or 27 cents on each reader; in Columbia College Library, 21½ cents per reader; in the Library Company of Philadelphia, 26 cents per volume, or 10 cents per head. The largest library in the world is the National Library of France, founded by Louis XIV., which now contains 1,400,000 books, 30,000 pamphlets, 175,000 manuscripts, 300,000 maps and charts, 150,000 coins and medals, 1,300,000 engravings, and 100,000 portraits. The Library of Congress is the largest in this country, containing over one million volumes. There are in the United States about 6,000 libraries.

LIBRARY OF CONGRESS, The (the National Library of the United States), established in 1800, destroyed in 1814 by the burning of the capitol, afterward replenished by the purchase by congress of the library of ex-President Jefferson, suffered again by a fire in 1851, which reduced it to 20,000 volumes. The collection has now come to be the largest in the Western Hemisphere and one of the half-dozen largest in the world, containing over one million printed books and phamphlets, over one hundred thousand manuscripts, 65,000 maps and charts, 35,000 pieces of music and 135,000 prints. It is rich in history, political and social science, public documents, and in Americana, including important files of American newspapers and original manuscripts. From 1800 to 1897 it remained at the capitol; in 1897 it was removed to the building erected for it under acts of congress. It is the largest and most magnificent library building in the world. It has a floor space of nearly eight acres; book-stacks which contain about forty-five miles of shelving and space for 2,200,000 octavo volumes, able to be so extended as to accommodate over 4,000,000 volumes; and provision for nearly a thousand readers at a time. The library is open from 9 a.m. to 10 p.m. on every week-day, and from 2 p.m. until 10 p.m. on Sundays and most holidays. For reference it is freely accessible without formality; but the privilege of drawing books for home use is at present in general limited to members of Congress and certain other classes.

LIBRATION, in astronomy, an apparent oscillatory motion of the moon, arising from the fact that it does not move round the earth with a uniform angular velocity exactly equal to its angular velocity of rotation on its axis, and that its axis is not at right angles to the plane of its orbit, but is inclined 1° 32′ 9″. In this way instead of seeing exactly one-half of the moon's surface we see about $\frac{4}{7}$ths, parts at the edge of the disc and also at the poles being sometimes visible and sometimes out of sight.

LIB'YA, an ancient name for all Africa west of Egypt, or used as equivalent to Africa, the real shape and dimensions of which were unknown.

LICE, wingless insects which occur as parasites upon the bodies of birds and mammals. Two distinct groups are recognized among the forms united under the common name lice: the one, the bird-lice, forming a distinct order, the others which occur upon mammals being included as a group. The bird-lice have their jaws fitted for biting. They live almost exclusively upon birds, each species of which has its peculiar parasite. They feed upon the feathers and dead skin, and it is to rid themselves of these pests that hens, etc., roll themselves in the dust. In a few cases, as the goat and sheep, they feed upon the wool or hair. The true lice have the mouth-parts, like those of the true bugs, fitted for piercing the skin and sucking the blood of their host. In some cases they manage to burrow entirely under the skin. Their feet are shaped something like pipe-tongs, enabling them to hold firmly to the hairs among which they move. They lay their eggs in firm capsules attached to the hairs, and the young pass through various changes. Man is subject to the attacks of three different species of lice: the head-louse, the body-louse, and the crab-louse. Other mammals have their own parasites. The best remedy for these pests is cleanliness.

LICENSE, in law, the grant of permission to do some lawful act, also the document conferring such authority. All civilized countries require that persons should not carry on certain trades or professions, or do certain acts, without previous grant of license, and such licenses may be imposed for the sake of regulating traffic or raising revenue. Most numerous are licenses issued to empower persons to sell certain articles. The articles not to be dealt in without a license include: beer, cider, wines and spirits, tobacco and snuff, patent medicines, gold and silver, game, sweets; besides these there are licenses for

auctioneers, appraisers, armorial bearings, carriages, dogs, guns, hawkers and pedlars, male servants, pawnbrokers etc.

LICHEN (lī'ken or lich'en), in medicine, a skin disease affecting adults. It consists of a number of pimples, red or white in color, either clustered or disseminated over the surface of the skin, with or without fever, or derangement of the digestive organs, usually terminating in slight desquamation, and very liable to recur, though not contagious. There are several varieties of this eruption, but in the milder forms all that is necessary is to avoid excess, especially in rich food and the use of stimulants, and to take a light diet, with diluent drinks, and a gentle laxative occasionally. Strong external applications should not be employed, but lotions of lime-water, or weak solutions of the bicarbonate of ammonia, afford relief. The prickly heat so well known to dwellers in tropical climates, is a species of lichen.

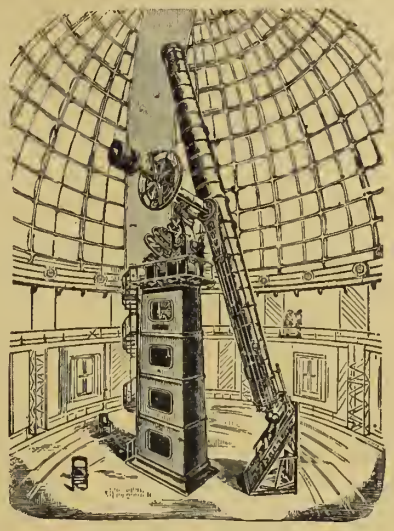
LICHENS, a very extensive order of flowerless plants. According to a modern theory lichens are not simple plants, but are fungi parasitic on algæ, the two being mutually dependent. They have neither stem nor leaves, but consist mainly of a thallus deriving its nourishment from the air. They are reproduced by spores contained in fruits called apothecia, which are regarded as the fungi of the particular lichen. They are common everywhere, commonly in the form of flat crusts, sometimes of foliaceous expansions, adhering to rocks, the trunks of trees, barren soil, etc. They are found flourishing to the very edge of perpetual snow, and one species, the reindeer-moss, grows in the greatest profusion in the Arctic regions, where it forms the reindeer's chief sustenance. The Iceland-moss is also abundant in the Arctic regions, and often affords aliment to the inhabitants. Several other lichens afford dyes of various colors, these being chiefly obtained from rocks in the Azores and Canaries. Litmus is also obtained from a lichen.

LICK, James, American philanthropist, born in Fredericksburg, Lebanon co., Pa., in 1796. In 1847 he settled in California, where he invested in real estate and became very wealthy. He gave $700,000 to the University of California for the erection of an observatory, and procuring therefor a telescope superior to and more powerful than any ever before constructed, and made other worthy bequests. He died in 1876.

LICK OBSERVATORY, an American observatory on Mount Hamilton (4200 feet), 60 miles s.e. of San Francisco, California, founded by James Lick, a piano manufacturer (1796–1876), and formally handed over to the University of California in 1888. It is supplied with instruments of the most perfect kind, and in particular possesses a refracting telescope with an object-glass 36 inches in diameter, being the next largest lens in existence.

LICTORS, in Rome, were the public servants who attended upon the chief magistrates, consuls, prætors, etc., to clear the way for them, and cause due respect to be paid to them. They carried axes tied up in bundles of rods, called fasces, as ensigns of office, and were selected from the lower class of free men. The number of lictors preceding the state dignitaries depended upon the rank of the latter.

LIEBER, Francis, a German-American writer, born at Berlin 1800, died at New York 1872. In 1827 he edited the Cyclopedia Americana, based



Lick observatory 36-inch telescope.

on the German Conversations-Lexikon. The South Carolina College, Columbia, elected him in 1835 professor of history and political economy, a post he held until 1856, when he accepted a similar appointment in Columbia College, New York. He has written many books and pamphlets on morals, education, and political economy, and some of them have been translated into French and German.

LIEBIG (lē'bih), Justus, Baron von, one of the most eminent of modern chemists, born at Darmstadt 1803, died at Munich 1873. He first secured the attention of the chemical world in 1824 by reading a paper before the French Academy of Sciences on fulminic acid and the fulminates, the true composition of which were until then unknown. This also gained him the favor of Humboldt, and through the latter's influence he was appointed extraordinary, and in 1825 ordinary professor of chemistry at the University of Giessen, a chair he held for 25 years. In 1850 he replaced Professor Gmelin at Heidelberg, and in 1852 he accepted the chemistry chair at Munich, with charge of the laboratory. The Munich Academy of Sciences elected him president in 1860. Liebig is regarded as the founder of organic chemistry, owing to the many discoveries he made in this department. He did much to improve the methods of analysis; his Chemistry of Food has brought about a more rational mode of cooking and use of food; while agriculture owes much to his application of chemistry to soils and manures.

LIEGE (li-āzh), a town of Belgium, capital of the province of same name, 54 miles east by south of Brussels. Liege is the principal manufacturing town of Belgium, its foundries, firearms, metal, and tool manufactures being very extensive; besides these there are important woolen-mills, tanneries, and printing-offices. It has many fine examples of Gothic architecture, including its cathedrals, the church of St. Jacques, and others, and its public buildings are mostly elegant structures. The town is rich in collections of various kinds, and has a university with a large library. Pop. 157,760.—The province has an area of 1117 sq. miles, with a population of 835,800. Until 1795 it was an independent state, governed by prince-bishops of the German empire; in that year France included it in the department of the Ourthe, but it was restored to Belgium in 1815, excepting certain portions annexed to Prussia.

LIEGNITZ (lēh'-nits), a town of Prussia, in the province of Selisia, 40 miles w.n.w. of Breslau. Pop. 54,839.

LI'EN, in law, in its most usual acceptation, signifies "the right which one person, in certain cases, possesses of detaining property placed in his possession belonging to another, until some demand which the former has is satisfied. Liens are of two kinds: 1, particular liens, that is, where the person in possession of goods may detain them until a claim, which accrues to him from those identical goods, is satisfied; 2, general liens, that is, where the person in possession may detain the goods, not only for his claim accruing from them, but also for the general balance of his account with the owners. See Mechanics Lien.

LIEUTENANT, in military language, the officer next below a captain. The distinction between first and second lieutenants exists in the British army and in that of the United States. A lieutenant in the navy is the officer next in command to the captain of the ship. He takes rank both in the British and United States' services with a captain in the army.

LIEUTENANT-COLONEL, the intermediate rank between major and colonel. In the United States army his duties are to assist the colonel in command of the regiment.

LIEUTENANT-COMMANDER, an officer of the United States navy above the rank of lieutenant and below that of commander. The grade was established upon the reorganization of the navy in 1862. Lieutenant-commanders rank with majors in the army and have the same pay when at sea, but on shore duty their pay is 15 per cent less.

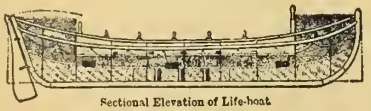
LIEUTENANT-GENERAL, in February, 1864, an act of congress was passed directing that the grade of lieutenant-general be again revived (General Scott having retired in 1861). On March 2, 1864, Major-Gen. U. S. Grant received the appointment, followed on July 25, 1866, by Major-Gen. W. T. Sherman, the grade of general having been revived for Lieutenant-General Grant. When the latter was elected president of the United States, Lieutenant-general Sherman was made general, Major-Gen. P. H. Sheridan becoming lieutenant-general. An act of congress, 1870, abolished the office of lieutenant-general and general as soon as vacated. Major-Gen. J. M. Schofield

was promoted to the grade of lieutenant-general by act of congress on February 5, 1895, retiring from active service as such on September 29, 1895. Major-Gen. N. A. Miles succeeded as commanding general of the army, the rank of lieutenant-general being again revived and conferred on him in 1900.

LIFE, to give an unobjectionable definition of life is impossible, as whatever the definition may be it will probably err either from redundancy or defect. Life has been defined as: "the sum total of the forces that resist death," "the constant uniformity of phenomena with diversity of external influences," "the special activity of organized bodies," "organization in action," "a collection of phenomena that succeed each other during a limited time in an organized body," "the two-fold internal movement of composition and decomposition, at once general and continuous." Herbert Spencer's conception of life is: "The definite combination of heterogeneous changes, both simultaneous and successive in correspondence with external coexistences and sequences." Mr. G. H. Lewes suggests the definition: "Life is a series of definite and successive changes, both of structure and composition, which take place within an individual without destroying its identity."

LIFE-ASSURANCE. See Insurance.

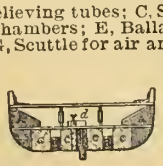
LIFE-BOAT, a boat for saving persons from shipwreck. The first life-boat was patented in Great Britain by Lukin in 1785, but Henry Greathead introduced an improved form in 1789 which proved very successful, and till 1851 was almost the only one in use. A boat approved by the Royal National Life-boat Institution of Britain is now the recognized English model, and possesses in the highest degree all the qualities which it is desirable that a life-boat should pos-



Sectional Elevation of Life-boat

Deck plan of life-boat.

A, Deck; B, Relieving tubes; C, Side air-cases; D, End air-chambers; E, Ballast; F, Air-scuttles; G, Scuttle for air and pump.



Midship section.

A, Side air-cases; B, Relieving tubes; C, Spaces packed with cork; *d*, Ventilation scuttle.

sess:—1. Great lateral stability, or resistance to upsetting. 2. Speed against a heavy sea. 3. Facility for launching and taking the shore. 4. Immediate self-discharge of any water breaking into her. 5. The important advantage of self-righting if upset. 6. Strength. 7. Stowage-room for a large number of passengers. The life-boat transporting carriage is an important auxiliary to the boat. The life-boat is kept on this carriage in the boat-house ready for immediate transportation to the spot most favorable for launching to the wreck. In this way a greater extent of coast can secure the benefits of the life-boat than could otherwise be the case; besides, a boat can be readily launched from a carriage through a high surf, when without a carriage she could not be got off the beach. The machine is admirably contrived, and the boat may be launched from it in an upright position with her crew on board. The life-saving service of the United States is chief among the life-boat societies of the world. It is supported by government funds, and the Atlantic and some of the lake coasts are now studded with life-saving stations, provided with suitable boats, appliances, and houses of refuge for the saved.

LIFE-BUOYS, LIFE-RAFTS, ETC. Various kinds of buoys or other apparatus for the preservation of human life in

Seaman with life-belt (of cork).

cases of shipwreck or danger from drowning in other circumstances have been introduced from time to time, constructed in all sorts of shapes and materials. India-rubber has been largely used in the construction of life-buoys, generally in the form of belts which can be easily inflated by the wearer in the course of a few seconds., They are very buoyant and portable, but easily punctured or torn, and soon decay if put aside while damp. Hence the interior has come to be divided into cells, so that the rupture of one affects only a partial damage. Another sort is in the form of a waistcoat; and inflated pillows and mattresses made on the same principle have been found very effective. Naval officers have also strongly recommended mattresses stuffed with cork. The life-buoy most favored by seamen of late years is composed of slices of cork so neatly arranged that they form a buoyant zone about 32 inches in diameter, 6 inches wide, and 4 inches thick. It contains about 12 lbs. of cork, is compactly covered with painted canvas to protect it from being injured by the water, and furnished with looped life-lines, that several, if necessary, may at once have a convenient hold. The belts in use by the Royal Life-boat Institution are made of cork fastened in canvas, securing great buoyancy with strength, while they afford at the same time a certain amount of protection in cases of contact with rock or wreck, and some degree of warmth. Various new life-saving suits have been shown at recent exhibitions.

LIFE-INSURANCE. See Insurance.

LIFE-ROCKETS, projectiles by means of which a rope is thrown either from a ship in distress to the shore or from the shore to the ship, generally the latter. The most reliable missiles are those that are discharged from a mortar or gun by gunpowder, having a line attached to them. The life-mortar of Captain Manby, invented in 1807, is practically still that in use, though variations in details have been made on it from time to time. His missile was a shot with curved barbs, resembling the flukes of an anchor, to grapple the rigging or the bulwarks of a ship. An ingenious rocket-apparatus now in use is Rogers' life-anchor. It consists of a three-fluked anchor, 12 lbs. in weight, having the flukes so hinged that they pack closely together. When the anchor has been shot out from a mortar 100 or 200 yards, the flukes open and fasten to the beach or to a ship, and thus establish a communication between the two for dragging boats or men ashore. The best lines are those made of loosely-spun Italian hemp. There are several ways of arranging or faking the line so that it may run out quickly without kinking or entangling. The sling life-buoy is employed in conjunction with the rocket apparatus, after communication has been established by a rope from the shore to the vessel. It consists of a circular cork life-buoy, having a pair of canvas breeches attached to it. The legs of the occupant protrude below the breeches, while his armpits rest on the buoy. The shipwrecked are by this means brought to the shore one by one, the buoy being drawn backward and forward by means of a traveling block. Or the life-car, a sort of covered boat, may be used to convey the men ashore.

LIFTS, Hydraulic, etc., contrivances now in common use for raising goods or persons from one story of a building to another. They consist usually of a cage or platform suspended by a rope or chain, and rising vertically in a shaft within the building, the motive power being the pressure of water on the plunger of a hydraulic press. Ships also are lifted for repair by means of contrivances called lifts, which are either screws, hydraulic-presses, or balance-pontoons. Many lifts are worked entirely by steam-power, and have no water-ram. The lifts in mills, grain and wool stores, etc., are now generally called elevators; and in the United States this term is applied to almost every description of lift.

LIGAMENT, in anatomy, the strong, tendinous, inelastic white bodies which surround the joints, and connect bones, or strengthen the attachments of various organs, or keep them together. Every joint is surrounded by a capsular ligament; the tendons at the wrist and ankle are bound down by what are called the annular ligaments. In dislocations of joints the capsular ligament is often broken.

LIGHT, the agent which enables us through the organ of sight to take cognizance of objects; it has a heating and chemical action which is all-important to

animals and plants; without it there would probably be neither animal nor plant life. The sun, the fixed stars, nebulæ, certain meteors, and terrestrial bodies in a state of incandescence or phosphorescence are self-luminous. The origin of light has been explained by two main theories, the emission or corpuscular theory adapted and developed by Newton, and the undulatory or wave theory, the fundamental principles of which were laid down by Huygens and Euler. Newton held that the sun and other light-giving bodies threw off, with immense velocity, vast numbers of infinitely minute particles of matter, which passed into space, and by their mechanical action upon the eye brought about the sensation of light. Numbers of distinguished men accepted this theory, and many of the phenomena of light were plausibly explained by it. Huygens suggested that light was due to some sort of wave motion transmitted through a medium. His theory, offered toward the end of the 17th century, made little progress until the beginning of the present century, when its truth was amply established by the labors of Young, Fresnel, and others; and it is now universally accepted. Though we are warranted in recognizing the existence of the transmitting medium called ether, of its nature we know as yet next to nothing. Rays of light proceed in straight lines, and when a screen is removed to twice or three times its distance from a luminous point it receives only one-fourth or one-ninth of the light per unit of area which it received formerly. This is the law of inverse squares, or,—the intensity of the light received from a luminous point is inversely proportional to the square of the distance from the point. Advantage is taken of this fact in determining the relative illuminating powers of two sources of light by means of the photometer. In 1676 Rœmer discovered that light is not instantaneously propagated from luminous bodies to the eye; and he calculated its velocity. Bradley, Foucault, Fizeau, Cornu, etc., made similar measurements, and it has been determined that light travels at the rate of about 186,000 miles per second.

When light falls upon the surface of a body part of it is reflected. When the surface is smooth and regular an eye placed to receive the reflected rays generally observes an image of the source of light, and the surface may be called a mirror. When it is not smooth the light which falls upon it is scattered in all directions, so that the surface itself becomes visible; planets and nearly all terrestrial objects become visible in this way by means of reflected solar light. While part of the light which falls upon the surface of a body is reflected part enters into the body, which absorbs or destroys a certain amount of it and may allow the rest to pass through. When light falls nearly vertically on a glass surface very little of it is reflected, but as the incidence becomes more and more oblique a greater and greater proportion of the light is reflected. Polished metals, particularly silver, are good reflectors of light at all incidences, and hence metallic surfaces are most commonly used as mirrors. The law of reflection was known to Archimedes; it is—the incident and reflected rays make equal angles with a perpendicular to the surface, and lie in the same plane with it. When a ray has passed obliquely from air into water, although in the water as in the air it is a straight line, this is not a mere continuation of its old path; it is bent to some extent at the point where it enters the new medium, the bending of the ray being called refraction. This bending of a ray when it passes from one medium, such as air, into another homogeneous medium, such as glass or water, or from air into denser air, is subject to a particular law. The law of refraction was discovered in the 17th century; it is—whatever be the obliquity of a ray passing from one medium to another, the sines of the angles made by the incident and refracted rays with the perpendicular to the refracting surface are in a constant ratio, which has been called the index of refraction. When a ray of light passes through a medium, such as the atmosphere, which continuously varies in density from place to place, its direction continuously changes, so that it is a curved line, a fact to which the phenomenon of the mirage is due. The application of mathematics to the two laws of reflection and refraction is called optics; this science includes the formation of images by mirrors and lenses, the eye, microscopes, telescopes, etc. See Optics.

Newton found that red light is not so much refracted as blue light when it passes from one medium to another. When a ray of solar light is refracted in passing through a glass prism he found that a great number of rays of different colors left the prism, the blue ray being most bent from its former path and the red ray least. (See Prism, Rainbow.) Letting these rays fall upon a screen he obtained a band of colors which he called a spectrum. Thus he had decomposed solar light and found it to consist of a mixture of lights of every gradation of refrangibility. On permitting all the colored rays to pass through a lens before falling on the screen they combined and became white light again. Newton failed to observe one peculiar feature of the spectrum which has since been studied, and has led to important results—namely, that it was not really continuous, but was crossed by a number of dark lines. From this has arisen the instrument called the spectroscope and the branch of physics called spectrum analysis. See these arts.

In Newton's experiment with solar light and the prism we find that the blue and green rays very slightly affect a thermometer, the yellow rays affect it slightly, and the extreme red rays possess great heating properties; moreover, when the thermometer is passed beyond the red into a space in which there are no luminous rays a maximum heating effect is produced. Again, the red and yellow rays are all but incapable of blackening photographic paper, whereas the blue and violet rays exert a rapid chemical action, and this is even exceeded by the invisible rays beyond the violet. It is evident then that (1) some of the solar rays which pass through the prism do not affect the retina; these rays are either less refrangible than red light, or are more refrangible than violet; (2) the least refrangible solar rays possess most heating power; (3) the most refrangible rays are capable of exerting the most powerful chemical action. As glass prisms absorb many of the heat rays it is convenient to use prisms of rock-salt in examining the heat (red) end of the spectrum.

Young showed that two rays of light may destroy each other's effects and produce darkness. He applied this discovery to the explanation of many natural phenomena, such as the colors in mother-of-pearl, on soap-bubbles, etc. It has also been shown that rays of light may bend round obstacles. When a ray of light enters Iceland-spar it divides into two rays which travel in different directions; these two rays possess peculiar properties which are not exhibited by ordinary rays of light, and are said to be polarized. These polarized rays cannot be made to interfere or destroy each other's effects, but either of them may be divided into two interfering rays. These and other allied phenomena are accepted by physicists as proofs that (1) there exists throughout all space a very elastic medium of small density, known as the ether; (2) the particles of all bodies are in a state of vibration; a rise in temperature of a body indicates an increase in the rapidity of vibration of its particles; (3) radiation of heat consists in the communication of these vibrations from the particles of a body by the ether to all parts of space; (4) when these vibrations communicated by the ether become rapid enough they are able to affect the retina of the eye and are then called light; (5) lights differ in color when their vibrations are not executed in equal times; (6) the vibrations of particles of the ether are all executed at right angles to the direction of propagation of the light; (7) in a ray of polarized light the vibrations are all executed at right angles to a certain plane called the plane of polarization; (8) the planes of polarization of the two rays in Iceland-spar mentioned above are at right angles to one another.

LIGHT. See Aberration.

LIGHT, Artificial, any kind of illuminant for supplementing the light of the sun. Some form of artificial light must have been in use for domestic purposes from the very earliest times, but, though large cities and a high state of civilization existed among the Egyptians, Greeks, and Romans, the systematic lighting of streets was unknown to them. From the writings of Libanius, however, who lived in the beginning of the 4th century after Christ, we may conclude that the streets of his native city, Antioch, were lighted by lamps, and Edessa, in Syria, was similarly illuminated about A.D. 500. Of modern cities Paris was the first to light its streets. In the beginning of the 16th century it was much infested with robbers and incendiaries, so that the inhabitants were ordered, in 1524, to keep lights burning after nine in the evening, before all houses fronting a street. In 1558 falots (a large vase

filled with pitch, rosin, and other combustibles) were erected at the corners of the streets. In London the inhabitants were instructed to hang out candles in 1668. A more definite order was issued in 1690. Every housekeeper was required to hang a light or lamp, every night as soon as it was dark, between Michaelmas and Lady-day, and to keep it burning till the hour of twelve at night. Successive acts of parliament and orders of the common council provided from time to time for the better lighting of London. The Hague commenced street lighting in 1552, Hamburg in 1675, Berlin in 1679, Copenhagen in 1681, Vienna in 1684, Hanover in 1696, Leipzig in 1702, and Dresden in 1705. The application of coal gas to economical purposes by Murdoch in 1805 opened a new era in artificial lighting. See Electric Light, Gas, Paraffin, Petroleum.

LIGHT, Electric. See Electric Light.

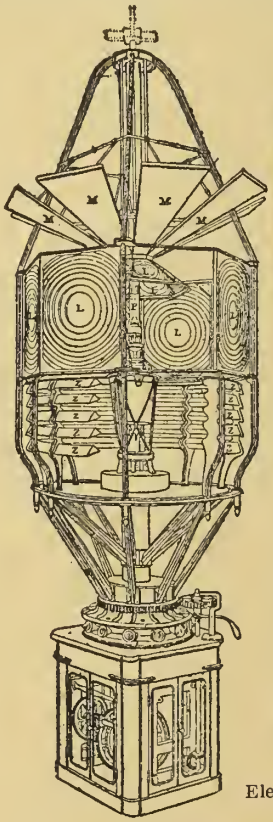
LIGHT CAVALRY, or Horse. See Cavalry.

LIGHTER, a large, open, flat-bottomed vessel, employed to carry goods to or from a ship.

LIGHTHOUSE, a tower or other lofty structure with a powerful light at top, erected at the entrance of a port or on some rock or headland, and serving as a guide or warning of danger to navigators at night. The Pharos of Alexandria, founded about 300 B.C., is the earliest building erected expressly as a lighthouse of which we have any authentic record. It is stated to have been 550 feet high. Lighthouses are supposed to have been erected by the Romans at Flamborough Head, Dover, and Boulogne. In modern times the first important lighthouse erected was the Tour de Cordouan, at the mouth of the Garonne in France, founded in 1584 and completed in 1610, altered and improved in 1727. It is 197 feet in height, and in architecture surpasses all other lighthouses in the world. In the United States the lighthouses are under the Lighthouse Board, which has charge of all buoys, beacons, etc., on the coasts and waters of the States. The earlier lights were simply of wood, and later fires of coal exposed in open chauffers upon the top of a tower. When oil was first introduced as an illuminant is not known. An immense improvement in lighting was made a few years previous to the French revolution by the introduction of parabolic reflectors, which concentrate and throw forward in a horizontal direction the rays of light proceeding from lamps placed in their foci. At the same time the revolving frame carrying the lamps and reflectors was introduced, which has proved of the greatest utility in establishing a distinction between lights. The reflectors are composed of sheet-copper plated with silver, and formed into a parabolic curve by a laborious and delicate process.

To enable seamen to distinguish one lighthouse from another, lights in proximity are arranged to exhibit different characters. The characters in common use are: fixed light; flashing light, showing one flash at intervals of a few seconds; group-flashing lights, showing two or more flashes in quick succession followed by a longer period of darkness; occulting lights, which show a fixed light and are eclipsed for a few seconds at regular intervals. A system of alternate flashes and eclipses (on the Morse alphabet principle) has been in some cases adopted to mark particular lights. Colored lights, red and green, are also used with any of the foregoing characters to produce further distinctions, but in general only to mark danger arcs, or in conjunction with a white flash, as the tinted-glass shades required seriously impair the power of the light, the color of which, moreover, is not easily distinguishable in foggy weather. The use of flashing and occulting lights is becoming more and more common, few fixed lights being now set up, and many having been converted. To produce the various characters requires the use of a revolving apparatus bearing the lenses.

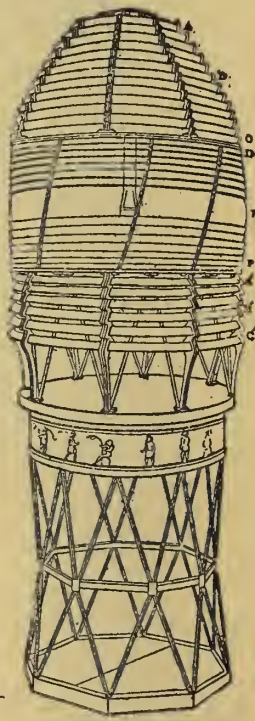
Oil, particularly mineral oil, is commonly employed at present, and it is likely to remain in use in isolated lighthouses. Gas has been substituted for oil in some lighthouses. With gas an eclipse can be simply produced by a partial stoppage in the supply pipes, and there is no such waste of light as when oil is employed. Gas has been successfully employed in illuminating buoys for the guidance of vessels. The buoys (which, of course, are gas and water tight) are charged to a pressure of perhaps ten atmospheres, giving a continuous light for three or four months; a luminous paint has also recently been applied with advantage to buoys. The electric light has been adopted for a number of lighthouses, and recent experiments prove it to be the most powerful and penetrative of all lights.



Revolving trioptric apparatus.

Elevation and plan of revolving catoptric frame.

LIGHTHOUSE.



Fixed catadioptric apparatus.

LIGHTNING, a sudden illumination of the sky caused by a discharge of electricity from one cloud to another, from a cloud to the earth, or from the earth to the cloud. The last-mentioned discharge is called the "backstroke." Lightning comes and goes so quickly that even while we see the stroke it is no longer there. What we see is the image that has been produced on the retina. Lightning never travels backward. The zigzag pictures one often sees, in which the streak returns on itself, is the pure imagination of the artist. The speed at which the current travels is 186,000 miles a second—about the same speed of light itself. For a long time it was believed that the thunder which accompanies lightning was caused by the collapse of the air, as in an ordinary explosion. This is a wrong notion. To understand why this is so, we must first understand what lightning really is. The flash we see is not electricity at all. Electric currents are wholly invisible. The flash is caused by the air being heated so highly by the discharge that it becomes brilliant along the line of the discharge. A lightning flash, therefore, is nothing but a gigantic electric spark, precisely the same as the spark one draws with his finger when he touches a live wire. It is the air which is heated.

The lightning stroke is made by the heating of a large quantity of air, the spark by the heating a small quantity. And the crack which accompanies the spark is produced by the same cause which produces the thunder clap. Both are precisely the same in nature.

Now the difference between the thunder peal and the noise made by a cannon, or other explosion is shown by the fact that the explosion will shatter glass and even throw down buildings, while a thunder peal, even when much louder, does not break glass at all. This is due to the fact that in the lightning stroke there is no collapse of air worth mention, but only a molecular agitation which produces sound waves.

The different kinds of lightinng such as "fork," "sheet," and "chain" lightning are due to the degree in which the clouds reflect the stroke.

LIGHTNING-ROD. See Conductor.

LIGHT-SHIP, or **LIGHT-BOAT,** a vessel, usually single-masted, serving as a lighthouse in positions where a fixed structure is impracticable. Octagonal lanterns, fitted with Argand lamps placed in the foci of parabolic reflectors, are usually hoisted on the mast; but they are less efficient and more expensive in maintenance than land lights.

LI HUNG CHANG (lē hung chäng), Chinese statesman, born in Lu-chow-Ngan-hwei Province in 1823 (or 1819). In 1864 he became governor of the Kiang Provinces, in which capacity he was intrusted with the task of putting down the Taiping rebels who had continued to hold their own. Li Hung Chang was successful in suppressing the rebellion. Li now became successively commander of the Chinese Imperial forces, an earl, head of the naval administration, and viceroy of the capital province of Chi-li. This last appointment placed him practically next the throne, and he held it for the exceptional period of twenty-four years, from 1870 to 1895. The war with Japan found him in a position of great responsibility. He had been instrumental in bringing on the war, and he had to bear the brunt of the defeat which followed. In 1896 he represented China at the coronation of Emperor Nicholas II. of Russia, and then made a tour of the world, passing through Germany, France, England, and the United States, received everywhere with high honors. Upon his return to China he became the virtual head of the Tsung-li-Yamen or foreign office. He returned to the governorship of the Kiang Provinces in 1900, but was soon recalled to the governorship of Chi-li and his former extensive power, because he was the only man who could be relied upon to meet the emergency in the foreign relations of the empire produced by the Boxer outbreak. His last public task was the settlement with the European powers and the United States of the issues raised by that trouble. He died November 7, 1901.

LIGUORI (lig-ụ-ō′rē), Alphonso Maria de, an Italian prelate, born 1696, died 1787, the founder of the sect called Redemptorists, or Ligorists. In 1732 he founded a monastery at Villa Scala (Principato Citra) with the approbation of the pope, the members of which, forming the Order of the most Holy Redeemer, were to be employed in the instruction of the people. In 1762 he was appointed bishop of Santa Agata de' Gotici (in the Principato Ultra) by Clement XIII., which office he held until his retirement in 1775 to Nocera de' Pagani, the chief seat of his order. Since 1816 his name has been enrolled among Roman Catholic saints.

LIGU'RIA, one of the larger divisions (compartimenti) of Italy; area, 2055 sq. miles; pop. 1,077,473. It includes the towns of Genoa, Spezzia, and St. Remo, and is the most important maritime division.

LIGUS'TRUM. See Privet.

LILAC, a familiar fragrant-flowered shrub, 8–10 feet high. There are several varieties, the most common color of the flowers being lilac, but some are white.

LILITH, according to Rabbinical legends Adam's first wife, mother of giants and demons.

LILIUOKALANI (lē′le-oo′e-kä-lä′ne), Lydia Kamekeha, Queen of the Hawaiian Islands, sister of King Kalakaua, whom she succeeded in 1891, was born in 1838. She secured the passage of bills authorizing the importation of opium and the establishment of the Louisiana lottery, and endeavored to substitute a reactionary constitution for the liberal one of 1887. This last measure aroused the white population of the islands, who would have been disfranchised under the proposed constitution, and on January 30, 1893, they deposed her and set up a provisional government which soon became a republic, with Sanford B. Dole at its head. The new government immediately sought to secure the annexation of the islands to the United States, but President Cleveland opposed this policy, and on the ground that United States forces had been used to dethrone the queen, demanded that the republican government restore her to power. This Dole and his advisors refused to do, and after a show of force, President Cleveland was compelled to acquiesce. The ex-queen visited the United States in order to plead her cause, and then retired to her private estate in Honolulu.

LILLE (lēl), a town of France, capital of the department Nord, and chief fortress of the northeast of France, near the Belgian frontier. Pop. 232,568.

LILY, a genus of plants, natural order Liliaceæ. The root is a scaly bulb; the leaves simple, scattered, or verticillate; the stem herbaceous, simple, and bearing at the summit very large and elegantly-formed flowers. The flower consists of six petaloid sepals, the calyx and corolla being alike in form and color. There are many species, the white, orange, and scarlet lilies, the tiger lily, etc. The common white lily is a native of Syria, Persia, and other eastern countries. The finest American species grow in marshes to the height of 6 or 8 feet, bearing reflexed orange flowers spotted with black. A well known Japanese lily is one of the noblest flowering plants in existence, and highly fragrant. It grows to the height of 12 feet. In the middle ages and in modern times the white lily has been the emblem of chastity, hence the Virgin Mary is often represented with a lily in her hand or by her side.

LILY-OF-THE-VALLEY, a plant distinguished for its beautiful bell-shape flowers. It is found in Europe, Asia, and North America. The flowers, generally white, form a terminal unilateral raceme on a curved stalk; and their odor is agreeable.

LIMA, the capital of Peru, is situated at the foot of granitic hills, 7 miles from Callao, its port on the Pacific, on the small river Rimac. The climate is very agreeable, but the locality is subject to earthquakes, the most destructive being that of 1746. Lima was founded in 1535 by Pizzaro, and called Ciudad de los Reyes (City of the Kings). In January, 1881, Lima capitulated to the Chilians, who occupied it for upward of two years. Pop. estimated at 100,000.

LIMA, the capital of Allen co., Ohio, on the Ottawa river, and the Cin., Ham. and Dayton, the Erie, the Lake E. and W., and the Penn. railways; 130 miles n. by e. of Cincinnati. It is the center of the great Ohio petroleum and natural-gas fields, and since 1885, when petroleum was first discovered in the city, it has become one of the largest petroleum shipping-points in the country. Pop. 26,260.

LIMBOURG, or **LIMBURG,** a province of Belgium, separated by the Maas from Dutch Limburg; area, 931 sq. miles; pop. 220,658. Hasselt is the capital.

LIMBURG, a province of Holland, partly intersected by the Maas; area, 850 sq. miles; pop. 254,846.

LIME, the oxide of the metal calcium. This oxide, which in a state of combination is one of the most abundant bodies in nature, has been known and used from the remotest antiquity. The forms in which it occurs native are very numerous, but it does not exist in a pure state in nature, its affinity for carbonic acid being such, that it absorbs it from the atmosphere, when it becomes converted into carbonate of lime. Combined with carbonic, sulphuric, phosphoric and other acids it constitutes large rock masses, and even mountains; it is present in sea and other waters; it is a constituent of most soils and of a great number of minerals; and is essential to plants and animals.

Ordinary lime is obtained with most facility from the carbonate (see Limestone), from which by a strong heat the carbonic acid may be expelled. This process is conducted on a large scale with the different varieties of limestone, which are calcined or burned in order to obtain the caustic earth, or quicklime, as it is called. The lime thus obtained, however, is rarely pure enough for chemical purposes. Pure lime is a soft, white substance, of the specific gravity of 2.3. It is quite infusible, but when heated in the oxyhydrogen blowpipe it emits one of the intensest of artificial lights, and it has accordingly been employed for a signal light and for facilitating the observation of distant stations in geodetical operations. It is soluble in about 700 parts of cold water. The solubility is diminished by heat. If a little water be sprinkled on new burned lime it is rapidly absorbed, with the evolution of much heat and vapor. This

constitutes the phenomenon of slacking. The heat proceeds from the combination of the water with the lime, forming a hydrate, as the slacked lime is called. This is a compound of 56 parts of lime with 18 of water, or rather more than 3 to 1. The water may be expelled by a red heat. Lime-water is astringent and somewhat acrid to the taste. It renders vegetable blues green, and yellows brown; and restores to reddened litmus its usual purple color. Lime, submitted to the action of galvanism in high intensity, afforded Sir H. Davy satisfactory evidence that, in common with the other earths, it consists of a metal, which he denominated calicum, and oxygen, the proportions being 72 of calcium and 28 of oxygen. (See Calcium.) Chlorine combines directly with lime, forming the very important substance used in bleaching, called chloride of lime or bleaching-powder. It is formed by passing chlorine gas over slacked lime. Chloride of lime is also used as a disinfectant.

The uses of lime are almost too numerous to mention, for there is hardly any operation in the arts for which lime is not at some part indispensable. In the manufacture of basic Bessemer steel (see Steel) it forms about one-half of what is called "Thomas slag," which, when ground, makes a cheap and efficient fertilizer; it is employed in the early stages of leather dressing to remove hair, fat, etc., from the hides; it is used in metallurgy as a flux; in soap-boiling to causticize the alkaline liquors; in the manufacture of washing soda; for neutralizing acids; for making mortars and cements; in agriculture to destroy inert or noxious vegetable matter, and to decompose heavy clay soils; and in the materia medica, chiefly as an antacid.

LIME, or **LINDEN,** a large tree, with alternate, simple, and cordate leaves, and sweet-scented flowers, disposed on a common peduncle. The common linden is a well-known tree. The inner bark of all the species is very tenacious; it is called bast, and mats are made of it in Russia in large quantities. The wood is rather soft, close-grained, and much used by turners. The American lime, or bass-wood is a large and beautiful tree, resembling the European species.

LIME, a small globular shaped lemon, the fruit of a shrub about 8 feet high. It is a native of India and China, but was introduced into Europe long before the orange, and is now extensively cultivated in the south of Europe, the West Indies, and some parts of Southern America. The fruit is agreeably acid, and its juice is employed in the production of citric acid, in beverages, etc.

LIME LIGHT. See Oxyhydrogen Light.

LIM'ERICK, a city of Ireland, capital of Limerick county, and a county of itself, is situated at the interior extremity of the estuary of the Shannon. The industries include the curing of bacon, the preparation of butterine, flax spinning and weaving, and lace-making. Pop. 38,085.—The county belongs to the province of Munster, area, 680,842 acres, of which one-fourth is under tillage. Pop. 146,018.

LIMESTONE, a species of mineral comprising numerous varieties of carbonate of lime, differing considerably in external appearance, structure, and composition. It is, if pure, essentially composed of 57 parts of lime and 43 of carbonic acid; but in some rocks the limestone is intermixed with magnesia, alumina, silica, iron, etc. All limestones give readily to the knife. They are infusible; but when impure, by an admixture with a portion of other earths, they vitrify in burning. All limestones effervesce when a drop of strong acid is applied on the surface, and they dissolve entirely in nitric or hydrochloric acid. Limestone is found both in primary and in secondary rocks, but most abundantly in the last. It is also not uncommon in alluvial deposits, when it is called calcareous tufa. Limestone has frequently a granular structure; and the size of the grains is variable, in some degree corresponding with the relative age of the mineral. Thus limestone which occurs in beds in gneiss, has usually a coarse texture, and large granular concretions; but when its beds exist in mica slate, or argillite, its texture becomes more finely grained, and its color less uniform. Silurian and Devonian limestones have a texture more or less compact; the colors are often variegated; and they often contain fossils. Secondary limestone has a compact texture, a dull fracture, and usually contains shells, and sometimes other organic remains. It is always stratified. Compact limestone passes into chalk when the particles are somewhat loosely connected with each other, so that the whole assumes an earthy character. A variety of very fine-grained compact limestone is used in lithography the best being that obtained near Pappenheim and Solenhofen in Bavaria.

LIMITATION, in English law, a certain time, assigned by statute, within which an action must be brought, varying according to the subject of action. This matter is regulated by certain acts of parliament, called Statutes of Limitations. According to those now in force, actions are limited as follows:—Actions for the recovery of land, rent-charge, or redemption of mortgages, to 12 years after right accrued; of debt or covenant, if founded on a deed, to 20 years, on less formal agreement, to 6 years after breach; bills, promissory notes, trade accounts, arrears of rent or dower, to 6 years. In the case of persons under disabilities, as infancy, coverture, idiocy, lunacy, or absence beyond seas, the action may be brought within 12 years of its accruing, or within 6 years of the disability ending or the disabled person dying, but in no case does the limit allowed exceed 30 years. Actions for slander are barred after 2 years; actions on penal statutes, if brought by the party injured after 2 years, if brought by a common informer after 1 year. Actions by the crown are limited to 60 years. An action for assault, battery, etc., must be brought within 4 years, an action for death by accident within 1 year. In a charge of murder the injured person must have died within a year and a day of the time when the injury was inflicted. These limitations do not apply to prosecutions for crime, or for breach of trust on the part of trustees, these may be instituted at any time. The American law is mainly based on the English statutes.

LIMOGES (li-mōzh), a town of Western France, capital of the department of Haute-Vienne, and former capital of Limousin. The principal industry is the manufacture of artistic porcelain, known as Limoges ware, and employing over 6000 hands. Pop. 83,569.

LI'MONITE, a very important ore of iron, varieties of which are bog iron ore and brown hæmatite. It is a hydrated oxide of a brownish color, occurring in mammillated or botryoidal masses, and found in various parts of England, and abundantly on the Continent and in America.

LINA'CEÆ, the flax family, a small natural order of exogenous plants, scattered more or less over most parts of the globe, those in temperate and southern regions being herbs, while the tropical representatives are trees or shrubs. They are principally characterized by their regular flowers, with imbricate glandular sepals having a disc of five glands outside the staminal tube; the ovary is three to five celled, with two ovules in each cell; the albumen is fleshy; the leaves are simple, usually stipulate, rarely opposite. The tenacity of the fibre and the mucilage of the diuretic seeds of certain species of the common flax are well known.

LINCOLN (ling'kon), a city of England and a county in itself, capital of Lincolnshire, 120 miles north of London, situated on the Witham, and at the junction of several railways. Pop. 48,783.—Lincolnshire is a large maritime county on the east coast, bounded by the Humber, the German Ocean, and the Wash, and by the counties of Cambridge, Northampton, Rutland, Leicester, Nottingham, and York; area, 1,767,879 acres. Pop. 498,781.

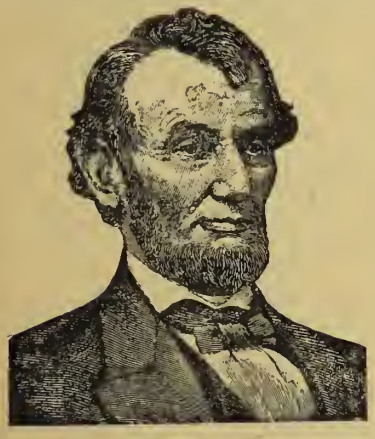
LINCOLN, capital of Nebraska, on the right bank of Salt Creek, a tributary of the river Platte. The public buildings include the United States revenue offices,

State capitol, Lincoln, Neb.

court-house, and post-office, in one building; state-house, university, schools and churches. It has a large trade in all kinds of merchandise, grain, live-stock, and lumber. Pop. 48,169.

LINCOLN, Abraham, the sixteenth president of the United States of America, born in Kentucky 1809. He removed

with his family in 1816 to Spencer co., Indiana, and for the next ten years was engaged in laborious work of various kinds, having only about a year's schooling at intervals. On the breaking out of the Black Hawk war in 1832 he joined a volunteer company, and as captain he served three months in the campaign. He next opened a country store, was appointed postmaster of New Salem, Illinois, began to study law, and at the same time turned amateur land-surveyor. In 1834 he was elected a member of the Illinois legislature, to which he was again returned at the three following biennial elections, and in 1836 he was licensed to practice law. In 1846 he was elected a representative in congress for the central district of Illinois, and voted steadily in congress with the anti-slavery party. In 1849 and again in 1858 he was unsuccessful in attempts to enter the senate. In the republican national convention held at Chicago in May, 1860, he was nominated as a candidate for the presidency, and after several votes he gained a majority, and was eventually chosen unanimously. The Southern states, exasperated at this defeat, and alarmed at the aggressive anti-slavery policy which many of the



Abraham Lincoln.

leading republicans had proclaimed their determination to follow, refused to acquiesce in Lincoln's election, and began one after another to announce their secession, and to organize the means of resisting the enforcement of the claims of the central government. The election of Lincoln took place in November, 1860, and he assumed office on the 4th of March, 1861. It was the intention of Lincoln to use every means of conciliation consistent with the policy he deemed it essential to the national interest to pursue. On one point, however, his resolution was steadfast, to admit no secession, and before his assumption of office secession was as resolutely determined on on the other side. On the 4th of February the southern confederacy had been constituted, and on the 14th of April the first blow in the civil war was struck by the capture of Fort Sumter by the confederates. The events of the civil war during the next four years in Lincoln's career belong to the history of the United States. Lincoln's persistence in raising and pouring in fresh troops after every disaster finally enabled the federal government to subdue the secession. The toleration of slavery was always, in Lincoln's opinion, an unhappy necessity; and when the southern states had by their rebellion forfeited all claim to the protection of their peculiar institution, it was an easy transition from this view to its withdrawal. The successive stages by which this was effected—the emancipation of the slaves of rebels, and the offer of compensation for voluntary emancipation, followed by the constitutional amendment and unconditional emancipation without compensation—were only the natural steps by which a change involving consequences of such vast extent was reached. The determination of the northern states to pursue the war to its conclusion on the original issue led to the re-election of Lincoln as president in 1864. The decisive victory of Grant over Lee on 2d April, 1865, speedily followed by the surrender of the latter, had just afforded the prospect of an immediate termination of this long struggle, when, on the 14th of the same month, President Lincoln was shot in Ford's Theater, Washington, by an assassin named John Wilkes Booth, and expired on the following day. In the affections of the Americans Lincoln holds a place second only to Washington.

LINCOLN'S INN. See Inns of Court.

LINCOLN, Robert Todd, American politician, son of Abraham Lincoln, born at Springfield, Ill., in 1843. At the close of the civil war he settled in Chicago, and practiced law until 1881, when he entered Garfield's cabinet as secretary of war. He was retained in this position by President Arthur, and in 1884 was mentioned for the presidential candidacy, but refused to oppose Arthur in the convention. From 1889 to 1893 he was minister of the United States to Great Britain. He was counsel for the Pullman Palace Car Company, and after the death of George M. Pullman became its president.

LINCRUS'TA-WAL'TON, an embossed wall-covering, designed as a substitute for wall-papers, natural woods, or plaster modeling. The material consists of linseed oil with which is mixed wood-fibre, cork, cellulose, paper, or other thickening substance. The mixture after being treated chemically is made into sheets, which are then backed with light canvas and stamped in an ornamental pattern. It is waterproof, warm, and washable. The original color is light brown or gray, but when mounted on the wall it may be painted, bronzed, or gilt. The figures may be stamped in high relief with striking effect. Lincrusta is really a variety of linoleum.

LIND, Jenny (Madame Otto Goldschmid), singer, born in Stockholm 1820, died 1887. She received part of her musical training under Garcia at Paris; achieved her first success in Berlin in 1845, and subsequently was received with a great ovation in her native city of Stockholm. She made her first appearance in London at Covent Garden in 1847 before an enthusiastic audience; went to the United States, where she married Herr Goldschmid in 1852; returned to Europe and made an extensive tour, finally settling in England. In recent years she seldom came before the public, but as professor in the Royal Academy of Music, and as trainer of the female voices in the Bach choir conducted by her husband, her talents were not lost.

LINDEN, a handsome forest tree. See Lime.

LINEN, cloth made of flax, has had a very ancient and extensive use. On the early monuments of Egypt artistic representations of the various processes of linen manufacture have been found, and the fine linen fabric in which the Egyptians wrapped their embalmed dead still gives evidence of the skill which they possessed. The Jews took with them into Canaan a knowledge of the manufacture; Tyre, Sidon, and Carthage seem also to have acquired the industry; while at an early period the manufacture of linen appears to have been common in Greece and Rome. In the middle ages linen and woolen were the chief articles of dress in all European countries, and among the Flemings in particular the flax manufacture rose to great importance. The linen manufacture has been known in England, Ireland, and Scotland for a long period. As early as the 7th century the Anglo-Saxon women were skilled in the weaving of this fabric, and fine linen was made in Wilts and Sussex in the 13th century. Since the extensive introduction of cotton, however, the linen industry has decreased in relative importance, this result having come about mainly within the present century. The chief center of the manufacture in England is Leeds and neighborhood. In Ireland the manufacture of linen was well established in the 17th century; subsequently it declined; but lately it has again obtained a flourishing position, Belfast being the center of the manufacture. Dundee is the chief center in Scotland for linen (especially coarse fabrics) as well as the allied jute manufacture. Dunfermline is celebrated for its table linens. The machinery used both in spinning and weaving linen is in general, with the exception of some special adaptations, the same as that used for cotton. (See Cotton Spinning and Weaving, also Flax.) The chief varieties of linen now manufactured are: lawn, which is of fine quality and mostly produced in Ireland; plain cloths for shirtings, bedding, etc.; damasks, table-cloths, and other ornamental fabrics; and cambric, which is the finest of all linen fabrics.

LING, a species of sea-fish allied to the cod family, and measuring from 3 to 4 feet in length. It abounds around the British coasts, and is caught with hook

Ling.

and line, and preserved in immense quantities in a dried state. From the beginning of February to May the ling is in highest perfection; the spawning season commencing in June.

LINGARD, John, an English historian, born at Winchester 1771; died at Hornby 1851. His Antiquities of the Anglo-Saxon Church appeared in 1858, and his great work on The History of England from the Invasion of the Romans to the year 1688 was first printed in 1819–25, and reached a fifth edition in 1850. Lingard's History is considered a standard work from the Roman Catholic stand-point.

LIN'IMENT, in medicine, a species of soft ointment of a consistence somewhat thinner than an unguent, but thicker than oil. The term is also applied to spirituous and other stimulating applications for external use.

LINK, in land-measuring, a division of Gunter's chain, having a length of 7.92 inches. The chain is divided into 100 links, and is 66 feet in length. 100,000 square links make an imperial acre.

LINLITH'GOW, a royal and parliamentary burgh of Scotland, capital of Linlithgowshire, 17 miles west of Edinburgh. Pop. 4279.—The county of Linlithgow, or West Lothian, is bounded by the Firth of Forth, Edinburghshire, Stirling, and Lanark; area, 76,806 acres. This county is one of the richest in Scotland in minerals, including coal, shales, ironstone, freestone, limestone. Pop. 65,699.

LINNÆ'A, a genus of plants of the natural order Caprifoliaceæ (honeysuckles). It contains but one species, a creeping evergreen plant found in woods and in mountainous places in Scotland and other northern countries, including North America as far south as Maryland, bearing two beautiful drooping fragrant bell-shaped pink flowers on each flower-stalk.

LINNÆAN SOCIETY, a society in London, instituted in 1788 by Dr. (afterward Sir) J. E. Smith, and incorporated in 1802, for the promotion of the study of all departments of botany and zoology. It has an excellent library, a museum, and herbarium, the nucleus of which were formed by the collection of Linnæus himself. Fellows take the initials F.L.S.

LINNÆ'US. See next article.

LINNE' (lin'nā), Karl von, commonly called Linnæus, the greatest botanist of his age, was born at Rashult, Sweden, 1707, and died at Upsala in 1778. Aided by the Academy of Sciences at Upsala Linné made a journey through Lapland, the result of which was shown in his Flora Lapponica, published 1735. In this year he went to the University of Harderwyk in Holland and took an M.D. degree; afterward visited Leyden, where he published the first sketch of his Systema Naturæ and Fundamenta Botanica. In 1736 he visited England, went to Paris in 1738, and afterward settled in Stockholm as a physician. He became professor of medicine at Upsala in 1741, and then of botany and natural history; was made a knight of the Polar Star with the rank of nobility; and died on his estate near Upsala from apoplexy. The great merit of Linné as a botanist was that he arranged plants on a simple system of sexual relationship and prepared the way for the more natural and satisfactory classification which has superseded the Linnæan system.

LINNET, a small singing bird of the finch family. Its general plumage is brownish, the top of the head and breast being reddish in the breeding season.

Linnet.

They are cheerful and lively birds, and very sweet and pleasing songsters.

LINO'LEUM, a preparation of linseed-oil with chloride of sulphur, by which it is rendered solid and useful in many ways. When rolled into sheets it is used as a substitute for india-rubber or gutta-percha; dissolved it is used as a varnish for waterproof textile fabrics, table-covers, felt carpets, and the like; as a paint it is useful both for iron and wood, and for ships' bottoms; as a cement it possesses some of the qualities of glue; vulcanized or rendered hard by heat it may be carved and polished like wood for mouldings, knife-handles, etc.; and mixed with ground cork and pressed upon canvas it forms floor-cloth.

LI'NOTYPE, a recently-invented printing-machine, in which types are discarded, and matrices used instead, these being brought to the proper places by touching corresponding keys, the rows of matrices being then automatically filled with molten metal so as to produce solid bars or lines of type, and then automatically returned to their places. The linotype is used almost exclusively in newspaper and magazine work and for the cheaper grades of book work.

LINSEED-OIL, the oil got from the seeds of flax either by pressure in the cold or by heating to about 200° Fahr. It is of a pale to dark yellow color; may or may not have a smell, and remains liquid even at zero Fahr. Linseed-oil is largely used in the arts, for painting, for printer's-ink, etc.; and in medicine, especially for burns. Linseed-cake is the solid mass or cake which remains when oil is expressed from flax-seed. It is much used as food for cattle and sheep, and is called also oil-cake.

LINT, in surgery, is the scrapings of fine linen, used by surgeons in dressing wounds. Lint made up in an oval or orbicular form is called a pledget; if in a cylindrical form, or in shape of a date or olive stone, it is called a dossil.

LION, a quadruped of the cat genus, the most majestic of all carnivorous animals, distinguished by its tawny or yellow color, a full flowing mane in the male, and a tufted tail with a sort of sharp nail at the end of it. The largest lions are from 8 to 9 feet in length. The period of gestation is five months; one brood is produced annually, with from two to four at a birth, and the mother nourishes the whelps for about a year. The mane of the male lion begins to grow when it is three years old; the adult age is reached about six or seven; and the extreme age is about twenty-two, although authorities differ from this estimate. The lion is a native of Africa and parts of Western and Central Asia. He preys chiefly in the night and on live animals, avoiding carrion, unless impelled by intense hunger. He approaches his prey with a stealthy pace, crouching when at a proper distance, when he springs upon it with fearful velocity and force. The whole frame is extremely muscular, the foreparts being particularly so, giving with the large head, flashing eye, and copious mane, a noble appearance to the animal, which has led to his being called the "king of beasts," and to fancies of its noble and generous nature which have no real

Head of maneless lion.

foundation. Of the African lion there are several varieites, as the Barbary lion, Gambian lion, Cape lion. The Asiatic varieties are generally smaller and may want the mane, as the maneless

Head of Gambian lion.

lion of Gujerat. The American lion is the puma.

LIPPE (lip'pē), or incorrectly Lippe-Detmold, a principality of north Germany, bounded chiefly by Rhenish Prussia and Wanover; area, 438 sq. miles. Pop. 139,238.

LIQUATION, or **ELIQUATION,** the process of separating by a regulated heat an easily fusible metal from an alloy in which is a metal difficult to fusion. Thus in the refining of tin to remove slag, iron, copper, and other metals, the ingots are heated in a reverberatory furnace to a temperature just sufficient to melt the tin, which is allowed to run into a basin, while the impurities are left behind on the hearth.

LIQUEUR (li-keur'; the French name), a palatable spirituous drink composed of water, alcohol, sugar, and an aromatic infusion, extracted from fruits, seeds, etc. The best-known liqueurs are absinthe, anisette, chartreuse, curaçoa, maraschino kümmel, and noyau.

LIQUID. See Gas, Hydraulics, Hydrostatics, etc.

LIQ'UORICE, a name for herbs growing in S. Europe, Asia, and Africa. One species is a perennial plant with herbaceous stalks and bluish papilionaceous flowers. The well-known liquorice juice, used as a demulcent and expectorant, is extracted from the root as well as from that of others.

LISBON, the capital and principal seaport of Portugal, on the right bank of the Tagus, about 9 miles above its mouth. The western quarter of the city, called Buenos Ayres, is airy and pleasant and chiefly occupied by foreigners. The town of Belem, still farther to the west, forms a sort of suburb to Lisbon. Above it stands the royal palace of Ajuda, a conspicuous edifice of white marble. Among the chief buildings are the castle of St. George or citadel, the cathedral, the church do Coraçoa de Jesus, the custom-house and other government buildings on the Praça do Commercio, the town-hall, etc. But the most remarkable specimen of architecture of

which Lisbon can boast is the aqueduct which conveys water to the city from springs about 10½ miles distant. The scientific and literary institutions comprise the Royal Academy of Sciences, Polytechnic School, National Museum and Picture gallery, National Library, containing about 200,000 vols. The harbor is one of the finest in the world, and the quays extend between 2 and 3 miles along the bank of the river. In 1755 it was visited by an earthquake, which threw down a considerable portion of the city, and destroyed above 30,000 of its inhabitants. Pop. 357,000.

LISTER, Sir Joseph, Baron, English surgeon, was born at Upton, Essex, in 1827. His name is more especially connected with the successful application of the antiseptic treatment in surgery, which inaugurated a new era in this branch of medical science. He received the prize of the Academy of Paris; the medal of the Royal Society; was made an LL.D. of Glasgow University and of Cambridge; D.C.L. of Oxford. Made a baronet in 1883, he was raised to the peerage in 1897. He died in 1902.

LISZT, Abbé Franz, distinguished pianist and composer, was born in Hungary in 1811, and died in 1886. He made his first public appearance in his ninth year; studied in Vienna and Paris; produced an opera in 1825, and became director of the Court Theater at Weimar in 1849. This gave him the opportunity to introduce the music of Wagner, Berlioz, Schuman, and the writers of what is known as "the music of the future." In 1861 he took up his residence in Rome, where he joined the priesthood. In 1870 he became director of the Conservatory of Music at Pest. His chief works are the Faust and Dante symphonies, and the oratorios St. Elizabeth and Christus.

LIT'ANY, a term generally applied to a series of short prayers or supplications together forming one whole. The best-known litany at the present day is that of the Angelican Church. It is chanted in the morning service, the priest uttering one prayer, and the people responding with another alternately.

LITH'ARGE, the yellow or reddish protoxide of lead partially fused. It is extensively used in the manufacture of glass, of enamels, of artificial gems, of lead plaster and lead soap, of sugar of lead, white and red lead, and other compounds. See Lead.

LITH'IA, the only known oxide of the metal lithium, which was at first found in a mineral called petalite. It is of a white color, very soluble in water, acrid, caustic, and acts on colors like other alkalies.

LITHIC ACID. See Uric Acid.

LITHOG'RAPHY, the art of drawing upon and printing from stone. The facility with which this is accomplished arises from the antagonistic qualities of grease and water. The processes of the art depend on the adhesion to a grained or polished stone of a certain greasy composition which forms the lines of the drawing, etc.; on the power acquired by those parts penetrated by the greasy composition of attracting and becoming covered with a specially prepared ink; on the interposition of water, which prevents the ink adhering to the parts not impregnated with the grease; and on pressure, which transfers to paper the greasy tracings or drawings.

The lithographic stone most suitable for the purposes of lithography is found in the district of Kellheim, Bavaria, is a species of slaty lime-stone; its color in the best quality is pale yellowish drab, and for printing purposes its thickness must be from 1½ to 4 inches. In preparing stones for the printer they are squared, leveled, ground, and polished.

Lithographic ink is made of wax, white soap, tallow, shellac, mastic, and lamp-black. What are called chalks are made from much the same materials; these ingredients being subjected to heat until they are fused, poured out on a slab to cool, and then cut into the required sizes.

There are various styles in which drawings on the stone are executed. Drawing on the smooth stone is executed with steel pens and sable-hair brushes. The design, etc., is drawn on the stone in reverse, after which it is slightly etched with dilute acid. In chalk drawing the surface of the stone is roughed or grained, after which the drawing is traced upon the stone. The tinting or shading follows. When completed the drawing is etched, after which it is put into the hands of the printer for printing. In engraving on stone the stone is first prepared with a solution of acid and gum. It is then washed with water, and a dry red or black powder rubbed over it. The drawing is produced by lines scratched through this ground into the stone. These lines are then spread with linseed-oil, and afterward charged with printing ink, from which impressions are taken. Etching on stone is in most respects similar to etching on copper. The stone is prepared in the same manner, the biting-in is effected with dilute acetic acid, and the lines filled in with printing-ink. The method of drawing directly on the stone has been largely superseded by the use of prepared paper, both grained and smooth, on which the drawing is executed, and afterward transferred to the stone Tinting and chromo-lithography is much practised in the reproduction of works of an artistic character. See Color-printing and also Photo-Lithography, under Photography.

In the year 1850 steam-power began to supersede manual labor in driving the lithographic press, and afterward a cylinder machine was introduced, which from time to time has been greatly improved. This machine, running at 500 revolutions in the hour, can produce good work, but for printing fine chalk drawings of large size the hand-press is still preferred. The number of good impressions that can be taken from one drawing or transfer ranges from 500 to 5000; chalk drawings producing few and ink drawings many copies. The drawing or writing can also be preserved good on the stone for any length of time by rolling it with a special kind of ink and covering it with gum mixed with sugar-candy. For similar purposes zinc has been treated in much the same manner as stone. See Zincography.

LITHOT'OMY, in surgery, the technical name for the operation popularly called cutting for the stone. As usually performed it consists in cutting through the perineum in front and to the left of the anus, so as to reach and divide the urethra and neck of the bladder where it is surrounded by the prostate gland. A grooved and curved staff is introduced into the bladder first, and then the incision is made in the perineum to reach the bladder, the groove in the staff serving as a guide to the knife. When thus performed, the operation requires seldom more than three minutes, and in favorable cases the wound heals in the course of a month.

LITHOT'RITY, in surgery, the operation of crushing a stone in the bladder into fragments of such a size that they may be expelled by the urethra. The instrument by which the stone is broken up is introduced in the same manner as a catheter or sound into the bladder, and after catching the stone either crushes, bores, or hammers it to pieces. The instrument, which is called a lithotrite, has two movable blades at the extremity, which are brought together to crush the stone by means of a powerful screw.

LITHUA'NIA, a region in eastern Europe which formed a grand-duchy in the 11th century; became united to Poland in the 14th century; and at the dismemberment of that kingdom, in 1773–95, was nearly all appropriated by Russia, now forming the governments

of Mohilev, Vitepsk, Minsk, Vilna, and Grodno; area about 100,000 sq. miles, of which 6700 are in Prussia. The Lithuanians are a race of people closely akin to the Letts. They are fair-haired, blue-eyed, and light-skinned; of mild disposition, and chiefly occupied in agriculture. Their language is akin to the Lettic and Old Prussian, and forms with these the Lithuanian or Lettic branch of the Aryan family of tongues. Their literature consists chiefly of popular songs and hymns, religious works, tales, etc.

LITRE, the French standard measure of capacity in the decimal system. The litre is a cubic decimetre; that is, a cube, each of the sides of which is 3.937 English inches; it contains 60,028 English cubic inches; the English imperial gallon is equal to fully 4½ litres, or more exactly 4.54345797 litres.

LITTLE FALLS, a city in Herkimer co., N. Y., 21 miles east by south of Utica, on the Mohawk river, the Erie Canal, and the New York Central and Hudson rivers and the West Shore railroads. Pop. 12,160.

LITTLE ROCK, the largest city in and capital of Arkansas, on the right bank of the Arkansas, here navigable, 250 miles from its mouth. It stands on a rocky bluff, rising about 50 feet above the river. It has the usual variety of churches, a state-house, court-house, jail, theater, military college, etc. Pop. 1909, 60,000.

LIT'URGY, a special series of prayers, hymns, pieces of Scripture, or other devotional matter, arranged and prescribed for use in worship; or in a narrower sense a prescribed service for the celebration of the eucharist; hence in the Roman Catholic Church equivalent to the mass or service contained in the Missal. There are a number of ancient liturgies connected with various places or names of various persons, but there seems to have been no written liturgy earlier than the 5th century. The chief liturgical books in the Roman Catholic Church are the Missal and the Breviary, both in Latin. The English Book of Common Prayer dates from the reign of Edward VI. (See Common Prayer.) It was based on the Roman Breviary. In the portions of Scripture contained in the prayer book the authorized version was latterly adopted, except in the Psalms, which are according to Coverdale's Bible. The liturgy of the Episcopal Church in Scotland is the same as that of the Church of England, except that there is a different communion office, which, however, is used only in some of the Scotch churches. The Kirk of Scotland, or the Scotch Presbyterian Church, has no liturgy, the Directory for the Public Worship of God being only certain general rules for the conduct of public worship. The Book of Common Prayer of the Protestant Episcopal Church in the United States was adopted in 1789 with some minor deviations from the English.

LIUTPRAND, or **LUITPRAND,** historian, prelate, and diplomatist, was born at Pavia about 920, and died at Cremona about 972. Besides an interesting narrative of a mission to Constantinople, he has left us a History of Otto; and his Antapodosis, a history of Europe in six books, from 886 to 950. These works are the chief historical authority for that period.

LIVER, the glandular structure, which secretes the bile. This gland is not confined to the Vertebrate animals, all of which—save the Amphioxus or lancelet—possess a well-developed liver, but is found in many Invertebrata. In man the liver is part of the alimentary apparatus, and is situated just below the diaphragm on the right side, extending across the middle line of the body toward the left side. Its front border reaches just below the border of the chest when the posture is sitting or standing; but when the person lies down the liver passes slightly up so as to be completely under cover of the ribs, except a small portion which extends beyond the lower end of the breast-bone. From its position it is extremely liable to compression and injury. It is the largest gland in the body, and weighs from 50 to 60 ounces avoirdupois. In its general form the liver is flat, broad, and thick toward the right side, becoming narrow and thin toward the left side. Its upper surface is convex or arched and fits into the concave surface of the diaphragm, while its lower surface is irregularly divided into certain "lobes," five in number, and separated by clefts or fissures. These lobes are known as the right, left, spegelian, caudatus and quadrate lobes.

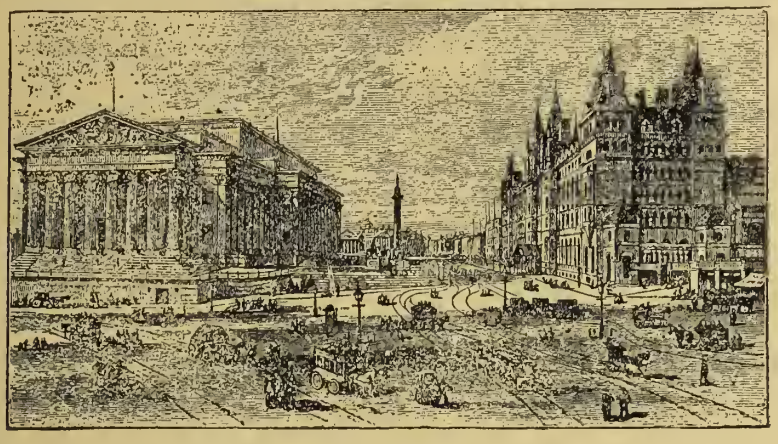
When microscopically examined the entire mass of the liver is found to consist mainly of large many-sided cells containing granular protoplasm. They are arranged in groups or masses, each little mass being called a lobule, and each lobule slightly mapped off by connective tissue and containing a meshwork of blood-vessels and ducts. These blood-vessels are branches of the portal vein. This vein receives the blood which has circulated in the stomach and intestines and carries it throughout the entire liver by a net-work of finely subdivided veins. It is from this supply of blood that the bile is secreted. The blood passes off from the liver by the hepatic vein, formed by the union of small vessels which begin in the center of the lobules. The connective tissue of the liver is supplied with arterial blood by the hepatic artery. This blood, like that which has entered through the portal vein, is drained off into the hepatic vein. There is, however, another set of vessels which ramify through the liver, namely the bile ducts, whose business it is to carry off the bile produced in the gland. These ducts intersect and unite until in the end two channels are formed, one from the right and the other from the left of the liver, which ultimately form one common exit into the small intestine called the common bile duct. Thus, when the bile has been secreted by the liver-cells, it is transferred by way of this hepatic duct into the small intestine, where it mingles with the food. When this flow of bile ceases, as it does when intestinal digestion is interrupted, the supply which still continues is stored in the gall-bladder, which forms a kind of reservoir situated under the liver.

The functions of the liver would seem to be, at least, threefold. It serves (1) to secrete from the blood received from the stomach and intestines that amount of bile which is necessary for the purposes of digestion. The bile, however, contains waste matter, which has been separated from the blood. The liver therefore (2) has a direct function in separating and casting forth the waste impurities of the blood. Further, it appears from recent investigation that (3) the liver secretes a substance which is called glycogen or animal starch. The use of this substance, which is readily converted into sugar, would seem to be to supply the tissues with material for their energy and heat. The functions of the liver, however, still form the subject of dispute and investigation among physiologists. See Bile and Gall-bladder.

There are many diseases connected with this important gland. There is congestion of the liver, which indicates that the structure is surcharged and choked with blood. This arises from various causes; heart disease, disease of the lungs, or even excess in food or drink will produce congestion. The symptoms are excessive weight, fulness, and a tenderness in the organ which may be proved by a slight push in the region beyond the breast-bone. Inflammation of the liver is frequent in hot countries; is closely connected with dysentery, and its symptoms are similar to those connected with congestion. Cirrhosis of the liver or drunkard's liver is frequently caused by excessive spirit-drinking—but not necessarily so, as it has been known to occur in children. The symptoms are many and not easily recognized; and the disease may remain for years before a fatal issue. Fatty degeneration of the liver occurs when the cells become crowded with globules of oil, and it becomes large and pale. This result usually arises from overfeeding or drinking and want of exercise. See Jaundice.

LIVERPOOL, an episcopal city, parl., county, and municipal borough, and seaport of England, county of Lancaster, on the right bank of the Mersey, about 4 miles from its confluence with the Irish Sea, 185 miles northwest from London. The chief public buildings are the town hall, municipal offices, revenue buildings, St. George's hall, exchange, public library and museum, art gallery, Picton reading-room, the Wellington rooms, government offices, and law courts. The free public library and museum accommodate a central technical school, while one portion is occupied by the reference library of 120,000 volumes, and another section by the museum. Near the library is a gallery of art for the unrestricted use of the people. There are altogether upward of 300 places of worship in Liverpool, and many of the churches and chapels are very handsome buildings. When Liverpool was constituted a bishop's see in 1880, the parish church of St. Peter was made the cathedral. The charitable and benevolent institutions, such as hospitals, and infirmaries, etc., are numerous. The educational institutions include University College (affiliated to the Victoria University, Manchester), Liverpool College, the Royal Institution, the Liverpool Institute, School of Art and

Gallery of Art, etc. Next to London it is the chief seaport in the United Kingdom, or indeed in the world. Among the imports cotton holds the chief place, followed by provisions and live-stock, cereals, fruits, hides, palm and olive-oil, wine and spirits, tobacco, etc. Cotton goods form by far the principal export; other exports are machinery, woolens,



St. George's Hall and Lime street station, Liverpool.

etc. Manufacturing industries are varied, and include engineering, iron- and brass-founding, chemicals, sugar-refining, brewing, rope-making, etc. Liverpool is the chief port in Britain for the departure of emigrants. There are five approaches to the town by railway, and by the opening of the tunnel under the Mersey the railway facilities have been

materially increased. Liverpool is, next to London, the largest town in England. Pop. 685,276.

LIVINGSTONE, David, missionary and African traveler, was born at Blantyre, Lanarkshire, 1813, and died near Lake Bangweolo, Africa, 1st May, 1873. His parents had settled in the neighborhood of the cotton mills near Blantyre, where David became a "piecer" at the age of ten. While at work in the mill he learned Latin and read extensively, and having attended the medical and Greek classes at Glasgow University during the winter months, he finally became a licentiate of the Faculty of Physicians and Surgeons of Glasgow. Under the auspices of the London Missionary Society he proceeded in 1840 to South Africa, where he joined Robert Moffat in the missionary field. His first station was in the Bechuana territory, and here his labors for nine years were associated with Mr. Moffat, whose daughter he married. Having heard from the natives that there was a large lake north of the Kalahari desert, he proceeded to explore that region, and discovered the valley of the Zouga and Lake Ngami. After making various journeys and exploring the Lake Nyassa and Zambesi region, Livingstone set forth in 1865 to set at rest the question of the sources of the Nile. From this time till his death he was engaged in laborious explorations in the lake region of South Africa, especially to the westward of Nyassa and Tanganyika, where he discovered Lakes Bangweolo and Moero, the Upper Congo, etc. For about three years no communication had come from him, and the doubts regarding the traveler's safety were only set at rest when it was known that H. M. Stanley, the special correspondent of the New York Herald, had seen and assisted Livingstone at Ujiji, on Lake Tanganyika. They parted in March, 1872, Livingstone going to explore the southern end of Tanganyika, and Stanley proceeding to Zanzibar. After another year's wanderings he was attacked with dysentery near Lake Bangweolo, and there he died. His body was buried in Westminster Abbey, having been conveyed to the coast, rudely preserved in salt, by his faithful followers.

LIVINGSTON, Edward, American jurist and statesman, was born in 1764, at Clermont, Columbia co., N. Y. From 1795 to 1801 he was a member of congress. In 1801 he was appointed United States attorney for the district of New York, and during the same year was elected mayor of the city of New York. In December, 1803, he sailed for New Orleans, and early in 1804 became a member of the bar there. During the second war with Great Britain he served for a time as secretary and confidential adviser to General Jackson. In 1820 he was elected to the lower house of the Louisiana legislature, and with two other members was commissioned to prepare a civil code for the state. In 1822 he was elected to congress. He was twice reëlected, serving until 1829, when he was transferred to the United States senate, where he took high rank. In 1831 President Jackson appointed him secretary of state, and in 1833 sent him as minister plenipotentiary to France to demand the payment by the French government of an indemnity of a million stirling on account of depredations upon American commerce. He was entirely successful. He died in 1836.

LIVINGSTON, Robert R., American

Robt R Livingston

jurist and statesman, was born in 1746; In 1776 he became a member of the

continental congress, and served on the committee which was appointed to draw up the Declaration of Independence. He was a member of the committee which drafted the constitution for the State of New York in 1777, and upon its adoption became the first chancellor of the state. It was in this capacity that he administered the oath of office to Washington, on the occasion of his first inauguration to the presidency, in New York City. In 1794 President Washington tendered him the post of Minister to France, which he declined; but in 1801, upon receiving a second tender of the same office, he accepted, and began the negotiations for the purchase of Louisiana, which, after the arrival of Monroe was carried to a successful conclusion. He died in 1813.

LIV'IUS, Titus, Patavinus, often called Livy, a celebrated Roman historian, born at Patavium (Padua) in the year 59 B.C. Nothing is known of his life except that he came to Rome, secured the favor of Augustus, and became a person of some consequence at court, that he was married, and had at least two children, and that he died in his native town, according to some authorities, A.D. 11, and to others, A.D. 16 or 17. His Roman history begins at the landing of Æneas in Italy, and comes down to the year of the city 744 (B.C. 9). His whole work consisted of 140 or 142 books, of which we have remaining only the first ten, and those from the twenty-first to the forty-fifth, or the first, third, and fourth decades, and half of the fifth. Of all the books, however, except two, we possess short epitomes or tables of contents. In the first ten books the history extends from the foundation of Rome B.C. 753 to the year 294 B.C.; the portion between the twenty-first and forty-fifth books contains the account of the second Punic war and the history of the city between B.C. 219 and 201. The fourth and the half of the fifth decade bring down the history to the year B.C. 167. Livy makes no pretensions to the character of a critical historian; his grand purpose was to glorify his country, and he adopted all the legends of the early history without troubling his mind about their authenticity.

LIVO'NIA, or **RIGA,** a government of Russia, including the island of Oesel, bounded west by the Baltic; area, 17,609 sq. miles. The inhabitants are almost all Protestants. The capital is Riga. Pop. 1,207,887.

LIVRA (lē-vr), an old French money of account, not now in use, having been superseded by the franc.

LIVY. See Livius.

LIZARD is the popular name of numerous reptiles having usually two pair of limbs and an elongated body terminating in a tail. The lizards number more than a thousand species, accommodating themselves to all conditions except cold, and increasing in size and number in tropical regions. In some the tongue is thick and fleshy and in others it is divided, while in most cases it is protrusible. Some lizards are vegetable feeders, but for the most part they are carnivorous and live upon small birds, insects, etc. The eggs are deposited and left to be hatched without care from the parents.

Nimble lizard.

LLAMA (lä'ma or lyä'mä), an ungulate ruminating quadruped found in South America, closely allied to the camel, and included in the family Tylopoda. They differ from the camel in having no hump upon the back, in having a deeper cleft between the toes, the callous pad of the foot is less developed, and the interval between the canine and the back teeth is greater. The tail being short and the hair long and thick, the llama has the general appearance of a long-necked sheep,

Llama.

standing about 3 feet at the shoulder. Of the four known species the guanaco and the vicuña are found in a wild condition, while the llama and the alpaca have long been domesticated. The llama is used by the inhabitants of Chile and Peru to carry burdens after the manner of a camel. When loaded with about a hundredweight it can travel some 14 miles a day across the mountain passes. They are gentle and docile creatures.

LLANOS (lyä'nōs), the Spanish name given to the vast plains situated in the north part of South America, particularly in Colombia and the basin of the Orinoco. During the dry season the vegetation is burned up by the sun, while in the rainy period they are flooded with water. Between these two seasons the llanos are covered with thick grass and ranged by vast herds of cattle and horses. Farther south such plains are called pampas, and in North America savannahs.

LLANQUIHUE (lyän-kē'wā), a southern province of Chile, situated between the Andes and the Pacific Ocean. Its area of nearly 8000 sq. miles is extremely fertile, yielding abundant harvests to its inhabitants, who are mostly Germans; capital, Puerto Montt. Pop. 91,000.

LLOYD, Henry Demarest, American author, born in New York City in 1847. From 1872 to 1885 he was connected with the Tribune of Chicago. He also held the secretaryship of the American Free Trade League. The first of his publications was A Strike of Millionaires Against Miner. His Wealth Against Commonwealth is an examination of the methods of the Standard Oil Company. His other works are: Labor Copartnership, Notes of a Visit to Coöperative Workshops, Factories and Farms in Great Britain and Ireland (1898); Newest England; Notes of a Democratic Traveller in New Zealand; and A Country Without Strikes; A Visit to the Compulsory Arbitration Court of New Zealand. He died in 1903.

LLOYD'S, an incorporated society of persons engaged in marine insurance in London, or otherwise connected with shipping, having rooms in the London Royal Exchange. Members are admitted by subscription, and the affairs of the institution are conducted by a committee. Reports are received daily from all foreign ports, and this information is posted in the common or merchants' room. Besides this, there are other rooms for the use of the underwriters and for ship-auctions, a library, restaurant, etc., Lloyd's List, containing shipping reports, is published daily, and Lloyd's Register of shipping is issued annually. Originally the London underwriters met at Lloyd's Coffee-house, hence, the name. See Insurance.

LOADSTONE, an ore of iron, consisting of the protoxide and peroxide in a state of combination and frequently called the magnetic oxide of iron. It was known to the ancients, and they were acquainted with the singular property which it has of attracting iron. See Iron, magnet.

LOAM, a soil compounded of various earths, of which the chief are sand, clay, and carbonate of lime or chalk, the clay predominating. Decayed vegetable and animal matter, in the form of humus, is often found in loams in considerable quantities, and the soil is fertile in proportion.

LOAN, anything lent or given to another on condition of return or payment. In law loans are considered to be of two kinds—mutuum and commodate; the former term being applied to the loan of such articles as are consumed in the use, as provisions, or money; the latter to the loan of such articles as must be individually returned to the lender. The acknowledgment of a loan of money may be made by giving a bond, a promissory note, or an I. O. U.,

LOBE'LIA, a very extensive genus of beautiful herbs, natives of almost all parts of the world, especially of the warmer parts of America. One species is the Indian tobacco, which is cultivated in North America, and is employed in medicine.

LOBLOLLY-BAY, the popular name of an elegant ornamental evergreen tree of the maritime parts of the southern United States, having large and showy white flowers. It grows to the height of 50 or 60 feet.

LOBLOLLY-PINE, an American pine, next to the white pine the loftiest in

North America. Its leaves are 6 inches long, united by threes or fours. Its timber is of little value.

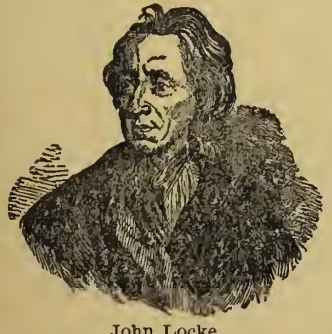
LOBSTER, the common name of long-tailed, ten-footed, stalk-eyed crustaceans. The first pair of ambulatory limbs bear the well-known and formidable lobster-claws. The abdomen has rudimentary limbs on its under side, among which are lodged the newly excluded spawn. The tail consists of several flat shelly plates capable of being spread like a fan, and used as a swimming organ. They inhabit the clearest water, living in the crevices of a rocky bottom. Lobsters are esteemed a very rich and nourishing aliment, but dangerous unless fresh and in good condition. They are generally in their best season from the middle of October till the beginning of May. The fresh-water lobster is the crawfish or crayfish.

LOCAL OPTION, a term applied to the principle by which a certain majority of the inhabitants or ratepayers of a certain locality may decide as to whether any, or how many, shops for the sale of intoxicating liquors shall exist in the locality.

LOCK, an inclosure in a canal, with gates at each end, used in raising or lowering boats as they pass from one level to another. When a vessel is descending, water is let into the lock till it is on a level with the higher water, and thus permits the vessel to enter; the upper gates of the lock are then closed, and by the lower gates being gradually opened, the water in the lock falls to the level of the lower water, and the vessel passes out. In ascending the operation is reversed, that is, the vessel enters the lock, the lower gates are closed, and water is admitted by the upper gates, which, as it fills the lock, raises the vessel to the height of the higher water.

LOCKOUT. See Strikes and Lockouts.

LOCKE, John, eminent English philosopher, was born at Wrington, in Somersetshire, 1632, and died 1704 at Oates in Essex. So early as 1670 Locke had formed the plan of his famous Essay on the Human Understanding, a plan which he had carefully elaborated, and which he published in its completed



John Locke.

form in 1690. It was received with much opposition, notably by the University of Oxford, who resolved to discourage it; but despite this it acquired a great reputation throughout Europe, and was translated into French and Latin. Briefly, it may be stated that the chief purpose of Locke's celebrated Essay was to find the original sources and the scope of human knowledge. The conclusions he arrived at were that there is no such thing as an "innate idea;" that the human mind is a sheet of white paper prepared to be written upon; that the knowledge thereon written is supplied by experience; and that "sensation" and "reflection" are the two sources of all our ideas.

LOCKPORT, a flourishing manufacturing town in New York, near a series of locks on the Erie Canal, 25 miles from Buffalo. Pop. 18,120.

LOCK'WOOD, Belva Ann (Bennett), American lawyer and reformer, was born at Royalton, N. Y., in 1830. In 1879, under a law admitting women, which she had been instrumental in getting passed, she was admitted to practice before the supreme court. She lectured frequently and became prominent in peace, woman suffrage, and temperance movements. In 1884 and in 1888 she was nominated for president by the equal rights party, and in 1896 represented the United States under a commission from the secretary of state at the congress of charities and corrections held at Geneva, Switzerland.

LOCKWOOD, James Booth, American Arctic explorer, was born at Annapolis, Md., in 1852. In 1881 he accompanied Adolphus W. Greely on his expedition to Lady Franklin Bay. His magnetic observations were among the most important results achieved by the expedition. On April 3, 1882, he started on his trip to the North Greenland coast, reaching on May 13th, the land called in his honor Lockwood Island, in latitude 83° 24′, the nearest point to the pole which had been reached up to that time, and added 125 miles of coast-line to the map of Greenland. He died in 1884.

LOCOMOTIVE ENGINE. See Steam Engine.

LOCOMOTOR ATAXIA, is a peculiar disease of the nervous system, deriving its name from the fact that the sufferer from it cannot order the movements of his limbs for definite purposes. The patient requires to guide his feet and legs by means of his sight, and even then the feet are jerked out and brought down in a violent way. This difficulty of movement is called "want of co-ordination of movement." The causes of the disease are obscure, its progress usually extends over a number of years, and recovery is rare.

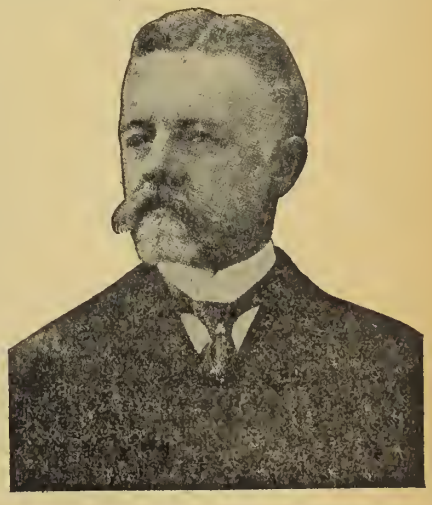
LOCUST, the name of several insects allied to the grasshoppers and crickets. Their hind-legs are large and powerful, which leaves them a great power of leaping. Their mandibles and maxillæ are strong, sharp, and jagged, and their food consists of the leaves and green stalks of plants. They fly well, but are often conveyed by winds where their own powers of flight could not have carried them. The most celebrated species is the migratory locust. It is about 2½ inches in length, greenish, with brown wing-covers marked with black. Migratory locusts are most usually found in Asia and Africa, where they frequently swarm in countless numbers darkening the air in their excursions, and devouring every blade of the vegetation of the land they light on. They are destructive both in the larval, nymph, and perfect conditions. The Arabs and others use them as food. When dried in the sun they are pounded up and baked into bread, or fried in oil as a delicacy. In America locusts are usually known as

Locust.

"grasshoppers." There are two specially destructive species, one of which is found in Northern New England and Canada; and the other breeds abundantly west of the Mississippi. In the summer months this latter species commits widespread ravages in Texas, Kansas, and Colorado.

LOCUST-TREE is found in the Eastern states, but grows to its best in Kentucky and Tennessee. There it acquires a girth of 4 feet and a height of 80 feet. The leaves are pinnate, smooth, prickly at the base; the flowers grow in pendulous racemes, white, fragrant, and producing smooth pods. The wood of the locust-tree is highly valued for certain purposes, being close-grained, tough, light, and elastic in the best variety; it is reddish-tinted.

LODGE, Henry Cabot, American politician and man of letters, was born in Boston in 1850. From 1873 to 1786 he edited the North American Review, and the following three years was lecturer on American history at Harvard. He then (1879) became editor of the International Review, which post he held till 1881. He was elected to the Massachusetts legislature, 1880–81, and was a



Henry Cabot Lodge.

delegate to the republican national conventions of 1880 and 1884. In 1886 he was elected to the national house of representatives. He was reëlected in 1888, and in 1893 succeeded Mr. Dawes as United States senator from Massachusetts. He was reëlected in 1899, and in 1905. He has written a Short History of the English Colonies in America; The Story of the American Revolution; and The War with Spain. The "Ameri-

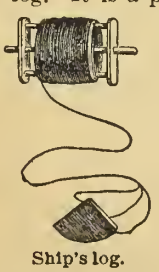
can Statesmen Series" owes to him the lives of Hamilton, Webster, and Washington.

LODI, a town in North Italy, in the province of Milan, in a fertile plain on the right bank of the Adda, 18 miles southeast of Milan. The principal buildings are the cathedral, a Gothic structure of the 12th century, and the Church of the Incoronata. The manufactures consist of majolica, silk, linen, and the great article of trade is Parmesan cheese. Here Napoleon effected the famous passage of the Bridge of Lodi against the Austrians, on the 10th of May, 1796. Pop. 27,811.

LODZ, a town in Russian Poland, in the government of Piotrokow, 76 miles southwest of Warsaw. Pop. 315,209.

LOEB (leb), Jacques, German-American physiologist and experimental biologist, was born in 1859. He was appointed state examiner at Strassburg in 1885, was assistant in physiology at the University of Würzburg in 1886–88, and held a similar position in the University of Strassburg in 1888–90. He made researches in animal physiology at the Naples Zoölogical station in 1889–91. In 1902 he was elected professor of physiology in the University of California. Professor Loeb is the pioneer in the study of the physiology of cells and tissues, including the effects of salt solutions on the muscles of the heart in different animals. He has made experiments on the mechanism of the reflex activities of the lower animals, with especial relation to the different kinds of tropisms and the mode of orientation of organisms. Although the true basis of instinctive acts as inherited reflexes was first pointed out by Herbert Spencer, Loeb has done much by his experiments to show the slight line of demarcation existing between the lower instincts and reflex actions. He has also made notable contributions to other problems in physiological psychology. His essays have appeared in Pflüger's Archiv, and in The American Journal of Physiology. In his book Comparative Physiology of the Brain and Comparative Psychology (1902) will be found the titles of other papers.

LOG, a contrivance used to measure the rate of a ship's velocity through the water. For this purpose there are several inventions, but the one most generally used is the following, called the common log. It is a piece of thin



Ship's log.

board, forming the quadrant of a circle of about 6 inches radius, and balanced by a small plate of lead nailed on the circular part, so as to swim perpendicularly in the water, with the greater part immersed. One end of a line, called the log-line, is fastened to the log, while the other is wound round a reel. When the log is thrown out of the ship while sailing, as soon as it touches the water it ceases to partake of the ship's motion, so that the ship goes on and leaves it behind, while the line is unwound from the reel, so that the length of line unwound in a given time gives the rate of the ship's sailing. This is calculated by knots made on the line at certain distances, while the time is measured by a sand-glass running a certain number of seconds. The length between the knots is so proportioned to the time of the glass that the number of knots unwound while the glass runs down shows the number of nautical miles the ship is sailing per hour. Thus, if the glass be a half-minute one, it will run down 120 times in an hour. Now, since a nautical mile contains about 6076 feet, the 120th part of this is about $50\frac{2}{3}$ feet; so that if the spaces between the knots be $50\frac{2}{3}$ feet, the number of knots and parts of a knot unwound from the reel in half a minute is the number of miles and parts of a mile the ship runs in one hour.

LOG. See Log-book.

LOGAN, John. A famous Indian chief, the son of Shikellamy, a Cayuga chief noted for his friendship with the whites. In April, 1774, several whites, headed by a man named Greathouse, the keeper of a whisky shop, murdered nearly the whole of Logan's family in cold blood at Yellow Creek. Logan, frenzied by this blow, incited the already restive Indians forthwith to attack the whites, and in the brief war which ensued was himself conspicuous for ferocity and cruelty, taking with his own hands as many as thirty scalps. He disdained to sue for peace along with the other chiefs, after the battle of Point Pleasant, and instead sent to Lord Dunmore, by a trader named John Gibson, a message which is regarded as one of the finest examples of Indian eloquence, though its authenticity has been called into question. Jefferson in his Notes on Virginia quoted it, and first directed general attention to it.

LOGAN, John Alexander, American soldier and political leader, was born in Jackson co., Ill., in 1826. At the outbreak of the war with Mexico he enlisted as a private, and became quartermaster of his regiment, with the rank of first lieutenant. He was a member of the Illinois legislature in 1852–53 and in 1856–57, was prosecuting attorney from 1853 to 1857, and was elected to congress in 1858 as a Douglas democrat. He was reëlected in 1860, but resigned his seat in 1861 to enter the army. He was made colonel of the Thirty-first Illinois volunteers, and led the regiment at Belmont, Fort Henry, and Fort Donelson; was wounded in the latter engagement and in 1862 was appointed brigadier-general and a few months later major-general of volunteers. In 1863 he was put in command of the fifteenth corps which he led until the death of McPherson, when he took for a time the command of the army of the Tennessee. After the war he was twice elected to congress and in 1871 he was elected to the United States senate. He was a candidate for the presidential nomination at Chicago in 1884 but after the unanimous nomination of James G. Blaine was announced he was nominated by acclamation for vice-president. He died in 1886.

LOGAN, MOUNT, the second highest peak of North America. It is situated in the southwestern corner of Yukon territory, Canada, close to the Alaskan boundary. Its height is 19,500 feet.

LOGANSPORT, the capital of Cass co., Ind., at the junction of the Wabash and Eel rivers; on the Pitts., Cin., Chi. and St. L., the Vandalia, and the Wabash railways; 70 miles n. of Indianapolis. The principal manufactures are galvanized iron, linseed oil, windpumps, paper, hubs and spokes, flour, and plow-handles. Pop. 19,140.

LOG'ARITHMS, the common logarithm of a number is the index of the power to which 10 must be raised to be equal to the number. Thus $10^3 = 1000$, so that the logarithm of 1000 (usually written log. 1000) is 3. Now $10^1 = 10$, $10^2 = 100$, $10^3 = 1000$, $10^6 = 1{,}000{,}000$, and it is well known that $10^0 = 1$, $10^{-1} = 0{\cdot}1$, $10^{2-} = 0{\cdot}01$, etc., thus—

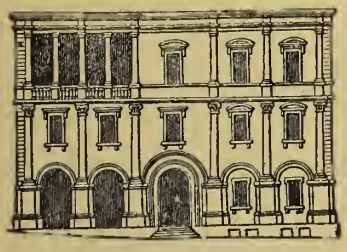
Log. 0·001 = −3	Log. 10 = 1
Log. 0·01 = −2	Log. 100 = 2
Log. 0·1 = −1	Log. 1000 = 3
Log. 1 = −0	Log. 10,000 = 4

It is evident that the logarithm of any number greater than 1 and less than 10 is fractional; the logarithm of any number greater than 10 and less than 100 is greater than 1 and less than 2. Again, the logarithm of any number less than 1 is negative. Suppose we wish to know the logarithm of the number 18.1. In a book of tables we only find the fractional part of the logarithm, it is ·257679. Now 18·1 is greater than 10 and less than 100, so that its logarithm is greater than 1 and less than 2; hence log. 18·1 = 1·257679. The integral part of a logarithm is called its characteristic, the fractional part its mantissa. Logarithms make arithmetical computation more easy, for by means of a table of them the operations of multiplication, division, involution or the finding of powers, and evolution or the finding of roots, are changed to those of addition, subtraction, multiplication, and division respectively. For instance, if x and y are the logarithms of any two numbers, the numbers are 10^x and 10^y now the product of these numbers is 10^{x+y}, so that the logarithm of the product of two numbers is the sum of the logarithms of the numbers. Again, the quotient of the numbers is 10^{x-y}; so that the logarithm of the quotient of two numbers is the difference of the logarithms of the numbers. Again, 10^x raised to the nth power is 10^{nx}; so that the logarithm of the nth power of a number is n times the logarithm of the number. Logarithms of this kind are common logarithms, and were invented by Briggs; their base, as it is called, is 10. Logarithms were first used by Napier of Merchiston (see Napier, John) and he employed a base which is smaller than 10, namely, the number 2·7182818....., or the sum of the infinite series $2 + \frac{1}{2} + \frac{1}{2.3} + \frac{1}{2.3.4} +$ etc. This base is denoted by e in mathematical treatises, and the Napierian logarithm of any number, say 7, is loge 7, to distinguish it from log. 7, which is the common logarithm, whose base is 10.

The common logarithm of a number is found from the Napierian by multiplying by 0·43429448. Napierian logarithms are of great importance in the higher mathematics.

LOG-BOOK, a book kept in ships and into which the direction of the wind, course of the ship, state of the weather at all hours of the day, are daily transcribed at noon, together with every circumstance deserving notice that may happen to the ship or within her cognizance, either at sea or in a harbor, etc.

LOGGIA (loj'â), a word used in Italian architecture with several significations. First, it is applied to a hall open on two or more sides, where there are pillars to support the roof, such as the Loggia de' Lanzi in Florence. It is also applied to an open colonnade or arcade surrounding a court, or to an



Loggia, palace at Montepulciano.

open gallery at the height of one or more stories in a building, as seen in the figure. The name loggia is also given to the large ornamental window, consisting of several parts, which is often seen in old Venetian palaces; and lastly, it is used to designate a small airy hall, usually open on all sides, constructed on the roof of an edifice.

LOGIC, a department or division of mental science which has been differently defined by authorities. The older school of logicians agreed on the whole in considering it as mainly treating of reasoning and the operations of mind subsidary to reasoning; and this definition sufficiently indicates the view of the science held by such logicians as Whately and Hamilton. According to them logic dealt only with the form of thought, that is, with what is common to all reasonings, judgments, and concepts respectively, and had nothing to do with the matter, that is, the subject or content of reasonings, judgments, etc. In this view the science of logic was merely deductive, and the syllogistic process, or the intellectual act performed in deducing particular truths from general truths already given, was the main subject of the science. It is evident, however, that in practical research there is another movement or process of the mind of at least equal importance—viz., the process by which the mind reaches general truths from the observation of particulars. This latter is the inductive process, and on it, regarded as the more important element in inference and the ascertainment of truth, John Stuart Mill founded his new system of inductive logic. The nature of scientific evidence, the methods and principles involved in scientific research, are the chief subjects of study in this system of logic. Very different from both of these are the conceptions of logic given by the chief German philosophers. Kant, in declaring that only the matter (not the form) of experience was given to the mind, had recognized thought as the essential factor of cognition, and had initiated a new co-called transcendental logic, which was an analysis of the general conditions under which the objective world became cognizable. Thus the foundation was laid for a view of reality as in its very nature constituted by thought. Thought or the ego is itself the real, and there being no separate reality logic becomes the system of the forms in and through which thought or intelligence is realized. Logic thus appears, as in Hegel, a complete theory of knowledge and a metaphysic. The earliest work on logic is the Organon of Aristotle, who practically gave the science the shape it possesses. See Deduction, Induction, Fallacy, Syllogism, etc.

LOGOMA'NIA, a disease of the faculty of language generally associated with organic disease of the nervous structure, as in paralysis. In this disease, while conceptions and ideas remain clear, the power of associating these with the word by which they are expressed is lost, and the patient can either not give any names to his conceptions at all or expresses them erroneously. Sometimes one class of words is lost and others retained. Thus a patient may forget his own name, or nouns only, and remember all other words. Sometimes he forgets only parts of the word, as terminations and not unfrequently in another form of the disease he inverts his phrases.

LOGRONO (lo-grōn'yō), a town in Spain, capital of the province of same name. Area, 1944 sq. miles; pop. 186,223.

LOGWOOD, a popular name for a tree, which grows in moist and swampy places in Central America, and particularly round the Bay of Campeachy; but is now naturalized in Jamaica and many of the West Indian islands. The tree is usually from 40 to 50 feet high, with pinnate leaves and small yellowish flowers. The wood is red in color, tinged with orange and black, so heavy as to sink in water, and susceptible of receiving a

Logwood.

good polish. It is used chiefly as a dyewood, the trees being cut down, the bark and alburnum removed, and the hard center parts cut into 3-foot-long logs. To obtain the coloring matter it is hewn into much smaller pieces, and ground or rasped to small chips, or to a coarse powder. The equeous extract is muddy and of a reddish-brown color. By acids the red color is made paler; by alkalies it is converted to purple. By mordanting the fabric with iron, black is produced; with alumina, violet and lilac; with copper, blue; and with chromium, a black or green. The coloring power of logwood depends chiefly on a crystalline ingredient called hæmatoxylin. It is employed in calico-printing to give a black or brown color, and also in the preparation of some lakes. An extract of logwood is used in medicine as an astringent.

LOH'ENGRIN, the hero of a German poem of the end of the 13th century represented as the son of Parcival and one of the guardians of the Holy Grail. Sent by King Arthur to help the Princess Elsa of Brabant, he arrives in a vehicle drawn by a swan, delivers the princess from captivity, and marries her; accompanies the emperor in a campaign against the Hungarians, and fights against the Saracens. He then returns to his bride at Cologne, but being pressed by her to state his origin he is prevailed upon to tell it, after which he must, in terms of his vow, return home to the Grail. The legend has been made the subject of a well-known opera by Wagner.

LOIRE (lwär), the largest river of France, which it divides into two nearly equal portions. It rises on the western slope of the Cevennes, in the department of Ardèche, and flows generally n. n. w. and w. till it falls into the Bay of Biscay below Nantes. Its whole course is about 645 miles, of which about 450 miles are navigable.

LOIRE, a central department of France; area, 1837 sq. miles. The department occupies the upper part of the Loire basin, and consists of the fertile plains which extend on both sides of the river, forming its valley, and long ridges of the Cevennes, which hem the valley in on every side. The capital and great center of industry is St. Etienne; other towns are Roanne and Montbrison. Pop. 647,633.

LOIRE, Haute (ōt-lwär; Upper Loire), a department of Southeastern France; area 1915 sq. miles. Le Puy is the capital. Pop. 314,058.

LOIRE-INFERIEURE (lwär-aṇ-fā-ri-eur; Lower Loire), a western maritime department of France, intersected by the lower Loire and its estuary; area, 2653 sq. miles. Nantes is the capital. Pop. 664,971.

LOIRET (lwâ-rā), a central department of France; area, 2614 sq. miles. Orleans is the chief town. Pop. 366,660.

LOIR-ET-CHER (lwär-ē-shār), a central department of France; area 2451 sq. miles. The capital is Blois. Pop. 275,538.

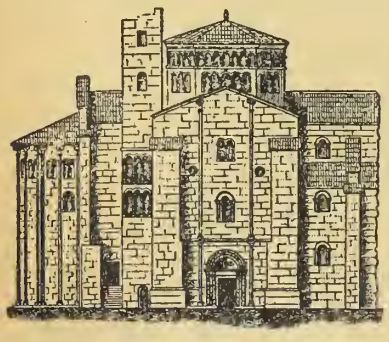
LOK, or **LOKI,** in Scandinavian mythology, the evil deity, father of Hel or Hela, goddess of the infernal regions. He is a personification of the principle of evil, described as of handsome appearance, but perpetually engaged in works of wickedness partly directed against the other gods.

LOLLARDS, a name which arose in the Netherlands about the beginning of the 14th century, and was applied as a term of contempt to various sects or fraternities deemed heretical, being probably derived from the Low German

lollen, to sing in a low tone. The name became well known in England about the end of the 14th century, when it was applied to the followers of Wickliffe, and to others more or less influenced by his teaching. The Wat Tyler revolt of 1381 was directly connected with Lollardism, and latterly the Lollards drew upon themselves the enmity of civil powers, and numbers of them were put to death especially during the reign of Henry V., when apparently another revolt was intended.

LOMBARD, Peter, or Petrus Lombardus, one of the most celebrated of the schoolmen, born near Novara, in Lombardy, about the year 1100. He was a scholar of Abelard in the University of Paris, became a teacher of theology, and at last, in 1159, bishop of Paris, where he seems to have died in 1164. His work Sententiarum Libri Quatuor is a classified collection of the opinions of the fathers on points of doctrine, with a statement of the objections made to them, and the answers given by church authorities. Hence he is known as the Master of Sentences.

LOMBARD ARCHITECTURE, the form which the Romanesque style of architecture assumed under the hands of the Gothic invaders and colonists of the north of Italy, comprising the buildings erected from about the beginning of the 9th to the beginning of the 13th century. It forms a connecting link between the romanized architecture of Italy and the Gothic of more northern countries. The most characteristic feature of the churches built in this style is the general introduction and artistic development of the vault, that feature which afterward became the formative principle of the whole Gothic style. In the Lombard architecture also pillars consisting of several shafts arranged round a central mass, and buttresses of small projection, appear to have been first employed. The tendency to the prevalence of vertical lines throughout the design, instead of the horizontal lines of the classic architecture, is also characteristic, as well as the use of the dome to surmount the intersection of the choir, nave, and transepts. Mr. Fergusson remarks: "Generally speaking the most beautiful part of a Lombard church is its eastern end. The apse with its gallery, the transepts, and, above all, the dome that almost invariably surmounts their intersection with the choir, constitute a group which always has a pleasing effect, and is very often highly artistic and beautiful." As examples of Lombard architecture may be mentioned the church of St. Michael, Pavia; San Zenoni, Verona; and the atrium of San Ambrogio, Milan.



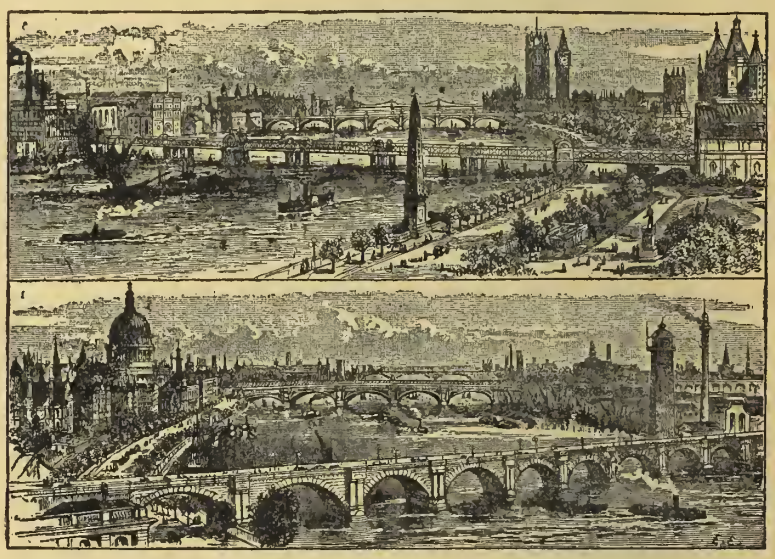
Lombard architecture. Transept, apse, and dome of St. Michael, Pavia.

LOM'BARDS, LONGOBARDI, or **LANGOBARDI,** a Germanic of Teutonic people who at the beginning of the Christian era were dwelling on the Lower Elbe. They make little appearance in history till the 6th century, when, under their king Alboin, they entered Italy in April 568, and, with the help of Saxons and others, conquered the northern portion, which hence received the name of Lombardy. Alboin was assassinated in 573 (see Alboin), and after some years of great confusion Autharis was recognized in 585 as king. He was a warlike and politic ruler, who gained the good-will of the subject Roman population, and instituted a better system of government than had heitherto existed. He married Theodelinde, a Frankish princess, who began the process of converting the Lombards from Arianism to the orthodox faith. The only king of note among the successors of her family was Rothari, who in 643 promulgated a system of laws, which, with subsequent additions, became among German jurists the basis of the study of law during the middle ages. From 713 to 744 the Lombards had a powerful king in the person of Liutprant, who extended his sway, at least temporarily, over the whole of Italy. From that time the power of the Lombards gradually declined, and finally Charlemagne captured Pavia after a six months' siege, and put an end to the Lombard Kingdom (773 or 774), the last monarch being Desiderius.

LOM'BARDY, the part of Upper Italy which took its name from the Lombards and which at first extended from the Adriatic to the Savoyan Alps. Lombardy is now the name of an Italian department (compartimento), embracing eight provinces (Bergamo, Brescia, Como, Cremona, Mantua, Milan, Pavia, and Sondrio), containing an area of 9086 sq. miles and a population of 4,282,728.

LOMBOK, an island, belonging to the Dutch, in the Indian Archipelago. The capital is Mataram on the west coast. Pop. 650,000.

LOMBROSO, CESARE (chā'zä-rē lŏm-brō'zō), Italian Scientist, was born in Verona in 1836. In 1862 he became professor of psychiatry at Paris and later of medical jurisprudence and psychiatry at Turin. He became widely known through his investigations of the abnormal human being and through his theories deduced therefrom; theories which encountered great opposition and are not yet entirely accepted but which formed in part the basis for the present criminal anthropology. His published works are: The Criminal, The Man of Genius, The Anarchist, The Cause of and Contest Against Crime. He died in 1907.



LONDON.—(1) The Thames embankment, Cleopatra's needle, Charing Cross and Westminster bridges, the houses of parliament, etc., looking up the river. (2) The Thames embankment, Waterloo bridge, St. Paul's, etc., looking down the river. Both views from the Savoy hotel.

LOMZA, a town of Russian Poland, capital of the government of the same name. Pop. 18,000. The government of Lomza covers an area of 4760 sq. miles, mostly flat and of a fertile soil. Pop. 608,000.

LONDON, the capital of the British Empire and the largest city in the world, is situated in the southeast of England on both sides of the River Thames, which winds through it from west to east. The river is crossed by numerous bridges, and is deep enough to allow large vessels to come up to London Bridge, the lowest of these (except the movable Tower Bridge), where it is 266 yards wide. London may be said to stretch from east to west about 14 miles, from north to south about 10. Its area may be stated at 74,672 acres, this being the area to which the registrar general's tables of mortality refer. The population within this area was 4,228,317 in 1891, and 4,536,063 in 1901. This is also the area of the administrative county, and of the school board district

LONDON

of London. The area embraced by the Metropolitan and City police districts, including all parishes within 15 miles of Charing Cross, is spoken of as Greater London; it covers 443,252 acres; pop. in 1891, 5,633,806; in 1907, 7,000,000. As regards population London is thus on a level with Scotland, Holland, Portugal, or Sweden.

The greater portion of London lies on the north side of the Thames, in the counties of Middlesex and Essex, mainly the former, on a site gradually rising from the river, and marked by several inequalities of no great height, except in the northern suburbs, where the elevation of 430 feet is reached; on the opposite bank, in the county of Surrey and partly in Kent, the more densely built parts cover an extensive and nearly uniform flat, in some places below the level of the highest tides, while the outskirts are mostly elevated. The nucleus of London was formed by what is still distinctively the City of London, situated in the heart of the metropolis on the north bank of the Thames. The city is a separate municipality, having a civic corporation of its own, at its head being the Lord-mayor of London. The city occupies only 671 acres, and has a resident population of only 27,000. Westminster, another portion of old London, associated with the sovereigns, the parliaments, and the supreme courts of justice of England for over 800 years, borders with the city on the west; while across the river from the city lies the ancient quarter of Southwark, or "The Borough."

As the capital of the British Empire London is from time to time the residence of the sovereign and court. It contains the buildings for the accommodation of parliament and all the great government departments. It is the chief intellectual center of Britain, if not of the world, and is equally great as a center of commerce, banking, and finance generally.

Although in the different districts of London, with the exception of the parts most recently built, there are numerous narrow and crooked streets, yet the whole extent of the metropolis is well united by trunk lines of streets in the principal directions, which render it comparatively easy for a stranger to find his way from one district to another. Piccadilly and Pall Mall; the Strand and its continuation, Fleet street; Oxford street and its continuations, Holborn, Holborn Viaduct, and Cheapside, are among noteworthy streets running east and west; while of those running north and south, Regent street, perhaps the handsomest street in London, and the location of fashionable shops, is the chief. The Thames embankment on the north or Middlesex side, known as the Victoria embankment, also forms a magnificent thoroughfare, adorned by important buildings, and at different points with ornamental grounds and statues. A number of magnificent bridges cross the Thames. A considerable traffic passes under the river by means of tunnels or underground passages, some of them for electric railways. The old Thames Tunnel, 2 miles below London Bridge, opened in 1843, is now traversed by a railway.

The chief parks are in the western portion of the metropolis, the largest being Hyde Park and Regent's Park, which, together with St. James's Park and the Green Park, are royal parks. The most fashionable is Hyde Park, containing about 400 acres. Regent's Park, in the northwest of London, north of Hyde Park, containing the gardens of the Zoological Society and those of the Royal Botanic Society, covers an area of 470 acres. The Zoological Gardens contain the largest collection in the world. Of the squares the most central and noteworthy is Trafalgar Square, with Charing Cross adjoining. Among the public monuments are "The Monument" on Fish Street Hill, London Bridge, a fluted Doric column 202 feet high, erected in 1677 in commemoration of the great fire of London; the York Column, in Waterloo Place, 124 feet high; the Guard's Memorial (those who fell in the Crimea), same place; the Nelson Column, in Trafalgar Square, 176½

Ludgate Hill and St. Paul's, London.

feet high, with four colossal lions by Sir E. Landseer at its base; the national memorial to Prince Albert in Hyde Park, probably one of the finest monuments in Europe, being a Gothic structure 176 feet high, with a colossal statue of the prince seated under a lofty canopy; Cleopatra's Needle on the Thames Embankment; a handsome modern "cross" at Charing Cross; numerous statues of public men, etc.

Among the royal palaces are St. James's, erected by Henry VIII.; Buckingham Palace, the King's London residence, built by George IV.; Marlborough House, the residence of the Prince and Princess of Wales; Kensington Palace, the birthplace of Queen Victoria. These are all in the west of London. Lambeth Palace, the residence of the Archbishops of Canterbury, is situated on the Surrey side of the river. On the north bank of the Thames stand the houses of parliament, a magnificent structure in the Tudor Gothic style, with two lofty towers. The buildings cover about 8 acres, and cost $15,000,000. Westminster Hall, adjacent to the houses of parliament, was formerly the place in which the supreme courts of justice sat, but is now merely a promenade for members of parliament. In and near Whitehall in the same quarter are the government offices, comprising the foreign, home, colonial, and India offices, the horse guards and admiralty. Somerset House, which contains some of the public offices, is in the Strand. The post-office in the city occupies two spacious and handsome buildings. Adjoining the city on the east is the Tower, the ancient citadel of London, which occupies an area of 12 acres on the banks of the Thames. The most ancient part is the White Tower, erected about 1078 for William the Conqueror. One of the most important of recent public buildings is the new Law Courts, a Gothic building at the junction of the Strand and Fleet street. Other noteworthy buildings are the Bank of England; the Royal Exchange; the Mansion House, the official residence of the lord-mayor; the Guildhall, the seat of municipal government of the city; the four Inns of Court (Inner and Middle Temple, Lincoln's Inn, Gray's Inn); etc.

Among the churches the chief is St. Paul's Cathedral, completed in 1710 by Sir Christopher Wren. Westminster Abbey dates from the reign of Henry III. and Edward I. It adjoins the houses of parliament. Here the kings and queens of England have been crowned, from Edward the Confessor to Edward VII. In the south transept are the tombs and monuments of great poets from Chaucer downward, whence it is called "Poet Corner;" and in other parts are numerous sculptured monuments to sovereigns, statesmen, warriors, philosophers, divines, patriots, and eminent individuals generally, many of whom are interred within its walls.

Among the museums and galleries the principal is the British Museum, the great national collection. It contains an immense collection of books, manuscripts, engravings, drawings, sculptures coins, etc. The South Kensington Museum is a capacious series of buildings containing valuable collections in science and the fine and decorative arts, and there is a branch museum from it in Bethnal Green, in the East End. The chief picture-galleries are the National Gallery, in Trafalgar Square, the National Gallery of British Art, the collection in South Kensington Museum, and the National Portrait Gallery.

London is one of the healthiest of the large cities of the world, the annual death-rate per 1000 being in recent years about 18 or 19. The sewerage system is necessarily gigantic, there being altogether about 250 miles of sewers. There is no single system of water supply, the water being furnished by several companies from the Thames, the Lea, and other sources.

The city of London proper is governed by a lord-mayor, chosen annually, and by twenty-five aldermen, four sheriffs, and two hundred and thirty-two common councilmen. The lord-mayor is elected by the members of the city guilds or companies, known as the

liverymen, and numbering about 7000. A body known as the Metropolitan Board of Works, created in 1855, took charge of all general improvements, and had the management of all public works in which the ratepayers of the metropolis had a common interest up to 1889, when it was superseded by the London County Council under the Local Government Act of 1888. The administrative county of London comprehends the whole of the metropolitan parliamentary boroughs, which elect 118 councillors; there being also 19 aldermen (or a number not to exceed one-sixth of the councillors). The city of London is unaffected by this change, except that its sheriffs are no longer sheriffs of Middlesex, and the right of appointing certain judicial officers is transferred from the corporation to the crown. By the London government Act of 1899 the county was divided into separate boroughs, each under its own mayor, aldermen, and council. The metropolitan police force numbers nearly 16,000, the city police over 1000.

LONDON, a town of Canada, the capital of Middlesex co., Ontario, on the Thames and the Great Western Railway, 121 miles west of Toronto. There are extensive oil-refining works, iron-foundries, chemical works, and other manufacturing establishments. It is the center of a fine agricultural region, and carries on an active trade in wheat and agricultural produce. Pop. 37,981.

LONDON, University of, was originally established as a joint-stock undertaking in 1825. In 1836 two charters were granted, one to London University, with power merely to examine and grant degrees, another to a teaching body, which took the name of University College. Supplementary charters were granted in 1858, 1863, and 1878, the last admitting women to all degrees and prizes. The university itself still continued to confer degrees simply, but by an act passed in 1898 provision was made for its reconstruction, whereby it should become both a teaching and an examining body; and in accordance with regulations, coming in force in 1900, the university embraces a number of institutions, in which students receive instruction in all branches of knowledge. These include University College, King's College, and a number of metropolitan institutions, medical, theological, scientific, etc.; the faculties of the university being eight in number. The university still continues to confer degrees on all comers after examination, admitting as a candidate any person who is above sixteen years of age. Provincial examinations are carried on simultaneously with the London ones.

LONDONDERRY, a city and seaport in the north of Ireland, capital of the county of the same name, on the river Foyle, which is here crossed by an iron bridge 1200 feet long. The harbor is commodious, and vessels of large tonnage can discharge at the town. Pop. 39,892.—The county is bounded on the north by Lough Foyle and the Atlantic Ocean, elsewhere by Tyrone, Lough Neagh, and Antrim; area, 522,315 acres. Pop. 144,404.

LONDONDERRY, Robert Stewart, Second Marquis of, British statesman, born in county Down, 1769. In 1796 he became Lord Castlereagh, and, being a member of the Irish parliament, next year he was made keeper of the privy-seal for that kingdom, and the year after chief secretary to the lord-lieutenant. In 1812 he became foreign secretary and he was a member of the congress of Vienna in 1814. He became very unpopular through his conduct on this occasion and his support of the Holy Alliance; and the responsibilities which he had to assume as virtual prime-minister in connection with repressive measures for the protection of order, and the fatigues of an arduous session, seem to have unhinged his mind, leading him to commit suicide in 1822. He had succeeded his father the year before as Marquis of Londonderry.

LONG, Crawford W., American surgeon, probably the first to use ether anæsthesia in surgery, was born in Danielsville, Ga., in 1815. Having learned of the insensibility produced by inhaling ether vapor, Long experimented upon himself, and in March, 1842, administered ether and during the patient's unconsciousness excised a tumor from his neck. In 1902 the Georgia Medical Association began to collect funds with which to erect a statue of Long in the Capitol at Washington, as "the discoverer of anæsthesia." He died in 1878.

LONG, Edwin, an English artist, born in 1839, died 1891, gained a high reputation as a painter of historical scenes from Eastern history. Among his more important works we may mention, Babylonian Marriage Market (1875), An Egyptian Feast (1877), Gods and Their Makers (1878), Esther and Vashti (1879), Why Tarry the Wheels of his Chariots (1882), Judith, Thisbe, Anno Domini (1884), Callista the Image Maker (1887). Mr. Long has also achieved considerable success in portraiture. He was elected a member of the Royal Academy in 1882.

LONG, George, English scholar, born 1800, died 1879. He was one of the founders of the Royal Georgaphical Society, and did much work in connection with the Society for the Diffusion of Useful Knowledge, including the editing of the Penny Cyclopedia.

LONG, Stephen Harriman, American engineer and explorer, born at Hopkinton, N. H., in 1784. In 1814 he was appointed second lieutenant, U. S. A., in the Corps of Engineers, from 1814 to 1816 was assistant professor of mathematics at the United States Military Academy. In 1816 he made under great difficulties a survey of the Mississippi and its branches, and soon after led an expedition from the Mississippi to the Rocky Mountains, one of the noblest peaks of which bears his name. In 1861 he was appointed chief of topographical engineers with rank of colonel, and in 1863 retired from the army. He died in 1864.

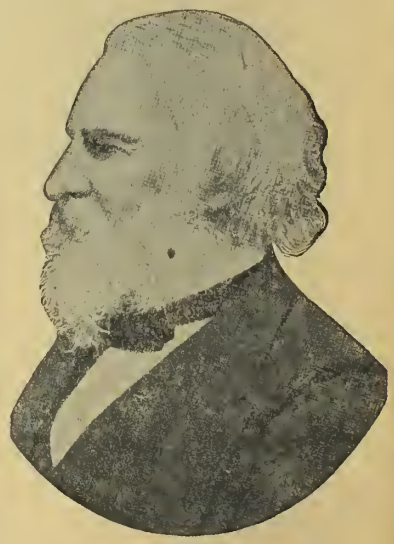
LONG-BOAT, a large ship's boat, carvel built, from 32 to 40 feet long, having a beam from .29 to .25 of its length.

LONG-BOW. See Bow.

LONG BRANCH, a fashionable watering-place in New Jersey, 30 miles south of New York City. It has wide avenues with numerous hotels, boarding-houses, and cottages. The permanent population is about 9000, but during summer is sometimes increased by 50,000.

LONGEVITY, a term which is used both for average or probable duration of life in a community, or for great length of life reached by particular individuals. When the sexes are considered separately the average duration of life is somewhat higher in women than in men. The question of the extreme limit to which human life may possibly attain is also of great interest. Ordinary observation leads to the conclusion that a comparatively small number of men reach the age of 70, a very much diminished number attain to 80, while 90 is rare. There are, however, well-authenticated cases of persons who have reached 100 years and even a few years more; but such cases as that of Thomas Parr, said to have been 152 years old, and Henry Jenkins, said to have been 169, rest on merely unreliable assertion. See Mortality-table in Insurance Life.

LONGFELLOW, Henry Wadsworth, American poet, was born at Portland, Maine, 1807; died 1882. In 1833 he published a volume of translations from Coplas de Manrique, with an essay on the Moral and Devotional Poetry of Spain; in 1835 appeared Outre Mer, a volume of prose sketches, and in the same year he was elected to the chair of modern languages and literature in Harvard University. In 1839 he published



Henry W. Longfellow

Hyperion, a Romance, and Voices of the Night, a series of poems. Ballads and other Poems and a small volume of Poems on Slavery appeared in 1842; the Spanish Student, a drama in three acts, in 1843; the Belfry of Bruges in 1846; Evangeline in 1847. In 1849 he published Kavanagh, a tale in idyllic prose; in 1850 the Seaside and the Fireside; in 1851 The Golden Legend; in 1855 Hiawatha; in 1858 the Courtship of Miles Standish; in 1863 Tales of a Way-

side Inn; in 1866 Flower de Luce; in 1867–70 an excellent poetical translation of Dante; in 1869 New England Tragedies; in 1871 the Divine Tragedy; in 1872 Three Books of Song; in 1874 the Hanging of the Crane; in 1875 Morituri Salutamus and the Masque of Pandora; and in 1878 Keramos. He resigned his chair at Harvard in 1854. In 1868–69 he again traveled in Europe, and received the degree of LL.D. and D.C.L. from the Universities of Cambridge and Oxford respectively. His poems are equally popular on both sides of the Atlantic.

LONGFORD, an inland county of Ireland, in the province of Leinster bounded on the west by the Shannon and Lough Ree; area, 269,409. acres. Pop. 46,581.

LONGICORN BEETLES, a family of Coleoptera, including a vast number of large and beautiful beetles, all remarkable for the length of their antennæ, which, in the males of some of the

Longicorn beetle.

species, are several times longer than their bodies. The females deposit their eggs beneath the bark of trees by means of a long, tubular, horny ovipositor, and the larvæ are very destructive to wood.

LONG ISLAND, an island belonging to the state of New York, extending 118 miles in length, and varying from 12 to 23 miles in breadth; area, 1682 sq. miles. It is connected with New York City by two great suspension bridges carried across East river, and is separated from Connecticut by Long Island Sound. There are considerable tracts covered with timber; the most fertile portions are carefully cultivated, and much produce is sent to New York and Brooklyn. Railways are numerous. The chief city is Brooklyn, but there are many popular seaside resorts along the coast. Pop. 1,600,000.

LONG ISLAND CITY, a town on the west coast of Long Island, and separated from Brooklyn by Newtown Creek. The city contains extensive warehouses, oil-refineries, timber-yards, machine-shops, manufactures of carpets, etc. Since 1898 it has been part of Greater New York. Pop. 48,272.

LONG ISLAND SOUND, an arm of the sea between Long Island and the state of Connecticut, about 115 miles long and generally about 20 miles wide. It is connected with New York Bay by the strait called East river. See East River, Hell Gate.

LONGITUDE, in geography, the distance of a place due east or west from a meridian taken as a starting-point, this distance being measured along the equator or a parallel of latitude; in other words, it is the angle between the meridian plane of one place and some fixed meridian plane. Longitudes are generally reckoned from the meridian of Greenwich; the meridians of Paris, Ferro, and

Washington are or have been also employed. (See Meridian.) Since the parallels of latitude get smaller toward the poles, at which all the meridians converge, it is evident that degrees of longitude which are 69½ statute miles long at the equator get shorter toward the poles, at which they finally become 0, as will be understood from the accompanying cut. As the earth makes one revolution on its axis, that is turns through 360° of longitude from west to east, in twenty-four hours, if the sun or a star is on the meridian of any place at a particular time it will be on the meridian of another place 15° west of the first in one hour. Thus 15° of longitude represent one hour of difference in time, and hence longitude may be easily determined by the use of the chronometer set to Greenwich time, which is the method commonly employed at sea. Longitude is reckoned to 180° eastward or westward of the fixed meridian. The latitude and longitude of a place are what enables us to fix its exact position on a map or globe. Celestial longitude is quite analogous to terrestrial.

LONGSTREET, General James, American soldier, born in South Carolina 1821. He graduated at the Military Academy in 1842; saw much service on the Mexican frontier, and took a prominent part on the confederate side during the civil war. Since the close of the war he has occupied several important offices, including that of ambassador to Constantinople. He died in 1904.

LONG'WORTH, Nicholas, American horticulturist, born in Newark, N. J., 1783. He is especially noted for his efforts to establish grape-growing in the Ohio valley. So successful was he that he has been called "The Father of American Grape Culture." Not only was he a pioneer and leading horticultural expert in his section, but was recognized as an authority in national horticultural matters. He died in 1863.

LOO-CHOO, LEW-CHEW, LIU-KIU (Japanese, Riu-Kiu), a chain of islands in the Pacific between Japan and Formosa, and between lat. 24° 10′ and 28° 40′ n.; but the name is sometimes extended also to the group further north, properly known as the Linschoten Islands. The largest island is Okinaw, or Great Loo-Choo (area about 500 sq. miles). Oshima the island next in size, has an area of 300 sq. miles. Since 1874 the archipelago has belonged to the Japanese empire. Confucianism is the prevailing religion, but Buddhism has a considerable number of adherents. Pop. 460,000.

LOOM. See Weaving.

LOON, or **GREAT NORTHERN DIVER,** popular name of a swimming bird of the family Urinatoridæ, found in both hemispheres. It is a large, solitary bird, 32 inches long, very difficult to shoot. It is a fine diver, perfectly at home in air or water, but by no means so on the land, its feet being set so far back that it can not walk at all, but

Great northern diver.

scrambles along scraping its breast on the ground.

LOPE DE VEGA. See Vega.

LOPEZ, Francisco Solano, President of Paraguay, born at Asuncion in 1827, son of Don Carlos Antonio Lopez, then president. He filled some of the principal offices of state, and was sent to Europe in 1853, accredited to the chief courts there. In 1855 he returned to Paraguay, became minister of war, and on the death of his father, in 1862, president for ten years. He had long been aiming at the foundation of a great inland empire, and as his military preparations were now complete, and his army superior to that of any of the South American states, he took opportunity in 1864 to commence hostilities against Brazil. The Argentine Republic and Uruguay allied themselves with Brazil, and after five years' conflict Lopez was reduced to extremities, and was finally surprised on the banks of the Aquidaban by a troop of Brazilian cavalry and slain, 1st March, 1870.

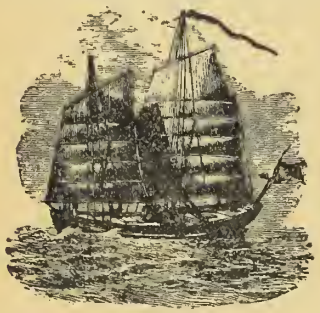
LOPHOBRANCHII, the sub-order of Teleostean fishes, including the peculiar "Sea-horses" and the "Pipe-fishes." See Pipe-fishes and Sea-horses.

LOQUAT, a Japan fruit-tree. The fruit is about the size of a large gooseberry, of a fine yellow color. The tree is a beautiful evergreen, whose white flowers have a fragrance like that of hawthorn blossom. It attains a height of from 20 to 30 feet, but when cultivated it is not allowed to exceed 12 feet.

LORAIN a town in Lorain co., Ohio, on Lake Erie, at the mouth of the Black river, and on the N. Y., Chi. and St. L and the Cleve., Lorain and Wheel. railways; 26 miles w. of Cleveland. Pop. 19,356.

LORCA, a town of Southern Spain, in the province and 42 miles southwest of Murcia, consists of an old Moorish town on a slope crowned by a castle, and a lower modern town. There are manufactures of coarse woolens, linens, leather, soap, and earthenware, and an important annual fair which lasts fourteen days. In the vicinity are lead-mines. Pop. 69,836.

LORCHA, a light Chinese sailing vessel, carrying guns, and built after the



Lorcha.

European model, but rigged like a Chinese junk.

LORD (Anglo-Saxon hlâford, for hlâfweard, that is bread-keeper), a title of honor or dignity, used in different senses. In the feudal times a lord was the grantor or proprietor of land, who retained the dominium or ultimate property of the land or fee, the use only being granted to the tenant. A person who has had the fee of a manor, and consequently the homage of his tenants, is called the lord of the manor. Loosely all who are noble by birth or creation, as the peers of Britain, may be called lords. The lords temporal, in contradistinction to the lords spiritual, are the peers who sit together in the house of lords, as opposed to the bishops who have seats in the house. Lord is sometimes only an official title, as lord advocate, lord mayor, etc. It is also applied, but only by courtesy, to the sons of dukes and marquises, and to the eldest sons of earls.

LORD MAYOR, the title given to the chief magistrates of London, Dublin, York, etc., during the year for which they hold office.

LORD-MAYOR'S-DAY, the 9th of November, on which a great procession accompanying the newly-elected Lord Mayor of London, from Westminster to Guildhall, takes place. The procession, formerly famous for its historical and allegorical devices, has now much dwindled.

LORDS, House of. See Parliament; also Britain, Peerage.

LORD'S PRAYER, a formula of prayer enunciated by Christ on two different occasions, for which see Matt. vi. 5–13, Luke xi. 1–4. Among the earliest Christians it was accepted as the standard form of prayer, and its use in the liturgy is frequently mentioned by the early fathers. The concluding clause of the prayer, known as the doxology, "For Thine is the kingdom," etc., is not found in St. Luke's gospel, and even in that of St. Matthew it is only found in some of the later manuscripts, in which it is generally held to be an interpolation. It is generally retained by Protestants, but is discarded by Roman Catholics.

LORD'S SUPPER, one of the sacraments of the Christian religion: so named because it was instituted by our Saviour when he took his last meal with his disciples, on the occasion of celebrating the Passover. It has also the names of eucharist and communion, and among the Catholics that of the mass or sacrifice of the mass. It has undoubtedly been celebrated, with certain differences, ever since its institution, and still is celebrated by all sects of Christians except the Quakers, however much their views may differ as to its nature and virtue. The chief controversies regarding the nature of the rite have been chiefly on the question of the "real presence" of Christ's body and blood and the doctrine of transubstantiation. The doctrine of transubstantiation, first started by Paschasius Radbertus in the 9th century, was soon generally received and at last was officially approved by the Council of Rome in 1079, and solemnly confirmed in 1215 by the fourth Lateran Council. According to this doctrine the whole substance of the bread and wine in changed into the body and blood of Christ, only the appearance of bread and wine remaining; and the Roman Catholic Church further maintains that Christ is given wholly and entirely both under the form of the bread and under that of the wine. From the doctrine of transubstantiation sprang the adoration of the host (or sacred bread), as well as the custom of refusing the cup in the communion to the laity and non-officiating priests, a practice first authoritatively sanctioned at the Council of Constance, 1415. At the Reformation both the German and Swiss reformers agreed in rejecting the doctrine of transubstantiation and the mass, and maintaining that the Lord's supper ought to be celebrated before the whole congregation, and with the administration of both bread and wine. In explaining the words by which the supper was instituted Luther and Zuinglius differed, and their different opinions on this subject formed the principal subject of dissension between the Lutheran and Calvinistic churches. Luther took the words, "This is my body," etc., in their literal sense, and thought that the body and blood of Jesus Christ are united, in a mysterious way, with the bread and wine, which, however, remain unchanged, so that the communicant receives, in, with and under the bread and wine, the real body and blood of the Redeemer. Zuinglius, on the other side, understood the words in a figurative sense and maintained that the Lord's supper was a mere commemoration of the death of Christ, and a profession of belonging to his church. This view is in substance adopted by the Socinians, Arminians, and some others. The opinion advanced by Calvin, by which a spiritual presence of the body and blood of Christ is supposed in the communion, by partaking of which the faithful receiver is brought into union with Christ, through the medium of the Holy Ghost, though it came nearer to the Lutheran doctrine than that of Zuinglius did, yet was essentially different. The Greek Church has not adopted the doctrine of transubstantiation in its whole extent; yet her doctrine, which was defined and sanctioned by the Synod of Jerusalem in 1672, comes nearer to this dogma than to that of the Reformed church. The Anglican Confessions incline more to the view of Zuinglius. The 28th Article of the Church of England declares that "the body of Christ is given, taken, and eaten in the supper only after an heavenly and spiritual manner." The doctrine adopted by the Presbyterian Church of Scotland in the main agrees with that propounded by Calvin.

LORELEI (lō're-lī), a precipitous cliff on the Rhine, about 450 feet high, half a mile above St. Goar. Legend gives it as the abode of a siren, who by her singing enticed boatmen thither to their destruction.

LORENZ (lō'rĕnts), Adolf, Austrian orthopædic surgeon was born in 1854. He graduated from the University of Vienna in 1880. The operatoin which made him famous—the so-called "bloodless" reduction of congenital dislocation of the hip-joint—was developed only after years of experiment. Beginning with the "open" method of Haffa, he modified it by stretching and parting, instead of cutting the muscles—the Haffa-Lorenz operation—and finally in 1892 conceived the idea of reducing the hip by manipulation alone. In 1895 he demonstrated the method before the medical congress at Berlin, and it found general acceptance. In 1902 he visited the United States and England; he demonstrated his methods in both countries. He devised several other orthopædic operations besides that for the reduction of hip dislocations, notably one for the straightening of club-foot, and has invented several instruments.

LORIS, a genus of quadrumanous mammals allied to the lemurs. Two species only are known, the short-limbed loris and the slender loris, both natives of

Slender loris.

the East Indies. They are not much larger than rats, and are nocturnal and arboreal in their habits.

LORIS-MELIKOFF, Michael Tarielovitch Tainoff, Count, Russian general, born 1826 at Tiflis, died 1888. Was made lieutenant-general in 1863; commander of the army in Armenia in 1876. In 1878

he was made a count; in 1879 governor-general of Charkow, in which post he suppressed the Nihilistic conspiracies with much vigor. In 1880 he was appointed minister of the interior, in which post he showed a tendency towards measures of a wide remedial kind, and had persuaded the czar, Alexander II., to call a kind of national representative assembly, when the assassination of the latter occurred, March, 1881. On the accession of Alexander III. Loris-Melikoff's position became untenable, and he resigned in 1881.

LORNE, Right Hon. John George Douglas Sutherland Campbell, Marquis of, born in 1845, married the Princess Louise in 1871, and was governor-general of Canada from 1878 to 1883. He succeeded to the dukedom on his father's death in 1900.

LORRAINE, a territory now divided between Germany and France, was originally so named as being the kingdom of Lothaire II. It was afterward divided into two parts, Upper and Lower Lorraine. The latter, between the Rhine Meuse, and Scheldt, became the duchy, of Brabant, and ultimately a part of Belgium. Upper Lorraine, between the Rhine, Saône, and Meuse, was for long an independent duchy, but was ceded to France in 1736. The inhabitants, though of German origin, speak the French language, except those of the district between Metz and the Vosges, which was on that account called German Lorraine. At the end of the war between France and Germany in 1870–71 a considerable portion of Lorraine, including the fortresses of Metz and Thionville, was annexed to Germany, and now forms part of the imperial territory of Alsace-Lorraine (which see).

LORRAINE, Claude. See Claude Lorraine.

LORY, a group of scansorial birds, having broad tails, and dense soft plumage, the colors of which are extremely brilliant. They are found mostly in the

Purple-capped lory.

Eastern Archipelago, but also in New Guinea, Borneo, and the South Sea Islands.

LOS ANGELES (lōs an'je-les), the capital of Los Angeles county, California on the river of the same name, about 15 miles from the Pacific coast. It has extensive vineyards, orange and olive plantations, corn-mills, paper-mills, distilleries, iron-foundries, and an active commerce. Gold, silver, copper, and zinc are found in the neighboring mountains. Pop. 1909, about 300,000.

LOT (lō), a department in the south of France; area, 2020 sq. miles. The capital is Cahors. Pop. 271,514.

LOT-ET-GARONNE (lō-e-gȧ-ron), a department in the southwest of France; area, 2050 sq. miles. Capital Agen. Pop. 278,740.

LOTI (lō'tē'), Pierre, name assumed by Louis Marie Julien Viaud. A French novelist and naval officer, was born at Rochefort, in 1850. He entered the marine service in 1867 and traveled extensively, resigning his naval office in 1898 with the rank of lieutenant. His novels include: Aziyadë, Rarahu (or Le Mariage de Loti, Le roman d'un spahi, Mon frère Yves, Le pêcheur d'Islande, Le Kasbah, Madame Chrysanthème, Ramuntcho, Au Maroc, Le Désert, Galilée. He was elected a member of the French Academy in 1897.

LOTIONS, liquid remedies, consisting principally of distilled or filtered soft water holding in solution various medical substances, and applied externally. Lotions are either cooling, stimulating, astringent, soothing, or sedative.

LOT'TERY, a scheme for the distribution of prizes by chance, the plan being generally to have a certain number of prizes and a much greater number of tickets, the prizes being allotted according as the drawing of numbered tickets from a suitable receptacle shall decide. Lotteries on the large scale originated in Italy, from which they passed into France. In England the first public lottery occurred in 1569, the proceeds being devoted to public works. In 1612 a lottery was granted in behalf of the Virginia Company. In 1709 the rage for private, and, in many instances, most fraudulent lotteries, was at its height in England, and toward the close of the year an existing act of parliament was put in force for the suppression of such lotteries as public nuisances. Government lotteries still continued, however, and large sums of money were raised by them; but in 1826 lotteries were entirely abolished in Britain, except in the case of art-unions, which are permitted from their supposed good effects in encouraging art. In France the demoralizing influence of lotteries caused their suppression in 1836, with the effect of largely increasing in the following year the deposits in the savings-bank. They are still exceptionally permitted. Lotteries for merchandise of all kinds, from estates to pictures, are common in Germany; and in Italy and Austria the governments draw an important part of the revenue from their management of money lotteries. In most of the United States lotteries formerly very commonly resorted to as means of assisting colleges or benevolent institutions, have been abolished, or at least require a special authorization from the legislature.

LOTUS, a name applied to a number of different plants, from the lotus famous in Greek legend. One of these is a native of Northern Africa and Southern Europe. It is a shrub 2 or 3 feet high, bearing a fruit, the jujube, which is a drupe of the size of a wild plum. The name lotus was also given to several species of water-lily, as the blue water-lily, the Egyptian water-lily, and to the nelumbo, which grow in stagnant or slow running waters. Lotus are often found figured on Egyptian buildings, columns, etc., and the nelumbo, or Hindu and Chinese lotus, bears a prominent part in the mythology of these countries. The name is also given to a genus of plants consisting of creeping herbs and undershrubs, chiefly natives of temperate regions throughout the world.

LOUBET (lōō'bā'), Emile, a French statesman, seventh president of the French republic, was born at Marsanne, in the department of Drôme, Southern France, in 1838. In 1876 he was elected to the chamber of deputies. Here he joined the group known as the Republican Left. He was reëlected to the lower house in 1877 and 1881, and in 1885 was chosen senator. In December, 1887, he entered the cabinet of M. Tirard as minister of public works, but retired with his colleagues in April following. On February 29, 1892, he became premier by appointment of President Carnot, who was his personal friend, succeeding M. de Freycinet. He himself took the portfolio of the interior. Reëlected to the senate, he was chosen president of that body in 1896 and again in 1898. On February 16, 1899, occurred the sudden death of President Félix Faure, and two days later the national assembly, comprising both houses of parliament, met in joint session and on the first ballot chose M. Loubet as president of the republic. His presidency strengthened the republic, and became marked by an almost total disappearance of the Monarchists as a party.

LOUIS I., or as a German name Ludwig, surnamed Le Débonnaire, or the Pious, the son of Charlemagne, born in 778, succeeded his father in 814 as king of the Franks and emperor of the West. He died in 840. He was succeeded as emperor by his son Lothaire I.; and by the treaty of Verdun in 843 his son Charles the Bald obtained the territories from which France as a separate nationality developed; while another son, Louis the German, obtained territories from which the distinctive German nationality developed.

LOUIS VII. of France (counting from the above Louis I.), born in 1120, succeeded his father Louis VI. in 1137. He joined the second crusade to Palestine in 1147, but returned two years afterward, having suffered many disasters and lost most of his men. He died in 1180, and was succeeded by his son Philip Augustus.

LOUIS IX. (St. Louis), King of France, eldest son of Louis VIII., born in 1215, succeeded to the throne in 1226, In the year 1244, when sick of a dangerous disorder, he made a vow to undertake a crusade to Palestine; and in August, 1248, sailed with his wife, his brothers, and 80,000 men to Cyprus, and in the following year proceeded to Egypt. Landing at Damietta, in 1249, he took this city, and afterward twice defeated the Sultan of Egypt, to whom Palestine was subject. But famine and contagious disorders soon compelled him to retreat; his army was almost entirely destroyed by the Saracens, and himself and his followers carried into captivity. In 1270 he determined to undertake another crusade. He sailed to Africa, besieged Tunis, and took its citadel. But a contagious disorder broke out, to which he

himself (1270), together with a great part of his army, fell a sacrifice. In 1297 he was canonized by Boniface VIII.

LOUIS XI., King of France, eldest son of Charles VII., was born in 1423, and on his father's death in 1461 he assumed the crown. In 1481 Louis, who had been twice affected by apoplexy, haunted by the fear of death, shut himself up in his castle of Plessisles-Tours, and gave himself over to superstitious and ascetic practices. He died in 1482. The great object of Louis was the consolidation of France, the establishment of the royal power, and the overthrow of that of the great vassals, and in achieving this end he was very successful, although by most unscrupulous means. He encouraged manufactures and trade, and did much for the good of his kingdom, but was cold-hearted, cruel, and suspicious. Louis XI. was the first French monarch who assumed the title of Most Christian King, given him by the pope 1469.

LOUIS XII., King of France from 1498 to 1515, was born in 1462. He was the son of Charles, duke of Orleans, grandson of Charles V. He divorced his first wife Jeanne, daughter of Louis XI., and married the widow of Charles VIII., thus uniting the Duchy of Brittany with the crown. At the age of fifty-three he married a second wife, Mary, the sister of Henry VIII. of England, and died about three months afterwards (1515) without male issue. He was succeeded by Francis I.

LOUIS XIII., King of France, surnamed the Just, the son of Henry IV., born 1601. He ascended the throne (1610) after the murder of his father, his mother (Maria de' Medici) being made guardian of her son and regent of the kingdom. In 1614 Louis was declared of age, and married the year following Anne, daughter of Philip III. of Spain. Louis gave himself up to the guidance of Cardinal Richelieu. He died in 1643.

LOUIS XIV., King of France, known as Louis the Great, son of Louis XIII. and Anne of Austria, was born at St. Germain-en-Laye 1638, and succeeded his father in 1643. In 1659 peace was

Louis XIV.

concluded with Spain, and Louis married Maria Theresa, daughter of Philip IV. of Spain. On the death of Mazarin in 1661 Louis resolved to rule without a minister. He reformed the administration and the taxes, and made the famous Colbert superintendent, who accomplished a series of financial reforms, created the Company of the Indies, made roads, canals, and founded manufactures. In 1672 he declared war with Holland, and in a few weeks he had conquered three provinces; but the formation of the Grande Alliance between the Emperor, William of Orange, Spain, Denmark, etc., checked his ambition. Still the Treaty of Nimeguen (1678) left Louis in possession of Franche-Comté and a part of Flanders. Maria Theresa having died in 1683, he secretly married Madame de Maintenon about 1684 or 1685. The League of Augsburg was now formed against Louis by Spain, Holland, England, Sweden, etc. A general war continued with frequent and severe losses to the French till the Peace of Ryswick (1697), by which Louis was to restore all his recent conquests and most of the acquisitions made since the Peace of Nimeguen. The question of the Spanish Succession once more brought Louis into conflict with a united Europe. The principal episodes of the war were the victories of Blenheim, Ramillies, and Malplaquet, gained by Marlborough and Prince Eugène. Hostilities were terminated by the Peace of Utrecht in 1713, without altering the relative position of the combatants. Louis died on the 1st of September, 1715, and was succeeded by his great-grandson Louis XV.

LOUIS XV., the great-grandson of Louis XIV., was born 1710; commenced his reign in 1715, but did not actually assume the government himself till 1723. In 1726 Louis placed his tutor Cardinal Fleury at the head of the administration. In 1725 he had married Maria, daughter of Stanislaus Leczynski, the dethroned king of Poland. After 1748 Louis began to sink into the grossest indolence and sensuality, abandoning the management of state affairs to Madame de Pompadour, who recklessly squandered the public money. From 1769 he was governed by Madame du Barry, who is said to have cost the royal treasury in five years 180,000,000 livres. The Seven Years' war (1756–63), in which France was involved, brought severe losses and humiliations on the country, and transferred to Great Britain Canada, Cape Breton, and other territories. Louis died in 1774 of smallpox, leaving a debt of $800,000,000 and a demoralized kingdom.

LOUIS XVI., King of France, grandson of Louis XV., was born 1754, and in 1770 married Marie Antoinette of Austria. He ascended the throne in 1774. His weakness and want of decision made him unfit to rule a great country at a critical period. In 1789, all the grievances and discontents which had been gathering during a long period of misrule found vent; the populace attacked and destroyed the Bastille; and the revolution was accomplished. On January 16, 1793, he was declared guilty of a conspiracy against the freedom of the nation, by a vote of 690 out of 719; on the 17th he was condemned to death, by a majority of only five in 721, and on the 21st he was guillotined.

LOUIS XVII., King of France, second son of Louis XVI., was born in 1785. On the death of his elder brother in 1789 he became dauphin, was proclaimed king by the royalists on the death of Louis XVI. He died in 1795.

LOUIS XVIII., King of France, third son of the dauphin, the son of Louis XV., was born in 1755, and died 1824. At the accession of his brother Louis XVI. in 1774 he received the title of Monsieur. After the death of Louis XVI. Monsieur proclaimed his nephew King of France as Louis XVII., and in 1795 he was himself proclaimed by the emigrants King of France and of Navarre. For many years he led a wandering life, supported by foreign courts and by some friends of the house of Bourbon. He at last took refuge in England in 1807, and lived there till the fall of Napoleon opened the way for him to the French throne. He entered Paris in May, 1814; had to fly on Napoleon's escape from Elba, but was replaced on the throne by the Allies after Waterloo.

LOUIS, St., a city of the United States See St. Louis.

LOUIS D'OR (lō-ē-dor), or simply Louis, a gold coin of France, first struck in 1640, in the reign of Louis XIII., and continuing to be coined till 1795. In 1810 the louis d'or was replaced by the napoleon of 20 francs, and when the coin was again struck under the restoration the same value (20 francs) was retained.

LOUISIANA (lō-iz-i-an'a), one of the southern United States of America, bounded north by Arkansas, northeast and east by Mississippi, from which it is partly separated by the river of that name, southeast and south by the Gulf of Mexico, and west by Texas, from which it is separated chiefly by the Sabine. It has an area of 48,720 sq. miles. The surface is generally flat and low; the delta of the Mississippi, and the land along that river, having to be protected from inundation by levées or artificial embankments. The coast is a low swampy

Seal of Louisiana.

region producing large quantities of rice and sugar-cane; toward the north and northwest, where the highest elevation is reached, the land is less productive, but bears valuable timber. The chief rivers are the Mississippi, which runs for about 600 miles along the border of and through the state; the Red river, which crosses the state diagonally and forms an important avenue of inland commerce; the Washita, Sabine, Pearl, etc., all navigable. There are also numerous "bayous" or secondary outlets of the

rivers of much importance for both navigation and drainage purposes, the chief of which are the Atchafalaya with its series of lakes, the bayou Teche, bayou de Large, bayou La Fourche, and bayou Bœuf. Numerous lakes and lagoons are scattered over the state, mostly land-locked bays and expansions of rivers. The climate is semi-tropical, and the rain-fall heavy along the coast. Coal, iron, sulphur, and rock-salt are found; the chief agricultural products are cotton, sugar, rice, corn, and tobacco. Louisiana ranks second among the gulf states in the total value of its fisheries. The Louisiana forests are exceeded in area and value by those of but few states. The most valuable variety is the long leaf pine. There are also very extensive areas of short leaf pine, intermixed with deciduous varieties. The dense and heavy cypress forests in the deltaic regions as yet have been scarcely touched. The port of New Orleans is the most important one on the Southern coast of the United States and is exceeded only by New York and Boston in the amount of its foreign trade.

Free education is established, and the University of Louisiana, at Baton Rouge, and other institutions are devoted to the higher education. There are about 3000 miles of railway. The capital is Baton Rouge, but New Orleans is much the largest town. Louisiana became a state in 1812, the territory now included within its limits having previously belonged to France and Spain, and having been acquired by purchase from Napoleon I. The earliest historical record of explorations by white men, is 1541, when De Soto, the Spanish explorer, landing on the Florida coast, made his way through trackless forests and swamps to the Mississippi. Marquette and Joliet in 1673 descended the Mississippi to the mouth of the Arkansas, and in 1682 Robert Cavelier de La Salle navigated the great river from the Illinois to the Gulf of Mexico. The early settlements proved unsuccessful, and it was not until 1700 that the French, under the leadership of Iberville, founded a permanent colony. Under the treaty of Utrecht the territory of Louisiana, which nominally extended over the whole valley of the Mississippi, and westward to the Pacific, or at least to the Rocky mountains, passed into the hands of France. New Orleans was founded in 1718, and the territory, at first governed by a French appointee, came into the jurisdiction of John Law, the originator of the great Mississippi scheme. In 1762, Spain acquired the province by a secret treaty with France, but did not take full possession until 1769. In 1763 all of Louisiana cast of the Mississippi, from its source to the river Iberville, was ceded to Great Britain and counted with Florida. By the treaty of 1783, which closed the war with Great Britain, the newly constituted United States came into possession of the eastern bank of the Mississippi south as far as the thirty-first parallel, while Spain held the other bank, and claimed complete possession of the river south of the thirty-first parallel. Spain ceded this territory back to France in 1800, and three years later Napoleon Bonaparte, being unable to hold the country himself, and desirous of damaging Great Britain, sold the whole country to the United States for $12,000,000. The arrangement was made by Thomas Jefferson, and he was denounced on all hands for his alleged unconstitutional action in making the bargain.

In 1804 a territory known as Orleans was formed, including most of what now is called Louisiana, and in 1812 the state was admitted to the union with its present boundaries. On January 8, 1815, was fought the great battle of New Orleans, when General Jackson at the head of some raw levies of Tennessee and Mississippi militia defeated General Pakenham and his peninsular regulars. Louisiana advanced rapidly in material prosperity during the forty-five years from this time until the outbreak of the civil war, and New Orleans became the most important port of the south, and the center of the cotton-shipping trade. The state went with the south and seceded from the union in December, 1860. It became the theater of war by land and river, and in April, 1862, Admiral Farragut passed the forts and compelled the surrender of the city. From this time on the federal forces practically controlled Louisiana. The state passed through a stormy time in the days of reconstruction, and it was not until 1877 that its administration was rescued from the hands of the carpet bag element. By the so-called grandfather clause in the constitution of 1898 which laid down the qualification for suffrage, the vast majority of the negroes were disfranchised. In 1900 out of 150,000 registered votes it was estimated only 7000 were colored, though the negro population almost equals the white.

In national politics Louisiana has been democratic, republican, and democratic except in 1840 and 1848, when it voted for the whig candidates and 1876 when its electoral vote was given by the electoral commission to Hayes. Since then it has invariably been Democratic. Pop. 1909, 1,700,000, about a half being colored.

LOUISIANA PURCHASE, the purchase by the United States from France in 1803 of the "Province of Louisiana." In 1802 news reached the United States that Spain had retroceded Louisiana to France. President Jefferson declared that the day she took possession the ancient friendship between the United States and France would be at an end, and the United States must henceforth ally itself with the British nation. The war between France and England had just been renewed, and Napoleon doubled the ability of France to hold Louisiana and therefore, proposed to sell the entire Province of Louisiana, and asked for an offer. The price finally agreed upon was 80,000,000 francs, including 20,000,000 for the debts which the United States was to assume. The total cost of Louisiana, principal, interest, and debts assumed, was $27,267,621. The area purchased exceeded 1,000,000 square miles. The population did not exceed 90,000, including about 40,000 slaves. The rest of the population consisted of French, Spanish creoles, Americans, English, and Germans.

LOUISIANA STATE UNIVERSITY AND AGRICULTURAL AND MECHANICAL COLLEGE, a State institution at Baton Rouge, La., chartered in 1877. The Agricultural and Mechanical College, opened at New Orleans in 1874, was merged with the University in 1877. In 1886 the United States Government gave the use of the buildings and grounds of the military garrison at Baton Rouge, and in 1902 the full title to the property was vested in the institution. The courses offered are literature, Latin-scientific, general science, commerce, agriculture and sugar-raising, mechanical and civil engineering. The degrees conferred are B. A., B. S., M. S., C. E., M. E., and M.A. The university has three experiment stations, at New Orleans, Baton Rouge and Calhoun. The discipline is military.

LOUIS NAPOLEON. See Napoleon III.

LOUIS PHILIPPE, King of the French, born at Paris 1773; died at Claremont, England, 1850. He was the eldest son of Duke Louis Philippe Joseph of Orleans, surnamed Egalité (see Orleans), and during his father's lifetime he was known as Duke of Chartres. He entered the army in 1791, and favoring the popular cause in the revolution he took part in the battles of Valmy and Jemappes; was present at the bombardment of Venloo and Maestricht, and distinguished himself at Neerwinden. Dumouriez had formed a scheme for placing him on the throne as a constitutional monarch, and being included in the order of arrest directed against Dumouriez, in 1793, he took refuge within the Austrian territory. For twenty-one years he remained exiled from France, living in various European countries, and in America. He had become Duke of Orleans on the death of his father in 1793, and in 1809 he married the daughter of Ferdinand IV. of Naples. After the fall of Napoleon I. he returned to France, and was reinstated in his rank and property. At the revolution of July, 1830, he was made "lieutenant-general of the kingdom," and in August became king of the French. He reigned for eighteen years, when the revolution of 1848 drove him from the throne to England where he remained till his death.

LOUISVILLE (lö'i-vil or lö'is-vil), the commercial capital of Kentucky and county seat of Jefferson county, on the south bank of the Ohio, immediately above the falls. It has a river frontage of 8 miles, and is connected with the towns of New Albany and Jeffersonville on the opposite bank of the river, in the state of Indiana, by a bridge 5218 feet long. A canal 2½ miles long carries the river traffic round the falls or rapids. In addition to the river traffic an enormous trade is carried on by railway, tobacco, whisky, pork, and flour being among the chief articles. The manufactures are important and varied. The principal public buildings are a fine court-house the city-hall, the public library, the jail, a custom-house, and four spacious market-houses, besides churches, asy-

lums, and literary and scientific institutions. There are four medical colleges. An artesian well 2066 feet deep, having a daily flow of 330,000 gallons, forms part of the city water-works. Pop. 1909, estimated at 275,000.

LOUSE, the common name of insect parasitic on man and other animals. The common louse is furnished with a simple eye or ocellus, on each side of a distinctly differentiated head, the under surface of which bears a suctorial mouth. There is little distinction between the thorax and abdomen, but the segments of the former carry three pairs of legs The legs are short, with short claws or with two opposing hooks, affording a very firm hold. The body is flattened and nearly transparent, composed of eleven or twelve distinct segments. The

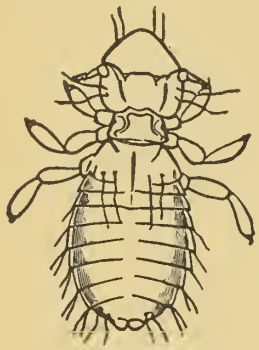


Fig. 1. Hen-louse.

young pass through no metamorphosis, and their multiplication is extremely rapid. Most, if not all, mammals are infested by lice, each having generally its own peculiar species, and sometimes having two or three. Three species are

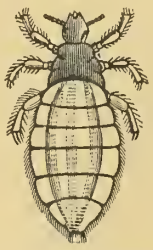


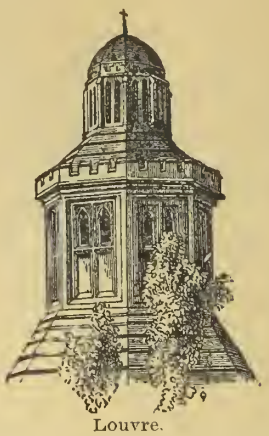
Fig. 2. Body-louse.

said to belong to man, viz.: body-louse, head-louse, and crab-louse.

LOUTH, the smallest county in Ireland, in the province of Leinster, comprising 204,123 acres. Pop. 65,741.

LOUVOIS (lö-vwa), François Michel Letellier, Marquis de, minister of war to Louis XIV., born at Paris 1641, died 1691. He effected quite a revolution in the art of disciplining, distributing, equipping, and provisioning armies, and his administration was brilliant. It was partly by his advice that the Edict of Nantes was revoked in 1685, and the Palatinate was devastated in 1689. Louvois's organization of the army lasted till the Empire; but he also undid the work of Colbert, and destroyed the commerce of France.

LOUVRE (lö'ver), a dome-turret rising from the roof of a hall or other apartment, formerly open at the sides, but now generally glazed. Louvres were originally intended to allow the smoke to escape when the fire was kindled in the middle of the room. Louvre window is the name given to a window in a



Louvre.

church tower, partially closed by slabs or sloping boards or bars called louvre boards (corrupted into luffer or lever boards), which are placed across to exclude the rain, while allowing the sound of the bell to pass.

LOUVRE, the old royal palace at Paris, said to have been a royal residence in the reign of Dagobert, 628. Francis I. erected that part of the palace which is now called the old Louvre, and the buildings have been enlarged and adorned by successive kings, particularly Louis XIV. The new Louvre begun by Napoleon I. was completed by Napoleon III. in 1857. The whole group of buildings is distinguished by its great extent, and by its elegant and sumptuous architecture. It contains museums of paintings, drawings, engravings, bronze antiques, sculptures, ancient and modern, together with special collections of antiquities, and an ethnographical collection. It was greatly injured by the Communists in May, 1871, the Richelieu pavilion, containing the imperial library of 90,000 volumes and many precious MSS., having been entirely destroyed.

LOVE-BIRD, a name given to a genus of the parrot family. They are a beautiful group consisting of very diminutive

Love-bird.

species, found in America, Africa, and Australia. They receive their name from the great attachment shown to each other by the male and female birds.

LOVEJOY, Elijah Parish, was born in Maine in 1802. He became a Presbyterian minister, and edited the St. Louis Observer and other abolitionist papers. Aroused by burning of a negro murderer he wrote an editorial that excited the wrath of the pro-slavery element. He removed his press to Alton, Ill., where it was siezed by a mob and thrown into the river. Several other presses which he secured were destroyed. A mob again attacked his office at midnight on November 7, 1837, and an attempt being made to set fire to the building, Lovejoy stepped out and was shot.

LOVEJOY, Owen, brother of the foregoing, was born in Albion, Me., in 1811. He was pastor of a Congregational church in Illinois; was present when his brother was murdered, and was often fined for holding anti-slavery meetings. He served in the Illinois legislature, and from 1856 until his death sat in congress as a republican. He died in 1864.

LOW, Seth, American educator and administrator, was born in Brooklyn in 1850. In 1882 he was elected mayor of Brooklyn on an independent ticket. His administration was characterized by his application of the civil-service system to city offices and the impartial maintenance of efficient service among appointees. In 1884 he was elected to a second term. In 1890 he was elected to the presidency of Columbia College. He made to the university a gift of $1,000,000, to be used for the erection of a library building In 1897 he received 150,000 votes as independent candidate for mayor of New York City. He was a member of the American delegation to the Czar's Peace Conference at The Hague in 1899, and at various times held other posts of public trust. In 1901 he was elected mayor of New York City. He was a founder and the first president of the Bureau of Charities of Brooklyn, and was elected vice-president of the New York Academy of Sciences and president of the American Archæological Institute. His academic dignities include, among others, the degree of LL.D., conferred by the University of the State of New York, Harvard, and Princeton.

LOVER, Samuel, novelist, poet, and musical composer, was born in Dublin, in 1797, and died in 1868. Among his works are Legends and Stories of Ireland (1832–34); Rory O'More, a novel (1837); Songs and Ballads (1839); Handy Andy, a novel (1842); Treasure Trove, a novel (1844). The Angels Whisper, Molly Bawn, and the Low-backed Car are among his most popular songs.

LOW CHURCH, a name given to a section of the Church of England whose opinions are opposed to those of the High Church party, and are especially hostile to ritualism and sacerdotalism. See High Church.

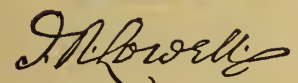
LOW COUNTRIES. See Netherlands.

LOWE (lō), Sir Hudson, lieutenant-general in the British army; born at Galway 1769, died 1844. On the fall of Napoleon he was appointed governor of St. Helena, and intrusted with the care of the ex-emperor.

LOW'ELL, a city in Massachusetts, on the right bank of the Merrimac, 25 miles n.n.w. from Boston, neatly and substantially built of brick, and chiefly remarkable for being a leading seat of the cotton manufacture. There are also extensive bleacheries, large machine-

shops, paper and chemical works, etc. Its machinery is largely driven by water-power supplied by the Merrimac, which here falls 33 feet. Seven railways center in the place. Pop. 1909, about 100,000.

LOWELL, James Russell, American author, born in 1819 at Cambridge, Massachusetts. In 1855 succeeded Longfellow as professor of modern languages and belles-lettres at Harvard. From 1857 to 1862 he wrote many essays for the Atlantic Monthly, founded by Holmes, Longfellow, Emerson, and himself, and of which he was the first editor. He was joint-editor of the North American Review from 1863 to 1872. In 1877 he was appointed American minister at Madrid, and in 1880 he was transferred to London, whence he was recalled in 1885. He was very popular in Britain, was made D. C. L. of Oxford, LL.D. of Cambridge, and rector of St. Andrews University. He died in 1891. Besides his poems, of which numerous editions have been published, and the Biglow Papers, his chief works are: Conversations on some of the Old Poets; Among my Books;



My Study Windows; Democracy, and other Addresses, etc. His first wife, Maria White Lowell (1821–1853), was a poet of considerable merit; a volume of her poems was privately printed after her death.

LOYO'LA, Ignatius, original name Inigo Lopez de Recalde, the founder of the order of the Jesuits, was born at the castle of Loyola, Guipuscoa, in 1491, died 1556. When still a young man he entered the army, and during the defense of Pampeluma in 1521 against the French he was severely wounded, and a long and tedious confinement was the result. The only books he found to relieve its tedium were books of devotion and the lives of saints. This course of reading induced a fit of mystical devotion in which he renounced the world, made a formal visit to the shrine of the Virgin at Montserrat, and vowed himself her knight (1522). After his dedication he made a pilgrimage to Rome and Jersualem, and from 1524 to 1527 attended the schools and universities of Barcelona, Alcala, and Salamanca. In 1528 he went to Paris, where he went through a seven years' course of general and theological training. Here in 1534

Ignatius Loyola.

he formed the first nucleus of the society which afterward became so famous, François Xavier, professor of philosophy Lainez, and others having in conjunction with Loyola bound themselves together to devote themselves to the care of the church and the conversion of infidels. Rome ultimately became their headquarters, when Loyola submitted the plans of his new order to Paul III., who under certain limitations, confirmed it in 1540. (See Jesuits.) Loyola continued to reside in Rome and govern the society he had constituted till his death. He was beatified in 1607 by Paul V., and canonized in 1622 by Gregory XV.

LOZERE (lo-zār), a department of Southern France, bounded by Haute-Loire, Cantal, Ardèche, Gard, and Aveyron; area, 1996 sq. miles. The capital is Mende. Pop. 128,866.

LUBECK (lü'bek), one of the free towns of Germany, and a constituent of the German empire, stands on a low ridge at the confluence of the Wackenitz with the Trave, 38 miles northeast of Hamburg, and 12 miles from the Gulf of Lübeck, a bay of the Baltic. Pop. of the town, 82,098; of the territory, 96,775.

LUBLIN, a town of Russian Poland, capital of the government of Lublin, 60 miles southeast of Warsaw. Pop. 53,137. —The government has an area of 6499 sq. miles; pop. 931,597.

LUBRICANT, any substance applied to surfaces that work against each other, to diminish friction. Lubricants may be either solid, semi-liquid, or liquid. Plumbago, grease, animal, vegetable, and mineral oils, simple or variously compounded, are the substances used.

LUCAN, George Charles Bingham, Earl of, born 1800, died 1888. His name is conspicuously associated with the Balaklava charge of the Light Brigade. He was lieutenant-general in 1858; general in 1865; and field-marshal in 1887.

LUCCA, a town of Italy, capital of a province of same name, stands near the left bank of the Serchio, 37 miles n.n.w. Florence. Pop. 72,971. The province of Lucca is bound n. by Massa e Carrara and Modena, e. by Firenze, s. by Pisa, w. by the Mediterranean; area, 577 sq. miles. Pop. 318,610.

LUCE, Stephen Bleecker, American naval officer, born in 1827 in Albany, N. Y. He entered the United States Navy in 1841, was commissioned lieutenant in 1855, and in 1862 as lieutenant commander aided in the blockade of South Carolina ports, participating in the battles of Hatteras Inlet and Port Royal. In 1872 he became captain, in 1881 commodore, and in 1885 rear-admiral. From 1884 to 1886 he was president of the United States Naval War College, of which he was a founder, and in 1889 he was retired. In 1892 he represented the United States as commissioner-general at the Columbian celebration held at Madrid to commemorate the four hundredth anniversary of the discovery of America. He died in 1905.

LUCERNE, Luzern (lö-sern,' lö'tsern), a city of Switzerland, capital of a canton of the same name, beautifully situated on the margin of Lake Lucerne and on the Reuss. The "Lion of Lucerne," a monument by Thorwaldsen to the Swiss guards who fell in Paris in 1792 while defending the Tuileries, and the glacier-garden, containing relics of the ice period are objects of interest. Pop. 29,633.—The canton is bounded by the cantons of Aargau, Zug, Schwyz, Unterwalden, and Bern; area, 587 square miles. Pop. 146,474.

LUCERNE, Lake of, a Swiss lake bounded by the cantons of Uri, Schwyz, Unterwalden, and Lucerne, and noted for its magnificent scenery and historical associations.

LUCIA, St., one of the British West India Islands, about 80 miles northwest of Barbadoes; area about 240 sq. miles. Pop. 49,895, of whom about 1000 are white.

LUCIFER, a name anciently given to the planet Venus as the morning star. The term is used figuratively by Isaiah (xiv. 12) and applied to the Babylonian king, but it was mistaken by the commentators for a reference to Satan.

LUCIFER-MATCH. See Matches.

LUCKNOW', a city of Hindustan, capital of Oude, 610 miles w. n. w. of Calcutta, on both banks of the Gumti, here crossed by four bridges, two of which were built by native rulers, and two by the British since 1856. Lucknow was one of the chief scenes of the Sepoy mutiny. At the beginning of the mutiny the Residency was fortified by Sir Henry Lawrence, and after his death (4th July, 1857) it was closely besieged by the rebels till relief was brought by Havelock and Outram. The relieving force was only a small one, however, and the British were again besieged, partly in the Residency, partly in a walled garden called the Alambagh. In the middle of October Sir Colin Campbell gained possession of the place after severe fighting; but as it seemed impossible to hold it with the troops at his disposal he left Sir James Outram to defend the Alambagh, and removed the civilians, women and children to Cawnpore. At last, in March 1858, Sir Colin returned with a sufficient force, completely defeated the rebels, and permanently recovered the tow Population, 264,049.

LUCRE'TIA, in Roman legendary history, a lady of distinguished virtue who was outraged by Sextus, son of Tarquinius Superbus, king of Rome. She stabbed herself, and her death was the signal for a revolution, by which the Tarquins were expelled from Rome and a republic formed.

LUCRE'TIUS, Carus, Titus, Roman philosophic poet, born about 98 B.C., died 55 B.C. He is said to have died by his own hand, but about his life almost nothing is known. He is admitted to be one of the greatest of Roman poets for descriptive beauty and elevated sentiment. We possess of his composition a didactic poem, in six books, De Rerum Natura (On the Nature of Things), in which he exhibits the cosmical principles of the Epicurean philosophy.

LUDLOW, William, American soldier, was born at Islip, Long Island, N. Y., in 1843. He graduated at West Point in 1864, and served under General Hooker in the Atlanta campaign as chief engineer of the Twentieth Army Corps, Army of the Cumberland. He was assistant engineer to General Sherman's army during the famous "march to the sea." In May, 1898, on the outbreak of the Spanish-American war, he was appointed brigadier-general of volunteers. In December, 1898, he was appointed military governor of Havana. On May 1, 1900, he was relieved, having previously, however (in January), been promoted to be brigadier-general in the regular army, the first engineer since the civil war to receive a line brigadier-generalship. He died in 1901.

LUDWIGSHAFEN (lud'vihs-hä-vn), a town of Rhenish Bavaria, on the left bank of the Rhine. Pop. 61,905.

LUGGER, a vessel having either two or three masts and a running bowsprit,

Lugger.

the masts carrying each one or two lugsails. There are also two or three jibs.

LUGO, a town of Northern Spain, capital of province of same name, Pop. 25,568.—The province has an area of 3788 sq. miles; pop. 465,386.

LUKE, ST., the evangelist, author of the Gospel which bears his name and of the Acts of the Apostles. He was probably born at Antioch in Syria; was taught the science of medicine, but the tradition that he was also a painter is doubtful. The date of his conversion is uncertain; he is supposed to have been one of the seventy disciples, and also one of the two who journeyed to Emmaus with the risen Savior. He was for several years a companion of the apostle Paul in his travels, so that in the Acts of the Apostles he relates what he himself had seen and participated in. (See Acts of the Apostles.) Luke is apparently mentioned three times in the New Testament: Col. iv. 14; 2 Tim. iv. 11; Philem. 24. He lived to an advanced age, but whether he suffered martyrdom or died a natural death it is impossible to determine. The Gospel of St. Luke was written probably about 58–60. It is addressed to a certain Theophilus, and records various facts connected with the early life of Jesus which were probably furnished to the writer by Mary herself. It is first quoted by the church writers Justin Martyr and the author of the Clementine Homilies, and at the time of Irenæus and Tertullian the gospel in its present form was fully accepted. See Gospel.

LULLY, Jean Baptiste, musical composer, born at Florence 1633, died at Paris, 1687. In 1672 he had the direction of the Royal Academy of Music, from which time dates the foundation of the grand opera. His fame now chiefly rests on his overtures, a species of composition of which he is said to have been the inventor.

LUMBA'GO, rheumatism or rheumatic pains affecting the lumbar region, and often disabling a person. See Rheumatism.

LUMBER, the common term in North America for timber sawn up for market, including laths, deals, planks, shingles. etc.

LUMINIFEROUS ETHER, a hypothetical medium of extreme tenuity and elasticity, supposed to be diffused throughout all space, as well as among the molecules of which solid bodies are composed, and to be the medium of the transmission of light, heat, and other forms of energy. From the extreme facility with which bodies move about in this medium it might be called a fluid; but the undulations which it serves to propagate are not such as can be propagated by fluids. Its elastic properties are rather those of a solid; and its waves are analogous to the pulses which travel along the wires of a piano rather than to the waves of extension and compression by which sound is propagated through air. See Undulatory Theory.

LUMINOSITY. See Flame and Phosphorescence.

LUNA, the Latin name for the moon, among the Greeks Selēnē. Her worship is said to have been introduced among the Romans in the time of Romulus.

LUNACY. See Insanity.

LUNACY, in law. Lunatics are not legally responsible for their acts, but before the law, all persons are considered sane until the contrary is proved. When the plea of lunacy is sustained the person accused is acquitted of guilt and kept in custody.

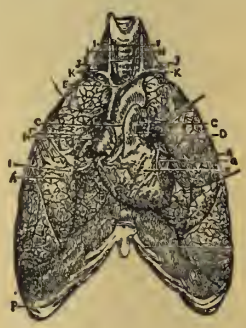
LUNAR CAUSTIC, nitrate of silver. See Silver.

LUNAR THEORY, the mathematical treatment of perturbations in the moon's motion due to the attraction of the sun, the earth, and the planets.

LUNAR YEAR. See Year.

LUNATIC ASYLUMS, houses established for the treatment of insane persons. Some are established by law, others by the endowments of charitable donors, while others are private establishments. Until near the close of the 18th century many lunatics were allowed to wander at large, exposed to all the arbitrary cruelty to which their defenseless condition made them liable, while those who were confined in asylums were in a still worse case. Chains, whipping, and confinement in dark dungeons were among the ordinary discipline of these establishments. The reformation of this unnatural system was begun in France by Philippe Pinel, a benevolent physician; and in England a parliamentary inquiry in 1815 into the barbarities hitherto practiced in lunatic asylums led to a slow but gradual improvement. Lunatic asylums, whether public or private, are now under the control of officers appointed under special statues, and lunatics must be visited at least once a year by medical and legal advisers. The general conduct of lunatic asylums is now brought more into harmony with humanity and common sense. Violence and undue coercion have been generally abandoned, and persuasion and address are relied on for the control of the patients. Religious services are provided, and recreations of various kinds are also commonly and sometimes freely provided.

LUNGS, the sole breathing organs of reptiles, birds, mammals, and in part of amphibians (frogs, newts, etc.), the latter forms breathing in early life by branchiæ or gills, and afterward partly or entirely by lungs. The essential idea of a lung is that of a sac communicating with the atmosphere by means of a tube, the trachea or windpipe, through which air is admitted to the organ, and



Human lungs, heart and great vessels.

A, Lungs with the anterior edges turned back to show the heart and bronchi. B, Heart. C, Aorta. D, Pulmonary artery. E, Ascending vena cava. F, Trachea. G G, Bronchi. H H, Carotid arteries. I I, Jugular veins. J J, Subclavian arteries. K K, Subclavian veins. P P, Costal cartilages. Q, Anterior cardiac artery. R, Right auricle.

through structural peculiarities to its intimate parts, the air serving to supply oxygen to the blood and to remove carbonic acid. In the Mammalia, including man, the lungs are confined to and freely suspended in the cavity of the thorax or chest, which is completely separated from the abdominal cavity by the muscular diaphragm or "midriff." In man the lungs are made up of honeycomb-like cells which receive their supply of air through the bronchial tubes,

If a bronchial tube is traced it is found to lead into a passage which divides and subdivides, leading off into air-cells. The walls of these air-cells consist of thin, elastic, connective tissue, through which run small blood-vessels in connection with the pulmonary artery and veins. By this arrangement the blood is brought into contact with, and becomes purified by means of the air. The impure blood enters at the root of the lung through the pulmonary artery at the right side of the heart, and passes out purified through the pulmonary veins toward the left side of the heart. Both lungs are inclosed in a delicate membrane called the pleura, which forms a kind of double sac that on one side lines the ribs and part of the breast-bone, and on the other side surrounds the lung. Pleurisy arises from inflammation of this membrane. The lungs are situated one on each side of the heart, the upper part of each fits into the upper corner of the chest, about an inch above the collar-bone, while the base of each rests upon the diaphragm. The right lung is shorter and broader than the left, which extends downward further by the breadth of a rib. Each lung exhibits a broad division into an upper and lower portion or lobe, the division being marked by a deep cleft which runs downward obliquely to the front of the organ; and in the case of the right lung there is a further division at right angles to the main cleft. Thus the left lung has two, while the right lung has three lobes. These again are divided into lobules which measure from $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter, and consist of air-cells, blood-vessels, nerves, lymphatic vessels, and the tissue by which the lobules themselves are bound together. The elasticity of the lungs by which they expand and expel the air is due to the contractile tissues found in the bronchial tubes and air-cells, this elasticity being aided by a delicate, elastic, surface-tissue. (See Respiration.) The lungs are popularly termed "lights," because they are the lightest organs in the body, and float when placed in water, except when they are diseased; a characteristic this which is applied in medical jurisprudence as a test whether an infant has respired or not. Among the diseases which affect this organ are pleurisy, pneumonia, pleuro-pneumonia, consumption, etc. See those terms.

LU'PULIN, the fine yellow powder of hops, which contains the bitter principle. It consists of little round glands, which are found upon the stipules and fruit, and is obtained by drying, heating, and then sifting the hops. It is largely used in medicine.

LUPUS, in medicine, a slow non-contagious tubercular affection, occuring especially about the face, and commonly ending in ragged ulcerations of the nose, cheeks, forehead, eyelids, and lips.

LURAY CAVERN, a remarkable cavern in the state of Virginia, near the village Luray. It contains many chambers, and is exceedingly rich in stalactite formations.

LUTE, a stringed musical instrument of the guitar kind, formerly very popular in Europe. It consists of four parts, viz.: the table or belly with a large sound-hole in the middle; the body, ribbed like a melon, having nine or ten ribs or divisions; the neck, which has nine or ten stops or frets which divide the strings into semitones; and the head or cross, in which are fitted the pegs or screws for tuning the strings, of which there are five or six pairs, each pair tuned in octaves or unisons. The strings are struck by the fingers of the right hand and stopped on the frets by those of the left.

LUTHER (lö'thẽr), Martin, the great religious reformer of Germany, was born at Eisleben, November 10, 1483, and died there on the 18th Feb., 1546. In 1501 he entered the University of Erfurt; and in 1505 received the degree of master. About this time he discovered in the library of the university a Latin Bible and found, to his no small delight, that it contained more than the excerpts in common use. Contrary to the wishes of his father he entered the monastery of the Augustines at Erfurt in 1505. In 1507 he was consecrated priest, and in 1508, by the influence of his patron, Staupitz, who was provincial of the order, he was made professor of philosophy in the new University of Wittenberg. In 1510 he visited the court of Pope Leo X. at Rome on business connected with the order. Returning to Wittenberg he was made a Doctor of

Martin Luther.

Theology in 1512, and here his profound learning and powerful eloquence drew large audiences. At that time he had no controversy with the pope or the church, but the arrival in 1517 of John Tetzel in Wittenberg selling indulgences for sins roused the fiery energy of Luther, and caused him to draw up his famous protest in ninety-five propositions, which he nailed to the church-door in Wittenberg. The result was that the sale of indulgences ceased, Tetzel fled, and a great religious commotion spread rapidly through Germany. Luther was summoned to Rome to explain his heretical proceedings, but refused to go; nor were the efforts of Cardinal Cajetan able to effect a reconciliation between him and the pope. His dispute with Dr. Eck at Leipzig in 1519, in which he denounced indulgences, and questioned the authority of the pope, was followed in 1520 by a bull of anathema—a document which Luther straightway burned publicly in Wittenberg. This open defiance of Rome required him to vindicate his conduct, which he did in a pamphlet addressed to the Christian Nobles of Germany, with the result that many of the worthiest rallied to his aid. When summoned to appear before the German emperor, Charles V., at the Diet of Worms (1521), Luther appeared, acknowledged his writings, made an eloquent defense, but refused to recant. When he retired in triumph from Worms he was met by a friendly troop of soldiers belonging to Frederick the Elector of Saxony, who conveyed him to the castle of Wartburg, where he lay in concealment for nearly a year. Here he employed his time in translating the New Testament into German, but when he heard that disturbances had been excited in Wittenberg on the question of images, he could no longer bear the restraint of inaction. Returning suddenly, and at great danger to himself, Luther succeeded in quieting the people by means of a wise and patient moderation. In 1524 he laid aside his cowl as a priest of the Roman Church, and in 1525 married Catharina von Bora, one of nine nuns who had renounced their religious vows under his teaching. The wisdom of this marriage was doubted by his friends, but his home-life and the birth of six children, contributed greatly to the happiness of the reformer. From the year 1521 Luther had been busy translating the Bible into German with the aid of Melanchthon and others, and the great task was completed in 1534. This important work, taken in connection with the Protestant Confession made at Augsburg in 1530, served to establish the reformer's doctrines in Germany, and closed the important part of his public life. The massive character of the German reformer lay along simple lines, and found its full and direct expression in his work. A vivid practice insight enabled him to mark the abuses of the Roman Church, and his fervid energy urged him to reform them.

LUTHERANS, the adherents of Luther, a term now applied to one of the great sections into which the Protestant Church is divided, the other being known as the Reformed or Calvanists. The doctrinial system of the Lutheran Church is contained in the Augsburg Confession, and other documents, including the two catechisms of Luther. The fundamental doctrine is that we are justified before God, not through any merits of our own, but through faith in His Son. In the eucharist the belief of the Lutherans is known as consubstantiation. Lutheranism extended in the time of its founder over the greater part of Germany, and became also the established religion of Sweden, Norway, and Denmark. The membership of the Lutherans is estimated at 45,000,000. In America they have a membership of about 1,230,000.

LUTRA, a genus of carnivorous animals, comprising the otters.

LUXEMBURG, Grand-duchy of, a small independent state of Western Europe, bounded north and east by Rhenish Prussia, south by France, and west by Belgium; greatest length, north to south, 55 miles; greatest breadth, 34 miles; area, 998 sq. miles. Pop. 236,543.

LUXEMBURG, the capital of the above grand-duchy, 117 miles southeast of Brussels. Pop. 20,928.

LUZON', the largest of the Philippine group of islands. Its greatest length is

about 540 miles; its greatest breadth about 125 miles; area estimated at 57,500 sq. miles. Two great mountain chains, the Sierra Madre and Cordillera de Caravallos, run north and south, and rise to a height in some cases of more than 7000 feet. They are of volcanic origin, and many disastrous eruptions have taken place. Rivers and lakes are numerous. Vegetation is luxuriant, and the vast forests contain ebony, cedar, and other valuable trees. Luzon also produces abundant crops of rice, Manila hemp, tobacco, coffee, ginger, and pepper. There are few wild animals except the buffalo, which is also domesticated; but oxen, sheep, and swine are reared. The population consists of the aboriginal Negritos, and of Malays, Chinese, Spaniards, etc., and the whole is estimated at about 3,400,000. The capital is Manila.

LYCE'UM, an academy at Athens in which Aristotle explained his philosophy. In modern times the name of lyceum has been given to the schools intended to prepare young men for the universities.

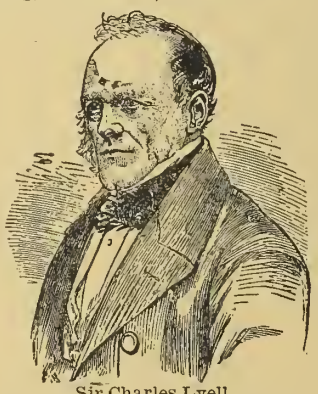
LY'COPODS, the club-moss tribe, chiefly inhabiting boggy heaths, moors, and woods. They are intermediate in their general appearance between the mosses and the ferns, and are in some respects allied to the Coniferæ. The lycopods occur in all parts of the globe, but grow most luxuriantly in tropical or mild climates. In the carboniferous era they attained a very large size, rivalling trees in their height and the thickness of their stems.

Lycopodium Selago. *a*, Leaf; *b*, Sporangium in the axil of bract; *c*, Spores—magnified.

LYCUR'GUS, the great legislator of the Lacedæmonians, was the son of Eunomus, king of Sparta. His history commences with the year 898 B.C., when he might have usurped the throne on the death of his brother, but preferring to guard the kingdom for the unborn child of the latter, he devoted himself to the study of legislation. On his nephew becoming of age, Lycurgus traveled into Crete, Egypt, and Asia, and thus prepared himself to give Sparta the laws which have rendered his name immortal. His object was to regulate the manners as well as the government, and to form a warrior nation, in which no private interest should prevail over the public good. It is said that Lycurgus persuaded the Spartans to swear that they would observe these laws till his return from another journey, and that he then departed, and they never heard of him more. One account states that he starved himself to death, but it is more probable that he retired to private life, and died naturally, as Lucian records, at the age of eighty-five.

LYDDITE, a high explosive, receiving its name from Lydd in Wales, the place of its first manufacture. It is used as a bursting charge for shells, its reputed destructive power being due to the shock of air-concussion, rather than to the fragments produced by the rupture of the shell. It is supposed to kill by shock, or suffocate by its fumes, every living thing within a radius of twenty-five yards of the bursting-point. It is a very stable compound under changes of temperature, and is said to be fully as effective against masonry as black powder, and twice as effective against sand or earth. It was extensively used against the Boers in the war of 1899–1902, but, owing to the character and conformation of the positions usually selected by the Boers, it did not prove very destructive.

LYE, water impregnated with alkaline salt imbibed from the ashes of wood, or any solution of an alkali used for cleaning purposes, as for types after printing, ink-rollers, etc.



Sir Charles Lyell.

LY'ELL, Sir Charles, Bart., geologist, born at Kinnordy, Forfarshire, 1797, died in London 1875. His first important work was the Principles of Geology (1830–33), and a portion of this book afterward formed the basis of the Elements of Geology. Another important work was the Antiquity of Man (1863), in which he summarized the evidence in favor of the theory that the race of man was much older than was currently believed. Lyell was knighted in 1848, and made a baronet in 1864. His Life and Letters were published in 1881.

LYMPH, in physiology, the fluid resulting primarily from the assimilation of food, and also obtained from the blood and tissues, and which is contained within a system of vessels called lymphatics and lacteals. The clearest and simplest view of the lymphatic system is to consider these vessels as the media through which matters are absorbed from the alimentary canal on the one hand, and from the blood and tissues on the other. The matters so absorbed are elaborated and converted in the lymphatic glands into lymph, a fluid which presents the essential features of the more highly elaborated blood, and which is ultimately poured into the blood mainly through the thoracic duct. Through this system the continual loss which the blood and body suffer is made good. The lymph as it exists in the lymphatic vessels is a colorless, transparent fluid, destitute of smell. The lymphatic glands are highly important structures, for it is only after passing through them that the lymph is fully elaborated and ready to enter the blood. Their average size is that of a small almond, and they are generally arranged in groups. As distinguished from the lymphatics the lacteals are the vessels by which the chyle is absorbed from the small intestine and elaborated in the lymphatic glands of the mesentery to be afterward poured into the thoracic duct. This duct pours its contents into a large vein at the root of the neck. Lymphatic vessels and glands are numerous throughout the body.

LYNCHBURG, a town in Campbell co., Virginia, on James' river, 120 miles west by south of Richmond. It contains iron and brass foundries, a large cotton factory, several flour mills, and extensive tobacco manufactories. Pop. 22,160

LYNCH-LAW, the practice of punishing men for crimes or offenses by private unauthorized persons without a legal trial. The origin of the phrase, used chiefly in the United States has been variously accounted for, but it is evidently derived from some person named Lynch, who adopted a rough and ready mode of punishing offenders.

LYNN, a town in Essex co., Massachusetts, on the north side of Massachusetts Bay, about 10 miles northeast from Boston. The town has some fine public buildings, including the city-hall, music-hall, Oddfellows' hall, etc. Its chief industry is the manufacture of boots and shoes, of which upward of 15,000,000 pairs are stated to be annually made. Pop. 1909, about 88,000.

LYNX, the popular name of several species of feline carnivora, resembling the common cat, but with ears longer and tufted with a pencil of hair, and tail shorter. The lynxes have been long

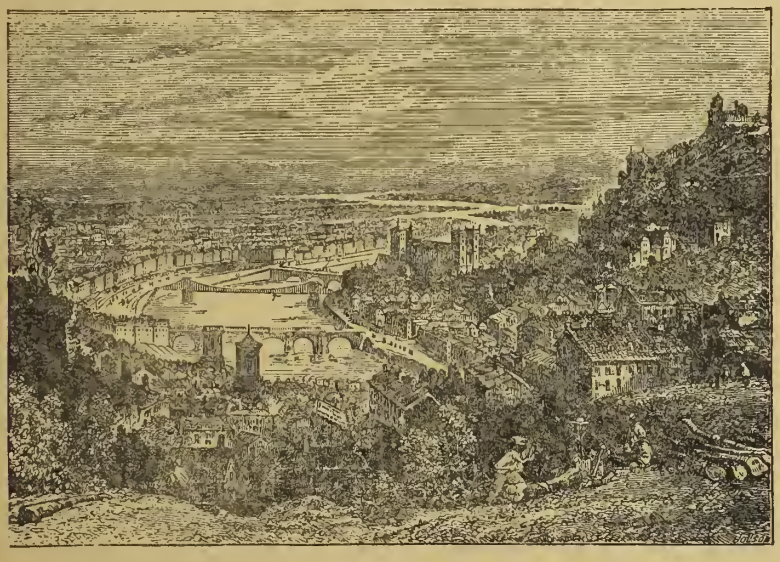
Lynx.

famed for their sharp sight, which character they probably owe to their habit of prowling about at night and their brilliant eyes.

LYON, Mary, American Educator through whose influence the movement for the higher education of women was begun, was born in Buckland, Mass., February, in 1797. From 1824 until 1834 she taught successively at Londonderry and Ipswich, Mass. In November, 1837, she founded Mount Holyoke Female Seminary, at South Hadley, Mass., and from that time until her death was its principal. Miss Lyon taught more than 3,000 pupils, many of whom became missionaries. In 1840 she published a pamphlet entitled Tendencies of the Principles embraced and the Systems adopted in the Mount Holyoke

Seminary, and also The Missionary Offering. She died in 1849.

LYON, Nathaniel, American soldier, was born in Ashford, Conn., in 1818. In the Mexican war he was present at the siege of Vera Cruz, and brevetted captain; at the assault on the Mexican capital he was wounded. At the close of that war he was ordered to California, where in 1851 he was promoted captain. Returning to the east in 1853, he sympathized with the Free State party. He was on duty in Kansas in 1859, and with Gen. William S. Harney in December, 1860, when the governor sent a brigade of militia to coöperate with the national troops in arresting James Montgomery, the Free State leader. In February he was ordered to St. Louis, Mo. There he began to drill and organize the home-guards, and had charge of the arsenal, where his ability and vigilance did much for the Union cause. The home-guards were nearly all German recruits, as the native population and the Irishmen were mostly secessionists. On June 10, 1861, at the head of a body of these



General view of Lyons.

German troops, he took possession of Camp Jackson, a secessionist rendezvous. A week later he was promoted to brigadier-general of volunteers, and soon afterward was placed in command of the department. He next dispersed the Confederate force at Potosi, and on June 17th defeated a body of Governor Jackson's State militia. On August 2d he defeated General McCulloch at Dry Springs, and eight days later attacked a formidable force under Generals McCulloch and Price at Wilson's Creek, when he was defeated. Here, in the ardor of action, he was twice wounded; nevertheless, keeping his saddle, he led his men to renewed attacks, until his horse was killed and himself shot in the breast by a minie rifle-ball. His death was deeply lamented throughout the Union.

LYONS, the second city in France, capital of the department of the Rhône, 240 miles s.s.e. of Paris, and 170 miles north of the Mediterranean. The town is built partly on a peninsula between the Saône and the Rhône, and partly on the opposite banks of the rivers on either side. The rivers are crossed by about a score of bridges, and the city is surrounded by a number of detached forts.

Among the chief buildings are the cathedral, mostly of the 13th century; the church of St. Martin d'Ainay, with a cupola supported by ancient Roman columns and a crypt believed to be of the 9th century; the church of St. Nizier, a fine example of flamboyant Gothic; the Hôtel de Ville, Palais de Justice, etc. In the archiepiscopal palace, situated near the cathedral, 1000 Protestants were butchered in 1572 as a sequel to St. Bartholomew. The Hôtel de Ville is considered one of the finest edifices of the kind in France. The public library has 180,000 volumes. Lyons carries on various industries, but its chief glory is that of being the greatest center of the silk manufacture in the world, giving employment in the town or surrounding neighborhood to 240,000 people. During the revolution the city suffered severely by the paralysis of its industry, and by the murderous excesses of the emissaries of the Paris convention, whom the citizens had defied, the chief buildings being destroyed and many of the inhabitants butchered. Pop. 453,155.

LYRE, one of the most ancient stringed instruments of music, consisting of a body with two horn-like pieces rising from it, and a cross piece between the horns, from which to the lower part the strings were stretched. It was used by the Egyptians, Assyrians, and Greeks. It is said to have had originally only three strings, but the number was afterward increased to seven, then to eleven, and finally to sixteen. It was played with the plectrum or lyre-stick of ivory or polished wood, also with the fingers, and was used chiefly as an accompaniment to the voice. The body of the lyre was hollow, to increase the sound. A musical instrument of similar construction is still to be met with in the hands of the shepherds of Greece and among certain tribes of Africa.

Various forms of Egyptian, Assyrian and Greek lyres.

LYRE-BIRD, an insessorial bird of New South Wales, somewhat smaller than a pheasant. The tail of the male is remarkable for the three sorts of feathers that compose it, which by their shape and arrangement resemble the form of an ancient Greek lyre. It has a pleasing song, and is said to be capable of imitating the voices of other birds.

LYRIC POETRY, originally, poetry sung to or suited for the lyre; in modern usage, that class of poetry in which are expressed the poet's own thoughts and feelings, or the emotions attributed to another, as opposed to epic or dramatic poetry, to which action is essential.

LYSAN'DER, an ancient Greek general who was appointed to the command of the Spartan fleet off the coasts of Asia Minor in 407 B.C., during the Peloponnesian war. In 405 B. C. he defeated and captured the Athenian fleet off Ægospotamos, and thus put an end to the war. He was killed in a battle with the Thebans 395 B. C.

LYTLE (lit'l), William Haines, American soldier and poet, was born in Cincinnati, Ohio, in 1826. He volunteered for the Mexican War, was chosen captain of the Second Ohio Regiment, and soon after the war was elected to the state legislature. Before the civil war he had become major-general in the state militia, and in 1861 was commissioned colonel of the tenth Ohio. He was killed leading a charge of his brigade at Chickamauga, Ga., in 1863. Lytle is also well remembered as a poet through his effective Address of Antony to Cleopatra, beginning "I am dying, Egypt, dying."

LYTTON, Edward George Earle Lytton Bulwer-Lytton, Baron, was born in 1805, died 1873. He published poetry at an early age, but first gained reputation by the novels Pelham and the Disowned (1828), Devereux (1829), and Paul Clifford (1830). These were followed up with the popular romances of Eugene Aram, the Pilgrims of the Rhine, The Last Days of Pompeii, Rienzi, and Ernest Maltravers with its sequel Alice. In connection with Macready's management at Covent Garden Bulwer-Lytton produced his Duchess de la Vallière, which proved a failure, but this was retrieved by the instant success of the Lady of Lyons, Richelieu, and Money. When he had thus shown his quick adaptability of talent he returned to

novel-writing, and published in steady succession—Night and Morning, Zanoni, The Last of the Barons, Lucretia, Harold, The Caxtons, My Novel, and What will He Do with It? He entered parliament for St. Ives in 1831, and supported the reform bill as a Wig; he changed his opinions and latterly supported the conservatives. Under Lord Derby's ministry he was colonial secretary, and in 1866 entered the House of Lords as Baron Lytton. He was elected rector of Glasgow University in 1856. His later literary works were The Coming Race, published anonymouly (1871), The Parisians (1872), and Kenelm Chillingly (1873). Among his poetic works were the epic King Arthur; the Lost Tales of Miletus; Brutus, a drama, etc.

LYTTON, The Right Hon. Edward Robert Bulwer-Lytton, Earl of, G. C. B., son of the novelist and politician, was born in 1831; educated at Harrow and Bonn; entered the diplomatic service in 1849 as attaché at Washington, and successively served in the embassies of Florence, Paris, the Hague, Copenhagen, Athens, Madrid, Vienna, Paris, and Lisbon. He was appointed Viceroy of India by Lord Beasonsfield in 1876, and during his administration the queen was proclaimed Empress of India, and war was waged with Afghanistan. In 1880 he resigned and was created an earl. He early attained reputation as a poet under the pen name of "Owen Meredith"; and wrote Clymnestra and other Poems, Lucile, Tannhauser, or the Battle of the Bards, Fables in Song, King Poppy, Glenaveril, besides prose works. He also published the life and letters of his father. He was appointed ambassador to Paris in 1888, and died there in 1891.

M

M is the thirteenth letter and tenth consonant of the English alphabet. It represents a labial and nasal articulation the compression of the lips being accompanied with the fall of the uvula so as to allow the voice to form a humming sound through the nose, which constitutes the difference between this letter and b.

MAARTENS (mär'tĕns), Maarten, a novelist of Dutch birth and English training, whose real name is J. M. M. van der Poorten-Schwartz, was born in 1858. His first novel, The Sin of Joost Avelingh, was clever and successful both with critics and the public. An Old Maid's Love, A Question of Taste, God's Fool, are other works of merit. The Greater Glory was first to gain for Maartens that general recognition that has been accorded also to My Lady Nobody and to his later novels.

MAB, a mythical personage often represented as queen of the fairies.

MACAD'AM, John Loudon, the great improver of roads, was born at Ayr, probably in 1756, and died in 1836. Having spent his early years in the United States he returned to Great Britain and was appointed agent for victualling the navy in the western ports. In 1815 he was appointed surveyor of the Bristol roads, and thus received the opportunity to put his road-making improvements into practice. He was so successful in this that the House of Commons presented him with a sum of $10,000, and his mode of road-making is still known as Macadamization. This method consists in covering the roadway or forming the road-crust with small broken stones to a considerable depth, and consolidating them by heavy rollers, so as to form a hard, firm, and smooth surface.

MACARO'NI, Maccaroni, preparation of wheaten flour, used as food, usually simply boiled and served up with grated cheese, or in soups, etc. Macaroni is generally made in tubular pieces resembling a long pipe-stalk by pressing it through holes in a metal plate. Vermicelli is a similar preparation, but is more thread-like. Macaroni is a wholesome food, made best in the neighborhood of Naples, and considered a national dish of the Italians.—Macaroni was used as a popular term for a coxcomb or dandy about 1770–1775.

MACAR'THUR, Arthur, American soldier was born in Massachusetts in 1845. He took part in the battles of Perryville, Stone River, and Chattanooga, and in the Atlanta campaign. In February, 1866, he entered the regular army as first lieutenant, and in July, 1889, he became assistant adjutant-general, with the rank of major. He was appointed brigadier-general of volunteers in May, 1898, and major-general of volunteers in August of the same year, and in 1898–99 was engaged on special duty in Havana, Cuba. In 1899 he was sent to the Philippine Islands, and in 1900 succeeded General Otis as commander of the Division of the Philippines and military governor of the islands. In January, 1900, he was promoted to be a brigadier-general in the regular army, and in February, 1901, to be major-general. Upon his return to the United States he was placed in command of the Department of the Lakes, whence he was transferred to the Department of California.

MACAU'LAY, Thomas Babington, Lord, historian, essayist, and politician, was born 1800 at Rothley Temple, Leicestershire, and died at Kensington 1859. In 1818 he entered Trinity College, Cambridge, where he obtained the Chancellor's medal for a poem on Pompeii, and a second time for a poem on Evening; received a fellowship, and took his M. A. degree in 1825. Before this he began to contribute to Knight's Quarterly Magazine, in which appeared his poems of the Armada, Ivry, and the Battle of the League; and in 1825 he inaugurated

Lord Macaulay.

his brilliant career in the Edinburgh Review by his article on Milton. He was called to the bar at Lincoln's Inn in 1826. He entered parliament in 1830 as member for Calne, and made his first speech in support of freedom for the Jews in England. During his political career Macaulay had continued his literary labors. In 1842 he published his Lays of Ancient Rome; and in 1848 appeared the first two of the five volumes of his History of England, which covers the period between the accession of James II. and the death of William III This brilliant rhetorical exposition, although touched with partisanship and with a tendency to paradox, has attained the position of an English classic. He was created a peer in 1857, and at his death he was buried in Westminster Abbey. The Life and Letters of Macaulay has been published by his nephew, Sir Geo. Otto Trevelyan.

MACAW', a genus of beautiful birds of the parrot tribe. The macaws are magnificent birds, distinguished by

Red and blue macaw.

having their cheeks destitute of feathers, and their tail-feathers long. They are all natives of the tropical regions of South America. The largest and most splendid in regard to color is the great scarlet or red and blue macaw. The great green macaw and the blue-and-yellow macaw are somewhat smaller.

MACAW-TREE, the name given to several species of trees of the genus Acrocomia, natives of tropical America, the fruit of one species yields an oil of a yellowish color of the consistence of butter, with a sweetish taste and an odor of violets, used by the natives of the West Indies as an emollient in painful affections of the joints.

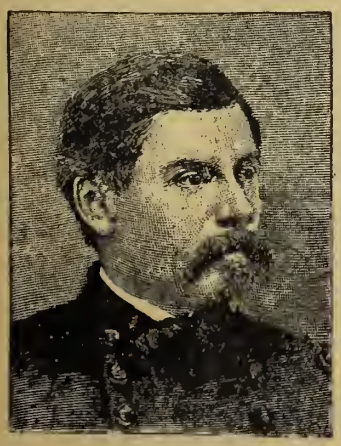
MACBETH,' MACBEDA, or **MACBETHAD,** son of Finnelaech, a king of Scotland who reigned from 1040 to 1057. During the reign of Duncan he was

"mormaer" of Moray by inheritance, and by his marriage with Gruoch, granddaughter of Kenneth IV. This Duncan, in his attempt to subdue the independent chiefs of the north, was slain by Macbeth at "Bothgowan," which is supposed to be near Elgin. By this means Macbeth became king, and, according to all accounts, his reign was fairly successful. In 1050 he is said to have gone on a pilgrimage to Rome. At the death of their father the sons of Duncan had taken refuge with their uncle Siward, earl of Northumberland, and with his aid they invaded Scotland in 1054; a battle was fought at Dunsinane, but it was not until 1057 that Macbeth was finally defeated and slain at Lumphanan in Aberdeen. The legends which gradually gathered round the name of Macbeth were collected by John of Fordun and Hector Boece, and reproduced by Holinshed in his Chronicle, and there found, as is supposed, by Shakespeare, who has made such splendid use of them.

MACCABEES, Books of, treat of the Jewish history under the Maccabean princes; they are five in number, the first two of which are included in the English Apocrypha, and are accounted canonical by the Roman and Greek churches.

M'CARTHY, Justin, M. P., novelist, historian, and politician, was born at Cork in 1830. His novels are numerous, and his historical writings include A History of Our Own Times, History of the Four Georges, etc. He was a Home Rule representative for Longford from 1879 till 1900. He died in 1904. His son, Justin Huntley McCarthy (born 1859), has also been an M. P. of the same party, and is favorably known in literature as the author of If I Were King.

MACCLELLAN, George Brinton, an American general, born at Philadelphia 1826, died 1885. He was trained at the West Point Military School; served in the Mexican war; joined the Red river expedition as engineer; and in 1855 was



George B. MacClellan.

appointed to the commission which reported on the condition of European armies, and watched the military operations during the Crimean war. At the outbreak of the civil war in the states he superseded McDowell after the first battle of Bull's Run; and became commander-in-chief on the 1st November, 1861. In this capacity he organized the raw levies of the North and advanced against Richmond the following spring, but was relieved from his supreme command by President Lincoln in 1862, and thenceforth led the army of the Potomac in a series of engagements which terminated in the Seven Days' Battle, when he had to retire from his lines in front of Richmond. Afterward, when Lee advanced into Maryland, MacClellan fought the battles of South Mountain and Antietam (September 14–17, 1862), and compelled the confederate forces to retire. The political authorities being dissatisfied with his apparent slackness in following up this victory, MacClellan was relieved from his command and retired from the army. In 1864 he was nominated for the presidency, but was overwhelmingly defeated by Abraham Lincoln.

M'CLERNAND, John Alexander, American soldier, was born in Kentucky in 1812. He removed to Illinois, and practiced law, and for some years edited a newspaper at Shawneetown. In 1836–40 and in 1842 he served in the state legislature, and from 1843 to 1851 sat in congresss as a democrat. In 1859 he was reëlected to congress, but resigned at the beginning of the civil war to raise a brigade of which he was given command. He commanded the right of the line at Fort Donelson, led a division at Shiloh, and was at Champion Hill, Vicksburg, and other battles. Afterward he commanded the thirteenth army corps until relieved in July, 1863, and in November, 1864, he resigned from the army. He died in 1900.

MACCLINTOCK, Vice-Admiral Sir Francis Leopold, K. C. B., born at Dundalk 1819; entered the navy in 1831; became a lieutenant in 1845; and in 1848 joined the expedition sent out by the British government in search of Sir John Franklin, the Arctic explorer. In 1850, and again in 1852, he went out with other Arctic expeditions, and on the latter occasion was instrumental in rescuing MacClure and his companions. MacClintock set forth again in 1857 as commander of the Fox, a vessel equipped by Lady Franklin, and discovered documentary and other evidence of the death of Franklin. For these services the explorer was knighted in 1860. He died in 1887.

MACCLURE, Vice-Admiral Sir Robert John Le Mesurier, C. B., born in 1807, died in 1873. He entered the navy in 1824; joined an Arctic expedition in 1836; accompanied Sir John Ross into the same region in 1848; and himself took command of an Arctic expedition in 1850. He penetrated as far north as Melville Sound, and there discovered a passage from the Atlantic to the Pacific, which he named Prince of Wales Strait.

M'CLURE (ma-kloor'), Alexander Kelly, American journalist, was born in Sherman Valley, Perry co., Pa., in 1828. He was state superintendent of printing in 1855, a member of the state convention of 1855, which met at Pittsburg to organize the republican party. As a leader of the Pennsylvania delegation in the republican national convention of 1860 he aided in the nomination of Abraham Lincoln. In 1875 he established the Philadelphia Times of which he was editor in chief till 1891. He has published Three Thousand Miles Through the Rocky Mountains, Our Presidents and How We Make Them. Recollections of Half a Century.

M'CLURE, Samuel Sidney, American editor and publisher, was born in County Antrim, Ireland, in 1857. In 1884 he established a newspaper syndicate which has grown to great proportions. In 1893 he founded McClure's Magazine and in 1899 the publishing house of McClure, Phillips & Company, New York. He is the president also of the S. S. McClure Company of the same city.

M'COOK, Alexander McD., American soldier, was born in Ohio in 1831. He served against the Apaches, and from 1858 to 1861 was instructor of infantry tactics at West Point. He commanded a regiment at the first battle of Bull Run, and a division of the army of the Ohio in the Tennessee and Mississippi campaigns. He was brevetted colonel for services at Shiloh, and finally brigadier-general and major-general United States army for gallant and meritorious services at Perrysville and elsewhere. At the close of the war he was brevetted brigadier-general in the regular army for "gallant and meritorious services at the battle of Perryville" and major-general for "gallant and meritorious services in the field during the rebellion," and in March, 1867, reëntered the regular service as lieutenant-colonel. He became a brigadier-general in 1890 and a major-general in 1894, was retired from service in 1895, represented the United States at the coronation of the Czar in May, 1896, and from September, 1898, to February, 1899, served on a commission appointed by President McKinley to investigate the administration of the war department during the Spanish-American war. He died in 1903.

M'CORMICK, Cyrus Hall, American inventor and manufacturer, was born in Virginia in 1809. He moved to Chicago in 1847. In 1831 he constructed the reaping machine which has become known all over the world. In 1859 he contributed largely to the establishment at Chicago of the Presbyterian Theological Seminary of the Northwest, and afterward endowed a professor's chair in Washington and Lee University, Lexington, Va. He died in 1884.

M'COSH, James, a Scottish-American philosopher, was born in Ayrshire, Scotland, in 1811. In 1868 he came to America and became president of Princeton College of New Jersey, and took a prominent place among American divines and educators. He resigned the presidency in 1888 owing to advancing age but retained the chair of philosophy and continued to live in Princeton until his death. Besides numerous contributions to British and American reviews, he has published many philosophical works and essays, and some occasional sermons and addresses. He died in 1894.

M'CULLOCH, Ben, American soldier, was born in Rutherford co., Tenn., in 1811; In 1835 he started to join the party of David Crockett and other Texan revolutionists at Nacogdoches.

In the war between the United States and Mexico he won distinction as an officer of the Texas rangers. He was particularly successful as a scout and was made quarter-master with the rank of major. In 1849 Major McCulloch settled at Sacramento, Cal., where he was chosen sheriff of the county. In 1852 he returned to Texas, where he was appointed United States marshal under the democratic administration, and later spent several years in Washington. At the outbreak of the war between the states he resigned his government employment and joined the confederates, and was commissioned brigadier-general on May 14, 1861. He gathered a force of men, and marched through Arkansas toward Missouri, formed a junction with the troops under Gen. Sterling Price and encountered the national troops under Gens. Nathaniel Lyon and Franz Sigel. The battle of Wilson's Creek was the result, where the confederates were victorious. Later he led a division at the battle of Pea Ridge and, while riding forward to reconnoiter, was killed by a bullet.

M'CULLOCH, Hugh, American financier, was born in Maine in 1808. In 1863 he became comptroller of the currency and assisted Secretary Chase in carrying out the provisions of the act organizing national banks. In March, 1865, he became secretary of the treasury, which office he held for four years He was instrumental in converting the debt and took strong ground in favor of a resumption of specie payments and the reduction of the national debt. From 1871 until 1878 he was at the head of a banking institution in England, and in October, 1884, he succeeded Judge Gresham as secretary of the treasury. He resigned in March following. He died in 1895.

M'CLOSKEY, John, cardinal, was born in Brooklyn, N. Y., in 1810. In 1834 he was ordained to the Roman Catholic priesthood. In 1837 he became pastor of St. Joseph's Church in New York City, and in June, 1841, when Bishop Hughes opened St. John's College in Fordham, N. Y., he was appointed its president. In 1844 he was translated to the new Roman Catholic diocese of Albany, N. Y., where he continued seventeen years, and built the cathedral. In May, 1864, he succeeded Dr. John Hughes as archbishop of New York. Here he built the new St Patrick's cathedral, and in 1875 was created cardinal-priest, being the first American elevated to that dignity. On several occasions he was called on to confer with the propaganda at the vatican; and he took part in the election of Leo XIII. He died in 1885.

MACDONALD, George, LL.D., novelist and poet, was born at Huntly in 1824. Among his numerous novels are David Elginbrod, Alec Forbes, Annals of a Quiet Neighborhood, Robert Falconer, Malcolm, The Marquis of Lossie, Castle Warlock, etc. He died in 1905.

MACDONALD, Sir John Alexander, K.C.B., D.C.L., Canadian statesman, was born in Scotland in 1815. Being taken to Canada, he was educated at Kingston; admitted to the bar in 1835; entered parliament for Kingston in 1844; and became successively a member of the executive council, receiver-general, commissioner of crown lands, and attorney-general. He became premier in 1867, a position which he held until 1873 when he resigned over the Pacific Railway charges, but resumed the office again in 1878, and held it till his death in 1891. He was an active promoter of the Canadian Pacific Railway and Canadian confederation, and was leader of the conservatives.

MACDUFF. See Banff.

MACE, a weapon of war in use in Europe as late as the 16th century. It consisted of a staff about 5 feet long, with a heavy metal head, which assumed a variety of forms, but was frequently in the form of a spiked ball. Another kind of mace is a sort of heavy ornamental staff used as an emblem of authority in universities, courts of law, parliament, etc.

MACE, a spice, the dried aril or covering of the seed of the nutmeg, this covering being a fleshy net-like envelope somewhat resembling the husk of a filbert. When fresh it is of a beautiful crimson hue. It is extremely fragrant and aromatic, and is chiefly used in cooking or in pickles.

M'CULLOUGH (m'-kŭl'lo), John Edward, American tragedian, was born at Blakes, Londonderry, Ireland, in 1837. He came to the United States in 1853, and first appeared on the stage in a minor part at the Arch Street Theater, Philadelphia, in 1857. In 1866–68 he traveled with Edwin Forrest, whose methods he imitated. He took many notable rôles, including Laertes, Iago, Edgar, Macduff, Richmond, Hamlet, Richelieu, Falconbridge, Pierre, De Mauprat, Richmond, Spartacus. His chief part, however, was Virginius, in which, indeed, he was unrivaled during his time. His interpretations were of the heroic type. He died in 1885.

MACDONOUGH(măk-dŏn'o), Thomas, American naval officer, was born at Macdonough, Del., in 1783. He entered the United States navy as a midshipman in 1800; served on the Constellation under Commodore Murray, in 1801–02; and in 1803 started for Tripoli in the Philadelphia, Commodore Bainbridge, but at Gibraltar was placed in charge of a captured Moorish frigate, and thus escaped capture and imprisonment at the hands of the Tripolitans when the Philadelphia ran aground on November 1, 1803. In the war of 1812 he served as first lieutenant on the Constitution, and in September, 1812, was placed in command of the United States naval force on Lake Champlain. In the following year he was promoted to be master commander, and in Plattsburg harbor, on Sunday, September 11, 1814, with a fleet of 14 vessels, carrying 86 guns and about 800 men, he completely defeated a British fleet of 16 vessels, carrying 95 guns and about 1000 men under Capt. George Downie. For this victory he was commissioned captain, then the highest rank in the United States navy, and received a gold medal from congress and an estate on Cumberland Head, near Plattsburg, from the legislature of Vermont. He died in 1825.

MACEDO'NIA, in ancient geography, a territory lying to the north of Greece, which first became powerful under its king Philip, the father of Alexander the Great, and conqueror of Greece Alexander the Great added immensely to the empire of Macedonia, and made, what had only been a petty province, mistress of half the world. After his death the empire was divided; dominion was lost over Greece; and the result of the battles of Cynoscephalæ (197 B.C.) and Pydna (168 B.C.) was to reduce the ancient kingdom to a Roman province. Macedonia now forms a part of Turkey in Europe, and is inhabited by Wallachians, Turks, Greeks, and Albanias.

MACERATA (mâ-che-rä'tà), a town in Italy. Pop. 20,263.—The province, bounded north by Ancona, west by Umbria, south by Ascoli, and east by the Adriatic, has an area of 1056 sq. miles, produces much corn, fruit, and hemp, and rears great numbers of sheep and cattle. Pop. 250,368.

MACFAR'REN, Sir George Alexander, musical composer, born in London 1813, died 1887. His chief operas are The Devil's Opera, Don Quixote, Robin Hood. He also essayed the cantata in Lenore, and the Lady of the Lake, while his oratorios are St. John the Baptist, The Resurrection, Joseph, and King David. He also wrote several musical treatises.

MACGAHAN (măk-gä'han), J. A., American journalist and traveler, was born in Perry co., Ohio, in 1844; died in Turkey, June, 1878. In 1870, while visiting in Europe, he was engaged as special correspondent for the New York Herald. Afterward he became special correspondent for the Herald at St. Petersburg, and reported the proceedings of the Geneva conference. In January, 1873, he started on his famous expedition to Khiva. In 1874 he published in London his Campaign on the Oxus, and the Fall of Khiva. In the same year he joined the Carlist forces in Spain and for ten months contributed letters to his paper from that country. During the Russo-Turkish war, which followed, he met with a severe accident, but managed to keep in the field, and described the scenes of battle from the fight at Shipka Pass to the surrender of Plevna. He died at Pera, in 1878, a suburb of Constantinople, of an epidemic disease.

M'DOWELL, Irvin, American soldier was born at Columbus, Ohio, in 1818. On the breaking out of the civil war he was made a brigadier-general and appointed to the command of the federal troops at Washington. He was in command when the Union army was defeated at the battle of Bull Run, July 21, 1861. General McClellan took the command soon after that battle, and General McDowell was placed in charge of the troops around Washington. He was made a major-general of volunteers, March 14th, and commander of the department of the Rappahannock, April 14, 1862. In 1863–64 he was president of the court for investigating cotton frauds, and of the board for retiring disabled officers. In November, 1872, he was made major-general of the regular army, and successively had com-

mand of the various military departments into which the United States is divided, until he was placed on the retired list in 1882. He died in San Francisco May 4, 1885.

M'GEE, W. J., American geologist, anthropologist, and ethnologist, was born near Dubuque, Iowa, in 1853. He began the study of archæology and geology in 1875, and in 1877–81 executed a topographic and geological survey of 17,000 square miles in northeastern Iowa. In 1881 he was appointed geologist in the United States Geological Survey, and in 1885 and 1892 compiled standard geological maps. In 1893, having resigned from the Geological Survey, he was appointed ethnologist-in-charge in the Bureau of American Ethnology. In 1895 he explored the Isla del Tiburon, Gulf of California, home of the Seri Indians, a savage tribe which until then had not been studied. His publications include: The Pleistocene History of Northeastern Iowa, The Geology of Chesapeake Bay, The Siouan Indians, Primitive Trephining, The Seri Indians, Primitive Numbers, and many other memoirs and minor papers.

M'GLYNN, Edward, American Roman Catholic clergyman, was born in New York City, in 1837. He was educated at the public schools of New York City, and for ten years, from 1851 to 1860, studied theology at the college of the Propaganda in Rome. In 1860 he was ordained priest of the Roman Catholic church, and on his return to the United States became a hospital chaplain. In 1866 he became pastor of St. Stephen's church in New York City. His unwillingness to establish a parochial school in connection with his church brought him into disfavor with the archbishop of his diocese and his coadjutor, Mgr. Preston. He also spoke in favor of the land theories of Henry George on several public occasions, for which he came under the censure of his church, and was suspended. In December, 1892, after a hearing before the Apostolic Delegate, Mgr. Satolli, he made his submission and was restored to his priestly functions. He died in 1900.

M'KINLEY, William, 25th president of the United States, was born in Niles,

William McKinley.

Ohio, in 1843. After teaching school for a short period, he enlisted, in June, 1861, in the twenty-third Ohio infantry, under command of Colonel (subsequently General) W. S. Rosecrans, and served through the war, gaining the rank of brevet major. He returned to Poland at the close of the war, began the study of law, and was admitted to the bar in 1867. Entering on the practice of law at Canton, Ohio, he soon mingled in politics, and became a leading stump speaker in the state. He was elected prosecuting attorney in 1869, and in 1876 member of congress, and re-elected successively until 1882. With one exception he continued to hold his seat in congress until 1890. He was elected governor of Ohio in 1891, and reëlected in 1893 by a majority of 80,000. In June, 1896, he was nominated by the republican national convention at St. Louis for president, and elected by a vote of 271 in the electoral college to 176 for William J. Bryan, his democratic opponent. In 1900 he was re-elected by increased majorities both in the popular vote and in the electoral college, the latter giving him 292 votes to 155 for W. J. Bryan. While holding a public reception at the Pan-American Exposition at Buffalo, Sept. 6, 1901, he was shot through the stomach by an anarchist named Leon Czolgosz, of Cleveland, O. An operation was performed immediately, and the President was removed to the home of President Milburn of the Exposition. For a week the physicians announced steady improvement, and it seemed that he was well out of danger, when he relapsed, and died at 2:15 A. M., Sept. 14. Gangrene had set in, and a post-mortem examination showed that from the first there was no hope of recovery. He was buried at Canton, O., Sept. 19.

MACGILL (-gil′), James, born in Glasgow, Scotland, 1744, died at Montreal 1813. He emigrated to Canada, and ultimately became one of the chief merchants in the city. He left property valued at $150,000 (now enormously increased in value), and $50,000 cash to found the university in Montreal which bears his name.

MACHIAVELLI (mȧk-yȧ-vel′lē), Niccolo, a distinguished Italian statesman and historian, born at Florence in 1469; died in 1527. He became prominent in public affairs in 1498, when he was appointed secretary to the Ten at Florence. For more than fourteen years he guided the destinies of the Florentine Republic, undertook embassies, concluded treaties, and jealously conserved the rights and liberties of his native city. When the Medici returned to power in 1512 by aid of Pope Julius II., Machiavelli was deprived of his office, and imprisoned for his supposed complicity in a plot to overturn the new authority, but being released after a time he retired to his country house of San Casciano. The name of Machiavelli was for long synonymous with all that is tortuous and treacherous in state affairs. The more recent, as also the more generous estimate of this Italian statesman, is to regard his Prince as a first honest but imperfect attempt to construct a state out of the decayed mediæval institutions still lingering in Italy, and that its defects on the ethical side are due to the corrupt times in which he lived, the conditions of political dissimulation under which his experience was gained, and the overmastering desire he had to see his country unified and made great.

MACHINE GUN, a name given to any of those pieces of ordnance that are loaded and fired mechanically, and can deliver a number of projectiles simultaneously or in rapid succession, having usually a number of separate barrels. The first of these to come into prominence in warfare was the French mitrailleuse, or mitrailleur, which was employed in the Franco-German war. The Gatling gun first appeared in the United States, and was speedily adopted by Britain and other powers, with modifications. Other guns of this kind are the Hotchkiss, the Nordenfeldt, and the Gardner gun. Such guns, while having their own use in warfare by land, are regarded as being of special value in marine warfare, and are intended mainly for use against torpedo-boats. The Nordenfeldt, the Gatling, and the Gardner are all in use in the British navy. The Gardner gun may be mounted in various ways—on a gun-carriage, or on a tripod stand, the legs of which can be screwed down to a ship's deck. As to absolute rapidity of fire the Nordenfeldt has slightly the superiority; yet the two-barrel Gardner can fire 236 rounds, the five-barrel Gardner 330 rounds in half a minute, while as regards reliability for continuous work and ease and rapidity of fire the Gardner gun has manifested a marked superiority over the Nordenfeldt. The latter is fired by a handle with a reciprocating motion, while the Gardner is fired by a handle with a rotary motion, which is the same whatever the elevation or depression of the gun. The Hotchkiss gun fires heavier projectiles (hollow percussion shells) than the other machine guns, the fire being continuous. It may be described as consisting of a gun-metal frame in which five Whitworth steel barrels revolve with intermittent motion, having a single firing action and cast-iron breech. The barrels become stationary at the moment of firing, loading, and extracting the empty cartridges. A more recent machine gun is the Maxim, which, after the first shot is fired by hand power, continues to fire shot after shot by means of the power derived from the explosion of each successive cartridge.

MACHINE TOOLS, a name given to various machines constructed to perform operations that otherwise would be done by hand. They include planing machines, drilling machines, punching machines, boring machines, steam hammers, etc.; and some of them are marvels of accuracy and ingenuity.

MACKAY (ma-kē′), Charles, LL.D., poet and miscellaneous writer, born at Perth in 1812. He visited America on a lecturing tour (1858), and represented the Times in New York during the civil war. His chief prose and poetical works are: Songs and Poems (1834), The Hope of the World and other Poems (1840). Voices from the Mountains (1847), Forty Years' Recollections, 1830–1870 (1876), Poetry and Humor of the Scottish Language (1882), The Founders of the American Republic (1885), a work

on Celtic Etymology, and many other works. He died in 1889.

MACKAY, John William, American capitalist, born in Dublin, Ireland, in 1831. He came to New York City when he was a boy. In 1851 he went to California and in 1852 to Nevada, where he secured a two-fifths share in the Bananza mines of the Comstock Lode. With Flood, Fair, and O'Brien, his partners, he formed the Nevada Bank, and was long its president, but withdrew his capital after Flood's disastrous attempt to corner wheat. In 1884, largely because of enmity to Jay Gould, he formed with James Gordon Bennett the Commercial Cable Company and the Postal Telegraph Company to fight the Western Union; laid the cable in spite of many difficulties, and fought a long fight with the old cable lines, which cut the rate to 12 cents a word in a vain attempt to force Mackay out. He died in 1902.

MACKEN'ZIE, Sir Alexander, Canadian explorer, born at Inverness, Scotland, 1755; died 1820. In the employment of the Northwest Fur Company he explored the great river named after him from the western end of Great Slave Lake to the Arctic Ocean (1789) He made another expedition to the western coast (1792), and was the first white man to cross the Rocky Mountains and reach the Pacific coast. He returned to Britain in 1801, and was knighted.

MACKENZIE, Alexander, Canadian statesman, born in Logierait, Perthshire, Scotland, 1822. Originally a stonemason, he emigrated to Kingston, Canada, in 1842, and began business as a builder and contractor. In 1852 he was editor of a liberal newspaper, and he entered parliament in 1861, becoming leader of the liberal party in 1873. On the resignation of Sir John Macdonald that same year he became premier, and retained office with much success till 1878 He died in 1892. He more than once declined the honor of knighthood.

MACKENZIE, Sir Alex. Campbell, composer, born at Edinburgh 1847. He became principal of the Royal Academy of Music in 1888. He is the author of the oratorio The Rose of Sharon (1884), the operas Colomba (1884), and The Troubadour (1886), the cantata of the Story of Sayid (1886), The Dream of Jubal (1889), etc.

MACKENZIE, Sir Morell, M.D., born at Leytonstone, Essex, 1837; educated at London Medical College, Paris, and Vienna; obtained the Jackson prize for diseases of the larynx; became physician to the London Hospital, and lecturer on diseases of the throat. In 1887–88 he was associated with the specialists of Berlin and Vienna in the treatment of the larynx disease of the Emperor Frederick (at first, while he was Crown Prince) of Germany He is the author of a treatise on Diseases of the Throat and Nose and several other works. He died in 1892.

MACKEN'ZIE, a district of the Northwest Territories, Canada, created in 1895. It extends from Athabasca and British Columbia on the south to the Arctic waters on the north, and from Keewatin on the east to Yukon on the west, the western boundary line following the line of the Rocky Mountain Divide. It contains an area of 563,200 sq. miles, being the largest district of Canada, and almost as large as the territory of Alaska. It is hummocky and broken throughout, with numerous swamps and lakes. Great Bear Lake in the north and Great Slave Lake in the south are two of the largest lakes in the dominion. The western half of the district is drained by the Mackenzie river. Among other streams are the Copper-mine and the Great Fish, or Back rivers. The winters are long and severe, the summers short and warm.

MACKENZIE RIVER, a large river in the Northwest Territories of Canada, which flows out of Great Slave Lake, first west, then north, finally northwest; and after a course of about 1200 miles falls into the Arctic Ocean by numerous mouths. It was discovered by Alexander Mackenzie in 1789.

MACKEREL, one of the spiny finned fishes, a well-known and excellent table fish, which inhabits almost the whole of the European seas. Mackerel, like

Mackerel.

herring, are caught only when they approach the shore to spawn, nets being chiefly used. The North American mackerel is also caught in great quantities on the Atlantic coasts.

MACLURE, William, the pioneer of American geology, was born at Ayr in Scotland, in 1763. In 1796 he came to this country. In 1803 he visited France as one of the commissioners appointed to settle the claims of American citizens on the French government for spoliations committed during the revolution; and during the few years then spent in Europe he applied himself with enthusiasm to the study of geology. On his return home he commenced the task of making a geological survey of the United States. Almost every state in the Union from St. Lawrence to the Gulf of Mexico was traversed and mapped by him, the Alleghany mountains being crossed and recrossed some fifty times. The results of his unaided labors were submitted in a memoir to the American Philosophical Society (1809), and published in the Society's Transactions (vol. vi.), together with a geological map. which thus antedates William Smith's great geological map of England by six years. From 1817 to his death Maclure was president of the Academy of Natural Sciences of Philadelphia, and much of the prosperity of the institution was due to his devoted services. He died in 1840.

M'KEESPORT, a city in Allegheny co., Pa., on the Monongahela river at the mouth of the Youghiogheny river, both of which are here navigable for steamboats, and on the Balto. and O., the Penn., and the Pitts. and Lake Erie railways; 14 miles s.e. of Pittsburg. It is the center of the greatest bituminous coal region in the country and of the natural-gas wells, and is a large manufacturing center. Pop. 42,175.

M'ALASTER, John Bach, American historian, was born in Brooklyn, N. Y., in 1852. In 1883 he was elected professor of American history at the University of Pennsylvania and in the same year the first volume of a History of the People of the United States was published. It is designed to cover the period from 1783 to 1861. Among his other published works are Benjamin Franklin as a Man, Origin, Meaning and Application of the Monroe Doctrine, A School History of the United States, and Daniel Webster.

MACMONNIES (măk-mŭn'ĭz), American sculptor, was born in Brooklyn in 1863. The most important of his works and the one which has done most to secure his reputation was the colossal fountain in the court of honor at the Columbian Exhibition in Chicago in 1893. He also executed the Army and Navy groups for the Soldiers' and Sailors' monument at Indianapolis, the decorations of the triumphal arch at the main entrance to Prospect Park, Brooklyn, and the Battle Monument at West Point He was made chevalier of the Legion of Honor in 1898 and won a grand prize of honor at the Paris exposition of 1900.

M'PHERSON, James Birdseye, American soldier, was born in Sandusky, Ohio, in 1828. At the beginning of the civil war he applied for active duty, was appointed lieutenant-colonel, November 12, 1861, and became major-general of volunteers October 8, 1862. In the early part of 1862 he was attached to the staff of Gen. U. S. Grant, and served as chief engineer at Fort Henry, Fort Donelson, Shiloh and the siege of Corinth. At the battle of Fort Gibson part of his corps, led by himself, decided the battle in favor of the federals. On May 12th his corps engaged part of Gen. Joseph E. Johnson's army at Raymond, and routed it. On August 1, 1863, he was made brigadier-general in the regular army. In 1864 General McPherson was advanced to the command of the army of the Tennessee. He assembled 25,000 men at Huntsville, Ala., in April, 1864. From May until June he had constant skirmishes with the confederate forces, and led several attacks that inflicted losses, but led to no permanent results. On July 22nd General Hood massed the confederate forces and made an attack on the left flank of General Sherman's army, commanded by General McPherson. The latter at the time was at General Sherman's headquarters, engaged in consultation, and rode rapidly to the threatened point. In attempting to pass from one column to another, to meet this attack, he unguardedly passed into the enemy's lines, and was killed. As a general he showed remarkable ability, being self-possessed, quick of perception and of untiring activity. In one of the public parks of Washington a statue is erected to his memory by his comrades of the army of the Tennessee.

MACMAHON (mak-mȧ-ōn), Marie Edmé Patrick Maurice de, Duke of Magenta and Marshal of France, born

in 1808; educated at the military college of St. Cyr; served with distinction in Algeria; became brigadier-general in 1848; received command of a division during the Crimean war, and assisted in storming the Malakoff; took part in the campaign of 1859 against Austria, and won the battle of Magenta by his prompt handling of the left wing; and after the war became governor-general of Algeria. At the outbreak of war between France and Germany (1870) Macmahon was placed in command of the 1st army corps, which was defeated at Weissenburg, Wörth, and finally fell back upon Châlons. Here he rallied his forces, and proceeded northeastward to relieve Bazaine, who was besieged in Metz, but he was pursued by the Germans, shut up by their encircling armies in the town of Sedan, and wounded in the battle before the final surrender. After the armistice with Germany he was employed by the Versailles government in putting down the commune, and in 1873 he was elected president of the republic, a position which he occupied until 1879. He died in 1893.

MA'CON, a city in Georgia, on the Ocmulgee, the seat of a Baptist university and a Wesleyan female college Pop. 26,172.

MACREADY (mak-rē'di), William Charles, English tragedian, born in London 1793, died at Cheltenham 1873. He played in the provinces with considerable success, and appeared at Covent Garden in 1816. In 1826 he made his first visit to America, and in 1828 played in Paris, with great success in both countries. He undertook the management of Covent Garden in 1837, and Drury Lane in 1842. He revisited the United States in 1849; returned to England; gave a series of farewell performances, and finally retired from the stage in 1851. His Reminiscences appeared in 1875.

M'VEAGH, Wayne, American lawyer and cabinet officer, was born at Chester co., Penn., in 1833. In 1870 he was appointed United States minister to Turkey, and in 1877 he was a member of the commission which visited Louisiana by request of President Hayes. At the accession of Mr. Garfield, in March, 1881, Mr. McVeagh was appointed attorney-general of the United States. This position he resigned on the accession of President Arthur. He supported Cleveland for the presidency in 1892 and from 1893 to 1897 was ambassador to Italy.

MADAGASCAR, a large island in the Indian Ocean, 230 miles distant from the east coast of Africa, from which it is separated by Mozambique Channel; length, 975 miles; average breadth, 250 miles; area, about 228,500 sq. miles; population, about 2,500,000. Madagascar may be described as an elevated region, with an average height of 3000 to 5000 feet, overlooked by mountains rising in some cases to nearly 9000 feet. The most striking feature in the vegetation is a belt of dense forest, with an average breadth of 15 to 20 miles, passing round the whole island. It is found at all levels from 6000 feet to the water's edge, and the trees include palms, ebony, mahogany, fig, cocoanut, and the ravinala or traveler's tree, which when pierced yields a refreshing juice. The vegetable products grown for food include rice, manioc or cassava, sweet-potatoes, ground-nuts, and yams. Ginger, pepper, and indigo grow wild in the woods; cotton, sugar-cane, coffee, tobacco, and hemp are cultivated. India-rubber, gum-copal, and dye-woods are exported. Humped cattle are found in immense herds, and form a large part of the wealth of the inhabitants, as also sheep, goats, swine, and horses. The most characteristic of the mammals are the lemurs. The birds are numerous; snakes are rare; crocodiles, lizards, chameleons abound. The native government, till overthrown by the French, was an absolute monarchy. The army consisted of 20,000 men, raised to 50,000 in the war with France. The capital is Antananarivo, in the elevated central region, with a population estimated at 100,000.—Madagascar was known to Marco Polo at the end of the 13th century, and in 1506 was visited by the Portuguese, who gave it the name of St. Lorenzo. Toward the end of the 17th and during the most of the 18th century the French established themselves in the island, but they were only able after a hard struggle to retain the islands of Ste. Marie on the east coast and Nossi-bé on the northwest. In the year 1810 Radama I. became king of the Hovas, and with his approval Christian missionaries began to teach in the capital in 1820, many converts were made, the Bible was translated into the Malagasy tongue, the language was first reduced to a systematic written form, and printing was introduced. In 1828 he was succeeded by his chief wife, Ranavalona, a woman of cruel disposition, who persecuted the Christians and closed the island to Europeans. She was succeeded in 1861 by her son, Radama II., who reopened it to the missionaries and emancipated the African slaves. He also granted extensive territories and privileges to France, an act which offended his chiefs and led to his assassination in 1863. His wife occupied the throne five years. and on Ranavalona II. becoming queen in 1868, the French brought forward their claims on the Malagasy territory, which being refused, led to war. The result was a treaty (1885) by which Madagascar became a French protectorate. Since then, by means of a military expedition, the French have reduced the island to the position of a colony (1895).

MADDER, a dye plant. It is a climbing perennial, with whorls of dark green leaves, and small yellowish cross-shaped flowers. The prepared root is used as a red dye-stuff. It yields colors of the greatest permanence, and is employed for dyeing both linen and cotton. Two kinds of it are fixed upon cotton; one is simply called madder-red, and the other, which possesses a much higher degree of luster and fixity, is called Turkey or Adrianople red, because it was for a long time obtained entirely from the Levant, where it was called alizara. The coloring principle of madder is termed alizarine, and as this can now be obtained artificially from coal-tar, the use of madder in dyeing is almost entirely superseded by that of artificial alizarine.

Madder plant.

MADEIRA (mȧ-dā'i-rȧ), a Portuguese island in the North Atlantic, 360 miles from the coast of Africa, 530 miles from Lisbon, 1215 from Plymouth; length, 30 miles; breadth, 13 miles; area, about 313 sq. miles. The staple products of Madeira are wine and sugar. The mean annual temperature is 65°, the two hottest months being August and September, and the three coldest January, February, and March. The climate is equable and the island is considered an excellent sanitorium for chest diseases. The Madeiras were known to the Romans, and were rediscovered and colonized by the Portuguese in 1431. Pop. 148,172.

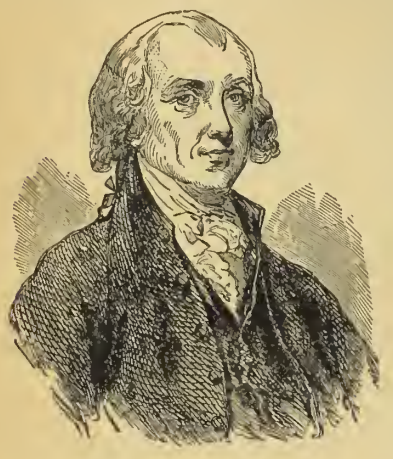
MAD'ISON, the capital of Wisconsin, 75 miles west of Milwaukee, situated upon an isthmus between lakes Mendota and Monona, and founded 1836. It contains the state-house, the state university dating from 1851, and has a lunatic asylum, etc. It is a great railway center, has important manufactures, a large trade, and a population of 21,000.

State capitol, Madison, Wis.

MADISON, a city in Indiana, on the right bank of the Ohio, 80 miles s.s.e. Indianapolis. Pop. 11,165.

MADISON, James, fourth president of the United States, 1809–17, born in Virginia 1751, died 1836. He was educated at Princeton; elected to the Virginia convention in 1765; became a member of the council of state; took his seat in the Continental congress in 1780 and was there made chairman of the committee of foreign affairs. Under the administration of Jefferson he became secretary of state, and in 1809 he was elected president. During his term of office war was declared with

Great Britain, which Madison prosecuted for three years with alternate defeat and success, until the decisive battle of New Orleans was fought, and peace



James Madison

signed in 1814. Madison retired into private life in 1817.

MADNESS, See Insanity.

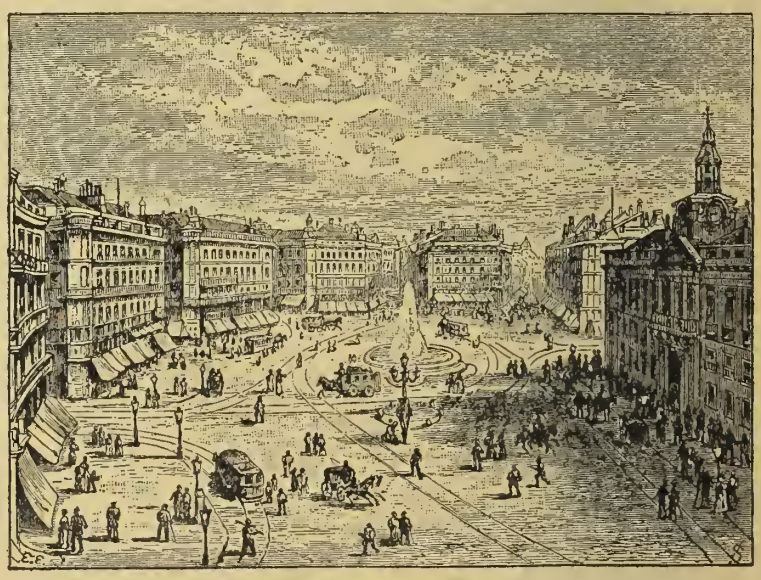
MADON'NA, an Italian term of address equivalent to Madam. It is given specifically to the Virgin Mary, like Our Lady in English, and hence pictures representing the Virgin are generally called madonnas.

MADRAS', a maritime city of British India, capital of the presidency of the same name, on the Coromandel coast. Altogether the municipality covers an area of 27 sq. miles, the native and business part being called the Black Town. The chief objects of interest are the citadel of Fort St. George, built in 1639, the cathedral of St. George, Scotch church government house, senate house, revenue buildings, college, etc. There are no manufactures to speak of, but the export and import trade amounts to $50,000,000 annually. Madras was founded in 1639 by the English, and soon became their chief settlement on the coast. Pop. 509,396.

MADRAS, Presidency of, includes with its dependencies and the state of Mysore the entire south of the peninsula of India. Its extreme length is 950 miles, breadth 450 miles; area, 149,092 sq. miles. There are extensive forests yielding teak, ebony, and other valuable timber trees. The principal vegetable products are rice, wheat, barley, corn, and other grains; sugar-cane, areca, yam, plantain, tamarind, jack-fruit, mango, melons, cocoa-nuts, ginger, tumeric, pepper, tobacco, oil seeds, coffee, and cotton. The wild animals met with are the elephant, tiger, chetah, jackal, wild hog, etc. The Madras administrative authority is vested in a governor, with a council of three members appointed by the queen, and of whom one is the commander-in-chief. For legislative purposes the council is increased by nominations of the governor. In each of the 22 districts there is a collector and a sessions judge. The chief educational institution is the Madras University, an examining body granting degrees in arts, law, medicine, and engineering. The population is 38,208,609, and the native protected states have in addition a pop. of 4,190,322. The chief languages spoken are the Dravidian, namely, Tamil, Telugu (which are spoken by the great majority of the inhabitants), Canarese, and Malayalam, while Hindustani is the language spoken by the Mohammedans.

MAD'REPORE, a coral-building polyp, forming coral of stony hardness and of a spreading or branching form, hence called tree-coral. Madrepore coral is of a white color wrinkled on the surface and full of little cavities, in each of which an individual polyp was lodged. These polyps raise up walls and reefs of coral rocks with astonishing rapidity in tropical climates. The term is often applied also to other branching corals.

MADRID (mȧ-drid'), the capital of Spain, in New Castile, in the province of Madrid, on the Manzanares, near the center of the Iberian Peninsula. The royal palace, a combination of Ionic and Doric architecture, is one of the most magnificent in the world, being 470 feet each way, and 100 feet high. It contains a small but splendid Corinthian chapel, a library of nearly 100,000 volumes, and a fine collection of ancient armor and



Puerta del Sol in Madrid.

coins. Madrid has no cathedral, being only a suffragan bishopric of Toledo, and the churches are few and uninteresting. The bull-fights take place in the Plaza de Toros (bull-ring), a building which is about 1100 feet in circumference, and capable of containing 12,000 spectators. The Prado, nearly 2 miles long, a boulevard on the east of the city, forms the popular promenade, and beyond it is the park. The Royal Museum of Painting and sculpture, in the Prado, contains more than 2000 pictures. The National Library, founded by Philip V., contains 230,000 volumes. The University has an average attendance of 5000 students, and there are numerous colleges and schools, medical, military, law, etc. The manufactures are of small importance. Madrid only began to be a place of importance under Charles V. and in 1560 Philip II. declared it to be the capital. It is the creation of a century, for it has not increased much since the age of Philip IV. Pop. 512,150.

MAD'RIGAL, a short amorous poem, consisting of not less than three or four stanzas or strophes, and containing some tender and delicate, though simple thought, suitably expressed. The madrigal was first cultivated in Italy, and those of Tasso are among the finest specimens of Italian poetry. The term is also applied to an elaborate vocal composition now commonly of two or more movements, and in five or six parts. The musical madrigal was at first a simple song, but afterward was suited to an instrumental accompaniment.

MADURA', a district of India forming part of the Madras presidency, mostly a plain drained by the Vaigai river; skirted on the southwest by the Travancore Hills; area 8808 sq. miles, pop. 2,608,404. The town has been much improved under British rule. Pop. 105,984.

MADU'RA, an island of the Indian Archipelago, n. e. of Java, and separated from it by the Strait of Madura; 105 miles long, and 30 miles broad; and belonging to the Dutch. Pop. 1,000,000.

MAELSTROM, a celebrated whirlpool off the coast of Norway, near the island of Moskoe, one of the Lofoddens. With a strong wind from the northwest the whirlpool rages violently, so as to be heard several miles, and to engulf small vessels which approach it.

MAESTO'SO, an Italian musical term meaning in a majestic or lofty style.

MAFEKING, a small town of Bechuanaland, on the railway from Kimberley to Buluwayo, famous for the long stand it made under Col. Baden-Powell against the Boers in the South African war of 1899–1902.

MAGALHAENS (mag'ȧl-yȧ-ens), or **MAGELLAN** (ma-gel'an), Fernando de, a Portuguese navigator, who conducted

the first expedition round the world; born about 1470; served under Albuquerque in the East Indies; distinguished himself at the taking of Malacca, in 1511; in 1519 received the command of a fleet of five ships from Charles V. of Spain, with which he sailed westward entered

Magellan.

the strait since called after his name, and discovered the Pacific Ocean. Subsequently he was killed in a skirmish with the natives on one of the Philippines, and his vessels were conducted to Spain by Juan Sebastian del Cano.

MAGAZINE GUN. See Gunnery.

MAGAZINES. See Periodicals.

MAG'DALEN, or MAGDALENE, Mary that is, Mary of Magdăla, a woman mentioned in the New Testament as having had seven devils cast out of her, as watching the crucifixion, and as having come early to the sepulchre on the resurrection morning. She was erroneously identified as the "woman who was a sinner" (Luke vii. 37), and hence the term Magdalen came to be equivalent to a penitent fallen woman.

MAGDEBURG (măh'dė-burh), the capital of Prussian Saxony, and a fortress of the first class, on the Elbe, 76 miles w.s.w. of Berlin, chiefly on the left bank of the river, which here divides into three arms. Magdeburg is a place of great antiquity, being a trading center in the 9th century. It early distinguished itself in the Reformation. During the Thirty Years' war the town was besieged, stormed, and sacked by Tilly, when 20,000 persons are said to have been murdered. Pop. 229,663.

MAGELLAN. See Magalhaens.

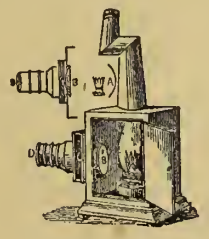
MAGELLAN, Strait of, separates the continent of South America from Tierra-del-Fuego, 300 miles long; varies in breadth from 5 to 50 miles, and forms communication between the South Atlantic and South Pacific Oceans. The number of obstructing islands makes the channel difficult of navigation. The strait was discovered in 1520 by Fernando Magalhaens.

MAGENTA, a brilliant blue-red coloring substance derived from aniline.

MAGI (mā'jī), the hereditary priests among the Medes and Persians, set apart to manage the sacred rites, and preserve and propagate the sacred traditions, acting also as diviners and astrologers. They possessed great influence both in public and private affairs, conducted the education of the princes, etc. Their order was reformed by Zoroaster. The name came also to be applied to holy men or sages in the East.

MAGIC, the art or pretended art or practice of producing wonderful effects by the aid of superhuman beings or of departed spirits or the occult powers of nature. A large proportion of magical rites are connected with the religious beliefs of those using them, their efficacy being ascribed to supernatural beings. In savage countries the native magician is often sorcerer and priest, and sometimes chief of the tribe. Among the ancient Egyptians magic was worked into an elaborate system and ritual, and it was regularly practiced among the Babylonians and Assyrians, as well as in Greece and Rome. Alexandria, from the 2d to the 4th century, became the headquarters of theurgic magic, in which invocations, sacrifices, diagrams, talismans, etc., were systematically employed. This system, influenced by Jewish magical speculation, had a strong hold in mediæval Europe, and many distinguished names are found among its students and professors. The magic which holds a place still among the illiterate and ignorant classes has come down by tradition in popular folk-lore. The name natural magic has been given to the art of applying natural causes to produce surprising effects. It includes the art of performing tricks and exhibiting illusions by means of apparatus, the performances of automaton figures, etc. See Legerdemain.

MAGIC LANTERN, a kind of lantern invented by Kircher, a German Jesuit (1604–80), by means of which small pictures or figures are represented on the wall of a dark room or on a white sheet, magnified to any size at pleasure. It consists of a closed lantern or box, in which are placed a lamp and a concave mirror (as at A), which reflects the light of the lamp through the small hole of a tube in the side of the lantern, which is made to draw out. At the end of this tube, next to the lamp, is fixed a plane convex lens (B), and at the other a double-convex lens (D). Between the



Magic lantern.

two lenses are successively placed (at C) various slips of glass, with transparent paintings, representing various subjects, which are thrown in a magnified form on the wall or screen opposite to the lantern and spectators. It has been vastly improved of late, and the substitutions of the oxyhydrogen and electric lights for the oil lamp has added much to the effectiveness of its displays; while photography applied to the production of objects has almost indefinitely increased its resources.

MAGISTRATE, a public civil officer invested with the executive government or some branch of it. In this sense a king is the highest or first magistrate in a monarchy, as is the president in a republic. But the word is more particularly applied to subordinate officers, to whom the executive power of the law is committed, either wholly or in part, as governors, intendants, prefects, mayors, justices of the peace, and the like.

MAGNA CHARTA LIBERTA'TUM, the Great Charter of Liberties, a document forming part of the English constitution, and regarded as one of the mainstays of English liberty, extorted from King John by the confederated barons in 1215. Its most important articles are those which provide that no freeman shall be taken, or imprisoned, or proceeded against except by the lawful judgment of his peers or by the law of the land; and that no scutage or aid shall be imposed in the kingdom (except certain feudal dues from tenants of the crown), unless by the common council of the kingdom. The remaining and greater part of the charter is directed against abuses of the king's power as feudal superior. It originally contained sixty-three clauses; subsequent confirmations altered the number of these till 1225 when it took its final and accepted legal form with thirty-seven clauses. The most accurate and complete copy of the original charter is that preserved in Lincoln Cathedral. The board of commissioners on the public records ordered a facsimile of it to be engraved, and it has been frequently translated into English.

MAGNE'SIA, a white, tasteless, earthy substance, possessing alkaline properties. It is absorbent, antacid, mildly cathartic, and almost insoluble. It is found native in the state of hydrate and carbonate, and exists as a component part of several minerals. In commerce, pure magnesia is generally distinguished by the term calcined magnesia and is readily obtained by exposing its hydrated carbonate to a red heat. The hydrated carbonate goes by the name of magnesia or magnesia alba. The chief use of magnesia and its carbonate is in medicine. See Magnesium.

MAGNESIAN LIMESTONE, a yellowish rock composed of carbonates of lime and magnesia, the latter amounting in some cases to nearly a half. There are several varieties, more or less useful for building or ornamental purposes, which are included under the generic name dolomite. The same name is also given to the whole Permian formation, from this rock being very largely developed in it.

MAGNE'SIUM, the metallic base of magnesia. It may be obtained by decomposing chloride of magnesium by means of potassium. It is of a white color like silver; its luster is metallic and brilliant; it is very malleable, and fuses at a red heat. Heated to redness in oxygen gas, it burns with brilliancy, and combining with oxygen becomes magnesia, or the oxide of magnesium. The magnesium light is rich in chemical rays, and is now employed to some extent in photography. The chief salts are the carbonate, the chloride, the sulphate (Epsom-salt), the phosphates and the silicates, among which are such minerals as chrysolite, meerschaum, soapstone, and serpentine.

MAGNET. See Magnetism.

MAGNETISM, the science which treats of the phenomena exhibited by magnets,—phenomena due to one of those forces which, like electricity and heat, are known only by their effects. The phenomena of magnetism were first observed in the loadstone or magnet

(so named from Magnesia in Asia Minor). The loadstone is a kind of iron ore (magnetic iron ore), and is found in many parts of the world, especially in the Scandinavian peninsula and in Siberia. It has the power of attracting small pieces of iron or steel, and when suspended in such a way as to be able to move freely, always points to what are called the magnetic poles of the earth, that is nearly north and south. A piece of loadstone forms a natural magnet, and has the further remarkable power of giving all its own properties to hard iron or steel when these bodies are rubbed by it. A bar or mass of iron or steel to which the peculiar properties of a natural magnet have been imparted by friction from other magnets or by electric induction is called an artificial magnet. When freely suspended, all magnets, natural and artificial, rest with their lengths in a northerly and southerly direction, and this property is utilized in the well-known compass. They attract iron and other magnetic substances with a force increasing from the middle of the magnet to its extremities, which are called its poles. The magnetism at the two poles is different, that pole which points to the north is distinguished as the north or north-seeking or austral pole, or by the sign plus (+); that which points to the south as the south or south-seeking or boreal pole, or by the sign minus (—). The poles of the same denomination repel each other while those of different names have mutual attraction, thus resembling the two electricities, positive and negative. The intensity of this attraction and repulsion varies inversely as the square of the distance, a law which also governs electrified bodies. Magnetism pervades the earth as electricity does the atmosphere. It assumes a totally different form in different substances; the metals iron, nickel, and cobalt being strongly attracted by the magnet, others such as bismuth, copper, silver, gold, etc., being as strongly repelled. (See Diamagnetic.) The space in the neighborhood of a magnet is called the magnetic field; a piece of soft iron brought into this space becomes magnetic, but it loses its magnetism as rapidly on removal from the field. (See Induction, Magnetic.) Steel has coercive force, in virtue of which it requires time for magnetization, and retains its magnetism on removal from the field. Hard steel may be made magnetic by rubbing it several times in the same direction with a powerful magnet, and hence it is easy to multiply magnets. The most powerful permanent magnets are produced by rubbing bars of steel on electro-magnets (see Electro-magnetism), or by moving them backwards and forwards along the axis of a coil of wire in which an electric current is passing. A bar is magnetized to saturation when its magnetism is as great as it can retain without future sensible loss. When a magnet is broken into a number of pieces each piece is found to be magnetic and its north pole is found to have been directed toward the north pole of the unbroken magnet. When these pieces are put together again poles placed in contact nullify each other, and the original magnet is reproduced.

Terrestrial magnetism, which pervades the whole earth, is extremely complicated. It becomes manifest by its influence on the magnetic needle, varying with time and place over the earth. One pole of the needle points toward the north, the other toward the south. There are, however, only two lines on the surface of the earth on which it points directly north and south, and where the magnetic and geographical meridians appear to coincide. Elsewhere the needle deviates more or less from the true north. This is termed the declination of the needle, and varies from place to place, and in the course of time at the same place. (See Isogonic.) When a needle is balanced on a horizontal axis so that it can turn in a vertical plane, the extremity attracted by the nearer magnetic pole of the earth points more or less downward. (See Dipping-needle.) The angle thus made is called the dip or inclination, and the lines marking equal inclinations on a map are called isoclinal lines. They intersect the isogonal lines, and the dip increases toward the perpendicular as the magnetic poles are neared. The magnetic poles do not coincide with the geographical poles, the northern being in 70° 5′ n. and 96° 43′ w. The southern is probably at 73½° s. and 147½° e. There are two foci of maximum force in the northern hemisphere and two in the southern. In the northern hemisphere the stronger focus is assumed to be in 52° n. and 90° w., and the weaker in 70° n. and 115° e. In the southern hemisphere the stronger focus is assumed to be in 65° s. and 140° e., and the weaker probably in 50° s. and 130° e. The earth's magnetism is subject to vast unaccountable commotions or storms of immense extent, which occur at irregular intervals and are of short duration. They are often connected with manifestations of electrical phenomena, such as the aurora borealis, or thunderstorms. These disturbances are made manifest by irregular motions of the magnetic needle. The various phenomena connected with terrestrial magnetism are now automatically recorded, and systematized in the interests of meteorology. The magnetic equator or line of no dip crosses the terrestrial equator in several places, extending alternately on each side, but never deviating more than 12° from it.

MAGNETISM, Animal. See Mesmerism.

MAGNETO-ELECTRICITY treats of the currents of electricity produced in a conductor when its position is changed relatively to a magnetic field (see Induced Current), whereas electro-magnetism (which see) treats of magnetization produced by currents.

MAGNETO-ELECTRIC MACHINES. In magneto-electric machines an electro-magnet of compact form called the armature is caused to rotate near the poles of a powerful fixed magnet, in such a manner that the core of the armature becomes magnetized first in one direction and then in the opposite, by the inductive action of the poles of the fixed magnet. Every change in the magnetization of the core induces a current in the coil wound upon it. Hence currents in alternately opposite directions are excited in this coil, their strength increasing with the speed of rotation. It is now usual in powerful machines of this class to employ electro-magnets as the fixed magnets, and the current which feeds these fixed magnets (called the field magnets) is often the current generated by the machine itself. The machines in this case are called dynamo machines. This name was originally confined to machines which thus supply the current for their own field magnets; but it is now applied to any machine in which the field magnets are electro-magnets. Such machines, of which there is an enormous variety, driven by steam-engines or other powerful motors, are now almost universally employed when electric currents are required on a large scale, as in electric lighting. See the articles Dynamo, Electric Light, Electro-magnet, Electro-magnetism, Electro-motors.

MAGNETOMETER, an instrument employed for observing the magnetic declination, and also for other absolute magnetic measurements. They are of various forms and are usually self-recording. See Declinometer, Dipping-needle.

MAGNIFICAT, the song of the Virgin Mary, Luke i. 46–55: so called because it commences with this word in the Latin Vulgate. It is sung throughout the Western Church at vespers or even-song.

MAGNIFYING-GLASS. See Microscope.

MAGNO'LIA, a genus of trees and shrubs. The species, which chiefly inhabit North America, Northern India, China, Japan, and other parts of Asia, are trees much admired on account of the elegance of their flowers and foliage, and are in great request in gardens. In their native countries some of them attain great height, and have flowers 10 inches across.

MAGOG. See Gog.

MAGPIE, a bird belonging to the crow family. There are several species, two

Magpie.

of which belong to America. The common European magpie is about 18 inches

in length; the plumage is black and white, the black glossed with green and purple; the bill is stout, and the tail is very long. The magpies continue in pairs throughout the year, and prey on a variety of food, chiefly animal. They are determined robbers of other bird's nests, destroying the eggs and young birds. In captivity they are celebrated for their crafty instincts, their power of imitating words, and their propensity to purloin and secrete glittering articles.

MAGRUDER, John B., American soldier, was born in Winchester, Va., in 1810. He served in the Mexican war, in which he commanded a battalion, and was brevetted lieutenant-colonel. At the beginning of the civil war he resigned his commission of captain of artillery and entered the service of the confederacy. He won the battle of Big Bethel and received a brigadier-general's commission. At Yorktown for several weeks he prevented the advance of the national forces, was promoted major-general and took part in the battle of Malvern Hill. In October, 1862, he was given command of the department of Texas, and on January 1, 1863, he recaptured Galveston from the Union forces. At the close of the war he entered the army of the usurper, Maximilian, in Mexico, in which he held the rank of major-general. After the execution of Maximilian he returned to Texas and lived in retirement. He died in 1871.

MAGYARS, the Hungarians. See Hungary.

MAHAN, Alfred Thayer, American naval officer and author, was born at West Point, N. Y., in 1840. During the civil war he saw service in the South Atlantic and Gulf Squadrons. He was made lieutenant-commander in 1865, commander in 1872, and captain in 1885. From 1886 to 1889, and again from 1892 to 1893, he was president of the Naval War College at Newport. At his own request he was retired from active service in November, 1896, but during the war with Spain served on the Naval War Board, and in the following year was one of the United States representatives to the Peace Congress at The Hague. Captain Mahan's reputation rests largely upon his work as an author. His great work, Influence of Sea Power Upon History, 1660–1783, received recognition both at home and abroad as a work of the utmost importance. Among his other works are The Navy in the Civil War, Influence of Sea Power upon the French Revolution 1793–1812, Life of Farragut, Life of Nelson and The Interest of America in Sea Power, Present and Future.

MAHA'LEB, a species of cherry, whose fruit affords a violet dye and a fermented liquor like kirsch-wasser. It is found in the middle and south of Europe. Its flowers and leaves are used by perfumers, and its wood by cabinet-makers.

MAHANADI (ma-hä'na-dē; or Mahanuddy) **RIVER,** a river in Southern Hindustan which flows through the Central Provinces and Orissa, falling by several mouths into the Bay of Bengal, after a course of 520 miles.

MAHANOY, a town in Schuylkill co., Pennsylvania, 80 miles from Philadelphia, in the middle of a rich anthracite coal district. Pop. 16,175.

MAHARA'JAH (literally, a great king), a title applied in courtesy to every Indian rajah, or to any person of high rank or deemed holy.

MAHDI (mä'dē; Arabic, the director or leader), a name assumed by some of the successors of Mohammed, particularly applied to the twelfth imam, the lineal descendant of Mohammed, born A.D. 868. He mysteriously disappeared, being probably murdered by a rival, and the belief was that he would remain hidden until the "last days," when he would reappear, and at the head of the faithful spread Mohammedanism over the world. Many professed Mahdis have appeared from time to time in Africa as well as Asia, the latest being Mohammed Ahmed, the leader of the Soudanese insurrection (1883–85). He was born at Dongola in 1843, died 1885. He studied Mohammedan theology at Khartoum and Berber, and at 25 years of age he retired to the island of Aba in the White Nile, where he lived in solitude for fifteen years. At the age of forty he took up the prophetic rôle, and his short victorious career began. See Egypt, Soudan.

MAHMUD (mä'mud), Sultan of Ghazna, the founder of the Mohammedan Empire in India, born at Ghazna about 970, died 1030. His father, Sabaktagin, governor of Ghazna, owed a nominal allegiance to Persia, but was really independent. On his death Mahmud put aside his elder brother; formed an alliance against the Persian monarch, overthrew his kingdom and laid the foundation of an extensive empire in Central Asia (999). He then turned his attention to India, and in a series of twelve invasions secured a great amount of treasure, and vastly extended his power.

MAHMUD I., Sultan of Turkey, born 1696; reigned 1730–50.—Mahmud II., Sultan of Turkey, born 1785, died 1839; placed on the throne by the Janizaries after the murder of his predecessor, 1808. The chief events of his reign are the war with Russia from 1808 to 1812, which cost him Bessarabia and the provinces of Servia, Moldavia, and Wallachia, as settled by the treaty of Bucharest; the war of Greek independence, which ended in the separation of that country, and the destruction of the Turkish fleet at Navarino, 1820–28; the extermination of the Janizaries, 1826; the treaty of Adrianople, with the Russians, who were on the point of entering Constantinople, 1829; the independence of Egypt under Mehemet Ali, and the new treaty of Unkiar-Skelessi with the Russians, 1832-33.

MAHOG'ANY, the wood of a lofty and beautiful tree, indigenous to Central America and the West Indies. It grows most abundantly and attains its greatest development between 10° n. lat. and the Tropic of Cancer. It reaches maturity in about 200 years, and grows to a height of 40 to 50 feet, diameter 6 to 12 feet. The wood is hard, compact, reddish-brown, and susceptible of a brilliant polish. It is one of the best and most ornamental woods known, and is of universal use in the making of furniture. It is imported chiefly from Mexico and British Honduras. That which is imported from the West Indies is called

Mahogany.

"Spanish" mahogany, and is the most valued.

MAHOMET. See Mohammed.

MAIDENHAIR, the name given to an elegant fern with a creeping scaly rhizome, and bipinnate fronds, the leaflets of which are between rhomboidal and wedge-shaped, margined with oblong sori, and more or less deeply lobed.

MAIDENHAIR-TREE, a deciduous tree of the yew family, a native of Japan, so called from the likeness of its leaves to the maidenhair fern.

MAID OF ORLEANS. See Joan of Arc.

MAIDS OF HONOR. See Honor, Maids of.

MAIL, Coat of. See Arms and Armor.

MAIL-COACHES. See Coach.

MAIMANSINGH, a British district in the Dacca division, Bengal; area, 6287 sq. miles. Pop. 3,472,186.

MAINE, one of the eastern and maritime United States of North America bounded on the east and northeast by New Brunswick, north and northwest by Quebec, west by New Hampshire, and southeast by the Atlantic Ocean; area, 33,040 sq. miles. Maine is nearly as large as all the rest of the New England states combined, and is thirty-fifth in size among the states of the Union. It is mostly an elevated country, but hilly rather than mountainous. The state is almost completely traversed by navigable rivers, the principal of which are the Penobscot and Kennebec; and in the

Seal of Maine.

interior are numerous lakes. The coast abounds with islands, the largest of which is Mount Desert, 15 miles long and 12 miles broad; and is indented with

numerous bays and inlets, the principal of which are Penobscot, Casco, and Passamaquoddy. Grass lands are extensive, and Indian corn, wheat, barley, rye, and flax are the chief crops. The leading industry is the production of lumber. Not long ago the forests covered about one-half the surface of the state, but they are rapidly diminishing. Marble, slate, limestone, and granite are abundant, and iron, lead, tin, copper, and zinc are found in considerable quantities. The fisheries give employment to a large portion of the population; and other industries are ship-building, the manufacture of cotton and woolen fabrics, etc. There are about 1100 miles of railways, and lines of steamers ply regularly from the larger ports. Augusta, on the Kennebec, is the seat of government, but Portland is the principal town, and a seaport of great importance. Maine was admitted into the Union on March 15, 1820, having been until that time an integral part of Massachusetts. The earliest explorers of the territory were the Cabots in 1497, followed by Verrazzano in 1524, and Gomez a year later. Gomez gave the name to Penobscot Bay and river, and the French built a fort on the river in 1526. In 1603 Henry IV. of France, granted to a Protestant nobleman, named De Montz a charter, which, in the liberal fashion of those days, purported to convey title to all the land between 40° and 46° n. latitude. Two years later James I. of England gave to an English company of adventurers a charter covering everything from 34° to 45° n. latitude. These grants created a double jurisdiction over the greater part of Maine and gave rise to a series of conflicts which extended over a century. In 1604 De Montz established a settlement on Neutral Island in the St. Croix river, and three years later the English founded a town at the mouth of the Kennebec. Here Capt. John Smith made his headquarters and built a fleet of boats, with which he explored New England. In 1622 the New England council gave to Sir Ferdinando Gorges and Capt. John Mason the country between the Merrimac and the Kennebec, and for sixty miles inland, which was thenceforward known as Maine. Gorges ruled as lord-palatine under a new charter obtained from Charles I. of England, in 1639, and established his capital at Georgiana (now York), the first chartered city in America. Troubles grew out of the confusion of jurisdiction and in the year 1677 Massachusetts bought the shadowy title of Gorges from his heirs for $6,250. In 1691 a new charter given by William and Mary merged all the provinces from Plymouth to Acadia in the Province of Massachusetts. For the next 120 years Maine was practically merged in Massachusetts. Maine contributed men to the revolutionary struggle and was represented in the Continental congress. After the close of the war in 1812 Great Britain claimed a great deal of territory which had long been under the jurisdiction of Massachusetts, and the legitimate limits of Maine were cut down almost 6,000 sq. miles when a final treaty was made. The only important subject of legislation in the state of other than local interest has been that of prohibition. After some tentative lawmaking, a stringent prohibitory law, passed in 1858 was incorporated into the constitution, and has remained in force ever since. Prohibition on the whole has not turned out entirely successful, and evasions of the law are frequent Before 1856 Maine was generally democratic in state elections, and only once (1840) voted against the democratic candidate in presidential elections. Since 1856 it has been emphatically republican except in the years 1878 and 1880, when the democrats and greenback party in fusion succeeded in electing their candidate for governor. In 1891 the Australian ballot law was passed. Pop. 756,000.

MAINE, University of, a co-educational state institution at Orono, Maine, founded on the national land grant in 1865 under the name of the State College of Agriculture and Mechanic Arts. The present name was assumed in 1897. The university comprises the colleges of arts and sciences, agriculture, engineering, and pharmacy, and the school of law. The Maine Agricultural Experiment Station is a department of the university. The university confers the bachelor's and master's degree in arts, philosophy, science, and law, the degrees of civil, mechanial, and electrical engineer, and pharmaceutical chemist. Military instruction is required by law. Students are admitted upon examination or on a certificate from an accredited school. During 1902 courses were begun in mining and naval engineering, a summer school and a correspondence course were established, and uniform entrance requirements with all other Maine colleges were adopted.

MAINTENON (maṇ-tē-nōṇ), Françoise D' Aubigné, Marchioness de, wife of Louis XIV. and grand-daughter of Henry the Fourth's friend Theodore Agrippa D'Aubigné, was born in 1635. Left quite destitute in her tenth year, Mademoiselle D'Aubigné spent her youth in dependence on her rich relatives, and was glad to contract a nominal marriage with the famous wit Scarron, a deformed, old, and infirm man. On Scarron's death she was intrusted with the charge of the children born to Louis XIV. by Madame de Montespan. She assumed this office in 1669, and played her cards so dexterously that the king married her privately, probably in 1685, when her age was fifty and his own forty-seven. For the remaining years of his life she was his most confidential advisor. She was a virtuous woman, and a devout and bigoted Catholic, ambitious and resolute but disinterested and charitable. Her published letters give her a creditable place in French literature. She died in 1719, at the nunnery or school of Saint Cyr, which she herself had founded.

MAINZ (mīnts; English, Mentz; French, Mayence), a fortified town of Germany, in the grand-duchy of Hesse, finely situated on the left bank of the Rhine, opposite the mouth of the Main, 20 miles w.s.w. Frankfort. Pop., including garrison, 84,251.

MAITLAND, William, commonly known as Secretary Lethington, a Scottish statesman, eldest son of Sir Richard Maitland, born about 1525, died 1573. On Queen Mary's arrival in Scotland he was chosen one of her principal ministers. After Darnley's murder he conspired to effect Mary's escape from Lochleven. The regent Moray had him arrested in 1569 as an accessory to Darnley's murder. He was set at liberty by Kirkcaldy of Grange, and after the assassination of Moray he became the life and soul of the queen's party, and kept up an active correspondence with Mary. In 1571 he joined Kirkcaldy in Edinburgh Castle; was proclaimed a traitor by the parliament, and attainted with his two brothers. On the surrender of Edinburgh Castle Kirkcaldy and his brother were hanged, but Maitland died in prison in Leith, presumably by his own hand.

MAIZE, Indian corn, a genus of plants commonly cultivated in the warmer parts of the world, where it answers a purpose similar to that of wheat in more northern countries. The common maize or Indian corn is a monœcious grass, of vigorous growth, with stems not more than 2 feet high in some varieties, and reaching the height of 8 or even 10 feet in others. The grains are large, compressed, and packed closely in regular parallel rows along the sides of a receptacle many inches long. In large varieties the ear or cob is often 1 foot long and 2 or 3 inches in thickness. Maize is extensively cultivated in America, where it forms almost the only bread eaten by many of the people. Its flour, though

Maize.

exceedingly nourishing, is not glutinous, and must accordingly be mixed with wheat, rye, or other flour before it can be baked. In America large quantities of unripe grain are roasted till they split, and are then eaten under the name of popcorn. From the green stems a syrup is expressed, which is fermented and converted into a kind of spirits. Paper has been made from maize fibres. It is also cultivated throughout a great part of Asia and Africa, and in several countries of the south of Europe, as Spain and Italy. The green stems and leaves form nutritious food for cattle, and it is sown and cut green for this purpose.

MAJOLICA, or MAIOLICA. See Faience.

MAJOR, in music, designates in general a larger in contradistinction to a smaller interval of the same denomination, called a minor interval; thus a major tone is the interval between two tones having the proportion to each

other in number of vibrations of 8:9; a minor tone the interval between two tones in the ratio of 9:10; a major third is an interval of two tones (major and minor); a minor third an interval of a tone and semitone. The major mode is one of the two recognized modern modes (or forms of the scale), in which the first third in the scale is a major third, in contradistinction to the minor mode, in which the first third is a minor third.

MAJOR, the rank next above a captain, and below a lieutenant-colonel. In the United States the command appropriate to the grade is: Infantry, a battalion; cavalry, a squadron; artillery, two or more batteries.

MAJOR'CA, an island in the Mediterranean belonging to Spain, the largest of the Balearic group, between Iviça and Minorca: greatest length, 58 miles; greatest breadth, 45 miles; area, 1420 sq. miles. Chief town, Palma. Pop. 244,265.

MAJOR-GENERAL, in the United States Army, the rank next above that of brigadier-general, and below that of lieutenant-general. The command appropriate to his grade is four regiments, or in time of peace a department. In war he would command a division or a corps.

MAJORITY, the period when the legal disabilities and peculiar advantages and privileges incident to infancy cease. A person upon attaining his majority has a last opportunity to disaffirm and avoid legal transactions to which he was a party during the period of his minority, and which were voidable because of his disability. Certain privileges of citizenship, such as voting and holding office, usually commence at this time.

MALABAR', a maritime district of British India, in the presidency of Madras, on the west coast; area 5765 sq. miles. Pop. 2,652,565. The name Malabar is often applied to the whole extent of coast country as far north as Bombay.

MALAC'CA, a territory and town forming part of the British colony of the Straits Settlements, on the west coast of the Malay peninsula, on the Strait of Malacca. It extends about 40 miles along the shore of the strait, and about 25 miles inland. Area 875 sq. miles. Pop. of town 15,000; of the district 95,487.

MALACCA, Strait of, the channel between the Malay peninsula and the Island of Sumatra, extending from latitude 1° to about 6° n. Entire length, about 520 miles; breadth, varying from 25 miles to 200 miles.

MALACCA CANE, a cane made from the wing-leaved, erect, slender, cane-stemmed palm, which, when dressed, is of a brown color, sometimes mottled or clouded. It is brought from Singapore and Malacca, but is chiefly produced in Sumatra.

MALACHI (mal'a-kī), the twelfth and last of the minor prophets. Nothing is known of the history of the writer, and it is even doubtful if Malachi (Messenger of Jehovah) be a proper name or an assumed epithet. The book evidently belongs to the latter part of the governorship of Nehemiah, about B. C. 420. It contains denunciations of the sins of the Israelites, and predicts the coming of the Messiah and the conversion of the Gentiles.

MALACHITE (mal'a-kīt), a carbonate of copper, a dark emerald-green color, and of a laminated, fibrous, or massive structure. The finest specimens are obtained from Siberia, but it is found in many places all over the world. Fibrous malachite, when finely pulverized, is used as a paint; massive malachite is made into boxes, knife-handles, table-slabs, and other ornamental articles, and is susceptible of a beautiful polish. Blue malachite or azurite contains a larger proportion of carbonic acid.

MAL'AGA, a seaport of southern Spain, in Andalusia, capital of a province of the same name, on the Mediterranean. It was anciently called Malaca. The climate is one of the mildest and most equal in Europe. Pop. 130,109.—The province of Malaga has an area of 2822 sq. miles; pop. 511,989. It is traversed in all directions by offsets of the Sierra Nevada. The valleys are fertile and generally well cultivated, yielding cereals, grapes, oranges, lemons, figs, almonds, sugar-cane, etc.

MALAGA WINE, a sweet Spanish wine produced in the province of Malaga. It is one of the "muscatel" wines, and is rich, luscious, and full of body.

MALA'RIA, air tainted by miasmata or deleterious emanations from animal or vegetable matter, especially the exhalations of marshy districts which produce fevers A class of diseases, among which intermittent and remittent fevers occupy a prominent place, have been known from a very early period to be especially prevalent in marshy districts, where they are promoted at particular seasons by certain conditions of heat and moisture. The noxious agents by which these results are produced have been attributed to the products of vegetable decomposition, the decomposition of animal tissues being regarded as giving rise to similar miasmata. Recent research seems to show that, whatever decomposition may have to do with malaria, the germs of malarial diseases are enabled to enter the human system through the bites of mosquitoes, and that the clearance of these from malarial districts is followed by the disappearance of malarial fevers.

MALAY ARCHIPELAGO, also known as the Indian, Asiatic, or Eastern, the great group of islands situated to the southeast of Asia, and washed on the west by the Indian and east by the Pacific Ocean. Within these limits lie some of the largest and finest islands in the world, as Borneo, Sumatra, Java, Celebes, the Philippines, etc., but New Guinea is not ranked as belonging to the group. The chief of the smaller islands are Moluccas or Spice Islands, Billiton, Banca, Madura, Bali, Lombok, Sumbawa, Flores, Timor. The small islands may be truly called innumerable. A large portion of the archipelago is really or nominally under the sway of Holland, and this portion is frequently called the Dutch East Indies.

MALAY PENINSULA, the most southern part of continental Asia, the long, narrow projection that stretches first s. and then s. e. from Siam and Burmah. It is connected with lower Siam by the Isthmus of Kra, has on the e. the Gulf of Siam and the China Sea, and on the w. the Strait of Malacca. It varies in width from 45 miles at the n. to about 210 miles. The area is about 70,000 sq. miles, and the pop. is variously estimated at from 650,000 to 1,000,000 including large numbers of Chinese.

MALAYS, the name of a race of people inhabiting the Malay Peninsula, and spread over all the Asiatic Archipelago. They claim to have had their native country in the Highlands of Sumatra, where they established the once powerful state of Menangkabo, now subject to the Dutch. In physical appearance they are rather under the middle height, light brown in color, with black, straight hair, high cheek-bones, black and slightly oblique eyes, and scanty or no beard. The civilized Malays profess the Mohammedan religion. They are said to be of a taciturn, undemonstrative disposition; naturally indolent, treacherous in their alliances, and addicted to piracy.

MALCOLM (mal'kom) **I.,** King of Scotland, reigned from 943 to 954.—Malcolm II. succeeded Kenneth II. in 1005. In his reign Lothian and Strathclyde became parts of the Scottish kingdom. He was assassinated at Glamis in 1034. He was the last direct male descendant of Kenneth MacAlpine.—Malcolm III., surnamed Canmore (Great Head), born about 1024, slain near Alnwick, 1093. His father, Duncan, being slain by Macbeth (1040), he sought aid from Siward of Northumbria, and was also assisted by Edward the Confessor. On the defeat and death of Macbeth he was crowned at Scone in 1058. In 1068 he granted asylum to Edgar Atheling, his mother, and two sisters (one of whom, Margaret, he married in 1070), with a number of Saxon exiles. His reign, which was mostly taken up with wars with England, had nevertheless an important bearing on the civilization and consolidation of Scotland.—Malcolm IV. (the Maiden) succeeded his grandfather, David I., in 1153. He surrendered Northumberland and Cumberland to Henry II. in 1157. Died at Jedburgh in 1165, at the age of twenty-four. See Scotland.

MALCOLM, Sir John, a distinguished soldier and diplomatist, was born near Langholm, in Dumfriesshire, 1769; died in London 1833. He entered in 1782, as a cadet, the service of the East India Company. He was three times ambassador to Persia, and did excellent service in the pacification of India after the wars of Holkar and the Peishwa. In 1827 he was appointed governor of Bombay, which post he continued to fill until 1831, when he finally returned to Britain. He received the honor of knighthood in 1812.

MALDEN, a city in Middlesex co., Mass., 5 miles n. of Boston, on the Malden river. It has extensive manufacturing industries, and a pop. of 40,160.

MAL'DIVE ISLANDS, a remarkable chain of islands in the Indian ocean. The larger islands are richly clothed with wood, chiefly palm, and are fertile in fruit and in various kinds of edible roots; they also produce millet, and

abound in cocoa-nuts, fowls, and all descriptions of fish. Pop. 150,000 to 200,000.

MALEBRANCHE (mål-bränsh), Nicholas, a French philosopher, born in 1638, died 1715. In 1673 he published his treatise De la Recherche de la Vérité. The doctrines of this celebrated work are founded upon Cartesian principles.

MALLARD. See Duck.

MALLEABILITY, the property of being susceptible of extension by beating; almost restricted to metals. The following is the order of malleability of the metals: Gold, silver, copper, platinum, iron, aluminium, tin, zinc, lead, cadmium, nickel, cobalt. Ductility and malleability are nearly allied, but they are seldom possessed in the same proportion by the same metal.

MAL'LORY, Stephen Russell, cabinet officer in the confederacy, was born at Trinidad, W. I., in 1813, and in 1832 was appointed by President Jackson inspector of customs at Key West. From 1851 to 1861 he represented Florida in the United States senate. In 1861 he was appointed secretary of the confederate navy, then without a ship. After the war he was taken prisoner, but in 1866 was released on parole. He died in 1873.

MALLOW, the mallow is a common and widely diffused species of plants, possessed of mucilaginous properties. The whole plant is used in fomentations, cataplasms, and emollient enemas. When fresh the flowers are reddish-purple,

Common mallow

but on drying become blue, and yield their coloring principle both to water and alcohol. The alcoholic tincture furnishes one of the most delicate of reagents for testing the presence of alkalies or acids.

MALMAISON, a historic chateau in France, department of the Seine, 5 miles w. of Paris, once the property of Richelieu. It was the favorite residence of the Empress Josephine, wife of Napoleon I.

MALMO (mål'meu), a seaport of Sweden, capital of the laen or prefecture of Malmöhus, situated on the eastern shore of the Sound, opposite Copenhagen. The manufactures and other industries are considerable, and the shipping trade of the port is large. Pop. 62,954.—The laen of Malmöhus is very fertile; has an area of 1781 sq. miles; pop. 413,400.

MALT, grain, usually barley, steeped in water and made to germinate, the starch of the grain being thus converted into saccharine matter, after which it is dried in a kiln, and then used in the brewing of porter, ale, or beer, and in whisky distilling. One hundred parts of barley yield about ninety-two parts of air-dried malt. See Brewing.

MALTA, an island in the Mediterranean belonging to Britain. The most important indentation is the double bay on which the capital, Valetta, stands. The greatest elevation of the island is about 750 feet. The soil is thin, and rests on a calcareous rock; in some parts earth has been brought from Sicily and put down. Corn, cotton, potatoes, and clover are the chief crops. Both the vine and olive are cultivated, and fruit, particularly figs and oranges, is very abundant. The manufactures consist of cotton goods, lace, jewelry, etc. The central position of Malta in the Mediterranean makes Valetta an invaluable naval station. It has, in consequence, been provided with excellent docks and very strong fortifications. The climate is very hot in summer, but pleasant and healthy in winter, attracting many visitors at this season. Malta passed successively through the hands of the Phœnicians, Greeks, and Carthaginians, and was finally attached to Rome during the second Punic war. After the fall of the Roman Empire it was siezed at different times by Vandals, Goths, and Saracens. From the last it passed to Sicily, and followed its fortunes till 1522, when Charles V. granted it to the order of St. John of Jerusalem. In 1798 the grand-master surrendered it without defense to Napoleon. It was taken by the British in 1800, and finally annexed by them in 1814. The executive government is in the hands of a governor and council. By a new constitution adopted in 1888 the legislative council consists of the governor and the members of council (6), with 14 members elected by the constituencies into which Malta and the islands of Gozo and Comino have been divided. The people are mainly of Arabic race and speak a kind of Arabic mixed with Italian. Italian and English are also spoken. The total pop., inclusive of the garrison, is 192,000.

MALTESE CROSS. See Cross.

MALTESE DOG, a very small kind of spaniel, with long silky, generally white hair and round muzzle. They are lively and good-tempered, and make agreeable pets.

MALTHA, a variety of bitumen, viscid and tenacious, like pitch. It is unctuous to the touch, and exhales a bituminous odor.

MALTHUS, Rev. Thomas Robert, English political economist, born 1766; died 1834. In 1798 he first published the views with which his name is associated in his Essay on the Principles of Population as it Affects the Future Improvement of Society. It was improved and matured in subsequent editions. His leading principle is that population, when unchecked, goes on increasing in a higher ratio than the means of subsistence can, under the most favorable circumstances, be made to increase; that the great natural checks to excessive increase of population are vice, misery, and moral restraint; and the great business of the enlightened legislator is to diminish the first two and give every encouragement to the last.

MALVA'CEÆ, the mallows, a large natural order of exogenous plants. A large proportion of the order consists of herbaceous or annual plants, inhabiting all the milder parts of the world, but found most plentifully in hot countries. Several species are of essential service to man. As emollients they are well known in medical practice. The hairy covering of the seeds of the various species forms raw cotton. The inner bark of many species yields fibre of considerable value. Many species are splendid flowering plants.

MAM'ELUKES, or **MAMALUKES** (Arabic, "slaves"), the former mounted soldiery of Egypt, consisting originally of Circassian slaves. As early as 1254 they became so powerful that they made one of their own number sultan, this dynasty continuing till 1517, when it was overthrown by Selim I. They still continued to be virtual masters of the country, however. They suffered severely in opposing the French at the end of the 18th century, and in 1811 Mehemet Ali caused a general massacre of them throughout Egypt.

MAMMA'LIA, the highest class at once of the Vertebrata and of the animal kingdom, including those warm-blooded animals we familiarly term "quadrupeds," the whales and other fish-like forms, and man himself. Their distinctive characteristic is that the female suckles the young on a secretion peculiar to the class, furnished by the mammary glands of the mother, and known as milk. The skin is always more or less covered with hairs, which are found in many forms, from the finest wool or silky down to large, coarse bristles and even spines. The skeleton exhibits a uniformity of essential structure, and in most points agrees with that of man. The cavity of the thorax or chest is bounded by the ribs, which vary greatly in number, but generally correspond to that of the dorsal vertebræ. The skull forms a single piece composed of bones immovably fastened together, to which is articulated the lower jaw, composed of two halves united at the chin. The skull is joined to the spine by means of two condyles which fit into the first cervical vertebra. The limbs, like those of all other Vertebrata, are never more than four. The front limbs are invariably present, but in cetaceans and such allied forms as the dugongs and manatees the hinder limbs are either completely suppressed or present only in a rudimentary state. The limbs are generally well developed, and are most commonly adapted for terrestrial progression; some are suited for burrowing, others for climbing, those of the cetaceans and seals for swimming, while some (the bats) have the fore limbs developed into a kind of wing. Teeth are present in most mammals; but they are only represented in the embryo in the whalebone whales, and are entirely absent in the anteater, pangolin, and echidna. The chest or thorax in all mammals is separated from the abdominal cavity, by a complete diaphragm or "midriff," which thus constitutes a great muscular partition between these cavities, and

also forms the most important agent in effecting the movements of the chest during respiration. Within the thorax the heart and lungs are contained; while the abdomen and its lesser pelvic cavity contain the organs relating generally to digestion, excretion, and reproduction. The stomach, generally simple, may, as in some monkeys, in the kangaroos, in the pig, and most of all in the ruminants, exhibit a division into compartments. A liver and pancreas are present in all Mammalia. The lungs agree in essential structure with those of man, as also does the heart with its four chambers—right and left auricles and right and left ventricles. The red corpuscles of the blood are non-nucleated, and are circular in shape except in the case of the camels. All mammals with the exception of the monotremes are viviparous but there are considerable differences in the relations subsisting between mother and young before birth, thus leading to the division into placental and aplacental mammals. Man and all other mammals except the monotremes and marsupials belong to the latter division. All mammals possess mammary or milk glands, which, however, may differ chiefly in number and position throughout the class. In the classification of this important group authorities differ somewhat, but the mammals may be divided into the following groups: man, apes and monkeys, the prosimians or lemurs, the bats, the insect-eaters, the flesh-eaters, the seals, the whales and dolphins, the sea cows, the elephants, the odd-toed ungulates, the even-toed ungulates, the gnawers or rodents, the edentates, the marsupials, or pouch-bearing mammals, and the monotremes.

MAMMARY GLANDS, the milk-producing organs, the distinctive mark of the mammals. These structures present in man an essentially lobular structure. The lobes are divisible into smaller lobules, which consist ultimately of groups of vesicles which open into minute ducts converging into larger channels which lead to the milk reservoirs at the nipple. The nipple itself is composed of unstriped muscular fibres and areolar tissue. It also possesses erectile powers, and blood-vessels are in consequence freely distributed to it. These glands, save in exceptional instances, are undeveloped in the male. They are always in pairs on some part of the ventral surface of the body, but in number and position they vary much in the various groups.

MAMMEE'-TREE, or **WEST INDIA APRICOT,** a tall handsome tree bearing a fruit about the size of a cocoa-nut. This has two rinds inclosing the pulp which is firm, bright yellow, and has a pleasant taste and smell.

MAMMON, a Syriac word used in St. Mathew as a personation of riches or worldliness. There does not appear to have been any idol in the east receiving divine honors under this name.

MAMMOTH, a species of extinct elephant, the fossil remains of which are found in European, Asiatic, and North American formations. Geologically speaking, the mammoth dates from the Post-pliocene period. It survived the glacial period, and lived into the earlier portion of the human period; its remains having been frequently found associated with human remains, and its figure carved on bone. It appears to have been widely distributed over the northern hemisphere, but never south of a line drawn through the Pyrenees, the Alps, the northern shores of the Caspian, Lake Baikal, Kamtchatka, and the Stanovoi mountains. It has large curved tusks, and shaggy hair. The bones and tusks have been found in great abundance in Siberia; and an entire carcass which had

Skeleton of mammoth.

been preserved in the ice and latterly thawed out, was discovered near the end of the 18th century on the banks of the river Lena, in such a perfect state that the flesh was eaten by dogs, wolves, and bears. Its skin was perfectly preserved, and was seen to be clothed with a furry wool of reddish color, interspersed with black hairs. The skeleton and other parts of this animal are preserved in the St. Petersburg Royal Museum. It must have been twice as bulky as the elephants at present living.

MAMMOTH CAVE, a stupendous cave in Kentucky, near Green River, about 80 miles s.s.w. of Louisville. It is one of a large series of vast caverns here formed in the limestone rock, and which are found over an area of 6000 miles in Kentucky, Tennessee, and Indiana. It has been penetrated 14 miles, and has many windings and offshoots, some of them but imperfectly explored. It is a dry cave, and the remains of its stalactite and stalagmite formations are dusty and dilapidated; consequently it is more remarkable for its extent, the size of its halls, and height of its domes, than for the variety or beauty of its scenery. It contains several small lakes or rivers, the largest, Echo river, being more than half a mile long. It rises and falls according as Green river is in flood or otherwise, there being an underground connection between them. The animals of the cave include blind wingless grasshoppers, beetles, rats, etc., and the viviparous blind fish Amblyopsis.

MAMMOTH TREES. See Sequoia.

MAN, the most highly organized member of the animal world. The endeavor has often been made in classification to separate man from the brute creation. One system, expressing a vast gap between the Quadrumana and man, classifies man in the order Bimana ("two-handed"), the highest division of the Mammalian class; and relegates the monkeys and apes to the lower and distinct order—that of the Quadrumana ("four-handed"). The more recent arrangements, however, classify man and the monkeys in one order, making man the highest family or group of this order. From the purely anatomical point of view the differences which separate the anthropoid apes from man are in some respects less than those which separate these higher apes from apes lower in the scale. But the mental or psychical endowments of man oblige us to remove him far above the highest Quadrumana; and even the characters by which he is anatomically separated from the highest apes form a very distinct and appreciable series. The first grand characteristic of man is his erect position and bipedal progression. The lower limbs, with the feet broad and plantigrade and the well-developed heel, are devoted exclusively to progression and supporting the weight of the body; while the upper limbs have nothing to do with progression, but subserve prehension entirely. The bones of the face in man do not project forward, while they are elongated in a downward direction; and the face and forehead are in the more civilized races situated nearly in the same plane, so that the face immediately underlies the brain. Similarly the development of a distinct chin is also a peculiarly human feature, and one which in the highest varieties of mankind becomes most marked. The great cranial capacity of man, or the greater size of the cranial or brain portion as compared with the facial portion of the skull, forms another noteworthy and distinctive character of the human form. The brain convolutions also are more numerous and complex than is the case with any other mammal. The teeth of man are arranged in a continuous series, and without any diastēma or interval. The development of hair too is very partial. The gorilla presents of all the apes the nearest approach to the human type taken in its entirety; but it differs in the relative number of vertebræ (13 dorsal and 4 lumbar, to 12 and 5 respectively in man), in the order of dental succession and in the presence of the interval or diastema, in the less prominent muscular development of the buttocks and calves, and in other minor differences. The orangs most closely approach man's structure in the number of ribs and in the form of the cerebrum, while they exhibit the greatest differences from him in the relative length of the limbs. The chimpanzees are most anthropoid in the shape of the cranium, in the arrangement and succession of the teeth, and in the length of the arms as compared with that of the legs. Of the higher apes the gibbons are those furthest removed from the human type of structure. Chief among the psychical features, or rather among the results of the operation of the principle of mind, we note the possession of the moral sense of right and wrong. The possession of an articulate language, by which he can communicate his thoughts, is also the exclusive possession of man, and draws a sharp line of separation between him and all other animals. With regard to the geological history of man, the earliest traces yet discovered belong to the Post-pliocene deposits in conjunction with existing species of shells and some extinct species of mammals. Man's

advent upon the earth is consequently referred to a period much anterior to that which former limits and theological ideas prescribed. Among the modern theories regarding the origin of man may be noted those of (1) Darwin; that man is directly descended from an extinct form of anthropoid ape, with a tail and pointed ears, arborcal in its habits and an inhabitant of the Old World; further, that man has diverged into different races or sub-species, but that all the races agree in so many unimportant details of structure, and in so many mental peculiarities, that they can be accounted for only through inheritance from a common progenitor. (2) Wallace also affirms the original unity of man, and places him apart as not only the head and culminating point of the grand series of organic nature, but as, in some degree, a new and distinct order of being; maintaining that a superior intelligence has guided the development of man in a definite direction and for a special purpose, just as man guides the development of many animals and vegetable forms. (3) Carl Vogt holds a plurality of the race; adopts Darwin's idea of natural selection accounting for the origin and endowments of man, but rejects Wallace's idea of the higher controlling intelligence. (4) Mivart propounds a theory of a natural evolution of man as to his body, combined with a supernatural creation as to his soul.

MAN, Isle of, an island in the Irish Sea, equidistant about 27 miles from England and Ireland, and 16 miles from Scotland; greatest length, n.e. to s.w., 33 miles, greatest breadth, e. to w., 12 miles; area, 145,325 acres. There is a small island, the Calf of Man (800 acres), at the s.w. extremity of Man. Lead and zinc are found in considerable quantities, especially the former. Fishing is an important industry, but the manufactures are almost entirely domestic. The island is governed by an independent legislature called the Tynwald, consisting of two branches—the governor and council and the house of keys. Two judges or "deemsters" try civil and criminal cases. The Manx language, a Celtic dialect, is still in use, although all the inhabitants speak English. The principal towns are Douglas, Castletown, Peel, and Ramsey. This island was taken by the Norwegians in 1098, sold to the Scots in 1266, and was repeatedly occupied by the English and Scots up till 1344, when it remained in possession of the former. It was latterly

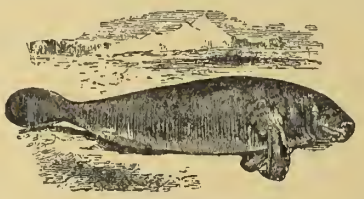
Golden-winged manakin.

held as a feudal sovereignty by the earls of Derby, and more recently by the dukes of Athole, from whom it was purchased for the British crown. Pop. 54,758.

MAN'AKIN, the name given to the dentirostral insessorial birds forming the sub-family Piprinæ. They are generally small and of brilliant plumage and are mostly confined to South America, a few species being found in Central America and Mexico. The typical genus is Pipra, which includes the bearded manakin and several others. An allied species is the beautiful orange manakin or cock-of-the-rock.

MANAS'SEH, (1) eldest son of Joseph, born in Egypt. His descendants formed a tribe, which, in the Promised Land, was settled half way east of the Jordan and half to the west of this river. (2) King of Judah, son of Hezekiah, whom he succeeded at twelve years of age, 697 B.C. He became an open idolater; was taken captive to Babylon; ultimately repented and was restored to his kingdom. He reigned for fifty-five years.

MANATEE', the sea-cow or lamantin, a gregarious aquatic mammal found on



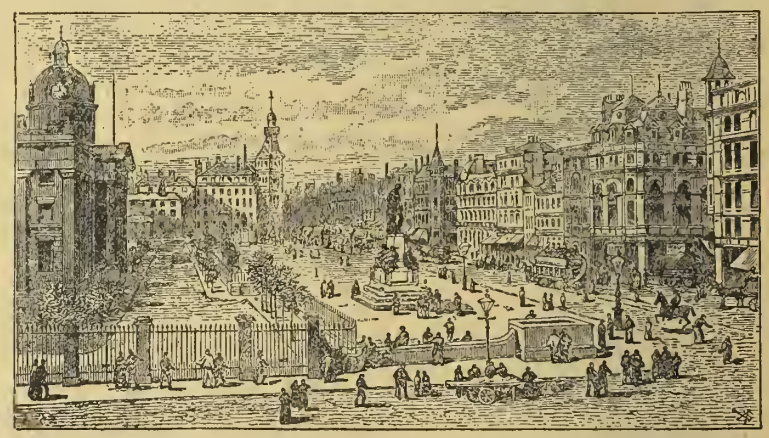
The manatee.

the coasts of South America, Africa, and Australia. They generally frequent the mouths of rivers and estuaries, and feed on algæ and such littoral land vegetation as they can reach at high tide. Their anterior limbs or swimming paws are furnished with nails, by means of which they drag themselves along the shore. They are large awkward animals, attaining a length of 8 to 10 feet as a rule, but sometimes growing to 20 feet. The skin is of a grayish color, sparsely covered with hairs. Their flesh is excellent, and they furnish a soft, clear oil, which does not become rancid. There are several species, the principal being the American manatee, which inhabits the shallow waters of the east coasts of South and North America, and the African manatee. The dugong belongs to the same order.

MANCHA, La, an ancient province of Spain, in New Castile, forming the chief part of the modern province of Ciudad-Real; famous as the scene of Don Quixote's adventures.

MANCHE (mänsh), La, a department of Northern France, bounded on the w., n., and n.e. by the English Channel, and landward by the departments of Calvados, Orne, and Mayenne. It is about 80 miles long by 30 broad, and has an area of 2263 sq. miles. Principal towns, Saint-Lô, the chief town, Cherbourg, Avaranches, Coutances, and Granville. Pop. 491,372.

MAN'CHESTER, a mun., parl., and county borough and city of Lancashire, England, 188 miles n.n.w. from London by railway, and 32 miles east by north of Liverpool. Manchester charter of incorporation dates from 1838; in 1832 it was made a parliamentary borough, and in 1852 it became a city. Among the chief public buildings are the town hall or municipal buildings, behind them being a well-arranged prison; the Royal Exchange; the Royal Infirmary; the Free Trade Hall, used for public meetings; the Royal Institution, Salford town-hall, new general postoffice, city court-house, commercial buildings, etc. Among the churches the first place is due to the cathedral, a fine specimen of Perpendicular Gothic, built in 1422. The chief educational institution is Owens College, the nucleus of the Victoria University, founded in 1846. Cheetham's hospital was founded under the will of Humfrey Cheetham in 1653 for the education of poor boys. Attached to the institution is a library of nearly 40,000 vols., the first free library in Europe. The city



Manchester—The Royal Infirmary and Piccadilly, from the Queen's Hotel.

has also a number of denominational colleges. The grammar school was founded in 1520, and has exhibitions at Oxford or Cambridge. There are numerous literary, scientific, and philosophical societies, some of them of considerable standing. The free library, established in 1851, has a reference library in the main building of 100,000 vols., and six branches with upward of 120,000 vols. Among the public monuments the most noteworthy is the Albert Memorial in front of the town-hall. The chief manufacture is cotton, though woolen and silk fabrics are also produced. Metal manufactures, engineering, and the making of all kinds of machinery employ many hands. Rail-

way communication is of the most extensive kind, the largest stations being Victoria, London Road, Exchange, and Central. The commerce of the city has been further facilitated by the completion of the ship canal, connecting it with the Mersey estuary, an undertaking which altogether has cost $75,000,000. It is 35½ miles long 26 feet deep, has several locks, and connected with it are docks at Manchester 100 acres in area. The manufacture of gas and supply of water are in the hands of the corporation, and an extensive scheme for bringing an improved water supply from Thirlmere in the Lake District has recently been completed at a cost of $20,000,000. The introduction of machinery in cotton-spinning toward the end of the 18th century gave power and direction to the trade of modern Manchester, and its progress since has been extraordinarily rapid. A temporary check resulted from the civil war in America, which led to a cotton famine in 1862, causing the decpest distress in South Lancashire. Pop. of Manchester 543,930; of Salford, 421,015.

MANCHESTER, a town in New Hampshire, on the Merrimac, at the Amoskeag Falls, 59 miles north-northwest of Boston. It is one of the chief manufacturing placcs in New England, having the advantage of an unlimited supply of water-power from the falls of the Merrimac. The chief articles manufactured are cotton, woolens, fire-engines, locomotives, edge-tools, castings and paper. Pop. 1909, about 65,000.

MANCHESTER, a town in Chesterfield co., Va., on the James river, and the Richmond and Danville railroad; opposite Richmond. Pop. 11,500.

MANCHU'RIA, or **MANCHOORIA** (Chinese Shing-King) a Chinese territory occupying the northeastern corner of the empire, and abutting on Siberia and Corea, its chief natural boundaries being the Yellow Sea and Amur. It has been occupied since the troubles of 1900 by Russian troops, the promise of evacuation by Russia not having yet been carried out. The trans-Siberian railway crosses it. It is divided into three provinces, Shing-King, Feng-Tien, or Leaotong in the south, of which Mukden is the capital; Kirin in the center, with a capital of the same name; and He-Lung-Kiang in the north, with capital Tsitsihar. The total area is about 380,000 sq. miles. The administration is military, the governors of the two northern provinces being subordinate to the governor of Mukden. The Manchus are a hardy race, and their country has long been the great recruiting ground for the Chinese army; but of late years vast numbers of Chinese proper have flocked into it, so that now they by far outnumber the native race. In the 17th century the Manchus invaded China and placed their leader's son upon the throne. Since that time the Manchu dynasty has continued to reign in China, and the Manchu language has become the court and official language. The country is mountainous, but on the whole fertile. The climate is good, for though the winters are severe they are healthy and bracing. The vast forests of the north are rich in useful timber of all kinds. The principal food crops are pulse, millet, barley, and wheat. The vine, indigo, cotton, opium, tobacco, etc., are cultivated. The chief seaport is the treaty port Newchwang. In 1894 and 1895 Manchuria was the field of war between China and Japan and in 1900 the Boxer movement was most destructive, and in 1904 it became the theater of war between Russia and Japan. On February 9, Japan destroyed the Russian ships Variag and Korietz in the harbor of Chemulpo, and by a torpedo attack disabled some of the ships in Port Arthur. The Japanese having gained practical control of the sea landed their armies, and by their brilliant naval and land campaigns had destroyed Russia's supremacy in Asiatic waters, involved Port Arthur in a protracted siege and had driven the Russian army back on Mukden.

The persistent attempts of Admiral Togo to block Port Arthur, the blowing up of several Russian ships, the blowing up and ramming of Japanese ships, the destructive raids of the Vladivostok squadroon on Japanese transports, the practical annihilation of the Vladivostok squadroon were some of the more striking events of the war by sea. By land, the armies led by Gens. Kuroki, Oku, and Nodzu, notwithstanding desperate Russian resistance, were irresistible in their onward progress. May 1, Kuroki forced the passage of the Yalu. May 20 Oku stormed Kinchau and Nanshau Hill, driving Gen. Stoessel back on Port Arthur. June 14–16 Gen. Nodzu beleagured Port Arthur while Oku and Kuroki defeated Gen. Stokelberg, who had been dispatched with 30,000 men to the relief of Port Arthur. The Japanese occupied Yinkow at the port of Newchwang, and on July 25 again defeated the Russians. One of the fiercest battles in history began on August 30 when after three days of the severest fighting Gen. Kuropatkin was compelled to abandon Liao-yang and retire on Mukden, the battle raging incessantly during the five days retreat.

On September 18, the Japanese began shelling the fortifications around Mukden. On October 4, Gen. Kuropatkin assumed the offensive, pushing his army across the Hun river. Here he was faced by Oku, Nodzu, and Kuroki. The battle of the Hun river lasting 11 days, and while the losses on both sides were enormous, the net result showed no gain to either side. During these months operations by land and sea before Port Arthur had been carried on with varying success. On December 2 the Japanese took 203 Meter Hill at a loss of 15,000 men, but it enabled them to mount their heaviest siege guns on a hill which commanded both the town and the harbor. On January 2, 1905, Gen. Stoessel was forced to surrender the entire garrison and the ships within the harbor.

With the fall of Port Arthur fighting was resumed at Mukden . By the middle of February Marshal Oyama had been reinforced by an army of 100,000 veterans under Gen. Nogi, the Japanese army now numbering 400,000 and the Russian 350,000. On February 20, a general advance was made against the Russians. On March 10 Mukden was occupied by the Japanese and the Russian retreat turned into a rout.

On the capitulation of the Port Arthur garrison in January, the Japanese fleet under Togo was released from blockade duty and lay in wait for the Baltic fleet under Admiral Rojestvensky, and on May 27 surrounded the Russian fleet and pounded it to pieces.

The campaign on land and sea was again vigorously pushed, when, yielding to the earnest requests of President Roosevelt to stop the war if possible, both Russia and Japan consented in the latter part of June to hold a conference with peace a possible outcome. Baron J. Komura and Minister Takahira for Japan and Serge Witte and Baron Rosen for Russia were chosen as ambassadors with full powers to arrange terms of peace. The Portsmouth, N. H., navy-yard was selected as the meeting place. On August 29 the plenipotentiaries reached a final agreement, the treaty was drafted and signed on September 5. Peace was concluded September 5, 1905, by the intervention of President Roosevelt by the treaty of Portsmouth. Pop. estimated at 22,000,000.

MAN'DALAY, the capital of Burmah from 1860 to 1886, and now that of Upper Burmah, in a level plain about 2 miles from the left bank of the Irrawaddy, 386 miles by rail from Rangoon. Pop. 183,816.

MANDA'MUS, in law, a command or writ issuing from a superior court, directed to any person, corporation, or inferior court, requiring them to do some act therein specified which appertains to their office and duty, as to admit a person to an office or franchise, or to deliver papers. etc.

MAN'DARIN, the term applied by Europeans to government officials of every grade in China. The Chinese equivalent is kwan, which signifies literally a public character.

MANDARIN DUCK, a beautiful species of duck from Eastern Asia, the males of which exhibit a highly variegated plumage of green, purple, white, and

Mandarin duck.

chestnut, the females being colored a more sober brown. The male loses his fine plumage in summer.

MANDATS (mäṇ-dä), a kind of paper-money issued during the French revolution, differing from the assignats in so far as specific pieces of property, enumerated in a table, were pledged for the redemption of the bills, while the assignats furnished only a general claim.

MAN'DIBLE, the term more espe-

cially applied to both the upper and under jaws of birds. In mammals it is applied only to the under jaw, and in the Articulata to the upper or anterior pair of jaws, which are generally solid, horny, biting organs.

MAN'DOLIN, a musical instrument of the guitar kind. There are several varieties, each with different tunings. The Neapolitan has four strings tuned like those of the violin, G, D, A, E; The Milanese has five double strings (each pair in unison) tuned G, C, A, D,

Mandolin.

E. A plectrum is used in the right hand, the fingers of the left stopping the strings on the fretted finger-board.

MANDRILL, a species of baboon which is distinguished by the short or rudimentary tail, by the elongated dog-like muzzle, and by the presence of buttock callosities which are generally brightly colored. The mandrill inhabits Western Africa, where they associate in large troops. Full-grown males meas-

Mandrill.

ure about 5 feet; they are exceedingly strong and muscular, and fierce in disposition. It has cheek protuberances colored with stripes of brilliant red and blue.

MANFRED, king of the Two Sicilies; born 1231, died 1266. A natural son of the Emperor Frederick III., he was regent in Italy first for his brother and then for his nephew, on whose rumored death he was crowned king. He refused to resign in favor of his nephew, was excommunicated, and his kingdom of the Sicilies given as a papal fief to Charles of Anjou. The latter marched into Naples and gained a victory, in which Manfred was killed.

MAN'GANESE, a metal of a dusky-white or whitish-gray color, very hard and difficult to fuse. Exposed to air it speedily oxidizes; it decomposes water with evolution of hydrogen. The common ore of manganese is the dioxide, black oxide, or peroxide, a substance largely employed in the preparation of chlorine for the manufacture of bleaching-powder or chlorate of lime. It is employed in the manufacture of plate glass, to correct the yellow color which oxide of iron is apt to impart to the glass. It is also used in making the black enamel of pottery. Other oxides are the protoxide, sesqui-oxide, the red oxide, and permanganic acid. The latter is only known in solution or in a state of combination. It is largely used in analytical chemistry. Metallic manganese is obtained by reduction of the oxide by means of heat and finely-divided carbon. It resembles iron in appearance and properties; is a constituent of many mineral waters, and is employed in medicine. In steel manufacture it is used in certain proportions with advantage as regards the ductility of the steel and ability to withstand forging, and in other manufacturing operations it forms an important element.

MANGANESE BRONZE, a kind of bronze in which the copper forming the base of the alloy is mixed with a certain proportion of ferro-manganese, and which has exceptional qualities in the way of strength, hardness, toughness, etc. Various qualities are manufactured, each suited for certain special purposes. One quality, in which the zinc alloyed with the treated copper is considerably in excess of the tin, is made into rods, plates, etc., and when simply cast is said to have a tensile strength of about 24 tons per square inch, with an elastic limit of from 14 to 15 tons. Another quality used in gun-founding has all the characteristics of forged steel without any of its defects. A third quality is now in extensive use for toothed-wheels, gearing, brackets, and all kinds of machinery supports. From its non-liability to corrosion it is largely employed in the manufacture of propellers.

MANGE, a cutaneous disease to which dogs, horses, cattle, etc., are liable. It resembles in some measure the itch in the human subject, ordinary mange being due to the presence of a burrowing parasite. Both local application and internal remedies are used in its cure.

MANGO, the fruit of the mango-tree, a native of tropical Asia, but not widely cultivated throughout the tropics. Fine varieties produce a luscious, slightly acid fruit much prized for dessert. The large flat kernel of the fruit is nutritious, and has been cooked for food in times of scarcity. The fruit forms a fleshy drupe about the size of a hen's egg or larger, somewhat kidney-shaped and yellowish or reddish in color, spotted with black on the outside. The fruit is much used for making pickles, chutneys, and curries. Dried, it forms a considerable article of commerce. It yields by distillation a spirit said to be not unlike whisky in flavor. The tree grows to a considerable size, with an erect trunk, and yields a timber that is used for a variety of purposes for which fine timber is not required, as for packing-boxes, country carts, rough furniture, house carpentry, etc.

MANGOSTEEN', a tree of the East Indies. The tree grows to the height of 18 feet, and the fruit is about the size of an orange, and contains a juicy white pulp of a delicate, sweet, sub-acid flavor. It is esteemed one of the most delicious and wholesome of all known fruits. The thick fleshy rind has astringent properties, and hence is used medicinally in diarrhœa and dysentery.

MANGROVE, a genus of plants consisting of trees or shrubs which grow in tropical countries along the muddy beaches of low coasts, where they form impenetrable barriers for long distances. They throw out numerous roots from the lower part of the stem, and also send down long slender roots from the branches, like the Indian banyan-tree. The seeds germinate in the seed vessel, the root growing downward till it fixes itself in the mud. By retaining mud and vegetable matter among their roots mangroves often help in the gaining of land from the sea. The wood is dark-red, hard, and durable, and the bark is used for tanning. The fruit is said to be sweet and edible, and the fermented juice is made into a kind of light wine. The name is also given to the verbena family, which occupies large tracts of shore in tropical countries, extending as far south as New Zealand and Tasmania.

MANHATTAN ISLAND, an island at the head of New York bay, forming the borough of Manhattan in New York City, and containing the commercial and financial nucleus of the metropolis, together with its main residence portion. It is situated between the Hudson or North river and the East river: Spuyten Duyvil creek and the Harlem river separate it from the mainland on the north and northeast. The island, with tapering northern and southern extremities, a few hundred yards wide, is 13½ miles long, with a maximum width, at Fourteenth street, of 2¼ miles, and an area of 22 sq. miles. It has a wharfage front of 22 miles, with a depth of water sufficient for the largest vessels. Three bridges connect Manhattan Island with Long Island. A number of bridges span the Harlem river and Spuyten Duyvil creek, and numerous steam ferries communicate with the adjacent shores. The surface is undulating and rocky, in the north rising from the Hudson to an altitude of 238 feet at Washington Heights, but sloping abruptly toward the east, where is a level stretch formerly known as the Harlem Flats. The greater part of the city is built on the rock foundation; pile foundations, however, are resorted to in the deeper glacial deposits and in the beach sand.

MANIA. See Insanity.

MAN'IFEST, is a document signed by the master of a vessel at the place of lading, to be exhibited at the custom-house, containing a specific description of the ship and her cargo, with the destination of the ship and of each package of the goods, etc.

MANI'LA, or **MANIL'LA,** the capital city of the island of Luzon and of all the Philippine islands, see of the Roman Catholic primate, and residence of the United States governor, lies on the bay of the same name, and at the mouth of the river Pasig. It consists of an old fortified city with extensive suburbs, in which are the mass of the population, and the business premises, factories, and residences of the European inhabitants. Manila is the center of commerce of the Philippines, and exports sugar, tobacco, cigars and cheroots, indigo,

Manila hemp, coffee, mats, hides, trepang, rice, etc. It imports British and United States cloths, hardware, etc., and a great variety of articles, tea, pottery, etc., from China. The manufactures consist chiefly of cigars and cheroots, and hemp and cotton fabrics. Manila

was founded by the Spaniards in 1571. It has frequently suffered from earthquakes. It has electric lighting and a good water-supply, and is rapidly improving under American rule, especially in sanitation. Pop. 275,000.

MANILLA, or MANILA HEMP. See Abaca.

MANIPUR (-pör'), a native state of Northeastern India, area, 8000 sq. miles; pop. 283,957; capital, Imphal.

MANISTEE, a town in Michigan, on Lake Michigan, at the mouth of the Manistee. It is in the great fruit belt region. It has the largest vacuum evaporating salt plant in the world. Pop. 17,362.

MAN'ITO, Man'itou, among certain of the North American Indians, a name given to whatever is an object of religious awe or reverence, whether a good or evil spirit or a fetish. Two manitos or spirits are spoken of by pre-eminence, the one the spirit of good, the other the spirit of evil.

MANITO'BA, a province of the Dominion of Canada, is bounded on the north by Saskatchewan and Kewatin, on the east by the states of Minnesota and North Dakota, and on the west by Assiniboia, and Saskatchewan. It occupies a position nearly in the center of the North American continent, and extends from 49° to 52° 50′ n. lat.; and from 89° to 101° 20′ w. lon.; area, estimated at 64,000 sq. miles. The climate is warm in summer, but very cold in winter. The summer mean is about 66°, but in winter the thermometer sinks to 30°, 40°, and sometimes 50° below zero, though this severe cold is mitigated by a clear dry atmosphere. The summer months are part of May, June, July, August, and September. The principal rivers are the Assiniboine and the Red river, the latter having the greater part of its course in the United States. The largest lakes are Winnipeg, Winnipegosis, and Manitoba, the two former being only partially included within the boundaries of the province. The greater part of the province consists of level treeless prairie land, covered with a rich vegetable growth in summer. The banks of the streams, however, are lined with a timber belt extending from about half a mile to ten miles back. The soil is generally a rich black mould, resting partly on a limestone formation, and partly on a thick coat of hard clay. Wheat, oats, barley, Indian corn, hops, flax, hemp, and all kinds of garden vegetables produce excellent crops. For wheat growing Manitoba presents peculiar advantages. Potatoes and all other root-crops thrive well, and the prairie grasses furnish good hay. Game is abundant, and the rivers and lakes teem with fish. Manitoba is divided into seven electoral districts for Dominion elections, each sending one member to the house of commons. The province likewise sends four members to the senate of the Dominion. The public affairs are administered by a lieutenant-governor, an executive council of five members, and a legislative assembly of forty members elected for four years. The school system established by law is now undenominational, and is supported by local assessments, supplemented by legislative grants. The capital of the province is Winnipeg, situated at the junction of the Assiniboine and Red rivers; other towns are Portage la Prairie, Brandon, Selkirk, and Emerson. The nucleus of Manitoba was the Red river settlement established in 1812, but little progress was made till the territory became part of Canada in 1870. The trade of the province has been greatly increased since 1878, when Winnipeg was connected with the railway system of the United States; and the construction of the Canadian Pacific railway, which crosses the province from east to west, has added materially to its progress and prosperity. Pop. 294,947.

MANITOBA LAKE, a lake of Canada, province of Manitoba, 30 or 40 miles s.w. of Lake Winnipeg, about 120 miles in length by about 25 miles in breadth; area, 1900 sq. miles. It receives the waters of several lakes at its northern extremity, and at its southern White Mud river. It discharges into Lake Winnipeg through the Dauphin river.

MANITOU. See Manito.

MANITOU'LIN ISLANDS, a group of North American islands in Lake Huron, consisting of Grand Manitoulin, 80 miles long by 5 to 30 broad, Little Manitoulin, and Drummond island. The two former belong to Canada, the latter to the United States (Michigan). Pop. about 2000, more than one-half being Indians.

MANITOWOC, the county-seat of Manitowoc co., Wisconsin, on Lake Michigan, at the mouth of a river of the same name. It has a good harbor and considerable trade. Pop. 13,640.

MANKA'TO, a town in Minnesota, 70 miles s.w. of St. Paul. It is a thriving center of a large agricultural district; has various manufactures and a good trade. Pop. 12,615.

MANNA, the sweet concrete juice which is obtained by incisions made in the stem of a species of ash, a native of Sicily, Calabria, and other parts of the south of Europe. The manna of commerce is collected in Sicily, where the manna-ash is cultivated for the purpose in regular plantations. The best manna is in oblong pieces or flakes of a whitish or pale-yellow color, light, friable, and somewhat transparent. It has a slight peculiar odor, and a sweetish taste mixed with a slight degree of bitterness, and is employed as a gentle laxative for children or persons of weak habit. It is, however, generally used as an adjunct to other more active medicines. In Scripture we are told that a substance called manna was miraculously furnished as food for the Israelites in their journey through the Arabian wilderness.

MANNA-ASH. See Manna.

MANNHEIM, (mȧn'hīm) a town of Germany, grand-duchy of Baden, on the right bank of the Rhine, near the confluence of that river with the Neckar. The principal buildings are the Schloss or castle, the theater, arsenal, Jesuits' church, etc. The town has suffered severely from war, especially in the siege of 1795. Pop. 140,384.

MANNING, Daniel, American journalist and politician, was born in Albany, N. Y., in 1831. In 1876 he became a member of the New York Democratic State Committee, was chosen secretary in 1879 and chairman in 1881. In 1882 he contributed greatly to the election of Grover Cleveland as governor of New York and it was Manning's astuteness and tact that made possible the successful presentation of Cleveland's name as a candidate for the presidency in 1884. In the latter year his personal supervision contributed greatly to the success of the democratic ticket in the pivotal state of New York. From 1885 to 1887 he was secretary of the treasury in Cleveland's cabinet, from which he retired on account of ill health shortly before his death in 1887.

MANNING, Henry Edward, Cardinal, born at Totteridge, Hertfordshire, 1808. He took an active part in the Tractarian movement, and in 1851 joined the Church of Rome, and was ordained priest. On the death of Cardinal Wiseman he succeeded him as Archbishop of Westminster (1865), and ten years after he was made cardinal. He died in 1892.

MANŒUVRES, the movements and evolutions of any large body of troops or fleet of ships, for the purpose of testing the efficiency of the various bodies of the service under the conditions of actual warfare, and for the purpose of instructing officers in tactics, and officers and men in their various duties. For these purposes mimic warfare is carried on periodically under the name of military or naval manœuvres.

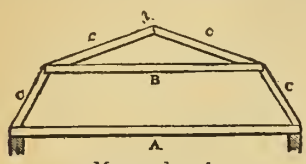
MAN-OF-WAR BIRD. See Albatross.

MANOM'ETER, an instrument to measure or show the alterations in the rarity or density of the air, or to measure the rarity of any gas. Such instruments as measure the elastic force of steam are also properly termed manometers. They are variously constructed.

MANS, LE (lė mäṇ), a town of France, capital of department Sarthe, on a height above the Sarthe, 115 miles southwest of Paris. Pop. 62,948.

MANSARD (mȧṇ-särr), François, French architect, born in Paris 1598, died 1666. The roof known by his name

was his invention. His nephew, Jules Hardouin, who assumed his name (1645–1708), attained great fame as an architect. The Palais de Versailles, Hôtel des



Mansard roof.
A, Tie-beam. B, Collar-beam. CC, Rafters.

Invalides, the Place Vendôme, and other works of the reign of Louis XIV., were from his designs.

MANSARD ROOF, a roof formed with an upper and under set of rafters on each side, the under set approaching more nearly to the perpendicular than the upper.

MANSFIELD, the capital of Richland co., O., on the Balt. and O., the Erie, the Penn., and the Pitts., Cin., Chi. and St. L. railways; 180 miles n. e. of Cincinnati. It is in an agricultural region; has manufactories of agricultural implements, flour, stoves, pumps, and numerous minor articles. Pop. 21,625.

MANSFIELD, Richard, American actor was born in the island of Heligoland in 1857. When about seventeen years of age he came to the United States. His first appearance on the stage was as Baron Chevrial in A Parisian Romance, and was a great success. Among his parts have been Doctor Jekyll and Mr. Hyde, Richard III., Beau Brummell, Cyrano de Bergerac, Monsieur Beaucaire and Brutus. He died in 1907.

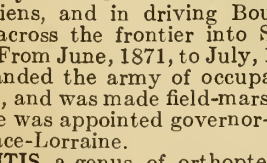
MANSLAUGHTER. See Homicide.

MANTCHOOS. See Manchuria.

MANTELL', Gideon Algernon, geologist and palæontologist, born at Lewes, in Sussex, 1790, died in London 1852. Through his investigations the fossilized skeletons of those gigantic reptiles the Iguanodon and Hylæosaurus were discovered. He was a popular lecturer on geology, and published The Fossils of the South Downs, Illustrations of the Geology of Sussex, Wonders of Geology, and Medals of Creation.

MANTEUFFEL (mân'toi-fl), Edwin, Baron von, German field-marshal, born 1809, died 1885. He played a distinguished part in the Franco-German war, especially in several actions around Metz at Amiens, and in driving Bourbaki's army across the frontier into Switzerland. From June, 1871, to July, 1873, he commanded the army of occupation in France, and was made field-marshal. In 1879 he was appointed governor-general of Alsace-Lorraine.

MANTIS, a genus of orthopterous insects, remarkable for their grotesque forms. They frequent trees and plants,



Praying-mantis.

and the forms and colors of their bodies and wings are so like the leaves and twigs which surround them as to give them remarkable power to elude observation. The praying-mantis has received its name from the peculiar position of the anterior pair of legs, resembling that of a person's hands at prayer. In their habits they are very voracious, killing insects and cutting them to pieces. They are natives chiefly of tropical regions, but are also found in France, Spain, and the warmer parts of Europe. They are very pugnacious, and are kept by the Chinese for the purpose of watching them fight.

MAN'TUA, a strongly fortified town of Northern Italy, one of four forming the Quadrilateral, capital of the province of the same name, 80 miles e. s. e. of Milan. Virgil was born at the adjoining village of Andes, supposed to be the modern Pietole. Pop. 28,048.—The province, which is intersected by the Po, Mincio, and other streams, produces rice, wheat, silk, wine, etc.; area, 961 sq. miles; pop. 315,314.

MAN'U, an early Sanskrit writer, author of a book of laws, civil and religious, called Dharma-Shastra, still extant.

MANUAL ALPHABET. See deaf and Dumb.

MANUAL OF ARMS, a text-book of rules and explanations for the instruction of military recruits in the use of their arms and their care and preservation. In the United States Army all drills begin and end with an examination of cartridge chambers, and for purposes of instruction the movements are divided into motions, and executed in detail. The command of execution determines the prompt execution of the first motion, and the commands Two, Three, etc., the other motions. The commands and movements of the manual of arms are given after the soldier is in position with rifle at the order, and are as follows: (1) Order arms; (2) carry arms; (3) present arms; (4) right shoulder arms; (5) port arms. Other movements are: (6) Parade-rest; (7) fix bayonets; (8) charge bayonets.

MANUMISSION, among the Romans, the solemn ceremony by which a slave was emancipated.

MANURES, vegetable, animal, and mineral matters introduced into the soil to accelerate vegetation and increase the production of crops; substances used to improve the natural soil, or to restore to it the fertility which is diminished by the crops annually carried away. Animal substances employed as manures comprehend the putrefying carcasses of animals, ground bones, blood, the excrements of animals, as the dung of horses, cattle, sheep, poultry, etc.; urine, guano (the decomposed excrement of aquatic birds); the scrapings of leather, horn, and the refuse of the shambles; the hair or wool of animals. Liquid manure, consisting of town sewage, the drainings of dung-heaps, stables, and cow-houses, is largely employed in many districts. Almost every kind of vegetable substance, in one state or another, is used as manure. The principal mineral substances employed as manures are lime, chalk, sand, clay, marl; sulphates of potash, soda, ammonia, and magnesia; nitrates of potash and soda; and phosphates of lime. It is from containing one or other of these substances that apatite, basic slag, cubic nitre, kainite, etc, are so valuable. Modern researches upon plant nutrition, and the chemistry of agriculture in general, have shown us that the food of plants may be classed under the two headings of air food and mineral food. Air food consists of ammonia, water, and carbon dioxide; mineral food, of those substances which remain as ash when the plant is ignited. The former class of food is supplied to the plant partly from the atmosphere and partly from the soil, the latter from the soil entirely. In the production of food by natural processes of plant-growth a certain amount of air food and also of mineral food is abstracted from the soil, those amounts varying for different species of plants; if this food be returned to the soil, then a further growth of plants may be expected; if, however, seed is sown in the partially impoverished soil, there must be a decrease in the amount of crop obtained from that soil. As the plants serve to nourish animals, it follows that the substances which have been withdrawn from the soil by the plants may be returned to it in the shape partly of animal excreta, and partly of ground bones, etc. Different plants require different kinds of food; if, therefore, the kind of crop grown on the same land be varied from year to year, and if the soil be tilled so as to unlock its natural supplies of mineral food, it will be found that the average yield of crops may be maintained simply by the restitution to the land of that amount of food which has been removed from it by the plants.

MANUSCRIPTS, are literally writings of any kind, whether on paper or any other material, in contradistinction to printed matter. Previous to the introduction of printing all literature was contained in manuscripts, and the deciphering and proper use of these form an important part in the science of palæography. All the existing ancient manuscripts are written on parchment or on paper. The paper is sometimes Egyptian (prepared from the real papyrus shrub), sometimes cotton or silk paper. The most common ink is the black, which is very old. Red ink of a dazzling beauty is also found in ancient times in manuscripts. With it were written the initial letters, the first lines, and the titles, which were thence called rubrics. Blue, green, and yellow inks were more rarely used. On rare occasions gold and silver were the mediums, though from their cost they are oftenest confined to initial letters. With respect to external form, manuscripts are divided into rolls, and into stitched books or volumes (properly codices). The most ancient manuscripts still preserved are those written on papyrus which have been found in Egyptian tombs. Several of these are of date considerably before the Christian era: notably fragments of the Iliad and a papyrus containing the orations of Lycophron and Euxenippus, 11 feet in length and containing 49 columns of writing. Next to them in point of age are the Latin manuscripts found at Herculaneum. It was a common custom in the middle ages to obliterate and erase writings on

parchment, for the purpose of writing on the materials anew, manuscripts thus treated being called palimpsests.

The art of illuminating manuscripts dates from the remotest antiquity. The Egyptian papyri were ornamented with vignettes or miniatures attached to the chapters, either designed in black outlines or painted in primary colors in distemper. The oldest ornamented Greek and Roman manuscripts that have survived are the Diosorides of Vienna and the Virgil of the Vatican, both of the 4th century, and having vignettes or pictures in a Byzantine style of art. From the 8th to the 11th century the initial letters in use were composed of figures of men, quadrupeds, fishes, birds, etc.

MANU'TIUS, Aldus, or Aldo Manuzio, Italian printer, born about 1447, died 1515. In 1488 he established himself as a printer at Venice, but the first work which he finished was not published till 1494. In the course of the ensuing twenty years he printed the works of the most ancient Latin and Greek authors extant, as well as many productions of his contemporaries, and some treatises of his own composition. He was the inventor of the italic or cursive character, hence called Aldine.

MANZO'NI, Alessandro, an Italian poet and novelist, was born 1784, died 1873. He was the son of Count Pietro Manzoni and of the Marchioness Giulia Beccaria, daughter of the Marquis Cesare Beccaria, author of the well-known treatise on Crimes and their Punishment. After his father's death in 1805 he lived for some time in Paris with his mother, and in 1808 he married the daughter of a Genoese banker, under whose influence he settled down into the fervent Catholicism which colored all the rest of his life. His chief works are the Inni Sacri, a series of sacred lyrics; Il Cinque Maggio, a powerful ode on the death of Napoleon; the tragedies Il Conte di Carmagnola, and Adelchi; and his great novel I Promessi Sposi (The Betrothed).

MAORIS (mâ'o-riz), the name given to themselves by the natives of New Zealand.

MAP, a projection on a plane surface of the whole or a part of the earth's surface, showing its main features in more or less detail. The earth being a spheroid, its surface cannot be made to coincide rigorously with a plane; and it therefore becomes necessary to have recourse to a projection, that is, a plan on a plane surface, which indicates with sufficient correctness the relative positions, dimensions, etc., of the different parts of the spherical surface. There are five principal projections, the orthographic, the stereographic, the globular, the conical, and the cylindrical or Mercator's distinguished from each other by the different positions of the point of projection, or that in which the eye is supposed to be placed. The last named gives a very erroneous idea of the relative size of the different portions of the earth's surface, especially toward the poles, but is very useful to mariners, in enabling them to lay off a course that can be steered by compass in straight lines. (See Mercator's Projection.) A nautical map is usually called a chart (which see).

MA'PLE, a name for trees, peculiar to the northern and temperate parts of the globe. About fifty species are known, distributed through Europe, North America, and different parts of Asia. They are small or large trees, with a sweetish, rarely milky, sap, opposite deciduous, simple, usually lobed leaves, and axillary and terminal racemes or corymbs of small greenish flowers. The characteristic form of the fruit is shown in the figure. The wood is valuable for various purposes, as for carving, turnery, musical instruments, wooden dishes, etc. Another well-known species is the Norway maple. The wood of several American species is also applied to various uses. The sugar or rock maple is the most important species; this yields maple-sugar, which in many parts of the United States is an important article of manufacture. A tree of ordinary size will yield from 15 to 30 gallons of sap yearly, from which are made from 2 to 4 lbs. of

Sugar maple.

sugar. The knotted parts of the sugar-maple furnish the pretty bird's-eye maple of cabinet-makers. Some other American species are the white maple, the red or swamp maple, the striped maple or moose wood, the mountain maple, the vine maple, and the large-leafed maple.

MAQUI (mak'wē), an evergreen or subevergreen shrub found in Chile, from the juice of whose fruit the Chilians make a kind of wine.

MARASCHINO (ma-ras-kē'nō), a fine liquor distilled from a small black wild variety of cherry. The best-known kinds are the maraschino de Zara, from Zara in Dalmatia, and that from Corsica. An inferior kind is made in Germany.

MARAS'MUS, a wasting of the flesh without fever or apparent disease; often, however, dependent on disease of the mesenteric glands, or some obstruction in the course of the chyle.

MARAT (mà-rä), Jean Paul, one of the most infamous leaders of the French revolution, born near Neufchâtel in 1744. The first breath of the revolution, brought him to the front, and when Danton instituted the club of the Cordeliers, Marat became the editor of the Publiciste Parisien, better know under its later title L'Amidu Peuple, which was again changed to the Journal de la République Française, a journal which was the organ of that society, and soon became the oracle of the mob. His paper was issued from various places of concealment until the 10th August, 1792, after which he took his seat at the commune, and played a leading part in the assassinations of September (1792). He was a member of the terrible committee of public safety, and of the convention

Jean Paul Marat.

where General Dumouriez and the Girondists, who endeavored at first to prevent his taking his seat, were the special objects of his attack. The establishment of the revolutionary tribunal, and of the committee for arresting the suspected, was adopted on his motions. On the approach of May 31, as president of the Jacobin Club he signed an address instigating the people to an insurrection, and to massacre all traitors. For this Marat was delivered over to the revolutionary tribunal, which acquitted him; and the people received him in triumph and covered him with wreaths. He was assassinated shortly after by Charlotte Corday, July 13, 1793. His remains were deposited in the Pantheon with national honors, but were subsequently removed.

MAR'ATHON, a village of ancient Greece, in Attica, about 20 miles northeast of Athens. It was situated (probably on the site of the modern Vrana) on a plain which extends for about 6 miles along the seashore, with a breadth of from 1¼ to 3 miles. It is famous for the overthrow of the Persians by the Athenians under Miltiades, 490 B.C.

MARAT'TI, Carlo, Italian painter and engraver, born in 1625. Louis XIV. employed him to paint his celebrated picture of Daphne. Clement IX., whose portrait he painted, appointed him overseer of the Vatican gallery. He has been styled the last painter of the Roman school. His Madonnas were particularly admired. He died in 1713 at Rome, where his chief works are to be found.

MARBLE, the name given to certain varieties of limestone capable of receiving a brilliant polish, and which, both from their durability and the beauty of the tints of many of them, have at all periods of the world been greatly in request for purposes of art or ornament. White statuary marble is a pure carbonate of calcium. Marbles have been divided into seven varieties or classes.

MARBLING, in bookbinding, a process of ornamenting the edges of books by dipping them, when cut, in a trough about 2 inches deep and filled with gum-water on the surface of which colored pigments have been thrown and disposed in various forms with a quill and comb.

The colors adhering to the edge of the book are set by dashing cold water over them. Marbled papers for the sides of books are made in the same manner.

MAR'CASITE, iron pyrites or bisulphide of iron. It is of a paler color than ordinary pyrites, being nearly of the color of tin, and its luster is more strongly metallic.

MARCELLUS, Marcus Claudius, a Roman general, five times consul (222, 215, 214, 210, and 208 B.C.); the first Roman who successfully encountered Hannibal in the second Punic war; and the conqueror of Syracuse (212 B.C.). He was killed in a skirmish with the Carthaginians in 208 B.C.

MARCH, originally the first month of the Roman year. Till the adoption of the new style in Britain (1752), the 25th of March was the first day of the legal year; hence January, February, and the first twenty-four days of March have frequently two years appended, as January 1, 170½, or 1701–2.

MARCO POLO. See Polo.

MARCONI, Guglielmo, Italian electrician was born near Bologna at Grifone in 1875. At the university of Bologna he became interested in the nature of the Hertzian wares, and saw the possibilities of using these wares for the transmission of messages. He made several successful experiments in 1895 and 1896. In 1897 The Marconi Wireless Telegraph Company was started with large capital. In 1899 signals were successfully exchanged across the English

Guglielmo Marconi.

channel. In 1901 from St. John, N. F., Marconi sent a signal to the Irish coast and on December 9, 1902, succeeded in sending a message. In February, 1902, on his way to the United States, Marconi received signals on board ship at a distance of 2099 miles. In January, 1903, Marconi sent a message from President Roosevelt to King Edward from Cape Cod, Mass., direct to Poldhu a distance of 3000 miles. See Wireless Telegraphy.

MARCUS AURELIUS. See Aurelius Antoninus.

MARCY, William Learned, American politician, was born at Sturbridge, Mass., in 1786. He soon became a leading democratic politician, and one of the "Albany regency" which was supposed to control the action of the party in New York State. He was United States senator in 1831–32, and during his term he incidentally made use of the phrase so frequently afterward heard, "To the victors belong the spoils." He resigned to become governor of New York, 1833—39. He was secretary of war under Polk, 1845–49, and secretary of state under Pierce, 1853–57. As secretary of state he conducted with success the Koszta case in 1854, involving a collision with Austria on the subject of the right of expatriation. All his political leanings were to that branch of the democratic party in New York which made the strength of the new republican party in 1856, and he would have been its natural leader if he had followed his own convictions on the Kansas-Nebraska bill. He hesitated, and other men took his place. He died at Ballston Spa, N. Y., July 4, 1857.

MARGARET, Queen of Denmark, Norway, and Sweden, called the Northern Semiramis, the daughter of Waldemar III., king of Denmark; born at Copenhagen in 1353, married to Hakon, king of Norway, in 1363. The death of her husband in 1380 placed Norway in her hands; that of her son Olaf in 1387 enabled her to secure the throne of Denmark, to which she had previously brought about his election; and after defeating Albert, the Swedish king, she also obtained possession of the throne of Sweden. She endeavored to place the union of the three kingdoms on a permanent basis by the celebrated Act of Union, or Treaty of Calmar (1397). She died in 1412, after having raised herself to a degree of power then unequalled in Europe from the time of Charlemagne.

MARGARET OF ANJOU, daughter of René, titular king of Sicily, was born at Pont-à-Mousson, in Lorraine, in 1425, and married in 1443 to Henry VI. of England. The imbecility of the king made her practically regent, and her power being contested by the Duke of York, a claimant of the throne by an elder line, the protracted wars of the roses commenced. At first victorious she was afterward compelled to flee to Scotland, but raising an army in the north, she secured, by the battles of Wakefield (1460) and St. Albans (1461), the death of York and the release of the king. Her army, however, was soon afterward annihilated at Towton (1461) and Edward (IV.), the son of the late Duke of York, was declared king. She succeeded in obtaining assistance from Louis XI. of France, but was once more defeated, and took refuge in France. Warwick then became embroiled with the young king, and determined to replace Henry on the throne. Edward was in turn obliged to escape to the continent but obtaining assistance from the Duke of Burgundy, returned and defeated Warwick at Barnet (1471). Margaret, collecting her partisans, fought the battle of Tewkesbury (1471), but was totally defeated. She and her son were made prisoners, and the latter, when led into the presence of the royal victor, was killed. Henry soon after died or was murdered in the Tower, and Margaret remained in prison four years. Louis XI. ransomed her for 50,000 crowns, and in 1482 she died.

MARGARET OF VALOIS, Queen of Navarre, sister to Francis I. of France, was born at Angoulême in 1492. She was brought up at the court of Louis XII., and married the Duke of Alençon in 1509, became a widow in 1525, and in 1527 was espoused to Henry d'Albret, count of Béarn and titular king of Navarre. From this time she resided at Béarn, assisting in the development of the resources of the small kingdom, and making it a center of liberal influence. Many Protestants took refuge in her territories; and her name is closely linked with those of Rabelais, Dolet, Marot, and the leading men of the period. She herself possessed no ordinary culture, being credited with a knowledge of six languages and the authorship of several works, of which the chief were Le Miroir de l'Ame Pécheresse, printed in 1533 and condemned by the Sorbonne for its Protestant tendencies; the Heptaméron, a collection of Tales in imitation of the Decamerone of Boccaccio, and first printed in 1559; and a collection of poems published in 1547 under the title of Marguerites de la Marguerite des Princesses. She died in 1549, leaving one child, Jeanne d'Albret, afterwards mother of Henry IV.

MAR'GARINE, a mixture of stearine and palmitine, obtained from beef fat, lard, etc., and formerly regarded as a simple fat. The name is now applied to an imitation of butter. See Butterine.

MAR'GRAVE, originally a commander intrusted with the protection of a mark, or country on the frontier. The margraves acquired the rank of princes, and stood between counts and dukes in the German Empire.

MARIA LOUISA, second wife of Napoleon I.; born in 1791; eldest daughter of the Emperor Francis I. of Austria. Her marriage with Napoleon took place in 1810 after the divorce of Josephine, and in 1811 she bore him a son. After his everthrow she received in 1816 the duchies of Parma, Piacenza, and Guastalla, which she governed till her death in 1847. At Napolean's death she made a morganatic marriage with her chamberlain, Count Neipperg.

MARIANA (or Marianne) **ISLES.** See Ladrones.

MARIA THERESA, Queen of Hungary and Bohemia, Arch-duchess of Austria, and Empress of Germany, daughter of the Emperor Charles VI., was born at Vienna 1717, and in 1736 married Francis Stephen, grand-duke of Tuscany. On the death of her father in 1740 she ascended the throne of Hungary, Bohemia, and Austria, and a little later declared her husband joint ruler. Her accession was in accordance with the Pragmatic Sanction, but her claims were at once contested. Frederick the Great made himself master of Silesia; Spain and Naples gained possession of the Austrian territory in Italy; and the French, Bavarians, and Saxons marched into Bohemia, carrying all before them. Charles Albert was proclaimed Archduke of Austria, and shortly after Emperor of Germany; and the young queen fled to Presburg, where she convoked the diet and threw herself upon the sympathy of her Hungarian subjects. The French

and Bavarians were speedily driven from her hereditary states; Prussia made a secret peace with the queen, who unwillingly abandoned Silesia and Glatz to Frederick; and though by the Treaty of Aix-la-Chapelle (1748) she was also compelled to give up the duchies of Parma, Piacenza, and Guastalla to Spain, her husband was elected emperor. During the time of peace which followed Maria Theresa, with the aid of her husband and the minister Kaunitz, made great financial reforms; agriculture, manufactures, and commerce flourished, the national revenue greatly increased, and the burdens were diminished. The Seven Years' war again reduced Austria to a state of great exhaustion, but on its conclusion the empress renewed her efforts to promote the prosperity of her dominions. Her son Joseph was elected king of the Romans in 1764, and on the death of her husband, in 1765, she associated the young prince with herself in the government. In 1772 she joined in the dismemberment of Poland, obtaining Galicia and Lodomeria, while in 1777 she acquired Bukowina from the Porte, and in 1779, by the Peace of Teschen, gained the Inn valley. She died in 1780. Of the sixteen children which she bore to the emperor ten survived her, one of whom was the unfortunate Marie Antoinette.

MARIE ANTOINETTE. See Antoinette.

MARIE DE MEDICI (mȧ-rē dė med'i-chē), the daughter of Francis II. of Tuscany, born 1573, married in 1600 to Henry IV. of France. On the assassination of Henry she became regent, but proved utterly incompetent to rule. Her partiality for unworthy favorites caused her deposition and imprisonment. She became reconciled to her son, the weak Louis XIII., through Richelieu, who had possessed himself of the highest power, but was again imprisoned at Compiègne in 1630. Thence she escaped, and after wandering through several countries died in misery at Cologne (1642).

MARIET'TA, a town, in Washington county, Ohio, the oldest town in the state. It is the seat of Marietta college, founded in 1835. Pop. 15,162.

MAR'IGOLD, a name of several composite plants. The common marigold is a native of France and of the more southern parts of Europe. It is an annual, from 1 to 2 feet high, with large deep-yellow flowers. It is as prolific as any weed, and was formerly used in broths and soups, partly to give color, and partly as an aromatic seasoning. It had also many medicinal virtues assigned to it. A number of species of this genus are indigenous to the Cape of Good Hope. The so-called African marigold and French marigold, common in flower borders, are both Mexican species, and have brilliant flowers.

MARINE CORPS, a body of soldiers enlisted for service in the navy, either on board ship or on shore at naval stations or elsewhere. Marines, as these soldiers are called in the United States and British navies, are a relic of the days when ships were manned by soldiers as their fighting complement. Instead of constituting the greater part of a ship's company, they now form usually less than 15 per cent. of it. At the present time marines are used in the United States Navy on board ship and to guard naval stations at home and in the insular possessions; and when on board ship they constitute a quickly available infantry force for service abroad. Sailors are also drilled as infantry and artillery, but as their chief duties are connected with the ship, when they are landed the fighting efficiency of the ship is greatly reduced.

MARINE HOSPITAL SERVICE, a bureau in the treasury department of the United States, charged with the management of marine hospitals and relief stations for the cure of sick and disabled seamen of the American merchant marine. It has also under its supervision the national quarantine stations, the supervision of local quarantines, the investigation and suppression of epidemics and plagues, the collection and dissemination of mortality statistics and sanitary information, the scientific investigation of sanitary problems, and the examination of immigrants under the laws excluding those affected with contagious diseases. At present there are 23 marine hospitals, a sanitarium for consumptive seamen in New Mexico, and 115 relief stations.

MARINE LAW. See Commercial Law, International Law.

MARINER'S COMPASS. See Compass.

MARINES, a military force drilled as infantry, whose especial duty is to serve on board ships of war when on commission, and also on shore under certain circumstances. They are trained to seamen's duties, but do not go aloft, being mainly employed in sentry duty, etc. The force was first embodied by an order in council in 1664, as a nursery for seamen to man the fleet. The United States is the only other nation which employs marines in the same manner as Britain.

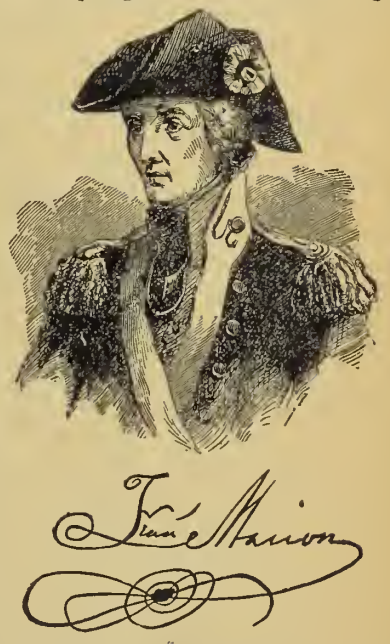
MARINETTE, the capital of Marinette co., Wis., on Green Bay, at the mouth of the Menominee river, and on the Chi. and N. W. and the Chi., Mil. and St. P. railways; 49 miles n. by e. of Green Bay. The city has a large lake traffic, and is principally engaged in the lumber industry, and in pulp and paper making. Pop. 19,260.

MARINO, San, a town and small independent republic in Italy. The territory consists of a craggy tract, with an area of about 22 sq. miles, on the borders of the provinces of Forli and Urbino, near the Adriatic coast. It is the last surviving representative of the Italian republics. At the head of the government are two "captains regent" elected for six months. There is a militia of 950 men. The town San Marino occupies the crest of a rocky hill 2200 feet in height, and is accessible only by the road from Rimini. The principal inhabitants, however, reside in the hamlet of Il Borgo, at its foot. Pop. of the town about 1200; of republic, 9600.

MARION, the capital of Grant co., Ind., on the Mississinewa river, and the Cleve., Cin., Chi., and St. L., the Pitts., Cin., Chi, and St. L., and the Toledo, St. L. and Kan. City railways; 41 miles s. e. of Logansport, 67 miles n. e. of Indianapolis. Pop. 20,761.

MARION, the capital of Marion co., O., on the Cleve., Cin., Chi. and St. L., the Col., Hock. Val. and Toledo, the Col., Sandusky and Hock. Val., and the Erie railways; 40 miles n. of Columbus. Pop. 14,261.

MARION, Francis, American general, was born in 1732 at Winyah, near Georgetown, S. C. He was made lieutenant-colonel after the defense of Fort Moultrie at the entrance of Charleston harbor (June 28, 1776), and was present at the unsuccessful attack on Savannah, Sept. 1779. In August he joined Gates, but was detached a few days before Gates' defeat at Camden on August 16th; at Nelson's Ferry, on the 20th, he rescued 150 of the prisoners from a strong guard. He soon received a general's commission. In April Lee and Marion took Fort Watson, and in May Fort Motte. At Eutaw Springs he commanded the right



under Greene. After the British retreat to Charleston, Marion went to an important session of the colonial assembly; on the very day that he returned to his brigade, February 24, 1782, it was surprised and dispersed, Marion arriving too late to recover the day. After the war he occupied himself with farming. He died February 27, 1795.

MARIONETTES. See Puppet-shows.

MARK, St., the Evangelist, according to the old ecclesiastical writers, the person known in the Acts of the Apostle as "John, whose surname was Mark" (Acts xii. 12, 25), for many years the companion of Paul and Peter on their journeys. His mother, Mary, was generally in the train of Jesus, and Mark was himself present at a part of the events which he relates in his gospel, and received his information partly from eye-witnesses. He was the cousin of Barnabas (Col. iv. 10), and accompanied Paul and him to Antioch, Cyprus, and Perga in Pamphylia. He returned to Jerusalem, whence he afterward went to Cyprus, and thence to Rome. He was the cause of the memorable "sharp con-

tention" between Paul and Barnabas. Of the close of his career nothing is known; and it is by no means certain even that the various passages, on which the church has based the biographical notes already cited, uniformly refer to the same individual. See Gospels.

MARK ANTONY. See Antonius.

MARKETS. See Fairs.

MARKET VALUE, the value of an article as established by public sales of such property in a particular locality. At times this value is proved by regular market quotations. It is also proved by persons familiar with the price at which such property sells regularly in the market. If the market price is abnormally enhanced or depressed at the time and place for delivery of any goods, by wrongful combinations or by an illegal monopoly, other evidence than the market sales may be resorted to for the purpose of showing the fair value of the property in question.

MARK TWAIN. The nom-de-plume of S. L. Clemens.

MARLBORO, a city in Middlesex co., Mass.; on the Fitchburg and the N. Y., N. H. and Hart. railways; 15 miles e. of Worcester, 25 miles w. of Boston. It is in a choice fruit-growing region, and is widely noted for its extensive manufacture of boots and shoes. Pop. 15,725.

MARLBOROUGH, John Churchill, Duke of, English general and statesman, second son of Sir Winston Churchill; born at Ashe, in Devonshire, in 1650. At the siege of Maestricht he distinguished himself so highly as to obtain the public thanks of the King of France. He had a regiment of dragoons presented to him, and strengthened his influence at court by his marriage with Sarah Jennings, an attendant upon the princess, afterward Queen Anne. On the accession of James II. he was sent ambassador to France, and soon after his return was created Baron Churchill of Sundridge, and raised to the rank of general. In 1691 he was suddenly dismissed from all his employments and committed to the Tower on the charge

Duke of Marlborough.

of high treason, but soon obtained his release; though it appears that the suspicions against him were not without foundation. On the death of Queen Mary he was made a privy-councillor, and appointed governor to the young Duke of Gloucester; and in 1701 was created by King William commander-in-chief of the English forces in Holland, and also ambassador plenipotentiary to the states-general. In 1702 he drove the French out of Spanish Guelders, and took Liége and other towns, for which he was created Duke of Marlborough. In 1704 he stormed the French and Bavarian lines at Donauwörth, and in the same year, in conjunction with Prince Eugene, gained the victory of Blenheim over the French and Bavarians, headed by Marshal Tallard and the Elector of Bavaria. On the victory of Ramillies, 1706, a bill was passed to settle his honors upon the male and female issue of his daughters. In the campaign of 1707 his antagonist was the famous Duke de Vendôme, over whom he gained no advantage, and on his return, found that his popularity at court was on the decline. Early in 1710 he returned to the army, and with Prince Eugene gained another victory over Villars. During his absence a new ministry, hostile to himself, was chosen, and on his return his command was taken from him. He repaired in disgust to the Low Countries in 1712 and on the accession of George I. was reinstated in the supreme military command. Retiring from all public employments, his mental faculties gradually decayed, and he died at Windsor Lodge in 1722. His duchess, Sarah Jennings, born 1660, died 1744, has been almost equally celebrated for her boundless ambition and avarice. The title fell to the descendants of one of their daughters who have assumed the name of Churchill.

MARLINE-SPIKE, an iron pin tapering to a point, and principally used on board ship to separate the strands of a rope in order to introduce the ends of some other through the intervals in the act of knotting or splicing; it is also used as a lever in various operations.

MARLOWE, Christopher, an English poet and dramatist, born at Canterbury 1564. Besides six tragedies of his own composition, the best known of which are Tamburlaine the Great, Edward II., Dr. Faustus, and the Jew of Malta, he left a translation of the Rape of Helen, by Coluthus; some of Ovid's Elegies; the first book of Lucan's Pharsalia; and the Hero and Leander of Musæus, completed by George Chapman. He appears to have led a reckless, dissipated life, and died in 1593 from a wound received in a quarrel with a serving-man at Deptford. Marlowe was by far the greatest dramatic writer before Shakespeare.

MARLOWE, Julia, American actress, born near Keswick, England, in 1870. She came with her parents to this country when five years old. In 1887 she appeared in New York, but it was in Boston, in December, 1888, that she won, as Parthenia in Ingomar, an assured place as a star. She is an actress of unusual personal charm, and soon became a popular favorite in a variety of rôles, especially as Viola in Twelfth Night and as Rosalind in As You Like It Among Miss Marlowe's successes in modern plays may be mentioned Barbara Frietchie in Clyde Fitch's play of that name (1899); and Charlotte Durand in the dramatization of Cable's Cavalier (1902).

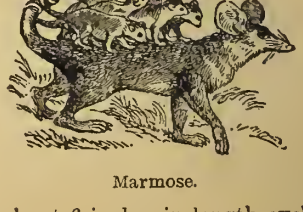
MAR'MALADE, a jellied preparation made from quinces, peaches, apricots, oranges, etc., and portions of their rinds, the most common kind being made from bitter or Seville oranges.

MARMALADE-TREE, Marmalade-plum, a tree of the order Sapotaceæ, a native of the West Indies and tropical America, valued for its fruit, the pulp of which resembles marmalade. It is also called Mammee-sapota.

Marmalade-tree.

MARMONT (mär-mōn), Auguste Frédéric Louis Viesse de, Duke of Ragusa and Marshal of France, was born in 1774, and entered the army as a lieutenant of infantry in his fifteenth year. In 1792 he changed to the artillery, and at Toulon became acquainted with Bonaparte, who chose him for his aide-de-camp. He obtained the title of Duke of Ragusa for his defense of Ragusan territory against the Russians and Montenegrins. He was present at Wagram, and after the truce of Znaim was made field-marshal. In 1814 he fought a final battle under the walls of Paris, but opposition appearing fruitless he surrendered to the allies. This proceeding was one main cause of Napoleon's immediate abdication, and brought Marmont into favor with the Bourbons. After the restoration Louis XVIII. made him a peer of France, but he was compelled to withdraw from Paris by the revolution of 1830, and his name was struck off the army list. He accompanied Charles X. in his exile, and afterward traveled, publishing the results of his travels in 1837–39. He also wrote Esprit des Institutions Militaires and his own memoirs. He died at Venice in 1852.

MARMOSE, a marsupial quadruped resembling the opossum, but less, being



Marmose.

only about 6 inches in length exclusive of the tail. It carries its young about with it on its back.

MAR'MOSET, a name of several small South American monkeys, the smallest of the monkey tribe. They are agile in their movements, possess long, nonprehensile tails, and have a thick woolly fur. They bear a close resemblance to squirrels in general appearance, feed upon fruit and insects, and occasionally upon the smaller birds and their eggs.

MARMOT, a rodent quadruped classed with the squirrels. They are thick-bodied, have short tails and short legs, and live in burrows, which are generally excavated in mountainous situations, and consist of a series of galleries in which whole communities reside. During the winter they lie dormant. The marmots inhabit Europe, Northern Asia, and North America. The prairie-dog or prairie-marmot, or wistonwish, of North America is the most familiar American species. Another species is the woodchuck of the middle states.

The marmoset.

MARNE, a department of France, bounded by Ardennes, Aisne, Seine-et-Marne, Aube, Haute-Marne, and Meuse; 67 miles long by 60 miles broad; area, 3158 sq. miles. Pop. 429,424.

MARNE, Haute (Upper Marne, a department of France, bounded by Meuse, Marne, Aube, Côte d'Or, Haute-Saône, and Vosges; area, 2401 sq. miles. Chaumont is the capital. Pop. 247,781.

MAROCCO. See Morocco.

MAROONS', the name given to runaway negroes in Jamaica and in some parts of South America. In many cases they rendered themselves formidable to the colonists. When Jamaica was conquered by the English in 1655 about 1500 slaves retreated to the mountains, and continued to harass the island till 1795, when they were reduced by the aid of blood-hounds.

MARQUE, Letters of, or Letters of Marque and Reprisal, a license or extraordinary commission granted by a sovereign or the supreme power of one state to the citizens of this state to make reprisals at sea on the subjects of another under pretence of indemnification for injuries received; that is, a license to engage in privateering. Letters of marque were abolished among European nations by the Treaty of Paris of 1856. The United States of America were invited to accede to this agreement, but declined.

MARQUETTE (mär-kĕt'), the county-seat of Marquette co., Mich., 170 miles west of Sault Sainte Marie; on Marquette Bay, an inlet of Lake Superior, and on the Duluth, South Shore and Atlantic, and other railroads that connect with the mining centers of the Lake Superior mineral region. Pop. 12,315.

MARQUETTE, Jacques, a Jesuit missionary and explorer, was born in 1637, at Laon in France, and died May 18, 1675, on the banks of a small stream, now known as the Marquette, which has its mouth on the eastern shore of Lake Michigan. Having joined the Society of Jesus, he sailed for Canada in 1666, spent eighteen months in the vicinity of Three Rivers, founded the mission of Sault Sainte Marie, on Lake Superior, in 1668, and followed the Hurons to Mackinaw in 1671. It is mainly, however, as Joliet's companion in his voyage down the Mississippi in 1673, that Marquette holds a permanent position in the history of discovery in America. His narrative, first published in Thevenot's Recueil de Voyages, is printed along with other documents relating to him in Shea's Discovery and Exploration of the Mississippi Valley.

MAR'QUETRY, inlaid cabinet-work in which thin slices of different colored wood, sometimes of ivory, pearl, shell, or metal, are inlaid on a ground usually of oak or fir, well seasoned to prevent warping. At one time figures and landscapes were represented by means of marquetry, but it is now chiefly disposed in regular geometrical figures.

MARQUIS, Marquess, a title of honor next in dignity to that of duke, first given to those who commanded on the marches or frontiers of countries. The title was first introduced into England by King Richard II. in the year 1387, but fell into disuse until the reign of Edward VI., who created the Marquisate of Winchester in 1551. The corresponding female title is marchioness.

MARRIAGE, a solemn contract between a man and woman, by which they are united for life and assume the legal relation of husband and wife. Different localities have different forms of the institution, the most broadly marked of which are connected with the right to have only one wife—monogamy, or a plurality of wives—polygamy. Polyandry, by which a woman may have several husbands, is known to have existed in ancient times, and still exists in various localities, as in Tibet. Among the most civilized communities monogamy is the prevailing practice. Though the church of Rome ranks marriage among the sacraments, and religious observances are almost everywhere customary on its celebration, the law regards it as nothing more than a civil contract. To render valid the civil contract constituting marriage it is requisite that the free-will of each of the parties should be spontaneously exercised, and that each should be capable of giving an intelligent consent. In males the age of consent is sixteen, and in females fourteen. A promise to marry given by a person under twenty-one is not binding. The legal disabilities are: (1) An undissolved prior marriage, and the former husband or wife still living. (2) Being within the prohibited degrees of consanguinity or affinity, cousins-german being the nearest relatives that may marry. Marriage with a wife's sister is prohibited as with one's own sister. (3) Impotence or inability to consummate the marriage. (4) The fraudulent suppression or alteration of the name of one or both in the publication of the banns; but this does not invalidate a marriage by license. Banns of marriage must be published three Sundays in the parish church or public chapel of the Establishment, in the parish wherein both parties reside, or in the parishes in which each separately resides. Ordinarily marriages must be celebrated in a church by a clergyman of the Church of England, or by a dissenting minister or a Roman Catholic priest in a building registered for marriages and in presence of the registrar, or they may be celebrated before the registrar and in his office. In the United States marriage is regarded as being entirely based on contract or on the present mutual consent of the parties; solemnization by a clergyman or by a magistrate, the presence of witnesses, and all the customary forms and ceremonies being simply convenient means of perpetuating the evidence of the contract. Marriage with a deceased wife's sister is not prohibited. The age at which a marriage may be contracted is the same as in England.

MARRIED WOMAN, a woman by marriage changes her legal status as to her personal rights, her contractual, property, and in some cases her political rights and her rights before the criminal law. After marriage, at common law, she is in a less favorable position in these respects than before, with the possible exception of at the criminal law when the presumption of her husband's coercion in case of criminal acts done in his presence makes her responsible for such acts except in the case of more serious crimes. Her personal property in possession and her chattels real, generally speaking, become her husband's or can be disposed of by him; in her real property he has an estate for their joint lives and may have an estate during his own life. Her rights in his property during their joint lives are practically limited to her right to the necessaries of life, and the control over his real property that arises from her dower rights which enable her as a matter of law to refuse to release her dower right. The hardship of these disabilities of the common law has caused the courts of equity to give certain equitable remedies against the husband in order to protect her and her children in the enjoyment of at least a portion of her property, and to neglect some of the legal formalities in giving effect to agreements to create a separate estate for the wife, and to protect her by establishing the doctrine that the use of the separate estate must be for its use or her benefit, and that its income could not be anticipated. Modern legislation has removed some of these disabilities. The first tendency was to free the wife and her property from her husband's control but to make them jointly liable for all obligations as arise from the marriage relation. In most states the wife is free from common law disabilities.

MAR'RYAT, Frederick, English novelist and naval officer, born in 1792. His first attempt in literature was made in 1829, by the publication of Frank Mildmay. Its success led to an extensive series of works of the like kind, including The King's Own, Peter Simple, Jacob Faithful, Japhet in Search of a Father, Newton Forster, Midshipman Easy, Snarley-Yow or the Dog Fiend, Masterman Ready, and others. He was also the author of a Code of Signals for the Merchant Service (1837). He died at his residence, Langham, Norfolk, in 1848. One of his daughters, Florence Marryat, has gained distinction as a novelist.

MARS, the Roman god of war, at an early period identified with the Greek Ares, a diety of similar attributes. Like Jupiter he was designated father, and was regarded in particular as the father of the Roman people, Romulus and Remus being the fruit of his intercourse with Rhea Sylvia. Several temples at Rome were dedicated to him. His service was celebrated not only by particular flamines devoted to him, but by the College of the Salii, or priests of Mars. The month of March, the first month of the Roman year, was sacred to him. As the tutelary deity of Rome he was called Quirinus, in his character as the god of war Gradivus (the striding). Ares, the Greek god of war, was the son of Zeus (Jupiter) and Hera (Juno). He is represented as terrible in battle, but not as invulnerable, since he was wounded at various times by Heracles, Diomedes, and Athena. He is represented as a youthful warrior of strong fame, either naked or clothed with the chlamys. The chief seats of the worship of Ares were in Thrace and Scythia.

MARS, of the superior planets that which lies nearest the sun, or next beyond the orbit of the earth. He moves round the sun in 686.9797 of our mean solar days, at the average distance of 139,312,000 miles, his greatest and least distances being 152,284,000 and 126,340,000 miles; his orbit is inclined to the ecliptic at an angle of 1° 51′ 5″; his distance from the earth varies from about 35,000,000 to 244,000,000 miles; he rotates on his axis in 24 hours 37 minutes 22 seconds; the inclination of his axis, or the angle between his equator and his orbit, is 28°; his diameter is about 4400 miles. His surface resembles that of the earth; but the seas, as the parts which have a greenish tinge are thought to be, cover a much smaller area than the reddish parts or land. The reddish hue of Mars is one of his characteristic features. About every 8 years 7 months he is in perihelion and perigee at the same time, and has a wonderful brilliancy. At his poles are white portions, which decrease and increase in size at the beginning and end of the Martial summer, so that the poles are supposed to be surrounded with snow. In 1877 two satellites, both very small bodies were discovered by Professor Hall of the Naval Observatory, Washington. The outer one, 14,500 miles distant from the center of Mars, revolves round the planet in a period of 30 hours 14 minutes; the inner one, 5800 miles from the center of Mars, has a period of 7 hours 38 minutes.

MARSEILLAISE HYMN (mär-se-lāz′), the war-song of the French Republic. The words, and, as is generally believed, the music, were written in 1792 by Rouget de l'Isle, an officer in garrison at Strasburg, on the occasion of a body of volunteers leaving that city for the war against Austria and Prussia, and the poem was entitled by him Chant de Guerre de l'Armée du Rhin (War-song of the Army of the Rhine). It was called Marseillaise because first sung in Paris by volunteers from Marseilles.

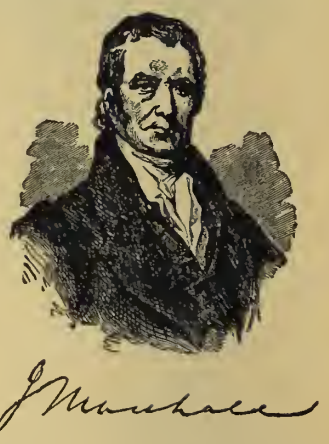
MARSEILLES, French Marseille (mär-sālz′, mär-sā-yē), a city and the principal commercial seaport of France, on the Mediterranean, capital of the department of Bouches-du-Rhône. Though a handsome city as a whole, Marseilles is not rich in public edifices. The most deserving of notice are the large new cathedral in the Byzantine style; the church of Notre Dame de la Garde, on a hill of same name; the church of St. Victor; the Hôtel de Ville; the Prefecture; the Palais des Arts de Longchamp, with picture-gallery and natural history museum; the exchange; public library (100,000 vols.); and the triumphal arch through which the town is entered on the side of Aix. The most important manufactures are soap, soda, and other chemical products; also olive and other oils, sugar, machinery, iron and brass work, candles, glass, earthenware, etc. The trade is chiefly in soap, olive-oil, wine, brandy, corn, flour, dried fruits, tobacco, wool, skins, iron, cotton. Pop. 494,769.

MARSH, George Perkin, American scholar and diplomatist, born 1801. He graduated at Dartmouth College, studied law, and practiced at the bar. In 1842–49 he was a member of congress, and in 1849 was appointed American minister at Constantinople. Before returning in 1854 he made extensive travels in Europe. From 1861 till his death in 1882 he was American minister to Italy. Among his works are: Lectures on the English Language; Origin and History of the English Language; Man and Nature; etc.

MARSH, Othniel Charles, American zoölogist and paleontologist, was born in 1831 in Lockport, N. Y. Upon his return from Germany he was appointed professor of paleontology and curator of the geological museum at Yale, and held these positions until his death. Professor Marsh accomplished a great amount of valuable scientific work in the discovery and description of new fossil vertebrates from the geological formations of the Western states and territories. His discoveries of the fossil ancestors of the horse marked an epoch in evolutionary science and have been frequently employed as an illustration of the principle of evolution. He served as president of the American Association for the Advancement of Science in 1878, and of the National Academy of Sciences from 1883 to 1895. The Geological Society of London, of which he was a fellow, bestowed upon him the first Bigsby medal in 1877. He also received the Cuvier prize of the French Academy of Sciences. His valuable collection of fossil vertebrates was left to Yale University. He died in 1899.

MARSHAL, French Maréchal, a word of German origin signifying originally a man appointed to take care of horses. A similar term is the French connétable or constable, from L. comes stabuli (count or master of the stable). The marshal of the German Empire derived his origin from the Frankish monarchs, and was equivalent to the comes stabuli or connétable. He had to superintend the ceremonies at the coronation of the emperor, and on other high occasions. There is still a marshal at the head of the households of German sovereigns. In France maréchal de France is the highest military honor. In Germany general-field-marshal is the highest military honor. In England field-marshal is an honorary rank given occasionally to general officers. Another English title is earl-marshal. Marshal also signifies a person who regulates the ceremonies on certain solemn celebrations. In the United States a marshal is an executive officer (resembling the sheriff) connected with the United States courts.

MARSHALL, John, chief justice of the United States, was born in Fauquier co., Va., in 1755. At various times from 1782 to 1798 he was elected a member of the Virginia legislature, in 1788 a member of the Virginia convention for the ratification of the constitution; in 1797 he was envoy extraordinary to France, and in 1799 a member of congress; in 1800 he became secretary of state; and on January 31, 1801, he was



appointed to the chief-justiceship, which position he held until his death. Marshall as a lawyer soon rose to the first rank at the Virginia bar, and acquired also a national reputation. In the Virginia convention of 1788 his influence was second only to that of Madison in securing the adoption of the constitution. But, unlike Madison, he continued under the constitution, to support the administration of Washington and federalist measures in general. It was as chief justice of the supreme court of the United States, however, that Marshall won lasting fame. His reports, filling about thirty volumes, form a work which time will only render more valued. He died in 1835.

MARSHALLTOWN, the county seat of Marshall co., Ia., on the Ia. Cent., the Chi. and N. W., and the Chi. and Gt.

West. railways; 70 miles w. of Cedar Rapids. Pop. 13,275.

MARSH-MALLOW, a common plant, growing in marshes, especially near the sea, in great abundance. It is employed medicinally as a demulcent, and is used in the preparation of demulcent lozenges. It is perennial, and has a white, fleshy, carrot-shaped root, which may be used as food. The stem is from 2 to 3 feet high, both leaves and stem being covered with a soft down. The flowers are flesh-colored. The hollyhock is another species.

MARSTON MOOR, in Yorkshire, about 7 miles west of York, a locality celebrated for the battle between the royal forces under Prince Rupert and the troops of the parliament under Fairfax and Cromwell (2d July, 1644), in which the latter were victorious.

MARSUPIA'LIA, or **MARSU'PIALS,** an extensive group of mammalia, differing from all others in their organization, and including genera which correspond to several orders of ordinary mammals. They belong to the aplacental mammals, and their most striking peculiarity is the production of the young in an immature state, a feature which renders necessary the pouch in which the immature young are placed immediately on their birth. In this pouch are the mammæ or teats, and sheltered here the imperfect young ones, attached to the nipple by the mouth remain till fully developed. The marsupials link the mammals through the Monotremata to the birds and reptiles. There are many genera both herbivorous and carnivorous, the great bulk of them being confined to the Australian region. The kangaroo and opossum are familiar examples.

MARTEN, the name of several carnivorous quadrupeds. The body of the marten, like that of the weasel, is elongated and slender. The legs are short, the feet being provided with five toes, armed with sharp claws. In habit the martens differ from the weasels in being arboreal, these forms climbing

Pine-marten.

trees with great ease. The pine-marten occurs chiefly in North America and in the northern parts of Asia. It is of smaller size than the common marten, possesses a yellowish mark on the throat, and has a finer fur largely used for trimmings. It burrows in the ground. The famous sable marten which furnishes the valuable sable fur, is nearly allied to the pine-marten. It inhabits Siberia.

MARTHA'S VINEYARD, an island of Massachusetts, on the south side of Cape Cod, 12 miles west-north-west of Nantucket, 19 miles long, and from 2 to 10 broad. It contains one or two seaside resorts.

MARTIAL LAW, the law by which the discipline of an army is maintained, applying only to persons in actual military service, and only to their conduct in such service. The jurisdiction under the law martial is in a distinct tribunal, known as a court-martial appointed by some superior officer. Under special circumstances of insurrection or rebellion, where the ordinary law is insufficient to protect life and property, it is sometimes necessary to administer the law according to the practice of military courts, by an armed force occupying the disturbed district. The district is then said to be under martial law.

MARTIN, a name applied to several birds or swallows. It builds a globular nest under the eaves of houses, or in the upper angles of windows. In habits it

House-martin.

resembles the chimney-swallow, but its tail is less markedly forked, while its nest also differs, that of the chimney-swallow being cup-shaped.

MARTINIQUE (mär-ti-nēk'), one of the French West India Islands, in the Windward group, area, 380 sq. miles. Its loftiest summit, Mount Pelée, is 4450 feet high. The climate is hot, but not unhealthy. Hurricanes and earthquakes are not unfrequent. The principal town, St. Pierre, on the northwest was destroyed by an eruption of Pelée in May, 1902, in which many thousand people perished. Pop. 207,011.

MARTYRS, a name applied by the Christian church to those persons in particular, who in the early ages of Christianity, and during the great persecutions, suffered ignominy and death rather than renounce their faith. Festivals in honor of the martyrs seem to have been observed as early as the second century.

MARX, Karl, German socialist, born in 1818, studied law and philosophy at Berlin. After editing the Rheinische Zeitung at Cologne from 1841 till its suppression, he went in 1844 to Paris, where he took part in the publication of the Deutsch-Französische Jahrbücher, and a newspaper, Vorwärts. Being compelled to flee to Brussels, he there in 1848 became head of the central committee of the socialists. In the same year he made an attempt at Cologne to revive the Rheinische Zeitung, but removed to London in 1849. In 1864 he established the International, but after the disruption in 1872, when he led the extreme party, he removed from London to New York. He died in 1883. His chief work, the Bible of one group of socialists, was Das Kapital, published in 1867.

MARY, The Virgin, the mother of Jesus, according to tradition embodied in the apocryphal gospels the daughter of Joachim and Anna (of Luke i. 32). The story of her life so far as it is given in the New Testament begins with her betrothal to Joseph (Luke i.), and the narrative of the birth of Christ. She is thrice mentioned during Christ's public ministry (John ii., Matt. xii. 47, John xix. 25–27), and once after his death (Acts i. 14). The title of Mary to adoration did not become a tenet in the orthodox Latin Church till the 6th century, when the Christian Church began to celebrate festivals in her honor, of which the Purification, the Annunciation and the Visitation (the visit of Mary to Elizabeth) are still retained in Protestant countries. The Greek and Roman Catholics, and the schismatic churches in the east, observe several feasts besides the above in honor of the Virgin; for instance the birth of Mary, and her death and reception into heaven (by the Roman Catholics called the Assumption) The festival of the Immaculate Conception is celebrated only by the Roman Catholic Church.

MARY I., Queen of England, daughter of Henry VIII. by Catherine of Aragon, was born in 1516. After her mother's death she was declared illegitimate, but was restored to her rights when the succession was finally settled in 1544. She was bred up by her mother in the Roman Catholic faith, on which account she was treated with rigor under Edward VI. She ascended the throne in 1553, after an abortive attempt to set her aside in favor of Lady Jane Grey. One of her first measures was the reinstatement of the Roman Catholic prelates who had been superseded in the late reign. Her marriage to Philip II. of Spain, united as it was with a complete restoration of the Catholic worship, produced much discontent, insurrections broke out under Cave in Devonshire, and Wyat in Kent, which, although suppressed, formed sufficient excuses for the imprisonment of the Princess Elizabeth in the Tower, and the execution of Lady Jane Grey and her husband Lord Guildford Dudley. England was now formally declared to be reconciled to the pope; the sanguinary laws against heretics were revived, and nearly 300 perished at the stake, including Cranmer, Latimer, and Ridley. Under Philip's influence a war began with France, which ended in the loss of Calais in 1558, after it had been held by England for above 200 years. This disgrace told acutely upon Mary's disordered health, and she died in 1558.

MARY II., Queen of England, born in 1662, was daughter of James, duke of York, afterwards James II., by his wife Anne Hyde, daughter of Lord Clarendon. She was married in 1677 to William, prince of Orange; and when the revolution dethroned her father, Mary was declared joint-possessor of the throne with William, on whom all the administration of the government devolved,

During the absence of William in Ireland in 1690, and during his various visits to the continent, Mary managed at home with extreme prudence. She was strongly attached to the Protestant religion and the Church of England. She died of small-pox in 1694. See William III.

MARYLAND, one of the United States of North America; bounded n. by Pennsylvania, e. by Delaware and the Atlantic, s. by Virginia and Chesapeake bay and w. by Virginia and West Virginia; area, 12,210 sq. miles. The part of the state lying to the east of Chesapeake bay is called the Eastern shore, and the other on the west the Western shore. The Eastern shore has a low, flat, and somewhat sandy surface, covered in many places with stagnant water, which makes ague and intermittent fever prevalent. The Western shore gradually

Seal of Maryland.

rises toward the northwest, where it is traversed by a lower branch of the Appalachian chain, and attains the height of 2000 feet above sea-level. Beyond this the land again sinks, forming the Hagerstown valley, part of the great Appalachian valley. The chief rivers are the Potomac, the Susquehanna, and the Patapsco. Almost all the lower part of Maryland is covered with alluvial deposits. In the Hagerstown valley there is a full development of the carboniferous system, with its valuable seams of coal and ores of iron. There are three important coal-fields in the state. The most important crops are Indian corn, wheat, and oats. Tobacco is very largely grown. The fisheries are productive, and there are extensive oyster-beds. The principal manufactures are cotton goods, cordage, bricks, and articles in iron; the trade, chiefly foreign, is extensive. A large part of the foreign trade consists in the exportation of canned fruits, vegetables, and oysters. The state sends six representatives and two senators to congress. Annapolis is the seat of government; but Baltimore is the most important city of the state. There is an excellent system of free public schools, and among the higher educational institutions may be noted the St. John's College at Annapolis, and the Peabody Institute (founded in 1857), and the Johns Hopkins University (opened in 1876), both at Baltimore. Maryland was one of the thirteen original states of the Union, and was first settled in 1634 by English Roman Catholics under Leonard Calvert, a brother of Lord Baltimore, who had obtained a charter from Charles I., of England. Unlike the Puritan colonists of New England, the early settlers of Maryland enacted laws granting toleration to all forms of religious belief. The early history was greatly disturbed by conflicts between Lord Baltimore's party and the traders who claimed under William Claiborne of Virginia. The Proprietary party finally established their power. In 1688 Lord Baltimore's deputies declined to proclaim William and Mary, and the result was a revolt which led to the overthrow of the feudal system, and Maryland became a crown colony. The Church of England was then established and disabilities were imposed upon Catholics and dissenters. In 1714 one of the Baltimore family became a Protestant and was recognized as the proprietor, and from this time until 1776 the Baltimores held possession. The original charter limits of Maryland, which was named after Henrietta Maria, queen of Charles I., included all of Delaware and a considerable part of Pennsylvania, and conflicted with the grant to William Penn. The controversy between the two colonies lasted from 1682 to 1760, when the Penn heirs proved successful and Maryland assumed its present limits, and Mason and Dixon's line was established to mark the boundaries in 1763–67.

In the war of independence Maryland bore a conspicuous part and furnished 20,636 men to the continental armies. In the war of 1812–14, the state had in the service no less than 42,636 men, a number only exceeded by the great states of New York and Virginia. In the war with Mexico Maryland's contribution was 2,500 men. In 1844 the first line of electric telegraph in the United States was run from Baltimore to Washington. In the civil war the people of Maryland were divided in sentiment. Many of her people favored secession, a large number entered the confederate army, and in the first days of the war the passage of Union troops through Baltimore was opposed, several Massachusetts soldiers being killed on April 19, 1861; but the strength of the Union party, added to the efforts of the governor served to keep the state from seceding. In national elections, Maryland balanced with fair regularity before the civil war between democrats and the federalists and whigs. In 1864 it voted for Lincoln, but from 1868 to 1892 was steadily democratic. In 1896 and 1900 it was carried by the republicans, and in 1904 it gave 7 electoral votes to Parker and 1 to Roosevelt. In 1908 it went Democratic. Pop. 1909, 1,188,044.

MARY MAGDALEN. See Magdalen.

MARY STUART, Queen of Scots, was born at Linlithgow Palace in 1542, and was the daughter of James V. by his queen, Mary of Lorraine, a princess of the family of Guise. In the summer of 1548 the young queen was sent by her mother to France, where she was educated in a French convent, and in 1558 was married to the dauphin, afterward Francis II. He died seventeen months after his accession to the crown, in December, 1560, and in August, 1561, the widowed queen returned to Scotland. The calamities of Mary began with her second marriage, namely, to her cousin, Lord Darnley, whom she married on July 29, 1565. Darnley was a Roman Catholic, and immediately after the marriage the Earl of Moray and others of the Protestant lords combined against the new order of things. They were compelled to take refuge in England, and the popularity of Mary began to decline. In addition to this Darnley proved a weak and worthless profligate, and almost entirely alienated the queen by his complicity in the murder of Rizzio (March 9, 1566), though a reconciliation seemed to be effected between them about the time of the birth of their son, afterward James VI. of Scotland and I. of England (19th of June, 1566). About the close of the same year, however, Darnley withdrew from the court, and in the meantine the Earl of Bothwell had risen high in the queen's favor. Once more, however, an apparent reconciliation took place between the king and queen. Darnley had fallen ill, and was lying at Glasgow under the care of his father. Mary visited him, and took measures for his removal to Edinburgh, where he was lodged in a house called Kirk-of-Field, close to the city wall. He was there tended by the queen herself; but during the absence of Mary at a masque at Holyrood the house in which Darnley lay was blown up by gunpowder, and he himself was afterward found dead with marks of violence on his person (February 9, 1567). The circumstances attending this crime were very imperfectly investigated, but popular suspicion unequivocally pointed to Bothwell as the ringleader in the outrage, and the queen herself was suspected, suspicion becoming still stronger when she was carried off by Bothwell, with little show of resistance, to his castle of Dunbar, and married to him on the 15th of May. A number of the nobles now banded together against Bothwell, who succeeded in collecting a force; but on Carberry Hill, where the armies met on the 15th June, his army melted away. The queen was forced to surrender herself to her insurgent nobles, Bothwell making his escape to Dunbar, then to the Orkney Islands, and finally to Denmark. The confederates first conveyed the queen to Edinburgh, and thence to Loch Leven Castle, where she was placed in the custody of Lady Douglas, mother of the Earl of Moray. A few days after, on the 20th of June, a casket containing eight letters and some poetry, all said to be in the handwriting of the queen, fell into the hands of the confederates. They were held by the confederates to afford unmistakable evidence of the queen's guilt, and on the 24th of July she was forced to sign a document renouncing the crown of Scotland in favor of her infant son, and appointing the Earl of Moray regent during her son's minority. After remaining nearly a year in captivity Mary succeeded in making her escape from Loch Leven (May 2, 1568), and, assisted by the few friends who still remained

attached to her, made an effort for the recovery of her power. Defeated by the regent's forces at the battle of Landside (May 13, 1568), she fled to England, and wrote to Elizabeth entreating protection and a personal interview; but this the latter refused to grant until Mary should have cleared herself of the charges laid against her by her subjects. For more than eighteen years she continued to be the prisoner of Elizabeth, and in that time the place of her imprisonment was frequently changed, her final prison being Fotheringhay Castle, Northamptonshire. She was at last accused of being implicated in a plot by one Babington against Elizabeth's life, and having been tried by a court of Elizabeth's appointing, was on the 25th of October, 1586, condemned to be executed. There was a long delay before Elizabeth signed the warrant, but this was at last done on the 1st of February, 1587. Mary received the news with great serenity, and was beheaded a week later, on February 8, 1587, in the castle of Fotheringhay.

MAS'CALONGE, a fine North American fresh-water fish of the pike genus, inhabiting the St. Lawrence basin.

MASCAGNI (mȧ-skȧ'nyē), Pietro, Italian composer, was born at Leghorn in 1863. In 1879 he wrote a symphony in C minor, in 1881 a cantata. In 1890 the production in Rome of his opera Cavalleria Rusticani raised him from utter obscurity to the height of fame. His subsequent works have met with varying success. In 1895 he was appointed director of the Rossini conservatory at Pesaro. In 1902 he made a tour of America with limited success.

MAS'CARENE ISLANDS, the islands of Bourbon, Mauritius, and Rodriguez, so called from Mascarenhas, a Portuguese navigator, who discovered Bourbon in 1545.

MASHO'NALAND, the land of the Mashonas, in South Africa, on the northeast of Matabeleland and south of the Zambesi, being part of the territory of the British South Africa Company or Southern Rhodesia. It consists largely of open plains and table-lands, well-watered and fertile, and is believed to be very rich in gold. The Mashonas belong to the Kaffir race, and were formerly masters of a much wider territory, but have been cooped up within their present limits by the powerful Matabele. They are a peaceful people, clever as smiths and weavers. Salisbury is the chief place.

MASK, a covering for the face, often shaped so as to form a rude representation of the human features. They have been in use from the most ancient times. Among the Greeks they were used particularly in the processions and ceremonies attending the worship of Dionysus (Bacchus). As the origin of Grecian tragedy was closely connected with the worship of Dionysus, masks were used in it even in the beginning. The ancient masks usually covered the whole head, and accordingly represented the features, head, hair, and eyes. They had mostly very large open mouths, and seem to have had some effect in strengthening the voice of the speaker, this being required by the immense size of the ancient theaters. The Roman theater differed little from the Grecian in the use of the mask, which the Italian popular theater, called Commedia dell' Arte, closely resembling the old Roman mime and pantomime, still retains. The mask used at masked balls or masquerades is a covering for the head and face made from a light stuff, a common form being the half-mask covering eyes and nose only. See Masqued-ball.

MASK, The Iron. See Iron Mask.

MASKELONGE. See Mascalonge.

MAS'KELYNE, Nevil, English mathematician and astronomer, born in 1732, educated at Westminster and Cambridge, chosen a fellow of the Royal Society, and in 1761 deputed to proceed to St. Helena to observe the transit of Venus. In 1765 he became astronomer royal; and in 1767 commenced the publication of the Nautical Almanac, which he edited till his death. In 1774 he was employed in observations on the eclipses of Jupiter's satellites; and the same year went to Scotland to ascertain the gravitative attraction of the mountain Schiehallien. He died in 1811.

MASON, Charles, born in England in 1730. For several years he served as assistant in the Greenwich, England, Observatory, and with Jeremiah Dixon, made an observation of the transit of Venus at the Cape of Good Hope in 1761. Two years later the two scientists were instructed to survey the boundary line between Pennsylvania and Maryland. They spent four years on this work, and the line then drawn became famous in the history of the United States, as practically marking the northern limit of the slave states. Mason and Dixon's line, however, must not be confounded with the boundary of 36° 30′, beyond which slavery was not to be permitted in any territories of the United States. He died in 1777.

MASON, George, member of the federal convention of 1787, was born in Fairfax co., Va., in 1726. He served in the Virginia convention in 1775, and drafted its declaration of rights and plan of government. His most conspicuous service was in the federal convention of 1787, of which he was a member. He died October 7, 1792.

MASON, James Murray, born in Fairfax co., Va., November 3, 1798. He served many years in the Virginia house of delegates, and sat in congress as a democrat from 1837 to 1839. From 1847 to 1861 he sat in the United States senate from Virginia, but resigned to join the confederacy. In the autumn of 1861 he was apponted with John Slidell as commissioner from the confederate states to England. They sailed from Charleston, October 12th, for Cuba. Here they took passage for England on the British mail steamer Trent. This vessel was overhauled by a United States ship of war under the command of Commander Charles Wilkes, who demanded the bodies of Mason and Slidell, and the steamer being unarmed, the captain turned the men over to him They were brought to Boston and confined in Fort Warren, and congress passed a resolution of thanks to Wilkes for his prompt action. The British government made an immediate demand, and a peremptory one, for the delivery of the men, whom they claimed were protected by the British flag. There was a great outcry against surrendering them, but Abraham Lincoln showed his good sense and political wisdom by giving them up. This occurrence, known as the Trent affair, intensified the ill-feeling between England and the United States, which had grown out of the expressions of sympathy made by the English aristocrats for the confederates. He died in 1871.

MASON, John Young, born in Virginia in April, 1799. He was graduated at the University of North Carolina in 1816, and practiced law for many years in his native state. He sat in the state legislature and in congress from 1831 to 1837, then became a judge of the United States district court, and in 1844 was appointed secretary of the navy. In 1845 he became attorney general of the United States, and a year later returned to the navy department. From 1853 until his death he was minister to France. He died in 1899.

MASON AND DIXON'S LINE, the line of 39° 43′ 26.3″ north latitude, which separates the states of Maryland and Pennsylvania, in the United States. From the time of the grant of the latter territory to William Penn by Charles II in 1681 there were disputes between the family of Penn and that of the Lords Baltimore, the possessors of Maryland, as to the boundary between the two territories. An agreement was at last come to in 1760, the line of demarcation being named after the astronomers Charles Mason and Jeremiah Dixon, who traced the greater part of it. Milestones were set up along the whole of this boundary line.

MASON-BEES, a name given to insects which construct their nests with sand or gravel, agglutinated together by means of a viscid saliva, and fix them on the side of walls, etc., or avail themselves of some cavity for that purpose The mason-bees, like the carpenter-bees, leaf-cutters, and other allied forms, are solitary in habits, not living in communities like the ordinary bees and wasps.

MASONRY, Free. See Freemasonry.

MASON-SPIDER, a spider more commonly known as the "Trap-door Spider" (which see).

MASON-WASP, a name given to certain hymenopterous, insects especially from their ingenuity in excavating their habitation in the sand.

MASQUE, or **MASK,** a dramatic entertainment much in favor in the courts of princes during the 16th and 17th centuries, in the latter particularly in England. In its earliest form it is perhaps best described as a masquerade with an arranged programme of music, dancing, etc., and a banquet. The first masque of this kind in England was performed in 1510, and they were frequently introduced into the plays of Shakespeare, Beaumont and Fletcher. The parts in the masques of the 16th and 17th centuries were usually represented by the first personages of the kingdom; if at court the king, queen, and

princes of the blood often performed in them.

MASQUED-BALL, an entertainment, generally of a public character, in which the company are masked or otherwise disguised by dominoes. The bal costumé in which the dancers appear in fancy costumes, but unmasked, is the nearest approach which American taste and law allow to this species of entertainment, which, from its nature, is peculiarly liable to abuse.

MASS, in the Roman Catholic Church, the prayers and ceremonies which accompany the consecration of the eucharist. The word is used generally for all that part of the Catholic service in which the eucharist is offered. At present the mass consists of four chief parts: 1. The introduction; 2, the offertorium, or sacrifice; 3, the consecration; 4, the communion. These four chief parts, of which the latter three are considered the most essential, are composed of several smaller parts, each having its proper denomination. They consist of prayers, hymns, shorter and longer passages of the Holy Scriptures, and a number of ceremonies, which, as the essential point of the mass is the sacrifice of the Lord, consist partly of symbolical ceremonies commemorative of important circumstances in the Savior's life, or signs of devotion and homage paid to the presence of the Lord in the host. The order of these ceremonies, and of the whole celebration of the mass, is given in the missal or mass-book. The masses are modified according to many circumstances, e.g. according to the saint in honor of whom the mass is celebrated or the seasons of the year connected with different events in the Savior's life, or the purpose for which the mass is said, as the missa pro defunctis (mass for the dead). Votive mass is an extraordinary mass, instead of that of the day, rehearsed on some special occasion. Low mass is the ordinary mass performed by the priest, without music. High mass is celebrated by the priest, assisted by a deacon and sub-deacon or other clergy, and sung by the choristers, accompanied by the organ and other musical instruments. Besides these there are different masses according to the different rites; the Greek mass, the Latin mass, the Roman mass and Gregorian mass, etc.

MASS, in physics, the quantity of matter in any body, or the sum of all the material particles of a body. The mass of a body is estimated by its weight whatever be its figure, or whether its bulk or magnitude be great or small. See Dynamics.

MASSA-CARRARA, formerly a small state of Italy. In 1859 it was united with those portions of the duchies of Parma and Modena lying west of the Apennines, and erected into the province Massa e Carrara. The province is celebrated for the Carrara marble. Area, 685 sq. miles; pop. 181,007.

MASSACHUSETTS, one of the Atlantic United States of North America, bounded north by Vermont and New Hampshire; east by the Atlantic; south by the Atlantic, Rhode Island, and Connecticut; and west by New York; area, 8315 sq. miles; capital, Boston. The coast-line of the state, which has a length of about 250 miles, is indented with deep and extensive bays, of which Massachusetts Bay (which includes the large bays of Boston and Cape Cod), Buzzard and Nantucket Bays are the most capacious. The indentations in

Seal of Massachusetts.

these bays form excellent harbors, the most commodious of which are Newburyport, Boston Harbor, and Marblehead. The islands of Nantucket and Martha's Vineyard, with several others, belong to Massachusetts. The west part of the state is traversed by the Green Mountain, whose loftiest peak rises 3500 feet above sea-level. The most considerable rivers are the Connecticut, Housatonic, and the Merrimac. The soil is poor and sandy near the coast, where salt marshes frequently occur; but in the middle and western parts it is very fertile and well cultivated. Massachusetts has for many years been the largest producer of granite. Limestone is quarried and also an increasing quantity of marble, iron pyrite, corundum, iron manganese, tin, slate, and tripoli are also produced. The fishing industry is of great importance. Boston began to export fish as early as 1633, whales were caught off Nantucket in 1690 and New Bedford became famous in the whale fisheries. The United States Fish Commission and the state have extensive hatcheries. The climate is liable to extremes of heat and cold. The mean annual temperature is about 48°. The principal vegetable productions are Indian corn, rye, oats, potatoes, hemp, flax, pease, hops, beans, and pumpkins; wheat, buck-wheat, and barley are raised only in small quantities. A considerable portion of the surface of the ground is still covered with forests, consisting of pine, oak, walnut, birch, maple, ash, cedar, cherry, and chestnut. All varieties of fruit-trees are cultivated with success. Massachusetts is the fourth state in the Union in manufacturing, being excelled in this respect only by New York, Pennsylvania, and Illinois; but in proportion to its area and population it is the first. Lowell is the great center of the cotton manufactures. In the manufacture of boots and shoes—both leather and rubber—Massachusetts holds first rank. Worsted goods, hosiery, silks, linens, etc., are also largely manufactured. There are numerous forges and furnaces; machine-shops, manufactures of edge-tools, agricultural implements, cutlery, boots and shoes, etc. Ship-building is carried on extensively. In shipping Massachusetts is superior to any other state of the Union except New York. The means of internal communication are ample. In connection with the railways may be mentioned the Hoosac Tunnel piercing the Hoosac mountain in the northwest corner of the state, with a length of 5¾ miles. In educational matters Massachusetts has a high reputation, among its leading institutions being Harvard university, the oldest in the Union, Boston university, and Amherst college. Massachusetts is divided into fourteen counties; and besides the capital, Boston, the chief towns are Worcester, Lowell, Cambridge, Fall River, Lawrence, and Lynn. Massachusetts was one of the thirteen original states of the Union. Its coasts were known to the early Norsemen, but its first authentic record is that of the discovery of Cape Cod in 1602. John Smith, of Pocahontas fame, explored it to some extent in 1614, but it was not until 1620 that the Puritans of the Mayflower effected their landing at Plymouth on December 21st. The Massachusetts Colony was established in 1628–30, and made the first settlement of Boston in the autumn of 1630. The early years of the colonists were made uneasy by continued difficulties with the Indians, who under Pequot, in 1637, and King Philip, 1675–76, caused much loss of life. The first settlers were Puritans of the Church of England; the religious liberty which they had sacrificed so much to obtain for themselves they denied to others and persecuted with impartiality Quakers, heretics, Catholics, and Protestant Dissenters, not to speak of burning women as witches.

Massachusetts was engaged in constant struggle with the English crown. In 1685, the crown finally annulled the charter of the colony, and sent orders to unite New York and New England under one rule. On the occurrence of the revolution of 1688, the people rose and reëstablished their colonial government. The province of Maine was united in the new provincial charter of 1691, and Sir William Phips became the first royal governor, the attempt to unite New York with Massachusetts being abandoned. From this time until the accession of George III. to the English throne the history of Massachusetts forms one long record of struggle between the popular party and the home government as represented by the royalist governors.

The Puritan colony led in the active opposition to royal usurpation and the imposition of the Stamp Act, and in 1770 occurred what is known as the "Boston Massacre," when the regular troops fired into an unarmed crowd which had gathered for a lawful purpose. Three years later witnessed the Boston "tea-party," when a party of citizens, disguised as Indians, threw the taxed tea into the harbor. The British parliament retaliated by closing the port of Boston, and Gen. Thomas Gage was placed in command of the town. In

April, 1775, the first gun of the war was fired at Lexington. The royal forces were shut up in Boston, and the provincial troops, though technically defeated at Bunker Hill, won a great moral victory. Washington, who had been appointed to the chief command, compelled the British to evacuate Boston in March, 1776, and after this date there was no more fighting within the limits of Massachusetts. From 1776 until 1790 a provisional government had charge, and in the last-named year John Hancock became the first governor of the state.

The federal constitution was accepted by a small majority, but Massachusetts afterward became a stronghold of the federalist party. The state opposed the war with England in 1812-14, but furnished a large quota of seamen to the federal navy. During the following half century Massachusetts developed wonderfully as a manufacturing state and grew rapidly in power and influence. It became the home of the advanced thinkers who opposed slavery. Although the people at large were righteously opposed to the Mexican war, the state sent a regiment of over 1000 men under Caleb Cushing to aid in carrying it on. The whig party of which Daniel Webster was the chief exponent, supplanted the federalists, and split to form the free soilers and later the republican party. To the civil war the state contributed almost 160,000 troops and over $50,000,000. In national elections Massachusetts has been federalist, whig, and republican with the exception of the years 1804 (Jefferson), 1820 (Munroe), 1824–1828 (John Quincy Adams). Pop. 1909, about 3,258,422.

MASSACHUSETTS AGRICULTURAL COLLEGE, a co-educational state institution at Amherst, Mass., chartered in 1863 and opened in 1867. Winter courses are offered for those unable to take the regular four years' course and special courses in botany, dairying, market gardening, and other departments are offered to women. The degrees conferred are B.S., M.S., and Ph.D.

MASSACHUSETTS BAY, a large bay to the east of the central part of Massachusetts; bounded on the north by Cape Ann, and on the south by Cape Cod.

MASSACHUSETTS HISTORICAL SOCIETY, the oldest historical society in the country, having been organized in 1781 and incorporated in 1794. Its objects are the collection, preservation, and diffusion of the materials for American history. The first volume of "Collections" was printed in 1792, and this has been followed by fifty more, together with about twenty volumes of "Proceedings." The society has a museum of relics and antiquities, and a fine library of 30,000 books, 60,000 pamphlets, and many rare manuscripts, including the Parkman collection of thirty volumes of manuscripts relating to the history of the French in Canada.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, a school of industrial science in Boston, Mass., established in 1861 for the purpose of instituting and maintaining a society of arts, a museum of arts, and a school of industrial science, and aiding generally by suitable means the advancement, development, and practical application of science in connection with arts, agriculture, manufacture, and commerce. Thirteen distinct courses are offered, each of four years' duration: Civil engineering, mechanical engineering, mining engineering and metallurgy, architecture, chemistry, electrical engineering, biology, physics, general studies, chemical engineering, sanitary engineering, geology, and naval architecture. Each of these courses leads to the degree of Bachelor of Science. Within most of the regular courses a considerable latitude is permitted in the selection of branches, a partial choice of professional course being made at the middle of the first year, while in the fourth year nearly the entire time is devoted to professional subjects.

MASSAGE (mas'äzh), a form of medical treatment in which the body of the patient, or some particular part of it, is subjected at the hands of an attendant to a variety of processes technically discriminated as stroking, rubbing, kneading, pinching, pressing, squeezing, and hacking. The tendency of this treatment is to assist and stimulate the circulation, and to increase the waste-removing action of the lymphatic vessels, and thus to affect the nutrition, not only of the parts acted upon, but of the whole body, and promote the removal of local swellings, inflammatory products, etc. The process, for which half an hour daily is usually sufficient, is performed upon the naked skin by the bare hands of the operator, no oil being used. The attendant should have a sufficient knowledge of anatomy to be able to separate out with the fingers a single muscle or group of muscles for treatment, and to trace the direction of the larger vessels and nerve-trunks and act upon them directly. The principal movements should be characterized by a certain uniformity and method. Thus in stroking with a steady pressure the limbs of the patient, the strokes should always be from the extremities toward the heart, not backward and forward in a random way; and in kneading the belly with the heel of the hand, the movements are carried round in the direction of the colon. The treatment has been remarkably successful in cases of nervous disorder of a hysterical kind, and in cases of wasting through imperfect nutrition dependent upon disturbances of stomach, bowels, or liver, and it has proved valuable in diabetes, some of the special diseases of women, and certain cases of paralyzed and contracted muscles.

MASSENA (mȧs-ā-nȧ), André, Marshal of France, born in 1758 at Nice. In 1775 he entered the French army. During the revolution he entered a battalion of volunteers, was elected chief of his battalion in 1792, and in 1793 made general of brigade. In 1799 he defeated the Austrian and Russian forces at Zürich, and in 1800, by his defence of Genoa for three months, gave Bonaparte time to strike successfully at Marengo. In 1804 he was created marshal of the empire. In 1807 he was given the command of the right wing of the French army in Poland, and soon after received the title of Duke of Rivoli. In 1809 he distinguished himself against the Austrians, and at Esslingen his constancy and firmness saved the French army from total destruction. Napoleon rewarded him with the dignity of Prince of Esslingen. In 1810 he took command of the army in Portugal, and forced Wellington within the lines of Torres Vedras, till want of provisions compelled Masséna to retire. In 1814 he was made a peer by Louis XVIII., and though on the return of the emperor he acknowledged his authority, he took no active part in the events of the hundred days. He died in 1817.

MASSENET (mȧs-nā), Jules, French composer, born in 1842. He is the composer of several operas, of which the best known are Herodias, Don César de Bazan, and Manon Lescaut. His Scènes Pittoresques are also well known, and there is a long list of works by him, including the choral works Maria Magdalene, Eva, La Vierge, etc.

MAS'SILLON, a city in Stark co., Ohio, on the Tuscarawas river, the Ohio Canal, and the Cleve., Lorain and Wheel., the Penn., and the Wheel. and Lake Erie railways; 65 miles s. of Cleveland. It is in an agricultural, coal-mining, and sandstone-quarrying region. Pop. 13,325.

MASSILLON (mȧs-ē-yōn), Jean Baptiste, French pulpit orator, born in 1663 at Hyères, in Provence. The applause which he met with in Paris, even at court, was almost without example. Louis XIV. gave him special praise, and the deaths of Bossuet and Bourdaloue in 1704 left him at the head of the French preachers. He pronounced the funeral oration of Louis XIV. in 1715, and in 1717 the regent appointed him to the see of Clermont. In 1719 Massillon was chosen a member of the Academy. The same year he retired to his diocese, where he acted the part of a model prelate, and died in 1742. He was the greatest pulpit orator France has produced.

MASSINGER (mas'in-jėr), Philip, a distinguished English dramatist, born at Salisbury in 1583. Little is known of his personal history beyond the fact that he was associated with Fletcher, Middleton, Rowley, and Dekker in the composition of certain plays. A note of his burial appears in the register of St. Savior's, Southwark; "March 20, 1639–1640, buried Philip Massinger, a stranger." As a dramatist Massinger is more natural in his characters and poetical in his diction than Jonson, and some critics rank him next to Shakespeare. In tragedy, however, he is rather eloquent and forcible than pathetic, and he is defective in humor. His best plays are the Duke of Milan, A City Madam, A Very Woman, The Fatal Dowry, A New Way to Pay Old Debts. The last-mentioned still maintains its place on the stage, chiefly on account of the characters Marrall and Overreach.

MAST. SeeShip.

MASTER IN CHANCERY, an officer of a chancery or equity court, appointed to assist the chancellor or judge. His duties in general, are not prescribed by statute. It is a common practice to refer causes to a master for hearing, particularly

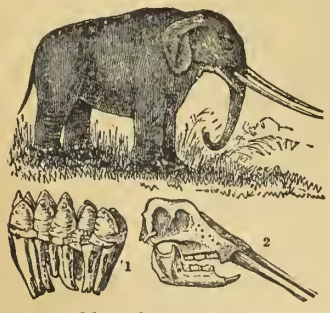
causes involving intricate accounts and requiring computations. A master is often appointed to examine witnesses, to take depositions, to inquire into and report the facts of a case to a chancellor or judge of the court, to make settlements under deeds, to discharge special acts under the direction and in behalf of the court, etc.

MASTER OF ARTS (M.A. or A.M.), an academical honor conferred by the universities of Britain, the United States, Germany, etc., upon students after a course of study and a previous examination in the chief branches of a liberal education, particularly languages, philosophy, mathematics, physics, and history. In the German universities the title is merged in that of Doctor of Philosophy (Ph.D.).

MASTICATION, the process of division of the food effected in the mouth by the combined action of the jaws and teeth, the tongue, palate, and muscles of the cheeks. This process is seen in its typical perfection in the higher Vertebrata only. By it the food, besides being triturated, is mixed with the salivary fluid. Imperfect mastication is a fertile source of indigestion.

MASTIFF, a race of large dogs found under various names from Tibet to England. The English mastiff is a noble-looking dog with a large head, a broad muzzle, lips thick and pendulous on each side of the mouth, hanging ears and smooth hair, the height at the shoulder usually ranging from 25 to 29 inches. The old English breed was brindled, but the usual color to-day is some shade of buff with dark muzzle and ears. The Tibet mastiff, which is also a fine animal, is common in Tibet and in Bhutan as a house dog.

MAS'TODON, an extinct genus of Proboscidea or elephants, the fossil remains of which first occur in the Miocene rocks of the Tertiary period, and which persist through the Pliocene and Post-pliocene epochs also. In general structure the mastodons bear a close resemblance to the existing species of ele-



Mastodon restored.

1, Molar tooth, weighing 17 lbs. 2, Skull of mastodon of miocene period.

phants. Their chief peculiarities consist in the dentition and structure of the teeth. The geographical range of the mastodons included North America, Europe, and Asia—one species inhabited England, Germany, France and Italy. A specimen, almost entire, from the Pliocene deposits of Piedmont, measured 17 feet from the tusks to the tail; and an American specimen measured 18 feet in length and 11 feet 5 inches in height.

MATABE'LELAND, the land of the Matabele, a warlike Kaffir race or people inhabiting part of South Africa between the Limpopo and Zambesi, north of the Transvaal, into which they removed from Natal in 1827 under their chief Moselikatse. It is now being rapidly settled and developed. Bulawayo is the capital.

MATAN'ZAS, a seaport on the northwest coast of Cuba, 52 miles east of Havana, with one of the largest, safest and most convenient harbors in America. It has considerable commerce, exporting sugar, molasses, and coffee, and ranking in importance next to Havana. Pop. about 40,000.

MATCHES, in the most common sense of the term, are splints or small slips of wood, one end of which is dipped into a composition that ignites by friction or other means. One of the first forms of this article was the brimstone match, which was a thin strip of resinous or dry pinewood with pointed ends dipped in sulphur, which were lighted with tinder ignited by a flint and steel. The lucifer-match was introduced in 1827, the inflammable substance being a mixture of chlorate of potash and sulphide of antimony, applied to the match, which had been previously dipped into melted sulphur. Safety matches were invented in Sweden in 1855, and are now extensively used. In the safety-match the composition is divided between the match and the friction paper attached to the box, so that the match can only be lighted in ordinary circumstances by being rubbed on the prepared paper. The compound put on the match consists of chlorate and bichromate of potash, red-lead, and sulphide of antimony, while the friction paper is coated with a mixture of amorphous phosphorus and sulphide of antimony.

MATCHLOCK, an old form of musket fired by means of a match. They were invented in the first half of the 15th century, and were succeeded by the arquebus. See Musquet.

MATE (mā'tā), the plant that yields Paraguay tea, a kind of holly. It has smooth, ovate-lanceolate, unequally serrated leaves, much branched racemes of flowers, the subdivisions of which are somewhat umbellate. In Brazil and other parts of South America the leaves are extensively used as a substitute for tea, the name Maté having been transferred to the plant from the gourd or calabash in which the leaves are infused. Boiling water is poured upon the powdered leaves, then a lump of burned sugar and sometimes a few drops of lemon juice are added. It contains theine, and acts as a slight aperient and diuretic.

MATERIALISM, in philosophy, that system which denies the existence of a spiritual or immaterial principle in man, called the mind or soul, distinct from matter; or in a more extended sense, the doctrine that is founded on the hypothesis that all existence (including, of course, the conscious subject) may be resolved into a modification of matter.

MATE'RIA MED'ICA, the collective name given to the materials with which physicians attempt to cure or alleviate the numerous diseases of the human body, and which comprehend a great variety of substances taken from the mineral, animal, and vegetable kingdoms—such as mercury, antimony, arsenic, and zinc, from among the metallic bodies; sulphur, lime, soda, nitre, magnesia, borax, and several salts, from among the other minerals; and some 200 substances belonging to the animal and vegetable kingdoms.

MATHEMATICS is the science in which known relations between magnitudes are subjected to certain processes which enable other relations to be deduced. Mathematical principles which are deduced from axioms with the help of certain definitions belong to pure mathematics, and those which have been deduced with the help of pure mathematics from certain simple physical laws, belong to mixed mathematics. Arithmetic, geometry, algebra, plane and spherical trigonometry, analytical or co-ordinate geometry, the differential and integral calculus, quaternions, the calculus of finite differences, etc., are departments of pure mathematics; the dynamics of rigid bodies and the application of its principles in astronomy and in investigating the actions of forces on ordinary matter, acoustics, the undulatory theory of light, optics, thermodynamics, electricity and magnetism, etc., are departments of mixed mathematics. See Algebra, Arithmetic, Dynamics, Geometry, etc.

MATHER, Cotton, D.D., American writer, born in Boston 1663. In 1685 he published his Memorable Providences relating to Witchcraft and Possessions, which was used as an authority in the persecution and condemnation of nineteen victims burned for witchcraft at Salem in 1692. He died in 1728 with the reputation of having been the greatest scholar and author that America had then produced, his publications, some of huge dimensions, amounting to 382.

MATHER, Increase, D.D., one of the early presidents of Harvard College,

Cotton Mather.

was born at Dorchester, Massachusetts, 1639; graduated at Harvard in 1656;

ordained a minister in 1661; president of Harvard College from 1685 to 1701. When King Charles II. signified his wish that the charter of Massachusetts should be resigned into his hands, in 1683. Dr. Mather contended against a compliance. In 1688 he was deputed to England, as agent of the province, to procure redress of grievances. He held conferences with King James II., and with William and Mary, and in 1692 returned to Boston with a new charter from the crown, settling the government of the province. He died at Boston in 1723.

MATHEW, Rev. Theobald, popularly known as Father Mathew, Irish apostle of temperance, was born in 1790, studied at Maynooth, and was ordained a priest in 1814. Shortly afterward he was appointed to a missionary charge at Cork, and established a society, on the model of those of St. Vincent de Paul, for visiting the sick and distressed. A more extended undertaking was the celebrated temperance crusade, which was so successful that in a few months he had 150,000 converts in county Cork alone. He died in 1856.

MATHEWS, Charles, an eminent English comedian, born in London 1776. He made his debut at Richmond in 1793, and after ten years' acting in the provinces made his first appearance in London at the Haymarket Theater in 1803. He instituted, in 1818, a species of entertainment in the form of a monologue which, under the title Mathews at Home, for five successive seasons drew crowded audiences to the English Opera House. In 1822 he played in America, and on his return in 1823 produced his Trip to America, which was as favorably received as his At Home. He continued both entertainments for upward of ten years. In 1834 he was again enthusiastically received in America, but was taken ill on the return voyage, and died at Plymouth in 1835. His powers of mimicry have perhaps never been surpassed on the stage. His son Charles James (born 1803, died 1878) long held a prominent place as a light comedian. His first wife was Madame Vestris, the celebrated actress. In his sixty-sixth year he made a tour of the world, gaining everywhere great applause for the grace and finish and exquisite humor of his acting.

MATRIX, in mining and geology, the rock or main substance in which any accidental crystal, mineral, or fossil is embedded.

MATTER, that which occupies space, and through which force is manifested. It is also that which makes itself known to us by our bodily senses, though there is believed to exist one kind of matter at least which is too subtle to be perceived by the senses, namely, the intermolecular and interstellar ether. Roughly speaking, matter exists in one of three states, solid, liquid, or gaseous, but these are not marked off by any distinct line. Matter is commonly regarded as the antithesis of mind.

MATTHEW, St., evangelist and apostle, son of Alpheus; previous to his call a publican or officer of the Roman customs and, according to tradition, a native of Nazareth. After the ascension of Christ we find him at Jerusalem with the other apostles, but this is the last notice of him in Scripture. Tradition represents him as preaching fifteen years in Jerusalem, then visiting the Ethiopians, Macedonians, Persians, Syrians, etc., and finally suffering martyrdom in Persia. His Gospel has been supposed by some critics to have been originally written in Hebrew, or rather Aramaic, but it is only found in Greek. The chief aim of this Gospel is evidently to prove the Messianic character of Jesus. See Gospel.

MATTHEWS (James) Brander, American author was born in New Orleans in 1852. In 1892 he was made a professor in Columbia, and soon won eminence in America as a critic of dramatic literature. His writings consist of essays on the theater, of comedies, and of short stories. Among his best known works are His Father's Son, A Confidant of To-morrow, Americanisms and Britticisms, Margery's Lovers, In the Vestibule Limited, The Historical Novel and other essays, Actors and Actresses of the United States, etc.

MATTOON, a city in Coles co., Ill., on the Ill. Cent., the Cleve., Cin., Chi. and St. L., and the Peoria, Dec. and Evans. railways; 56 miles w. of Terre Haute, Ind., 172 miles s. by w of Chicago. It is in a corn and broom-corn growing region. Pop. 11,510.

MAUPASSANT (mō'pȧ'sän'), Henri René Albert Guy de, French novelist, one of the greatest modern writers of short stories. His first story, Boule de Suif, published in 1881, revealed a finished master of the naturalistic school. Among his well known works are La Maison Tellier, Mlle Fifi, Bel Ami, Pierre et Jean, and Notre Coeur. He died in 1893.

MAUREPAS (mōr-pä), Jean Frédéric Phélippeaux, Count de, French statesman, born in 1701. An epigram on Madame de Pompadour led to his banishment from the court in 1749, but Louis XVI. recalled him in 1774, and placed him at the head of his ministry, and he retained the confidence of the king till his death in 1781. The restoration of the parliaments was the principal measure of his later ministry.

MAURICE, of Saxony, Count. See Saxe.

MAURICE OF NASSAU, Prince of Orange, stadtholder of the Netherlands, the youngest son of William the Silent, was born 1567. He died at the Hague in 1625, and was succeeded by his brother Frederick Henry.

MAURICIUS, Flavius Tiberius, one of the greatest Byzantine emperors, was born about 539 A.D. He distinguished himself in war against the Persians, obtaining by his complete victory over them in 581, the honor of a triumph at Constantinople. A defeat of the Byzantines by the Avars, and the massacre of the Byzantine prisoners, whom Mauricius declined to ransom, led to a revolt of his troops on the Danube. They marched on Constantinople under Phocas, who was proclaimed emperor (602), and Mauricius was seized and executed in 603.

MAURITIUS, or **ISLE OF FRANCE,** an island in the Indian Ocean, a colony of Great Britain, 400 miles east from Madagascar; area, 705 sq. miles. Pop. 371,655.

MAU'RY, Matthew Fontaine, American naval officer and hydrographer, born in Spottsylvania co., Va., in 1806. In 1839 he sustained a fracture of the leg which made him a cripple for life. This accident led to his being appointed to the Naval Observatory and Hydrographic office in Washington, where he made a study of old ships' logs, the result of which was a series of Wind and Current Charts that were of incalculable benefit to navigators. Here also he prepared his Physical Geography of the Sea and Its Meteorology. He died in 1873.

MAUSER, (mou'zĕr), Paul, German inventor, was born at Oberndorf, Württemberg in 1838. In 1879 he invented the Mauser revolver, and in 1882, in conjunction with his brother, he succeeded in securing the adoption by the Servian government of an improved rifle known as the "Mauser, 1882." He is principally known, however, for his invention of the Mauser magazine rifle, and a magazine revolver. (See Small Arms.) His weapon was distinguished for its low trajectory, and the projectile which it fired for its penetrative power. In 1898 he was elected a member of the Reichstag.

MAUSOLE'UM, a sepulchral monument, so named from Mausōlus, a king of Caria, to whom his wife Artemisia erected a monument which became so famous as to be esteemed the seventh wonder of the world, and to give a generic name to all superb sepulchres. From Pliny we learn that its height was 140 feet. In modern times the term is applied generally to a sepulchral edifice erected for the reception of a monument, or to contain tombs.

MAUVE, a beautiful purple dye obtained from aniline, used for dyeing silks, etc. In silk and wool the colors are permanent without the use of mordants.

MAXIL'LA, the term applied in comparative anatomy to the upper jawbones of Vertebrates, in contradistinction to the mandible or lower jaw; and in Invertebrata to the second or lesser pair or pairs of jaws. Thus in insects, spiders, crustaceans, etc., the maxillæ form definite and important organs in the trituration and division of food.

MAX'IM, Sir Hiram Stevens, American civil, mechanical, and electrical engineer, inventor of the automatic system of firearms, was born in Sangersville, Maine, in 1840. In 1878 he invented an incandescent lamp capable of burning for 1000 hours. Other important inventions were "a method of flashing electric carbons" and "a process to standardize carbons for electric lighting." In 1880 he went to Europe and exhibited some of his inventions at the Paris exposition of 1881. His most celebrated invention was the Maxim gun (see Machine Guns). More than one hundred international patents relating to petroleum and other motors, explosives, smokeless powders, and so on, were taken out by him. Maximite powder, a smokeless high explosive, was one of his discoveries. He became a naturalized

citizen of Great Britain because of the alleged unfair treatment of his inventions by the United States government. He was made a chevalier of the Legion of Honor and was created a knight by the English crown in 1901.

MAXIMIA'NUS, Marcus Aurelius Valerius Herculius, a Roman emperor, who became colleague of Diocletian in the empire 286 A.D. He endeavored to murder his rival Constantine, to whom he had given his daughter Faustina in marriage, and being frustrated by the fidelity of the latter, strangled himself 310. He was the father and contemporary of Maxentius.

MAXIMIL'IAN I., Emperor of Germany, son of the Emperor Frederick III. and of Eleonora of Portugal, was born in 1459; in 1486 was elected king of the Romans, and emperor in 1493.

Maximilian I.

He first became an independent prince by his marriage with Mary of Burgundy, the daughter of Charles the Bold, who was killed in 1477. He died in 1519, and was succeeded by his grandson Charles V. See Germany.

MAXIMILIAN II., Emperor of Germany, born 1527, died 1576. He succeeded his father, Ferdinand I., in 1564.

MAXIMILIAN, Emperor of Mexico, known in his earlier life as Ferdinand Maximilian Joseph, Archduke of Austria, born at Vienna, 1832, was the younger brother of Francis Joseph I. of Austria. In 1863 he was induced by the Emperor Napoleon, to accept the throne of Mexico. With this intention he entered Mexico in June, 1864. Having become involved in financial and political difficulties, Maximilian, with the approval of Napoleon, resolved to abdicate (1866), and he had proceeded to Orizaba when he was induced to return by the conservative party in the state. The fighting which followed culminated in the capture and execution of the emperor and two of his chief generals, 19th June, 1867.

MAXIMILIAN JOSEPH, King of Bavaria, born 1756, died 1825. He married his daughter to Eugene Beauharnais, son of Napoleon's wife Josephine, and had his duchy raised to a kingdom in 1806. In 1813 he joined the league against France.

MAXIMI'NUS, Caius Julius Verus, Roman emperor, the son of a peasant of Thrace. He entered the Roman army under Septimus Severus before 210, and gradually rose in rank until, on the death of Alexander Severus, he caused himself to be proclaimed emperor, A.D. 235. He was successful in his German campaigns, but his acts of barbarity and tyranny provoked an insurrection, in the attempt to quell which he was assassinated by his own soldiery, A.D. 238. The emperor is represented as being of immense stature and strength.

MAXIMITE, an explosive used in the bursting charge of shells. It is impossible to explode it by shock but is easily detonated by a suitable fuse. It melts at a temperature of 174 when heated in air. When detonated the products of combustion are almost wholly gaseous. In an unconfined state it burns slowly without explosion; heated it melts and evaporates rapidly but not explosively. It was invented by Sir Hiram Maxim.

MAXIMUM, is the greatest quantity or degree fixed, attainable, or attained, in any given case as opposed to minimum, the smallest. In mathematics and physics maximum is used also for the value which a varying quantity has at the moment when it ceases to increase and begins to decrease.

MAY, fifth month in the year, but third in the old Roman calendar, has thirty-one days. The Romans regarded it as unlucky to contract marriages during its course—a superstition still prevalent in some parts of Europe. On the 1st of May the old Celtic peoples held a festival called Beltane. In former days out-door sports and pastimes on the first of May were very common, and are not yet entirely given up. They included the erection of a May-pole decorated with flowers and foliage, round which young men and maidens danced, one of the latter being chosen for her good looks as queen of the festival, or "Queen of the May."

MAY-APPLE, a plant, a native of North America, and its creeping rootstalk affords an active cathartic medicine

May-apple.

known as podophyllin. The yellowish pulpy fruit, of the size of a pigeon's egg, is slightly acid, and is sometimes eaten.

MAYENCE (mà-yȧns). See Mainz.

MAYENNE (mà-yen), a department of northwestern France, named from the small river Mayenne, which joins with the Sarthe to form the Maine; area, 1996 sq. miles. Laval is the capital. Pop. 313,103.

MAYO, a western maritime county of Ireland, in Connaught; area, 1,360,731 acres, of which about an eighth is under tillage. Principal towns, Castlebar (the county town), Ballina, and Westport. Pop. 199,166.

MAYO, Frank, American actor, was born in Boston in 1839. In 1863 he became a leading man in San Francisco and in 1865 in Boston. He appeared in Othello, Hamlet, Ferdinand in The Tempest, and other classic rôles, but his greatest success was as Badger in The Streets of New York, till in 1872 he brought out Davy Crockett. Among his later productions were his own dramatization of Nordeck and of Mark Twain's Pudd'nhead Wilson, the latter a character well suited to display his peculiar gifts as a comedian. He died in 1896.

MAYO, Richard Southwell Bourke, sixth Earl of, born 1822; entered parliament in 1847 under the title of Viscount Naas; was made chief secretary for Ireland under the Derby administration (1852–68). He succeeded to the earldom in 1867, and was appointed viceroy of India by Mr. Disraeli in 1868. After a successful career in this capacity, he was assassinated at Port Blair in the Andamans by a Mohammedan convict in 1872.

MAYOR, the chief magistrate of a city or corporate town in England, Ireland, the British colonies, and the United States. The mayor is elected by the people, and holds office for two years. In some of the larger cities the term has been lately extended to four years. The mayors of London, York, Dublin, and two or three other towns, are called "lord-mayor;" the lord-mayor of London having also the title of "right honorable," first allowed in 1354 by Edward III. Mayors are ex-officio justices of the peace during both their year of mayorality and the following one.

MAZANDERAN, or **MAZENDERAN,** a province of Persia, bounded on the north by the Caspian Sea. The capital is Sari, and the population of the province is estimated at 300,000.

MAZARIN (mà-zà-raṇ), Jules, or **GUILIO MAZARINI,** first minister of Louis XIV. and cardinal, an Italian by origin, born in 1602, died 1661. He entered the pope's military service, and distinguished himself by diplomatic ability, for which he was rewarded with two canonries, and the appointment of nuncio to the court of France (1634–36). Here he gained the favor of Richelieu; accepted service from the king, and became a naturalized citizen of France; was made a cardinal in recognition of his diplomatic services in Savoy and in 1642, when Richelieu died, Mazarin promptly succeeded him. On the death of Louis XIII. the queen, Anne of Austria, became regent for her young son, Louis XIV., and it was thought that Mazarin would be dismissed; but instead he gained over the queen-regent, and made himself master of the nation. The parliament of Paris denounced his increasing taxation, while the nobility dreaded his supremacy, and the combination of these malcontents resulted in the civil war of the Fronde (which see). As the immediate result of the conflict, Mazarin had to go into exile, but finally returned to his position at court in 1653. During the succeeding eight years he remained all-powerful in

France. Just as his foreign policy was successful, so was his home policy disastrous. He did nothing for the people but increase their taxes to fill an impoverished exchequer. Yet when he died Mazarin left an enormous fortune to his nieces, whom he had married into the most powerful families of Italy and France.

MAZEP'PA, John, Hetman of the Cossacks, born about 1645. He became page to the King of Poland, and being detected in an intrigue with a Polish lady of high rank, Mazeppa was bound naked upon an untamed horse by her husband and cast loose. He was found and released by some peasants, and afterward joined the Cossacks, where his skill, sagacity, and strength procured him the position of hetman in 1687. He gained the confidence of Peter the Great, who made him prince of the Ukraine; but having entered into a treasonable intrigue with Charles XII. he suffered defeat with the Swedish monarch at Pultawa, fled to Bender, and there died in 1709. He is the hero of a poem by Lord Byron, and a drama by Pushkin.

MAZUR'KA, or **MAZOUR'KA,** a lively Polish round dance in $\frac{3}{8}$ or $\frac{3}{4}$ time, and generally danced by four or eight pairs. It is quicker than the polonaise. The name is also applied to the music.

MAZZINI (mät-sē'nē), Giuseppe, Italian patriot, born at Genoa 1805, died at Pisa 1872. While he was an advocate he turned his attention to literature, his first significant essay being Dante's Love of Country. As his writings grew more distinctly liberal in their politics the government suppressed the Indicatore Genovese and the I dicatore Livornese, the papers in which they appeared. He afterward joined the Carbonari, and was imprisoned in Savona for some months. On his release (1832) he was exiled to Marseilles, but he was compelled by the French government to retire into Switzerland. During the following five years he planned and organized various unsuccessful revolutionary movements, until, in 1837, he was expelled by the Swiss authorities and sought refuge in London. During the revolutionary movements of 1848 he proceeded to Italy; served for a time under Garibaldi, and when the pope fled from Rome he became president of its short-lived republic, made a heroic defense of the capital against the French, until compelled to surrender. From that time he continued to organize various risings in Italy, and the successful Sicilian expedition of Garibaldi in 1860 was due largely to his labors.

MEADE, George Gordon, American soldier, born of American parentage at Cadiz, Spain, in 1815. In October, 1836, he resigned from the army and adopted the profession of civil engineer. In 1842 he was reappointed to the army as a second lieutenant in the corps of topographical engineers. On the breaking out of the war with Mexico, when General Taylor crossed the Rio Grande, he was ordered to the front, and served with distinction throughout the war. At the outbreak of the civil war he was ordered to Washington; was commissioned brigadier-general of volunteers in 1861, and was placed in command of the second brigade of the Pennsylvania reserve corps. In 1862 he was commissioned major-general of volunteers. He was engaged in the battles of Fredericksburg and Chancellorsville, covering the retreat at Chancellorsville with his corps and guarding the crossings until the entire army was safely over the Rappahannock. On June 28, 1863, he succeeded General Hooker in the command of the Army of the Potomac. On July 1st the hostile armies met at Gettysburg, and a three days' battle ensued, which resulted in the utter discomfiture of Lee, who, however, was not pursued with any vigor. For this victory Meade was publicly thanked by a resolution of congress, passed January 28, 1866. From May 4, 1864, to April 9, 1865, General Meade commanded the Army of the Potomac, under General Grant, through the bloody struggle in the Wilderness, and until the surrender of Lee. On August 18, 1864, he was commissioned a major-general in the United States army. He died in 1872.

Gen. Geo. G. Meade.

MEADOW-LARK, a North American starling-like bird frequenting meadows and open places. Few American songbirds are more general favorites. It is a near relative of the bobolink, oriole, and blackbird. The common meadow lark of the eastern states ranges in summer from New Brunswick to the Gulf of Mexico, east of the Mississippi and even in winter only retreats as far south as Southern New England and Illinois. The western meadow-lark occupies the western half of the continent and extends southward into Western Mexico, while other subspecies occur in Cuba and Mexico. They are somewhat less than a foot in length, with large feet and a long, straight, sharp bill. The feathers of the upper surface are prevailingly black, with rufous and buff borders and tips, so that the whole upper surface is variegated with those three colors. The throat, breast, and anterior half of the belly are bright yellow, with a prominent black crescent about the middle of the breast. The tail feathers are narrow and short, and when the bird takes to the wing the white outer ones become very conspicuous. The notes of the meadow-lark are clear and strong—a sort of cheerful whistle—but they differ in different localities, so that the notes of the Florida birds are markedly different from those heard in the northern states. The notes of the western meadow-lark are famous for their musical quality.

MEADVILLE, a town in the northwest of Pennsylvania, the seat of Allegheny College (Methodist Episcopal) and a Unitarian theological school. Pop. 12,120.

MEAL-WORM, the larva of a beetle, which infests granaries, corn-mills, bakehouses, etc., and is very injurious to flour, meal, and the like.

MEAN, in mathematics, a quantity having a value intermediate between those of two other quantities. The arithmetical mean between two quantities is equal to half their sum; the geometrical mean to the square-root of their product; and the harmonic mean to twice their product divided by their sum.

MEASLES, also called Rube'ola, an acute infectious fever, chiefly affecting children. In a period of from ten to fourteen days after contagion symptoms of the disease begin to appear in sneezing, watering of the eyes, hoarseness, a hard cough, and high temperature. On the fourth day of the fever a rash appears in blotches, crescentic in form, first upon the temples, and gradually extends over the whole surface of the body. It begins to fade about the seventh day. The complications most to be dreaded are inflammations of the mucous membranes of the eye and chest. The treatment consists in keeping the patient confined to bed in a warm room, relieving the chest by hot bathing or warm packing, and preventing constipation. During convalescence give good nourishing food.

MEASURES, See Weights and Measures.

MEATH (mēth), a county of Ireland, province of Leinster, abutting on the Irish sea; area, 579,861 acres. Pop. 67,463.

MECCA, or **MEKKA,** a city of Arabia, about 60 miles from Jidda, its port on the Red Sea, and the birth-place of Mohammed, consequently the holiest city of the Mohammedan world. In its center is the Beitu-'llah (house of God) or El-Haram (the inviolable)—the great mosque inclosing the Kaaba, occupying a square dividing the upper from the lower town. The city is annually filled at the time of the Hajj or pilgrimage to the Kaaba. This pilgrimage, enjoined by Mohammed on all his followers, is the sole foundation of Mecca's fame, and the only source of its wealth and occupation. The pop. is estimated at 50,000, with the periodical addition of from 100,000 to 150,000 pilgrims.

MECHAIN (mā-shaṇ), Pierre François André, French astronomer, born 1744, died 1804. His name is notably connected with the measurement of a degree of the meridian in order to get a natural basis for the new French decimal system of weights and measures.

MECHANICAL POWERS, the simple instruments or elements of which every machine, however complicated, must be constructed; they are the lever, the wheel and axle, the pulley, the inclined plane, the wedge, and the screw. See those terms.

MECHANICS, the term originally used to denote the general principles involved in the construction of machinery. Latterly the term became divorced from all direct connection with practical applications, and dealt entirely with abstract questions in which the laws of

force and motion were involved. In this sense mechanics is usually divided into dynamics, which treats of moving bodies and the forces which produce their motion; and statics, which treats of forces compelling bodies to remain at rest. See Dynamics, Statics.

MECHANICS' LIEN, a statutory lien or charge upon real estate to secure payment for work and labor performed on, or materials furnished for, buildings or other improvements thereon, at the request or with the consent, express or implied, of the owner. With the development of business customs much work which was formerly done by persons acting as servants for a master came to be performed by independent contractors who stood on an equal footing with those who engaged them. For the protection of such contractors and of material men whose wares are used in buildings and other improvements on real estate, the statutes known as "mechanics' lien laws" have been enacted in all the United States and in Canada. The theory on which mechanics' liens are given by statute is that the value of the real estate has been increased by the addition of the improvements on which the work was performed or materials furnished, and that the property should accordingly be held subject to such claims. This creates a preference of these claims over those of unsecured creditors of the owner, but a mechanics' lien is subject to valid prior liens on the real estate, such as mortgages, judgments, taxes, etc. The term mechanics' lien is used in a general sense to cover all liens for labor, whether skilled or unskilled, and to describe liens for materials furnished. These liens give a right to look to the property for compensation, but do not create a personal claim against the owner. As a general rule, the lien attaches both to the building or improvement and to the land on which it is erected; but if the improvement is placed on the land without the owner's consent the lien will not extend to the land, but will cover the improvement to the extent of the interest of the person who ordered the work and materials. The lien only attaches to the very property on which the work was done, and will not affect the other real estate of the owner. A mechanics' lien may be filed against any title or interest in real estate, even though it is quite limited, as a lease for a year, provided it is such an interest as may be sold on execution.

As a general rule the work to which the owner is entitled under a contract must be entirely performed before the contractor can file a lien, but where an owner defaults in his payments or otherwise breaks his part of the contract, the right to file a lien usually attaches at once. In order to perfect a mechanics' lien the statutes of most jurisdictions provide that a notice setting forth the names of the owner and the party claiming the lien, the character of the work done, a description of the premises, the total contract price, the amount paid thereon, the amount still due, and the date when the last item of work was performed, shall be filed in the county clerk's office and a copy thereof served on the owner of the property affected.

MECKLENBURG-SCHWERIN, a grand duchy of the German Empire; bounded on the north by the Baltic Sea, elsewhere chiefly by Prussia and Mecklenburg-Strelitz; area, 4847 sq. miles. Pop. 607,835.

MECKLENBURG-STRELITZ, a grand duchy of the German Empire. Pop. 102,628.

MECON'IC ACID, an acid with which morphia is combined in opium. When pure, meconic acid forms small white crystals. Its aqueous solution forms a deep red color with the persalts of iron, which therefore are good tests for it.

MEDALLION, a term applied to the large antique medals struck in Rome and in the provinces by the emperors. They were usually of gold or silver, and exceeded in size the largest coins of these metals of which the name and value are known. They were probably struck to commemorate persons or events. In architecture the term is applied to any circular or oval, and sometimes square tablet, bearing on it objects represented in relief, as figures, heads, animals, flowers, etc.

MEDALS. See Numismatics.

MEDE'A, in Greek mythology, daughter of Æetes, king of Colchis, on the eastern coast of the Black Sea. She enabled Jason to obtain the celebrated golden fleece and lived with him for ten years, until he discarded her in favor of Glauce or Creusa, daughter of King Creon. In revenge she sent Glauce a bridal robe which enveloped her in consuming flame, and thereafter she slew her own children by Jason. There are many versions of this Greek myth, and it has been a favorite theme with painter and dramatist. Euripides has a well-known tragedy of this name.

MED'FORD, a city in Middlesex co., Mass., five miles north by west of Boston; on the Mystic river, and on the southern and western divisions of the Boston and Maine railroad. Pop. 21,280.

MEDIA, an ancient country in Western Asia, formerly the seat of a powerful kingdom, corresponding nearly to the northwestern portion of modern Persia. The Medes and Persians, from their near resemblance to each other, appear to have amalgamated readily after the conquest or revolution which gave the ascendency to the latter. Media henceforward formed part of the Persian Empire, and shared its fate.

MEDIATIZATION, the term applied to the annexation of the smaller German sovereignties to larger contiguous states, which took place on a large scale after the dissolution of the German Empire in 1806.

MEDICAL JURISPRUDENCE. See Forensic Medicine.

MEDICI (mā'di-chē), a Florentine family who rose to wealth and influence by successful commerce, and who continued to combine the career of merchants and bankers with the exercise of political power, a princely display of private munificence, and a liberal patronage of literature and art. The Medici were associated with the history of the Florentine republic from an early period, but they first became prominent in the person of Salvestro, who became gonfalonier in 1378. Giovanni de' Medici (1360–1429) amassed great riches by trade; rendered great services to the city and in 1421 became gonfalonier. He was succeeded by his son Cosmo (the elder, 1389–1464), surnamed the father of his country. Cosmo acquired immense wealth and influence, and laid

Cosmo de'Medici.

the foundation of his reputation by the munificent patronage of art and letters, and the conjunction of consummate statesmanship with his commercial enterprise. He was for thirty-four years the sole arbitrator of the republic and the adviser of the sovereign houses of Italy. His grandson Lorenzo the Magnificent (1449–92) was the second great man of the house of Medici. He governed the state in conjunction with his brother Giuliano (1453–78) till the latter was assassinated by the Pazzi, a rival Florentine family. Escaping from this massacre he sustained a war with Ferdinand of Naples, with whom he signed a definite peace in 1480. The rest of Lorenzo's reign was passed in peace and in those acts of profuse liberality and magnificent patronage of arts and sciences, in which he rivaled or excelled his grandfather. He left three sons—Piero (1471–1503), Giovanni (afterward Pope Leo X.), and Giuliano, duke of Nemours. Piero succeeded his father, but was deprived of his estates when the French invaded Italy in 1494. He finished his career in the service of France. His eldest son Lorenzo came to power by the abdication of his uncle Giuliano, who became Duke of Urbino. He died in 1519, leaving a daughter, the famous. Catherine de Medici, queen of France. After several reverses in the family Alessandro, an illegitimate son of the, last named Lorenzo, was restored to Florence by the troops of Charles V., and by an imperial decree he was declared head of the republic, and afterward Duke of Florence. The next name of importance in the family is that of Cosmo "the great," in 1537 proclaimed Duke of Florence and afterward Grand-duke of Tuscany. A learned man himself, he was a great patfon of learning

and art, a collector of paintings and antiquities. He died in 1574. Francisco Maria, his son, obtained from the Emperor Maximilian II., whose daughter Joanna he had married, the confirmation of his title of grand-duke in 1575 which continued in his family until it became extinct in 1737 on the death of Giovanni Gasto, who was succeeded by Francis, duke of Lorraine. See Tuscany, Catherine de Medici, Marie de Medici.

MEDICINE, the science of diseases, and the art of preventing, healing, or alleviating them. It deals with the facts of disease, with the remedies appropriate to various diseases, with the results of accident or injury to the human body, with the causes that affect the origin and spread of diseases, and with the general laws that regulate the health of individuals and the health of communities. It is broadly divided into two great sections, surgery (which see) and medicine proper; that is to say, the diseases affecting the outer frame visible to the eye are relegated to the care of the surgeon, while those that affect the internal organs belong to the province of the physician. A department related to both is obstetric medicine or midwifery, dealing with child-bearing and with the diseases peculiar to women. With this department is closely connected that which comprehends the diseases of children. There are also departments dealing with special organs, such as those relating to diseases of the eye, of the ear, of the throat, of the skin, etc., each of which occupies its own domain of knowledge, and is represented by highly-trained specialists. The treatment of the insane, as it is concerned with nervous diseases and correlated states of other organs, is an integral part of medical practice. War also has given rise to special developments of medical and surgical science, viz.: military hygiene and military surgery; and the administration of the law has created a special branch—medical jurisprudence or forensic medicine.

At first all diseases, in common with other phenomena, were attributed to supernatural causes, and the direct doings of unseen beings; and had to be exorcised by ceremonies, prayers, and adjurations. In course of time it was recognized that diseases were natural phenomena, but at the same time each was held to be a principle or entity distinct from its effects, and each disease was supposed to have a specific remedy —something that would actually cure the disease. Such views led to the adoption of various systems of treatment. For instance, one school held that only vegetable remedies were appropriate to the treatment of diseases; another school upheld the hydropathic system, or the virtues of the bath in one or other of its forms as a universal panacea for all human ills. A third maintained the application of the homœopathic principle that similars are cured by similars that is to say, diseases are cured by substances having, in small doses, an action on the body similar to that of the disease, so that one might treat diseases by a series of fixed and specific formulæ all depending on this single principle. Finally, even in orthodox medical circles there is a strong disposition to attribute success of treatment to particular drugs, and to simply act on a principle contrary to that of homœopathy, viz.: that diseases are cured by contraries, that is, by remedies having an action on the body the reverse of that of the disease. All these opinions depend on a mistaken view of disease. Anything that interferes with the free and healthy action of any part of the body produces a state of disease, and the symptoms of the disturbance manifest the disease. For instance, in the case of zymotic diseases, they are caused by the entrance into the body of living germs which grow and multiply in the blood and tissues, and interfere with the various organs. These germs are, however, not the disease, but the cause of the disease. Again many diseases are due not to something that has entered the body, but to a breaking down of a certain part of the system. It is clear, therefore, that no specific remedies can be applied to such diseases. The object of the physician is to restore as far as possible the conditions of healthy action: to remove if he can the causes of the disease, to relieve pain, and to control symptoms so as to direct them toward recovery.

The chief departments of medical science may be given as follows: The science of health is called hygiene, or as far as it relates to the regulation of the diet, dietetics. Pathology is the science of disease, of that in which it consists, its origin, etc. Nosology treats of the various sorts of diseases, their origin and symptoms, and strives to arrange diseases according to a scientific classification. Pathological anatomy deals with the mechanical alterations and changes of structure. Therapeutics is the science of the cure of diseases, often divided into general, treating of the subject of cure in general, its character, etc.; and special, of the cures of the particular diseases. Surgery treats of external diseases and injuries, and the mode of relieving derangements by operative means. Obstetrics treats of the modes of facilitating delivery. Materia medica is the science of medicines, their external appearance, history, and effects on the human organization. Pharmacy teaches how to preserve drugs, etc., and to mix medicines. Clinics applies the results of all these sciences at the bedside of the patient. (See the various medical articles under separate heads.) Among names famous in the history of medicine, may be mentioned Hippocrates, the father of medicine; Celsus, Galen, Avicenna, Paracelsus, Vesalius, Van Helmont, Sylvius, Stahl, Harvey, Sydenham, Boerhaave, Hoffman, Cullen, Brown, Hahnemann, etc. There are various statutes having direct relation to medicine: they may be divided into four groups (1) those related to public health; (2) those relating to lunacy (and habitual drunkenness); (3) those relating to the status of the medical profession, to dentists, and to pharmaceutical chemists; (4) those relating to restrictions on the practice of anatomy and physiology. See also Surgery.

MEDITERRANEAN SEA, the great inland sea between Europe, Asia, and Africa, about 2200 miles long and 1200 in extreme breadth. It communicates on the west with the Atlantic Ocean by the Strait of Gibraltar, and on the northeast with the Black Sea through the Sea of Marmara and the Straits of the Dardanelles and Constantinople. The

principal rivers which discharge themselves directly into the Mediterranean are the Ebro, Rhône, Po, and Nile. The depth varies from 30 to 2150 fathoms. Owing to the very narrow channel which connects the Mediterranean with the main ocean, there is very little tide; though on parts of the African coast, etc., a rise of more than 6 feet sometimes occurs.

MEERSCHAUM (mēr-shum), a hydrated silicate of magnesium, consisting of 60.9 parts silica, 26.1 magnesium, and 12.0 water, occurring as a fine white compact clay. It is found in Europe, but more abundantly in Asia Minor, and is manufactured into tobacco-pipes.

MEERUT', or **MIRAT',** a city, cantonment, and administrative center of the United Provinces, India. Pop. 118,129. The district of the same name occupies an area of 2379 sq. miles. Pop. 1,391,458.

MEGAPO'DIUS, a genus of rasorial birds, type of the family Megapodidæ, the best known and most remarkable species of which is the Australian jungle-fowl, a large bird remarkable for erecting considerable mounds, composed of earth, grass, decayed leaves, etc., sometimes 15 feet high and 150 in circum-

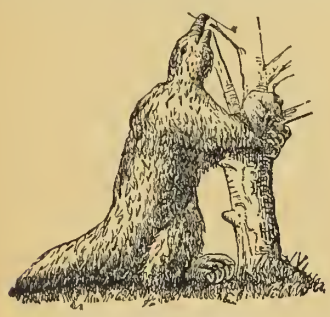
Nest of megapodius.

ference, and in the center of which, at a depth of 2 or 3 feet, it deposits its eggs, leaving them to be hatched by the heat of the fermenting vegetable mass.

MEGAPHONE, a speaking-trumpet used to render the voice audible at considerable distances. It consists of a large funnel of tin or papier-maché, in which the sound-waves are so reflected that they issue from its mouth in approximately parallel directions. The size and shape of the megaphone are so regulated that the usual tones of the voice undergo the largest possible amount of strengthening. For this reason a megaphone to be used with the best effect by a woman would be different in size from that suited to the deeper notes of a man's voice. The megaphone has succeeded the old speaking-trumpet for use at sea, and is generally employed by naval officers and mariners for communicating with the shore or with a distant vessel.

MEGAP'TERA, a genus of whales of the family Balænidæ, including the hump-backed whales.

MEGATHE'RIUM, a fossil genus of edentate mammals, allied to the sloths, but having feet adapted for walking on the ground, found in the upper Tertiary or pampas deposits of South America. It was about 8 feet high, and its body 12



Megatherium restored.

to 18 feet long. Its teeth prove that it lived on vegetables, and its fore-feet, about a yard in length and armed with gigantic claws, show that roots were its chief objects of search.

MEHEM'ET ALI, Viceroy of Egypt, born at Kavala, in Macedonia, in 1769, died 1849. He entered the Turkish army, and served in Egypt against the French; rose rapidly in military and political importance; became pasha of Cairo, Alexandria, and subsequently of all Egypt. In 1811 he massacred the Mamelukes to the number of 470 in Cairo, and about 1200 over the country. By means of a vigorous domestic policy Mehemet reduced the finances to order; organized an army and a navy; stimulated agriculture, and encouraged manufactures. In 1824-27 he assisted the sultan in endeavoring to reduce the Morea, which led to the destruction of his fleet by the allied European powers at Navarino (1827). Subsequently he turned his armies against the sultan, and in his efforts to secure dominion over Syria by armed invasion, he was so far successful (see Ibrahim Pasha) that the European powers had to interfere and compel him to sign a treaty in 1839, which gave him the hereditary pashalic of Egypt in lieu of Syria, Candia and Hejaz. In his latter days he sank into dotage.

MEISSONIER (mā-son-yā), Jean Louis Ernest, French painter, born in Lyons 1815; went to Paris in 1830; first picture exhibited, The Visitors, 1834. He first became known as an illustrator of books, but rapidly became famous for the singular perfection of his art. His pictures, which, whether in genre or in portraiture, are almost without exception upon a small scale, are characterized by great minuteness of execu-

J. L. E. Meissonier.

tion and high finish, but are at the same time not less remarkable for their excellence in composition and breadth of treatment. They have the force of appeal of large works. Among his pictures, which possess an astonishing market value, may be mentioned, The Smoker (1839); La Partie des Boules (1848); Napoleon III, at Solferino (1864); the Cavalry Charge (1867), sold for 150,000 francs; the picture entitled "1807" (1875), representing Napoleon I, in the battle of Friedland, sold for 300,000 francs; Le Guide (1883); Jena (1889). He died in 1891.

MELANCHOLIA, Melancholy. See Insanity.

MELANCHTHON (me-langk'thon), Philip, German reformer, born at Bretten, in the Palatinate, 1497; died at Wittenberg, 1560. In 1518, at the instigation of Luther and Reuchlin, he was invited by Frederick, elector of Saxony, to fill the chair of Greek in the recently founded University of Wittenberg. In 1519 he accompanied Luther to Leipzig, in order to dispute with Dr. Eck, and in 1521 he published his famous Loci Communes, an exposition of Protestant dogmatics, which ran through some sixty editions in his lifetime, and was followed by other influential writings, such as the Epitome Doctrinæ Christianæ (1524).

MEL'ANITE, a lime-iron variety of garnet, of a velvet black or grayish black, occurring always in crystals of a dodecahedral form. See Garnet.

MELBOURNE, a city of Australia, capital of the colony of Victoria. Melbourne was founded in 1836 during the premiership of Lord Melbourne, after whom it was named. It was incorporated in August, 1842, and in 1849 erected into an episcopal see. The public buildings of Melbourne as a whole are handsome and substantial. Among them the most remarkable are the houses of parliament, the treasury, the law-courts, the free library, containing over 200,000 volumes; the mint, the university, with an admirable museum attached. The chief industrial products are leather, clothing, furniture, flour, ales, cigars,

ironware, woolens, etc. Population of city proper, 66,391; inclusive of suburbs, 493,956.

MELODEON', the early American organ, in which an exhaust or suction bellows draws the air inward through the reeds. The supply of wind for the reeds is obtained by means of a pair of treadles, worked by the performer, and the reeds themselves are controlled by stops and slider mechanism. The tone of the instrument has been steadily improved, and now successfully imitates a number of orchestral instruments.

MELODRAMA, originally and strictly that species of drama in which the declamation of certain passages is interrupted by music, but now the term has come to designate a romantic play, generally of a serious character, in which effect is sought by startling incidents, striking situations, and exaggerated sentiment, aided often by splendid decoration and music.

MELODY, in the most general sense of the word any successive connection or series of tones; in a narrower sense, a series of tones which please the ear by their succession and variety; and in a still narrower sense, the particular air or tune of a musical piece.

MELON, a well known plant and fruit. It is an herbaceous, succulent, climbing or trailing annual, cultivated for its fruit in hot eastern countries from time immemorial. There are many varieties,

Melon.

as the Cantaloupe, which is reckoned the best. The water-melon is much cultivated in the warmer parts of the world on account of its refreshing juice, which, however, is less sweet than that of the common melon.

MELOS, now **MILOS** or **MILO,** an island belonging to Greece, in the Grecian Archipelago. In 1820 a peasant discovered here the celebrated statue known as the Venus of Milo, now placed in the museum of the Louvre at Paris.

MELROSE, a city in Middlesex co., Mass., on the Boston and Maine railroad; 7 miles n. of Boston. Pop. 15,160.

MELTING-POINT. See Fusing-point.

MELVILLE, George Wallace, American naval engineer, was born in New York City in 1841. He entered the United States navy as an engineer in 1861. Among his contributions to the building up of the new navy are his designs for the triple screw machinery for the two cruisers Columbia and Minneapolis. Melville sailed in 1879 under Lieutenant De Long on the ill-fated Jeannette expedition to discover a northeast passage across the Polar Sea. After the loss of the Jeannette he brought to safety the crew of his own boat, and subsequently conducted the search which discovered the Jeannette records and the bodies of De Long and his companions. He was afterward a member of the Greely Relief Expedition (1884). He was appointed chief engineer in 1881, engineer-in-chief in 1887, and rear-admiral in 1899. He is the author of "In the Lena Delta."

MELVILLE ISLAND.—1. An island in the Polar Sea, north of America. Captain Parry discovered it, and passed the winter of 1819–20 there. 2. An island off the north coast of Australia; area, about 1800 sq. miles.

MEMBRANE, in anatomy, a texture of the animal body, arranged in the form of laminæ, which covers organs, lines the interior of cavities, or takes part in the formation of the walls of canals or tubes. Membrane is generally divided into three kinds, mucous, serous and fibrous. The lining of the nose, trachea, œsophagus, stomach, intestines, is of the first kind; the serous membranes form the lining of the sacs or closed cavities, as of the chest, abdomen, etc.; the fibrous membranes are tough, inelastic, and tendinous, such as the dura mater, the pericardium, the capsules of joints.

MEMNON, a mythological personage mentioned in the Homeric poems as the beautiful son of Eōs (the morning), and in the post-Homeric accounts as the son of Tithōnus and nephew of Priam, whom he assisted at the siege of Troy. He slew Antilochus, but was himself slain by Achilles. His mother was filled with grief at his death, which Zeus endeavored to soothe by making her son immortal. The name of Memnon was latterly connected with Egypt, and was attached to a statue still standing at Thebes, being one of two known from their size as "the Colossi." This statue known as "the vocal Memmon," was celebrated in antiquity as emitting a sound every morning at the rising of the sun—perhaps through the craft of the priests, though some think it was owing to expansion caused by heat. Both statues seem originally to have been about 70 feet high.

MEMORY, the power or the capacity of having what was once present to the senses or the understanding suggested again to the mind, accompanied by a distinct consciousness that it has formerly been present to it; or the faculty of the mind by which it retains the knowledge of past events, or ideas which are past. The word memory is not employed uniformly in the same precise sense, but it always expresses some modification of that faculty which enables us to treasure up and preserve for future use the knowledge which we acquire; a faculty which is obviously the great foundation of all intellectual improvement. The word memory is sometimes used to express a capacity of retaining knowledge, and sometimes a power of recalling it to our thoughts when we have occasion to apply it to use, the latter being more correctly called recollection. See Mnemonics.

MEMPHIS, an ancient city of Egypt on the left bank of the Nile, some 20 miles south of Cairo, said to have been founded by Menes, the first king of Egypt. It was a large, rich, splendid city, and after the fall of Thebes, the capital of Egypt. At the time of the conquest of Egypt by Cambyses (524 B.C.) it was the chief commercial center of the country, and was connected by canals with the Lakes of Mœris and Mareotis. With the rise of Alexandria the importance of Memphis declined, and it was finally destroyed by the Arabs in the 7th century. The pyramids of Sakkara and the colossal statue of Rameses II., now mutilated and thrown down, are the chief objects of antiquarian interest on the site.

MEMPHIS, a city and port in Tennessee, on the Mississippi, just below the junction of Wolf river, 209 miles w.s.w. of Nashville. It stands upon a bluff about 30 feet above the river in its highest floods, and is fronted by a fine esplanade. Its rapid growth is due to its favorable position for trade, which is largely carried on by rail and river, chiefly in cotton. Pop. 1909, about 175,000.

MENA'DO, the capital of a Dutch residency of same name in the northeast peninsula of Celebes. The town itself has a population of about 6000, while the inhabitants of the whole territory number about 500,000.

MENDELSSOHN-BARTHOLDY, Felix, distinguished composer, born at Hamburg, 1809, died at Leipzig, 1847. He was the son of a wealthy Jew, who, recognizing his son's talent for music, had him carefully trained. In his ninth year he publicly appeared in Berlin as a musician, and in his sixteenth year he produced the well-known overture to the Midsummer Night's Dream. In 1829 he began an extensive tour through England, Scotland, France, Italy, and on his return to Germany he became musical director in Düsseldorf. Here he tried to establish a theater but without success; and when he left that city in 1835 he became conductor of the famous concerts in the Gewandhaus of Leipzig—a position which he maintained with several slight interruptions until his death. In 1841 he was appointed musical director to the King of Saxony; was afterward summoned to Berlin by the King of Prussia to become director of music at the Academy of Arts; and journeyed repeatedly to England, where he conducted his own music at London and Birmingham. Of his musical compositions the best known are the oratorios Elijah and St. Paul; the overture to Ruy Blas; and his Songs without Words. He left unfinished the oratorio of Christus and the opera of Lorlei.

MENDICANT ORDERS. See Orders (Religious).

MENDOZA, a province of the Argentine Republic, on the eastern side of the Andes, area, about 34,000 sq. miles. The country is volcanic, the soil fertile but requiring irrigation; chief products: corn, wine, and fruits. Pop. 141,431.—The capital, which has the same name, is situated about 2891 feet above the sea at the foot of the Cordilleras. It was almost totally destroyed by an earthquake in 1861, over 13,000 lives being lost, but has been rebuilt, and has now about 29,500 inhabitants.

MENELA'US, in Greek mythology, son of Atreus, brother of Agamemnon, and husband of the beauteous Helen, with whom he received the kingdom of Sparta or Lacedæmon. His wife having been abducted by Paris, son of Priam, king of Troy, he summoned the Greek princes to avenge the affront, and himself led sixty ships to the siege of Troy. After its conquest he returned with Helen to his native land in a devious voyage which led him to Cypria, Phœnicia, Egypt, and Libya during a period of eight years.

MENES, or **MENA,** according to Egyptian traditions, the first king of Egypt. See Egypt.

MENINGITIS (-jī'tis), the term applied to inflammation of the two inner membranes (meninges) which envelop the brain—the arachnoid membrane and the pia mater. There are two forms of this disease called simple and tubercular. The former may be caused by injuries of the head, exposure to cold or heat, disease of the ear, etc., and the symptoms are, pain in the head, giddiness, feverishness, and often vomiting; while the latter is frequently due to a scrofulous taint, and is also called acute hydrocephalus or water in the head.

MENNO, Simons, the founder of the sect known as the Mennonites, was born in Friesland 1496, died 1561. He was educated for the church, and became a Roman Catholic priest; but about 1510 he joined the Anabaptists. After the suppression of the disturbances at Münster Menno collected the scattered remnants of the sect, inculcated on them more moderate views, and for many years in Holland and the north of Germany, as far as Livonia, labored to increase the number of his followers. and to disseminate his doctrines. In this he was not unsuccessful, and there are still a number of congregations in Holland, Germany, and Russia who pass under the name of Mennonites. These do not believe in original sin, and object to taking oaths, making war, or going to law. The Mennonites are also found in the United States, where they number about 200,000. See Anabaptists.

MENNONITES. See above article.

MENOMINEE, the capital of Menominee co., Mich., on Green Bay, at the mouth of the Menominee river, and on the Chi., Mil. and St. Paul and the Chi. and N. W. railways; 52 miles n.n.e. of Green Bay. It has numerous saw-mills, and is an important lumber shipping-point. Pop. 15,710.

MENSCHIKOFF, ALEXANDER, Danilovitch, Russian minister, born at Moscow in 1672, died 1729. He was born in humble life, but ultimately became a prince of the empire and first favorite with Peter the Great. When that monarch died his power under Catherine I. was greatly increased. After two years she was succeeded by her grandson, Peter II., who came under the guardianship of Menschikoff, and to whom he endeavored to marry his daughter. His designs, however, were frustrated by the combined efforts of the Dolgorukis and the young czar, and Menschikoff was exiled to Siberia, where he died.

MENSTRUATION, or **MENSES,** the periodical discharge of blood from the generative organs of the human female. The period at which menstruation begins is usually between the 14th and 16th year; it recurs at monthly intervals, lasting for four to six days, and thus continues until from the 45th to the 50th year; the discharge at each period is from 6 to 8 oz. All these conditions, however, vary with each individual. A discontinuance of this discharge is one of the first signs of conception, and the cessation usually continues during the period of pregnancy and lactation.

MENSURATION is the practical application of the simpler processes of mathematics to the measurement of the area of a plane figure, or the volume of a solid, the result being expressed in square or cubic inches, feet, yards, etc. The area of any plane rectilineal figure is easily found, since it can always be dividedinto a certain number of triangles and the area of every triangle is equal to the base multiplied by half the perpendicular height. If the figure is a parallelogram its area is equal to any side multiplied by the perpendicular distance from this side to the opposite; if a trapezium it is equal to half the sum of two opposite sides multiplied by the perpendicular distance between them. Circumference of a circle = diameter multiplied by 3.14159. Area of a circle = square of radius multiplied by 3.14159 = radius multiplied by half circumference. Volume of any rectangular solid = length, breadth, and depth multiplied together.

MENTAL DERANGEMENT. See Insanity.

MENTAL PHILOSOPHY. See Mind, Metaphysics, Psychology.

MENTHOL, a white crystalline substance obtained from oil of peppermint of which it smells strongly, used externally in cases of nervous headache.

MENTZ. See Mainz.

MENU. See Manu.

MEPHISTOPH'ELES, older forms Mephistophilus, Mephistophilis, the name of a demon in the old puppet-plays, adopted and developed by Marlowe in his tragical history of Dr. Faustus, and more especially by Goethe in the first part of Faust, where he becomes the cultured personification of evil rather than the Satan of popular belief.

MERCANTILE LAW. See Commercial Law.

MERCA'TOR, Gerard, geographer, born at Rupelmonde, in Flanders, 1512; died 1594. He studied at Louvain; became a lecturer on geography and astronomy; entered into the service of Charles V., for whom he made a celestial and a terrestrial globe; and in 1559 he retired to Duisburg as cosmographer to the Duke of Juliers. He is the author of a method of projection called by his name (see next article), the principles of which were applied practiaclly by Edward Wright, in 1599. He is also the author of Tabulæ Geographicæ (Cologne, 1578).

MERCATOR'S PROJECTION, a method of projection used in map-making in which the meridians and parallels of latitude cut each other at right angles, and are both represented by straight lines. By means of this projection seamen are enabled to steer by compass in straight lines, and not in the spiral necessitated by the other projections. It is constructed as follows: A line of any length is drawn to represent the equator. This line is divided into 36 or 18 equal parts for meridians at 10° or 20° apart, and the meridians are then drawn through these perpendicular to the equator. From a table of meridional parts take the distances of the parallels and of the tropics and arctic circles from the equator, marking them off above and below it. Join these points, and the projection is complete.

MERCIER, Honoré, Canadian politician, born 1840. He studied law, and has been engaged in journalism. He sat in the Dominion parliament from 1872 till 1874, and became solicitor-general in the legislative assembly of Quebec in 1879, and attorney-general in 1887.

MERCURY, in mythology, the name of a Roman divinity, identified in later times with the Greek Hermēs. As representing Hermēs he was regarded as the son of Jupiter and Maia, and was looked upon as the god of eloquence, of commerce, and of robbers. He was also the messenger, herald, and ambassador of Jupiter. As a Roman divinity he was merely the patron of commerce and gain. See Hermēs.

MERCURY, in astronomy, the planet nearest the sun. He moves round the sun in 87.9693 of our mean solar days, at a mean distance of 35,392,000 miles; his eccentricity of orbit is 0.205618; the inclination of his orbit to the ecliptic is 70° 0′ 8″.2, his diameter about 3050 miles. The period of his axial rotation is the same as that of his revolution round the sun. His volume is about $\frac{1}{17}$ that of the earth; his density $\frac{1}{10}$ greater than the earth's. He is visible to the naked eye in the spring and autumn after sunset and before sunrise. Transits of Mercury over the sun's disc take place at intervals of 13, 7, 10, 3, 10, 3, etc., years.

MERCURY, called also quicksilver, a metal whose specific gravity is greater than that of any other metal, except the platinum metals, gold, and tungsten, being 13.56, or thirteen times and a half heavier than water. It is the only metal which is liquid at common temperatures. It freezes at a temperature of 39° or 40° below the zero of Fahrenheit, that is, at a temperature of 71° or 72° below the freezing point of water. Under a heat of 660° it rises in fumes, and is gradually converted into a red oxide. Mercury is used in barometers to ascertain the weight of the atmosphere, and in thermometers to determine the temperature of the air, for which purpose it is well adapted by its expansibility, and the extensive range between its freezing and boiling points. Preparations of this metal are among the most powerful poisons, and are extensively used as medicines. The preparation called calomel or mercurious chloride is a most efficacious deobstruent. Another valuable preparation is corrosive sublimate or mercuric chloride. From the fluid state in which mercury exists it readily combines with most of the metals, to which, if in sufficient quantity, it imparts a degree of fusibility or softness. An alloy of mercury and any other metal is termed an amalgam. Mercury is chiefly found in the state of sulphide, but it is also found native. The chief mines of mercury are in Spain, but it is also found in Germany, Italy, China, California, Borneo, Mexico, and Peru.

MERCY, Sisters of, the name given to members of female religious communities founded for the purpose of nursing the sick at their own homes, visiting prisoners, attending lying-in hospitals, superintending the education of females, and the performance of similar works of charity and mercy. Communities of Sisters of Mercy are now widely distributed over Europe and America, some of them being connected with the Church of England.

MEREDITH, George, poet and novelist, born 1828 in Hampshire; studied for the law, but essayed a literary career with a volume of poems in 1851. This was followed by others, among them the following: Farina, a Legend of Cologne; The Ordeal of Richard Feverel; Poems and Ballads; The Egoist; Diana of the Crossways; Ballads and Poems of Tragic Life; The Amazing Marriage.

MERGAN'SER, a genus of aquatic birds belonging to the duck family.

Red-breasted merganser.

They inhabit lakes and the sea-coast, migrate southward in winter, lay from eight to fourteen eggs, and are gregarious in habit.

MER'IDEN, a town in Connecticut, 18 miles n.e. of New Haven. It is largely engaged in the manufacture of iron-castings, tinware, cutlery, brass-work, glass, woolen goods, and plated ware. It contains a state reformatory. Pop. 29,296.

MERIDIAN, one of the innumerable imaginary lines on the surface of the earth, that may be conceived of as passing through both poles and through any other given place, and serving to settle the longitude of places and thus to mark their exact position. There are also corresponding lines called astronomical or celestial meridians, which are imaginary circles of the celestial sphere passing through the poles of the heavens and the zenith of any place on the earth's surface. Every place on the globe has its meridian, and when the sun arrives at this line it is noon or mid-day, whence the name (Latin meridianus—medius, middle, and dies, day). The longitude of a place is its distance—usually stated in degrees, minutes, and seconds—east, or west of any meridian selected as a starting-point, just as its latitude is its distance north or south of the equator. In Britain it has long been the custom to count from the meridian of Greenwich as a starting-point; this meridian being called the first meridian, and the longitude of Greenwich being marked 0 or nothing. Other countries, however, had selected their own meridian, with the result that confusion arose among geographers and navigators in localizing any given place. This difficulty was discussed at a national conference held at Washington October, 1884, and at last Greenwich was selected as the geographical and astronomical reference meridian of the world, longitude to be reckoned east and west from this up to 180°. It was also arranged that the astronomical day should begin at midnight, 1st January, 1885, so that astronomers henceforth have one definite day over all the world. See also Longitude, Day.

MERIDIAN, the capital of Lauderdale co., Miss., on the E. Tenn., Va. and Ga., the Mobile and Ohio, and the Queen and Cresc. railways, 85 miles e. of Jackson, 135 miles n. by w. of Mobile, Ala. It is in an agricultural region, chiefly producing cotton. Pop. 16,210.

MERIDIAN CIRCLE, a mural circle or transit circle.

MERINO (me-rē′nō), a twilled woolen tissue, dyed various colors, and often also printed. In the better kind of goods both the warp and the woof are of carded woolen yarn, but in inferior sorts the warp is of cotton.

MERINO SHEEP, a variety of sheep originally peculiar to Spain, but now

Head of Merino ram, before and after shearing.

reared in other parts of Europe, in Australia, New Zealand, etc. They are raised chiefly for the sake of their long fine wool, the mutton being but little esteemed.

MERLIN, a legendary Welsh prophet and magician, who is said to have lived in the 5th century. He is said to have been the offspring of a demon and a Welsh princess, and became adviser to the English kings Vortigern, Ambrosius, Utherpendragon, and Arthur. There was also a prophet connected with the ancient kingdom of Strathclyde called Merlin the Wild, or Merlinus Caledonius, who is said to have lived in the 6th century. His prophecies, containing also those ascribed to the Welsh Merlin, were published at Edinburgh in 1615.

MERLIN, the smallest of the British falcons, being only about the size of a black-bird, but very bold. It was formerly used in hawking quails, partridges, larks, and such small game, and is even yet occasionally trained. It is of a bluish ash color above; reddish yellow on the breast and belly, with longitudinal dark spots, the throat of the adult male white. It builds its nest on the ground.

MERMAID AND MERMAN, were legendary creatures who lived in the sea, possessed a human body united to the tail of a fish, and who were supposed capable of entering into social relationships with men and women. Under various names they were known over Northern Europe, the typical mermaid being a lovely creature who combs her long beautiful hair with one hand while she holds a looking-glass with the other. The origin of this myth is supposed to rest in the human-like appearance of certain aquatic animals, such as the seal. The legends of mermaids and mermen have been largely treated in poetry.

MERRIMAC, a river of the United States in New Hampshire and Massachusetts. The immense water-power furnished by its falls has created the towns of Lowell and Lawrence in Massachusetts, and of Nashua and Manchester in New Hampshire.

MERSEY, an important river of England, expands into an estuary 17 miles from its mouth at Runcorn; and its entire length is 60 miles. The principal towns on its banks are Warrington, Stockport, Birkenhead, and Liverpool. The Manchester Ship Canal comprises part of the channel of the Mersey.

MERSEY TUNNEL, opened in 1886, connects Liverpool and Birkenhead by a railway under the river Mersey. It is 21 feet high, 26 feet wide, and 31 feet below the bed of the river; is 4½ miles long with the approaches, and is ventilated by means of large fans and a small tunnel which runs alongside. The cost of construction is stated to have been $6,250,000.

MERTHYR-TYDVIL, a parliamentary borough of South Wales, county of Glamorgan, 24 miles n.n.w. of Cardiff, on the Taff. Pop. (which includes Aberdare), 122,536; of town, 69,227.

MESMER, Friedrich Anton, German physician, founder of the doctrine of mesmerism or animal magnetism, was born in 1733, died in 1815. He professed to cure diseases by stroking with magnets, but about 1776 he renounced their use, and declared that his operations were conducted solely by means of the magnetism peculiar to animal bodies. (See Mesmerism.) He went to Paris in 1778, where he achieved considerable success and fame and made many converts to his views, but was regarded by the medical faculty as a charlatan. The government at length appointed a committee of physicians and members of the Academy of Sciences to investigate his pretensions. The report was unfavorable, and the system fell into disrepute. Mesmer retired to Swabia, where he died.

MESMERISM, Animal Magnetism (electro-biology, hypnotism), terms applied to certain peculiar nervous conditions which may be artificially induced, and in which the mind and body of one individual may be peculiarly influenced by another apparently independently of his own will. The term mesmerism is derived from Mesmer (see preceding article), who professed to produce these conditions in others and to cure diseases by the influence of a mysterious occult force residing in himself. This force he called animal magnetism. He held that it pervaded the whole universe, and specially affected the nervous system. The phenomena were known from the earliest ages, when the priests of most of the ancient civilizations affected to cure diseases by the touch of the hand, or threw people into deep sleeps, induced dreams, and produced many of the effects now referred to mesmerism. While the phenomena which Mesmer professed to produce were probably in many cases genuine his theory of animal magnetism rested on no proper scientific basis. He has been followed by many disciples, whose success in producing the mesmeric condition has left no doubt as to the reality of many of the phenomena of mesmerism; but modern scientific investigation, while not fully explaining all these, has shown that they are due to peculiar nervous conditions, and that it is unnecessary to presuppose any occult force to account for them. The means usually employed to produce the mesmeric condition are such as touching and stroking with the hands, according to rule (manipulation), breathing on the person, fixing the eyes on him, etc. It may also, it is said, be produced by causing the patient to stare at an object, especially a bright one, placed in such a position as to strain the eye, the effect being completed by a few passes of the hand over the face without touching it. In the condition thus induced the patient seems to be in a kind of sleep. The limbs will remain in any position in which they may be placed. By stroking the surface of the body the muscles adjacent may be rendered rigid as in a person suffering from catalepsy. Reason and memory are temporarily suspended, the will is paralyzed, and the subject is irresistibly impelled to act in accordance with suggestion, however absurd. He can be persuaded into any hallucination, such as that he is some one other than himself, or that he hears or sees, smells or tastes something which has no existence before him. As a therapeutic agent mesmerism has been successfully employed in cer-

tain forms of disease, especially in cases of nervous irritation and sleeplessness, and such diseases in general as have a nervous origin. It has been claimed also by professors of the art that the patient when in this condition can determine the nature of any disease from which he may be suffering and the means of its cure, that he can penetrate the mysteries of the future and hold communication with distant persons. But these last statements cannot be regarded as authenticated.

MESOPOTA'MIA, a name given by the Greeks to the extensive region inclosed by the Tigris and Euphrates, anciently associated with the Assyrian and Babylonian monarchies. Its Old Testament name is Aram Naharaim, or Padan Aram. The Greek title was probably not in use till after Alexander the Great invaded the east. This country is inhabited chiefly by Arabs, Kurds and Armenians. Many of them are nomadic, and their chief occupation is the grazing of cattle. Mesopotamia is now part of the Turkish Empire.

MESOZO'IC PERIOD, the term applied by geologists to the geological period between the Palæozoic and the Cainozoic. It is coextensive with the secondary formations, and includes the rocks of the Triassic, Oolitic, and Cretaceous groups.

MESQUITE, a small tree allied to the acacia, common in Mexico, Texas, and other of the western states. It yields a gum not much inferior to gum arabic; its seeds are eaten, and a drink is prepared from the mucilage of its pods. Another species has pods that are eaten by the Indians, being rich in saccharine matter. They are of a twisted form, hence the name "screw bean."

MESSALI'NA, Valeria, the third wife of the Roman emperor Claudius. She is notorious in history on account of her licentiousness and cruelty. She was murdered A. D. 48.

MESSA'NA. See Messina.

MESSE'NIA, a country of ancient Greece, in the southern part of the Peloponnesus. Messenia gives name to a monarchy in modern Greece, with an area of 1221 sq. miles, and a pop. of 119,327.

MESSI'AH, corresponding to the Greek Christos of the New Testament, that is, "anointed," has in the Old Testament several applications, as to the whole Jewish people, to the priests, to the kings ("the Lord's Anointed"), and even to Gentile kings, as persons who had been anointed with holy oil. The designation, however, owes its special importance to the application of it in the prophetic books of the Old Testament to an ideal holy king and deliverer whose advent they foretold. The whole of the prophetic pictures agreed in placing Jehovah in the central place of the desired kingship. These prophecies, which are called the Messianic prophecies, had at the time of our Lord come to be applied by the Jews to a temporal king who should free them from foreign oppression. They are affirmed by Jesus Christ and His apostles to apply to and be fulfilled in Him; and this is the belief of the Christian Church, by which he is called "The Messiah." The rationalistic school of theologians assert that Jesus laid claim to the dignity either to meet the preconceptions of his countrymen, or because he felt that the truth which he taught was the real kingdom never to be destroyed which the God of Heaven was to set up.

MESSI'NA, the chief commercial town and seaport of Sicily, capital of the province and on the strait of the same name. Pop. 149,823, in 1908 when it was destroyed by earthquake. (See earthquake.)—The province of Messina has an area of 1768 sq. miles, and a pop. of 548,898.

MESSINA, Strait of, the strait which separates Sicily from Italy. It has a length of about 20 miles, and varies in width from 2 miles in the north to 11 miles in the south, is very deep, and has a strong tidal current.

MESTIZOS (mes-tē'zōs), people of mixed origin in countries where Spanish Europeans have settled and intermingled with the natives.

METALLURGY (met'al-ėr-ji), the art of working metals, comprehending the whole process of separating them from other matters in the ore, smelting, refining, etc.

METALS, elementary substances have been divided by chemists into two classes, metals and non-metals or metalloids, but these merge one into the other by gradations so imperceptible that it is impossible to frame a definition which will not either include some non-metallic bodies or exclude some metallic. The term metal is an ideal type, and is applied to those elementary substances which in the combination of physical characteristics which they present approach more or less nearly to it. The following are the chief characteristics of metals. They are opaque, having a peculiar luster connected with their opacity called metallic; insoluble in water; solid, except in one instance, at ordinary temperatures; generally fusible by heat; good conductors of heat and electricity; capable, when in the state of an oxide, of uniting with acids and forming salts; and have the property, when their compounds are submitted to electrolysis, of generally appearing at the negative pole of the battery. Many of the metals are also malleable, or susceptible of being beaten or rolled out into sheets or leaves, and some of them are extremely ductile or capable of being drawn out into wires of great fineness. They are sometimes found native or pure, but more generally combined with oxygen, sulphur, and some other elements, constituting ores. The great difference in the malleability of the metals gave rise to the old distinction of metals and semi-metals, which is now disregarded. The following—fifty-two in number—are the principal substances usually regarded as metals: aluminium, antimony, barium, beryllium, or glucinum, bismuth, cadmium, cæsium, calcium, cerium, chromium, cobalt, columdium, or niobium, copper, didymium, erbium, gallium, germanium, gold, indium, iridium, iron, lanthanum, lead, lithium, magnesium, manganese, mercury, molybdenum, nickel, osmium, palladium, platinum, potassium, rhodium, rubidium, ruthenium, scandium, silver, sodium, strontium, tantalum, tellurium, terbium, thallium, thorium, tin, titanium, tungsten, uranium, vanadium, yttrium, zinc, zirconium. Of these gold, silver, copper, tin, lead, zinc, platinum, iron, are the most malleable; gold, which possesses the quality in the greatest degree, being capable of being beaten into leaves $\frac{1}{100000}$ of a millimetre in thickness. The following, given in the order of their ductility, are the most ductile: platinum, silver, iron, copper, gold, aluminium, zinc, tin, lead, platinum wire having been obtained of not more than $\frac{1}{1200}$ of a millimetre in diameter. The majority of the useful metals are between seven and eight times heavier than an equal bulk of water; platinum, osmium, and iridium are more than twenty times heavier; while lithium, potassium, and sodium are lighter. The metals become liquid, or otherwise change their condition, at very various temperatures: platinum is hardly fusible at the highest temperature of a furnace; iron melts at a little lower temperature; and silver somewhat lower still; while potassium melts below the boiling-point of water, and becomes vapor at a red heat, and it and sodium may be moulded like wax at 16° C. (61° Fahr.). Mercury is liquid at ordinary temperatures, and freezes only at 39½° C. below zero (−39° Fahr.). Osmium and tellurium are also regarded by some as non-metals. All the metals, without exception, combine with oxygen sulphur, and chlorine, forming oxides, sulphides, and chlorides, and many of them also combine with bromine, iodine, fluorine. Several of the later discovered metals exist in exceedingly minute quantities, and were detected only by spectrum analysis, and there is every likelihood that research in this direction will add to the present list of metals.

METAMOR'PHIC ROCKS, in geology, stratified or unstratified rocks of any age whose original texture has been altered and rendered less or more crystalline by subterranean heat, pressure, or chemical agency. The name is given more especially to the lowest and azoic, or non-fossiliferous, stratified rocks, consisting of crystalline chists, and embracing granitoid schist, gneiss, quartz-rock, mica-schist, and clay-slate, most of which were originally deposited from water and crystallized by subsequent agencies. They exhibit for the most part cleavage, crumpling, and foliation, and their lines of stratification are often indistinct or obliterated.

METAMOR'PHOSIS, any change of form, shape, or structure. In ancient mythology the term is applied to the transformations of human beings into inanimate objects, with which ancient fable abounds. In zoology it includes the alterations which an animal undergoes after its exclusion from the egg or ovum, and which alter extensively the general form and life of the individual. All the changes which are undergone by a butterfly in passing from the fecundated ovum to the imago, or perfect insect, constitute its development — each change, from ovum to larva, from larva

to pupa, and from pupa to imago, constituting a metamorphosis.

MET'APHOR, a figure of speech founded on the resemblance which one object is supposed to bear, in some respect to another, and by which a word is transferred from an object to which it properly belongs to another in such a manner that a comparison is implied, though not formally expressed. It may be called a simile without any word expressing comparison. Thus, "that man is a fox," is a metaphor; but "that man is like a fox," is a simile. So we say, a man bridles his anger; beauty awakens love or tender passions; opposition fires courage.

METAPHYS'ICS, a word first applied to a certain group of the philosophical dissertations of Aristotle which were placed in a collection of his manuscripts after his treatise on physics. As since employed, it has had various significations, and latterly it has been understood as applying to the science which investigatesthe ultimate principles that underlie and are presupposed in all being and knowledge. In the part of the Aristotelian treatise alluded to the problems were concerned with the contemplation of being as being, and the attributes which belong to it as such. This implies that things in general must be divided into beings or things as they are, and into phenomena or things as they appear. In modern usage metaphysics is very frequently held as applying to the former division, that is to the ultimate grounds of being. To attain this end it takes into account the correlative of being, that is, knowledge, and of knowledge not as coming within the province of logic or of mental philosophy, but as it is in relation to being or objective reality. In this respect metaphysics is synonymous with ontology. The science has also been considered as synonymous with psychology, and to denote that branch of philosophy which investigates the faculties, operations, and laws of the human mind.

METAZOA (met-a-zō'a), one of the two great sections into which Huxley divides the animal kingdom, the other being the Protozoa. The lowest of the Metazoa are the Porifera or sponges. That portion of the Metazoa which possess a notochord, constitute the subkingdom Vertebrata; the rest are invertebrate.

METEMPSYCHO'SIS, transmigration; the passage of the soul from one body to another. See Transmigration of the Soul.

ME'TEOR, a name originally given to any atmospheric phenomenon; it is now more usually applied to the phenomena known as shooting-stars, falling-stars, fireballs, or bolides, aerolites, meteorollites, meteoric stones, etc. It is now generally believed that these phenomena are all of the same nature, and are due to the existence of a great number of bodies, some of them very small indeed, revolving round the sun, which, when they happen to pass through the earth's atmosphere, are heated by friction and become luminous. Under certain circumstances portions of these bodies reach the earth's surface, and these are known as meteorites or meteoric stones. These stones consist of known chemical elements. They have this peculiarity, that whereas native iron is extremely rare among terrestrial minerals, it usually forms a component part in meteorites, and is known as meteoric iron. Exceptionally large showers of meteors appear in August and November every year, and the November showers exhibit a maximum brilliancy every 33 years. As to the connection of meteors with comets see Comets.

METEORIC IRON. See Iron (Native), and Meteor.

METEORIC STONES. See Meteor.

METEOROLOGY, the science or branch of knowledge that treats of atmospheric phenomena relating to weather and climate. The phenomena with which it deals and the instruments used in their observation are mainly these, viz.: temperature (thermometer), humidity (hygrometer), atmospheric pressure (barometer), wind (anemometer), rainfall (rain-gauge), and clouds. These phenomena are all referable to the action of the sun, and accordingly present variations depending upon locality (including the infinitely varied physical features of different places), the diurnal revolution of the earth upon its axis, and the annual revolution of the earth round the sun. It is the business of meteorology to examine the laws which regulate these variations. It pursues its inquiries in two directions, (1) with reference to the variations observed at different times in the same locality with the view of obtaining average results as to its climate—climatology, and (2) with reference to the variations observed in different localities at the same time with the view of arriving at the laws which regulate the changes in the weather—weather study. In the prosecution of this study observations are taken at the same hour of Greenwich time at a number of stations situated over a large extent of the earth's surface. These observations include readings of barometer, thermometer, hygrometer, rain-gauge, anemometer, etc., with non-instrumental observation of clouds. The results which indicate the phenomena existing at that hour at the several stations are tabulated, or registered, formed into weather charts, etc. These charts are made by putting down on a map readings taken at the same moment over a large tract of country, and joining by lines the points where the readings agree. Since the general use of the electric telegraph this branch has assumed great practical importance. By its means observations made at many distant places may be immediately communicated to one center, and men of science are thus enabled to forecast with considerable accuracy the weather which may be expected in certain districts. Such forecasts can be made with great accuracy in tropical and subtropical countries where the atmospheric conditions are very constant, and variations from the average are consequently easily observed. They are attended with much more difficulty in temperate countries. In the British Isles they are exceptionally difficult owing to the fact that on the side from which nearly all weather changes come, namely, the west, the existence of the Atlantic Ocean renders telegraphic warning of changes of weather impossible. The fact that a storm is travelling eastward may be telegraphed from America, but there is always a chance of its being dissipated or deflected long before it reaches the coasts of Europe. It having been observed, however, that a storm is always preceded by a fall of the barometer, the tendency to fall is observed some time before the minimum depression occurs; the notice of this tendency, together with observations of the wind and motions of cirrus clouds, enables storm warnings to be sent from observatories to the Meteorological office established by government in London, whence they are telegraphed to the various parts of the United Kingdom. The further eastward we travel in Europe the easier does the forecasting of the weather become. In the United States, where the majority of storms rise in the district to the west of the Mississippi, and are thus capable of easy observation, great accuracy has been attained. In Great Britain, the United States, and most civilized countries, systems of weather forecasting have now been established since about the year 1860, the name of Admiral Fitzroy being associated with the early days of the system in England. The United Kingdom is now divided into eleven districts, and a forecast for each of these is issued twice a day. Weather disturbances are generally cyclonic or anticyclonic in character. In the U.S., where the majority of storms rise in the district to the west of the Mississippi, and are thus capable of easy observation, great accuracy has been attained. The Weather Bureau originated in 1870, as an attachment to the Signal Service Office of the War Department. In 1891 it was transferred by law to the Department of Agriculture, its functions being closely allied to that interest. Its forecasts of the coming weather seldom extend beyond twenty-four to thirty-six hours in advance, and are telegraphed and published twice daily. See Cyclone, Anti-cyclone, Climate, etc.

METH'ODISTS, a sect of Christians founded by John Wesley, so called from the fact that the name was applied to Wesley and his companions by their fellow-students at Oxford, on account of the exact regularity of their lives, and the strictness of their observance of religious duties. The religious movement which resulted in the foundation of this sect began at Oxford in 1729, the chief leaders besides John Wesley being his brother Charles and George Whitefield (see Wesley, Whitefield). The first general conference of the Methodists was held in 1744, and the Methodists were constituted a legally corporate body in 1784. Their doctrines are substantially those of the Church of England. The appointment of a minister of the body to any place is always for three years. There are in addition to the ordained ministers lay preachers, leaders, trustees, and stewards. The body is governed by an annual confer-

ence, having at its head a president and secretary, whose term of office lasts but for a year. In each district the ministers hold half-yearly meetings, the several chairmen being appointed by the conference. There are also quarterly circuit meetings of ministers and lay officers. The supreme legislative and judicial power is vested in the conference to which the half-yearly and quarterly district and circuit meetings are subordinated. The number of members at Wesley's death was 76,968; but the denomination has increased with such marvelous rapidity, that there are said to be in different parts of the world above 28,000,000 adherents. The Methodists are especially numerous in North America, forming numerically the leading denomination in the United States. The Methodist Episcopal Church is the oldest and leading Methodist body in America. Since 1845 it has been divided into two branches, the Methodists of the southern states forming what is called the Methodist Episcopal Church, South.

METH'YL, the name given to the hypothetical radical of methyl alcohol which is contained in wood spirit. It is analogous to ethyl in its chemical character.

METHYLATED SPIRIT, spirit of wine containing 10 per cent of wood naphtha, which contains a large proportion of methylic alcohol. The naphtha communicates a disagreeable flavor, which renders it unfit for drinking, and for this reason it is admitted duty free. It is of much use in the arts as a solvent, for preserving specimens, in manufacture of varnishes, for burning in spirit-lamps, etc.

METHYLIC ALCOHOL, alcohol obtained by the destructive distillation of wood.

METONIC CYCLE, METONIC YEAR, the cycle of the moon, or period of nineteen years, in which the lunations of the moon return to the same days of the month: discovered by Meton, an Athenian mathematician who flourished 432 B.C.

METRE, rhythmical arrangement of syllables into verses, stanzas, strophes, etc. See Rhythm, Verse.

METRE, Mètre, a French measure of length, equal to 39.37 English inches or 3.28 feet, the standard of linear measure, being the ten-millionth part of the distance from the equator to the North Pole, as ascertained by actual measurement of an arc of the meridian.

METRIC SYSTEM OF WEIGHTS AND MEASURES. See Decimal System.

METRIC SYSTEM SIMPLIFIED, THE, the following tables of the metric system of weights and measures have been simplified as much as possible by omitting such denominations as are not in practical, everyday use in the countries where the system is used exclusively.

TABLES OF THE SYSTEM.

Length.—The denominations in practical use are millimetres (mm.), centimetres (cm.), metres (m.), and kilometres (km.).

10 mm. = 1 cm; 100 cm. = 1 m.; 1,000 m, = 1 km.

NOTE.—A decimetre is 10 cm.

Weight.—The denominations in use are grams (g.), kilos* (kg.), and tons (metric tons).

1,000 g. = 1 kg.; 1,000 kg. = 1 metric ton.

Capacity.—The denominations in use are cubic centimetres (c.c.) and litres (l.).

1,000 c.c. = 1 l. NOTE.—A hectolitre is 100 l. (seldom used).

Relation of capacity and weight to length. A cubic decimetre is a litre and a litre of water weighs a kilo.

APPROXIMATE EQUIVALENTS.

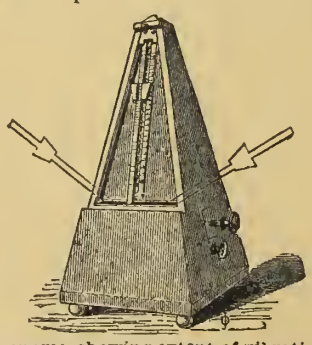
A metre is about a yard; a kilo is about 2 pounds; a litre is about a quart; a centimetre is about ½-inch; a metric ton is about same as a ton; a kilometre is about ⅝ mile; a cubic centimetre is about a thimbleful; a nickel weighs about 5 grams.

PRECISE EQUIVALENTS.

1 acre	= .40	hectar	.4047
1 bushel	= 35	litres	35.24
1 centimetre	= .39	inch	.3937
1 cubic centimetre	= .061	cubic inch	.0610
1 cubic foot	= .028	cubic metre	.0285
1 cubic inch	= 16	cubic cent. †	16.39
1 cubic metre	= 35	cubic feet	35.31
1 cubit metre	= 1.3	cubic yards	1.308
1 cubic yard	= .76	cubic metre	.7645
1 foot	= 30	centimetres	30.48
1 gallon	= 3.8	litres	3.785
1 grain	= .065	gram	.0648
1 gram	= 15	grains	15.43
1 hectar	= 2.5	acres	2.471
1 inch	= 25	millimetres	25.40
1 kilo	= 2.2	pounds	2.205
1 kilometre	= .62	mile	.6214
1 litre	= .91	quart (dry)	.9081
1 litre	= 1.1	quarts (liq'd)	1.057
1 metre	= 3.3	feet	3.281
1 mile	= 1.6	kilometres	1.609
1 millimetre	= .039	inch	.0394
1 ounce (av'd)	= 28	grams	28.35
1 ounce (Troy)	= 31	grams	31.10
1 peck	= 8.8	litres	8.809
1 pint	= .47	litre	.4732
1 pound	= .45	kilo	.4536
1 quart (dry)	= 1.1	litres	1.101
1 quart (liquid)	= .95	litre	.9464
1 sq. centimetre	= .15	sq. inch	.1550
1 sq. foot	= .093	sq. metre	.0929
1 sq. inch	= 6.5	sq. c'timetr's	6.452
1 sq. metre	= 1.2	sq. yards	1.196
1 sq. metre	= 11	sq. feet	10.76
1 sq. yard	= .84	sq. metre	.8361
1 ton (2,000 lbs)	= .91	metric ton	.9072
1 ton (2,240 lbs.)	= 1	metric ton	1.017
1 ton (metric)	= 1.1	ton (2,000 lbs)	1.102
1 ton (metric)	= .98	ton (2,240 lbs)	.9842
1 yard	= .91	metre	.9144

*Contraction for kilogram. †Centimetres.

MET'RONOME, an instrument consisting of a weighted pendulum moving on a pivot and set in motion by clockwork; invented about 1814, for the purpose of determining, by its vibrations, the quickness or slowness with which musical compositions are to be executed



Metronome, showing extent of vibrations.

so as to mark the time exactly. There is a sliding weight attached to the pendulum rod, by the shifting of which up or down the vibrations may be made slower or quicker. A scale indicates the number of audible beats given per minute, and this must be made to agree with the number attached to the music by its composer.

METROSIDE'ROS, a genus of trees and shrubs, one species known as iron-wood, is a tree, a native of Java and Amboyna. The trees of this genus have thick, opposite, entire leaves, and heads of showy red or white flowers.

Iron-wood.

METTERNICH (met'tèr-nih), Clemens Lothar Wenzel, Prince von Metternich, Austrian statesman, born 1773, died 1859. He represented Austria as ambassador at various European courts between 1801 and 1809. In the latter year he became minister of foreign affairs. In this capacity he negotiated the marriage of the Archduchess Maria Louisa with Napoleon, and conducted her to Paris. In 1813, after the French reverses in Russia, Austria gave in her adhesion to the other allied powers, and declared war against France. From this period the policy, not only of Austria, but in a great measure that also of the leading continental powers, was shaped by Metternich. He was one of the plenipotentiaries who signed the Treaty of Paris, and he presided at the congress of Vienna (1814). The object of his policy was to arrest the progress of what were called revolutionary principles. With this view he formed the scheme known as the Holy Alliance. He continued in power till, by the revolution of 1848, he was driven from office, and had to flee to England, where he remained till 1851, when he returned and lived in retirement at Vienna.

METZ, a town and important fortress of Alsace-Lorraine, on the Moselle, which here divides into several arms, 79 miles northwest of Strasburg. Pop. 60,186.

MEURTHE-ET-MOSELLE (meurt--ĕ mo-zel), a department of northeast France, formed in 1871 by uniting portions of the old departments of Meurthe and Moselle, in consequence of the cession by France to Prussia of a portion of her territory on the east under the treaty of Frankfort (10th May, 1871); area, 2024 sq. miles. The capital is Nancy. Pop. 484,722.

MEUSE (meuz), a European river, which rises in France, in the south of the department Haute-Marne, and flows through France, Belgium, and Holland. Its length, including windings, is 580 miles. It is navigable for about 460 miles.

MEUSE, a northeast department of France; area, 2404 sq. miles. Bar-le-Duc is the capital Pop. 283,480.

MEXICAN WAR, a war between the United States and Mexico in 1846–48, was the result of outrages upon American citizens, the recognition of the in-

dependence of Texas by the United States (1837), the annexation (1845) of Texas to the United States, in the face of bitter opposition on the part of Mexico, herself torn with revolution and contending factions, and finally of a dispute regarding the boundary of Texas, the United States claiming the Rio Grande as the boundary, while Mexico held that Texas did not extend farther south than the Nueces.

Gen. Zachary Taylor, with an army of 4000 men, arrived at the Rio Grande at a point opposite Matamoros, on March 28, 1846, where he erected Fort Brown. Gen. Ampudia, the Mexican commander at Matamoros, sent a note to Taylor, telling him to withdraw back to the Nueces under the alternative of war. Taylor refused, and in the meantime Gen. Arista superseded Ampudia, and sent part of his army across the river on April 24 to attack Taylor. Capt. Thornton, with a small party of American dragoons, sent up the river to watch the Mexican's movements, fell into an ambuscade on the 25th, a few were killed and the rest were captured. This was the formal beginning of the war. A messenger dispatched by Taylor soon reached Washington, and on May 11 President Polk sent a message to congress declaring that "Mexico has passed the boundary of the United States, has invaded our territory, and shed American blood upon American soil. War exists, and, notwithstanding all our efforts to avoid it, exists by the act of Mexico herself." Taylor, on May 8, with 3000 men, encountered Arista with 6000 at Palo Alta, defeating him, with a loss of forty-four Americans, and 600 Mexicans. On the 9th Taylor met the Mexicans at Reseca de la Palma, and won another victory, the American loss being 110 and the Mexican estimated at 1000. Taylor captured 100 prisoners, eight pieces of artillery and a large quantity of military stores. On the 18th Taylor crossed the Rio Grande and took possession of Matamoros, which had been evacuated by the retreating Mexicans.

Taylor, now promoted to be a major-general, remained at Matamoros, getting reinforcements, which were mostly volunteers, and in September, 1846, marched to Monterey. On the 19th the army encamped before the city, an attack was begun on the 20th, and after desperate fighting Ampudia surrendered the city on the 24th. An armistice of eight weeks, subject to revocation by either government at any time, was then agreed to, the Mexicans being allowed to take their army out of the city. As Taylor was making preparations to march against San Luis Potosi, orders came to him which stripped him of most of his best troops, which were sent to Gen. Scott, who was to invade Mexico from Vera Cruz. Taylor, encamped at Auga Neva, near Saltillo, learning that Santa Anna, who had been put in command of the Mexican army in the revolution which deposed President Paredes in the summer of 1846, and who became president in December of that year, was marching with 20,000 men to attack him, fell back a few miles to a strong position at Buena Vista, with his force of 5,000, mostly volunteers, who had not participated in any of his battles. Here Taylor was assailed by Santa Anna on February 22, 1847, but after fierce fighting, Santa Anna retreated.

This was the end of the fighting under Taylor, and closed the campaign in the valley of the Rio Grande. Nevertheless, it gave Taylor the prestige which gained him the presidential nomination in the whig convention of 1848, and the election in that year.

Two months after Taylor's first battle on the Rio Grande, it was determined to prosecute the war on a larger scale, and General Winfield Scott, the commanding general of the American army, was sent to invade Mexico from a base at Vera Cruz. Vera Cruz was invested, and on the refusal of the Mexican general, Landaro, in command of the city, to capitulate, Scott opened fire on March 22, and after a four days' terrific bombardment the city was surrendered with 5000 prisoners and 400 pieces of artillery.

On April 8, 1847, Scott began his memorable march to the City of Mexico. At a position of great natural strength in the mountain pass of Cerro Gordo, Scott, with 8500 men, encountered Santa Anna with 12,000 on April 17, stormed Santa Anna's position on the 18th, and captured 3000 prisoners, 4500 stand of arms and 43 cannon. Scott paroled his prisoners, captured Jalape without resistance on the 19th, occupied Perote, on the summit of the Cordilleras, on the 22d, and entered Puebla on May 15

The arrival of Gen. Franklin Pierce with re-inforcements of about 2500 men in August set Scott's army again in motion. On the 6th of that month the march on the City of Mexico was resumed. On the 20th, Contreras and Cherubusco were captured after fierce fighting, 3000 prisoners being taken, including eight generals, two being ex-presidents, and thirty-seven pieces of artillery. An armistice was granted to Santa Anna on August 23, and Nicholas P. Trist, a special commissioner from Polk, opened negotiations with the Mexicans for peace. No agreement being reached and Santa Anna utilizing the cessation of operations by strengthening his fortifications, Scott resumed hostilities. On September 8 Molino del Rey was stormed by Worth, and on the 12th, after a two days' battle, Chapultepec, by Scott, was also carried by storm.

The Americans entered the City of Mexico on the 14th, the Mexican government having abandoned it on the previous day. There were some disturbances in the city on that day, and guerrilla fighting under Santa Anna's direction afterward, but the general result could not be changed. On February 2, 1848, at Guadalupe Hidalgo, a small town near the city of Mexico, a treaty of peace was signed by Trist, on the part of the United States, and three commissioners representing Mexico, whereby the southwest boundary of Texas was fixed at the Rio Grande, the line claimed by Texas and the United States, and New Mexico and California were added to the United States, for which this country paid $15,000,000 to Mexico, and assumed the payment of claims amounting to $3,250,000 of American citizens against Mexico. The American flag was lowered in the city of Mexico on June 12, 1848, and the Mexican flag was run up. It was saluted by the American troops, who at once marched out of the city, and the evacuation of Mexico began. An addition of 545,783 square miles to the country's domain was made and the boundary of the United States was advanced to the Pacific.

MEX'ICO, or MEJICO (mā-hi-kō), a republic of North America, between the United States and Central America, and having on the east the Gulf of Mexico, on the west the Pacific Ocean; area estimated at 742,148 sq. miles. Nearly one-half of this territory lies within the torrid zone, but the peculiar geological structure of the republic, that of an elevated plateau rising into volcanic peaks, supported by the two branches of the Mexican Cordilleras, the northeast and northwest, causes the greatest diversity of climate. The largest river is the Rio Grande del Norte, forming part of the boundary with the United States. Mexico is a country of great natural resources. There is a vast variety of useful indigenous trees and plants, and many others have been introduced. The principal agricultural products are maize and other corn, sisal-hemp, tropical fruits, cotton, coffee, sugar, tobacco, indigo, vanilla, cochineal, etc. Large numbers of cattle are reared, especially in the north. The chief industries (besides agriculture and mining) are the manufacture of cottons and woolens, pottery, tobacco and cigars, leather, soap, sugar-refining, brewing, and distilling (principally from the agave or maguey), etc. Mexico is rich in minerals, especially gold and silver, which are far the most valuable of the exports.

The republic is divided into twenty-seven states; two territories; and what is called the Federal District, which comprises Mexico, the capital of the republic, and a small portion of adjoining territory. The population in 1908 was about 15,000,000. All religions are tolerated, but no religious body can own landed property. Primary education is compulsory, but the law is not strictly enforced. The schools are supported partly by the central and partly by the state government, and partly by charitable foundations supported by voluntary subscriptions. The present form of government is that of a federal republic, each member of which manages its own internal concerns. The supreme executive power is vested in a president, who has powers very similar to those of the president of the United States. There is an army numbering on the peace footing some 30,000 men. The chief money unit is the silver peso or dollar, nominal value 50c.

Prior to 1521 Mexico was inhabited by an Aztec race and ruled by native emperors. (See Aztecs.) This race had attained a remarkable degree of civilization, and interesting remains of their

architecture are existent in the teocallis or pyramids of Cholula, Pueblo, and Papantla. In 1521 Mexico fell into the hands of the Spaniards under Hernando Cortez. Cortez called it New Spain, and was created captain-general, but in 1535 was displaced by a viceroy. From that date till 1821 the country was one of the viceroyalties of Spanish America, and governed by a series of viceroys possessed of almost absolute-power. The spirit of discontent engendered by the selfishness of the Spanish rule manifested itself in open rebellion, when, in 1808 the deposition of King Ferdinand by Napoleon and the unsettled state of affairs in Spain afforded an opportunity. This rebellion, begun by a priest, Hidalgo, and continued with more or less vigor till 1821, secured in that year the independence of Mexico. After an unsuccessful attempt to secure a Bourbon prince for the throne, Iturbide, the chief of the insurgents, caused himself to be proclaimed emperor, May 18, 1822, under the title of Augustin I., but was forced to abdicate, March, 1823. A new form of government, on federal republican principles, was then established, the constitution being adopted and proclaimed in 1824. Since the acquisition of its independence Mexico has had a most unsettled history. The republican form of government has been interrupted by numerous dictatorships, and by the brief rule of the Austrian archduke Maximilian as emperor from 1864 till his execution in 1867; and till recently there has been almost incessant civil war. It has also been at war with Spain (1829), the United States (1847–48), the allied armies of Spain, France, and England (1861), and with France (1862).

MEXICO, capital of the republic of Mexico, is situated within the state of Mexico in the Federal district (461 sq. miles), about 7400 feet above the level of the sea, near several lakes. It is on the site of the ancient city of Tenochtitlan, which was destroyed on the capture of Mexico by the Spaniards in 1521. The principal public buildings are the cathedral, the palace of government, the college of mines, the mint, the townhouse, the university, etc. Mexico enjoys a mild climate, and a pure and healthy atmosphere. Pop. estimated at 350,000.

MEXICO, one of the states of the Mexican republic; area, 7848 sq. miles. It lies in the south of Mexico, and forms an elevated region, one of the best cultivated and most thickly peopled part of the republic. Its capital is Toluca, but it embraces within its boundaries the city and Federal District of Mexico. Pop. 924,457.

MEXICO, Gulf of, a large bay or gulf of the Atlantic, oval in form, and nearly surrounded by a continuous coast line 3000 miles in length, of the United States and Meixco; estimated area, 800,000 sq. miles. It gives name to the Gulf Stream, which issues from it by the Strait of Flordia.

MEYERBEER (mī'ėr-bār), Giacomo, musical composer, born in Berlin 1791, died at Paris 1864. His father was of Jewish descent. He gave early proof of his devotion to music, and at nine was regarded as one of the best pianists in Berlin. He studied under Bernhard Anselm Weber at Berlin, and the Abbé Volger at Darmstadt, where he began his life-long friendship with Karl Maria von Weber. His first two operas, Jephtha's Daughter and Abimelek, the one produced at Munich and the other at Vienna, having failed, he went to Italy. There he rapidly composed a series of operas in the Italian style, which were generally well received: In 1826 he went to Paris. There he produced Robert le Diable (1831); Les Huguenots (Paris, 1836); Le Prophète (1849); and L'Africaine (1865). In these Parisian operas he ceases to be an imitator of the Italians, and it is upon them that his fame as a composer is founded. Besides his operas Meyerbeer wrotc a great number of songs, an oratorio, cantatas, a Te Deum, etc.

MEZZOTINT, a particular manner of engraving on copper or steel in imitation of painting in Indian ink, the lights and gradations being scraped and burnished out of a prepared dark ground. The surface of the plate is first completely covered with minute incisions, so that it would give in this condition a uniform black impression. The design is then drawn on the face, and the dents are erased from the parts where the lights of the piece are to be, the parts which are to represent shades being left untouched or partially scraped according to the depth of tone.

MIAMA (mī-a'mi), a river of the United States, in Ohio, joining the Ohio below Cincinnati; length 150 miles.

MIASMA. See Malaria.

MICA, a mineral of a foliated structure, consisting of thin flexible laminæ or scales, having a shining, pearly, and almost metallic luster. These are sometimes parallel, sometimes interwoven, sometimes wavy or undulated, sometimes representing filaments. The laminæ of mica are easily separated, and are sometimes not more than the 300,000th part of an inch in thickness. The plates are sometimes as large as 36 inches diameter. They are employed in Russia for window panes, and in that state are called muscovy-glass. Mica enters into the composition of the crystalline rocks, as granite, gneiss, mica schists, chlorites, talcose rocks and occurs in trappean and volcanic products. It is found also in many sedimentary rocks, as shales and sandstones, giving them their laminated texture. In the latter case, it is derived from the disintegration of the crystalline rocks. It is essentially a silicate of alumina, with which are variously combined small proportions of the silicates of potash, soda, lithia, oxide of iron, oxide of manganese, etc., in accordance with which several species have been constituted, as common or potash mica, lithia mica, magnesia mica, pearl mica. Regarded as minerals, varieties of mica have received the names of biotite, lepidolite, muscovite, lepidomelane, steatite, etc.

MICACEOUS ROCKS, rocks of which mica is the chief ingredient, as mica slate and clay slate.

MICAH, the sixth of the minor prophets, a member of the tribe of Judah. He prophesied in the reigns of Jotham, Ahaz, and Hezekiah, and was a contemporary of Isaiah. His style is pure and correct, his images bold and vivid.

MICA SCHIST, MICA SLATE, a metamorphic rock, composed of mica and quartz; it is highly fissile and passes by insensible gradations into clay-slate.

MICHAEL, St. (Hebrew, "he who is equal to God"), in Jewish theosophy, the greatest of the angels (Daniel x. 13, 21; xii. 1), one of the seven archangels. In the New Testament he is spoken of as the guardian angel of the church (Jude, ver. 9; Rev. xii. 7). There is a festival of St. Michael and All Angels in the Western Church, held on 29th September. (See Michaelmas.)—The order of St. Michael and St. George is a British order of knighthood dating from 1818. It consists of Knights Grand Cross (G.C. M.G.), Knights Commanders (K.C.M.G.) and Companions (C.M.G.). The ribbon of the order is blue with a red stripe down the center. The badge is a white star of seven double rays, having in the center a representation of St. Michael overcoming Satan.

MICHAEL, St. or **SÃO MIGUEL,** the largest of the Azores, famous for the production of oranges and lemons, of which it exports 120,000 boxes annually. The population is about 115,000; capital, Ponta Delgado.

MICHAEL ANGELO. See Buonarotti.

MICHAELMAS, the feast of St. Michael the Archangel (see Michael, St.). It falls on the 29th of September, and is supposed to have been established toward the close of the 5th century.

MICHIGAN (mish'i-gan), one of the north-central United States; area, 58,915 sq. miles. It consists of two separate peninsulas—one projecting eastward between Lakes Superior, Huron, and Michigan, and bounded inland by Wisconsin; the other projecting northward between Lakes Michigan, Huron, St. Clair, and Erie, and bounded on the

Seal of Michigan.

south by Ohio and Indiana. It has upward of 1100 miles of lake-coast, with numerous bays and excellent harbors The northwestern peninsula, occupying nearly a third of the whole surface, is comparatively elevated, and presents a succession of mountains and lakes, plains, rivers, and forests. The surface

of the other peninsula is gently undulating, and rises gradually from the lakes toward its center. It is mostly covered with fine forests of timber, interspersed with plains and prairies. Agriculture is the staple industry, the chief cereals being wheat and Indian corn. The remaining crops include barley, buckwheat, rye, hay, potatoes, tobacco, hops, etc. After agriculture, lumbering is perhaps the chief employment. The cultivation of fruit-trees is receiving increasing attention, and considerable quantities of apples and peaches are now exported. The mines in the northwestern peninsula produce hæmatite ore, from which is obtained great quantities of excellent iron; and here also are seated very rich copper mines. Salt of unsurpassed purity occurs in a basin extending over 8000 sq. miles. Manufacturing industries are varied and important. The important commerce of the state is greatly benefited by its large navigable waters and by its extensive system of railways, which measure some 7500 miles. The capital is Lansing, but the commercial metropolis and much the largest city is Detroit, Grand Rapids being next in size. In the primary schools education is free, but a fee may be required for advanced studies in higher schools. At the head of the educational institutions is the Michigan University, situated at Ann Arbor. Remains of ancient mines and mining implements have been found within the present limits of the state. The white discoverers and first settlers were French missionaries and fur traders, some of whom visited the site of Detroit as early as 1610. In 1641 French Jesuits found their way to the falls of the Saint Mary. The first actual settlement by Europeans within the limits of the state was the mission at Sault Sainte Marie, founded by Father Marquette and others in 1668. Three years later Michilimackinac (now Mackinac) was established. In 1679 and 1686 forts were built at the mouth of the Saint Joseph, and at the outlet of Lake Huron, and in 1701 Antoine de la Mothe-Cadillac founded Detroit. The territory, with other French possessions, fell into the hands of the English at the end of the French and Indian war. Detroit was occupied in 1763, but early in May of that year the Indians, loyal to the French, rose under Pontiac, massacred the garrison at Mackinac, and besieged Detroit for about five months. During the revolution Detroit was the starting point for many Indian expeditions which laid waste the American frontier. After 1784 the Indians of the northwest, deeming themselves unjustly treated by the Americans, waged a bloody warfare against the western settlements till they were brought to terms by General Wayne in 1795. By the treaty of peace concluded in that year, they ceded large tracts of land on the eastern shore of the southern peninsula of Michigan and in the north to the United States. On June 30, 1805, Michigan was set off as a separate territory, with substantially its present limits, and Gen. William Hull was appointed governor. During the war of 1812 the inhabitants were harassed by the British and Indians; Mackinac was captured by the British; Detroit was surrendered by Governor Hull; and at Frenchtown, in 1813, a number of American prisoners of war were massacred by the Indians. In 1819 the territory was authorized to send a delegate to congress, and in 1823 the system of rule by a governor and three judges was replaced by that of a governor and a council of nine, selected from eighteen chosen by the people; in 1825 the council was increased to thirteen, and after 1827 the members were elected by popular vote. In 1835 a state constitution was adopted by a convention called for that purpose, but the admission of Michigan into the Union was delayed by a dispute with Ohio concerning a strip of land on the southern boundary. There was danger that the dispute would lead to bloodshed, but in 1836 congress agreed to admit Michigan upon condition that she should surrender her claim to the disputed territory and accept in lieu thereof a larger area in the Upper Peninsula. The first convention called to consider this proposal, January 26, 1836, rejected it, but it was accepted by a second in December, 1836, and on January 26, 1837, Michigan was admitted into the Union.

The opening of the Erie canal (1825) poured a vast stream of immigration into Michigan. The first bank was established at Detroit in 1818, and by 1837 there were fifteen such institutions. The state undertook the building of three railways across the Lower Peninsula, but after running greatly into debt was forced in 1846 to sell them. In 1847 the capital was removed from Detroit to Lansing. Legislation after the civil war was concerned largely with the taxation of corporations. In 1889 the Australian ballot was adopted. A factory inspection act was enacted in 1894, and a stringent anti-trust law in 1899. Michigan has consistently supported the republican party since its formation, except for three lapses—in 1882 and 1883, when the democrats and greenback party in fusion elected their candidate for governor, and in 1890, when the democrats alone carried the state. Pop. 2,875,000.

MICHIGAN, Lake, the second largest of the great lakes of North America. It is wholly within the United States, having the state of Michigan on the east and northwest, Wisconsin and Illinois on the west, and Indiana on the south. On the northeast it communicates with Lake Huron by the narrow strait of Mackinaw. It is 350 miles long, and on an average 60 miles broad; area, estimated at 26,000 sq. miles. The lake is 578 feet above sea-level; the greatest ascertained depth is about 1000 feet.

MICHIGAN CITY, a city in Laporte co., Ind., 56 miles east of Chicago, Ill.; on Lake Michigan, and on the Lake Erie and Western, the Chicago, Indianapolis and Louisville, and the Michigan Central railroads. It is the seat of the northern Indiana state prison, and has a United States life-saving station. There are good transportation facilities, to which are due the city's large commercial interests, the trade being principally in lumber, salt, and iron ore. The manufactures of railroad cars, chairs, hosiery, and knit goods, lumber and products of lumber are important. Pop. 17,620.

MICHIGAN STATE AGRICULTURAL COLLEGE a coeducational state institution at Lansing, Mich., the oldest institution of its kind in the country. It was established in pursuance of a constitutional provision in 1855, and was opened in 1857. There are three courses, agricultural, mechanical, and women's or domestic science. Farmers' institutes are carried on annually in each county of the state.

MICHIGAN, University of, a coeducational state institution at Ann Arbor, Mich., chartered in 1837. The institution was opened in 1841, graduating its first class in 1845. It is intended primarily for the higher education of residents of the state, but receives students from all parts of the country on payment of a small tuition fee. The governing body is a board of regents, elected for terms of eight years. The university is organized in seven departments: literature, sciences, and the arts, engineering, medicine and surgery, law, pharmacy, the Homœopathic Medical College, and the College of Dental Surgery. Each department has its special faculty, with representation on the University Senate, which considers questions of common interest. The degrees conferred are bachelor and master of arts, science, and law; civil, mechanical, and electrical engineer; and doctor of philosophy, science, medicine, dental surgery, and dental science. The university was a pioneer in coeducation, women having first been admitted in 1870. They now constitute about one-fifth of the student body. Coeducation at the university has been uniformly successful. Entrance is based upon examination or upon certificates from accredited schools. The university has no dormitories and no commons. Recent extension of the elective system has resulted in a considerable loss in the choice of Latin, Greek, and mathematics, and a marked gain in the modern languages.

MICHOACAN', one of the states of Mexico, on the Pacific Coast; area, 25,689 sq. miles. It has rich mines of gold, silver, and other minerals. Capital Morelia. Pop. 930,033.

MICKIEWICZ (mits-kyā'vich), Adam, Polish poet; born 1798, died 1855. He wrote several epics, and is regarded as the chief national poet of his country.

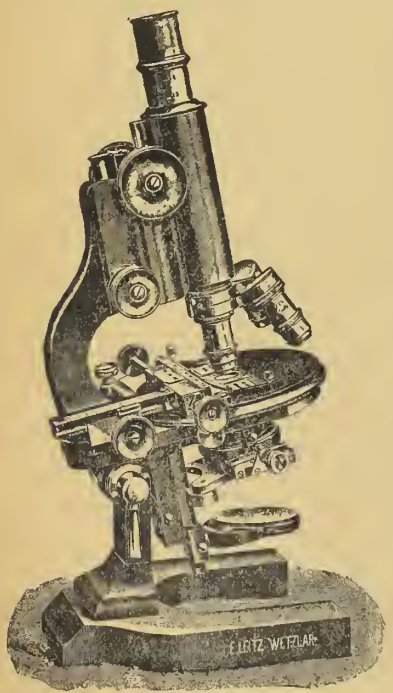
MICMACS, a tribe of North American Indians, mostly inhabiting New Brunswick and Nova Scotia, and numbering some 3600. Their language has been reduced to writing, and a dictionary of it has been compiled.

MICROM'ETER, an instrument used with a telescope or microscope, for measuring very small distances. Micrometers are variously constructed; but in perhaps the most common form (the filar micrometer) the principle of operation is that the instrument moves a fine thread or wire parallel to itself in the plane of the image of an object, formed in the focus of a telescope, the wire or thread being moved by means of

delicate screws with graduated heads, so that the distance traversed by the wire can be measured with the greatest precision. The micrometer is of the utmost value to the astronomer, and in trigonometrical surveys, and military and naval operations.

MICROPHONE, an instrument to make faint sounds more audible. The most sensitive conductor of sound is willow-charcoal, dipped when at white-heat into a bath of mercury. A piece of charcoal, thus prepared, placed vertically between two carbon-blocks which are connected with a telephone, is a common form of microphone, and magnifies sounds, otherwise inaudible, enormously.

MICROSCOPE, an optical instrument consisting of a lens or combination of lenses (in some cases mirrors also) which magnifies objects and thus renders visible minute objects that cannot be seen by the naked eye, or enlarges the apparent magnitude of small visible bodies, so as to enable us to examine their minute texture or structure. For a good microscope an achromatic combination of lenses to form an object-glass and a well-made eye-piece are necessary. The magnifying power of an instrument may be increased by (1) increasing the magnifying power of the object-glass; (2) increasing the



Compound microscope.

power of the eye-piece; (3) increasing the distance between the objective and the eye-piece. The simplest form of microscope is nothing more than a lens or sphere of any transparent substance, in the focus of which minute objects are placed. When a microscope consists of two or more lenses, one of which forms an enlarged image of objects, while the rest magnify that image, it is called a compound microscope. A binocular microscope is a miscroscope with two tubes starting from a point above the object-glass, which is simple, and gradually diverging to fit the eyes of the observer. The rays of light arising from the object under observation are caused to diverge into the two tubes by a prism. A solar microscope has a reflector and a condenser connected with it, the former being employed to throw the sun's rays on the latter, by which it is condensed to illuminate the object placed in its focus. A lucernal microscope is the same in principle as the solar, except that a lamp is used, instead of the sun, to illuminate the object. When an oxyhydrogen lime-light is used it is called an oxyhydrogen microscope.

The magnifying power of a microscope varies inversely with the size of the objective, the smaller the objective the larger being the magnification. In looking into a compound microscope the observer sees only two dimensions—length and breadth. Magnification, therefore, is expressed in diameters, or areas. An object which is magnified 1,000 diameters is really magnified 1,000,000 times, that is, 1,000 × 1,000 times, 1,000 being the diameter of the magnification. The highest power lenses magnify 2,800 to 3,000 diameters. High powers lose in definition, so that often a lower power will show more detail than a higher.

MICROTASIM'ETER, an instrument for measuring extremely small variations, in the expansion or contraction caused by heat, moisture, etc. It has been used by astronomers to indicate the altered radiation of heat from the sun during an eclipse or when the atmosphere is filled with moisture.

MIDAS, in Greek mythology, king of Phrygia, whose request that whatsoever he touched should turn to gold was granted by the god Dionysus (Bacchus). In this way even his food became gold, and it was not until he had bathed in the Pactolus that the fatal gift was transferred to the river. Another legend is that, in a musical contest between Pan and Apollo, Midas, who was umpire, decided in favor of the former; whereupon the angry Apollo bestowed upon the presumptuous critic a pair of ass's ears.

MIDDLE AGES, a term applied loosely to that period in European history which lies between the ancient and modern civilizations. With some writers the period began when the western Roman Empire was overthrown by Odoacer in 476; with others when Charlemagne was crowned emperor of the West in 800; while yet others make it begin when the Frankish Empire ended in 843. The end of the period is variously conceived to have closed with the Reformation in Germany; with the discovery of America by Columbus; with the invention of printing; and with the end of the Thirty Years' war in the Peace of Westphalia (1648). The outstanding political events of Middle Ages include the rise of the German, French, and Italian nationalities; the rise of the Norman power, and the conquest of England by William of Normandy; the crusades; and the establishment of the Holy Roman (or German) Empire. The two most characteristic institutions which grew up into widespread power during the Middle Ages were the feudal system (which see), the monastic institutions and the power of the papal hierarchy.

MIDDLESBROUGH, a river port and mun., parl., and county borough of England. Pop. 91,300.

MIDDLESEX, the metropolitan county of England, one of the smallest in the kingdom, but among the most important, from its containing the greater portion of the city of London; area, 181,317 acres. Pop. 3,585,139.

MIDDLETOWN, a city (settled in 1650, incorporated in 1784); formerly a port of entry, and one of the county-seats of Middlesex co., Conn.; on the Connecticut river opposite Portland, with which it is connected by an iron railway bridge, and on the N. Y., N. H., and Hart. railroad; 15 miles s. of Hartford, 24 miles n.e. of New Haven. Pop. 11,310.

MIDDLETOWN, a city in Orange co., N. Y., on the Wallkill river, and the Erie, the N. Y., Ont. and W., and the N. Y., Sus. and West. railways; 24 miles w.s.w. of Newburg, 66 miles n.n.w. of New York. It is in an agricultural and dairy region, is the seat of the New York Homœopathic Hospital for the insane. Pop. 17,315.

MIDDLETOWN, a city in Butler co., Ohio, on the Miami river, and the Cin., Ham. and Day., the Cleve., Cin., Chi. and St. L., the Cin. and Day., and the Middle. and Day. railways; 32 miles n. of Cincinnati. There are paper-mills, tobacco factories, paper-bag factories, foundry, planing-mill, and flour-mills. Pop. 11,140.

MIDGE, the ordinary name given to numerous minute species of flies, resembling the common gnat. The eggs are deposited in water, where they undergo metamorphosis.

MIDHAT PASHA, a Turkish statesman, born 1822, died 1884. He was educated in Constantinople; entered the Turkish civil service; attracted attention by his administrative capacity; became governor of Bulgaria in 1862, and was ultimately in 1876 created grand vizier. In this position he was supreme in the palace, and caused Abdul Aziz and Murad V. to be deposed. In the following year, however, he was himself banished; and in 1881, after a judicial investigation into the murder of Adbul Aziz, he was condemned and exiled to Arabia, where he died.

MIDIANITES, an Arabian tribe, represented in the Old Testament as the descendants of Midian, son of Abraham by Keturah (Gen. xxv.2), and described as engaged at an early period in commerce with Egypt. They dwelt in the land of Moab (Arabia Petræa), to the southeast of Canaan. One portion of them inhabited the country on the east of the Dead Sea.

MIDNAPUR, an administrative district of Bengal, with an area of 5082 sq. miles. Pop. 2,517,802.

MIDRASH, is the general name given among the Jews to the exposition of the hidden meaning of the Scriptures. It includes any and every ancient exposition on the law, psalms, and prophets.

MIDWIFERY, a branch of medicine or

surgery, also called obstetrics, being the art of aiding and facilitating childbirth, and of providing for the preservation of the health and life of the mother during and after her delivery.

MIGRATION OF ANIMALS, the phenomenon of certain animals moving, either periodically or at irregular times and seasons, from one locality or region to another, sometimes far distant. Migration has been observed in mammals, birds, fishes, and insects, but it probably occurs in other groups of the animal world, the observation of which is less easy than that of the higher forms. The buffaloes or bisons of North America used, it would seem, to migrate in herds from one place to another. Many fishes (for example salmon, lampreys, etc.) make periodical journeys from the sea toward fresh-water streams and rivers for the purpose of depositing their eggs. The migratory habits of locusts, and those of certain species of ants, etc., exemplify migration among insects; but among the birds we meet with the best-marked instances of migration. With sea-birds (for example, puffins), the day of arrival or that on which they appear in certain localities may be prognosticated with perfect safety; and similarly, the day of departure appears in some birds (for example, swifts), to be almost as accurately timed. Storks have been known to return regularly to their old nests, and the same has been observed of swallows. The mode in which birds migrate varies greatly even in the same species of bird. The swallows migrate in bodies comprising vast numbers, and so also do cranes, wild ducks, geese, and many other forms. The migratory flight is generally made against the wind; and certain species of birds, as quails for instance, appear to wait for favoring winds, and to delay their flight by resting on islands when the wind is unfavorable. Regarding the causes of migration, science cannot at present definitely pronounce. Probably a combination of causes, or different causes in different cases, as scarcity or plenty of food-supply, the powerful influences of temperature, and the influence of the breeding-season, may contribute to the migratory "instinct." It has been further suggested by Mr. A. R. Wallace, that this migratory habit or instinct has gradually been acquired since a time when the breeding and feeding grounds of the animals were coincident, these having been gradually separated by climatic and geological changes.

MIKADO (mi-kä′dō), the emperor of Japan, the spiritual as well as temporal head of the empire. See Japan.

MIL'AN, a city of Northern Italy, capital of the province of its own name. The city is entered by eleven gates, several of which are magnificent. The chief open space is the Piazza d'Armi (Place of Arms), part of which has been made into an amphitheater capable of containing 30,000 spectators. The castle, now a barrack, fronts the Piazza d'Armi on one side; at the opposite side is the Porta Sempione with the fine Arco Sempione or Arco della Pace, built of white marble. The Piazza del Duomo, in front of the cathedral, is the center of the traffic of Milan. Among the public edifices the first place belongs to the Duomo or cathedral, a magnificent structure, inferior only in size to St. Peter's at Rome and the cathedral of Seville. It was begun in 1386, and was

Milan—The Cathedral, from the Corso Vittoria Emanuele.

only completed in 1805. There are many other fine edifices, among them being Palazzo di Brera or Delle Scienze Lettere ed Arte, containing the picture-gallery and the library of the academy (200,000 vols.); and the Ambrosian Library, the earliest, and still one of the most valuable public libraries in Europe. The chief theater is La Scala, accommodating 3600 spectators. The manufactures include silks, cottons, lace, carpets, hats, earthenware, jewelry, etc. Pop., including suburbs, 491,460.

MILDEW, a name given to various minute parasitic fungi producing a state of disease or decay in living and dead vegetable matter, and in some manufactured products of vegetable matter, such as cloth and paper. Numerous cultivated crops, fruit-trees, etc., suffer from mildew.

MILE, a measure of length or distance, and used as an itinerary measure in almost all countries of Europe. The English statute mile contains 8 furlongs, each 40 poles or perches, of 5½ yards. The statute mile is therefore 1760 yards, or 5280 feet. It is also 80 surveying chains, of 22 yards each. The square mile is 6400 square chains, or 640 acres. The Roman mile was 1000 paces, each 5 feet; and a Roman foot being equal to 11.62 modern English inches, it follows that the ancient Roman mile was equal to 1614 English yards, or very nearly $\frac{1}{12}$ths of an English statute mile. The ancient Scottish mile was 1984 yards = 1.127 English miles; the Irish mile, 2240 yards = 1.273 English miles; the German short mile is 3.897 English miles, the German long mile 5.753. The geographical or nautical mile is the sixtieth part of a degree of latitude, or 2028 yards nearly.

MILES, Nelson Appleton, American soldier, was born at Westminster, Mass., in 1839. He served in the battle of Fredericksburg, was wounded at Chancellorsville, and took part in the campaign before Richmond in 1864. In July, 1866, he was appointed colonel, fortieth infantry, regular army; and on March 2, 1867, he was brevetted brigadier and major-general, U. S. A., for bravery at Chancellorsville and Spottsylvania. During the succeeding year General Miles' chief service was against the Indians in the west. In 1886 he made a campaign against the Apaches and compelled their chiefs, Geronimo and Natchez, to surrender. In 1890 he became a major-general, and in 1895, he became the commanding general of the army. In 1897 he represented the United States army at Queen Victoria's jubilee. During the war of 1898 against Spain he directed in person the occupation of Porto Rico. He was raised to the rank of lieutenant-general in February, 1901, in pursuance of an act of congress of June 6, 1900. In 1902–03 he made a tour of inspection in the Philippine Islands.

MILESIANS, a name sometimes given to natives of Ireland, a portion of whose inhabitants, according to Irish tradition or legend, are descended from Milesius, a fabulous king of Spain, whose two sons conquered the island 1300 years before Christ, establishing a new nobility.

MILHAU (mē-yō). See Millau.

MILITARY LAW. See Martial Law.

MILITARY ORDERS. See Orders (Military).

MILITARY SCHOOLS, may be divided into two classes—regimental schools, which give training in the ordinary branches of education to soldiers and their children; and schools which are intended to prepare pupils for the duties of military service. The Royal Academy at Woolwich gives instruction in the special duties of the artillery and engineer branch of the service; the college at Sandhurst for infantry and cavalry; and the Greenwich Naval college for marine artillery. Schools for practical instruction to officers and men are also established: for gunnery, at Shoeburyness; for military engineering, at Chatham; for musketry, at Hythe; for army surgeons, at Netley; and there are also establishments for the education of officers of the regular army and of the auxiliary forces in the advanced branches of their profession in all the large garrison towns of the United Kingdom. Similar institutions exist in all European countries, in the United States (the Military Academy, West Point), and in Canada, where there is a military college at Kingston, and eight military schools in the different provinces.

MILITARY ACADEMY, United States, at West Point. Each senator, congressional district, and territory—also the District of Columbia, Porto Rico and Alaska—is entitled to have one cadet at the academy. There are also forty appointments at large, specially conferred by the president of the United States. The number of students is thus limited to 523.

Appointments are usually made one year in advance of date of admission, by the secretary of war, upon the nomina-

tion of the senator or representative. These nominations may either be mad after competitive examination or given direct, at the option of the representative. The representative may nominate two legally qualified second candidates, to be designated alternates. The alternates will receive from the war department a letter of appointment, and will be examined with the regular appointee, and the best qualified will be admitted to the academy in the event of the failure of the principal to pass the prescribed preliminary examinations. Appointees to the Military Academy must be between seventeen and twenty-two years of age, free from any infirmity which may render them unfit for military service, and able to pass a careful examination in reading, writing, spelling, English grammar, English composition, English literature, arithmetic, algebra through quadratic equations, plane geometry, descriptive geography and the elements of physical geography, especially the geography of the United States, United States history, the outlines of general history, and the general principles of physiology and hygiene; or in lieu thereof to submit a certificate of graduation from a public high school or state normal school, or a certificate that the candidate is a regular student of an incorporated college or university.

The course of instruction, which is quite thorough, requires four years, and is largely mathematical and professional. The principal subjects taught are mathematics, English, French, drawing, drill regulations of all arms of the service, natural and experimental philosophy, chemistry, chemical physics, mineralogy, geology, electricity, history, international, constitutional, and military law, Spanish, civil and military engineering, art and science of war, and ordnance and gunnery. About one-fourth of those appointed usually fail to pass the preliminary examinations, and but little over one-half the remainder are finally graduated. The discipline is very strict—even more so than in the army—and the enforcement of penalties for offenses is inflexible rather than severe. Academic duties begin September 1 and continue until June 1. Examinations are held in each December and June, and cadets found proficient in studies and correct in conduct are given the particular standing in their class to which their merits entitle them, while those cadets deficient in either conduct or studies are discharged.

From about the middle of June to the end of August cadets live in camp, engaged only in military duties and receiving practical military instruction. Cadets are allowed but one leave of absence during the four years' course, and this is granted at the expiration of the first two years. The pay of a cadet is $609.50 per year, and, with proper economy, is sufficient for his support. The number of students at the academy is usually about four hundred and seventy.

Upon graduating cadets are commissioned as second lieutenants in the United States army. The whole number of graduates from 1802 to 1906, inclusive, has been 4,530. It is virtually absolutely necessary for a person seeking an appointment to apply to his senator or member of congress. The appointments by the president are usually restricted to sons of officers of the army and navy, who, by reason of their shifting residence, due to the necessities of the service, find it next to impossible to obtain an appointment otherwise.

MILITARY SERVICE INSTITUTION OF THE UNITED STATES, an organization of officers of the United States regular army and allied forces, associated for professional improvement, the interchange of views upon military matters, and such topics in general as may be calculated to promote the best interests of the army of the United States. The headquarters of the Institution are at Governor's Island, N. Y. The Journal of the Military Service Institution published its first number in January, 1880, and is devoted to regimental histories and the discussion of contemporary military questions, domestic and foreign.

MILITIA, the United States militia consists of every able-bodied male citizen of the respective states, territories, and the District of Columbia, and every able-bodied citizen of foreign birth, who has declared his intention to become a citizen, who is more than eighteen and less than forty-five years of age. It is divided into two classes—the organized militia, known as the National Guards of the state, territory, or District of Columbia, or by such other designation as may be given them by the laws of the respective states or territories, and the remainder known as the reserve militia. The organization, armament, and discipline are the same as those prescribed for the regular and volunteer armies of the United States. The president may call out, for a period not exceeding nine months, such numbers of the militia of the states, territories, or District of Columbia as he may deem necessary. During their period of service they become subject to the same rules and articles of war as the regular forces. Each state and territory and the Dis-

States and Territories	Generals and General Staff Officers	Cavalry	Artillery	Infantry	Total Organized Militia	Number Available for Military Duty (Unorganized)
Alabama	9	67	136	2,084	2,296	72,000
Arizona	1	94	....	344	439	15,500
Arkansas	39	....	....	1,126	1,165	255,000
California	30	*287	292	2,750	3,353	232,500
Colorado	13	*261	59	741	1,074	70,000
Connecticut	14	97	252	2,449	2,812	109,500
Delaware	7	....	....	381	388	41,500
District of Columbia	14	†48	81	1,572	1,715	53,000
Florida	15	....	....	1,539	1,554	189,500
Georgia	21	401	257	2,233	2,912	306,000
Hawaii	5	46	....	469	510	8,250
Idaho	6	....	....	670	676	52,000
Illinois	40	*507	‡181	5,052	5,780	757,500
Indiana	15	*†130	252	1,865	2,262	515,000
Iowa	17	*54	....	2,089	2,160	324,000
Kansas	12	....	60	1,099	1,171	112,000
Kentucky	7	49	157	1,012	1,223	255,000
Louisiana	9	*251	420	640	1,320	138,000
Maine	8	*†32	....	1,196	1,236	106,000
Maryland	13	56	....	2,053	2,122	200,000
Massachusetts	37	350	1,020	4,773	5,143	476,000
Michigan	17	....	....	2,973	2,390	290,000
Minnesota	10	....	215	1,667	1,692	216,000
Mississippi	19	....	....	1,186	1,205	269,000
Missouri	16	....	92	2,036	2,144	396,000
Montana	4	....	....	484	488	33,000
Nebraska	7	150	62	1,129	1,348	120,000
Nevada	7	....	....	129	136	7,400
New Hampshire	16	....	65	1,074	1,155	38,000
New Jersey	46	*771	129	4,944	4,290	420,000
New Mexico	3	69	....	338	410	39,100
New York	70	*550	1,796	11,860	14,276	1,000,000
North Carolina	47	....	60	1,495	1,602	282,000
North Dakota	7	....	....	612	619	60,000
Ohio	30	126	440	4,804	5,400	662,000
Oklahoma	7	*131	....	474	612	67,000
Oregon	10	61	70	872	1,013	79,500
Pennsylvania	52	*290	143	8,536	9,021	963,000
Rhode Island	20	150	96	652	916	68,000
South Carolina	18	....	....	2,236	2,254	100,000
South Dakota	3	....	....	769	772	60,000
Tennessee	7	....	42	1,797	1,846	170,000
Texas	44	*212	....	2,095	2,351	425,000
Utah	18	41	....	220	279	30,500
Vermont	4	....	97	597	694	47,000
Virginia	12	51	140	1,769	1,972	309,000
Washington	7	....	....	710	717	154,000
West Virginia	11	....	....	998	1,009	130,000
Wisconsin	9	65	70	2,480	2,624	385,000
Wyoming	7	53	....	230	290	12,000
Total	861	*4,780	6,684	95,253	107,578	11,086,750

* Includes Mounted Signal Corps. † Includes Ambulance Corps. ‡ Includes Engineer Corps.

Alaska and Indian Territory have no militia, though provision is made for such if need arises. Guam and Samoa each has a small provisional force used more for police purposes than for military. The Philippines have a constabulary force which can be used either for police or war purposes, provided the latter is on the islands. So also Porto Rico has a provisional force of 700 foot and 100 mounted men, 100 non-commissioned officers, and 26 officers, the whole under command of a lieutenant-colonel of the United States Army. Numbers available in the Southern States include negroes capable of bearing arms.

trict of Columbia has an adjutant-general who is charged with the duties as prescribed by the state, and the rendering of regular reports to the secretary of war regarding the strength, condition, etc., of the organized militia of the state to which he belongs.

The table preceding is an abstract of the militia force of the United States, according to the records of the war department up to December 1, 1906.

MILK, the secretion peculiar to the females of the class mammalia, which is secreted in the mammary glands, and which is employed as the nutritive fluid of the young mammal after its birth. Examined by aid of the microscope, milk is seen to consist of a clear fluid, containing many globules, the average size of which is about $\frac{1}{10000}$ of an inch in diameter, and each appears to consist of oily matter invested by a thin layer of albumin. When churned, the globules in the milk are forced together en masse, and form butter. The cream of milk is formed by the globules rising to the top of the milk without coalescing; the "skim"-milk, or that left after the cream is formed, being of a pale bluish color, owing to its being deprived of its fatty or oily particles. In itself, milk exhibits the type of a perfect food. The casein of milk represents the albuminous or flesh constituents of food; the butter supplies the fatty or oleaginous parts; the water exists as such in milk, while it contains the saccharine constituents in the form of milk-sugar, and the inorganic parts in the form of phosphates of lime and alkaline chlorides, so necessary for the production of bone. The milk of every animal has certain peculiarities which distinguish it from all other milk, but the general properties are the same in all. In the making of butter, cream is allowed to stand for some time, during which an acid is generated. It is then put into a churn and agitated, when the butter gradually separates. The buttermilk, or that left after the separation of the butter by churning contains the casein, sugar, etc., of the milk; and the milk left after creaming also contains the greater part of the casein and milk sugar. Milk may be coagulated by various substances, but rennet prepared from the fourth stomach of the calf is generally used for domestic purposes. The result of coagulation is to separate the milk into a thin fluid, or whey, and a thick whitish deposit, the curd. (See Butter, Cheese.) Whey has a pleasant taste, and contains a large quantity of the milk-sugar, hence it is frequently used as drink, and from its nutritious quality it is administered to delicate people. It is also sometimes made to undergo fermentation, by which a very weak spirituous fluid is obtained. (See Koumiss.) Condensed milk (which see) is now largely used, and consists of ordinary milk which has undergone a process of evaporation and been mixed with sugar. Milk is very liable to be infected with the germs of disease, either from disease in the cow, contamination from unhealthy persons, or the use of infected water in cleaning vessels; and many epidemics of zymotic disease have been traced to impure milk.

MILK-FEVER, a febrile state sometimes induced in women when the milk begins to be secreted after parturition. It is accompanied with severe pains and throbbing in the head, flushing in the face, thirst, heat and dryness of the skin. The pulse is full, the tongue furred, bowels costive, urine scanty, and light and sound are painful. The treatment consists in cooling saline purgatives, good ventilation and moderate temperature in apartments, and encouraging the free flow of milk. Milk-fever attacks the lower animals, and in cows it is best prevented by unstimulating diet, and by milking the cow regularly ten days before calving.

MILK-SNAKE, a harmless snake of the United States.

MILKY-WAY. See Galaxy.

MILL, originally, a machine for grinding and reducing grain or other substance to fine particles; now applied also to machines for grinding or polishing by circular motion, and especially to complicated machinery for working up raw material and transforming it into a condition in which it is fit for immediate use or for employment in a further stage of manufacture. In the first sense of the word we have flour-mills and meal-mills, cider-mills, coffee-mills; in the second sense we speak of a lapidary's mill; and in the third sense we speak of cotton-mills, spinning-mills, weaving-mills, oil-mills, saw-mills, bark-mills, fulling-mills, etc. The word commonly includes the building for the special accommodation of the machinery, as well as the machinery itself. The oldest kind of flour or meal mill was the hand-mill or quern.

MILL, John Stuart, son of James Mill, was born in London 1806, died at Avignon 1873. At the age of fourteen he entered upon a course of political economy. His fifteenth year was spent in France; on his return he studied law for a time, and in 1823 he obtained a clerkship in the East India House, remaining in the company's emlpoyment till it was supplanted by the crown in 1858. In 1823 the Westminster Review was begun by the followers of Bentham, and young Mill was one of its earliest contributors, while from 1835 to 1840 he was its principal conductor. In his twenty-first year he edited Bentham's work On Evidence. In 1843 appeared the first of his two chief works, A System of Logic, Ratiocinative and Inductive, the second being Principles of Political Economy, 1848. To these he afterward added his work On Liberty, 1859; Thoughts on Parliamentary Reform, 1861; Utilitarianism, 1862; the Examination of Sir William Hamilton's Philosophy, and a Study of Auguste Comte and Positivism, 1865. His Autobiography was published in 1873, and the three essays, Nature, The Utility of Religion, and Theism, in 1874. Mill's works on logic and political economy are standard text-books. In the former he placed the system of inductive logic on a firm basis. See Logic.

MILLAIS (mil'ās), Sir John Everett, Bart., R. A., born at Southampton 1829. In his earlier days he was a leader of the Pre-Raphaelite School, but on attaining maturity in art he abandoned the peculiarities for which that school is noted. As the result of this new departure Millais painted such pictures as Ferdinand Lured by Ariel, Mariana in the Moated Grange, The Huguenot Lovers, The Black Brunswicker and

Sir John E. Millais, R. A.

Ophelia, while its influence was also apparent in his landscapes of Chill October, The Fringe of the Moor, etc. In portraiture he holds the foremost rank and has painted a number of the most distinguished men of the day. He was made a baronet in 1885, and he was also a member of the Legion of Honor. Many of his works are well known by engravings. He died in 1896.

MILLEN'NIUM, an aggregate of a thousand years; a word used to denote the thousand years mentioned in Rev. xx. 1–5, during which period Satan will be bound and restrained from seducing men to sin, and during which, millennarians believe, Christ will reign on earth with his saints. The near approach of the millennium has been often foretold.

MILLEPEDE, a name common to animals resembling centipedes from the number of their feet. The most common is about 1¼ inch long. The young when hatched have only three pairs of legs, the remainder being gradually acquired till the number is complete, which is usually about 120 pairs.

MILLER, Hugh, geologist, was born at Cromarty in 1802. In 1840 he went to Edinburgh as editor of the Witness newspaper, after 1843 the chief organ of the Free Church. In this paper he printed the work subsequently published under the title of The Old Red Sandstone, which attracted the immediate attention of the scientific world and established his reputation as a geologist. This was followed by First Impressions of England and its People; Footsteps of the Creator; My Schools and Schoolmasters, a charming account of his earlier life; and The Testimony of the Rocks, in which he tried to reconcile the Mosaic account of creation with the teachings of geology. Having just finished this latter work, his brain collapsed from over-pressure, and he died by a pistol-shot from his own hand at Portobello in 1856. His Schools and Schoolmasters was supplanted by the Life and Letters, published in 1871.

MILLER, Joaquin, the pen-name of Cincinnatus Heine Miller, born 1841 in Indiana; spent some time in the California mining districts; lived with the Modoc Indians for five years; edited a

newspaper called the democratic Register; studied law and was called to the bar in Oregon, and became district judge in Canyon City, subsequently settled in California. He has written Pacific Poems, Songs of the Sierras, Songs of the Sun Lands, Songs of the Desert, Songs of the Mexican Seas, besides novels and dramas.

MILLER, Joseph, better known as Joe Miller, was born in 1684, it is supposed in London, and was a favorite low comedian. He died in 1738. The jests which have immortalized his name were collected in 1738, by John Mottley, author of the life of Peter the Great, and other works.

MILLER, William, the founder of an American religious sect holding peculiar millennarian views, was born at Pittsfield, Massachusetts, in 1781, and died in 1849. About 1843 the second coming of Christ was expected by as many as 50,000 believers in the doctrines of Miller; and, although the disappointment of their hopes somewhat diminished their numbers, many continued their adherence to his tenets regarding the nature of the millennium.

MILLET, a common name for various species of cereals yielding abundance of small seeds, cultivated in the East Indies, China, Arabia, Syria, Egypt, etc., where it is used as human food. The leaves and panicles are given both green and dried as fodder to cattle. German millet is cultivated on account of its seeds, which are used as food for cage-birds. Italian millet is a closely allied species.

MILLET (mi-lā), Jean François, French artist, born at Gruchy, near Cherbourg, in 1814, died in 1875. He worked with his peasant father in the fields; studied drawing at the academy of Cherbourg; from thence passed with an allowance from this town to the atelier of Delaroche in Paris, and exhibited at the Salon in 1840. As a student and until the death of his first wife in 1844 he was frequently in the greatest poverty, and his life subsequently was by no means free from difficulty. In 1849 he left Paris and settled among the peasants of Barbizon, on the edge of Fontainebleau Forest, and devoted himself to transferring their simple everyday life to his canvases, which he did with great truth of sentiment and subdued poetic charm. Of his paintings may be mentioned The Sheep-shearers, The Gleaners, The Sower, The Shepherdess with her Flock, and The Angelus. The last was sold by auction in Paris in 1889 for about $115,000. His works are at present very highly esteemed.

MILLIGRAMME, a French weight, the thousandth part of a gramme, or .0154 of a grain.

MILLIMETRE, a French lineal measure containing the thousandth part of a meter; equal to .03937 of an inch.

MILMAN, Henry Hart, D.D., born in London 1791, died 1868. His principal works are: Samor, a legendary poem; The Fall of Jerusalem; The Martyr of Antioch; History of the Jews; History of Christianity to the Abolition of Paganism; History of Latin Christianity.

MILTI'ADES (dēz), an Athenian general of the 5th century B.C. When Greece was invaded by the Persians he was elected one of the ten generals, and drew up the army on the field of Marathon, where, B.C. 490, he gained a memorable victory. Next year he persuaded the Greeks to intrust him with a fleet of seventy vessels, in order to follow up his success. With this, to gratify a private revenge, he attacked the island of Paros, but was repulsed, and dangerously wounded. On his return to Athens he was impeached, and condemned to pay a fine of fifty talents. Being unable to pay, he was thrown into prison, where he soon after died of his wound.

MILTON, John, English poet, was born in London, Eng., Dec. 9, 1608; died there, Nov. 8, 1674. At the age of seventeen he entered Christ's College, Cambridge, where he resided for seven years. It had been intended by his parents that he should enter the church, but their puritanical beliefs and his own scruples regarding the oaths decided otherwise. In 1637, on the death of his mother, he made a continental journey,

Milton.

in which he visited Paris, where he was introduced to Grotius, Florence, where he met Galileo, Rome and Naples. After remaining abroad for fifteen months he returned to England. The home at Horton having been broken up, Milton settled in the metropolis. While settled here his Paradise Lost was partially sketched out. In the summer of 1643 Milton married Mary Powell, the daughter of a royalist family. Divided from her kinsfolk by politics, he was also dissimilar to his wife in age—she being little more than seventeen, while he was thirty-five. Moreover, she found his habits austere and his house dull, with the result that she returned to her father about a month after marriage. In the end, however, his wife returned in 1645, bore him three daughters, and continued to live with him until her death in 1653. When in 1649 Charles I. was executed and a republic established, Milton avowed his adherence to it in his pamphlet Tenure of Kings and Magistrates, and was appointed foreign (Latin) secretary to the commonwealth. In his literary task his eyesight suffered so much that in 1652 he became totally blind. In 1663 he began the writing of Paradise Lost. This was published in 1667, the publisher agreeing to pay the author $25 down and a further $25 after the sale of each edition of 1300 copies. In two years a second edition, now arranged into twelve books, was printed, and Milton's position as the greatest poet of his time was established. In 1670 there appeared his History of Britain to the Norman Conquest, and in the following year the continued vigor of his poetic faculty was shown in Paradise Regained and Samson Agonistes. In 1674, the last year of his life, he printed his Epistolæ Familiares and Prolusiones Oratoriæ. His death took place at his house in Bunhill, and he was buried in the church of St. Giles, Cripplegate.

MILLVILLE, a city in Cumberland co., N. J., on the Maurice river, here navigable, and the W. Jersey railroad; 40 miles s. of Philadelphia. Pop. 11,790.

MILWAU'KEE, chief city and port of Wisconsin, United States, on the west shore of Lake Michigan, which here receives the united rivers Milwaukee and Menomonee. It has an elevation of from 600 to 700 feet above sea level, rising from 80 to 125 feet above Lake Michigan, and reaching its greatest height in Kilbourn Park, which affords a fine view. The business quarter is near the Milwaukee river, while the largest and most beautiful residence sections lies to the west and east, and are characterized by handsomely shaded avenues and detached houses. The accessibility of popular health and pleasure resorts and the beauty of its suburbs, add to the attractions of Milwaukee. Among these suburbs is the city of Wauwatosa—the seat of the state fair grounds and of a group of county institutions: almshouse, hospital, hospital for the insane, chronic insane asylum, and a children's home. The rivers are spanned by a number of bridges, and there are three viaducts, one of which, over the Menominee Valley is nearly a mile long.

Among the most prominent buildings are the city hall, the county court-house, the United States government building, and the public library and museum. The library has 120,000 volumes and maintains a number of branches in various parts of the city. The Layton Art Gallery is located in a fine building and possesses a valuable collection. The chamber of commerce, athenæum, lighthouse, squadron armory, and the Germania, Pabst, and Mitchell buildings also are noteworthy structures. A mile west of the city limits is a National Soldier's Home, accommodating 2400 inmates and surrounded by 400 acres of well-kept grounds.

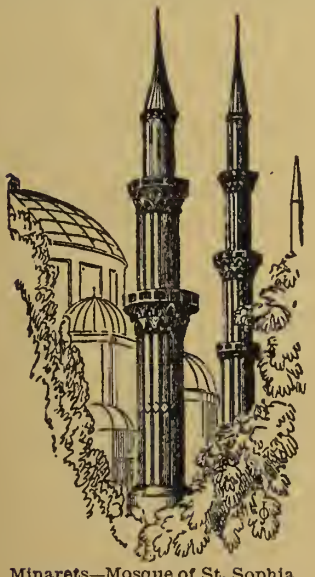
The Johnston emergency hospital, the Milwaukee general hospital, the United States marine hospital, and the state industrial home for girls are among a large number of charitable institutions of various kinds. Owing to the large population of German birth and descent, Turner and musical societies play an unusually important part in the club and society life of the city. Milwaukee is the seat of a Roman Catholic archbishop and of a Protestant Episcopal bishop.

The main element in the prosperity of Milwaukee is its vast trade in grain, and extensive industrial establishments connected with iron, flour, leather, lager-beer, agricultural implements, etc.

It has rapidly advanced from a population in 1840 of 1700 to one of 400,000.

MIMICRY, the name given to that condition or phenomenon which consists in certain plants and animals exhibiting a wonderful resemblance to certain other plants or animals, or to the natural objects in the midst of which they live. This peculiar characteristic is generally the chief means of protection the animal has against its enemies. It is well seen in the leaf-insects and in the "walking-stick" insects. Certain tropical butterflies reproduce the appearance of leaves so closely that even the parasitic fungi which grow upon the leaves are imitated. So also a South American moth has a most accurate resemblance to a humming bird; while the cacti of America and the euphorbias of Africa might easily be mistaken for each other, though widely different in structural characters. The theoretical explanation of this mimetic quality is attributed by recent biologists to purposes of self preservation. Thus, the form or color which enables an animal to seize its prey easily and to protect its own life by deceptive resemblance to other objects, is conceived to be that form and color which is most likely to survive. The term is used in a merely metaphorical sense, and implies no act of volition on the part of the animal or plant.

MIN'ARET, a slender lofty turret rising by different stages or stories, surrounded by one or more projecting balconies, commonly attached to mosques in Mohammedan countries, and frequently of very elegant design.



Minarets—Mosque of St. Sophia, Constantinople.

Minarets are used by the priests for summoning from the balconies the people to prayers at stated times of the day; so that they answer the purpose of belfries in Christian churches.

MINAS GERAES (mē'nȧs je-rā'es), the most populous of the Brazilian states, bounded by Bahia, Espirito Santo, Rio de Janeiro, Sao Paulo, and Goyaz; area 246,700 sq. miles. The capital is Bello Horizonte. Pop. 3,018,807.

MIND, a term that admits of no exhaustive scientific definition, but may be said to indicate, generally, the power possessed by each of us in virtue of which we know, think, feel, and will. Limited to the individual, and verifiable only through individual experience, its phenomena have long been held to represent the immaterial as distinguished from the material world, mind and matter forming thus a direct antithesis. Yet we have no experience of mind as apart from matter, and many, instead of regarding mind as a separate entity, hold it rather to be akin to some function of the nervous system. The mental powers or functions are generally classed as three—intellect or understanding, emotion or feeling, and volition or will. Sometimes the term mind is specially given to the first (the intellect), which itself possesses several powers or capacities, such as perception, memory, reasoning, imagination. It is by the intellect that we acquire knowledge, investigate phenomena, and combine means to ends, etc.; but the ultimate analysis of our mental powers gives different results with different investigators, the classification of the faculties of the mind being thus very various. The science that has specially to do with the investigation of mental phenomena is generally known as psychology. See also Emotion, Imagination, Will, etc.

MINDANA'O, one of the Philippine Islands, next to Luzon in point of size, about 300 miles long and 105 broad; area, 34,250 sq. miles. All the country, except upon the sea-coast, is mountainous, the volcano of Apo being 8819 feet high. The chief rivers are the Mindanao and the Batuan, and there are several lakes. Some coffee, cocoa, and cotton are exported. The chief town is Zamboanga or Samboangan, a port and naval station at its western extremity. The total population, according to a recent American estimate, is about 300,000. Mindanao was ceded by Spain to the United States in 1898.

MINDO'RO, one of the larger of the Philippine Islands, situated south of Luzon, from which it is separated by the Strait of Manila; about 110 miles long by about 53 broad. It is evidently volcanic, the climate is hot, and the rain almost incessant. Rice, cacao, and wild cinnamon are among the products. Pop. 61,900.

MINE, in military language a subterranean passage dug under the wall or rampart of a fortification, or under any building or other object, for the purpose of blowing it up by gunpowder or other explosive. What are called submarine mines are now used in the defense of places liable to attack from a naval force. Such a mine consists of a charge of some powerful explosive inclosed in a suitable case, which is anchored at the bottom of the water, or at a suitable depth, and may be exploded at will by means of electricity so as to blow up a hostile vessel, or the mere contact of a vessel may cause it to explode.

In ordinary language a mine is a pit or deep excavation in the earth, from which coal, metallic ores, and other mineral substances are taken. The pits from which stones only are taken are called quarries. See Mining and Mine Inspection.

MINE WORKERS OF AMERICA, The United, American labor union, the largest in the country organized January 25, 1890, the object of which is to unite mine employees that produce or handle coal or coke in or around the mines and ameliorate their condition by means of conciliation, arbitration or strikes. The national executive committee consists of the president, vice-president, secretary, treasurer, and one delegate from each of the 25 districts. In the bituminous districts of Illinois, Indiana, Ohio, and Pennsylvania strikes have been practically eliminated by the annual joint conference, or collective bargaining, between the miners and operatives, in which a scale of prices for the following year is adopted and the settlement of further differences provided for by local boards of arbitration. Mr. John Mitchell was elected president in 1898 and has held that position constantly since that time.

MINERAL'OGY, the science which treats of the properties of mineral substances, and teaches us to characterize, distinguish, and classify them according to their properties. It comprehends the study or science of all inorganic substances in the earth or on its surface. As distinguished from geology, mineralogy deals with the various mineral bodies as separate constituents of the earth's crust, and examines their properties as such, while geology treats them in the aggregate, as building up the crust of the earth, and as forming masses and presenting phenomena that have a history to be investigated. Minerals may be described and classified either in accordance with their chemical composition, their crystallographic forms, or their physical properties of hardness, fracture, luster, etc., or a combination of all, and thus various systems of classification have been adopted. Most minerals crystallize in definite forms, and this form is one of the chief characteristics of many mineral species. There are not a few, however, which are not distinctly crystalline, but are earthy or occur in masses; the latter exhibiting important varieties of structure, as laminated, fibrous, granular reniform, botryoidal, etc. Other distinctive characteristics are color, which, however, varies even in the same mineral; luster, the character of the light reflected from the surface, and described as adamantine, vitreous, nacreous, greasy, silky, etc.; fracture, or the character of the freshly-broken surface; streak, or the appearance and color of a furrow made in the mineral by a hard-tempered knife or file; and hardness, which is now determined by what is called Mohs's scale. In this scale certain minerals are represented by numbers from 1 to 10, viz. (1) talc, common laminated light-green variety; (2) gypsum, a crystallized variety; (2.5) mica; (3) calcite, transparent variety; (4) fluorspar, crystalline variety; (5) apatite, transparent variety; (5.5) scapolite, crystalline variety; (6) potash, felspar, white cleavable variety; (7) quartz, transparent; (8) topaz, transparent; (9)

corundum; (10) diamond. To determine the hardness of a mineral, it is ascertained by experiment which of these it will scratch and which will scratch it; thus if a mineral will scratch fluorspar but not apatite, while the latter will scratch it, its hardness is between 4 and 5. Diaphaneity, refraction, polarization, electric properties, etc., are all distinguishing marks. In the classification of minerals, their chemical composition, though not to be regarded by itself, is of much importance. Among famous names in connection with mineralogy may be noted those of Werner, Haüy, Mohs, Dana, etc

MINERAL WATERS is the term commonly applied to the spring-waters that contain an unusual quantity of such substances as sodium, magnesia, iron, carbonic acid, and sulphur; but it cannot be used in any absolute fashion. The most popular European springs are those of Aix-la-Chapelle, Wiesbaden, Baden-Baden, Carlsbad, Ahrweiler (Apollinaris) Friedrichshall, Buda-Pesth (Hunyadi-Janos), Vichy, and Bath. The most popular springs in the United States are Congress, and Excelsior, at Saratoga, N Y.; Warm Sulphur Springs, Virginia; Hot Springs, Arkansas; Red Sulphur Spring, Sharon, N. Y.; Las Vegas Hot Springs, N. Mex.; Bethesda Spring, Waukesha, Wis. The waters are usually drunk at an early hour before breakfast, and the curative effects are greatly aided by early rising, moderate exercise, mental relaxation, and complete freedom from all kinds of excess. It has not been found practical or useful to classify mineral waters under their chemical elements, but the attempt has been made, as where the springs are described as—salt, earthy, sulphur, iron, alkaline, and alkaline-saline. Besides the substances which these terms indicate, the waters are frequently impregnated with carbonic acid gas, which is found to aid digestion while giving a pleasant stimulus to the general system.

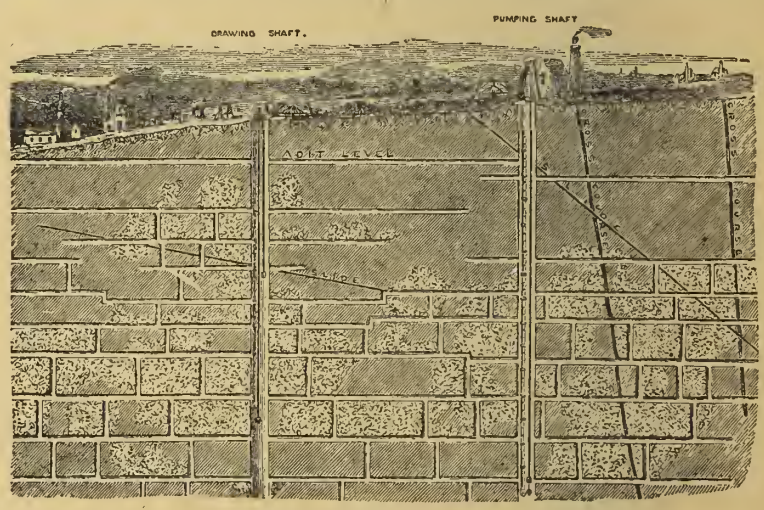
MINERAL WOOL, a substance which is produced from the vitreous liquid slag of a blast-furnace drawn out into fine fibres under pressure of steam. The slag, when in a molten condition, is driven by the steam from the furnace through a crescent-shaped aperture, and suddenly cools into long fibrous filaments. The thin, glassy, thread-like substance thus produced is useful as a non-conductor of heat, and it has, therefore, been largely employed as a covering for boilers and steam-pipes, to prevent the freezing of water in pipes, etc.

MINERVA, a daughter of Jupiter, and one of the great divinities of the ancient Romans. She was looked upon as the patroness of all arts and trades, and her annual festival, called Quinquatrus, lasted from the 19th to the 23d of March inclusive. This goddess was believed to protect warriors in battle, and to her was ascribed the invention of numbers, and of musical instruments, especially wind-instruments. At Rome a temple was built for Minerva by Tarquin on the capitol, where she was worshipped along with Jupiter and Juno; and there was also a temple on the Aventine dedicated to herself alone. This deity is supposed to be of Etruscan origin, and her character has much in common with the Greek goddess Athena.

MINHO (min'yō), more fully Entre Douro e Minho, a province of Portugal, Pop. 1,014,768.

MIN'IATURE, a small painting, especially a portrait, executed with delicate care, chiefly upon ivory, also upon vellum, paper, etc. The term is from the Italian miniatura, originally applied to a small painting, such as those formerly used to adorn manuscripts, from the common use of minium or vermilion in the ornamentation of the illuminated manuscripts in the middle ages. The art of miniature painting was carried to its highest perfection, chiefly in France, during the 18th century.

MINING is the term applied to the underground engineering process by which minerals are excavated and brought to the earth's surface. That this process in a rude form was known to the ancients is shown by references in the book of Job, the records of the Phœnicians and Egyptians, and the signs of supposed Roman excavations found in Britain. The development of mining has been greatly advanced by the introduction of gunpowder for blasting purposes; by the use of steam-engines for pumping water from the mine and bringing material to the surface; and by the aid of improved ventilation, which now enables mines to be carried to deeper levels.



Section of part of copper mine.
The parts lightly shaded indicate where the mineral has been removed.

Metalliferous mining has to deal with a mineral which is found in lodes or veins irregularly imbedded in rock-fissures, the trend of which is uncertain and the thickness variable. In preparing to excavate this irregularly distributed mineral two shafts are sunk in the vicinity of the lodes, one of which is used for pumping and ventilating the mine, the other for drawing the material to the surface. From these two shafts horizontal galleries are driven at distances of 10 or more fathoms apart, an additional gallery being driven at intervals of 10 or 15 fathoms as the mine is increased in depth. The galleries are driven as far as possible on the course of the lode, and if the lode is going down on a slope, the galleries in such case are not vertical above one another. These galleries are connected by vertical passages or "winzes;" and in this way they are ventilated, and the material to be excavated is divided into rectangular blocks. The metal ore after being excavated is broken up by the miner, put into a barrow, wheeled to one of the main galleries, thence transported in cars drawn on rails by men, mules, or engines, to the main shaft. There it is hoisted to the surface in an iron "kibble" or a wooden "skip" which travels up and down in guides fixed to the side of the shaft. Access to many metalliferous mines is still obtained by means of ladders fixed almost vertically in the sides of the shaft. This toilsome method is averted in some mines by what is called a "man-engine," which consists of two rods with platforms attached which move up and down reciprocally the distance between two platforms, the miner ascending or descending from the platform of one rod to that of another alternately. Besides the shafts there is usually an entrance to the mine called an "adit" or "day-level" which is driven straight into the mine from the nearest convenient depression or valley and is mainly used for purposes of drainage. Adits are sometimes of great length.

Coal-mining has to deal with a mineral which is deposited in seams or beds, sometimes nearly horizontal, at other times nearly vertical. These seams are interstratified with layers of sandstone, shale, clay, etc., and when the beds are tilted the coal has been frequently found outcropping at the surface. In the chief coal-fields of the United Kingdom this outcrop coal has been exhausted, and it is now found necessary to approach the coal-seams by means of shafts, of a rectangular or circular shape, sunk into the earth. The rectangular shape, commonly 18 feet by 6 feet, is that which is used most frequently in Scotland, while the circular shaft obtains in the large mines of Northumberland and Durham. Before sinking the shaft it is expedient

to bore down through the strata in order to test the thickness and direction of the coal-measures. The bore-hole is usually begun by digging a small pit above 6 feet deep, and the old method was to pierce the rock by means of a cutting-tool attached to long rods and worked by a lever with hand-power. Various improvements on this slow method have been recently made, as where hydraulic or steam power is used to drive the boring-rods, and diamond drills employed instead of the steel tool. (See Boring). When this boring test has been found satisfactory the shaft is then sunk. One shaft not unfrequently intersects a number of workable coal-seams, these being generally separated by shale, sandstone, and limestone. Seams of coal vary in thickness from 2 inches up to 30 feet as in Staffordshire, or even to 90 feet as in a small coal area at Johnstone, near Glasgow. The coal having been reached, the mining engineer has to devise the safest and most economical method of cutting the coal and sending it to the surface. There are two commonly adopted methods of working out coal-seams, viz. the "pillar-and-stall" or "stoop-and-room" system, and the "longwall" or "longwork" system. The former method consists in excavating "rooms" in such a manner as to divide the coal into rectangular pillars or "stoops." In the early days of coal-mining the stalls were made large and the upholding pillars left small, no attempt being afterward made to recover the coal in these pillars. When the floor of the mine was of soft clay or lime the weight of the roof drove the pillars down, causing the floor to rise in the center between the pillars, and establishing an undulating movement throughout the underlying strata called by miners "the creep." To prevent this the coal is now left in wide barriers or "pannels" which divide one part of the workings from another. The pillars of coal which are now left are recovered by a second operation, which consists in cutting them out after a division or pannel has been excavated to its boundary or by working them out when the stalls have been driven the length of two or three pillars. These pillars are, in most cases, about 20 yards square, and in one panel of the mine there are often 600 such pillars. In the "longwall" method the miner cuts into, or "holes" into, the under part of the coal-bed for two or three feet, and then, with the aid of wedges driven in atop, he loosens and extracts the mass of coal which has been "holed." By this system the entire coal-seam is at once extracted, while the empty space or "goaf" is filled in with waste material as the work advances.

One of the most important matters connected with coal-mining is ventilation. To facilitate this there are two openings into the mine, which are technically called the "intake" and "return" air-passages. The necessary supply of pure air is maintained either by the natural heat of the mine causing a constant inrush of cold air; by pumps or fans forcing the air down the "downcast" shaft or drawing it up the "upcast" shaft; or by furnace ventilation. This latter mode is considered the most efficient. The furnace by its heat causes a constant current up the upcast shaft, thus drawing the vitiated air away from the workings. Connected with ventilation is the dangerous accumulation of fire-damp which may take place in a mine, to guard against which safety-lamps have been introduced. See Fire-damp, Safety-lamp.

The pumping of water out of the workings is an essential part of mining. Some of the largest pumping engines raise from 2000 to 3000 gallons of water per minute. Air-engines are frequently in use for subterranean haulage and for driving the coal-cutting machines which are now to some extent, employed.

MINION, a size of type between brevier and nonpareil. See Printing.

MINISTERS, the name applied in politics to the chief servants of the state in the administration of its affairs, and the chief representatives of a country at a foreign court. The former are known collectively as the ministry, and the head of the administration is called the prime-minister or premier. All the ministers are appointed by the prime-ministers, subject to the approval of the crown.

MINISTERS, Foreign, are those accredited representatives which one country sends to another. Generally they are divided into three classes. The highest in rank is the ambassador extraordinary, who can claim to represent his state or sovereign in his own person, and receive honors and enjoy privileges accordingly. The legates and nuncios of the pope also belong to this class. Envoys extraordinary, internuncios, and ministers plenipotentiary belong to the second class, and neither hold the same degree of power nor receive the same distinction as the former. The third class includes ministers resident, envoys, and chargés d'affaires, the last being sometimes regarded as a fourth class. Persons who are sent merely to conduct the private affairs of their monarch or his subjects in a foreign place are called agents or residents; and where they are occupied chiefly with subjects of a commercial character they are called consuls. When the foreign minister is accredited directly to the sovereign of a state he can demand an audience, his person is considered inviolable, and he is freed from taxes and territorial restrictions. See Ambassador, Envoy, Consul.

MINK, an American and European quadruped, allied to the polecat. It is semi-aquatic, burrowing on the banks of rivers and ponds, living on frogs, crayfishes, and fishes, which it pursues in the water. It exhales a strong odor of musk, and its fur is in considerable request. The European and American minks are by some regarded as distinct species.

Minks.

MINNEAP'OLIS, a city of the United States, capital of Hennepin co., Minnesota, on both sides of the Mississippi, at the Falls of St. Anthony, 8 miles n.w. of St. Paul. It is regularly laid out with avenues 80 feet wide running east and west, having double rows of trees on each side.

Minneapolis stands on a gently undulating plateau, 800 feet above sea-level, in a picturesque lake region much frequented as a place of resort. There are several lakes within the city limits and of others in the immediate vicinity, Lake Minnetonka is the largest and most popular. An extensive park system has been developed. There are some twenty parks, comprising a proportionately large area of 1581 acres. Minnehaha Park, of 133 acres, is a picturesque tract, embracing the Falls of Minnehaha, 50 feet in height, which have been immortalized by Longfellow's Hiawatha. Adjoining the park are the beautiful grounds of the State Soldier's Home, occupying 60 acres. Minneapolis has many handsome edifices, both public and private. The court house and city hall was completed at a cost of more than $3,000,000.

The principal industries are the manufacture of flour, engines, boilers, agricultural implements, carriages, wagons, and pork-packing. The city possesses a territory of about 33 sq. miles, with the celebrated falls of Minnehaha and several fine lakes.

Among the railroads that contribute to the high commercial and industrial rank of Minneapolis are: the Chicago and Northwestern; the Burlington Route; the Chicago, Milwaukee and Saint Paul; the Chicago, Rock Island and Pacific; the Northern Pacific; the Great Northern; the Minneapolis, Saint Paul and Sault Sainte Marie; the Chicago Great Western; and the Saint Paul and Duluth. The Mississippi river is navigable to Minneapolis, but vessels practically go no higher than Saint Paul. Pop. 300,000.

MINNESO'TA, one of the United States of America, bounded north by Canada, east by Lake Superior and Wisconsin, south by Iowa, and west by the Dakotas; area, 83,360 sq. miles. The chief towns are Minneapolis, and the capital, St. Paul. This state occupies the summit of a central plateau formed by the conterminous basins of the Mississippi, the St. Lawrence, and Lake Winnipeg. The surface is generally an undulating plain, with a general slope southeast toward the basin of the Mississippi, which, with its affluents, drains about two-thirds of the state. The Red river of the north, which forms part of the west boundary, also receives a part of the drainage, and part is carried by Rainy Lake river to the Lake of the Woods, part to Lake Superior. Lakes are numerous, including Leech lake, Red lake, Vermilion lake. Mille Lacs,

and part of Lake of the Woods and Rainy lake. Iron and copper are among the chief minerals. The soil for the most part is good, and the Red river valley is considered the finest wheat-growing district in the state. A large forest known as the "Big Woods" extends over the center of Minnesota for the length of 100 miles and a breadth of 40 miles, and the country, especially above lat. 46°, is well wooded with pine, spruce, oak, beech, elm, maple, while the prairies have been planted with millions of trees by the aid of state bounties. The climate is on the whole excellent, the winters, though cold, being clear and dry; and, the temperature being equable, the state has become a winter resort for invalids.

Although only a little over one-half of the land area is included in farms, the state has attained the first rank in

Seal of Minnesota.

the cultivation of certain crops. In the Red river valley wheat-growing has been extensively developed. With the introduction of modern methods the state mills became famous for the high quality of their product. The cultivation of wheat increased rapidly, and in 1890 the state had become first in both acreage and production. Oats has about a third as great an acreage as wheat, and ranks next to it in importance. Both corn and oats are grown most extensively in the southwestern part of the state. In barley and flaxseed raising also, the state takes a high rank, and increasing quantities of rye are produced. Hay and forage crops cover about one-half as great an acreage as is devoted to wheat. Large quantities of Irish potatoes are raised, and the cultivation of the sugar beet has been introduced. Fruit culture is mainly confined to the southern part of the state and is not yet extensively developed.

Minnesota is one of the richest states in forest resources, having a woodland area of about 52,200 sq. miles. Hardwood forests border the prairies, while farther north the white pine predominates, Norway pine and spruce being also abundant. The lumber industry has increased rapidly and it ranks third in importance. There is a forest reserve of 200,000 acres in Chippewa reservation.

Minnesota is favored with the advantages of both the Saint Lawrence and the Mississippi systems of navigation. The latter is becoming relatively less important owing to the development of railroads. Duluth has become one of the leading lake ports. It has immense shipments of ore, grain, and lumber. But few regions of the country are better supplied with railroads than are the southern and western parts of the state. Minneapolis-Saint Paul is the objective point of most of the great lines northwest of Chicago, and the transcontinental Great Northern and Northern Pacific crosses the state from east to west. Among the lines which have a large mileage in the state are the Chicago, Milwaukee and Saint Paul; the Chicago and Northwestern; the Chicago, Saint Paul and Omaha; the Eastern Railway of Minnesota; and the Minnesota and St. Louis. The total mileage has increased from 1092 miles in 1870 to over 7000.

By the state constitution a portion of land is set apart in each township to provide a perpetual education fund. The state university is at Minneapolis. The state sends two senators and three representatives to the national congress.

The first European to visit the region now included within the state was Duluth, who, in 1678, built a fort at the mouth of the Pigeon river, on the north shore of Lake Superior. In 1680 the Falls of Saint Anthony were discovered by Louis Hennepin, a Franciscan priest Before 1700 there were trading posts situated on Lake Pepin and on the Minnesota river. Minnesota formed a part of the extensive territory ceded by France to Great Britain in 1763. In 1766 it was explored by Capt. Johnathan Carver, of Connecticut. In 1783 it became a possession of the United States. The exploring expedition of Lieutenant Pike in 1805 was followed by many others within the succeeding forty years; and with an increased knowledge of the country came the first important beginning of immigration. The Indian titles to the lands east of the Mississippi were not extinguished until the year 1838, and it was not until March 3, 1849, that the territory of Minnesota was organized, with the Missouri river as its western boundary. In 1851 the Indian titles to the lands (except reservations) between the Mississippi and the Red River of the North were extinguished, and immigration increased rapidly. On May 11, 1858, Minnesota was admitted as a state. In 1862 the Sioux Indians, under Little Crow, angered at the continuous inroads made upon their lands, attacked and destroyed many of the frontier settlements. Over 500 white settlers and soldiers were killed and 25,000 people were driven from their homes. Legislation after the civil war was concerned largely with the regulation of railway corporations.

Since 1860 Minnesota has been steadily republican, save for the election of 1898, when the democrats, populists, and silver republicans elected their candidate for governor. Pop. 2,125,000.

MINNESOTA RIVER, a river in the United States, which flows through Minnesota and falls into the Mississippi 5 miles above St. Paul; length, 470 miles.

MINNESOTA, University of, a co-educational state institution of higher learning in Minncapolis, Minn., established in 1851. Its government is vested in a board of thirteen regents, nine appointed by the governor of the state and holding office for six years, and three ex-officio members, the governor, the state superintendent of public instruction, and the president of the university. The annual income of the university is now, 1906, about $510,500, received from various sources, as follows: Permanent endowment fund, $53,000; Hatch and Morrill bills, $40,000; state tax of $\frac{2}{100}$ of a mill, $194,000; annual state appropriation, $69,500, fees, $126,000; miscellaneous sources, $28,000. It provides courses in general college work, engineering, mining, chemistry, agriculture—including forestry, home economics, short practical course in agriculture and dairying, law, medicine—including homeopathic medicine, dentistry, pharmacy, leading to appropriate degrees. The faculty numbers 350; students 4,000; alumni 6148; buildings 35, valued at $2,200,000; campus 50 acres on east bank of Mississippi river well wooded with native oaks, valued at $300,000; experimental farm 200 acres, valued at $400,000, and substations valued at $30,000 Co-educational in all departments.

MINNOW, a species of fish belonging to the same genus as the carp. They swim in shoals, seldom exceed 3 inches in length, and make excellent bait for trout. In America various small fish receive this name.

MINOR, a person of either sex under age, who is under the authority of his parents or guardians, or who is not permitted by law to make contracts and manage his own property. See Age.

MINOR, in Music. See Major.

MIN'OTAUR, in Greek mythology, a monster fabled to have had the body of a man with the head of a bull, and to have fed on human flesh, on which account Minos shut him up in the labyrinth of Dædalus, and at first exposed to him criminals, but afterward youths and maidens yearly sent from Athens as a tribute. He was slain by Theseus.

MINSK, a town of Russia, capital of government of same name. Pop. 91,494. The government, which has an area of 35,290 sq. miles, has extensive forests and great stretches of marsh or swamp. Pop. 2,156,123.

MINSTREL, a singer and musical performer on instruments. In the middle ages minstrels were a class of men who subsisted by the arts of poetry and music and sang to the harp or other instrument verses composed by themselves or others. The person of the minstrel was sacred; his profession was a passport; he was "high placed in hall, a welcome guest." So long as the spirit of chivalry existed the minstrels were protected and caressed but they afterward sank to so low a level as to be classed, in the reign of Queen Elizabeth, with beggars and vagabonds.

MINT, the name given to several aromatic plants. They are nearly all perennial, having square stems which bear opposite and simple leaves; they are widely distributed throughout tem-

perate regions; and they abound in resinous dots which contain an essential oil. Mint has an agreeable odor, and partakes in the highest degree of tonic and stimulating properties. Spearmint is generally used, mixed with vinegar and sugar, in sauce. Peppermint yields the well-known stimulating oil of the same name. Pennyroyal is used for the same purposes as peppermint.

MINT, the place where a country's coinage is made and issued under special regulations and with public authority. In England there was formerly a mint in almost every county; the sovereign, barons, bishops, and principal monasteries exercised the right of coining and it was not till the reign of William III. that all the provincial mints were abolished. The present mint on Tower Hill, in London, was erected between the years 1810 and 1815. In former times the coinage was made by contract at a fixed price. The English mint supplies the whole of the coinage of the British Empire, except Australia and the East Indies, which are supplied from branch mints at Sydney, Melbourne, Calcutta, and Bombay. In the United States, there are mints at Philadelphia, San Francisco, Carson, and New Orleans. In France, as in England, the number of mints was at one time considerable. See Coining.

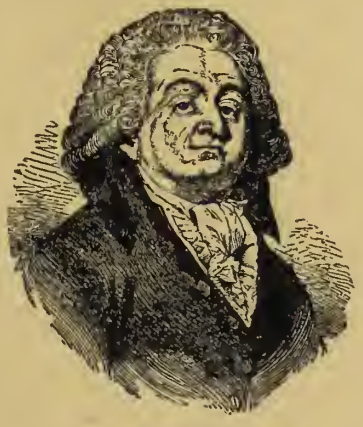
MIN'UET, a slow graceful dance said to have been invented in Poitou, in France, about the middle of the 17th century, performed in $\frac{3}{4}$ or $\frac{3}{8}$ time. The term is also applied to a tune or air to regulate the movements in the dance, or composed in the same time.

MI'NUS, in algebra, the term applied to the negative or subtractive sign –, which, when placed between two quantities, signifies that the latter is to be taken from the former; thus a – b (called a minus b) signifies that b is to be subtracted from a. Quantities which have the sign minus before them are called negative or minus quantities; as, –xy, – 5 cd.

MIN'UTE, a division of time and of angular measure. As a division of time it is the sixtieth part of an hour. As a division of angular measure it is the sixtieth part of a degree. In astronomical works minutes of time are denoted by the initial letter m, and minutes of a degree or of angular space, by an acute accent (′).

MI'OCENE, in geology, the name given by Sir Charles Lyell to a subdivision of the tertiary strata. The terms Miocene and Pliocene are comparative, the first meaning less recent and the other more recent. The Miocene strata contain fossil plants and shells which indicate a warm climate. The mammals are important, and foreshadow the animal life of the present day. No strata of Miocene age occur in the British Isles.

MIRABEAU (mē-rȧ-bō), Gabriel Honoré Riquetti, Comte de, French statesman, born in 1749 at Bignon, near Nemours; died at Paris April 2, 1791. At an early age he manifested extraordinary intelligence; but his youth was a stormy and licentious one, so much so that on several occasions he was imprisoned by his father under a lettre de cachet. It was during an imprisonment at Vincennes, which lasted three years and a half, that he wrote his Lettres à Sophie, Lettres de Cachet, and L'Espion Dé-valisé. On his release from this prison he lived for some time in Holland and England, returning to France in 1785. On the assembling of the states-general Mirabeau, elected for Aix, soon became prominent. When the king required the tiers état to vote apart from the other two orders it was Mirabeau who counseled resistance, demanded the withdrawal of the troops, consolidated the national assembly, and defied the king's orders. For some months he continued to lead, but he soon found that



Mirabeau.

the members of the assembly were mostly impracticable and inexperienced men, whose chief function was to discuss an ideal constitution. As a practical statesman Mirabeau desired action, and for this reason he attempted to form alliances with Lafayette, the Duke of Orleans, Necker, and finally with the queen. Correspondence with the latter was maintained through La Marck, and he received a subsidy from the royal party. No practical result followed from this secret alliance, for the queen rejected Mirabeau's counsel and suspected his methods of government. Whether he might ultimately have been able to guide the revolution into peaceful ways has always been a matter of conjecture to historians, but this possibility was prevented by his death in 1791. This was regarded as almost a national calamity, and the people buried him with splendid pomp in the Pantheon.

MIRACLE, a suspension of, or deviation from, the known laws of nature, brought about by the direct interference of a supreme supernatural Being. It is in its nature, as the term applies, an occurrence which is strange, marvelous, inexplicable, and is usually connected with some ulterior moral purpose. By the elder theologians a miracle was conceived to be the triumph of the Divine Will over the work of His hands and the laws of His making. In modern exegesis, however, the miraculous element is not considered to give evidence of opposing forces. On the contrary, a miracle is explained as a manifestation of the Divine Power working through laws and by methods unknown to us, and which, upon a higher plane, are altogether natural and orderly.

MIRAGE (mi-räzh′), an optical illusion, occasioned by the refraction of light through contiguous masses of air of different density; such refraction not unfrequently producing the same sensible effect as direct reflection. It consists in an apparent elevation or approximation of coasts, mountains, ships, and other objects, accompanied by inverted images. In deserts where the surface is perfectly level a plain thus assumes the appearance of a lake, reflecting the shadows of objects within and around it. The mirage is commonly vertical, that is, presenting an appearance of one object over another, like a ship above its shadow in the water. Sometimes, however, the images are horizontal. Looming is a phenomenon of the same nature, in which the objects appear to be lifted above their true positions, so that an observer sees objects which are beyond the horizon. The cause is in both cases the same, for while the mirage is produced in most instances by reflection from the desert sand, looming is occasioned by reflection from the sky. The phenomenon called Fata Morgana which is sometimes seen on the Calabrian coast is a kind of mirage. By it men and animals apparently of immense size may sometimes be seen presented in the air.

MIRROR, a smooth surface capable of regularly reflecting a great proportion of the rays of light that fall upon it. The mirrors used by the ancients, and more especially by the Etruscans, were made of thin polished bronze. Small metal mirrors were also used by the Greeks and Romans, and specimens brought by the latter have been found in Cornwall. The making of glass mirrors, which had their backs silvered with an amalgam of mercury and tin, was early practiced by the Venetians. In 1835 Liebig observed that by heating aldehyde in a glass vessel along with an ammonical solution of nitrate of silver, a coating of brilliant metallic silver was left upon the glass. This has now been made use of in mirror-making by what are known as the hot and cold processes. In the hot process the glass is first sensitized with a solution of tin, which is then rinsed off and the plate laid upon a flat, double-bottomed metal table heated by steam to about 100° Fahr. In this position a solution of nitrate of silver, ammonia, and tartaric acid in distilled water is poured over it; and if the temperature is kept uniform a thick deposit of silver will be formed in about half an hour. When the silver layer is carefully wiped this process is repeated. In the cold process a solution of nitrate of silver, nitrate of ammonium and caustic soda dissolved in water, is mixed with a solution of loaf-sugar, vinegar, and water. This is poured quickly and evenly over the glass plate, and the silver is precipitated in a few minutes, after which it is washed and the process repeated. The silvering is then protected by a coating of shellac or copal varnish. More recently a solution of bichloride of platinum is applied to the surface of the glass and precipitated with oil of lavender in the manufacture

of the cheapest mirrors. Mirrors may be plane or spherical, and in the latter case they may be either convex or concave. The optical principles involved in reflection from mirrors are simple.

MIRZAPUR, a city of India, capital of a district of same name, in the United Provinces, on the Ganges, 56 miles below Allahabad and 45 above Benares. Pop. 79,862.—The district has an area of 5223 sq. miles. Pop. 1,161,508.

MISDEMEANOR, an offense of a less atrocious nature than a crime, including generally all indictable offenses which do not amount to felony, as perjury, libels, conspiracies, assaults, etc.

MISERE'RE, the name of a psalm in the Roman Catholic church service, taken from the fifty-first Psalm, beginning in the Vulgate, "Miserere mei, Domine" ("Pity me, O Lord"). The name is also applied to a projecting bracket on the under side of a hinged seat in a stall of a church; or to the seat and bracket together. The bracket served as a rest for a person standing, the seat being turned up.

MISSIONS, Missionaries. The first Christian missionaries were the apostles, and by them and their successors Christianity was in the course of a few centuries spread over all parts of the Roman Empire. In some parts, as in Britain, it gave way again before the Germanic invaders of the 5th and 6th centuries, and some of the most noted missionaries were those who reintroduced their faith among the German tribes. St. Augustine or Austin, who was sent by Gregory the Great with forty associates to preach the gospel among the Saxons of Britain at the end of the 6th century, was the first of this missionary group. Britain in its turn sent forth missionaries, such as St. Boniface, "the apostle of Germany." Germany also sent out the missionaries who converted Denmark, Sweden and Norway, Poland, Hungary, and Bohemia. The Crusades opened up new spheres for missionary efforts in the east, and two religious orders founded at the beginning of the 13th century, the Dominicans and Franciscans, devoted themselves to preaching among the Musselmans. Others advanced as far as Tartary, Tibet, and China, but the persecutions there became so violent that those countries had to be abandoned. A new impulse was given to missions by the discovery of the New World. When the way had been prepared by the Spanish and Portuguese armies a crowd of friars of all orders set out for the West Indies, Mexico, Peru, and Brazil, to spread Catholicism; but very few, like Las Casas, protected the natives from rapacity or preached Christianity by their conduct. The powerful order of the Jesuits, which was founded in the 16th century, turned their attention to the east, and the celebrated Francis Xavier, a member of the order, proceeded to India, where his efforts were crowned with success. From India Christianity was introduced into Japan, where it had to contend against terrible persecutions, before which the missionaries were compelled to retire. Father Ricci, another Jesuit, penetrated to Peking, and succeeded about the end of the 16th century in gaining a firm footing. At the beginning of the 17th century some Dominican missionaries made Tonquin and Cochin China the center of their efforts, and pushed out thence into all the neighboring countries with considerable success. In 1622 Gregory XV. gave a better organization to the Roman Catholic missions by the foundation of the Propaganda, and they are now very widely spread and carried on with much energy.

The earliest Protestant foreign mission appears to have been one which was established in Brazil in 1555. Gustavus Vasa, king of Sweden from 1523 to 1560, toward the close of his reign sent forth a mission to convert the Laplanders. Shortly after the settlement of New England in 1620 John Eliot took a deep interest in the condition of the North American Indians, and in 1646 began a regular mission among that people. But these were only isolated trivial efforts, and it was not until the 18th century that the true missionary spirit awoke. The English took the lead in this movement, but were speedily followed by Danes and Germans, especially the Moravian Brethren. After the missions of Great Britain the next in importance are those of the United States. The first missionary society of this country was founded in 1810 under the title of the American Board of Commissioners for Foreign Missions. The American Baptist Missionary Union was founded in 1814, the Methodist Episcopal Church Missionary Society in 1819, the Protestant Episcopal Missionary Society in 1820, the Presbyterian Board of Foreign Missions in 1833. The American missionaries have naturally done much in the conversion of the Indians of this continent, but their missions are widely spread elsewhere.

MISSISSIP'PI ("Great Water"), the principal river of North America, and one of the largest rivers in the world. It has its source in Lake Itasca, state of Minnesota, whence it issues about 12 feet wide and 2 feet deep; from thence it trends southward through a number of lakes and over a series of rapids until the Falls of St. Anthony are reached; below this it receives the Iowa, the Illinois, and the Missouri as tributaries, but the latter is really the main stream, having a length of 2908 miles before the rivers unite, while that of the Mississippi is only 1330 miles. From St. Louis, a little below their confluence, the Mississippi becomes a broad, rapid, muddy river, liable to overflow its banks; lower down it receives in succession the Ohio, Arkansas, and Red rivers, and it finally enters the Gulf of Mexico through a large delta with several "passes," some distance below New Orleans. The combined lengths of the Missouri and Mississippi are about 4200 miles; the whole area drained by the Mississippi is 1,246,000 sq. miles; the maximum flood volume reaches 1,400,000 cubic feet per second below the Ohio; and the sediment transported to the gulf annually would make a solid block 1 mile square and 260 feet high. Above its junction with the Ohio at Cairo the river enters upon a large alluvial basin, bounded on both sides by high bluffs, and through this plain the river winds for about 1150 miles. The volume is usually smallest in October and greatest in April, and the lowlying lands are subject to terrible floodings during the spring freshets. At many places attempts have been made to secure the river within its banks and save the country from loss and suffering by building dykes, or levees as they are called. The sediment carried down, however, is continually raising the bed of the river, and thus breaks are frequently made in these levees. A recent method of improving the river's course, sanctioned by congress and superintended by Captain Eads, is to construct light willow screens or dams on the shoals and at the wide places on the river where bars already exist. By this a deposit is formed which in time will act as a bank to hem in the river, while the increased volume thus obtained will help to scour out a deeper channel. The most important towns on the river banks are St. Paul, St. Louis, Cairo, Memphis, Vicksburg, Natchez, and New Orleans.

MISSISSIPPI, one of the United States of America; bounded north by Tennessee, east by Alabama, south by the Gulf of Mexico and Louisiana, and west by Louisiana and Arkansas; area, 46,810 sq. miles. The Mississippi winds along its western frontiers for 530 miles. Near the Gulf of Mexico the country is low and swampy, the central part is hilly and mostly prairie-land, a large part of the northeast is covered with forests, while 7000 sq. miles along the Mississippi consist of rich bottom-lands. This river

Seal of Mississippi.

receives the far larger part of the drainage. In the north the climate is tolerably mild and agreeable; but in the south, below lat. 13°, and along the swampy basin of the Mississippi, it is both extremely hot and unhealthy. In the southeast, where the pine forests extend, the soil is light and comparatively barren, but large tracts of it are well adapted for pasture. In the northwest, on the borders of the Yazoo, the soil is composed of rich black mould; and in the Mississippi bottom-lands, where it is protected from inundation by embankments or levees, it is of remarkable fertility. The staple of the state is cotton, and the other crops are chiefly Indian corn, bananas, sweet-

potatoes, tobacco, and indigo; while fruit is abundant. The predominant industry in the state is agriculture and it is highly favored both by the nature of the climate and the soil. The most desirable region is included between the Yazoo and the Mississippi rivers. Very extensive areas are still covered with forests, but it is nearly all susceptible of cultivation. There are 18,240,736 acres, or 61.5 per cent of the total area, included in farms. Of this 41.6 per cent is improved, the improved area having increased about 1,500,000 acres since 1860, while the unimproved area remains about the same. The change in the system of agriculture incident upon the cessation of slavery has decreased the average size of farms from 369.7 acres in 1860 to 82.6 in 1900. In no other state is cotton so dominant as in Mississippi. The acreage of cotton is over half of the total crop acreage and contributes 63.6 per cent of the value of farm crops. The state ranks third in the production of cotton. The greatest production was reached in 1897–98, when the output amounted to 1,600,000 bales, and only once in that decade did the production fall below 1,000,000 bales. Aside from cotton the agricultural interest of the state is almost wholly centered in corn. The acreage of this crop constitutes 95.9 per cent of the total area devoted to cereals. The production of oats has decreased. Compared with its sister state across the Mississippi river, remarkably little attention is paid to the growing of sugar cane, and the crop of late years is almost wholly converted into syrup and molasses. Small fruits and orchard fruits are not extensively raised. In the decade 1890–1900, however, the number of trees almost doubled. In the latter year the peach trees numbered 1,856,748 which was 53 per cent of the total number.

The manufacturing industry is probably less developed in Mississippi than in any other of the older states of the Union. On the other hand, the rate of the recent increase has been greater than that of most of the other states. In the decade 1880–1890 the value of the manufactured product increased 148.8 per cent and in the decade 1890–1900 increased 116.1 per cent. Having no large transportation center, and the water power and mineral resources being of little consequence, the state is at a comparative industrial disadvantage. But the products of her cotton fields and forests supply an abundance of raw materials.

The manufacture of cottonseed oil and cake—experienced an increase during the decade of 177.6 per cent. The state contained the first mill of this kind erected in the United States. A less absolute but much larger per cent of increase was made in cotton-ginning. The export trade, carried on through New Orleans and Mobile, is chiefly in lumber and cotton, while the river and coasting traffic is large. The railroads extend to about 2500 miles. The state supports a public school system with separate schools for the white and colored races, besides a state university and other schools of high grade. The capital is Jackson. The other principal towns are Vicksburg and Natchez.

In 1539 Hernando de Soto, with a band of Spanish adventurers, crossed the northeastern part of what is now the state, and in the early part of 1541 reached the Mississippi river, near the present site of Memphis, Tenn. In 1673 the French explorers Joliet and Marquette, passing down the Mississippi, sailed as far as the mouth of the Arkansas. In 1681–82 La Salle sailed down the river to its mouth, and, taking formal possession for the king of France, Louis XIV., named the country Louisiana after him. The first attempt to found a colony was made in 1699 by Iberville, who brought 200 immigrants from France to Biloxi, on the eastern shore of the Bay of Biloxi.

By the treaty of Paris, in 1763, France ceded all her possessions east of the Mississippi river to England, excepting the island of New Orleans, ceded to Spain. The British province of West Florida at first extended eastward from the Mississippi river along the Gulf coasts, with its northern limit at the 31st parallel of north latitude. Soon afterward the northern boundary was fixed at a line drawn eastward from the point where the Yazoo river unites with the Mississippi.

During the revolutionary war of the Atlantic colonies, West Florida remained undisturbed until 1779. In 1781 West Florida was conquered by Spain. In 1798, the territory was extended from the Mississippi river eastward to the Chattahoochee river. By the treaty of 1795 Spain ceded her claims to the United States. In the war of 1812 the territory was well represented at the battle of New Orleans. In March, 1817, congress passed an enabling act for the admission of Mississippi to the Union and the state was formally admitted December 10, 1817. The most notable features of the first constitution of Mississippi were the high property qualifications for holding office, the short tenures of offices, and the large appointing power of the governor and legislature. The first governor was David Holmes, and during his administration the capital was permanently located at Jackson, near the headwaters of the Pearl river. Upon the outbreak of the Mexican war Mississippi was called upon to furnish one regiment of volunteers, but more than enough men for two regiments responded. The first regiment was commanded by Col. Jefferson Davis, who won great distinction at the battle of Buena Vista. In 1851 occurred the first important struggle in Mississippi over the slavery question, which had become serious on account of the enactment by congress of the so-called Compromise Measures of 1850. It was left, however, for the election of Lincoln to bring the secession movement to a head. An ordinance of secession was passed on January 9, 1861, by a convention, by a vote of 84 to 15, and the state constitution was amended to bring it into conformity with the constitution of the confederate states. In 1870 the state was re-admitted into the Union. By the constitution of 1890 the suffrage was restricted to those able to read a section of the constitution, or to interpret any passage, if read aloud, a provision aimed against the negro voter, and sufficiently successful in attaining its aim. In national elections Mississippi has been a democratic state with the exception of the year 1840, when it voted for the whig candidate, and of 1872, when its vote was given to Grant. In 1864 and 1868 its vote was not counted. Pop. 1,750,612.

MISSISSIPPI, University of, a state university chartered in 1844 and opened in 1848, at Oxford, Miss., and maintained until 1880 by annual grants by the legislature. In 1872 the policy of separate schools, with optional studies and with courses leading to other degrees besides that of B.A., was adopted. The work of the university is organized in seven undergraduate courses, partially elective, leading to the bachelor's degree in arts, science, pedagogy, philosophy, mining, and both civil and electrical engineering. The university also maintains a law school and a summer school, and confers the degree of M.A. and Ph.D. In 1894 the preparatory education was discontinued at the university; and the requirements for admission are those adopted by the Association of Colleges and Preparatory Schools of the Southern States, of which the university is one of the original members. Students from approved high schools are admitted without examination. Since 1882 women are admitted to the classes, but are not permitted to lodge on the campus.

MISSISSIPPI AGRICULTURAL AND MECHANICAL COLLEGE, a state institution at Agricultural College, Miss., founded in 1880 on the federal land grant of 1862. It has a preparatory department and three courses of instruction, agricultural, mechanical, and textile, with provision for graduate work and summer sessions. It confers the degrees of Bachelor and Master of Science, and the honorary degree of Master of Progressive Agriculture. Tuition is free to students residing in the state; others pay an annual fee of $20. The college has a military organization, and all students are required to wear a prescribed uniform within five miles of the college buildings. The attendance of women is permitted.

MISSISSIPPI SCHEME, a bubble scheme projected by John Law at Paris in 1717. Part of the scheme was for the colonization and development of the Mississippi valley, but combined with this there was a banking scheme and a scheme for the management of the national debt, the whole being supported by the French government. Such were the hopes raised by this undertaking that the shares originally issued at 500 livres (say $100) were sold at ten, twenty, thirty, and even forty times their value. People came from all parts of France, and even from foreign countries, in order to invest in the company, and there was a general mania of speculation. The state took advantage of the popular

frenzy to issue increased quantities of paper-money, which was readily accepted by the public creditors and invested in shares of Law's company. This went on till the valuc of the paper-money became depreciated in value and all the shares fell in price. All attempts to check the downward course failed, and when Law, the originator of the bankrupt company, fled from France in 1720 the state acknowledged itself debtor to the shareholders to the extent of 1700 million livres. See Law, John.

MISSOURI (mi-sō'rē), a river of North America, which is formed in the Rocky Mountains, in Montana, winds circuitously along the base of the mountains, then east till it reaches the western boundary of N. Dakota, and receives the Yellowstone. Here it begins to flow southeastward through N. and S. Dakota, then forms the eastern boundary of Nebraska, separating it from Iowa and Missouri; separates for a short distance Kansas from Missouri, then strikes eastward across the latter state, and joins the Mississippi after a course of 2908 miles. It it navigable 2500 miles from the Mississippi. Its affluents are very numerous on both banks, but by far the most important of them are the Yellowstone, the Nebraska or Platte, and the Kansas, all from the west.

MISSOURI, one of the United States of America, bounded north by Iowa; east by the Mississippi, which separates it chiefly from Illinois, but partly also from Kentucky and Tennessee; south by Arkansas; and west by Kansas and Nebraska, from which it is partly separated by the Missouri, and by the Indian Territory; area, 69,415 sq. miles. The surface is traversed by numerous hills and swelling ridges, but the southeast corner is almost an alluvial flat. The

Seal of Missouri.

most important rivers are the Mississippi and the Missouri, the latter of which crosses the state from west to east, and has several navigable tributaries—the Lamine, Osage, Gasconade, the Grand, and Charlton. The state is rich in minerals: iron and lead are produced, the latter in large quantities, and coal is raised to the extent of some 4,000,000 tons annually. Much of the soil is fertile, and there is a great deal of valuable timber.

Agriculture is the leading industry, 33,997,873 acres, or 77.3 per cent of the total area is included in farms. The crop production is characterized by the great attention given to corn, which constitutes over 71 per cent of the total cereal crop, and places Missouri among the leading corn states. Wheat is the next most important of the cereals. A largely increasing acreage is devoted to hay and forage, which together rank next to corn in area. A great deal of flax is raised near the western border of the state south of the Missouri river. In the lowlands in the southeast corner of the state, cotton is the leading crop. Potatoes and sorghum cane are grown throughout Missouri. The state produces watermelons, tomatoes, cabbages, and other vegetables. Broom corn and castor beans receive some attention. Both small fruits and orchard fruits are grown in abundance.

Red deer are found in every part of the state, especially in the thinly settled and mountainous districts. Wild turkeys are numerous in the swampy and mountainous districts, and are found in all parts of the state. Prairie chickens are found in the prairie portion of Missouri, and are shipped in great quantities to eastern markets. And in all parts of Missouri are found the quail or Virginia partridge. The rabbit, a species of hare, is so common as to be considered a pest. The gray squirrel and the red fox-squirrel are also found in large numbers all over the state. Black bass, perch, catfish, buffalo fish, suckers, and pike are the leading varieties of native fish.

Missouri is the leading manufacturing state west of the Mississippi. Development in this direction has been favored by its location on the Mississippi and Missouri rivers. The growing of tobacco in the state gives rise to extensive manufactures of this product, especially chewing and smoking tobacco and snuff. A large number of railroads cross the Mississippi at St. Louis, while Kansas City and St. Joseph on the western border are also large railroad centers. Some of the leading lines in Missouri are: The Missouri Pacific, the Atchison, Topeka and Santa Fe, the St. Louis and San Francisco, St. Louis Southwestern, the Chicago, Burlington and Quincy, Chicago and Alton, the Wabash, the St. Louis, Iron Mountain and Southern. The climate is generally healthy, but subject to extremes. Education has been well provided for, both by the state and by the different religious bodies. Besides the state university there are other universities and colleges (medical and other), normal schools, school of agriculture, school of mining and metallurgy, etc. Jefferson City is the capital, but St. Louis is the commercial metropolis and largest city, and there are many others more populous than Jefferson.

Missouri was part of the vast area of Louisiana claimed by the French on the ground of the discoveries of La Salle, who descended the Mississippi to its mouth in 1681–82. A few years before La Salle, in 1673, Marquette and Joliet had sailed down the river as far as the mouth of the Arkansas. The territory included within the present state was traversed before 1720 by parties of French explorers in search of mines of lead and silver, and in 1723 a certain Lieutenant Renaud received the grant of a large tract of land in that region. The foundation of Old Saint-Genevieve is sometimes placed in the year 1735. The second settlement within the state was St. Louis, established as a trading-post in 1764, a year after the cession of Louisiana to Spain by the Peace of Paris. After the acquisition of Louisiana by the United States, in 1803, the entire territory was divided into two by the line of the 33d parallel of latitude, the northern part being known as the district and territory of Louisiana till 1812 and subsequently as the territory of Missouri. In June, 1812, Missouri was organized as a territory, with a governor and general assembly. In 1818 Missouri applied for admission to the Union as a state. Two years of bitter controversy followed a resolution introduced into Congress of an anti-slavery restriction. This was settled by the adoption of the "Missouri compromise," which forbade slavery in all that portion of the Louisiana purchase lying north of 36° 30′ except in Missouri, and on July 19, 1820, Missouri was admitted to the union.

In the first half of the nineteenth century Missouri, though a slave state, was not an ardent defender of slavery, and a very large proportion of its citizens were interested in movements looking toward the gradual emancipation of the slaves. With the rise of the abolitionists, however, Missouri became decidedly a pro-slavery state. It favored the annexation of Texas in 1845, and took a very prominent share in the Mexican war, General Kearny's army of invasion consisting largely of Missourians. In 1849 the legislature adopted the so-called Jackson resolutions, in which the right of congress to regulate slavery in the territories was denied, and the principle of squatter sovereignty was asserted. In reply to President Lincoln's call for troops, Governor Jackson, who, with the rest of the state government, was in favor of secession, refused to participate in the "unholy crusade," and summoned the state militia to arms. Between the state militia and the federal troops, under Colonel Lyon aided by the volunteer bands which the loyalists of St. Louis had organized, civil war ensued. The governor, together with a majority of the legislature, fled to the southern part of the state, and the supreme power was assumed by the convention, which declared all the offices vacant and proceeded to install a provisional government. With the fall of the confederate power in Missouri the regular state government was reorganized (1864), and in January, 1865, a constitutional convention controlled by the radical union party assembled in St. Louis. Since the war the prosperity of the state has been greatly increased by the development of its mineral industries, and the growth of railroads. The improvement of the navigation of the Mississippi and the Missouri was carried on actively for many years. In the matter of public education there has been exceedingly rapid progress, the

school fund of the state being one of the largest in the Union. In 1903 an exposition was held at St. Louis to commemorate the one hundredth anniversary of the acquisition of Louisiana.

From 1824 to the civil war Missouri was always democratic, but the whig minority was very strong. From 1864 to 1872 the republicans were in power, but the defection of a large body of liberal republicans who were opposed to the vindictive policy pursued against those who had participated in the rebellion led to the reëstablishment of democratic supremacy, which has remained unbroken since, save for the election of 1894, when the republicans secured a majority in the legislature and the congressional delegation. Pop. 3,575,862.

MISSOURI COMPROMISE, an act of the American congress, passed in 1820, by which Missouri was admitted into the Union as a slave-holding state but which enacted that slavery should never be established in any future-formed state north of lat. 36° 30′.

MISSOURI, University of, at Columbia, in Boone county, is the oldest state university west of the Mississippi river. Its legal existence dates from Feb. 11, 1839, and the beginning of its courses of instruction from April 14, 1841. The organization of the university comprises nine departments: The college of liberal arts; the Missouri teachers' college, the college of agriculture and mechanic arts (including the experiment station), the college of engineering, the Missouri school of mines (at Rolla), the department of law, the department of medicine, the Missouri state military school, and the graduate department. All, excepting the military school, are open to women. 178 professors, assistant professors, instructors, and assistants were engaged in teaching in the various faculties in 1906. Forty-five states and eighteen foreign countries were represented in 1905–6 by 2,067 students, an increase in attendance of more than 100% since 1901, when the enrollment first reached 1,000. No tuition is charged and the cost of living is comparatively low. Excellent laboratory facilities exist and in the various general and special libraries more than 120,000 books and pamphlets are accessible to students. The buildings, grounds, books, and other equipment are valued at $2,000,000, and the income of the university in 1905-6 was $510,000. There are 30 buildings—23 at Columbia and 7 at the School of Mines at Rolla.

MISTLETOE, a plant growing parasitically on various trees, and celebrated on account of the religious purposes to which it was consecrated by the ancient Celtic nations of Europe, being held in great veneration by the Druids, particularly when it was found growing on the oak. It is a small shrub, with sessile, oblong, entire, somewhat leathery leaves, and small, yellowish-green flowers, the whole forming a pendent bush covered in winter with small white berries, which contain a glutinous substance. It is common enough on certain species of trees, such as apple and pear trees, hawthorn, maple, lime, and other similar trees, but is very seldom found on the oak. Its roots penetrate into the substance of the tree on which it grows, and latterly it kills the branch supporting it.

MISTRAL, a violent cold northwest wind experienced in Provence and other neighboring districts bordering on the Mediterranean, and destroying crops, fruit, blossom, etc. It blows with greatest violence in autumn, winter, and early spring.

MITCHEL, Ormsby McKnight, American astronomer, was born in Kentucky in 1809. He was assigned to the artillery, and until 1832 was assistant professor of mathematics in the United States military academy. He resigned from the army and became professor of mathematics, philosophy, and astronomy in Cincinnati College in 1836. In 1844 he succeeded in obtaining the construction of an observatory in Cincinnati, of which he was made first director. During his incumbency of this office, which extended over many years, he made many notable astronomical discoveries, including, with exactness, that of the period of rotation of the planet Mars, and in 1859 he took charge of the Dudley University in Albany, N. Y. He was promoted major-general of volunteers in 1862. He died in 1862.

MITCHELL, Donald Grant (Ik Marvel), American author, was born in Norwich, Conn., in 1822. In 1850 and 1851 he wrote Reveries of a Bachelor, and Dream Life, the books most popularly associated with his pseudonym, Ik Marvel. In 1848 he again went abroad, traveling through Great Britain, France, and Switzerland, and on his return published The Lorgnette, a periodical in the manner of Irving's Salmagundi. In May, 1853, Mr. Mitchell was appointed United States consul at Venice, and on his return, in 1855, settled on a farm near New Haven, Conn. In 1876 he received the degree of LL.D. from Yale. He died in 1907.

MITCHELL, John, labor representative, was born in Braidwood, Ill., in 1869. He worked in the coal mines of Illinois and joined the Knights of Labor in 1885. He was secretary and treasurer of United Mine Workers in 1895, national vice-president in 1898. He was elected vice president of the American Federation of Labor in 1900. He was president of the United Mine Workers from 1898, to Jan. 1908. He directed the strike of the anthracite workers, and brought it, through the intervention of President Roosevelt, to a successful conclusion. He is one of the most prominent labor representatives in the United States. In 1902 he was appointed a member of the executive committee of the Industrial Department of the National Civic Federation.

MITCHELL, Margaret J. (Maggie), American actress, was born at New York City about 1832, and made her first appearance when a child on the stage of the old Bowery theater. She became prominent as a soubrette during 1852, and later acquired a national reputation in Fanchon the Cricket, of which she is the original. She has played with great success Little Barefoot, The Pearl of Savoy, and other dramas adapted to the requirements of her particular school.

MITCHELL, Silas Weir American neurologist, was born in Virginia in 1829. His earliest work of importance consisted of researches upon the chemical composition and physiological action of venom snakes. He system of "Rest Treatment" has been adopted the world over. He is best known to the public through his novels, Hugh Wynne, Free Quaker, The Adventures of François, Dr. North and His Friends, etc.

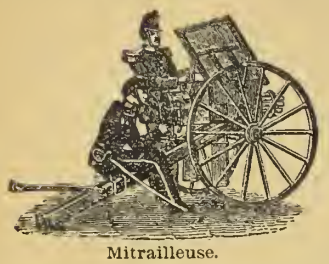
MITE, a name common to numerous small, in some cases microscopic, animals. Sometimes the name is given only to those of the Acarida which have feet formed for walking and the mouth not furnished with a sucker formed of lancet-like plates, as in the ticks, but with mandibles. Some are of a wandering character, and are found under stones, leaves, the bark of trees; or in provisions, as meal, cheese, pepper, etc.; others are stationary and parasitic on the skin of various animals sometimes proving of serious injury to them.

MITFORD, Mary Russell, English authoress, daughter of a physician at Alresford, Hampshire, and born there 1786, died 1855. Her best-known work is Our Village, a series of prose sketches descriptive of English country life and scenery, drawn from the village of Three Mile Cross, near Reading.

MITHRIDA'TES, or **MITHRADA'TES,** king of Pontus, on the southern shore of the Black Sea, surnamed the Great. His father was murdered B.C. 120, and Mithridates ascended the throne at the age of thirteen. Soon after attaining his majority he commenced his career of conquest, which made him master of nearly all Asia Minor, besides Greece, and brought him into conflict with Rome. For four years Mithridates disputed possession of Asia, but was at last compelled to succumb, B.C. 84, After the death of Sulla, which occurred in B.C. 78, Mithridates levied another army with a determination to expel the Romans from Asia. Being defeated by Lucullus, who was appointed consul B.C. 74, he was followed by the victorious Romans into his own states, and driven to seek a refuge in Armenia, then ruled by Tigranes, who refused to deliver him up. Here Mithridates raised a third great army, and in B.C. 67 completely defeated the Romans, and, following up his success, rapidly recovered the larger part of his dominions. The Romans now invested Pompey with absolute power in the east, and by him, in B.C. 66, the forces of Mithridates were completely routed near the Euphrates. The king retired to Bosporus (the Crimea), where his troops, headed by his son Pharnaces, broke out in mutiny, and Mithridates killed himself B.C. 63.

MITRAILLEUSE (mit-rà-yeuz), a breech-loading machine-gun introduced in France shortly before the Franco-German war of 1870–71. It consists of a number of rifled barrels, generally thirty-seven, either bound together or bored out of the solid, and mounted on

the same principle as an ordinary field-piece. Plungers and springs are fixed in connection with the breech ends of the barrels that they may be fired in succession with great rapidity, so as to concentrate a deadly fire upon any desired point.



Mitrailleuse.

MITRE, a sacerdotal ornament worn on the head by bishops and archbishops (including the pope), cardinals, and in some instances by abbots, upon solemn occasions, or by a Jewish high-priest. It is a sort of cap pointed and cleft at the top, this form being supposed to symbolize the "cloven tongues" of the day of Pentecost. The pope has four mitres, which are more or less rich according to the solemnity of the feast-days on which they are to be worn. The English archbishops have a ducal coronet round their mitres.

MITTIMUS, in law, a warrant of commitment to prison; also a writ for removing records from one court to another.

MIZZEN, a term applied to the aftermost mast of a three-masted vessel, that is the one nearest the stern. In a four-master the jigger-mast comes between it and the stern

MNEMONICS (nē-mon'iks), the art of assisting the memory by methods of association. Many devices have been devised for assisting in the recollection of facts, dates, numbers, or the like, but they all go on the principle of associating the thing to be remembered with something else which can be more easily recollected. The art dates from a very early period, Simonides the Greek poet (500 B.C.) having devised a system. All the systems are more or less arbitrary, and their chief value would seem to lie in the exercise which they give the memory, thereby strengthening it. Memorial lines and verses have been extensively used as aids to memory

MOA, an extinct bird of New Zealand. See Dinornis.

MOAB, the land of the Moabites, a tribe dwelling in the mountainous region east of the Dead Sea. According to the Mosaic account (Gen. xix: 30) the Moabites were descended from Moab, the son of Lot by his eldest daughter. In the time of the judges they were for eighteen years masters of the Hebrews, but in the time of David were rendered tributaries to them. After the Babylonish captivity they lost their separate national existence.

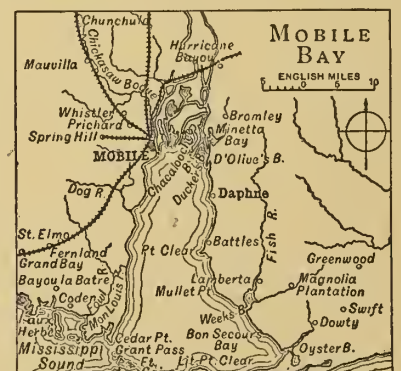
MOABITE STONE, a monument of black basaltic granite about 3 feet 5 inches high and 1 foot 9 inches wide and thick, with rounded top but square base, on which there is an inscription of thirty-four lines in Hebrew-Phœnican characters, discovered in 1868 at Dhiban in the ancient Moab. It was unfortunately broken by the natives, but almost the whole of the inscription has been recovered from the broken pieces. The inscription dates about 900 B.C., and is the oldest known in the Hebrew-Phœnician form of writing. It was erected by Mesha, king of Moab, and is a record of his wars with Omri, king of Israel, and his successors

MOBERLY, a city in Randolph co., Mo., on the Mo., Kan. and Tex. and the Wabash railways; 130 miles e. by n. of Kansas City, 148 miles w. of St. Louis. It contains the division headquarters and machine-shops of the Wabash railway system. Pop. 10,142.

MOBILE (mo-bēl'), a city and port of the United States, in Alabama, on the right bank of the Mobile, at its entrance into Mobile Bay. It has regular streets and several fine public buildings; is well supplied with water, and generally healthy, though at times visited by yellow fever. It has an important export trade, and next to New Orleans is one of the greatest cotton marts of the South. A channel 33 miles long is maintained by dredging to allow the approach of tolerably large vessels to the harbor; but it is proposed to construct a new and deeper harbor on Dauphine Island, which will be connected with Mobile by rail. Pop. 1909 about 65,000.

MOBILE, a river of the United States, in Alabama, formed by the union of the Alabama and the Tombigbee, which unite about 45 miles above the town of Mobile. It enters Mobile Bay by two mouths.

MOBILE BAY, an estuary of the Gulf of Mexico, from 8 to 18 miles wide, and



about 35 miles in length, n. to s., the general depth being 12 to 14 feet.

MOBILIER. See Crédit Mobilier.

MOBILIZATION, a military term, being the act of putting troops into a state of readiness for active service. The mobilization of an army or a corps includes not only the calling in of the reserve and the men on furlough, but the organizing of the staff, as well as the commissariat, medical, artillery, and transport services, the accumulating of provisions, munitions, and the like.

MOC'CASIN, a shoe or cover for the feet, made of deer-skin or other soft leather, without a stiff sole, and ornamented on the upper part; the customary shoe worn by the native American Indians.

MOC'CASIN SNAKE, a very venomous serpent frequenting swamps in many of the warmer parts of America. It is about two feet in length, dark-brown above, and gray below.

MOCKING-BIRD, an American bird of the thrush family. It is of an ashy-brown color above, lighter below, and is much sought for on account of its wonderful faculty of imitating the cries or notes of almost every species of animal, as well as many noises that are produced artificially. Its own notes form a beautiful and varied strain. It inhabits North America chiefly, being a constant resident of the southern states, and but rare and migratory in the northern parts of the continent. It is also found in the West Indian Islands and in Brazil.

MOD'ENA, a town of North Italy, capital of the province of its own name. Pop. 64,941.—Modena was formerly an independent duchy bordering on Tuscany, Lucca, Bologna, Mantua, and Parma; area, 2340 sq. miles; pop. over

Mocking-bird.

600,000. It is now divided into the provinces of Modena (966 sq. miles; pop. 315,804), Massa-Carrara, and Reggio.

MODERATOR, the person who presides at a meeting or disputation; now used chiefly as the title of the chairman for president of meetings or courts in the Presbyterian churches.

MODJESKA, Helena, actress, was born at Cracow, Poland, about 1843. In 1865 she became the theatrical star and favorite of Warsaw, a position which she held until about 1876, when she and her husband emigrated to America. She made her appearance in 1877 in an English version of Adrienne Lecouvreur at San Francisco. She won immediate success and has since achieved various triumphs on both sides of the Atlantic. Her notable impersonations were Ophelia, Rosalind, Imogen, Cleopatra, Lady Macbeth. In 1889–90 she starred with Edwin Booth in Romeo and Juliet.

MODOCS, an American Indian tribe originally settled on the s. shore of Klamath lake, California. From 1847 till 1873 they were in continual conflict with the whites. Only a small remnant of them now exists in the Indian territory and in Oregon.

MODULATION, in music, the transition from one key to another. The simplest form is the change from a given key to one nearly related to it, namely, its fifth (dominant), fourth (subdomi-

nant), its relative minor, or the relative minor of its fifth. Modulation is generally resorted to in compositions of some length, for the purpose of catching and pleasing the ear with a fresh succession of chords.

MOGUL', a word which is the same as Mongol, but is applied particularly to the sovereigns of Mongolian origin, called Great or Grand Moguls, descendants of Tamerlane, who ruled in India from the 16th century downward, the first of them being the conqueror Baber. See India, History of.

MOHAIR, the hair of the Angora goat of Asia Minor. It is soft and fine as silk, of a silvery whiteness, and is manufactured into camlets, plush, shawls, braidings, and other trimmings, etc.

MOHAM'MED, Mahom'et, or more correctly Muhammad, the founder of Islamism, was an Arabian by birth, of the tribe of the Koreish, and was born of poor parents in 571 A.D., in Mecca. In his twenty-fifth year his uncle recommended him as agent to a rich widow, named Chadidja, and he acquitted himself so much to her satisfaction that she married him, and thus placed him in easy circumstances. He seems to have had from his youth a propensity to religious contemplation, for he was every year accustomed, in the month Ramadhan, to retire to a cave in Mount Hara, near Mecca, and dwell there in solitude. Mohammed began his mission in the fortieth year of his age by announcing his apostleship to his own family. His wife was one of the first to believe in him, and among other members of his family who acknowledged his mission was his cousin Ali, the son of Abu Talib. Of great importance was the accession of Abu Bekr, a man of estimable character, who stood in high respect, and persuaded ten of the most considerable citizens of Mecca to join the believers in the new apostle. They were all instructed by Mohammed in the doctrines of Islam, as the new religion was styled, which were promulgated as the gradual revelations of the divine will, through the angel Gabriel, and were collected in the Koran. After three years Mohammed made a more public announcement of his doctrine, but his followers were few for years. In 621 Mohammed lost his wife, and the death of Abu Talib took place about the same time. Deprived of their assistance he was compelled to retire, for a time, to the city of Taif. On the other hand, he was readily received by the pilgrims who visited the Kaaba, and gained numerous adherents among the families in the neighborhood. Mohammed now adopted the resolution of encountering his enemies with force. Only the more exasperated at this they formed a conspiracy to murder him; warned of the imminent danger, he left Mecca, accompanied by Abu Bekr alone, and concealed himself in a cave not far distant. Here he spent three days undiscovered, after which he arrived safely at Medina, but not without danger (A.D. 622). This event, from which the Mohammedans commence their era, is known under the name of the Hejra, which signifies flight. In Medina Mohammed met with the most honorable reception: thither he was followed by many of his adherents. He now assumed the sacerdotal and regal dignity, married Ayesha, daughter of Abu Bekr, and as the number of the faithful continued to increase, declared his resolution to propagate his doctrines with the sword. In the battle of Bedr (623), the first of the long series of battles by which Islamism was established over a large portion of the earth, he defeated Abu Sofian, the chief of the Koreishites. He in turn was defeated by them at Ohod, near Medina, soon after, and in 625 they unsuccessfully besieged Medina, and a truce of ten years was agreed on. Wars with the Jewish tribes followed, many Arabian tribes submitted themselves, and in 630 he took possession of Mecca as prince and prophet. The idols of the Kaaba were demolished, but the sacred touch of the prophet made the black stone again the object of the deepest veneration, and the magnet that attracts hosts of pilgrims to the holy city of Mecca. The whole of Arabia was soon after conquered, and a summons to embrace the new revelation of the divine law was sent to the Emperor Heraclius at Constantinople, the King of Persia, and the King of Abyssinia. Preparations for the conquest of Syria and for war with the Roman Empire were begun, when Mohammed died at Medina (632). His body was buried in the house of Ayesha, where he died, and which afterward became part of the adjoining mosque, and a place of pilgrimage for the faithful in all time to come. Of all his wives, the first alone bore him children, of whom only his daughter Fatima, wife of Ali, survived him. There is no doubt that Mohammed was a man of extraordinary insight and deep reflection. Though without book-learning, he had a deep knowledge of man, was familiar with Bible narratives and eastern legends, and possessed a grasp of the eternal ground of all religion, though tinged and modified by his vivid poetic imagination. See Koran, Mohammedanism.

MOHAMMED, the name of four Ottoman sultans. See Ottoman Empire.

MOHAMMED AHMED. See Mahdi.

MOHAMMED ALI. See Mehemet Ali.

MOHAMMEDANISM, the name commonly given in Christian countries to the creed established by Mohammed. His followers call their creed Islam (entire submission to the decrees of God), and their common formula of faith is, "There is no god but Allah, and Mohammed is his prophet." The dogmatic or theoretical part of Mohammedanism embraces the following points: 1. Belief in God, who is without beginning or end, the sole Creator and Lord of the universe, having absolute power, knowledge, glory, and perfection. 2. Belief in his angels, who are impeccable beings, created of light. 3. Belief in good and evil Jinn (genii), who are created of smokeless fire, and are subject to death. 4. Belief in the Holy Scriptures, which are his uncreated word revealed to the prophets. Of these there now exist, but in a greatly corrupted form, the Pentateuch, the Psalms, and the Gospels; and in an uncorrupted and incorruptible state the Koran, which abrogates and surpasses all preceding revelations. (See Koran.) 5. Belief in Gods prophets and apostles, the most distinguished of whom are Adam, Noah, Abraham, Moses, Jesus, and Mohammed. Mohammed is the greatest of them all, the last of the prophets and the most excellent of the creatures of God. 6. Belief in a general resurrection and final judgment, and in future rewards and punishments, chiefly of a physical nature. 7. The belief, even to the extent of fatalism, of God's absolute fore-knowledge and predestination of all events both good and evil.

The practical part of Mohammedanism inculcates certain observances or duties, of which four are most important. The first is prayer, including preparatory purifications. Prayer must be engaged in at five stated periods each day. On each of these occasions the Moslem has to offer up certain prayers held to be ordained by God, and others ordained by his prophet. During prayer it is necessary that the face of the worshipper be turned toward the kebla, that is, in the direction of Mecca. Prayers may be said in any clean place, but on Friday they must be said in the mosque. Second in importance to prayer stands the duty of giving alms. Next comes the duty of fasting. The Moslem must abstain from eating and drinking, and from every indulgence of the senses, every day during the month of Ramadhan, from the first appearance of daybreak until sunset, unless physically incapacitated. The fourth paramount religious duty of the Moslem is the performance at least once in his life, if possible, of the pilgrimage (el-Hadj) to Mecca, after which he becomes a Hadji. Circumcision is general among Mohammadans, but is not absolutely obligatory. The distinctions of clean and unclean meats are nearly the same as in the Mosaic code. Wine and all intoxicating liquors are strictly forbidden. Music, games of chance, and usury are condemned. Images and pictures of living creatures are contrary to law. Charity, probity in all transactions, veracity (except in a few cases), and modesty, are indispensable virtues. After Mohammed's death Abu Bekr, his father-in-law, became his successor, but disputes immediately arose, a party holding that Ali, the son-in-law of Mohammed, was by right entitled to be his immediate successor. This led to the division of the Mohammedans into the two sects known as Shiites and Sunnites. The former, the believers in the right of Ali to be considered the first successor, constitute at present the majority of the Musselmans of Persia and India; the latter, considered as the orthodox Mohammedans, are dominant in the Ottoman Empire, Arabia, Turkestan, and Africa. The total Mohammedan population of the world is estimated at fully 215,000,000. See Caliph, Shiites, Sunnites, etc.

MO'HAWK, a river of the United States, the principal tributary of the Hudson in the state of New York; length about 135 miles. It affords abundant

water-power, and flows through beautiful scenery.

MO'HAWKS, a tribe of North American Indians, belonging to the confederacy of the Five (afterward six) nations. (See Iroquois.) They originally inhabited the valley of the Mohawk river. With the rest of the confederacy they adhered to the British interest during the war of the revolution, and left the country on its termination for Canada, where lands were assigned them on the Grand river. Their language has been committed to writing.

MOHIC'ANS, or **MOHE'GANS,** a tribe of Indians formerly occupying the country now forming the southwestern parts of New England and that portion of New York state east of the Hudson.

MO'HILEV, a town of Russia, capital of a government of the same name. Pop. 43,106.—The government has an area of about 18,545 sq. miles. Pop. 1,708,041.

MOIRE (mwȧ-rā), the French name given to silks figured by the process called watering. The silks for this purpose, though made in the same way as ordinary silks, are of double width, and must be of a stout substantial make. They are folded and subjected to an enormous pressure, of from 60 to 100 tons, generally in a hydraulic machine, and the air in trying to escape drives before it the small quantity of moisture that is used, and hence is effected the permanent marking called watering, which is for the most part in curious waved lines.

MOLASSES, the uncrystallized syrup produced in the manufacture of sugar. It differs from treacle, as molasses comes from sugar in the process of making, treacle in the process of refining.

MOLE, a name given to insectivorous animals of the genus Talpa, family Talpidæ, which, in search of worms or insect larvæ, form burrows just under the surface of the ground, throwing up the excavated soil into a little ridge or into little hills. The common mole is found all over Europe, except in the extreme south and north. It is from 5 to 6 inches long; its head is large, without any external ears; and its eyes are very minute, and concealed by its fur, which is short and soft. Its fore-legs are very short and strong, and its snout slender, strong, and tendinous. It is

European mole (*Talpa europæa*) Fore-foot of the mole Hind-foot.

the only British representative of the family. Another species, blind mole, is found in the south of Europe. It has its name from its eye being always covered by its eyelid. The Cape mole or changeable mole is remarkable as being the only mammal that exhibits the splendid metallic reflection which is thrown from the feathers of many birds. The "star-nosed moles" of North America are so named from the star or fringe-like arrangement of the nasal cartilages. The shrew moles of North America are more properly included among the shrews.

MOLE, a mound or massive work formed of large stones laid in the sea so as to partially inclose and shelter a harbor or anchorage.

MOLECULE, the smallest quantity of any elementary substance or compound which is capable of existing in a separate form. It differs from atom, which is not perceived, but conceived, inasmuch as it is always a portion of some aggregate of atoms. Molecular attraction is that species of attraction which operates upon the molecules or particles of a body. Cohesion and chemical affinity are substances of molecular attraction. See Chemistry.

MOLE-RAT, a name given to dumpish stout-bodied rodents, with short, strong limbs, a short tail or scarcely any, and minute or rudimentary eyes and ears. They make tunnels and throw up hillocks like the mole, but their food appears to consist wholly of vegetable substances.

MOLESKIN, a strong twilled cotton fabric (fustian), cropped or shorn before dyeing; much used for workmen's clothing. So called from its being soft like the skin of a mole.

MOLIERE (mol-yār), the assumed name of Jean Baptiste Poquelin, French comic dramatist, born at Paris in 1622. He studied law, but gave it up for the career of an actor, assuming in this profession the name of Moliere. After obtaining great success in the provinces he settled in Paris in 1658, having previously produced his two comedies, L'Etourdi and Le Dépit Amoureux. In the following year his reputation was greatly advanced by the production of the Précieuses Ridicules, a delicate satire on the prevailing affectation of the character of bel esprit, on the pedantry of learned females, and on affectation in language, thoughts, and dress. It produced a general reform when it was brought forward in Paris. Continuing to produce new plays, and performing the chief comic parts himself, he became a great favorite both with the court and the people, though his enemies, rival actors and authors, were numerous. Louis XIV. was so well pleased with the performances of Moliere's company that he made it specially the royal company, and gave its director a pension. In 1662 Moliere made an ill-assorted marriage with Armande Béjart, upward of twenty years younger than himself, a union that embittered the latter part of his life. Among his works other than those mentioned may be noted: L'Ecole des Maris, L'Ecole des Femmes, Le Mariage Forcé, Don Juan, Le Misanthrope, Le Médecin Malgré lui, Le Tartufe, L'Avare, George Dandin, Les Fourberies de Scapin, Le Bourgeois Gentilhomme, Le Malade Imaginaire, etc. Molière died in 1673 of an apoplectic stroke, a few hours after playing in the latter. As a player he was unsurpassed in high comic parts; and in the literature of comedy he bears the greatest name among the moderns after Shakespeare. He borrowed freely from Latin, Spanish, and Italian writers, but whatever materials he appropriated he so treated them as to make the result entirely his own and original. The Archbishop of Paris at first refused him burial as being an actor and a reviler of the clergy; but the king himself insisted on it.

MOLINE, a city in Rock Island co., Ill., on the Mississippi river, and the Chi., Bur. and Quincy, Chi., Mil. and St. P., and the Chi., Rock Is. and Pac. railways; opposite Rock Island, 2 miles e. of Davenport, Ia., 168 w. of Chicago. The three cities of Moline, Rock Island, and Davenort, are connected by steam and street railways, ferries, and bridges, and all derive water-power for manufacturing from the river. The city is in a rich coal-region, and there are a number of productive mines in its vicinity. Pop. 20,868.

MOLLUS'CA, an animal sub-kingdom, comprising those soft-bodied animals known as slugs, snails, limpets, oysters, cockles, etc. In some the body is naked and unprotected, in others it is inclosed in a muscular sac, but the great majority are provided with an exoskeleton or shell. The shell-bearing molluscs are popularly divided into univalves, bivalves, and multivalves. The univalves are those whose shell consists of only a single piece, often open and cup-shaped, as in the limpet, or more commonly of a long cone wound spirally round a real or imaginary axis, as the garden-snail, the whelk or periwinkle. The bivalves are those of which the shell is formed of two pieces joined by a hinge, as the cockle and oyster. The multivalve

Mollusca and molluscoida.

1, Cuttle-fish and cuttle-bone. 2, A gasteropod. 3, A pteropod. 4, Terebratūla diphya. 5, Cytherea maculāta. 6, Cynthia papillosa.

have the shell composed of several pieces. These latter molluscs are few in number. The shells of the Mollusca are secreted by the soft integument or mantle (also called the pallium). The chief mass of the shell is made up of carbonate of lime with a small proportion of animal matter. The mollusca have a distinct alimentary canal, shut off from the general cavity of the body, and situated between the blood system, which lies along the back, and the nerve system, which is toward the ventral aspect of the body. The digestive system consists of a mouth, gullet, stomach, intestine, and anus, except in a few forms, in which the intestine ends blindly. The blood is almost colorless. Respiration is variously effected; in the lamp-shells, by long cilated arms springing from the sides of the mouth; in the bivalve shell-fish, the cuttle-fishes, and most of the univalves, by gills; while in

the remainder of the univalves, as snails, slugs, etc., the breathing-organs have the form of an air-chamber or pulmonary sac, adapted for breathing air directly. A characteristic of the typical Mollusca is the "foot" or organ of locomotion, which may be modified so as to perform various offices. Its use in the case of the snail is well known, and in the cockle it is developed to a great size. In some cases (as the razor-shells) it enables the animal to burrow rapidly in the sand; while in the mussels, etc., the organ is devoted to the secretion of the well-known beard or byssus, a collection of strong fibrous threads by means of which these animals moor or fix themselves to rocks, etc. In some bivalves (as the oyster) in which the locomotive powers are in abeyance, the foot is rudimentary. In the cuttle-fishes it is represented by the arms or tentacles round the mouth. The chief peculiarity, however, of the Mollusca is in the nervous system, which in the lower forms consists essentially of a single ganglionic mass, giving off filaments in various directions; while in the higher there are three such masses, united to one another by nervous cords.

MOLLY MAGUIRES, the name assumed by members of a secret illegal association in Ireland, afterward reorganized in the anthracite coal-mining district of Pennsylvania. The organization was guilty of many outrages, and was broken up in 1876, twenty members being hanged for murder.

MOLOCH, the chief god of the Phœnicians, frequently mentioned in Scripture as the god of the Ammonites, whose worship consisted chiefly of human sacrifices, ordeals by fire, mutilation, etc.

MOLOCH LIZARD, a genus of lizards found in Australia. M. horridus (moloch-lizard) is one of the most ferocious-looking, though at the same time one of of the most harmless of reptiles, the horns on the head and the numerous spines on the body giving it a most formidable and exceedingly repulsive appearance.

MOLTKE (molt'kĕ), Helmuth Carl Bernhard, Count von, German field-

Field-marshal Von Moltke.

marshal, born near Mecklenburg, 1800; entered the Danish army in 1819; left that service for the Prussian in 1822, and became a staff-officer in 1832. In 1835 he superintended the Turkish military reforms, and he was present during the Syrian campaign against Mehemet Ali in 1839. He returned to Prussia and became colonel of the staff in 1851, and equerry to the crown prince in 1855. In 1858 as provisional director of the general staff he acted in unison with Von Roon and Bismarck in the vast plans of military reorganization soon after carried out. The conduct of the Danish war (1864) was attributable to his strategy, as was also the success of the Austro-Prussian war of 1866, and the Franco-Prussian war of 1870–71. In the latter year he was made field-marshal and became count in 1872. He retired from the position of chief of the general staff in 1888. His death took place in 1891.

MOLUC'CAS, or SPICE ISLANDS, a name originally confined to the five small islands of Ternate, Tidore, Motir, Makian, and Batshian, but now applied to the widely scattered group lying between Celebes and Papua, between lat. 3° s. and 6° n., and lon. 126° to 135° e. The area is about 45,000 sq. miles, and the population 500,000. The islands (some hundreds in number) are nearly all mountainous, mostly volcanic and earthquakes are by no means uncommon. They abound in gaily-colored birds and gorgeous insects; and are covered by a luxuriant tropical flora. Cloves, nutmegs, mace, and sago are exported to Europe; and birds'-nests, trepang, etc., to China.

MONACHISM. See Monastery and Orders (Religious).

MON'ACO, a principality lying between the French department Alpes Maritimes (Nice) and the Mediterranean. In 1861 the Prince of Monaco sold the departments of Mentone and Roccabruna to France for 4,000,000 francs; and the principality has since then been confined to an area of about 8 square miles, with a population of 15,180. The prince (a scion of the house of Grimaldi) exercises both legislative and executive functions, while the people are exempt from taxation, as the revenue is almost entirely derived from the rents of the gaming establishment. The capital, Monaco (pop. 3292), situated on a rocky height projecting into the sea, is a renowned watering-place. About a mile to the e. is Monte Carlo, a collection of hotels and villas which have sprung up near the luxurious gardens of the handsome gambling casino, established here in 1860. This institution is now the property of a joint-stock company. The inhabitants of Monaco are not admitted to the gaming-tables.

MONAD, in philosophy, an imaginary entity in the philosophy of Leibnitz, according to whom monads are simple substances, of which the whole universe is composed, each differing from every other, but all agreeing in having no extension, but in being possessed of life, the source of all motion and activity. Every monad, according to Leibnitz, is a soul, and a human soul is only a monad of elevated rank.

MON'AGHAN, a county of Ireland in Ulster; area 319,741 acres. Pop. 74,505.

MONARCHY is a state or government in which the supreme power is either actually or nominally vested for life in a single person, by whatsoever name he may he distinguished. A monarchy in which the subjects have no right or powers as against the monarch (e.g. Persia) is termed despotic or absolute; when the legislative power is wholly in the hands of a monarch, who, however, is himself subject to the law (e.g. Russia), it is termed autocratic; but when the monarch shares the power of enacting laws with representatives of the people, the monarchy is limited or constitutional (e.g Great Britain). In ancient Greece, a monarchy in which the ruler either obtained or administered his power in violation of the constitution was termed a tyranny, however beneficient and mild the rule might be. Monarchies are either hereditary, as in Great Britain, or elective, as was formerly the case in Poland.

MONASTERY, a house into which persons retire from the world to lead a life devoted to religion. The practice of monachism or monastic seclusion, though it has been carried to its greatest development within the Christian Church had its origin in periods long anterior to the Christian era, and has long flourished in countries where Christianity has little or no influence, as among the Brahmans and Buddhists. Christianity was probably not without its ascetics even from the first, but it was not until the close of the 3d century, when the Neo-Platonic and Gnostic doctrines of the antagonism between body and soul had gained strength, that solitary life began to be specially esteemed. The foundation of the first Christian monasteries is ascribed to Anthony the Great, who about 305, in the deserts of Upper Egypt, collected a number of hermits, who performed their devotional exercises in common. His disciple Pachomius in the middle of the 4th century, built a number of houses not far from each other, upon the island of Tabenna, in the Nile, each of which was occupied by three monks (syncelli) in cells, who were all under the superintendence of a prior. These priors formed together the cœnobium, or monastery, which was under the care of the abbot, hegumenos or mandrite, and were obliged to submit to uniform rules of life. Western monasticism, which rapidly spread during the 5th century, was accompanied by many irregularities, until monastic vows were introduced in the 6th century by St. Benedict. The monasteries of the west now became the dwellings of piety, industry, and temperance, and the refuge of learning. Missionaries were sent out from them; deserts and solitudes were made habitable by industrious monks; and in promoting the progress of agriculture and converting the German and Slavonic nations, they certainly rendered great services to the world from the 6th century to the 9th. Another incalculable benefit conferred upon civilization by the monasteries is the preservation of nearly the whole of the classic and mediæval MS. literature that we possess.

But monasteries changed their character, to a great degree, as their wealth and influence increased. Idleness and luxury crept within their walls, together

with all the vices of the world, and their decay became inevitable, when, by a custom first introduced by the Frankish kings, and afterward imitated by other princes, they came under the care of lay abbots or superiors, who, thinking only of their revenues, did nothing to maintain discipline among the monks and nuns. These being left wholly to their own government by the bishops, originally their overseers, soon lost their monastic zeal. A few only, by means of the convent schools (founded by Charlemagne for the education of the clergy), as, for instance, those at Tours, Lyons, Rheims, Cologne, Trèves, Fulda, etc., maintained their character for usefulness till the 9th and 10th centuries. The monastery at Cluny, in Burgundy, first led the way to reform. This was founded in the year 910, under Berno, was governed by the rules of St. Benedict, with additional regulations of a still more rigid character, and attained the position, next to Rome, of the most important religious center in the world. Many monasteries in France, Spain, Italy, and Germany were reformed on this model, and the Benedictine rule now first became prominent in Britain through the instrumentality of Dunstan. The Celtic and other monasteries of Britain and Ireland heretofore seem to have had an independent historical connection with the early monachism of Egypt. The three great military orders (Templars, Hospitallers, and Teutonic Knights) were founded in the 12th century; while the famous mendicant orders of the Franciscans and Dominicians date from the 13th. With the reputation of renewed sanctity the monasteries acquired new influence and new possessions. Many of them ("exempt monasteries") released themselves from all superintending authority except that of the pope, and acquired great wealth in the time of the Crusades from the estates of Crusaders and others placed under the protection of their privilege of inviolability, or even left to them in reversion. But with this growing influence the zeal for reformation abated; new abuses sprang up, and the character of each monastery came, at last to depend chiefly upon that of its abbot.

The number of monasteries was much diminished at the time of the reformation, when the rich estates of those in Protestant states were in part appropriated by the sovereign to his own use, in part distributed to nobles and ecclesiastics, and in part devoted to educational and benevolent purposes. In Catholic countries this period was marked by a revival of the spirit of monastic reform; while many new orders were founded whose objects were more directly practical (teaching, tending the sick, visiting the poor) than those of the older and more contemplative orders. Monachism, however, as belonging to the older system of things, was regarded with hostility by the spirit of rationalism and liberalism which found decisive expression in the French revolution; and during the 18th century the monastic orders were obliged, as the papal power diminished, to submit to many restrictions imposed upon them by Catholic princes, or to purchase immunity at a high price. In 1781 the houses of some orders were wholly abolished by the Emperor Joseph II., and those suffered to remain were limited to a certain number of inmates, and cut off from all connection with any foreign authority. In France the abolition of all orders and monasteries was decreed in 1789, and the example was followed by all the states incorporated with France under the protection of Napoleon I. In the 19th century, however, under Napoleon III. and during the early years of the republic, monachism prospered in France, though since 1880 only monasteries authorized by the state are permitted to exist. In Germany all orders except those engaged in tending the sick were abolished in 1875. The unification of Italy was followed by a series of decrees pronouncing all monastic orders illegal. In Portugal monasteries were abolished by decree in 1834, and in Spain in 1837. In Russia the number of such institutions is strictly limited by law. In the Roman Catholic states of South America the same policy of abolition has been adopted; whereas in the United States and Canada several orders have made considerable progress.

MONASTIC VOWS, are three in number: poverty, chastity, and obedience. The vow of poverty prevents the monks from holding any property individually. Monasteries, however, professing merely the "high" degree of poverty may possess real estate, yet not more than enough for their support, as the Carmellites and Augustines. In the "higher" degree a monastery may hold only personal property, as books, dresses, supplies of food and drink, rents, etc., as the Dominicans. The "highest" degree absolutely forbids both real and personal property, as is the case with the Franciscans, and especially the Capuchins. The vow of chastity requires an entire abstinence from familiar intercourse with the other sex; and that of obedience, entire compliance with the rules of the order and the commands of the superior.

MONDAY (that is, moon-day; Anglo-Saxon, Monandæg; German, Montag), the second day of our week, formerly sacred to the moon.

MONEY, in its ordinary sense, is equivalent to pieces of metal, especially gold and silver, duly stamped and issued by the government of a country to serve as a legalized standard of value. In this sense it is more precisely designated metallic money to distinguish it from paper money, from which latter it is also distinguished by having an intrinsic value. A few particulars regarding money may here be given as supplementary to information contained in the articles Currency, Coining, Bank, etc. The sovereign and half-sovereign are the legal metal standard of value in the United Kingdom and most of the colonies. By the Latin Monetary Convention, which includes France, Belgium, Italy, Switzerland, and Greece, it has been agreed that the gold napoleon and the silver five-franc piece—or corresponding pieces—are to be exchangeable throughout these countries as their standard money; while by the Scandinavian Monetary Convention, which includes Norway, Sweden, and Denmark, the gold 20-kroner and 10-kroner pieces are the standard coins. These contracting states have thus agreed to issue no gold or silver coins except of a certain weight, fineness, and diameter. In Germany the 5-mark, 10-mark, and 20-mark pieces, and in the United States the gold dollar, are the standard units; while in Austria the silver florin, and in Russia the silver rouble, are the recognized standard coins. Moneys of account are those denominations of money in which accounts are kept, and which may or may not have a coin of corresponding value in circulation. In England the pound sterling may be said to be purely a money of account, although there is a coin, the sovereign of corresponding value. The money unit in various countries is as follows: England, the pound sterling; Belgium, France, and Swtizerland, the franc; Germany, the mark; Austria-Hungary, the crown; Russia, the rouble; Italy, the lira; Spain, the peseta; Sweden, Norway, and Denmark, the krona; Holland, the guilder; Portugal, the milreis; Greece, the drachma; Turkey, the piaster; United States, the dollar; Brazil, the milreis; India, the rupee; China, the liang or tael; Japan, the yen.

MONGHYR (mon-gēr'), a district and town of India, in Bengal. The district has an area of 3921 sq. miles. Pop. 35,880; of the district, 2,064,077.

MONGO'LIA, a vast region of the northeast of Asia, belonging to the Chinese Empire, is situated between China Proper and Asiatic Russia; estimated area, 1,400,000 sq. miles. Pop. estimated at 2,000,000.

MONGOLS, a race of people in the northeast of Asia, whose original seat seems to have been in the north of the present Mongolia, and in Siberia to the southeast of Lake Baikal. Their first great advance was due to Genghis Khan, who having been, originally, merely the chief of a single Mongol horde, compelled the other hordes to submit to his power, and then, in 1206, conceived the bold plan of conquering the whole earth. (See Genghis Khan.) After the death of Genghis Khan, in 1227, his sons and grandsons pursued his conquests, subjugated all China, subverted the caliphate of Bagdad (1263), and made the Seljuk sultans of Iconium tributary. In 1237 a Mongol army invaded Russia, devastated the country with the most horrible cruelty, and from Russia passed, in two divisions, into Poland and Hungary. At Pesth the Hungarian army was routed with terrible slaughter, and at Liegnitz, in Silesia, Henry, duke of Breslau, was defeated in a bloody battle, April 9, 1241. The Mongols were recalled, however, from their victorious career by the news of the death of Ogdai, in December, 1241, the immediate successor of Genghis Khan. The empire of the Mongols was at the summit of its power during the reigns of Mangu Khan (1251–59) and Khubilai or Kublai Khan (1259–94), the patron of Marco Polo. At that time it extended from the Chinese Sea and from India far into the interior of Siberia, and to the frontiers of Poland. The principal seat of the khakan or great

MONEY—VALUE OF FOREIGN COINS IN UNITED STATES

(Proclaimed by the Secretary of the Treasury October 1, 1906*)

Country	Standard	Monetary Unit	Value in U.S. Gold Dollar	Coins
Argent. R...	Gold...	Peso	$0.96,5	Gold: argentine ($4.82,4) and ½ argentine. Silver: peso and divisions.
Austria-H...	Gold...	Crown	.20,3	Gold: 10 and 20 crowns. Silver: 1 and 5 crowns.
Belgium	Gold...	Franc.....	.19,3	Gold: 10 and 20 francs. Silver: 5 francs.
Bolivia	Silver.	Boliviano.....	.48,5	Silver: boliviano and divisions.
Brazil.....	Gold...	Milreis.....	.54,6	Gold: 5, 10, and 20 milreis. Silver: ½, 1, and 2 milreis.
Canada	Gold...	Dollar	1.00	
Cent. Am...	Silver.	Peso†	.48,5	Silver: peso and divisions.
Chile	Gold...	Peso	.36,5	Gold: escudo ($1.82,5), doubloon ($3.65), and condor ($7.30). Silver: peso and divisions.
China	Silver.	Tael .. Shanghai	.72,6	
		Tael .. Haikwan	‖.80,8	
		Tael .. Canton ..	.79,2	
Colombia....	Gold...	Dollar.....	1.00	Gold: condor ($9.64,7) and double condor. Silver: peso.
Costa Rica..	Gold...	Colon	.46,5	Gold: 2, 5, 10, and 20 colons ($9.30,7). Silver: 5, 10, 25, and 50 centimos.
Denmark....	Gold...	Crown	.26,8	Gold: 10 and 20 crowns.
Ecuador	Gold...	Sucre	.48,7	Gold: 10 sucres ($4.86,65). Silver: Sucre and divisions.
Egypt.....	Gold...	Pound ..... (100 piasters)	4.94,3	Gold: pound (100 piasters), 5, 10, 20, and 50 piasters. Silver: 1, 2, 5, 10, and 20 piasters.
France.....	Gold...	Franc.....	.19,3	Gold: 5, 10, 20, 50, and 100 frs. Silver: 5 frs.
Germany ...	Gold...	Mark.....	.23,8	Gold: 5, 10, and 20 marks.
Gt. Britain..	Gold...	Pound sterling...	4.86,6½	Gold: sovereign (pound sterl.) and ½ sov'gn.
Greece	Gold...	Drachma	.19,3	Gold: 5, 10, 20, 50, and 100 drachmas. Silver: 5 drachmas.
Hayti	Gold...	Gourde	.96,5	Gold: 1, 2, 5, and 10 gourdes. Silver: gourde and divisions.
India.....	Gold...	Pound sterling§..	4.86,6½	Gold: sov. ($4.86,65). Sil.: rupee and div'ns.
Italy	Gold...	Lira.....	.19,3	Gold: 5, 10, 20, 50, and 100 lire. Silver: 5 lire.
Japan.....	Gold...	Yen	.49,8	Gold: 1, 2, 5, 10, and 20 yen. Silver: 10, 20, and 50 sen.
Mexico.....	Gold...	Peso¶	.49,8	Gold: 5 and 10 pesos. Silver: dollar (or peso)** and divisions.
Netherlands	Gold...	Florin	.40,2	Gold: 10 florins. Silver: ½, 1, and 2½ florins.
N'foundland	Gold...	Dollar.....	1.01,4	Gold: 2 dollars ($2.02,7).
Norway.....	Gold...	Crown	.26,8	Gold: 10 and 20 crowns.
Panama.....	Gold...	Balboa.....	1.00,0	Gold: 1, 2½, 5, 10, and 20 balboas. Silver: peso and divisions.
Peru	Gold...	Libra	4.86,6½	Gold: ½ and 1 libra. Sil.: sol and divisions.
Portugal ...	Gold...	Milreis.....	1.08	Gold: 1, 2, 5, and 10 milreis.
Russia	Gold...	Ruble	.51,5	Gold: 5, 7½, 10, and 15 rubles. Silver: 5, 10, 15, 20, 25, 50, and 100 copeks.
Spain	Gold...	Peseta	.19,3	Gold: 25 pesetas. Silver: 5 pesetas.
Sweden.....	Gold...	Crown	.26,8	Gold: 10 and 20 crowns.
Switzerland	Gold...	Franc	.19,3	Gold: 5, 10, 20, 50, and 100 francs. Sil.: 5 fr's.
Turkey	Gold...	Piaster	.04,4	Gold: 25, 50, 100, 250, and 500 piasters.
Uruguay....	Gold...	Peso	1.03,4	Gold: peso. Silver: peso and divisions.
Venezuela ..	Gold...	Bolivar	.19,3	Gold: 5, 10, 20, 50, and 100 bolivars. Silver: 5 bolivars.

* The coins of silver-standard countries are valued by their pure silver contents, at the average market price of silver for the three months preceding the date of this circular. † Not including Costa Rica. § The sovereign is the standard coin of India, but the rupee ($0.44,8) is the money of account, current at 15 to the sovereign. ‖ Customs. ¶ Seventy-five centigrams fine gold. ** Value in Mexico 49.8.

TABLE SHOWING THE VALUE OF FOREIGN COINS AND PAPER NOTES IN AMERICAN MONEY BASED UPON THE VALUES EXPRESSED IN THE ABOVE TABLE

Number	British £ Sterling	German Mark	French Franc, Italian Lira	Chinese Tael (Haikwan)	Dutch Florin	Japanese Yen, Mexican Peso	Russian Gold Ruble	Austrian Crown
1	$4.86,6½	$0.23,8	$0.19,3	$0.80,8	$0.40,2	$0.49,8	$0.51,5	$0.20,3
2	9.73,3	.47,6	.38,6	1.61,6	.80,4	.99,6	1.03	.40,6
3	14.59.9½	.71,4	.57,9	2.42,4	1.20,6	1.49,4	1.54,5	.60,9
4	19.46,6	.95,2	.77,2	3.23,2	1.60,8	1.99,2	2.06	.81.2
5	24.33,2½	1.19	.96,5	4.04,0	2.01	2.49,0	2.57,5	1.01,5
6	29.19,9	1.42,8	1.15,8	4.84,8	2.41,2	2.98,8	3.09	1.21,8
7	34.06,5½	1.66,6	1.35,1	5.65,6	2.81,4	3.48,6	3.60,5	1.42,1
8	38.93,2	1.90,4	1.54,4	6.46,4	3.21,6	3 98,4	4 12	1.62,4
9	43.79,8½	2.14,2	1.73,7	7.27,2	3.61,8	4.48,2	4.63,5	1.82,7
10	48.66,5	2.38	1.93	8.08,0	4.02	4.98,0	5.15	2.03
20	97.33	4.76	3.86	16.16,0	8.04	9.96,0	10 30	4.06
30	145.99,5	7.14	5.79	24.24,0	12.06	14.94,0	15.45	6.09
40	194.66	9.52	7.72	32.32,0	16.08	19.92,0	20.60	8.12
50	243.32,5	11.90	9.65	40.40,0	20.10	24.9,00	25.75	10.15
100	486.65	23.80	19.30	80.80,0	40.20	49.80,0	51.50	20.30

khan was transferred by Khubilia from Karakorum to China; the other countries were governed by subordinate khans, all of whom were descended from Genghis, and several of whom succeeded in making themselves independent. This division of the empire was the cause of the gradual decay of the power and consequence of the Mongols in the 14th century. The adoption of new religions (Buddhism in the east and Mohammedanism in the west) also contributed to their fall. In 1368 the empire of the Mongols in China was overturned by a revolution which set the native Ming dynasty on the throne. Driven northward to their original home, the eastern Mongols remained for a time subject to the descendants of Genghis Khan, but gradually splitting up into small independent tribes they finally were subdued and absorbed by the Manchu conquerors of China. Of the western Mongols the most powerful were the Kipchaks or Golden Horde, who lived on the Volga, and the khanate founded in Bokhara, on the Oxus, by Jagatai, the eldest son of Genghis Khan. The former gradually fell under the power of the Russians; but among the latter there appeared a second formidable warrior, Timurlenk (Tamerlane), called also Timur Beg. In 1369 he chose the city of Samarcand for the seat of his new government. The other Mongol tribes, with Persia, Central Asia, and Hindustan, were successively subjugated by him. In 1402, at Ancyra (Angora), in Asia Minor, he defeated and captured the Sultan Bajazet I., who had been hitherto victorious against the Christians in Europe, and before whom Constantinople trembled. After Timur's death, in 1405, his empire barely held together until 1468, when it was again divided. Baber (Babur), a descendant of Timur, founded in India, in 1519, the empire of the Great Mogul, which existed in name till 1857, though its power ended in 1739. After the commencement of the 16th century the Mongols lost all importance in the history of the world, became split up into a number of separate khanates and tribes, and fell under the power of the neighboring peoples. Their name still lingers in the Chinese province of Mongolia, but Mongolian tribes are found far beyond its boundaries.

The term Mongolians or Mongolidæ is to some extent used by anthropologists to signify a very large division of the races of men, of which the Mongol proper were considered typical. This use of the name, which includes Tartars, Turks, Finns, Chinese, and Japanese, is to be carefully distinguished from the historical use.

MONITOR, the popular name for a class of very shallow, heavily-armed iron-clad steam-vessels, invented by Ericsson, carrying on their open decks either one or two revolving turrets, each containing one or more enormous

Ericsson's monitor of 1861.

guns, and designed to combine the maximum of gun-power with the minimum of exposure. Monitors are so called from the name of the first vessel of the kind, built during the American civil war, which proved its superiority in a famous engagement with the Merrimac in 1862.

MONK, a man who retires from the world to live in a monastery as member of some religious order. Originally all monks were laymen, but after about the 8th century the superiors, and by degrees other members, were admitted to holy orders. See Monastery.

MONK, George, Duke of Albemarle,

an English general, famous for the prominent part he took in the restoration of Charles II., was born in 1608. In the struggle between Charles I. and the parliament Monk at first joined the royalists; but in January, 1644, he was taken prisoner at the seige of Nantwich, and after a short delay he was committed to the Tower. After the capture of the king Monk took the Covenant and regained his liberty, in 1646. Under the parliament he served in Ireland, and subsequently with Cromwell in Scotland and in 1650 he reduced that country to obedience within a few weeks. In 1654

General Monk.

he was the head of the English army in Scotland, and he was still in this position at the death of the protector and at the resignation of his son in 1659. The coming over of Charles II. was arranged with Monk, and the king rewarded his restorer with the dukedom of Albemarle the order of the Garter, and with a pension. He died in 1670, and was buried in Westminster Abbey.

MONKEYS, the popular name applied sometimes to the whole of the great mammalian order Quadrumana, sometimes limited to those of the order that have tails, and generally cheek-pouches, to the exclusion of the apes, baboons, and lemurs. The general characters of the quadrumanous mammals are found in the great toe being opposable to the other digits of the foot, so that the feet become converted into "hands." The

Guenon, or common green monkey.

hallux or thumb may be absent, but when developed it is generally opposable to the other fingers; and the animals thus come to possess "four hands," or are "quadrumanous." The monkeys may all be divided into a lower and a higher section. The higher section is that of the Catarhina (Greek, kata, downward, and rhines, nostrils) or Old World monkeys. The catarhine monkeys are distinguished by their obliquely-set nostrils, the nasal apertures being placed close together, and the nasal septum being narrow. Opposable thumbs and great toes exist in nearly all. The tail may be rudimentary or wanting, but in no case is it prehensile. Cheek-pouches, which are used as receptacles for food preparatory to its mastication, are present in many; and the skin covering the prominences of the buttocks is frequently destitute of hair, becomes hardened, and thus constitutes the so-called natal callosities. The catarhine monkeys inhabit Asia and Africa. They include the anthropoid or man-like apes; the gibbons, the orang, the chimpanzee and the gorilla, the baboons and mandrills, the sacred monkey of the Hindus, the proboscis monkey, the Diana monkey, the mona, the wanderoo, etc. The lower section of monkeys consists of the New World monkeys, which are entirely confined to South America. They have the nostrils widely separated, the septum or partition between being broad, hence the name. Another peculiarity consists in their prehensile tails and there are none of the cheek-pouches or hard callosities on the rump so characteristic of Old World monkeys. The diet is especially of a vegetable nature. This section includes the marmosets, the spider-monkeys, the capuchin monkeys, the squirrel-monkeys, the howling monkeys, etc. See Apes, Baboons, etc.

MONK'S-HOOD. See Aconite.

MONMOUTH, a parliamentary and municipal borough of England, county town of Monmouthshire, is situated in a beautiful valley at the confluence of the Monnow and Wye. Pop. 5470.—The county is bounded by the counties of Hereford, Gloucester, Brecknock, and Glamorgan, and the estuary of the Severn; area, 370,350 acres. Pop. 292,327.

MONMOUTH, James, Duke of, the natural son of Lucy Walters, one of the mistresses of Charles II., was born at Rotterdam in 1649. After the restoration he was created Duke of Orkney and Duke of Monmouth (1663), married the daughter and heiress of the Earl of Buccleuch, and received the Garter. It was reported that the king had been privately married to Lucy Walters, and the popular dislike of the Duke of York, afterward James II., joined with the fact of Monmouth being a Protestant, gave occasion to hopes that her son might succeed to the crown. On the accession of James II. he was induced to attempt an invasion of England. His small body of undisciplined troops were totally defeated at Sedgmoor, and the duke himself was captured and beheaded 15th July, 1685, after abject appeals to the king for mercy.

MON'OCHROME, a painting executed in a single color. This description of art is very ancient, and was known to the Etruscans. The most numerous examples existing of this kind of painting are on terra cotta. A painting, to be a proper monochrome, must have the figures relieved by light and shade.

MON'OGRAM, a character or cipher composed of one, two, or more letters interwoven, and used as a sign or abbreviation of a name or word. The use of monograms was common among the Greeks and Romans, and the art of combining and contorting letters and words flourished universally in the middle ages. The term is now applied to conjoined initials of a personal name on seals, trinkets, letter-paper and envelopes, etc. or employed by printers, painters, engravers, etc., as a means of distinguishing their work.

MON'OLITH, a pillar, obelisk, or other large object cut from a single block of stone. See accompanying plate and description.

MONOMET'ALLISM, the principle of having only one metallic standard in the coinage of a country; opposed to bimetallism.

MONONGAHE'LA, a river of the United States, formed by the union of West Fork and Tygart's Valley river in West Virginia, runs north into Pennsylvania, and unites with the Alleghany, at Pittsburg, to form the Ohio. It is navigable for large boats 60 miles, and for small boats 200 miles from its mouth. Its length to the source of the Tygart's Valley river is 300 miles.

MONOP'OLY, is an exclusive right, conferred by authority on one or more persons, to carry on some branch of trade or manufacture. The monopolies most frequently granted were the right of trading to certain foreign countries, of importing or exporting certain articles, or of exercising particular arts or trades. The entire trade and industry of the middle ages was characterized by attempts to erect and maintain monopolies, as evidenced by the trade-guilds and such associations as the Hanseatic League. The discovery of the New World only provided a fresh sphere for the same system; for not only did every government endeavor to monopolize the trade of its colonies, but in nearly every case the new countries were opened up by privileged "adventurers" and jealous monopoly companies. The granting of monopolies has at all times been opposed to the spirit of English common law, but the practice was very common previous to the accession of the Stuarts. The abuse reached its height under Elizabeth. Notwithstanding the reluctance of the crown to surrender what was considered one of its most valuable prerogatives, the Statute of Monopolies (21 James I. cap. iii.) was passed in 1623, abolishing all licenses, monopolies, etc., with some exceptions. This act, which lifted an immense incubus from the industrial prosperity of the realm, is (with amendments) still in force; and its excepting clauses are the basis of the present laws as to patents, copyrights, etc. Both in Great Britain and other countries there are certain so-called government monopolies maintained on various grounds of public policy. Examples of such monopolies are the postal and telegraph service, the tobacco monopoly in France, the opium monopoly in India, etc. There are also numerous quasi-monopolies, such as those enjoyed by railway, water, and gas companies, and similar semi-public ogranizations.

MON'OTHEISM, the belief in, and

worship of, a single, personal God; opposed to polytheism and distinct also from pantheism. It was at one time the received opinion that monotheism was the primeval intuitive form of religion, but most recent authorities now hold that it was everywhere posterior to polytheism, whence it was evolved by a gradual education. Henotheism, which Max Müller and Schelling maintain to be the primeval form, is merely the rudimentary phase of polytheism in minds, not yet conscious of the complexity of the problems for which polytheism is suggested as the solution by more developed intellects. The three great modern monotheistic religions are Judaism, Christianity, and Mohammedanism. The Jewish prophets had a firm persuasion of one God, the Father and Judge of all; but they are continually upbraiding the people for lapsing into polytheism. After the Babylonish captivity the people became fixed in their belief. Christian monotheism is, of course, historically a development of Hebrew monotheism; and Mahomet probably borrowed the doctrine from the same source. Both Jew and Mohammedan regard the Trinitarian conception of Deity as a deviation from the pure doctrine of monotheism.

MONROE (mon-rō′), James, fifth president of the United States of America, was born in 1758 in Westmoreland county, Virginia; died at New York in 1831. He was educated at William and

James Monroe.

Mary college, and from 1776 till 1778 served in the revolutionary army. He then devoted himself to the study of law. In 1782 and in 1787 he was elected a member of the Virginia Assembly, and from 1783 till 1786 he represented Virginia in congress. In 1788 as a member of the Convention of Virginia he strenuously opposed the ratification of the new Federal constitution. In 1790 he was elected to the senate of the United States. In 1794–96 he was minister plenipotentiary to France. From 1799 till 1802 he was governor of Virginia, and in 1803 he returned as envoy-extraordinary to France on a mission which resulted in the acquisition of Louisiana for 15,000,000 dollars. He was afterward employed in diplomacy in England and Spain. In 1811 he was governor of Virginia, in 1811–17 he was secretary of state, being secretary of war in 1814–15. In 1816 the democratic republican party elected him to the presidency of the United States. In 1820 he was re-elected, only one vote being cast against him. This he owed chiefly to his having procured the cession of Florida by Spain, and to the settlement of the vexed question of the extension of slavery by the Missouri compromise (which see). Mexico and the emancipated states of South America were formally recognized by the American government during Monroe's second term; but the leading event in it was the promulgation of the "Monroe doctrine."

MONROE DOCTRINE, The, a principle in international politics, corresponding in America to the balance of power in Europe, was formulated in President Monroe's message of December 2, 1823, in the statement that the United States would consider any attempt to extend the European political system to any portion of America, as dangerous to their peace and safety. At the same time the American continents were declared to be no longer subjects for colonization by any European power. The doctrine has several times been asserted, notably in the attitude of the United States toward Napoleon III. during his Mexican undertaking, and in connection with the Panama Canal and the Venezuela-Guiana boundry question. The interference of the United States in Mexico, resulting in the withdrawal of the French in 1866, and President Cleveland's declaration to Great Britain in connection with the Venezuelan boundary dispute in 1895, are the notable examples of such recognition. Notwithstanding the protests of the United States Government, during the progress of the Civil War, the French had secured a foothold in Mexico and attempted to install Maximilian, an Austrian prince, on the Mexican throne. With the conclusion of peace a formal demand for withdrawal was made, and General Sherman was sent to the Mexican frontier with a large force. After some delay in negotiations the French Emperor withdrew his troops, and Maximilian was left to his fate. In the Venezuelan affair, representations having been made by our Government that the action of Great Britain was a violation of the Monroe Doctrine, the latter yielded to the suggestion of the United States and consented to an arbitration, thus effecting an amicable settlement. It has all the force of a first principle in the United States but not in international law.

MONSEIGNEUR (mon-sān-yeur), a title of dignity in France. Under Louis XIV. the dauphin was styled monseigneur, without any addition. Princes, dukes and peers, archbishops, bishops (who adopted the title at the close of the 17th century), cardinals, marshals of France, presidents of parliament, etc., were addressed by this title.

MONSIEUR (mo-syeu), used without any addition, formerly in France designated the king's eldest brother, though, in addressing him, the title Monseigneur was used. The last prince so called was the Comte d'Artois, brother of Louis XVIII. In common use it answers both to the English sir and Mr., and is also used before titles.

MON'SOON, the name given to a certain modification or disturbance of the regular course of the trade-winds which takes place in the Arabian and Indian seas. Between the parallels of 10° and 30° south latitude the eastern trade-wind blows regularly, but from the former parallel northward the course is reversed for half the year, and from April to October the wind blows constantly from the southwest. During the other six months of the year the regular northeast trade-wind prevails. These two alternating winds are the monsoons proper, but the name is now commonly given to similar alternating winds in any region.

MONSTER, or Monstrosity, a term applied in anatomy and physiology to living beings which exhibit from birth onward some important abnormal features in structure, or present notable deviations from the normal type of their kind. From the earliest times writers have argued for the production of such ideal monsters by the intercourse of demons and women, of brutes and men; and witchcraft, magic, spell, divine vengeance—and, more lately, the effect upon the mother's mind of fright, terror, dreams, etc., have each and all been credited, but equally erroneously, with causing malformations and abnormalities in the yet unborn child or embryo. Teratology can explain most, if not all malformations, as results of abnormal growth or disease. These so-called "freaks of nature" are in truth the results of morbid actions and operations in the living organisms, as well defined, but not yet so well known, as are those of the healthy and normal body.

MON'STRANCE, or **REMONSTRANCE** is the sacred vessel in which, in the Roman Catholic Church, the host is shown to the people at benedictions, processions, and other solemnities. Its use probably dates from the establishment

Monstrance.

of the festival of Corpus Christi in 1264 by Pope Urban IV. The earliest monstrances known date from the 14th century, and are made in the form of a Gothic tower. The most common form now consists of a chalice-footed stand of some precious metal, and a circular repository, usually a transparent pyx, surrounded by sun-like rays. In the Greek Church the monstrance is shaped like a coffin.

MON'TAGU, Lady Mary Wortley, famous for her brilliant letters, was born in 1689, and died in 1762. She was the eldest daughter of Evelyn Pierrepont,

afterward duke of Kingston. Her beauty and elegance and her wit and vivacity rapidly gained her admiration and influence, and she became familiarly acquainted with Addison, Congreve, Pope, and other distinguished writers. In 1716 Mr. Montagu was appointed ambassador to the Porte, and Lady Mary accompanied him to Constantinople, where they remained from January, 1717, to May, 1718. It was during this period that Lady Mary's famous "Turkish Letters" were written. On her return to England she resumed her ascendency in the gay world of wit and fashion. Her letters are marked by great vivacity and graphic power, together with keen observation and independent judgment. Lady Mary has another claim to remembrance in her courageous adoption of the Turkish practice of inoculation for smallpox in the case of her own children, and for her energy in promoting its introduction into England, in the face of a storm of obstinate prejudice.

MONTAIGNE (mon-tān'), Michel Eyquem de, the famous French essayist, was born in 1533 at the castle of Montaigne, in Périgord. In 1580 he published the first two books of his Essais, and immediately afterward set out on a journey through Germany, Switzerland, and Italy to restore his health, which had been shattered by the attacks of a hereditary disease. In 1582 and 1584 he was chosen mayor of Bordeaux. In 1588 he republished his Essais, with the addition of a third book. After a last visit to Paris (in the course of which he was thrown into the Bastille for a short time by the leaguers) Montaigne seems to have dwelt quietly in his château. He died of quinsy in 1592.

MONTANA (mŏn-tă'na), one of the United States organized as a territory in 1864 out of portions of the territories of Idaho and Dakota, admitted as a state in 1889. It is bounded on the north by the Canadian provinces of British Columbia, Alberta, and Assiniboia on

State seal of Montana.

the east by the Dakotas, on the south by Wyoming and Idaho. It ranks third in size among the states of the Union. Its area is 146,080 sq. miles. The eastern three-fifths of the state consist of rolling plains, lying at an elevation of from 2000 feet in the northeast to about 4000 feet among the foothills of the Rocky Mountains, which take up the western portion. The Main Divide runs from Yellowstone Park for some distance along the southwestern boundary, after which it turns eastward and then crosses the state obliquely in a northwestern direction. A great longitudinal basin separates the Main Divide from the Bitter Root Mountains which form the western boundary. The principal rivers are the Missouri, the Yellowstone and Clark's Fork of the Columbia. The climate is in general dry, exhilarating, and healthful. The average mean temperature for the state is 70° for the warmest and 11° for the coldest month. The rainfall is exceedingly scanty and irrigation is almost necessary everywhere for agriculture.

Building materials such as limestone, slate, granite, sands, and clay are abundant, and there are large deposits of marble of various hues. Bituminous coal and extensive beds of lignite exist in the east along the Missouri and Yellowstone rivers, while petroleum is also found. Copper is abundant, lead, iron, gold, silver ores exist.

In the western part of the state it is only in exceptional years that the rainfall is inadequate, and in the northwest corner of the state, on the western side of the mountains, the rainfall is plentiful and certain. Considerable land has been brought under irrigation by the construction of large canals. The irrigated region is confined to the southwest quarter of the state, the supply being obtained from the tributary headwaters of the Missouri and from the Yellowstone river.

Hay is the principal crop, its acreage being more than twice that of all other crops. Native grasses constitute the greater part of the acreage, but alfalfa, clover, and other tame varieties are also grown. Oats, wheat, and barley yield abundant crops. Corn is but little grown, owing partly to the coolness of the nights. Potatoes are a favorite crop, and other vegetables are successfully raised. The apple and other temperate zone fruits flourish, and much interest is being developed in their culture.

The state greatly exceeds any other in the number of sheep and in the production of wool. Formerly, the males were shipped to eastern states to be fed for the market, but with the increased production of alfalfa it is being found possible to fatten them within the state. The number of cattle has also shown a considerable increase, and the breed has greatly improved.

The population is about 300,000. Helena is the capital. The tribal Indians chiefly Crows, Blackfeet, Yankton Sioux, Assiniboins, Gros Ventres, and Pend d'Oreilles, are located on five reservations, embracing an area of 45,000 sq. miles of fine agricultural and grazing land, of which only a small portion is cultivated.

In 1742 the Sieur de la Verendrye traversed the region now included within the state of Montana, and in January, 1743, reached the foot of the Rocky Mountains. Gold was discovered as early as 1852 near the Hellgate river, but the discovery aroused little attention till 1857. In the winter of 1860 rich placers were discovered and an active immigration set in, mining settlements springing up at Banack City on Grasshopper creek, on the Bighole river, and on North Boulder creek. In May, 1863, gold was discovered at Fairweather Gulch, near Alder creek. The town of Virginia City sprang up near the spot, and within a year it had a population of 4000. The region, which constituted a part of Washington territory, was organized in 1860–61 as Shoshone and Missoula counties. In 1863 the territory of Idaho, including the present Montana, was set off from Washington, and on May 22, 1864, the territory of Montana was erected from land taken from Idaho. In 1874 the seat of government was removed from Virginia City to Helena. On June 25, 1876, occurred the disastrous fight between General Custer and the Sioux Indians under Sitting Bull on the Little Big Horn river.

The prosperity of the territory was increased by the completion of the Northern Pacific railroad in 1883. About 1880 began the development of silver and copper mining, which soon surpassed in importance the gold-mining industry. In January and February, 1884, a constitutional convention framed a constitution which was ratified by the people in November, and application was made to congress for admission into the Union. No action was taken, however, until February, 1889, when an enabling act was passed by congress. On November 8, 1889, Montana was admitted into the Union by proclamation of the president, after a state constitution had been framed and state officers elected. In national elections Montana was republican in 1892 and democratic in 1896. In 1900 it was carried by the Democrats and people's party, and in 1904 and 1908 by the Republicans.

MONTANA, University of, a coeducational state institution at Missoula, Mont., founded in 1895. It maintains a preparatory department and a department of literature, science, and the arts, and offers graduate courses, leading respectively to the degrees of B.A., B.S., M.A., and M.S. There is also a summer school of science and a biological station. Tuition is free except in the law department.

MONT BLANC, the loftiest mountain of Europe, belonging to the Pennine chain of the Alps, and rising 15,781 feet above the sea-level, is situated on the frontiers of France and Italy, and near that of Switzerland. On the s.e. its face is steep; on the n.w. lateral chains are sent off, among which about thirty glaciers are counted. The chief are the glaciers Des Bossons, Bois, Argentière, and Mer de Glace. The summit was first reached in June, 1786, by the guide Jacques Balmat.

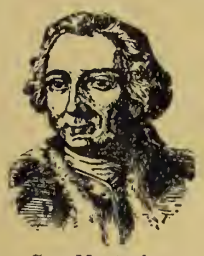
MONTCALM (mon-kăm), Louis Joseph Saint Veran, Marquis de, French general, born in 1712. In 1756 was appointed to the chief command of the French troops in Canada. Here he took Fort Ontario and Fort William Henry and occupied Ticonderoga; but at Quebec in 1759 was completely defeated by General Wolfe on the Heights of Abraham, both commanders being mortally wounded.

MONTCLAIR, a city in Essex co., N. J., on the Del., Lack. and W. and the

N. Y. and Greenwood Lake railways; 5 miles n. by w. of Newark, the county seat, 14 miles w.n.w. of New York City. Pop. 14,175.

MONTE CARLO. See Monaco.

MONTE CRISTO, a small island 6 miles in circumference belonging to Italy, 25 miles s. of Elba, the seat of a penal colony. Dumas has given the



Gen. Montcalm.

name of this isle to the hero of one of his most popular romances.

MONTECU'CULI or, more correctly, **MONTECU'COLI,** Raimondo, Prince of the Empire, and Duke of Melfi, military commander, born near Modena in 1608, died at Linz 1680. In 1664 he gained a great victory over the Turks after having driven them out of Transylvania. In 1673 he was placed at the head of the imperial troops, and checked the progress of Louis XIV. by the capture of Bonn, and by forming a junction with the Prince of Orange in spite of Turenne and Condé. Montecuculi's subsequent advance into Alsace was repulsed by the Prince of Condé. His last military exploit was the siege of Philipsburg.

MONTEFIORE (mon-te-fi-ō'rā), Sir Moses, Jewish philanthropist and centenarian, was born 24th October, 1784, died 28th July, 1885. In 1837 he was chosen sheriff of London, the same year he was knighted, and in 1846 he was made a baronet. His benevolence to Jews throughout the world was unbounded; and he visited Palestine seven times, the last when in his 92d year.

MONTENE'GRO, an independent principality in Europe, in the northwest of Turkey, bounded by Herzegovina, Albania, the Adriatic, and Balmatia. Area, about 3630 sq. miles. The climate is healthy. Forests of beech, pine, chestnuts, and other valuable timber cover many of the mountain sides. Fruit-trees of all kinds abound, especially in the sheltered valleys, where even almonds, vines, and pomegranates ripen. Agriculture is in a very rude and inefficient state, though every cultivable piece of land is planted with Indian corn, potatoes, tobacco, rye, wheat, cabbages, or some other useful plant. Sheep, cattle, and goats are reared in great numbers. Manufactures, with exception of a coarse woolen stuff, are unknown. The population amounts to about 240,000.

MONTEREY (mon-te-rā'i), capital of the state of New Leon, in Mexico, about 100 miles from the Texas frontier. Monterey, which is said to be the most Americanized town in Mexico, has a considerable transit trade. In 1846 it was captured by the United States troops under Gen. Taylor. Pop. 62,266.

MONTESPAN (mon-tes-pän), Françoise Athenaïs, Marchioness de, mistress of Louis XIV., born in 1641, was the second daughter of the Duke of Mortemart, and was, in 1663, married to the Marquis de Montespan. Mme. de Montespan bore eight children to the king, four of whom died in infancy. The others were intrusted to the care of Mme. Scarron, afterward De Maintenon. The influence of the favorite mistress was often exercised in public affairs, and her empire over the king continued until about 1679, when a growing attachment to Mme. de Maintenon finally estranged his affections from Mme. de Montespan. She rarely appeared at court after 1685, and in 1691 she entirely quitted it. Her last years were devoted to religious exercises, acts of benevolence, and penitence.

MONTESQUIEU (mon-tes-kyeu), Charles Louis de Secondat, Baron de la Brède et de, born 1689 at the château of La Brède, near Bordeaux; died at Paris 1755. The Lettres Persanes, the first of the three great works on which his fame principally rests, appeared in 1721. Other works of less importance followed; and in 1728 Montesquieu was admitted to the French Academy. He gave up his president's office in 1726, and then visited Germany, Hungary, Italy, Holland, and England. In England he stayed for eighteen months, and imbibed a deep admiration for its social and political institutions. He returned to France in 1731, and in 1734 he published his Considérations sur les Causes de la Grandeur et la Décadence des Romains. In 1748 L'Esprit des Lois, the result of twenty years of labor, was published, and at once placed its author among the greatest writers of his country. The scope of the work is perhaps best indicated by the sub-title of the original edition, which describes it as a treatise on the relation which ought to exist between the laws and the constitution, manners, climate, religion, commerce, etc., of each country. Among his lesser works are Dialogue de Sylla et d'Eucrate, Le Voyage de Paphos, Essai sur le Goût (unfinished), Arasce et Isménie (probably a work of his youth), Lettres Familières, etc.

MONTEVID'EO, capital of Uruguay is situated on a small peninsula on the north coast of the estuary of the La Plata, 130 miles east-southeast of Buenos Ayres. Pop. 250,000, one-third of whom are foreigners.

MONTEZU'MA, Aztec emperor of Mexico when Cortez invaded the country in 1519. Influenced by an ancient prophecy, he at first welcomed the Spaniards; but when he discovered that they were no supernatural beings, he secretly took measures for their destruction. Cortez on learning this seized Montezuma, and compelled him to recognize the supremacy of Spain. The Aztecs immediately rose in revolt, and refused to be quieted by the appearance of Montezuma. While urging them to submission he was struck on the temple with a stone and fell to the ground. Cut to the heart by his humiliation, he refused all nourishment, tore off his bandages, and soon after expired.

MONTFORT, Simon de, Earl of Leicester, famous in the constitutional history of England, was born in France between 1195 and 1200. He was the youngest son of Simon de Montfort, Earl of Leicester, the "scourge of the Albigenses." He won the favor of Henry III. and married Eleanor, countess dowager of Pembroke, and sister of the king. He was conspicuous among those who extorted the Provisions of Oxford from the king in the "Mad Parliament" in 1258; and he was the leader of the barons in the so-called "Barons' War" that followed. In 1264 he agreed to submit the question of the king's right to repudiate the Provisions to Louis XI. of France: but when the latter, by the Mise of Amiens, decided in favor of Henry, De Montfort refused to be bound by the decision. Both sides took up arms and at the battle of Lewes (May 14, 1264) the king was defeated and taken prisoner. The Mise of Lewes, to which Henry III. agreed, contained the outlines of a new constitution, in which the principle of representative government was recognized. The king accepted the constitution on Feb. 14, 1265; but Prince Edward and the Mortimers raised the standard of revolt. At the battle of Evesham (Aug. 4, 1265) De Montfort was defeated and slain. His memory was long revered by the people as a martyr for the popular liberty.

MONTGOM'ERY, or **MONTGOMERYSHIRE,** an inland county in North Wales, has an area of 495,082 acres, consisting mostly of wild, rugged, and sterile mountains, varying from 1000 to 2000 feet in height. It contains, however, some fine and fertile valleys, the most extensive and fruitful of which is that of the Severn, the principal river. Pop. 54,892.

MONTGOMERY, capital of Alabama, on the left bank of the navigable Alabama river. The principal buildings are the state-capitol, the United States court-house, and a number of churches. Montgomery contains several foundries, flour and oil mills, and a cotton factory; and carries on an extensive trade. Pop. 32,416.

MONTH, a period of time derived from the motion of the moon generally one of the 12 parts of the calendar year. The calendar months have from 28 to 31 days each, February having 28, April, June, September, and November 30, the rest 31. Month originally meant the time of one revolution of the moon, but as that may be determined in reference to several celestial objects there are several lunar periods known by distinctive names. Thus the anomalistic month is a revolution of the moon from perigee to perigee, average 27 days 13 hrs. 18 min. 37.4 sec.; the sidereal month, the interval between two successive conjunctions of the moon with the same fixed star, average 27 days 7 hrs. 43 min. 11.5 sec.; the synodical, or proper lunar month, the time that elapses between new moon and new moon, average 29 days 12 hrs. 44 min. 2.9 sec. The solar month is the twelfth part of one solar year, or 30 days 10 hrs. 29 min. 5 sec.

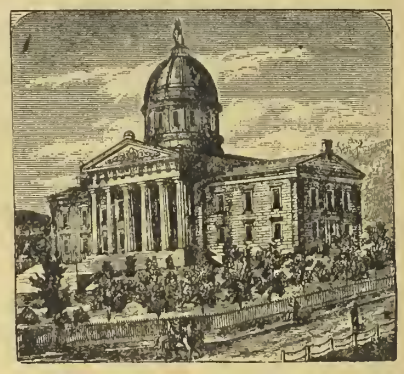
MONTHS, the Derivations of the Names of the, January—the Roman

Janus presided over the beginning of everything; hence the first month of the year was called after him. February—the Roman festival Februs was held on the 15th day of this month, in honor of Lupercus, the god of fertility. March—named from the Roman god of war, Mars. April—Latin, Aprilis, probably derived from aperire, to open; because spring generally begins, and the buds open in this month. May—Latin Maius, probably derived from Maia, a feminine divinity worshipped at Rome on the first day of this month. June—Juno, a Roman divinity worshipped as the Queen of Heaven. July—(Julius) Julius Cæsar was born in this month. August—named by the Emperor of Augustus Cæsar, B.C. 30, after himself, as he regarded it as a fortunate month, being that in which he had gained several victories. September (septem, or 7)—September was the seventh month in the old Roman calendar. October (octo, or 8)—Eighth month of the old Roman year. November (novem, or 9).—November was the ninth month in the old Roman year. December (decem, or 10)—December was the tenth month of the early Roman year. About the 21st of this month the sun enters the Tropic of Capricorn, and forms the winter solstice.

MONTMOREN'CY, a small river of Canada, which rises in Snow lake, prov. of Quebec, flows south, and joins the St. Lawrence 8 miles below Quebec. Near its mouth are the Falls of Montmorency, which have a breadth of about 50 feet, and a perpendicular descent of 242 feet.

MONTMORENCY (mon-mo-rân-si), the name of a noble family of France and the Netherlands, derived from the village of Montmorency near Paris. One of its most distinguished members was Anne de Montmorency, first duke of Montmorency, Constable of France, and a distinguished general, born in 1492. He distinguished himself at the battle of Marignano in 1515, and for his valor at Bicocca in 1522 was made marshal. He was taken prisoner along with Francis I. at the battle of Pavia in 1525, but was soon after ransomed. In 1536 he defeated Charles V. Francis I. conferred on him the dignity of Constable in 1538. In 1551 he was made a duke. In 1557 he lost the battle of St. Quentin against Philip II. of Spain, and was taken prisoner, but he regained his freedom by the Peace of Cateau-Cambrésis in 1559. Under Charles IX. he joined the Duke of Guise and Marshal St. André in forming the famous triumvirate against Condé and the Huguenots. At the battle of Dreux in 1562 Montmorency was made prisoner by the Huguenots; on the renewal of the civil war he gained a decisive victory over them at St. Denis, November 10, 1567, though the following day he died of his wounds.

MONTPELIER, the capital of the state of Vermont and of Washington co., on the Winooski or Onion river, here crossed by a stone bridge, and on the Mont. and Wells river and the Cent. Vt. railways; 40 miles s.e. of Burlington, 205 miles n.n.w. of Boston. The principal industry is the quarrying of the celebrated Barre granite; other industries are the manufacture of saw-mill, candy-making, and other machinery, leather, organ and piano springs, and clothes-wringers and washing-machines. Pop. 10,100.



State capitol, Montpelier, Vt.

MONTPELLIER (mon-pel-yā), chief town of the department of Hérault, in France, is situated in a picturesque region, on the Lez, about 6 miles north of the Mediterranean and 80 miles w.n.w. of Marseilles. Pop. 76,364.

MONTREAL, the largest city and the commercial capital of the Dominion of Canada, is situated on an island of the some name, formed by the mouths of the Ottawa, where, after a course of 750 miles, it debouches into the St. Lawrence. It is built upon the left or northern bank of the St. Lawrence, and is situated 180 miles s.w. of Quebec, and 985 miles by river from the Atlantic Ocean. Behind the town rises the Mount Royal (Mont Real), from which it derives its name, and which is reserved as a public park. Situated at the junction of the inland and the ocean navigationn, it has a harbor with three miles of wharfage accessible to steamers of the deepest draught. It is also the chief terminus of the Grand Trunk Railway, and the

eastern terminus of the Canadian Pacific Railway. The city is divided into distinctly marked English and French quarters. The chief public buildings are the court-house, custom-house, city hall, etc.; and the principal churches are St. Peter's Cathedral, the church of Notre Dame, St. Patrick's, Christ Church Cathedral, St. Andrew's, St. Paul's, etc. M'Gill University, Presbyterian College, Wesleyan Theological College, Congregational College, Angelican Diocesan College, Bishop's College, and University, the Montreal School of Medicine and Surgery, are the leading Protestant educational institutions; those of the Roman Catholics comprise Laval University, St. Mary's College, Montreal College, Hochclaga Convent, etc. Among the industrial establishments of Montreal are iron foundries, distilleries, breweries, sugar-refineries, soap and candle works; and there are manufactures of cotton, silk, boots and shoes, paper, carpets, tobacco, hardware, edge-tools, floor-cloth, carriages, etc. The Grand Trunk railway, which connects the railways of Canada with those of the United States, crosses the St. Lawrence at Montreal by the great Victoria bridge (formerly tubular) 9184 feet in length, constructed in 1854–59. Pop. 318,165, of whom the majority are Roman Catholics and of French origin.

MONTROSE, James Graham, Marquis of (1612–1650), son of the 4th earl of Montrose, was born at Montrose in 1612. In 1637 Montrose joined the covenanters in their resistance to episcopacy. In 1639 he was one of the

James Graham, Marquis of Montrose.

leaders who were appointed to confer with Charles I., after which he went over to the royalist side, was created a marquis, and made commander of the royal forces in Scotland. He was defeated at Philiphaugh by Leslie, and fled to Norway in 1646. In March, 1650, he returned, landing in Orkney with a small body of followers. He failed, however, in raising an army, and a month later was surprised and captured in Rossshire, and was conveyed to Edinburgh, where he was hanged and quartered 21st May, 1650.

MOODS (in Logic). See Syllogism.

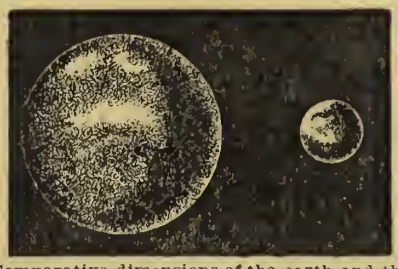
MOO'DY, Dwight Lyman, American evangelist, was born at Northfield, Mass. 1837. In 1856 he removed to Chicago, became active in mission work, and established a Sunday school which numbered over a thousand children. In 1873 he visited Great Britain and Ireland with Ira D. Sankey, the singer, and in 1875 held a long series of meetings in Brooklyn and Philadelphia, and in 1876 in New York. Similar services followed in many large cities throughout the country. In 1882 a second visit to England was made. He died at Northfield in 1899. He published numerous discourses and works of a popular character.

MOODY, William Henry, American lawyer, was born in 1853, in Newbury, Essex co., Mass. From 1890 to 1895 he was district attorney for the Massachusetts Eastern District, member 54th congress to fill vacancy; also member 56th and 57th congresses. In May, 1902, he became secretary of the navy and in 1904 he was appointed attorney-general which he held until 1906, when he resigned.

MOON, The, one of the secondary planets and the satellite of the earth revolves round the latter in an elliptic (almost circular) orbit, in one sidereal month (see Month), at a mean distance of 238,818 miles, he. greatest and least distances being 252,948 and 221,593 miles. Her mean diameter is 2159 miles. Her surface is about $\frac{1}{13}$ (14,600,000 sq. miles) of that of the earth; her volume $\frac{1}{49}$; her mass about $\frac{1}{81}$; and her mean density a little more than $\frac{1}{2}$. A mass weighing 1 lb. on the earth's surface would weigh about 2.64 ozs. on the moon's surface. For every revolution in her orbit, the moon rotates once on her axis, so that the same portion of her surface is constantly turned toward the earth; but in virtue of an apparent oscillatory motion, known as libration (which see), about $\frac{4}{7}$ of her surface is presented at one time or another to terrestrial observers. If the moon's orbit were in the plane of the ecliptic, solar and lunar eclipses would occur monthly. Her orbit is, however, inclined 5° 8′ 48″ to the ecliptic, so that her meridian altitude has a range of 57°, and she occults in course of time every star within 5° 24′ 30″ of the ecliptic. An eclipse of the moon occurs when she passes into the

Orbit of the moon, showing the lunar phases.

earth's shadow; when she prevents the sun being seen there is an eclipse of the sun. (See Eclipse.) The changes in the appearance of the moon, described by the words waxing and waning, are known as phases. The four chief phases, occurring at intervals of 90° in the lunar orbit, are New Moon, when she is between the earth and sun (i.e. in conjunction with the sun), and so turns an unilluminated side to the earth; First Quarter, when one-half of her illuminated disc (i.e. one quarter of the entire lunar surface) is visible; Full Moon, when her whole illuminated disc is presented to the earth; and Last Quarter, when once more only half of her disc is visibly illuminated. Between new moon and full moon the moon is said to wax; on the rest of her course she wanes. When more than a semicircle is visible she is said to be gibbous; when new or full she is said to be in her syzygies. On the visible portion of the lunar surface there is either no atmosphere or an exceedingly rare one, and no traces of organic life have been observed. As each portion is alternately in sunlight and in shade for a fortnight at a time, and as no atmosphere has been detected, it is conjectured that the lunar extremes of heat and cold far exceed the greatest terrestrial extremes. The surface of the moon is mainly occupied by mountains, most of which are named after eminent scientific men. They are



Comparative dimensions of the earth and the moon.

sometimes detached as precipitous peaks, more frequently they form vast continuous ranges, but the most prevalent form is that of crater-mountains, sometimes 8 to 10 miles in diameter, and giving evident traces of volcanic action. Certain crater-like formations, which have still greater diameters are generally spoken of as "walled plains." Larger still are the "gray plains," which were at one time taken for seas, before the absence of water from the lunar surface was demonstrated. They may possibly be the floors of old seas. Some of the mountains have been estimated to be over 24,000 feet in height, from observation of their shadows. Very peculiar ridges of comparatively small elevation extend for great distances, connecting different ranges or craters. The so called-"rilles" or "clefts" are huge straight furrows of great length (18 to 90 miles), now generally believed to be caused by cracks in a shrinking surface. There are also valleys of various sizes, and "faults" or closed cracks, sometimes of considerable length. In reading descriptions of the visible peculiarities of the moon, it should be remembered that the highest telescopic power yet applied to that planet is only equivalent to bringing it within about 40 miles of the naked eye. The attraction of the sun for the earth and the moon tends to diminish their mutual action. When the moon is at new or full (in syzygies) the mutual attraction of the earth and moon is lessened by the sun more than usual, whereas it causes a small increase in the mutual action when the moon is in quadrature (when the line from the earth to the moon is at right angles to the line from the earth to the sun); again, the sun exerts a direct tangential acceleration on the moon which is positive (or toward the sun) when the moon is nearer the sun than the earth, and negative when the moon is further away than the earth; these two produce what is called the moon's variation, which, on the whole, is such that in each lunation the moon's velocity is greatest when she is in syzygies and least when nearly in quadrature. For the influence of the moon on tides see Tides.

MOORE, Clement Clarke, American poet and educator, was born in New York in 1779. He compiled a Hebrew and English Lexicon, and published a collection of Poems, among which is "Twas the Night Before Christmas," or more properly, "A Visit from Saint Nicholas," through which he is best remembered. He died in 1863.

MOORE, George, a British novelist and dramatist, born in Ireland in 1853. His novels, A Modern Lover, A Mummer's Wife, and Esther Waters, aroused vigorous protest as being unduly realistic. Among his later works are Sister Teresa, Confessions of a Young Man, Miss Fletcher, Impressions and Opinions, Modern Painting, and The Celibates.

MOORE, Sir John, a celebrated British general, was born at Glasgow in 1761, killed at Corunna in 1809. Having obtained an ensign's commission in the 51st regiment he served at Minorca in the American war, as bragadier-general in the West Indies (1795), in Ireland during the rebellion of 1798, in Holland in 1799, and in Egypt in 1801, where he was severely wounded in the battle which cost Sir Ralph Abercrombie his life. Moore was now regarded as the greatest living British general, and in 1805 he was knighted. In 1808 he was appointed commander-in-chief of the British army in Portugal to operate against Napoleon. He advanced to Salamanca in spite of the gravest difficulties, but was finally compelled to retreat to Corunna, a distance of 200 miles, in face of a superior force. This he accomplished in a masterly manner; but the absence of the fleet to receive his army forced him to a battle against Marshal Soult, in which Moore fell, mortally wounded, in the hour of victory (16th January, 1809).

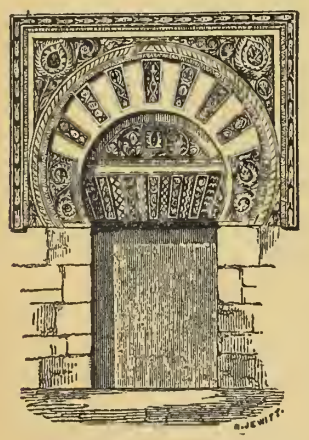
MOORE, Thomas, the national poet of Ireland, was born in 1779 in Dublin; died near Devizes in 1852. Moore in 1806 published his Odes and Epistles. In 1807 he agreed to write words for a number of Irish national airs, arranged by Sir John Stevenson. In these Irish Melodies, which were not finished till 1834, he found the work for which his genius was peculiarly fitted, and it is on them that his poetic reputation will mainly rest. With The Intercepted Letters, or the Twopenny Post Bag, by Thomas Brown the Younger (1812), Moore entered upon the field of political and social satire, in which his wit and playfulness found good account; other works of this kind are the Fudge Family in Paris (1818), Rhymes on the Road (1823), Memoirs of Captain Rock (1824), etc. His most ambitious work, the gorgeous Eastern romance of Lalla Rookh, was published in 1817. The Life of Sheridan was produced in 1825, and The Epicurean, a prose romance in 1827. Next came the Life of

Lord Byron, and the Life of Lord Edward Fitzgerald.

MOORISH ARCHITECTURE, is that form of Saracenic architecture which was developed by the Moslem conquerors of Spain in building their mosques and palaces. Its main characteristics are—the horse-shoe arch, varied by the trefoil, cinquefoil, and other forms of arch; profuse decoration of interiors by elaborately designed arabesques in low relief, enriched by colors and gilding, as well as by geometrical designs worked in

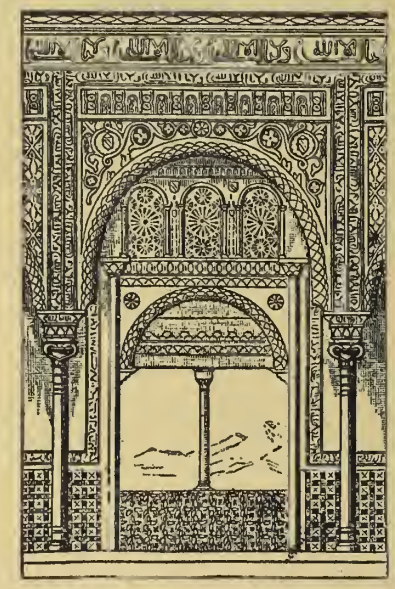
Thomas Moore.

mosaics of glazed tiles; the slenderness of the columns in proportion to the supported weight; and the curious stalactitic pendentives by which the transition is effected from the rectangular ground plan to the arched or domed roof. An important specimen of this style is the mosque of Cordova, now the cathedral, which was begun by Caliph Abd-el-Rahman (786 A.D.), completed by his son, and subsequently much altered.



Moorish doorway, Cordova.

It consisted originally of eleven aisles, and the eight aisles which were afterward added (976–1001) made it one of the largest buildings in Europe, but the effect of its great extent, 420 feet by 375, is marred by its height, which is only about 30 feet to the roof. Another notable specimen of Moorish architecture is the Giralda or cathedral-tower of Seville. It is supposed to have been built by Abú Yusúf Kakúb (1171 A.D.) as a tower of victory, and was used by the Moslems as a minaret or mueddin-tower. The base is a square of about 50 feet, from which the tower rises straight for 185 feet, and is now crowned by a belfry added in the 16th century. The lower part of this tower is nearly plain, but from about



Moorish decoration—court of the Alhambra.

one-third of its height upward it is enriched by sunk panels filled with ornamentation in relief, which give lightness and grace to the structure without affecting its general massiveness. The most characteristic Moorish palace in existence is the Alhambra in Granada, an immense structure of simple and rather forbidding exterior, but within gorgeous almost beyond description. (See Alhambra.) In this palace are found to perfection the distinctive characteristics of Moorish architecture.

MOORS, a Mohammedan, Arabic-speaking race of mixed descent, forming part of the population of Barbary and deriving their name from the Mauri, the ancient inhabitants of Mauretania, whose pure lineal descendants are, however, the Amazirgh, a branch of the Berbers. The modern Moors have sprung from a union of the ancient inhabitants of this region with their Arab conquerors, who appeared in the 7th century. As the Mohammedan conquerors of the Visigoths in Spain (711–713) came from North Africa, the name Moor was also applied to them by Spanish chroniclers, and in that connection is synonymous with Arab and Saracen. These Moors pushed northward into France, until their repulse by Charles Martel at the great battle of Tours in 732, after which they practically restricted themselves to Spain south of the Ebro and the Sierra Guadarrama. Here, for centuries, art, science, literature, and chivalry flourished among them, while the rest of Europe was still sunk in the gloom of the dark ages. Their internal dissensions and divisions, however, weakened them in face of the new Christian kingdoms of Aragon and Castile, and before the close of the 13th century their possessions were limited to the kingdom of Granada. This, too, was finally subdued by Ferdinand the Catholic in 1492; and while great numbers of the Moors emigrated to Africa, the remainder, under the name of Moriscos, assuming in great part a semblance of Christianity, submitted to the Spaniards. The cruel proselytizing zeal of Philip II., however, excited a sanguinary insurrection among the Moors in 1568–70, which was followed by the banishing of many thousands, while Philip III. completed the work in 1610 by finally expelling the last of these, the most ingenious and industrious of his subjects. Between 1492 and 1610 about 3,000,000 Moriscos are estimated to have left Spain. The expulsion of the Moors was one of the chief causes of the decadence of Spain; for both agriculture and industries fell into decay after their departure. The expelled Moors, settling in the north of Africa, founded cities from which to harass the Spanish coasts, and finally developed into the piratical states of Barbary, whose depredations were a source of irritation to the civilized Christian powers even till well into the 19th century.

MOOSE. See Elk.

MORADABAD, a town of India in Rohilkhand, in the United Provinces, 75 miles east of Meerut, on the Ramganga. Pop. 75,176.—The district has an area of 2281 sq. miles. Pop. 1,179,398.

MORAINE. See Glaciers.

MORAL PHILOSOPHY. See Ethics.

MORAN, Thomas, American etcher and landscape painter, was born at Bolton, Lancashire, in 1837, and came to Philadelphia with his parents. He then studied oil painting in Paris and Italy. He returned to the United States in 1871 and produced the picture of the "Grand Cañon of the Yellowstone," now filling a panel in the Capitol at Washington. In 1873 he completed a picture of "The Chasm of the Colorado," which was purchased by congress as a companion of the Yellowstone picture. He was elected a member of the National Academy in 1884. Among his smaller pieces are: "The Lost Arrow," "The Conemaugh in Autumn," "The First Ship," "The Track of the Storm," "Ponce de Leon in Florida," "New York from Communipaw," and "After a Thaw." His illustrations include designs for Longfellow's Hiawatha and Whittier's Mabel Martin. Both he and his wife, Mary Moran, are etchers, and members of the British Society of Painter-Etchers.

MORAVIA, a northwestern province or crownland of the Austrian empire, area, 8578 sq. miles. It is inclosed by the Carpathians and other mountains. The minerals include iron, coal, graphite, and slate. Nearly 97 per cent of the soil is productive, the chief crops being rye, oats, barley, potatoes, beet-root, and flax. Fruit is very abundant, and large quantities of wine are annually produced. Sheep in great numbers, and cattle, are reared. Moravia is the most important manufacturing province of the empire, after Austria Proper and Bohemia. Its woolen industries are of

world-wide fame, and linen and cotton, beet-root sugar, iron and steel goods, machinery, beer, and spirits. Pop. 2,276-870.

MORAVIAN BRETHREN, also called United Brethren, a Protestant sect or church which originally sprang up in Bohemia after the death of John Huss. After the sanguinary religious war which prevailed in Bohemia until 1627 they were everywhere almost annihilated. Their doctrines were still, however, secretly cherished in Moravia, and in 1722 a colony emigrated thence, and were invited by the Lutheran Count Zinzendorf to settle on his estate near Berthelsdorf, in Saxony, where they built the town of Herrnhut, still the headquarters of the church. The doctrines of the brethren had hitherto been more in harmony with the Calvinistic than with the Lutheran form of Protestantism, but under the influence of Count Zinzendorf, who himself became a bishop, they attached themselves to the Lutheran Church.

MORAY, or **MURRAY,** James Stuart, Earl of, half-brother of Mary Queen of Scots, natural son of James V. of Scotland and Margaret Erskine, born about 1533. On the deposition of Mary he was appointed regent, defeated her forces at Langside on her escape from Lochleven (1568), and appeared as evidence against her at her trial in England. In 1570 he was shot in the streets of Linlithgow.

MORBIHAN, (mor-bi-äṇ) a northwestern department of France, on the Bay of Biscay; area, 2624 sq. miles. The chief town is Vannes. Pop. 563,468.

MORE, Sir Thomas, a chancellor of England; born in London in 1480, beheaded 1535. About 1502 he became a member of parliament, and immediately made for himself a place in history by upholding the privileges of the House of Commons to treat all questions of supply as their own exclusive business. On the accession of Henry VIII. he was made under-sheriff of London. In 1514 he was envoy to the Low Countries, soon after was made a privy-councillor, and in 1521 was knighted. In 1532 he became speaker of the House of Commons, and in 1529 succeeded Wolsey in the chancellorship. He was requested to take the oath to maintain the lawfulness of the marriage with Anne Boleyn. His refusal to do so led to his committal to the Tower, trial for misprision of treason, and execution.

MOREAU (mo-rō), Jean Victor, French general, born at Morlaix, in Bretagne, in 1763, died 1813. He was named commander-in-chief of the army of the Rhine and Moselle in 1796. His conduct of the operations, and especially of the retreat to the French frontier in the face of a superior army, showed exceptional strategic power. In 1799 he was in command of the army of Italy, and next year had the command of the armies of the Danube and the Rhine. Being found guilty of participation in the conspiracy of Pichegru and Cadoudal against Napoleon (1804), he had to go into exile. He was subsequently induced to aid in the direction of the allied armies against his own country, but was mortally wounded in the battle before Dresden in 1813, and died a few days later.

MORE'LOS, an inland state of Mexico, south of Mexico, containing the volcano of Popocatepetl; area, 1776, sq. miles; Pop. 141,565.

MO'REY, Samuel, American inventor, was born in Hebron, Conn., in 1762. In 1793 he succeeded in constructing a small steamboat, which was moved by a wheel at its prow. In 1795 Morey patented a crank-motion steam-engine for use in boats. Two years afterward he built a boat with paddle wheels on each side, and operated it successfully on the Delaware. He had the problem of steam navigation practically solved; but misfortunes prevented him from following up his success, and to Robert Fulton went the honor that might otherwise have been Morey's. He died in 1843.

MORGAN, Edwin Dennison, an American politician, governor of New York from 1859 to 1863. He was born at Washington, Berkshire co., Mass., in 1811. From 1849 to 1853 he was a member of the state senate. He was a delegate to the first national convention of the republican party at Philadelphia, and was one of the vice-presidents of that assembly. In 1858 he was elected governor of New York, and was re-elected in 1860. In the latter term it fell to him to supervise and control the sending of New York's quota of troops to the front in defense of the Union, and when he left office in 1863 more than 223,000 volunteers had been enlisted in the Federal service. In 1861, in order that he might better carry out the administration's desires, New York state was made a military district, and he was placed in command with rank of major-general. He died in 1883.

MORGAN, John Hunt, American soldier, prominent on the confederate side in the civil was, was born at Huntsville, Ala., in 1825, moved with his parents to Kentucky in 1830. In 1861 with about two hundred men and the guns of the militia company of which he was captain, he escaped to the confederate lines. His great success in daring and unexpected raids gave him the command of a cavalry brigade, and after promotion to brigadier-general made the "Christmas Raid" into Kentucky, for which he was thanked by the confederate congress. In June, 1863, with about 2500 men he crossed the Ohio river into Indiana and was closely pursued by Generals Hobson and Shakelford, and opposed everywhere by the militia. A sudden rise in the Ohio river prevented him from recrossing the river and he was captured and confined in the Ohio state prison at Columbus. On November 27th he escaped and reached the confederate lines in safety. On September 4, 1864, in Greenville, Tenn., he was betrayed by an inmate of the house in which he was sleeping, and was shot while attempting to escape.

MORGAN, John Pierpont, American banker and financier, was born at Hartford, Conn., in 1837. In 1857 he entered the banking house of Duncan, Sherman & Co., in New York City. In 1860 he became agent for George Peabody & Co., of London, and in 1864 became a partner in the firm of Dabney, Morgan & Co., In 1871 he entered as a partner the banking firm of Drexel, Morgan & Co., which later was changed to the firm of J. P. Morgan & Co. The United States Steel Corporation, the Northern Securities Company, and the Atlantic shipping combination are examples of his genius in reorganization and combination.

MORGAN, John Tyler, American politician, born at Athens, Tenn., in 1824. He removed to Alabama with his parents in 1833. In 1861 he was a delegate from Dallas co., to the Alabama state convention which passed the ordinance of secession, and he enlisted as a private in the Fifth Alabama Infantry, of which he ultimately became lieutenant-colonel. In 1862 he recruited the Fifty-first Alabama regiment and became its colonel. After the war he again entered politics as an elector-at-large on the Tilden ticket. In 1877 he was elected to the United States senate, of which body he remained a member, receiving his fifth re-election in November, 1900. He died in 1907.

MORGAN, Lewis Henry, American ethnologist, was born near Aurora, N. Y., in 1818. Morgan, after leaving college, organized "The Grand Order of the Iroquois." The limits of the grand order were to be the territory anciently occupied by the Iroquois. Morgan lived among the existing tribes, in order to master their social organizations and forms of government, and his scientific interests assumed substantial form in the celebrated work, The League of the Iroquois, in which the author traced the social organization, government, daily occupations, and customs of this wonderful league.

In 1858 Morgan discovered, in visiting a camp of Ojibwa, that their system of kinship was essentially the same as among the Iroquois. This was the revelation that determined Morgan's enduring fame. His System of Consanguinity and Affinity of the Human Family is a work essential to all studies on primitive sociology. His Ancient Society is a comprehensive and philosophical work. He died in 1881.

MORGAN, Sir Henry, the most famous of English buccaneers, was born at Llanrhynny, Glamorganshire, Wales, in 1635. He was kidnaped at Bristol when a boy, and sold as a servant in Barbadoes, whence after a time he worked his way to Jamaica. There he joined the buccaneers, and by 1663 was in command of a privateer of his own. He took and sacked Puerto Príncipe, and then sailed to Puerto Bello, Panama, which he captured after a brilliant attack. After levying a heavy ransom Morgan sailed for Jamaica. Later in the year he led an expedition which ravaged the entire Cuban coast, and in January, 1669, with a fleet of eight ships, he started on his famous expedition against Maracaibo. The capture and sack of the town was followed by the greatest excesses on the part of the buccanners, who were surprised in their orgies by the arrival of three Spanish ships of war. Morgan assembled his half-drunken comrades, manned his ships, and after parleying with the Spanish commander

suddenly attacked him, totally defeated him, and escaped. In August, 1670, he ravaged the Cuban and mainland coasts, and in January, 1671, he captured and plundered the city of Panama, one of the richest in Spanish America. The attack had been made after a peace had been arranged between England and Spain, and Morgan was sent to England, but he took enough gold along with him to secure his vindication, eventually receiving knighthood and high favors from the king; was sent back to Jamaica as lieutenant-commander and commander-in-chief of his majesty's forces in the colony. He died in 1688.

MORGAN, William, American Mason, whose disappearance under peculiar circumstances in 1826 caused the organization of the Anti-Masonic party, was born in Culpeper co., Va., in 1775. He suddenly disappeared in 1826, shortly after it had been announced that he intended, in conjunction with one David C. Miller, to publish a book exposing the secrets of Freemasonry. Morgan's book, Illustrations of Freemasonry, by One of the Fraternity Who Has Devoted Thirty Years to the Subject, was published in 1826 and was republished at various times thereafter, sometimes under the title of Free-masonry Exposed and Explained.

MORGANAT'IC MARRIAGE, in some European counrties, one in which it is stipulated that the wife (who is inferior in birth to the husband) and her children shall not enjoy the privileges of his rank nor inherit his possessions. The common law of Germany permits such marriages only to the high nobility.

MORGUE (morg), a place where the bodies of unknown persons who have perished by accident, murder, or suicide are exposed, that they may be recognized by their friends.

MOR'ION, a helmet of iron, steel, or brass, somewhat like a hat in shape, often with a crest or comb over the top,

Morion of the time of Queen Elizabeth.

and without beaver or visor, introduced into Britain from France or Spain about the beginning of the 16th century.

MORISCO. See Moors.

MORLEY, Right Hon. John, author and politician, born at Blackburn, Lancashire, 1838. He conducted the Fortnightly Review from 1867 to 1882, and edited the Pall Mall Gazette for three years (1880–83), and Macmillan's Magazine for two years (1883–85). He also edited the English Men of Letters series, to which he contributed the volume on Burke. He is author of Critical Miscellanies; Voltaire; Rousseau; Diderot and the Encyclopedists; Life of Cobden; Walpole in the English Statesmen series; Life of Gladstone (1903); etc. He represented Newcastle from 1883 to 1895; and in 1896 became member for the Montrose burghs. Radical in politics, he is a supporter of Irish Home Rule, and was chief secretary for Ireland in 1886, and again in 1892–95.

MORMONS, a sect founded in 1830 by Joseph Smith, a native of the United States. The distinguishing peculiarities of the sect are—the belief in a continual divine revelation through the inspired medium of the prophet at the head of their church, the practice of polygamy, and a complete hierarchical organization. The supreme power, spiritual and temporal, rests with the president or prophet (elected by the whole body of the church), who alone works miracles and receives revelations. The Mormons accept both the Bible and the Book of Mormon as divine revelations, but hold them equally subject to the explanation and correction of the prophet. The latter mentioned book (in large part a kind of historical romance written by one Solomon Spaulding in 1812) pretends to be a history of America from the first settlement of the continent after the destruction of the tower of Babel up to the end of the 4th century of our era, at which time flourished the legendary prophet Mormon, its reputed author. It was said to have been written on gold plates, and concealed until its hiding-place was revealed to Smith by an angel. The name given to it was evidently owing to the important part which Spaulding had assigned to Mormon and his son Moroni in his novel; but Smith and his coadjutors, instead of confining themselves to the original manuscript, had clumsily engrafted upon it a number of maxims, prophecies, etc., evidently garbled from the sacred volume, and interpolated in such a manner as to involve anachronisms and contradictions. The doctrine of the Mormons is a mixture of materialism and millenarianism, and their most distinctive feature, polygamy, which, though originally condemned in the Book of Mormon, was introduced under a theory of "spiritual wives," and a mysterious system of unrestricted marriage called "sealing." The Mormons first appeared at Manchester, New York, whence they were compelled by the persevering hostility of their neighbors to flee, first to Kirtland in Ohio (1831), then to Nauvoo, the "City of Beauty," in Illinois (1838), and finally to the Salt Lake in Utah (1848). In 1844 the founder, Joseph Smith, was shot by a mob in Carthage prison, where his lawless behavior had brought him. The advance made by Mormonism seems to have been due far more to the abilities of Brigham Young, the successor of Smith, than to the founder himself, who was little better than a dissipated and immoral scamp. Under Young's direction large tracts of land at Salt Lake were brought under cultivation, an emigration fund was established, and a skilful system of propagandism set on foot, by which large numbers of converts were brought from Europe, especially from Great Britain. A state was organized under the name of Deseret. Congress refused to recognize it, but erected Utah into a territory, and Brigham Young was appointed governor of it. He was soon removed by the United States authorities, but after a time the Mormons were left pretty much to themselves. In 1870 congress passed a bill to compel them to renounce polygamy, or quit the United States. A prosecution was instituted against Brigham Young, who was sentenced to fine and imprisonment. In 1877 Young died and was succeeded by John Taylor, an Englishman, who in turn was succeeded as president by Wilford Woodruff in 1887. In 1890 he proclaimed that polygamy is no longer taught as a doctrine of Mormonism.

MORNING-GLORY, a name given to several climbing plants of the convolvulus family, having handsome purple or white, sometimes pink or pale blue, funnel-shaped flowers.

MORNING-STAR, the planet Venus when it rises before the sun.

MOROCCO, or **MAROCCO,** an empire or sultanate occupying the northwest extremity of Africa, bounded by the Atlantic ocean, the Mediterranean, Algeria and the desert; area, about 300,000 sq. miles. Its most remarkable natural feature is Mount Atlas, the great chain or series of chains extending through it from northeast to southwest, and reaching a height of 12,000 to 15,000 feet. The minerals include gold, silver, copper, iron, and lead in larger or smaller quantities. The flora includes the esculent oak and cork oak; in the higher regions of the Atlas the cedar and Aleppo pine; the date-palm and the dwarf-palm east and south of the Atlas. Agriculture is in the lowest possible condition, and the annual production is calculated barely to supply the wants of the country. The cereal crops include wheat, barley, and maize; but dhurra or millet constitutes the chief support of the population. The vine is cultivated only near towns for the sake of the fresh grapes and for the raisins. All the fruits of the south of Europe are cultivated to some extent. Among the wild animals are the lion, panther, jackal, hyena, wild boar, gazelle, and several species of large antelope. The locust is a cause of much devastation. The ostrich is found on the southern frontiers. Cattle and sheep are reared and the spirited small horses for which the country was once famous are still numerous. There are large numbers of goats, which furnish a principal article of export—the well-known Morocco leather. Fez makes and exports the cloth caps which bear its name. Carpets, embroidered stuffs, pottery, arms are also made. The civilization of Morocco has sunk to a low condition. The education at the schools and at the University of Fez does not go beyond the theology of the Koran. The public libraries, once famous, are now dispersed. Morality is represented as being in a deplorable state. The sovereign or sultan, styled by Europeans emperor, is absolute in the strictest sense. Morocco in ancient times formed part of Mauritania, and about 43 A.D. was incorporated in the Roman Empire. In the latter part of the 7th century the Arabs spread over North Africa, and took possession of Mauritania. Among ruling dynasties since then have been the Almoravides, Almohades, and others. The present dynasty, the ninth, was founded in 1648. In 1814 the slavery of Christians was abolished, and piracy was prohibited in 1817. The conquest of Algeria brought about com-

plications with France, and the plundering of vessels by pirates has often caused troubles with European powers. In 1859 a war broke out with Spain, owing to attacks made by some of the wild tribes upon the Spanish territory, and resulted in a cession of land and an indemnity of $20,000,000 to Spain. The population is estimated at from 6,000,000 to 6,500,000.

MOROCCO, the capital (conjunctly with Fez) of Morocco, lies in the southwest of the country, on an extensive and fertile plain, 1500 feet above sea-level. Pop. estimated at 40,000 to 50,000.

MOROCCO, a fine kind of leather made from the skins of goats, imported from the Levant, Barbary, Spain, Belgium, etc., tanned with sumach, dyed, and grained, the last process being that which gives it its well-known wrinkled appearance. It is extensively used in the binding of books, upholstering furniture, making ladies' shoes, etc. Imitation moroccos are made from sheep-skins, so perfect in appearance that it is difficult to distinguish them, but they are entirely lacking in the durability of the real article.

MOR'PHIA, MORPHINE, the narcotic principle of opium, a vegetable alkaloid of a bitter taste, first separated from opium in 1816. It forms when crystallized from alcohol brilliant colorless prisms of adamantine luster. As it is very slightly soluble in water, it is never used alone medicinally, but it readily combines with acids forming salts extensively used in medicine. In small doses it is powerfully anodyne; in large does it causes death, with narcotic symptoms. It is very commonly administered medicinally by subcutaneous or hypodermic injection, and the practice of injecting morphia has become a not infrequent vice, leading to a diseased mental state known as morphinomania.

MORPHOLOGY, a branch both of zoology and botany which deals with the structure and form of animals and plants respectively, and their different organs, from those of the lowest to those of the highest type. In morphology questions of homology and analogy are of the greatest importance, and morphology may be said to lie at the foundation of all true systems of classification and arrangement.

MOR'RILL, Justin Smith, American legislator and political leader, was born in Strafford, Vt., in 1810. He was elected to congress in 1854, was five times re-elected, was transferred to the senate in 1867, and retained his seat continuously until his death, having at that time served for a longer consecutive period than any other man. In 1857 he introduced a bill for the establishment, through the aid of public land grants, of state colleges for the purpose of teaching agriculture and the mechanic arts. This bill was vetoed by President Buchanan. In 1861 it was again introduced by Morrill, and this time became a law through the signature of President Lincoln. Morrill framed and introduced in the House the famous Morrill Tariff Act of 1861, which, with the enactments of 1862 and 1864, in the passage of which he also took a prominent part, modified the tariff system of the United States. He died in 1898.

MORRILL, Lot Myrick, American legislator and cabinet officer, was born at Belgrade, Maine, in 1813. In 1853 and 1854 he was elected to the lower house of the state legislature, and in 1856 was elected to the state senate. He was elected governor in 1857, and was re-elected in 1858 and 1859. In 1861 he was chosen United States senator and re-elected in 1863 and 1869. In 1876 he resigned to enter the cabinet of President Grant as secretary of the treasury. This portfolio he held until after the inauguration of President Hayes, when he became collector of customs at Portland, Maine. He died in 1883.

MORRIS, Clara, American actress and author, was born in Toronto, Can., in 1849. She was reared in Cleveland, Ohio, where at the Academy of Music she became a member of the ballet and leading actress. In 1872 she made a sensation in L'Article 47. Among her great successes are Alixe, Camille and Miss Multon. Her best known works are Little Jim Crow and other stories for children, My Personal Experiences and Recollections, and A Pasteboard Crown.

MORRIS, George Pope, American journalist and poet, was born in Philadelphia in 1802. His drama Briarcliff (1825) was a popular success. He is best known by his poems: Woodman, Spare That Tree, My Mother's Bible, We Were Boys Together, and A Long Time Ago. He died in 1864.

MORRIS, Gouverneur, American statesman, was born at Morrisania, N. Y., in 1752. He was admitted to the bar in 1771. In 1775 he was chosen to represent Westchester county in the first Provincial Congress of New York. He served in two succeeding congresses in the same and the following year. In 1777, as assistant superintendent of finance, a position he held from 1781 to 1785, he drew up a scheme for a system of coinage that ultimately became the basis of our present system. He represented Pennsylvania in the constitutional convention of 1787 at Philadelphia. In 1790 he went to London as private agent to the British government to conduct negotiations regarding the unfilled stipulations of the treaty of 1783. In 1792 he was appointed minister to France. In 1800 he was elected from New York to the United States senate. He died in 1816.

MORRIS, Lewis, English poet, born near Caermarthen, Wales, 1834. His poems have been widely popular, many of them running through numerous editions; they include Songs of Two Worlds, Epic of Hades, Gwen, Ode of Life, Songs Unsung, Gycia, Songs of Britain, etc. His Jubilee Ode was recognized by a silver medal from her Majesty. He was knighted in 1895.

MORRIS, Robert, American financier and one of the signers of the Declaration of Independence, was born at Liverpool, England, in 1734. At the age of fourteen he was sent to America and by the outbreak of the revolutionary war had acquired a large fortune. In June, 1775, he became a member of the Pennsylvania committee of safety; in October of the same year he was elected to a seat in legislature of Pennsylvania (to which he was re-elected in 1776), and in November he was appointed by that body a delegate to the Continental congress. At the expiration of his term in congress, in 1778, he was elected again to the state legislature. In October, 1780, he was returned to the legislature for the fourth time.

The fortunes of the colonial army at this time had reached their lowest ebb; Charleston had fallen; Gates was defeated; ammunition and supplies were wanted, the continental currency was worth little more than waste paper, together with Arnold's treachery, made

Rob Morris

the situation one of despair. Congress in this situation decided to supersede the old treasury board by a superintendent of finance. Morris was chosen to the position February 20, 1781. The means which enabled Washington and Greene to carry out the campaign of 1781 were raised by his exertions. In 1781, with the approval of congress, he founded the Bank of North America. He continued to hold the office of superintendent of finance until November, 1784, when he resigned. In 1786 he was again elected to the legislature, and in 1787 became a member of the constitutional convention at Philadelphia. He nominated Washington for the presidency of the convention. Upon the organization of the new government President Washington offered him the position of secretary of the treasury. He declined the offer. He, however, accepted a seat in the United States senate where he served until 1795. He died in 1806.

MORRIS, William, English poet, born in 1834. His poems include The Life and Death of Jason, 1867; The Earthly Paradise, 1868–70; Love is Enough, 1873; Sigurd the Volsung, 1877, etc. He translated various Scandinavian works, also Virgil's Æneid and Homer's Odyssey into English verse, and published romantic tales, lectures on art, etc. He was a leader of the socialistic movement in Britain. He died in 1896.

MORRIS-DANCE, a dance supposed to have been derived from the Moriscos in Spain, formerly danced at puppet-shows, May-games, etc., in England. Bells were fastened to the feet of the performers, which jingled in time with the music, while the dancers clashed their staves or swords. In the reigns of Henry VII. and VIII. it was a principal feature in the popular festivals.

MORRISON, William Ralls, American politician was born in Monroe co., Illinois, in 1825. He took part in most of

the battles in Taylor's campaign in the Mexican war. From 1855 to 1859 he was a democratic member of the lower house of the Illinois legislature, serving as speaker in the last year. At the outbreak of the civil war he became colonel of the forty-ninth Illinois infantry. In 1863, he resigned to take his seat as a democrat in the thirty-eighth congress. From 1863–65 and from 1873–87 he was a member of the National House of Representatives. During his congressional career he attained wide distinction as an advocate of a radical reduction in the tariff. The bill of 1884, embodying the famous "horizontal" tariff scheme, proposed a straight (or horizontal) reduction of 20 per cent from the tariff of 1883. In 1885 Morrison was defeated for election to the United States senate by John A. Logan. He was appointed by President Cleveland a member of the Interstate Commerce Commission in 1887, and served until 1897, for the last six years as chairman.

MORRISTOWN, the capital of Morris co., N. J., on the Del. Lack. and West. Railroad; 30 miles W. of New York City. The city is in the great Morris county peach and rose belt, has an elevation of nearly 700 feet above sea-level. At Morris Plains, 4 miles from the city, is the New Jersey state lunatic asylum, the largest institution of its kind in the United States. Pop. 13,247.

MORSE, Samuel Finley Breese, inventor of the electro-magnet telegraph in its first practicable form; born at Charlestown, Mass., 1791; died at New York, 1872. He devoted special attention to chemistry and natural philosophy; but in 1811 went to England to study painting under West. In 1813 he was awarded a gold medal of the Royal

Samuel Morse.

Academy for his model of the Dying Hercules. Returning to the United States in 1815, he continued painting, and in 1826 succeeded in establishing the "National Academy of Design," of which he was first president. In 1839 he went to Europe for three years, and during the return voyage worked out roughly a plan for employing electro-magnetism in telegraphy. It was not until 1835, however, that he was able to exhibit an instrument that was found to work well. By July, 1837, this instrument was perfected, and ultimately in 1843 congress granted him means to construct an experimental line between Washington and Baltimore. From that time Morse's instrument came into general use in America and Europe. In 1857 the representatives of ten countries met at Paris, and voted him 400,000 francs.

MORSE'S TELEGRAPH. See Telegraph.

MORTALITY, Law of, the statement of the average proportion of the number of persons who die in any assigned period of life or interval of age, out of a given number who enter upon the same interval, and consequently the proportion of those who survive. Tables showing how many out of a certain number of infants, or persons of a given age, will die successively in each year till the whole become extinct, are generally called tables of mortality. See Insurance.

MORTAR, a mixture of sand with slaked lime and water, used as a cement for uniting stones and bricks in walls. The proportions vary from 1½ part of sand and 1 part of lime to 4 or 5 parts sand and 1 of lime. When exposed to the action of the air this mixture absorbs carbon dioxide and "sets," forming a hard, compact mass. Hydraulic mortars which harden under water, and are used for piers, submerged walls, etc., are formed from so-called hydraulic lime, containing considerable portions of silica and alumina. See also Cement.

MORTAR is a kind of short cannon, of a large bore, with a chamber, used especially for throwing shells. The fire from mortars is what is termed vertical fire, the mortar being directed at a high angle and the shell striking the ground nearly vertically. The principal recommendations of vertical fire are, that the shells search behind cover and produce a great moral effect, also that at high elevations a great range is obtained with a comparatively small charge of powder.

MORT'GAGE, in law, is the temporary pledging of realty in security of a debt, and as the realty can not be delivered into the creditor's hand, he acquires a hold over it by a deed called an indenture, or deed of mortgage. The ordinary form of a mortgage-deed resembles an absolute conveyance, but it contains a proviso that if the money borrowed is repaid within a certain time, then the mortgagee shall reconvey the realty to the mortgagor or borrower. Mortgage deeds must be recorded. A mortgagee can assign his mortgage security to another person, who thereupon stands in his shoes. The laws of each state in the Union have their own peculiarities as to mortgages, so that the legal status of the subject can only be obtained by consulting the various codes.

MORTIFICATION, in medicine, is the death of a part of the body while the rest continues alive, and often in a sound state. Mortification is a popular term, the scientific term being gangrene or necrosis, the former usually applied to the death of soft parts, the latter to the death of the bone. Mortification is generally induced by inflammation, by exposure to freezing cold, by hospital fevers, by languid, or impeded, or stopped circulation, as in cases of bedridden or palsied persons, and by improper food, particularly the spurred rye.

MORTON, Julius Sterling, American political leader, was born in Adams, Jefferson co., N. Y., in 1832, and was taken by his parents in 1834 to Michigan. In 1855 he removed to Nebraska, where he founded the City News, the first newspaper published in the state. In 1856–7 he was elected to the Nebraska territorial legislature, and in 1858 was appointed by President Buchanan secretary of the territory, and became acting governor a few months later. In 1893 he entered the cabinet of President Cleveland as secretary of agriculture. In 1901 he was appointed by President McKinley one of the United States commissioners for the Louisiana Purchase exposition. He was a student of forestry and was the originator of Arbor Day in Nebraska, the observance of which has extended to many other states. He died in 1902.

MORTON, Levi Parsons, American banker and vice-president of the United States, was born at Shoreham, Vt., in 1824. In 1863 he founded the banking-house of Levi P. Morton & Co., later Morton, Bliss & Co. In 1878 Morton was elected to congress. From the completion of his term until 1885 he was United States minister to France. In 1888 he was the successful candidate for vice-president on the republican ticket. From 1894 until 1896 he was governor of New York.

MORTON, Oliver Perry, American political leader, best known as the "War Governor" of Indiana; was born in Salisbury, Wayne co., Ind., in 1823. He entered politics as a democrat, but opposition to the Kansas-Nebraska bill led him to withdraw from that party, and ultimately he assisted in the formation of the republican party, to whose first national convention he was a delegate. In 1860 he was elected lieutenant-governor, and upon the governor's election as United States senator, Morton became governor, January 16, 1861. Upon the outbreak of the civil war he threw himself with extraordinary energy into the work of raising troops. He was re-elected governor in 1864. In 1867 he was elected United States senator, and was re-elected in 1873. At the republican national convention in 1876 he was a strong candidate for the presidential nomination, and received 124 votes on the first ballot. He subsequently served on the electoral commission. He died in 1877.

MORTON, William Thomas Green, American dentist, was born at Charlton, Mass., in 1819. In 1840 he began the study of dentistry at the Baltimore College of Dental Surgery. In 1844 Morton began with Dr. Jackson of Boston, the study of medicine. The art of dentistry was at that time in a transition stage, and Morton discovered many improvements, especially in attaching false teeth. In the course of his investigations he became acquainted with the value of sulphuric ether as a local anæsthetic. The new form of narcosis was christened "anæsthesia," and Morton obtained a patent for the use of ether. Jackson also claimed the honor of having made the discovery, and the Montyon prize of the French Academy was equally awarded to Dr. Morton and to Dr. Jackson, but Dr. Morton declined to accept it, which resulted in his receiv-

ing in 1852 the large gold medal, the Montyon prize in medicine and surgery. He died in 1868.

MOSAIC, a term applied to a kind of inlaid work formed by an assemblage of little pieces of enamel, glass, marble, precious stones, etc., of various colors, cut, and disposed on a ground of cement in such a manner as to form designs, and to imitate the colors and gradations of painting. This kind of work was used in ancient times both for pavements and wall decoration, while in modern times paintings are by this means copied, and the art is also used in pavements, jewelry, etc. The most remarkable modern works of this kind have been executed by Roman, Venetian, and Russian artists, those of the Roman school being the most celebrated, and consisting in particular of a series of portraits of the popes, and copies of notable paintings by the great artists, such as Raffaele, Domenichino, Guido, etc. For the production of these works rods of opaque colored glass are employed, an immense variety of colors and shades being used. Pieces are cut from the ends of these rods, according to the color required and are arranged side by side, their lower ends being attached by the cement while their upper ends show the design. From such works, when on a small scale, sections may be cut across, each section exhibiting the pattern.

MOSAIC GOLD, an alloy of copper and zinc, called also ormolu; also a sulphide of tin, the aurum musivum of the ancients.

MOSAIC WOOL-WORK, rugs, etc., made of variously-colored woolen threads, arranged so that the ends show a pattern. The threads are held firmly in a frame, so as to form a dense mass, with the upper ends of the threads presenting a close surface; this surface is smeared with a cement, and has a backing of canvas attached, after which a transverse section is cut the desired thickness of the pile, and so on with a number of similar sections.

MOSASAURUS, a gigantic extinct marine lizard occurring in the calcareous freestone which forms the most recent

Skull of Mosasaurus.

deposit of the Cretaceous formation. This reptile was about 25 feet long, and furnished with a tail of such construction as must have rendered it a powerful oar.

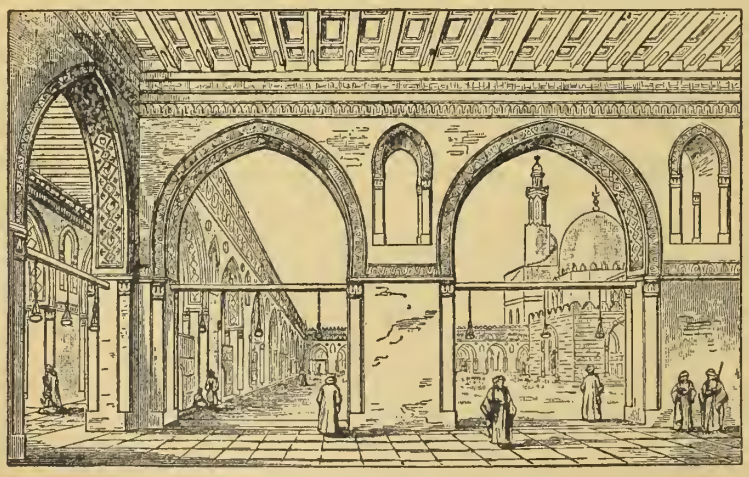
MOSBY (mōz'bĭ,) John Singleton, American soldier, was born at Edgemont, Powhatan co., Va., in 1833. After serving under Johnston in the Shenandoah Valley, in the winter of 1861–62, he was appointed an independent scout, and guided a bold raid in the rear of McClellan's army on the Chickahominy in June, 1862. In 1863 Mosby recruited an independent body of cavalry and began his remarkable career as a "partisan" leader of an irregular force known as rangers, with which, until the close of hostilities, he operated in Virginia and Maryland. In August, 1864, he captured Sheridan's entire supply train, which he surprised near Berryville. In December, 1864, he was promoted to be colonel. After being disabled for a short time by a wound, he continued his operations until Lee's surrender, when he disbanded his troops, gave himself up, and by General Grant's intercession was paroled. From 1878 to 1885 he was United States consul at Hong Kong.

MOS'COW, the second capital (formerly the only capital) of the Russian Empire. It is the chief town of the government of the same name, and is situated in a highly-cultivated district on the Moskwa, 400 miles southeast of St. Petersburg, with which it is in direct communication by rail. It is surrounded by a wall or earthern rampart 26 miles in circuit and of no defensive value; and a considerable portion of the inclosed space is unoccupied by buildings. The quarter known as the Kreml or Kremlin, on a height about 100 feet above the river, forms the center of the town, and contains the principal buildings. It is inclosed by a high stone wall, and contains the old palace of the czars and several other palaces; the cathedral of the Assumption, founded in 1326, rebuilt in 1472; the church of the Annunciation, in which the emperors are crowned; the cathedral of St. Michael; the Palace of Arms, an immense building occupied by the senate, the treasury, and the arsenal; and the Tower of Ivan Veliki (209 feet), surmounted by a gilded dome, and having at its foot the great Czar Kolokol, or king of bells, 60 feet round the rim, 19 feet high, and weighing upward of 192 tons, the largest in the world. Outside the Kreml the chief building is the cathedral of St. Vassili, with no less than twenty gilded and painted domes and towers, all of different shapes and sizes. Among the principal educational establishments are the Imperial University, founded in 1755 by the Empress Catharine. It has a rich museum and a library of 200,000 volumes, and is the most important of the Russian universities. Moscow is the first manufacturing city in the empire, and of late years its industrial and commercial activity has greatly increased. The principal manufactures are textile fabrics, chiefly woolen, cotton, and silk, besides hats, hardware, leather, chemical products, beer, and spirits. From its central position Moscow is the great entrepot for the internal commerce of the empire. The foundation of the city dates from 1147. It became the capital of Muscovy, and afterward of the whole Russian Empire; but was deprived of this honor in 1703, when St. Petersburg was founded. The principal event in the history of Moscow is the burning of it in 1812 for the purpose of dislodging the French from their winter quarters. Pop. (1897), 1,035,664.—The government forms an undulating tract of about 13,000 sq. miles, and the soil is mostly productive, the forests occupying about 39 per cent. Pop. 2,433,356.

Moscow—general view of the Kremlin.

MOSES, leader, prophet, and legislator of the Israelites, was born in Egypt about 1600 B.C., during the time of the oppression of the Hebrews. His father, Amram, and mother, Jochebed, both of the race of Levi, where obliged to expose him in obedience to a royal edict, but placed him in a basket of bulrushes on the river border, where he was found by the daughter of the Egyptian king as she went to bathe. She adopted him as her son, and in all probability had him educated for the duties of the priesthood, the means of instruction thus afforded him being the best which his time possessed. His expedition into Ethiopia, in his fortieth year, as leader of the Egyptians, when he subdued the city of Saba (Meroe), won the affections of the conquered Princess Tharbis, and married her, rests only on the tradition preserved by Josephus. An outrage committed by an Egyptian on a Hebrew excited his anger, and he secretly slew the Egyptian. The deed became known, and he escaped the vengeance of the king only by a hasty flight into Arabia. Here he took refuge with Jethro, a Midianitish prince and a priest, and

espoused his daughter Zipporah. The promises of God that his race would become a great nation occupied much of his thoughts, and at last God appointed him the chosen deliverer from the bondage of Egypt. Being slow of speech, and possessing none of the arts of an orator, God therefore gave him power to prove his mission by miracles, and joined to him his elder brother Aaron, a man of little energy, but of considerable eloquence. Thus prepared, Moses returned to Egypt at the age of eighty years to undertake the work. At first he had the greatest obstacles to overcome, but after the visitation of ten destructive plagues upon the land, Pharaoh suffered the Hebrews to depart. Moses conveyed them safely through the Red Sea, in which Pharaoh, who pursued them, was drowned with his army. New difficulties arose, however. The distress of the people in the desert, the conflicts with hostile races, the jealousies of the elders, often endangered his authority and even his life, despite the miraculous attestations of his mission. During the term of the encampment at Sinai he received the Ten Commandments and the laws for the regulation of the lives of the Israelites. When they were already near the end of their journey toward Canaan Moses saw himself compelled, in consequence of new evidences of discontent, to lead them back into the desert, for forty years more of toilsome wandering. He was not himself permitted, however, to see the Israelites settled in their new country on account of a murmur which, in the midst of his distresses, he allowed to escape against his God. After appointing Joshua to be the leader of the Hebrews he ascended a mountain beyond Jordan, from which he surveyed the land of promise, and so ended his life in his 120th year.



Court of the mosque of Tooloon, Cairo.

MOSLEM, a general appellation in European languages for all who profess Mohammedanism.

MOSQUE, a Mohammedan church or house of prayer. These buildings are constructed in the Saracenic style of architecture, and often astonish by their extent and the grandeur and height of their cupolas or domes. In these Mohammedan places of worship we find neither altars, paintings, nor images, but a great quantity of lamps of various kinds, arabesques which form the principal interior ornament, and sentences from the Koran written on the walls. Every mosque has its minaret or minarets. The buildings are often quadrangular in plan, with an open interior court, where are fountains for ablutions. The floor is generally covered with carpets, but there are no seats. In the direction toward Mecca is the mihrab, a recess in the wall to direct the worshippers where to turn their eyes in prayer, and near this is the mimbar or pulpit. The buildings may embrace accommodation for educational purposes, etc., besides the temple proper.

MOSQUITO (mos-kē'tō), a general name for such insects of the gnat family as inflict a severe bite and make themselves a pest to people residing in warm climates, or during the warm season in many arctic regions.

MOSQUITO TERRITORY, a region of Central America, lying on the Caribbean Sea, and forming the eastern seaboard of Nicaragua. For a considerable period it was governed by a native chief, and was under British protection, but in 1860 it was made over to the state of Nicaragua. The capital is called Bluefields.

MOSS-AGATE. See Mocha-stone.

MOSSES, a group of cryptogamic or flowerless plants of considerable extent, and of great interest on account of their very singular structure. They are in all cases of small size, seldom reaching a foot in height, but having a distinct axis of vegetation, or stem covered with leaves; and are propagated by means of reproductive apparatus of a peculiar nature. They are formed entirely of cellular tissue, which in the stem is lengthened into tubes. Their reproductive organs are of two kinds—axillar cylindrical or fusiform bodies, containing minute roundish particles; and thecæ or capsules, supported upon a stalk or seta, covered with a calyptra, closed by an operculum or lid, within which is a peristome composed of slender processes named teeth, and having a central axis or columella, the space between which and the walls of the theca is filled with minute sporules. Mosses are found in cool, airy, and moist situations in woods, upon the trunks of trees, on old walls, on the roofs of houses, etc. The genera of mosses, which are numerous, are principally characterized by peculiarities in the peristome, or by modifications of the calyptra, and of the position of the urn, or hollow in which the spores are lodged.

MOTH, the popular name of a numerous and beautiful division of lepidopterous insects, readily distinguished from butterflies by their antennæ tapering to a point instead of terminating in a knob, by their wings being horizontal when resting, and by their being seldom seen on the wing except in the evening or at night (though some moths fly by day); hence the term crepuscular and nocturnal lepidoptera applied to them. Among the more notable of the moths are the "feather" or "plume-moths," the "death's-head moth," the "clothes-moths," and the "silk-moth."

Caterpillar, chrysalis, and butterfly, male and female, of the gypsy moth.

Tiger moth.

MOTHER CAREY'S CHICKEN, the sailors' name for the stormy petrel. See Petrel.

MOTHER-OF-PEARL, or **NACRE,** the hard silvery brilliant internal or nacreous layer of several kinds of shells, particularly of the oyster family, often variegated with changing purple and azure colors. It is destitute of coloring matter, but is composed of a series of minute and slightly imbricated layers or ridges which have the power of decomposing the rays of light, thus producing beautiful iridescent hues. The large oysters of the tropical seas alone secrete this coat of sufficient thickness to render their shells available for the purposes of manufacture. Mother-of-pearl is extensively used in the arts, particularly in inlaid work, and in the manufacture of handles for knives, buttons, toys, snuff-boxes, etc.

MOTION, in physical science, is the passing of a given body from one place

to another. We have no idea of absolute position in space, so that when we speak of the motion of a point it is only in relation to some point regarded as fixed. Thus our conception of the movement of the earth is derived from its relation in position to the sun and stars Bodies move in various directions, their motion being described as rectilinear when they move in a straight line, curvilinear when they move in a curve, vibratory when they move to and fro in relation to a fixed point, rotatory when they turn on an axis, and circular when they sweep round a given point. For Newton's laws of motion see Dynamics.

MOTLEY, John Lothrop, historian and diplomatist, born in Massachusetts 1814, died 1877. He published, after ten years' labor and a journey to Europe his great History of the Rise of the Dutch Republic in 1856, a work which was further developed in the History of the United Netherlands (1860–65); and the Life and Death of John Barneveld (1874) He was ambassador from the United States to Vienna in 1861–67, and to London in 1869–70.

MOTOR NERVES. See Nerve.

MOTT, Lucretia (Coffin), American abolitionist and woman's rights advocate, was born on Nantucket Island in 1793. As a resulst of a visit to Virginia she became an ardent advocate of emancipation. In 1833 she attended the first convention of the American Anti-Slavery Society. Soon afterward she helped to organize the Female Anti-Slavery Society. In 1840, in London, the question of the equal participation of women in the proceedings of the Anti-Slavery Convention came up, and all women were excluded. It was then that Lucretia Mott and Elizabeth Cady Stanton first discussed the woman's rights movement, which they launched eight years later at a convention in Seneca Falls, N. Y. She died in 1880.

MOUKDEN. See Mukden.

MOULDINGS, in architecture a general term applied to the varieties of outline or contour given to the surfaces or edges of various subordinate parts or features of buildings, whether projections or cavities, such as cornices, bases, door or window jams, lintels, etc.

MOULMEIN (moul-mīn'), or **MAULMAIN,** a seaport of Burmah, division of Tenasserim, at the mouth of the river Salween. It has a good harbor, and a considerable trade chiefly in teak, cotton, rice, tobacco, stick-lac, lead, copper, cocoa-nuts, hides and live stock. Pop. 58,446.

MOULT, the process of shedding or casting feathers, hair, skin, horns, etc. The word is most commonly used with regard to birds; but other animals, such as crabs and lobsters, which shed their entire shells, frogs and serpents, which cast their skins, are also said to moult.

MOUND BUILDERS, the name given to the people who at one time lived in the artificial hillocks or mounds which existed in the valleys of the Mississippi, the Ohio, the Missouri and their tributaries, also in Michigan, Wisconsin, Pennsylvania, Iowa, Nebraska, Kentucky, Louisiana, and Arkansas, and the Red River valleys, and in certain parts of North Carolina and Indiana. The new state of Washington is dotted over with these mounds, having an arrangement like that on a five-spot playing card. The mounds are artificial hillocks of earth or sand—sometimes round, oval, square, and in some cases polygonal or triangular, varying in height from a few inches to 100 feet, and in diameter from 100 to 300 yards. The most important mound still in existence is that of Cahokia in Illinois. This mound

rises in the midst of about 60 others in four successive terraces, reaching an elevation of 91 feet. It covers a surface of 12 acres, being almost equal to the great pyramid of Cheops. The mound-builders' are now regarded merely as the ancestors and representatives of the tribes found in the same region by Spanish, French, and English pioneers. The chief contents of the mounds are skeletons, with ceremonial and other objects buried with the bodies, while the structures are wholly of earth; in a few cases house-like structures form the nucleus of the mound.

MOUNTAIN, a mass of earth and rock rising above the surface of the globe higher than a hill. Mountains are usually found in groups, systems, ranges, or chains, though isolated mountains, due to volcanic action, are also found. The elevation of great mountain masses is due to gigantic subterranean movements long continued; but mountains of considerable mass have also been carved out by surface denudation. The highest mountain in the world is Mount Everest, one of the Himalayan range, which is 29,002 feet above the level of the sea.

MOUNTAIN LION, the name in the western part of the United States for the panther, cougar, or puma. Early writers upon America reported that the lion was a resident of North America from the skins they saw among the Indians, which they supposed to be those of lionesses. See Puma.

MOUNTAIN MEADOWS MASSACRE, the massacre near Mountain Meadows in Utah in 1857, of a party of emigrants passing through Utah on their way to Southern California. They numbered about 140 men, women, and children. Stopping to rest their horses, they were fired upon by Indians, and, it is alleged, by Mormons disguised. They withstood siege until September 11th, when, on promise of protection by John D. Lee, Mormon bishop and Indian agent, they left the shelter of their wagons. All adults and children over seven years of age were killed, and seventeen younger children were distributed among Mormon families, but were afterward restored to relatives by the United States government. Lee was executed for this crime in 1877.

MOUNT CARMEL, a town in Northumberland co., Pa.; on the Lehigh Val., the N. Cent., and the Phila. and Read. railways; 28 miles e. by s. of Sunbury, the county seat. It has a number of anthracite coal mines. Pop. 14,689.

MOUNT CLEMENS, the capital of Macomb co., Mich., on the Clinton river at the head of navigation, and on the Grand Trunk railway; 22 miles n.e. of Detroit. It is noted for its mineral and magnetic waters, said to have remarkable curative properties, which make the city a resort for thousands of invalids annually. Pop. 8,160.

MOUNT VERNON, a city in Westchester co., N. Y.; on the Bronx river, and the N. Y., N. H. and H. and the N. Y. C. and H. R. railways; 13 miles n. of New York. Pop. 21,975.

MOURNING, as the outward expression of grief, has greatly varied at different times and among different nations. Thus the eastern nations and the Greeks cut off their hair, while the Romans allowed the beard and hair to grow; and as an evidence of mourning the ancient Egyptians wore yellow; the Ethiopians, gray; the Roman and Spartan women, white, which is still the color of grief in China, Japan and Siam; in Turkey, blue and violet; and in the other European countries black is used for this purpose. The Jews, in sign of grief at the loss of their relatives, rent their garments, tore out their hair, and wore coarse garments of a dark color; and with the Greeks and Romans it was the custom to lay aside all ornaments of dress, to abstain from the bath, and other indulgences.

MOUSE, the name of a number of rodents of which the most familiar is the domestic mouse. The harvest-mouse, is a hybernating mammal, and constructs a little nest of grass, etc., entwined round

Mouse.

and supported by the stalks of the corn or wheat. The common field-mouse is a dusky brown, with a darker strip along the middle of the back, while the tail is of a white color beneath. There are about a hundred members of the mouse genus, of which the common rat is one. The dormouse is of a different family from the true mice.

MOUTH, the aperture in the head of an animal through which food is received and voice uttered; or generally the anterior opening of the alimentary canal. In the higher animals the use of the mouth is for mastication, the emission of sound or voice, deglutition, and taste. In many animals of a low type of structure there is no distinct mouth. Thus in the simpler Protozoa the food is taken into the interior of the body by a process of intussusception, any portion of the surface being chosen for this purpose, and acting as an extemporaneous mouth, which closes up again when the particle of food has been received into the body.

MOZAMBIQUE (mo-zam-bēk'), a Portuguese government on the east coast of South Africa, extending from Cape Delgado to Delagoa Bay, and inland to British territory (Rhodesia, Transvaal, etc.); estimated area, 380,000 sq. miles; only a small part of which is occupied. Pop. 8522.

MOZART (mo-zart'; German pron. mō'tsart), Johann Chrysostomus Wolfgang Amadeus, a great German composer, born at Salzburg 1756, died at Vienna 1791. At the age of four years his father, Leopold Mozart, a violinist of repute, began to teach him some minuets and other small pieces on the harpsichord. From this period he made rapid progress, and a concerto for the harpsichord, which he wrote in his fifth year, was so difficult that only the most practiced performer could play it. In his sixth year Mozart was taken by his father, along with his sister, to Munich and Vienna, where the little artists were received at court with great favor. In 1763 the family made a journey to Paris, where Mozart published his first sonatas for the harpsichord; and in the following year they proceeded to England, where the child-musician performed before the court the most difficult compositions of Bach and Handel. In 1769 Mozart, who had been made master of the concerts at the court orchestra at Salzburg, commenced a journey to Italy in company with his father. In Rome he wrote down, on hearing it, the famous Miserere, annually sung in the Sistine Chapel during the holy week. At Milan in 1770 he composed, in his fourteenth year, his first opera, Mithridates, which was performed more than twenty times in succession. Henceforth he resided chiefly in Salzburg, but also visited Paris, Munich, and finally Vienna. In the latter city, although he was appointed composer to the court, he found it necessary to maintain himself by giving lessons in music and writing waltzes. Notwithstanding this poverty it was here that most of his best work, such as his famous operas, The Marriage of Figaro, Clemency of Titus, The Magic Flute, and his last work, the Requiem, were written. It was here also that the best pianist and greatest composer of his time—perhaps of the world—died in obscurity and was buried in a pauper's grave. The extent of work done by Mozart during his short life is almost incredible, and in every department of composition, whether vocal or instrumental, he excelled. In the history of music he stands most prominently forward as an operatic composer, his Don Giovanni, Magic Flute, and Marriage of Figaro being works previously unequalled and never since surpassed.

MUCILAGE, a solution of some gummy substance in water, giving it a certain consistence; in chemistry, one of the proximate elements of vegetables, a carbohydrate. It is contained abundantly in gum tragacanth, many seeds, as linseed, quince seed, etc., and certain roots, as marsh-mallow. It forms a thick jelly with water, and when boiled with dilute sulphuric acid gives rise to a sugar and a gum.

MUCUS, a viscid fluid secreted by the mucous membrane of animals, which it serves to moisten and defend. It covers the lining membranes of all the cavities which open externally, such as those of the mouth, nose, lungs, intestinal canal, urinary passages, etc. It is transparent, glutinous, thready, and of a saline taste; it contains a great deal of water, chloride of potassium and sodium, lactate of sodium and of calcium; and phosphate of calcium. Mucus forms a layer of greater or less thickness on the surface of the mucous membranes, and it is renewed with more or less rapidity. Besides keeping these membranes in a moist and flexible condition, it also protects them against the action of the air, of the aliment, the different glandular fluids, and agencies that might otherwise irritate and inflame.

MUD, in geology, a mixture of clay and sand with organic matter. Mud may be argillaceous, calcareous, or otherwise, according to the most notable ingredient which enters into its composition.

MUD-BATH, a kind of bath connected with some mineral springs, consisting of mud transfused with saline or other ingredients, in which patients suffering from rheumatism, etc., plunge the whole or portions of the body.

MUEZ'ZIN, or **MUED'DIN,** a Mohammedan crier attached to a mosque, whose duty it is to proclaim the ezam or summons to prayer five times a day—at dawn, at noon, 4 p.m., sunset, and night fall. He makes his proclamation from the balcony of a minaret; and as this elevated position enables a person to see a good many of the private proceedings of the inmates of the neighboring houses, the post of meuzzin is often intrusted to a blind man.

MUFTI, in the Turkish Empire, a religious officer who exercises the functions of an authoritative judge in matters of religion. The muftis are chosen from among the ulemas or doctors of the law, and the grand mufti or Sheikh-ul-Islam is the highest officer of the church and the representative of the sultan in spiritual matters.

MUGWORT, a popular name for various species of artemisia.

MUGWUMP, a term originally applied to a voter identified with a particular party, but claiming the right to vote with another party. Its popular use began with an article in the New York Sun for March 23, 1884, and was in the same year applied to the independent republicans, who refused to support James G. Blaine for the presidency The name was applied to them in derision, but was accepted by them, and now regularly denotes any body of voters who profess to be independent of strict party obligations.

MUHLHAUSEN (mül'hou-zn), a town of Prussian Saxony, on the Unstrut, 29 miles northwest of Erfurt. It has two interesting churches, an old town-house, a gymnasium, and manufactures of woolen and cotton cloth, leather, sewing-machines, etc. It was formerly a free city of the empire. Pop. 33,433.

MUHLHAUSEN, or **MULHAUSEN,** a town of Germany, situated on the Ill, in Alsace-Lorraine, 61 miles s.s.w. of Strasburg. Pop. 89,012.

MUKDEN (muk'den), **MOUKDEN,** a town of China, capital of Manchuria and of the province of Leao-Tong, about 380 miles n.e. of Peking. Pop. about 250,000.

MULATTO, a person that is the offspring of parents of whom one is white and the other a negro. The mulatto is of a dark color tinged with yellow, with frizzled or woolly hair, and resembles the European more than the African.

MULBERRY, the black or common mulberry is the only species worthy of being cultivated as a fruit-tree. The fruit is used at dessert, and also preserved in the form of a syrup. The juice of the berries mixed with that of apples forms a beverage of a deep port-wine color, called mulberry cider. The white mulberry is the most interesting of the

Black mulberry.

genus, on account of its leaves being used for food by silkworms. It grows to the height of 40 or 50 feet, with a trunk 2 or more feet in diameter. The red mulberry has fruit of a deep-red color, and is a valuable American tree. The paper mulberry is a distinct genus, belonging originally to Japan, its bark is used in making paper, and its wood is highly valued for ornamental work.

MULE, the name applied to any animal produced by a mixture of different species, but specifically denoting the hybrid generated between an ass and a mare. The head of the mule is long and thin, its tail is bushy, and its mane short. It unites the speed of the horse with the dogged perseverence of the ass, and is docile in temper when fairly treated.

MULE, a spinning-machine invented by Samuel Crompton in 1775, and so called from being a combination of the drawing-rollers of Arkwright and the jenny of Hargreaves. In this machine the rovings are delivered from a series of sets of drawing-rollers to spindles placed on a carriage, which travels away from the rollers while the thread is being twisted, and returns toward the rollers while the thread is being wound.

MULLER (mül'ér), Friedrich Max, a celebrated philologist, was born at Dessau

in 1823; published (1844) the Hitopadesa, a collection of Sanskrit fables; proceeded then to Berlin, where he attended the lectures of Bopp and Schelling; continued his studies under Burnouf in Paris; came to England in 1846, and established himself at Oxford, where he was appointed successively Taylorian professor of modern languages (1854), assistant, and ultimately sub-librarian at the Bodleian library (1865), and professor of comparative philology (1868), a position which he practically resigned in 1875, but nominally held till his death in 1900. He was a member of the French Institute, and an LL.D. of Cambridge and Edinburgh. His numerous writings include an edition of the Rig-Veda, History of Sanskrit Literature, Lectures on the Science of Language, Chips from a German Workshop, On the Origin and Growth of Religion, Selected Essays, The Science of Thought, Biographies of Words, Natural Religion, and he was the editor of the series of Sacred Books of the East undertaken by the university.

MUL'HALL, Michael George, distinguished statistician, born in Dublin, Ireland, in 1836. In 1884 he was elected to the British Association for the advancement of science. His works include a Handbook of the River Plata; Rio Grande do Sul and Its German Colonies; The English in South America. In 1880 Mulhall brought out his Progress of the World in Arts, Agriculture, Commerce, Manufacture, Instruction, Railways, and Public Wealth, since the beginning of the nineteenth century. This was followed by other highly valued works on statistics: History of Prices; Industries and Wealth of Nations; and a Dictionary of Statistics. He died in 1900.

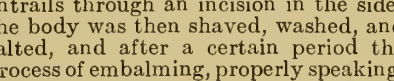
MULLET, a name common to two groups of fishes, viz. the gray mullets and the red mullets. Naturalists, however, generally restrict the name to the former, designating the red mullets as sur-mullets. Of the true mullets the best-known is the common gray mullet found round the shores of the British islands, and in particular abundance in the Mediterranean. It grows to the length of 18 to 20 inches, and will sometimes weigh from 12 to 15 lbs. It has the habit of rooting in mud or sand in search of food. Another species also called gray mullet a native of the Mediterranean, is distinguished by having its eyes half covered by an adipose membrane. It weighs usually from 10 to 12 lbs., and is the most delicate of all the mullets. A smaller species, the thick-lipped gray mullet, is common on the British coasts. Many other species, natives of India and Africa, are much esteemed as food.

MULOCK, Dinah Maria. See Craik.

MULTAN', or **MOOLTAN',** a city of India, in the Punjab, the chief city and capital of a district of same name. It is one of the most ancient cities in India, and is the center of a large trade. Pop. 87,394.—The district has an area of 6079 sq. miles; pop. 710,548.

MULTIPLE, in arithmetic a number which contains another an exact number of times without a remainder; as 12 is a multiple of 3, the latter being a submultiple or aliquot part. A common multiple of two or more numbers contains each of them a certain number of times exactly; thus 24 is a common multiple of 3 and 4. The least common multiple is the smallest number that will do this; thus 12 is the least common multiple of 3 and 4. The same term is applicable to algebraic quantities.

MUMMIES, dead human bodies embalmed and dried after the manner of those taken from Egyptian tombs. An immense number of mummies have been found in Egypt, consisting not only of human bodies, but of various animals, as bulls, apes, ibiscs, crocodiles, fish, etc. The proccsses for the preservation of the body were very various. Those of the poorer classes were merely dried by salt or natron, and wrapped up in coarse cloths and desposited in the catacombs. The bodies of the rich and the great underwent the most complicated operations, and were laboriously adorned with all kinds of ornaments. Embalmers



Mummy of Penamen, priest of Amun Ra—British museum.

of different ranks and duties extracted the brain through the nostrils, and the entrails through an incision in the side; the body was then shaved, washed, and salted, and after a certain period the process of embalming, properly speaking, began. The whole body was then steeped in balsam and wrapped up in linen bandages; each finger and toe was separately enveloped, or sometimes sheathed in a gold case, and the nails where often gilded. The bandages were then folded round each of the limbs, and finally round the whole body, to the number of fifteen to twenty thicknesses. The head was the object of particular attention; it was sometimes enveloped in several folds of fine muslin; the first was glued to the skin, and the others to the first; the whole was then coated with a fine plaster. The Persians, Assyrians, Hebrews, and Romans had all processes of embalming, though not so lasting as that of Egypt. The art also was practiced by the Guanches of the Canaries, the Mexicans, Peruvians, etc. Natural mummies are frequently found preserved by the dryness of the air.

MUMPS, a disease consisting in a peculiar and specific unsuppurative inflammation of the salivary glands, accompanied by swelling along the neck, extending from beneath the ear to the chin. Children are more subject to it than adults.

MUNCHHAUSEN (münh'hou-zn), Karl Friedrich Hieronymus, Baron von, a German officer, born in Hanover in 1720, died 1797. He served several campaigns against the Turks in the Russian service 1737–39. Baron Munchhausen's Narrative, a small book of 48 pages, appeared in London in 1785. Two years after it was translated into German by Bürger, who naturally passed in Germany for the writer. The real author was Rudolf Erich Raspe (1737–94), a native of Hanover who took refuge in England from a charge of theft. The book was afterward enlarged by additional stories, many of them very old.

MUNCIE, the capital of Delaware co., Ind., on the White river, and the Lake Erie and W., the Cleve., Cin., Chi. and St. L., and the Ft. W., Cin. and Louis. railways; 54 miles e. of Indianapolis, 110 miles n. w. of Cincinnati It is in the center of the great Indiana natural-gas belt, which gives the factories frec fucl. Pop. 22,132.

MUN'GOOSE, a species of ichneumon, otherwise known as the "gray" or "Indian" ichneumon. Being easily domesticated it is kept in many houses in Hindustan to rid them of reptiles and other vermin, as rats, mice, etc. It has been said that it neutralizes the poison of snakes, which it fearlessly attacks, by eating, during its contests with them, snake-root; but its immunity is really due to the extreme celerity of its movements. It is of a gray color flecked with black, and about the size of a rat.

MUNICH (mū'nik), the capital city of Bavaria. It lies on an extensive but uninteresting plateau, about 1700 feet above sea-level, chiefly on the left bank of the Isar. Munich is one of the finest towns in Germany. Vast improvements are due to the munificence of King Ludwig I. The royal palace forms a very extensive series of buildings chiefly in the Italian style, and contains many magnificent apartments and rich artistic and other treasures. Connected with it are the court church and the court and national theater, among the largest in Germany. The city is highly celebrated for its fine galleries of sculpture and painting, and for various other important collections, such as that of the Bavarian national museum. The royal library has upward of 1,000,000 volumes and 30,000 MSS., being thus one of the largest in Europe. The university is attended by some 3500 students, and has a library of 300,000 vols. There is an academy of science, an academy of arts, and many fine churches, including the cathedral, founded in 1488. Munich is the seat of the high courts of legislature and of law, and of all the more important offices of the state. It was founded by Henry, duke of Saxony, in 962; taken by Gustavus Adolphus in 1632, by the French under Moreau in 1800, and by Napoleon in October, 1805. Pop. 499,959.

MUNICIPALITY, a town or city possessed of certain privileges of local self-government, derived from incorporating charters granted by the state. Or the term may be applied to the corporation or body of persons in a town having the powers of managing its affairs.

MUNICIPAL OWNERSHIP, properly speaking the possession by a city or town of any property is municipal ownership; but the term is generally applied to public ownership and operation of public utilities, such as water works, gas and electric light plants. In England this is called municipal trading. Municipal ownership has become an issue in America during the last decade, advocacy or opposition to it being based largely upon the utility considered, with almost the unanimous agreement that services of a sanitary character, such as water works and sewerage, should be under municipal control. There is some divergence of opinion, however, as to

municipal lighting, and less than twenty-five gas works in the United States are operated by municipalities, while only one-sixth of the electric light plants are municipal, the largest of these being in Detroit and Chicago, and which are used only for lighting streets and public buildings. In Europe, private ownership of electric lighting plants is customary outside of the United Kingdom, in which the majority are municipal. The gas works in Germany and Great Britain are nearly evenly divided between municipal and private plants, with the tendency increasing toward the former.

All but eight of the thirty-eight cities of over 100,000 population in America own their water works, but of the water works in the United States nearly one-half are private works, most of these being in the smaller towns which have been unwilling to compete with private enterprise. Private companies supply the sewerage for all but six places where the population is 3,000 or over.

The theory on which the argument for municipal ownership is based is that undertakings which require the use of the streets or other public places, are natural monopolies, and that all natural monopolies should be vested in the city rather than in the private corporation, as their use is compulsory upon citizens. The advocates say there is greater need for public lighting in the large cities than there is for public water supply in some localities.

The arguments for municipal ownership of street railways is generally based upon the additional theory that means of transportation should belong to the city just as much as should the sidewalks upon which people travel. Even when there has been a public sentiment in favor of municipal operation of street railways, there has been an objection raised on the ground that the amount of money involved affords unusual opportunity for graft and also failing effective civil service reform employes would be used as a part of the political machine. These arguments have been the principal ones used in cities like Chicago, where the subject of municipal operation of street railways has been most agitated. Great Britain contains almost all the municipal street railway systems in the world, there being about forty in that country, the most notable being those in Manchester, Glasgow, and Sheffield. In other cities and in several places in Canada street railways are owned by the city and leased to operating companies.

One-eighth of the ferries in the United States are municipal, the Boston system being the most elaborate. Several cities own their docks, including New York, which receives a large income therefrom. There are municipal markets throughout the world, 150 being in the larger cities of the United States, the largest of which are those in New York, New Orleans, Boston, and Baltimore.

Under municipal ownership there is much difference of opinion as to whether revenue should be sacrificed to cheapness and efficiency of service. Varying policies in these respects are in force, the advocates of municipal ownership usually believing that cheapness is the prime requisite, while the opponents declare this of itself is an argument against the system, asserting it results in an increase of the general tax rate and a consequent shifting of the expense upon the large property holders.

MUNKACSY (mün'kâch-i), Mihaly, real name Michael Lieb, Hungarian genre and historical painter, born at Munkacs 1846; studied at Gyula, Vienna, Munich, and Düsseldorf, and settled in Paris in 1872. Among his best-known pictures are Last Day of a Condemned Man, Milton dictating Paradise Lost, Christ before Pilate, Last Moments of Mozart. He died in 1900.

MUNN, Orson Desaix, American lawyer and journalist, was born in Monson, Hampden co., Mass. In 1824 he bought with Alfred E. Beach the Scientific American; founded the Scientific American Supplement in 1876 and the Architects' and Builders' Edition in 1885.

MUNNICH, Burkhard Christoph Count, Russian statesman and general was born in 1683, and who, through brilliant military service, was made chief minister and became the most powerful man in Russia. Afterward falling from favor, he was exiled to Siberia for twenty years. His estates were finally restored to him and he was made director-general of the Baltic ports. He died in 1767.

MUNROE, Kirk, American journalist and author, was born in Appleton, Wis., in 1856. Wrote many books for boys. First editor of Harper's Young People. His works include: The Flamingo Feather, Under the Great Bear, Dory Mates, and the Belt of the Seven Totems.

MUNSEY, Frank Andrew, American publisher, was born in Albany, N. Y., in 1854. Established the Golden Argosy, afterward changed to The Argosy. Founded Munsey's Weekly, which was changed to Munsey's Magazine, The Puritan, and The Scrapbook. Controlled Washington Times, the New York Daily News, and the Boston Journal.

MUNSON, James Eugene, American inventor and author, was born in Paris, Oneida co., N. Y., in 1835. Originated the Munson system of stenography, an automatic typesetting machine, and a mechanism for operating typewriting machines by telegraph.

MUNSTER, the southwest province of Ireland comprising the six counties of Clare, Cork, Kerry, Limerick, Tipperary, and Waterford. Area, 9475 sq. miles. Pop. 1,076,188.

MUNSTER (mün'stèr), a town of Prussia, capital of the province of Westphalia. The principal edifices are the cathedral, the church of St. Lambert, the townhouse, the exchange, museum, theater, etc. The manufactures include woolen, linen, and cotton goods, etc. Pop. 68,562.

MUNSTER, Peace of. See Westphalia, Peace of.

MURAL CIRCLE, an astronomical instrument consisting of a telescope attached to a vertical brass circle which turns upon an axis passing through a stone pier. The brass circle revolves exactly in the plane of the meridian, and is carefully divided into degrees and minutes. Attached to the stone pier, and at equal distances apart are six microscopes for the purpose of viewing the graduated circle and determining exactly its position and consequently that of the telescope. It is regarded as the principal fixed instrument in all the great public observatories. Its chief use is to measure angular distances in the meridian, and so to determine the declination of a star, or its distance from the celestial equator. The right ascension of a star being given by the transit instrument, and its declination by this, its exact position is determined.

MURAT (mu-rä), Joachim, French marshal, and for some time King of Italy born in 1771, died 1815. He served in the constitutional guard of Louis XVI.; then entered the 12th Regiment of mounted chasseurs; rose by his zealous Jacobinism to the rank of lieutenant-colonel; was afterward removed as a terrorist, and remained without employment till his fate placed him in connection with Bonaparte, whom he followed to Italy and Egypt, becoming general of division in 1799. In 1800 he married Caroline, the youngest sister of Bonaparte. He was present at the Battle of Marengo, and in 1804 was made marshal of the empire, grand-admiral, and prince of the imperial house. His services in the campaign of 1805 against Austria, in which he entered Vienna at the head of the army, were rewarded in 1806 with the grand-duchy of Cleves and Berg. In the war of 1806 with Prussia, and of 1807 with Russia, he commanded the cavalry, and in 1808 he commanded the French army which occupied Madrid. He anticipated receiving the crown of Spain, Charles IV. having invested him with royal authority; but Napoleon, who destined Spain for his brother Joseph, placed him on the throne of Naples, July 15, 1808. He then took the title of Joachim Napoleon. He shared the reverses of the Russian campaign of 1812, and in 1813 again fought for Napoleon, whose cause he deserted after the battle of Leipzig. He took up arms again in 1815 for Napoleon; but being defeated by Generals Neipperg and Bianchi near Tolentino, 2d and 3d May, he was forced to leave Italy, and took refuge in Toulon. After the overthrow of Napoleon he escaped to Corsica, and set sail for the Neapolitan territory with a view to recover his kingdom. He landed at Pinzo on 8th October, but was immediately captured, tried by a court-martial, and shot.

MURCHISON (mèr'chi-sun), Sir Roderick Impey, Scottish geologist, born at Tarradale, in Ross-shire, 1792; died 1871. By a comparison of specimens of the rocks of Australia with the auriferous rocks of the Ural Mountains, which he had personally examined, he was led, so early as 1845, to predict that gold would be found there. He was one of the founders and most active members of the British Association for the Advancement of Science. He was several times elected president of the Royal Geographical Society. He was made K.C.B. in 1853, and a baronet in 1863. His chief works are Siluria, The Geology of Russia, and numerous contributions to the transactions of the learned societies. He endowed the chair of geology in Edinburgh university.

MURCIA (mur'thi-ä), a city of South-

ern Spain, capital of the ancient kingdom and modern province of same name. Pop. 111,539.—The province formed part of the ancient kingdom of Murcia; area, 5970 sq. miles; pop. 577,987.

MURDER, the act of unlawfully killing a human being with premeditated malice, the person committing the act being of sound mind and discretion, and the victim dying within a year and a day after the cause of death administered. In Britain it is the law that every person convicted of murder shall suffer death as a felon. In the United States of America the law recognizes degrees in murder, and in France and some other civilized nations "extenuating circumstances" are taken into consideration.

MURDOCH (mur'doh), William, an inventor, born near Auchinleck, Ayrshire, in 1754. At Redruth, in 1784, he constructed a model high-pressure engine to run on wheels, the precursor of the modern steam locomotive. In 1815 he introduced the hot-water apparatus which, with certain slight modifications, is now so extensively used for heating large buildings and conservatories. Various other inventions of his might be mentioned; but his work as a gas-inventor remains his most conspicuous achievement. In 1792 he first lighted his offices and cottage at Redruth with coal-gas, but it was not till 1798 that he constructed his first extensive apparatus at Birmingham for the making, storing, and purifying of gas, with a view to the supply of factories. Not long after this the offices at Soho were lighted with gas, and the new illuminant was brought prominently before public notice in 1802, when the exterior of the factory was lighted up in celebration of the Peace of Amiens. His great invention was never patented. He retired from business in 1830, and died in 1839.

MURGER (mur-zhār), Henri, born at Paris 1822, died 1861. He lived a life of extreme privation; formed an informal club or society of unconventional young artists and authors similarly situated which was named "Bohemia," and the associates "Bohemians"—a name famous in general literary history. He contributed a great mass of "copy" to numerous periodicals, and at last made a reputation by his Scènes de la Vie de Bohême. He also published two volumes of poetry, Ballades et Fantaisies, and Les Nuits d'Hiver; and wrote dramas for the Luxembourg theater, and tales, etc., for the Revue des Deux Mondes.

MURIATIC ACID, the older name of hydrochloric acid.

MURILLO (mụ-rēl'yō), Bartolomeo Esteban, the greatest of Spanish painters, was born at Seville in 1618. He received his first instructions in art from his relation Juan del Castillo. In 1642 he visited Madrid, and was aided by Velasquez, then painter to the king, who procured him permission to copy in the Royal Galleries. Murillo returned to Seville in 1645, where he commenced that great series of works which have now made his name so glorious. He married a lady of fortune in 1648, which much aided his personal influence, and he succeeded in establishing an academy of the arts at Seville in 1660, and acted as president the first year. He died at Seville 3d April, 1682, in consequence of a fall from a scaffolding at Cadiz, where he was engaged in the church of the Capuchins, painting a large altar-piece of St. Catharine. He obtained the

Murillo.

name of Painter of the Conception from his fondness for the subject of the Immaculate Conception. About 250 of his pictures are preserved in British and foreign galleries, and in Spanish churches.

MURPHY, Francis, an American temperance evangelist, born in 1836 in Wexford, Ireland. In 1870 he started temperance reform clubs. His headquarters were in Pittsburg, Pa., and 10,000,000 persons signed the pledge as a result of his ministrations in different parts of the United States. He labored also in England, and he acted as chaplain in the Spanish-American war.

MURRAIN, a name given in general to any widely prevailing and contagious disease among cattle, though in different localities it is also used as the name of some specific disease.

MURRAY, John, founder of the Universalist body in America, was born at Alton, England, in 1741. He preached his first sermon in America September 30, 1770, in an obscure place in New Jersey, called "Good Luck." He was prominent in the organization of a convention of his sect in 1785, and which took the name of Independent Christian Universalists. In 1793 he was installed pastor of a society of Universalists in Boston, where he remained till his death, September 3, 1815.

MURRAY, Lindley, grammarian, born in Pennsylvania, of Quaker parents, in

1745, died 1826. He wrote, besides his well-known English Grammar, several works on education and morals.

MURSHIDABAD', or **MOORSHEDABAD,** a city of India, Bengal. Pop. 28,553.—The district of Murshidabad has an area of 2144 sq. miles and a population of 1,335,374.

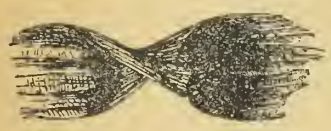
MUSCAT, or **MASKAT,** the chief city of the sultanate of Omán, or Muscat, a seaport on the Indian Ocean, near the east angle of Arabia. It is an important center of trade, exporting coffee, pearls, mother-of-pearl, dye-stuffs, drugs, etc., and importing rice, sugar, piece-goods, etc. Pop. of town and suburbs estimated at 60,000.

MUSCATEL', or **MUSCADEL,** a term for various sweet, strong, and fragrant wines.

MUS'CATINE, a town in Iowa, on the Mississippi, at the apex of what is called the Great Bend, and in connection with an extensive net-work of railways, 27 miles southeast of Iowa City. Pop. 16,170.

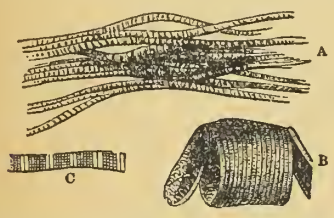
MUSCLE AND MUSCULAR MOTION, the name muscle is applied to those structural elements or organs in animals which are devoted to the production of movements either of a part of the body, or of the body as a whole. They consist of fibres or bundles of fibres, susceptible of contraction and relaxation, inclosed in a thin cellular membrane. Muscles are composed of fleshy and tendinous fibres, occasionally intermixed, but the tendinous fibres generally prevail at the extremities of the muscle, and the fleshy ones in the belly or middle part of it. When the fibres of a muscle are placed parallel to each other it is called a simple or rectilinear muscle; when they intersect and cross each other they are called compound. When muscles act in opposition to each other they are termed antagonist; when they concur in the same action they are called congeneous. Muscles are also divided into voluntary and involuntary muscles, the former being those whose movements proceed from an immediate exertion of the will, as in raising or depressing the arm, bending the knee, moving the tongue, etc., while the latter are beyond this control, being the agents in the contraction of the heart, arteries, veins, absorbents, stomach, intestines, etc. When examined under the microscope the fibres of the voluntary muscles (as also those of the heart) are seen to be marked by minute transverse bars or stripes, while those of the involuntary are smooth and regular in appearance. The former is therefore called striped or striated muscle, the latter unstriped, nonstriated, or smooth muscle. The great property of muscular tissue is the power of responding when irritated. The response is in the form of contraction, that is, when the muscle is irritated or stimulated it responds by shortening itself, so that its ends are brought nearer and it becomes thicker in the middle, its inherent elasticity making it capable of returning to its previous length when the stimulation is withdrawn. By these contractions the muscles are able to do work. The usual stimulation is by nervous action (see Nerve), but mechanical means, such as pinching, pricking, etc., electricity, heat, and chemicals also cause irritation. All the muscles are

connected with bones not directly but through the medium of tendons. A tendon presents the appearance of a white glistening cord, sometimes flat, but often cylindrical and of considerable thickness. The mass of flesh composing



A striped muscular fibre with its sheath.

the muscle is called the belly of the muscle. One end is usually attached to a bone more or less fixed, and is called the origin of the muscle. The other end is attached to the bone meant to be moved by the contraction of the muscle, and is called the insertion of the muscle. Involuntary muscle consists of spindle-shaped cells having an elongated nucleus in the center. They are united in ribbon-shaped bands, and respond much less rapidly than the voluntary to irritations, and the wave of contraction passes over them more slowly. There are several hundreds of separate muscles in the human body, and they are broadly grouped into muscles of the head, face,



Muscular fibre separated—A into fibrillæ and B into discs. C is a highly magnified portion of a fibril.

and neck; muscles of the back; muscles of the chest; muscles of the upper extremity, the shoulder, arm, forearm, and hand; muscles of the abdomen, and muscles of the lower extremity, the thigh, leg, and foot.

MUS'COVY. See Russia.

MUSES, in the Greek mythology the daughters of Zeus and Mnemosynē, who were, according to the earliest writers, the inspiring goddesses of song, and according to later ideas divinities presiding over the different kinds of poetry, and over the sciences and arts. Their original number appears to have been three, but afterward they are always spoken of as nine in number: Clio, the muse of history; Euterpē, the muse of lyric poetry; Thalīa, the muse of comedy, and of merry or idyllic poetry; Melpoměnē, the muse of tragedy; Terpsichŏrē, the muse of choral dance and song; Erăto, the muse of erotic poetry and mimicry; Polymnia or Polyhymnia, the muse of the sublime hymn; Urania, the muse of astronomy; and Calliŏpē, the muse of epic poetry.

MUSE'UM, a building or apartment appropriated as a repository of things that have an immediate relation to literature, art, or science, and where the objects may be inspected by those who are curious in such matters. Of the museums of Britain the British museum is the greatest—being perhaps the greatest in the world. Museums illustrative of the industrial arts, though of recent origin, are of great importance. Foremost among institutions of this kind in Britain may be instanced the South Kensington Museum. All the chief capitals of Europe and many large cities in the United States have valuable museums.

MUSHROOMS, the common name of numerous cryptogamic plants of the natural order Fungi. Some of them are edible, others poisonous. The species of mushrooms usually cultivated is the Agaricus campestris, or eatable agaric, well known for its excellence as an ingredient in sauces, especially ketchup. Mushrooms are found in all parts of the world, and are usually of very rapid growth. In some cases they form a staple article of food. In Tierra del Fuego the natives live almost entirely on mushrooms; in Australia many species of Bolētus are used by the natives, and is commonly called native bread. Mushroom spawn is a term applied to the reproductive mycelium of the mushroom.

MUSIC, any succession of sounds so modulated as to please the ear; also the art of producing such melodious and harmonious sounds, and the science which treats of their properties, dependencies, and relations. Sound is conveyed through elastic media, as the atmosphere or water, by undulations, which may be generated in the medium itself, as by a flute or organ-pipe, or transmitted to it by the vibrations of violin or pianoforte strings or the reeds of a wind-instrument. When the vibrations are fewer than 16 in a second or more than 8192 the sound ceases to have a musical character. The pitch or relative height of a tone is determined by the number of vibrations in a given tone, the lower numbers giving the grave or deep tones, the higher numbers the acute or shrill tones. The loudness of a tone is determined by the largeness of the vibrations, not their number. The note or musical sound called middle C on the pianoforte is usually assumed by theorists to be produced by 512 vibrations per second, and this was long the pitch recognized in practice as the standard or concert pitch useful for the guidance of all musicians. The perpetual striving after increased brilliance of tone led, however, to a gradual heightening of the pitch, and in the course of a century the middle C in France had become 522 vibrations, while in England and Germany it was somewhat higher. Of late years there has been a movement among European musicians to lower the pitch to about the French standard, and this lower pitch has now been adopted by many foreign nations.

A note produced by double the number of vibrations required to produce any given note will be found to be in perfect unison with it though higher in pitch. Between two such notes there is a gradation by seven intervals in the pitch of tone, more agreeable than any other, the whole forming a complete scale of music called the diatonic scale. The space between the notes sounding in unison is termed an octave, and the note completing the octave may become the keynote of a similar succession of seven notes, each an octave higher or double the pitch of the corresponding note in the first scale. These seven notes of the diatonic scale are designated by the first seven letters of the alphabet, and each note bears a fixed ratio to the key-note in respect of pitch as determined by the number of vibrations. Thus in the case of a key-note obtained from a vibrating string, its octave is produced by halving the string, which vibrates twice as fast in a given time as the whole string, and the other notes may be obtained by applying reciprocally the ratios given below to the length of the string.

Taking C or Do for our fundamental note we have for our scale—

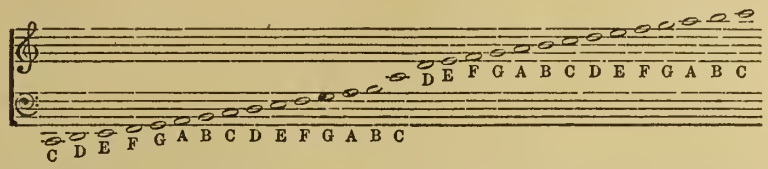
C	D	E	F	G	A	B	C	D	E	F	G	A	B	C
C, &c. (Scale in key of C major) or Do Re Mi Fa Sol La Si Do Re Mi Fa Sol La Si Do, &c.														
1	8/9	4/5	3/4	2/3	3/5	8/15	1/2							(Ratio to key-note).

The scale may be extended up or down so long as the sounds continue to be musical. In order to allow reference to be made to the various degrees of scales without reference to the key in which they are pitched the tones composing the octave are known in their ascending order as (1) tonic or keynote, (2) supertonic, (3) mediant, (4) subdominant, (5) dominant, (6) superdominant or submediant, (7) leading note or subtonic, (8) final note. The tonic, the subdominant, and the dominant are the governing or emphatic notes of the scale. In the diatonic scale the various notes proceed from the keynote by five tones and two semitones; the semitones (the smallest intervals recognized in musical notation) occurring between the 3d and 4th and the 7th and 8th notes in the scale. The first four and last four notes, therefore, form a natural division of the octave into two "tetrachords," each consisting of two tones and a semitone.

Every sound employed in the art of music is represented by characters called notes on a staff—that is, five equidistant horizontal lines on or between which the notes are placed. A note represents a higher or a lower sound according as it is placed higher or lower on the staff. When any note is higher or lower in pitch than can be placed upon the staff short lines called ledger-lines are added above or below the staff to indicate the relation of the note to those on the staff. As, however, the multiplication of ledger-lines is liable to become embarrassing to the eye, musicians have endeavored to overcome the difficulty by the use of more than one staff. The staves are the bass, mean, and the treble, but the second is now seldom used. The treble staff, which contains the upper notes, is distinguished by a character called a G or treble clef the bass by a character called the F or bass clef and the mean by a character called the C or mean clef The treble and bass clefs only are required for keyed instruments

MUSIC

of the pianoforte kind, and when a staff is wanted for each hand they are joined by a brace, the upper staff carrying the notes generally played by the right hand and the lower those played generally by the left, as follows:

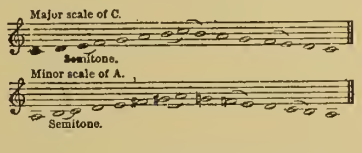


It will be seen that the steps in every diatonic scale must correspond to those of the scale of C, in that the notes composing it stand in the same fixed ratio to the keynote of the scale. In selecting another keynote than C, however, it is necessary to modify some of the natural notes by the insertion of what are called sharps or flats in order to preserve the required relation and sequence of the intervals (the tones and semitones in their due relative positions) and so produce the major musical progression. The sharp (♯) placed before a note raises the pitch by a semitone, the flat (♭) lowers it by a semitone. A sharp or flat placed at the beginning of a staff affects every note upon the line which it dominates, unless the contrary be indicated by the sign of the natural (♮), which restores the note to which it is attached to its normal pitch. In the model diatonic scale given it has been pointed out that there is an interval of a tone between every note, except the 3d and 4th (E and F) and 7th and 8th (B and C), when the interval consists of a semitone. Now if we wish to make G the key-note it is clear that without some contrivance the notation of the scale from G to its octave would throw one of the semitones out of its place—namely, that between E and F, which, instead of being, as it ought to be, between the seventh and eighth, is between the sixth and seventh. It is obvious then that if we raise the F a semitone we shall restore the interval of the semitone to a position similar to that which it held in the key of C. If D be taken as a key-note we shall find it necessary to sharpen the C as well as the F in order to bring the semitones into their proper places. Still proceeding by fifths, and taking A as a key-note, a third sharp is wanted to raise G. We may proceed thus till we reach the scale of C sharp, with seven sharps, which is, however, rarely used. This series of scales with sharps is obtained by taking the dominant, first of the model scale as the key-note and then of the others in succession, and sharpening the fourth of the original scales to make it the seventh of the new. Another series is obtained by taking the subdominant of the model scale as the key-note and lowering its seventh a semitone, making it the fourth of the new scale, or scale of F. Taking the subdominant of the scale (B) as the key-note we require to flatten the E in addition to the B, and so on until we have lowered all the tones in the scale a semitone.

Besides the forms of the diatonic scale, which have an interval of two tones between the tonic and the third, and is called the major scale, there are minor scales of which the most important kind has an interval of a tone and semitone between its tonic and third, the seventh note being sharpened so as to form a leading note. In the ascending scale, too, the harsh interval of the second between this leading note and the one immediately below it is frequently avoided by sharpening the lower note. In the descending scale the sharps are removed, and the scale is identical with the major, beginning at its sixth and descending an octave. See example at top of next page.

Major and minor scales which, like those given in the example, have the same key signature, are called relative. Thus, the major scale of G has for its relative minor the scale of E minor, the major scale of D has for its relative minor the scale of B minor; and so on. Each minor scale is also called the tonic minor to the major scale on the same key-note. The tonic minor scale to C major is C minor. One major scale is also said to be related to another when it is raised from its dominant or its subdominant: thus the scales of G and F are held to be nearly related to that of C.

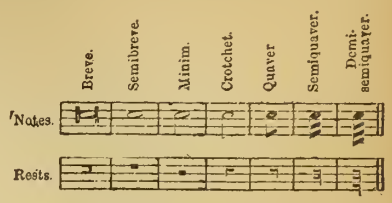
There is still another kind of scale, called the chromatic (Greek chrōma, color), because, like colors in painting



it embellishes the diatonic by its semitones. It consists of thirteen notes, and usually ascends by sharps and descends by flats.

Intervals in music (i.e. the distance from any one note to any other) are reckoned always upward and inclusively number of names of notes they contain, both limits to the interval being counted. Thus C to E is a third, both C and E being counted in the interval. They are known as major or normal when they are such as would be found in any major scale; as minor when the interval consists of a semitone less than the corresponding major interval; as augmented when consisting of a semitone more than major; as diminished when a semitone less than minor; and as simple or compound according as they fall within or exceed the compass of an octave.

Hitherto notes have been referred to only as representatives of the various sounds with reference to their pitch and distance from each other; but each note serves also to mark the relative duration of the sound it represents. The following are the names and forms of the notes commonly in use, each in succession being half the duration of the note preceding it:

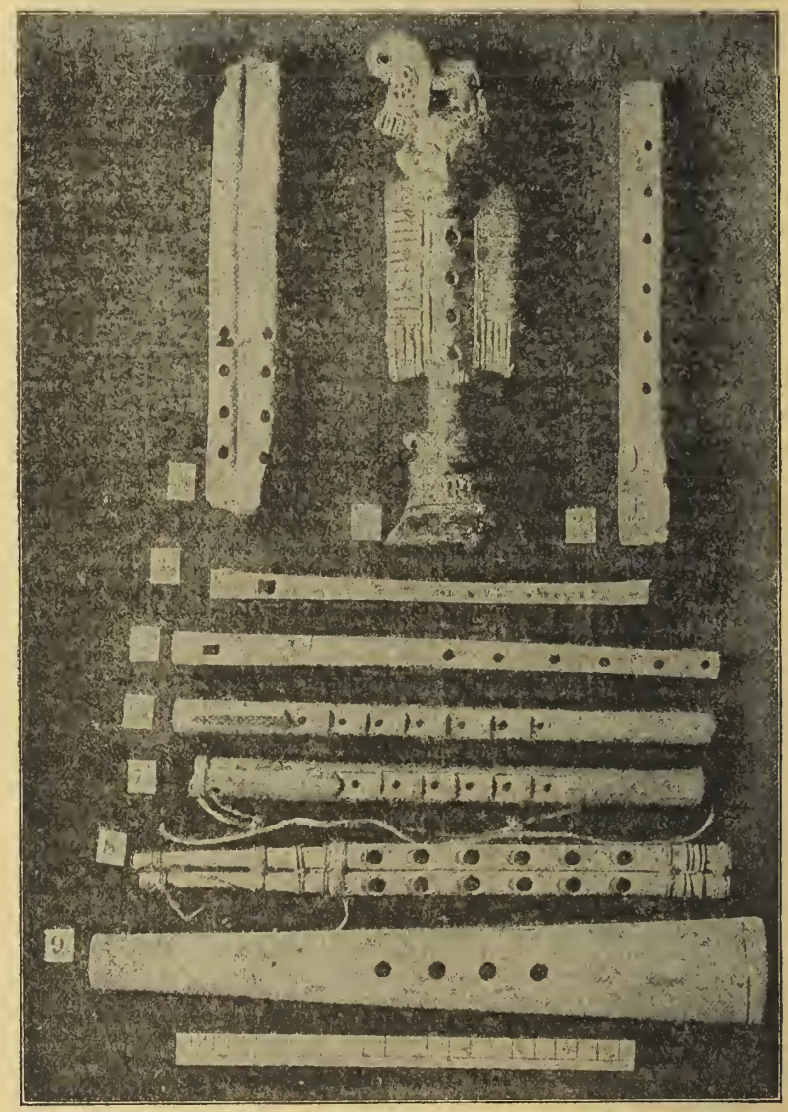


The stems of the notes may be written upward or downward as convenient. In connection with these notes other signs are used still further to indicate duration. A dot placed after a note lengthens it by one-half, two dots by three-fourths. Instead of the dot a note of its value may be written, and a curve, called a tie, written over it and the preceding note. Sometimes three notes of equal value have to be played in the time of two, in which case the figure 3 with a curve thrown over it is written above or below the notes. Two triplets (as this group is called) may be joined, and the figure 6 surmounted by a curve written over them; they are then performed in the time of four notes of the same form. A sensible interval of time often occurs between the sounding of two notes; this is represented by characters called rests, each note having a corresponding rest. A dot may be added to a rest in the same manner as to a note, to indicate an addition of a half to its length. See the example just given, which shows the rests in connection with their corresponding notes.

Every piece of music is divided into portions equal in time, called measures, which are separated from each other by vertical lines called bars. The term bar is often loosely applied to the measure as well as to the line. The exact length of the measure is indicated by a sign at the beginning of the piece of music. In common time, indicated by a 𝐂 written after the clef, each measure contains a semibreve, or such notes and rests as make up together its value. Another form of common time, marked with a ₵ contains two semibreves in the measure, or their equivalents in minims, crotchets, etc. Another method of indicating time (or rather more correctly, rhythm) is by figures, in the form of a fraction. The figures of the denominator are either 2, 4, 8, or 16, which (the semibreve being considered the unit) stand for minims, crotchets, quavers, and semiquavers respectively; and the numerator shows the number of these fractional parts of a semibreve in the measure. Besides common time, which may be indicated in two ways, there is triple time, in which a measure is made up of three minims, crotchets, or quavers, which can only be marked by figures; these are $\frac{3}{2}$, $\frac{3}{4}$, or $\frac{3}{8}$. When two or four measures or triple time are united in one measure the music is said to be written in compound common time, and is indicated by the fractions $\frac{6}{4}$ and $\frac{6}{8}$; rarer examples of compound time signatures are $\frac{9}{4}$, $\frac{9}{8}$, $\frac{9}{16}$, $\frac{12}{8}$, etc. The object of the division of musical passages into measures is to indicate their rhythm

Notes, like words or syllables, are accented or unaccented. The strongest accent is given to the first note of a measure. In common time of four notes to the measure the third has a subordinate accent, as, though in a less degree, the third measure note in triple time. In compound common time the subordinate accents falls on the first note of the last half of the measure, and in compound triple time on the first note of each of the groups of three of which the measure is composed. When a curve is placed over two notes in the same degree, but not in the same bar, the two notes are played as one of the length of both, and the first note acquires the accent. This displacement of the accent is called syncopation. If the curve is written over notes of different degrees it is called a slur, and indicates that the notes are to be played or sung smoothly, as if gliding into each other. When an opposite effect is wanted, that is, when the notes are to be produced distinct and detached (staccato), a dot is placed over them. The various degrees of loudness and softness which occur in a piece of music are indicated by such Italian words as forte, loud; fortissimo, very loud; piano, soft; pianissimo, very soft. In order to save time in writing music various abbreviations are used.

MUSICAL INSTRUMENTS, any device for the production of sounds, whether of discord or concord, supposed to arouse emotion of any kind, pleasant or unpleasant, in the hearer. The origin of many musical instruments dates back to the earliest times. Monuments recently unearthed at Thebes and in the upper valley of the Nile contain representations of harps and flutes. Even so recent an instrument as our grand pianoforte can be traced through its many and vital changes to the dulcimer known to the Arabs and Persians. Many of our museums are filled with various instruments of all times and nations preserved only as curiosities. Thus the large family of lutes is now entirely obselete; and yet at one time these instruments enjoyed the same popularity as the pianoforte does to-day, and no orchestra was complete without them. If we except the stringed instruments, it may safely be asserted that no instrument found in the modern orchestra is the same as it was a century ago. Musical instruments may be divided into three classes: stringed, wind, and percussion. Stringed instruments are of three kinds: those whose sounds are produced by friction, as the violin, viola, violoncello, etc.; by twitching with the finger or otherwise, as the harp, guitar, mandolin, etc.; by striking, as the pianoforte, and dulcimer. Wind instruments are of two kinds, viz., the reed species—as the hautboy, clarionet, etc.—and the flute species, as the flute, flageolet, etc. The trumpet, horn, trombone, and all similar wind instruments, are generally classed among the reed intruments; but whether the sound is produced by the lips of the blower acting as a reed, or by the compressed stream of air, as in flute instruments, is not yet determined Percussion instruments are those which on being struck produce only one fixed sound, as the drum, triangle, cymbals, tambourine, etc. Whatever material may be used to form a musical instrument, there are only two means of producing musical sounds, and these are by the vibrations of a fixed elastic body, such as the string of the violin or pianoforte, the reed of the hautboy, bassoon etc.; or by the vibrations of a confined column of air put into motion by a stream of eompressed air, as in the flute, flageolet, and all the ordinary flute species of organ-pipes.



Early flutes with equal-spaced holes.

MUSIC-BOX, an instrument for producing by mechanical means tunes or pieces of music. The modern music-box is an elaboration of the elegant toy musical snuff-box in vogue during the 18th century. The notes or musical sounds are produced by the vibration of steel teeth, or springs cut in a comb or flat plate of steel. The teeth are graduated in length from end to end of the comb or plate, the longer teeth giving the deeper notes; and, where necessary, by filling or loading with lead the individual teeth are accurately attuned. Each tone and semitone in the scale is represented by three or four separate teeth in the comb, to permit of successive repetitions of the same note when required by the music. The teeth are acted upon and musical vibrations produced by the revolution of a brass cylinder studded with projecting pins, which, as they move around, raise and release the proper teeth at due intervals according to the nature of the music. An entire revolution of the cylidner completes the performance of the special pieces of music for which the apparatus is set, but upon the same cylinder there may be inserted pins for performing as many as thirty-six separate airs. This is accomplished by making both the points of the teeth or springs and the projecting pins which touch them very fine, so that a very small change in the position of the cylinder is sufficient to bring an entirely distinct set of pins in contact

with the note teeth. In the more elaborate music-boxes the cylinders are removable, and may be replaced by others containing distinct sets of music. In these also there are combinations of bell, drum, cymbal, and triangle effects, etc. The revolving motion of the cylinder is effected by a spring and clockwork, and the rate of revolution is regulated by a fly regulator. The headquarters of the music-box trade is Geneva, where the manufacture gives employment to upward of 1000 persons.

The music-box is a type of numerous instruments for producing music effects by mechanical means, in all of which a revolving cylinder or barrel studded with pins is the governing feature. The principle of the barrel operating by percussion or by wind on reeds, pipes, or strings governs carillons or music bells, barrel organs, mechanical flutes, celestial voices, harmoniphoñes, and the sometimes huge and complex orchestrions in which a combination of all orchestral effects is attempted. A principle of more recent introduction than the studded cylinder consists of sheets of perforated paper or card, somewhat similar to the Jacquard apparatus for weaving. The perforations correspond in position and length to the pitch and duration of the note they represent, and as the web or long sheet of paper passes over the instrument, the perforated holes are brought in proper position and sequence under the influence of the suction or pressure of air from a bellows, and thereby the notes are either directly acted on, as in the case of reed instruments, or the opening and closing of valves set in motion levers or liberate springs which govern special notes. The United States is the original home of the instruments controlled by perforated paper known as organettes, organinas, melodeons, pianola, etc. See Phonograph.

MUSK, a substance used in perfumery and medicine, and obtained from several species of deer. A perfume of similar character is also obtained from one or two other animals, (see Musk-rat); and various animals and plants are noted for emitting a strong, musky smell.

MUSK-DEER, a genus of deer, which is essentially distinct from the true deer.

Musk-deer.

Their chief habitat is Asia and the islands of the Eastern Archipelago; though one species is found on the west coast of Africa. These animals attain the size of a young roe-deer, and the upper jaws bear prominent canine teeth. The males alone yield the musk, which is secreted by an abdominal gland of about the size of a hen's egg. The Tibet musk is most in repute, that known as Russian or Siberian being inferior in quality. Besides its familiar use as a scent, musk is employed medicinally as an antispasmodic.

MUSKE'GON, a city in the state of Michigan, situated at the upper end of Lake Muskegon. It does a great trade in lumber, the timber being floated down the Muskegon river, and passing through extensive sawing and planing mills here. Pop. 24,501.

MUSKET, a hand-gun with which infantry soldiers were formerly armed. When first introduced, early in the 16th century, as a development of the culverin and arquebus, it was discharged by means of a lighted match (hence the name matchlock given to it), and was so heavy that it had to be laid across a staff or rest to be fired. To make use of it the soldier required to carry a slow-burning match with him, which was apt to be extinguished in wet weather. The wheel-lock followed (16th century), the chief feature of which was a wheel made to revolve by means of a spring, and to cause sparks by friction against a flint. The next improvement was the flint-lock proper (about 1625), in which sparks were produced by one impact of a piece of flint on the steel above the priming powder. Musketeers were soon introduced into all armies, and in the beginning of the 17th century infantry consisted of pikemen and musketeers, and all changes in regard to the relative proportion of the two arms where always in favor of the latter. The flint-lock musket was introduced into the British army toward the end of the 17th century, and was the British musket of the days of the Peninsular war and Waterloo, known familiarly as "Brown Bess." It was superseded by the percussion musket in 1842, this musket being in turn superseded by the rifle. See Rifle.

MUSKINGUM, a river in the state of Ohio, United States, and falling into the Ohio river at Marietta. It is connected with Lake Erie by canal.

MUSK-MALLOW, a British perennial plant, so named from the peculiar musky odor thrown off by the parts of the plant.

MUSK-MELON, a delicious variety of melon, named probably from its fragrance.

MUSK-OX, an animal intermediate between the ox and sheep. Resembling in general appearance a large goat-like sheep, its body is covered with a coat of tufted hair, brownish in color and of great length. The hair about the neck and shoulders is so thick as to give the animal a "humped" appearance; on the rest of the body it is very long, smooth, and flowing, while interspersed among its fibres is a layer of lighter-colored wool. The musk-ox is active and agile, and climbs mountainous places with ease and dexterity. The horns, broad at the base and covering the forehead and crown, curve downward between the eye and the ear, and then upward and slightly backward. The horns of the female are smaller than those of the male, and their bases do not touch. The ears are short, the head large and broad, the muzzle blunted. The average size of the male is that of a small domestic ox. Gregarious in habits, each herd numbers from twenty to thirty members. The female brings forth one calf in May or June. The food consists of grass, lichens, etc. The musk-ox inhabits the Arctic regions of America north of the 60th degree of latitude. The flesh is pleasant to the taste, though it smells strongly of musk; the odor of which is also diffused from the living animal.

MUSK-PLANT, a little yellow-flowered musky-smelling plant, a native of Oregon.

MUSK-RAT, an American rodent allied to the beaver, and the only known species of the genus. It is about the size of a small rabbit, and has a flattened lanceolate tail, covered with small scales and a few scattered hairs. Its toes are separate, and provided with a stiff fringe of hair. In summer it has a smell of musk, which it loses in winter. The odor is due to a whitish fluid deposited in certain glands near the origin of the tail.

MUSLIN, a fine, thin, cotton fabric, first made at Mosul or Moussul (whence the name), afterward in India. There are many different kinds made, as book, mull, jaconet, leno, foundation, etc. Some Indian muslins are of extraordinary fineness. Figured muslins are wrought in the loom to imitate tamboured muslins, or muslins embroidered by hand.

MUSSEL, a term popularly given to several molluscs, in which "siphons" or tubes admitting water to the gills, are absent. The common mussel forms a typical example, the shells being equivalve and have a hinge destitute of teeth. It has a "byssus" or "beard," by means of which the mussels attach themselves to fixed objects. The mussel is extensively employed as a bait for deep-sea fishermen; and in some districts it is used as an article of food, the best mussels approaching nearly to the oyster in flavor, though occasionally found to be unwholesome. The pond mussels, of which many species are known, are found in the rivers and lakes both of Europe and America.

MUSSET (mu-sā), Louis Charles Alfred de, French poet, novelist, and dramatist, born at Paris in 1810, died there in 1857. In 1829 he published a volume of poems called Contes d' Espagne et d'Italie, which had an immediate and striking success. In 1831 appeared Poésies Diverses, and in 1833 Un Spectacle dans un Fauteuil, in which the two chief pieces are a comedy of a light and delicate grace called A quoi Rêvent les Jeunes Filles, and a poem entitled Namouna, written after the manner of Byron. In 1836 was published his Confession d'un Enfant du Siècle, a gloomy novel, containing the analysis of a diseased state of mind, all the phases of which the author had studied in himself. The same settled melancholy also distinguishes his Rolla, Une Bonne Fortune, Lucie, Les Nuits, Une Lettre à Lamartine, Stances à Madame Malibran, L'Espoir en Dieu, and other poems. Among his light and sparkling dramatic pieces are: On ne badine pas avec l'

Amour, Les Caprices de Marianne, Il ne faut pas jurer de Rein, etc. In 1852 he was admitted a member of the French Academy. De Musset was one of the most distinctive, and, in a certain sense, original of modern French writers.

MUSSULMAN. See Moslem.

MUST, the juice of grape, which by fermentation is converted into wine.

MUSTANG, a small wild horse of the Southwestern states and northern Mexico, where it is found in extensive herds, and is captured and tamed as the Indian pony. A reversion from the domesticated stock, it seldom exceeds 13 hands in height, but is a strong and useful animal, and capable of great endurance.

MUSTARD, the seeds of the white and common mustard, when ground and freed from husks, form the well-known

Mustard.

condiment. The plant is an annual, with stems 3 to 4 feet in height, lower leaves lyrate, upper lanceolate and entire, flowers small and yellow. The preparation from the seeds is often very valuable as a stimulant to weak digestion, and as an adjunct to fatty and other indigestible articles of food. When mixed with warm water and taken in large quantities it acts as an emetic. The tender leaves are used as a salad, and the seeds are used in the well-known form of poultice, being applied to various parts of the skin as a rubefacient. Oil of mustard is an essential oil obtained from the seeds. It is very pungent to the taste and smell, and when applied to the skin speedily raises a blister.

MUTINY, resistance by soldiers or sailors to the authority of their officers. Joining in inciting to or conniving at mutiny is punishable with death, whether the troops are on active service or not; on active service the same sentence may follow treachery or cowardice, deserting a post, etc.

MUTTRA, a town in India, United Provinces, on the Jumna, 36 miles northwest of Agra. Pop. 60,042.—The Muttra district has an area of 1453 sq. miles; pop. 763,221.

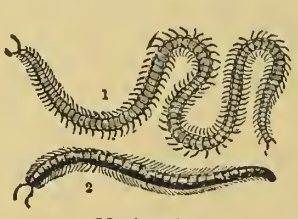
MY'LODON, a genus of extinct edentate mammalia, allied to the megatherium. Its remains have been found in the upper tertiaries of South America. In size the mylodon robustus—the most familiar species—attained a length in some instances of 11 feet. Of terrestrial habits, the mylodon obtained the vegetable food upon which it subsisted chiefly by uprooting trees.

MYO'PIA, the scientific name for shortsightedness. See Sight, Defects of.

MYRIAP'ODA, the lowest class of the higher annulose or arthropodous animals

Skeleton of Mylodon.

represented by the centipedes, millepedes, and their allies, and resembling the Annelids in the lengthened form and the numerous segments of the body, each segment being provided with one pair of ambulatory feet, whence the name. They have a distinct head, but no division of the body into thorax and abdomen, as in insects. They are therefore of a lower structural type than insects, which in general organization they resemble. No wings are developed. They respire through minute spiracles or pores along the whole length of the body, and are invested with a hard or horny covering. This class is divided into two orders, the Diplopoda, in which the fusion of two rings gives apparently two pairs of feet on each ring; and the Chilopoda,



Myriapoda.
1, *Geophilus sefeborii*, one of the Chilopoda. 2, *Iulus plicatus*, one of the Chilognatha.

which have two pairs of foot-jaws, and not more than one pair of feet on each segment.

MYRRH is the name given to a gum resin which exudes from a shrub growing

Myrrh.

in Aradia and Abyssinia. It was much esteemed as an unguent and perfume by the ancients, who used it also for embalming and for incense. It is still used as a perfume and for incense, as also medicinally. By distillation with water myrrh yields a viscid, browish-green, volatile oil. Myrrh of the best quality is known as Turkey myrrh; that of an inferior kind goes under the name of East Indian, being exported from Bombay.

MYRTLE, a genus of plants, consisting of aromatic trees or shrubs, with simple opposite leaves sprinkled with pellucid glandular points, and having axillary or terminal white or rose-colored flowers. One species, the common myrtle is a native of the south of Europe and other countries bordering on the Mediterranean. It has been celebrated from remote antiquity on account of its fragrance and the beauty of its evergreen foliage, and by different nations was con-

1, branch with flowers of myrtle; 2, branch with fruits; *a*, vertical section of a flower; *b*, calyx, torus, and pistin of the fruit; *d*, vertical section of the seed, showing the embryo.

secrated to various religious purposes. With the moderns it has always been a favorite ornamental plant.

MYSOR', or **MYSORE',** a principality of southern India; area, 27,936 sq. miles. Pop. 5,538,482.

MYSOR, the capital of the state of the same name, 250 miles west by south of Madras, stands at an elevation of 2450 feet above the level of the sea. Pop. 68,151.

MYS'TICISM, a word of very vague signification, applied sometimes to views or tendencies in religion which aspire toward a more direct communication between man and his Maker through the inward perception of the mind, than that which is afforded through revelation or to efforts and inclinations by some special and extraordinary means to hold intercourse with divine powers or the inhabitants of higher worlds. According to John Stuart Mill, "whether in the Vedas, in the Platonists, or in the Hegelians, mysticism is neither more nor less than ascribing objective existence to the subjective creations of our own faculties, to ideas or feelings of the mind, and believing that, by watching and contemplating these ideas of its own making, it can read in them what takes place in the world without." The tendency toward mysticism seems naturally implanted in some natures, and has been observed in all ages. It is a characteristic feature of the great Asiatic re-

ligions, Brahmanism and Buddhism. In the Neo-Platonic philosophy it is an important element, as represented by Plotinus (204–269 A.D.). Christianity, in consequence of its special tendency to practical good, as well as of its submission to a system of doctrine expressly revealed, would seem to have afforded little scope for the extravagances of mysticism. It soon, however, made its appearance, forming a kind of profane mixture, and reached its extreme in the writings of the so-called Dionysius the Areopagite. This pseudo-Dionysius obtained an extensive influence, especially through Hugo St. Victor, in the 12th century, and was everywhere held in high respect until the time of the Reformation. In opposition to scholasticism, which labored in the construction of a systematic and almost demonstrative theology, this system embodied a theology of feeling and immediate illumination, which attached very little importance to intellectual effort, and laid so much the more weight on purification of heart and ascetic morality. Of the most notable of the German mystics in the middle ages were Eckhart and Tauler. In the philosophy of the 15th and 16th centuries, in Paracelsus, Bruno, and others mysticism took a direction which at a later period gave rise, on the one side, to the alchemists and Rosicrucians, and on the other side to a number of religious sects, of which such men as Jacob Böhmen and Swedenborg may be considered the representatives. The Quietism of Madame Guyon and her adherents (such as Fénelon) in France in the 18th century was a product of the same nature.

MYTHOLOGY, the collective name for the whole body of fables, legends, or traditions (myths) that take their rise at an early period of a nation's existence and of its civilization, and that embody the convictions of the people among whom such fables arise as to their gods or other divine personages, their origin and early history and the heroes connected with it, the origin of the world, etc. Though speculations as to the origin of mythology have been put forth from a very early period, it is only in recent times, by the help of comparative philology, and by comparing together the myths of different peoples (comparative mythology), that any real advance has been made. Myths are of course believed in by the bulk of the people among whom they are current, and it is only when speculative and reflective spirits arise, and when science and philosophy have made some advances, that their truth is called in question. Thus Zeus, Apollo, Athēnē, Heracles, and the other divinities of ancient Greece, were believed by the bulk of the people to have a real existence, and the stories regarding them were looked upon as true; but even in Greece in early times the absurdities and monstrosities of some of the myths attracted the attention of philosophers and led to attempts at explaining the stories in such a way as that they should not shock common sense or moral feeling. In doing this three chief systems of interpretation were followed, called respectively by Max Müller the ethical, the physical, and the historical. Those who adopted the first explained that the stories of the power and omniscience of the gods, of their rewarding good and punishing evil, were invented by wise men for the purpose of maintaining law and order in communities—leaving it to be supposed that the immoral representations of the gods were the inventions of poets. The interpreters of the physical (also called the allegorical) school held that the myths contained explanations of natural phenomena, or of certain views regarding them, under a peculiar phraseology, which disclosed its hidden wisdom when rightly understood. The third or historical school, identified with the name of Euhemerus, represented the gods as having been originally kings or chiefs, great warriors, sages, or benefactors of the human race, who, being exalted above their fellowmen in life, after their death gradually came to be looked upon as deities.

Perhaps the most common theory of mythology at the present day is one that is based upon comparative philology, and on a comparison of the myths of the different Indo-European nations, Thus in early times men would speak quite naturally of the sun as the child of the night, as the destroyer of the darkness, as the lover of the dawn and as deserting her, as traveling over many lands, as the child of the morning, as her husband, as her destroyer, and so on. This language was natural in early times, and was perfectly understood as descriptive simply of natural phenomena, and nothing else; but in course of time such expressions lost their natural significance, and in this way it is explained that Phœbus Apollo, Endymion, and Phaëthon, for instance, all originally significant epithets applied to the sun from his brilliancy or other characteristic, became the names of divinities, who were regarded as quite distinct from each other. So Zeus originally meant the sky, Athēnē and Daphnē the dawn, Hermes the wind, and so on. According to this theory the story of Apollo slaying the children of Niobē with his arrows is nothing more than a mythological way of telling how the morning clouds are dispersed before the rays of the rising sun. Heracles or Hercules, again, is the sun laboring throughout his life for the benefit of others: soon after birth he strangles the serpents of darkness, and after performing innumerable toil he dies on the funeral pyre, as the sun sinks in the fiery west. Endymion, as his name implies, is the setting sun, who is courted by the moon, and who sinks to sleep in the west. Some of these identifications of deities with natural phenomena are pretty certain. Zeus, for instance, the supreme god of Greece, the same as the Jupiter of the Romans and the Dyaus of the early Hindus, is clearly the bright sky; and among the Hindus the name of the sky-god Dyaus always retained its meaning of sky, so that Dyaus had only an indistinct personality as a deity. The Hindu Varuna, a sky-god, is clearly the same as the Greek Ouranos, which latter word, besides being the name of a deity, had the ordinary signification of sky or heaven. So the Scandinavian Thor, the god of thunder, can hardly be anything else than thunder personified. Yet as a whole the "solar theory" cannot be accepted as a key to all mythology. It fails to account for many of the wild and monstrous myths told of deities, of the creation of the world, of the state of the dead, etc., and though it may throw a certain amount of light on the mythology of the Aryan or Indo-European nations, is quite insufficient when myths as a whole are investigated.

Another road has been taken therefore by some recent investigators. Thus Mr. Andrew Lang finds a key to mythology in a study of the myths and mental habits of savage races; he maintains that "the savage and senseless element in mythology is for the most part a legacy from ancestors of the civilized races who were in an intellectual state not higher than that of Australians, Bushmen, Red Indians, the lower races of South America, and other worse than barbaric peoples," and that the monstrous myths current in Greece, Egypt, and India were thus inherited. He points to the currency of such myths among savages at the present day, and to the fact that in general savages are eager to arrive at some explanation of the natural phenomena around them, and are quite satisfied with explanations that to civilized men may seem even imbecile. When a phenomenon presents itself the savage requires an explanation, and that explanation he makes for himself, or receives from tradition, in the shape of a myth. But, indeed, no one theory can be expected to explain the origin of all myths, for it is impossible to deny that some may be pure products of imagination, tales invented by early bards or minstrels to beguile a weary hour, while in others fragments of real history may be hidden.

MYTILENE, or **MITYLENE,** a town in the island of Lesbos. See Lesbos.

N

N, the fourteenth letter and eleventh consonant of the English alphabet; formed by placing the point of the tongue against the root of the upper teeth and forcing out the breath. It is classed as a nasal, a lingual, and liquid or semi-vowel. In English and most other languages n has a pure nasal sound in French and Portuguese, after a vowel in the same syllable, as on, un, etc., it has the effect of giving a semi-nasal sound to the vowel preceding, that is to say, the vowel is sounded by an emission of the breath partly through the nose and partly through the mouth. The Spanish alphabet has a character ñ, called n with the tilde, as in España, pronounced like ni in onion, minion; gn in Italian is pronounced in the same way.

NA'BOB, in India, formerly the title of a governor of a province or the commander of the troops; borne, however, by many persons as a mere titular appendage.

NABONASSAR, a king of Babylon, with whose reign begins an epoch called the Era of Nabonassar. It began on the 26th of February, 747 or 746 B.C.

NA'DIR, in astronomy, that point of the heavens which is diametrically opposite to the zenith, or point directly over our heads. The zenith and nadir are the two poles of the horizon.

NADIR SHAH, King of Persia, a famous conqueror and usurper, was born in 1688. Having distinguished himself against the Afghans and Turks he acquired the chief power in Persia in 1732, seized the shah, confined and deposed him, and proclaiming his son Abbas, then an infant, in his stead, assumed the title of regent. The young king dying in 1736, he seated himself on the throne as shah. He undertook the conquest of India, at the head of 120,000 men, and with little, resistance reached Delhi in March, 1739. Being exasperated by some tumults on the part of the inhabitants he caused a general massacre, in which upwards of 100,000 persons perished. In this expedition it is supposed that he carried away, and distributed among his officers, valuables to the amount of $560,000,000. A conspiracy having been formed against him by the commander of his bodyguard and his own nephew, he was assassinated in his tent in 1747, his nephew, Ali Kuli, succeeding to the throne.

NADIYA, or **NUDDEA,** a district in the lieutenant-governorship of Bengal, with an area of 2794 sq. miles. Pop. 1,644,108.

NÆVUS, or **"MOTHER'S MARK,"** a disfigurement which occurs most frequently on the head and trunk, but may also appear on the extremities. It consists essentially of an enlargement of the minute veins, or venous capillaries, which are dilated, and anastomose or unite among themselves to form a vascular patch generally of a deep-red color. The familiar name of "mother's mark," or "longing mark," is applied from the popular belief that the lesion was the result of fear, fright, unnatural longing, or some such irritation acting upon the mother's constitution, and communicating its effects to the unborn child in the shape of this mark.

NAGASA'KI, or **NANGASA'KI** a city and port in Japan, on the west coast of the island of Kiusiu, beautifully situated on a peninsula at the extremity of a harbor, affording excellent anchorage, and inclosed by hills, up the sides of which a portion of the town extends. Nagasaki was one of five Japanese ports opened in 1858 to the Britsh and Americans, having been previously open to

the Dutch; and in 1869 it and seven others were opened to foreign nations generally. The exports are copper, silk, camphor, tobacco, porcelain, lackered wares, etc. A dry-dock measuring 460 by 89 feet was opened here in May, 1879. Pop. 107,422.

NAGPUR, or **NAGPORE,** a town in India, capital of the Central Provinces, and of the division of Nagpur (area 24,040 sq. miles; pop. 2,716,748), 440 miles e.n.e. of Bombay. A bed of coal, estimated to contain 17,000,000 tons at a depth of 200 feet, has been discovered at Nagpur. There is a trade in opium, hemp, and above all, in cotton, for which this is a great mart. Nagpur was formerly the seat of a line of rajahs, which became extinct in 1853, when their territory was annexed to the British dominions. Pop. 127,734.

NA'IADS, in the Greek mythology, nymphs of fountains and brooks, of similar character to the dryads, oreads, etc., analogous to the nixies of the northern mythology.

NAID'IDÆ, a family or group of water-worms, some of them of common occurrence in the mud of ponds and streams.

NAILS (of Animals), like hairs, are appendages which belong to the category of the exoskeletal elements of the animal frame, or as parts of the skin, of the outer layer of which they are modified appendages. A nail, in fact, is a specialized arrangement of the cells of the epidermis. In man the nails do not inclose the ends of the digits; but in the horse, and "hoofed" or ungulate quadrupeds generally, the nails assume the form of protective coverings to the digits, and are then known as "hoofs." Nails may be produced to form "claws," as in birds and carnivorous mammals, while in the sloths they assume a large relative size, and are used as a means in arboreal progression. In the Amphibia—as in some toads, efts, etc.—the nails appear as mere thickenings of the skin at the extremities of the digits. The nails appear about the fifth month of fœtal or embryonic life.

NAILS, small pointed pieces of metal, generally with round or flattened heads, used for driving into timber or other material for the purpose of holding separate pieces together. They are of many different lengths and shapes. Brads used for nailing floors and ceilings have the head only on one side; the small sharp nails with round flat heads, used by sadlers and upholsterers, are called tacks; the small sharp taper nails without heads, used by shoemakers, are called sprigs; a variety in which the head is large and the spike small are called hobnails; very large nails are called spikes. Until a comparatively recent period almost every kind of nail was produced by hand labor alone, each nail being separately forged from a thin rod of iron. These wrought nails are preferable, for many kinds of carpenter work, to those made by machinery. Making of wrought nails retains, in many places, the character of a domestic manufacture, the workmen being often assisted by the female members of his family. In 1810 a machine was contrived by which nails could be cut from an iron sheet, and headed at one operation, at the rate of 100 per minute. Since that time great improvements have been made in nail-making machinery, and the method commonly adopted is to cut nails out of sheet-iron of the required thickness, an operation which, by the improved processes, is carried on with great rapidity. The quantity produced in this way is astounding, some mills turning out at the rate of 10 miles of nail-rods an hour.

NAMAQ'UALAND, Great, an extensive region in South Africa, extending along the west coast from the Orange river to Walfish Bay, and inland from the west coast to the Kalahari Desert; estimated area 100,000 sq. miles. Pop. about 50,000 .

NAMES, Personal. It is probable that at first all names were significant. Old Testament names are almost all original, that is, given in the first instance to the individual bearing them, and either originated in some circumstance of birth or expressed some religious sentiment, thus—Jacob (supplanter), Isaiah (salvation of Jehovah), Hannah (favor), Deborah (bee), etc. Neither the Hebrews,

Egyptians, Assyrians, Babylonians, Persians, nor Greeks had surnames; and in the earliest period of their history the same may be said of the Romans. In course of time, however, every Roman citizen had three, the prænomen or personal name, the nomen or name of the gens or clan, lastly, the cognomen or family name, as Publius Cornelius Scipio. Conquerers were occasionally complimented by the addition of a fourth name or agnomen, commemorative of their conquests, as Publius Cornelius Scipio Africanus. Greek names refer to the personal appearance or character; and were often supplemented by the occupation, place of birth, or a nickname. Times of great public excitement have had a very considerable influence in modifying the fashion in names. It is impossible to state with any degree of certainty when the modern system of personal nomenclature became general. Surnames were introduced by the Norman adventurers, but were for centuries confined to the upper classes. They became general in Scotland about the 12th century. In some of the wilder districts of Wales they can hardly be said to have been adopted even yet. The principal sources from which surnames are derived are personal characteristics (Black, Long, Short), rank, profession, or occupation (Bishop, Knight, Miller), localities or natural objects (Hill, Dale, Stone), and patronymics (Johnson, Wilson, Andrews). The Hebrews had no surnames proper, but to distinguish two men of the same name they used the form Solomon ben David (Solomon son of David). The Welsh used the word ap in the same way; Evan ap Richard (John son of Richard = Prichard). In most countries the wife changes her surname on marriage to that of her husband; in Spain, however, she retains it, while the son may adopt either the paternal or maternal name. In Great Britain a man may now change his Christian name and surname without an act of parliament, royal license, or even public advertisement; but there is no law to compel third parties to use the new name.

NAMUR (nä-mür), a town of Belgium capital of province of same name, situate at the confluence of the Meuse and Sambre, and at the foot of a bold promontory on which is a fortress. There is a fine modern cathedral (1751–67). The town has manufactures of cutlery, hardware, etc. Pop. 31,558.—The province has an area of 1413 sq. miles. It has coal-mines and flourishing industries. Pop. 344,323.

NANA SAHIB, the infamous leader of the Sepoys in the Indian Mutiny. He was born in 1825, and adopted by the ruler of the state of Bithoor. On the death of the latter the British refused to recognize Nana as his successor. In May, 1857, Nana placed himself at the head of the mutineers at Cawnpore. The Europeans there capitulated on a promise that they should be sent away in safety. But the men were shot down and the women and children massacred. (See Cawnpore.) Nana was defeated by Sir H. Havelock, and was driven across the frontier into Nepaul, and there all knowledge of him ceases.

NANCY (näṅ-sē), a town of France, capital of the dep. Meurthe-et-Moselle, in a fertile plain, near the left bank of the Meurthe. The manufactures embrace woolens, cottons, hosiery, lace, embroidery, stained-paper, etc. Pop. 102,559.

NANKING', a city of China, capital of the province of Kiangsu. It is one of the chief literary centers of China. Pop. estimated at 150,000.

NANSEN, Fridtjof, Norwegian explorer, born in 1861, studied at Christiana University, and in 1882 made an Arctic voyage in a sealing vessel. In 1888 he crossed Greenland from sea to sea a little north of latitude 64°. In 1893 he sailed on board a specially-built steamer (the Fram) in the expectation that, entering the Polar ice in the neighborhood of the New Siberian islands, he would be drifted by a current over the Pole and would come out on the east side of Greenland. After being carried so far in the desired direction he left the Fram and crew, and with a single companion, and with sledges, dogs, and kayaks, took the ice. In this way he reached the highest latitude yet attained, 86° 14′ (April, 1895), and then turned southwestward to Franz Josef Land, where he spent the winter of 1895–96 and met Mr. Jackson, leader of an expedition sent from England, with whom he returned, being followed soon after by the Fram.

NANTES (näṅt), a town of France capital of the department of Loire-Inférieure, on the right bank of the Loire where it receives both the Erdre and the Sèvre, 269 miles west-southwest of Paris. The public edifices most deserving of notice are the cathedral, in the Flamboyant style, dating from the 15th century, and containing many fine monuments; the castle, an edifice of the 14th century partly modernized in the 16th, with massive round towers; the Hôtel de Ville, the exchange, the theater museum of natural history, picture-gallery, the courts of justice, and the Hôtel Dieu or infirmary. The chief industries are ship-building, and the manufacture of ships' boilers and machinery, linens, cottons, sail-cloth, flannel, chemicals, leather, ropes, soap, etc. Pop. 132,990.

NANTES, Edict of, was signed by Henry IV. in that city, April 30, 1598. It allowed the Protestants the free exercise of their religion, and threw open to them all offices of state. This edict was formally revoked by Louis XIV. on October 20, 1685. As a consequence of this fatal act for France about 400,000 Protestants, forming the most intelligent and industrious section of the people, emigrated to Britain, Holland, and other Protestant countries, much to the benefit of their adopted homes.

NANTICOKE, a town in Luzerne co., Pa., on the Susquehanna river, and the Cent. of N. J., the Penn., and the Del., Lack. and W. railways; 8 miles s.w. of Wilkesbarre, the county seat. Pop. 14,517.

NAPHTHA, a term which includes most of the inflammable liquids produced by the dry distillation of organic substances. Mineral or native naphtha, or petroleum, is an inflammable liquid which is found in nearly all countries, but especially at Baku, on the Caspian Sea, and in Canada and Pennsylvania. It consists of a mixture of hydrocarbons chiefly belonging to the paraffin series, but it also contains members of the olefin and of the benzine series. Boghead naphtha, which is also known as photogen and paraffin oil, is obtained by distilling certain minerals allied to coal, such as the Torbane Hill mineral or Boghead coal, found at Bathgate in Scotland. Coal naphtha is obtained by the distillation of coal-tar. After the light oil has been separated it is shaken with caustic soda and afterward with sulphuric acid. The liquid portion is then run off and rectified. Shale naphtha is a mixture of paraffins obtained by distilling bituminous shales. When petroleum is distilled, that portion which distils below 76° C. is sold as petroleum spirit or petroleum ether, and is used for dissolving india-rubber and making varnishes. The next fraction of the distillate is sold under the names benzoline, paraffin oil, or mineral sperm oil. Benzene occurs in petroleum, but is more abundant in the light oil obtained in distillation of coal-tar. Nitro-benzene is largely employed in the preparation of aniline.

NAPIER (nā'pi-ẽr), Sir Charles James, British general and administrator, born in 1782. He entered the army in 1794. In 1812 he was made lieutenant-colonel. In 1837 he was made major-general; in 1838 K.C.B. In 1841 he was appointed to the chief command in the presidency of Bombay, with the rank of major-general, and was shortly afterward called to Scinde. Here he gained the splendid victories of Meanee and Hyderabad, and was afterward made governor of Scinde, which he administered till 1847. Having returned to England, he died in 1853.

NAPIER, Admiral Sir Charles, British naval commander, was born in 1786; died in 1860. He entered the navy as

General Sir Charles Napier.

midshipman in 1799, was promoted lieutenant in 1805. He was promoted commander in August, 1809, and in 1811 was employed in Portugal and along the coast of Southern Italy. Returning to England, he was appointed in 1839 to the command of the Powerful, and ordered to the Mediterranean, where on the outbreak of the war between Mehemet Ali and the Porte, and the co-operation of Britain with Russia and Austria on behalf of the latter

power, Sir Charles Napier performed some of his most gallant exploits, including the storming of Sidon and the capture of Acre. Having blockaded Alexandria, he concluded on his own responsibility a convention with Mehemet Ali, by which the latter and his family were guaranteed in the hereditary sovereignty of Egypt on resigning all claim to Syria. On his return toEngland he was created K.C.B. He sat in Parliament as member for Southwark from 1855 till his death.

NAPIER, John, Laird of Merchiston, near Edinburgh, the inventor of logarithms, was born 1550, died 1617. In 1614 he published his book of logarithms (Logarithmorum Canonis Descriptio; Edinburgh, 4to). The invention was very soon known over all Europe, and was everywhere hailed with admiration by men of science.

NAPIER, Robert Cornelius, Baron Napier of Magdala, born in Ceylon Dec. 6, 1810. He entered the Royal Engineers in 1826, and served in the Sutlej campaign in 1845–46, where he was severely wounded. In 1867 he was intrusted with the command of the Abyssinian expedition, and captured Magdala, April 13, 1868. He was then made Baron Magdala and G.C.B. In 1870 he was made commander-in-chief in India, with the rank of general, became governor of Gibraltar in 1876, was made field-marshal in 1883, and constable of the Tower in 1887. He died in 1890.

NAPIER, Sir William Francis Patrick, British officer, was born in 1785, died in 1860. At the age of fourteen he entered the army, became lieutenant-colonel in 1813, and colonel in 1830. Some years after the conclusion of peace he commenced his celebrated History of the Peninsular War, the publication of which began in 1828, and extended over the intermediate period till 1840. In 1841 Colonel Napier was advanced to the rank of major-general; he was appointed lieutenant-governor of Guernsey the following year and in 1848 created a K.C.B.

NAPLES (nā'plz), a city in Southern Italy, the largest in the kingdom, situated on the northern shore of the beautiful Bay of Naples, about 160 miles from Rome. The city is divided into two unequal parts by a steep ridge proceeding from the height on which stands the castle of St. Elmo, and terminated by a rocky islet surmounted by the Castello dell' Ovo. Among the more remarkable public edifices is the cathedral, dating from 1272, a large Gothic building erected on the site of two temples dedicated to Neptune and Apollo. Other edifices are the church De' Santi Apostoli, said to have been originally founded by Constantine the Great on the site of a temple of Mercury, and, though subsequently rebuilt, still very ancient; the church of St. Paul, built in 1817–31 in imitation of the Pantheon at Rome; the Palazzo Reale (Royal Palace, a building of great size in the lower part of the town); the palace of Capo di Monte situated on a height in the outskirts; the old palace, where the courts of justice now hold their sittings; the Palazzo dei Pubblici Studj, formerly occupied by the university, but now converted into the Museo Nazionale, a museum containing not only a valuable library of 275,000 volumes and many rare MSS., but also the older and more recent collections belonging to the crown, the Farnese collection of paintings and sculpture from Rome and Parma, and an unequalled collection of gems, bronzes, vases, etc., chiefly obtained from the excavations of Pompeii and Herculaneum; numerous theaters, of which that of San Carlo is remarkable for its magnificence, and is one of the largest in existence. Naples has a university, dating from 1224, and attended by over 3000 students; many other educational institutions, and numerous hosptials and charitable foundations. The manufactures, which are numerous but individually unimportant, include macaroni, woolens and cottons, silks known as gros de Naples, glass, china,

musical instruments, flowers and ornaments, perfumery, soap, chemicals, machinery, etc. Naples is one of the most densely populated cities of Europe, and one of the most peculiar features of the city is its unique population and the universal publicity in which life is passed. In the environs are situated the tomb of Virgil, the ancient ruined cities of Herculaneum and Pompeii, the remains of Roman temples, villas, palaces, and tombs, together with the physical phenomena of Vesuvius. Pop. 563,751.

NAPLES, Bay of, on the west coast of Italy, in the Mediterranean, extending for about 20 miles from the Capo di Miseno, its n.w. boundary, to the Punta della Campanella, its s.e. limit. It is separated from the open sea by the islands of Procida, Ischia, and Capri. Its shores have for ages been the scene of powerful volcanic agency, and the scenery has long been celebrated for its beauty and grandeur. Mount Vesuvius is the most striking and distinctive feature.

NAPOLEON I., Emperor of the French, was born August 15, 1769, at Ajaccio, Corsica, and was the son of Charles Bonaparte, an advocate, and of Letizia Ramolino. (See Bonaparte.) In his tenth year he was sent to the military school of Brienne, and after a short time spent at that of Paris he received, in 1785, his commission as lieutenant of artillery. During the development of the revolution Napoleon took the popular side, but in a quiet and undemonstrative way. In 1792 he became captain of artillery, and in 1793 he was sent, with the commission of lieutenant-colonel of artillery, to assist in the reduction of Toulon, then in the hands of the British. The place was captured (19th December) entirely through his strategic genius; and in the following February he was made a brigadier-general of artillery. In 1795, when the mob of Paris rose against the convention, Napoleon was made commander of the 5000 troops provided for its defense. He had only a night to make arrangements, and next morning he cleared the streets with grape, disbanded the national guard, disarmed the populace, and ended the outbreak. On the 9th March 1796, he married Joséphine Beauharnais, and soon after he had to depart to assume the command of the army of Italy against the forces of Austria and Sardinia. After a series of victories, culminating in that of Lodi (10th May), Naples, Modena, and Parma hastened to conclude a peace; the pope was compelled to sign an armistice; and the whole of Northern Italy was in the hands of the French. Army after army sent by Austria was defeated (at Roveredo, Bassano, Arcole, Rivoli, etc.), Napoleon carried the war into the enemy's country; and by the Peace of Campo Formio, which followed (Oct. 17, 1797), Austria ceded the Netherlands and Lombardy, and received the province of Venetia. The pope had previously been forced to cede part of his dominions.

In December, 1797, Napoleon returned to Paris. About this time the directory determined to invade Egypt, as a preliminary step, to the conquest of British India. Napoleon was put in command of the expedition, and on the 1st July, 1798, he landed at Alexandria. This city fell on the 4th July, and Cairo was taken on the 24th, after the sanguinary battle of the Pyramids. On Aug. 4th Nelson annihilated the French fleet in the Bay of Aboukir. All means of return to Europe for the French were then cut off; but Napoleon, having suppressed with rigor a riot in Cairo, advanced to attack the Turkish forces assembling in Syria. He took El Arish and Gaza, and stormed Jaffa. But after sixty days'

siege he was compelled to abandon the attempt to capture Acre, which was defended by a Turkish garrison under Djezzar Pasha, assisted by Sir Sidney Smith and a small body of English sailors and marines. He re-entered Cairo on the 14th June, 1799, and on the 25th July attacked and almost annihilated a Turkish force which had landed at Aboukir. On the 22d August he abandoned the command of the army to Kléber, and embarking in a frigate landed at Fréjus, 9th October, having eluded the English cruisers. He hastened to Paris, secured the co-operation of Moreau and the other generals then in the capital, and abolished the Directory on the 18th and 19th Brumaire (9th–10th November). A new constitution was then drawn up chiefly by the Abbé Siéyès, under which Napoleon was made first consul, with Cambacérès and Lebrun as second and third consuls. From this time he was virtually ruler of France.

Napoleon's government was marked by sagacity, activity, and vigor in the administration of civil affairs, and so far was highly beneficial to France. But war was his element, and in 1800 he resolved to strike a blow at Austria. Having executed a daring march into Italy across the Great St. Bernard he defeated the Austrians at Marengo, and after the decisive battle of Hohenlinden Austria obtained peace by the Treaty of Lunéville, 1801. Treatics were subsequently concluded with Spain, Naples, the pope, Bavaria, Portugal, Russia, Turkey, and finally, on the 27th March, 1802, the treaty known as that of Amiens was signed by Britain. In 1802 Napoleon was proclaimed by a decree of the senate consul for life, and in 1804 he had himself crowned as emperor, upward of 3,000,000 votes of the people being given in favor of this measure. To this period belongs the famous body of laws known as the Code Napoléon. See Code.

In 1803 war had again broken out with Britain, and Napoleon collected an army and flotilla which were to invade England. In 1805 Britain, Russia, Austria, and Sweden united against Napoleon, who marched at once across Bavaria at the head of 180,000 men, and compelled the Austrian General Mack to capitulate at Ulm with 23,000 men (20th October), the day before Nelson's great victory at Trafalgar. On the 13th November he entered Vienna, and on December 2, having crossed the Danube, he completely routed the allied Russian and Austrian armies at Austerlitz. The Austrian emperor instantly sued for peace, giving up to France all his Italian and Adriatic territories. In February, 1806, a French army occupied the continental part of the Neapolitan states, of which Joseph Bonaparte was declared king on the deposition of their former sovereign. Another brother of the emperor, Louis, became king of Holland. Various districts in Germany and Italy were erected by the conqueror into dukedoms and bestowed upon his most successful generals. This brought him into collision with Prussia, and war was declared on 8th October. On the 14th Napoleon defeated the enemy at Jena, while his general, Davoust, on the same day gained the victory of Auerstädt. On the 25th Napoleon entered Berlin and issued the celebrated Berlin Decrees, directed against British commerce. He then marched northward against the Russians, who were advancing to assist the Prussians. At Pultusk (28th December) and at Eylau (8th February, 1807), he met with severe checks; but on the 14th June was fought the battle of Friedland, which was so disastrous to the Russian arms that Alexander was compelled to sue for an armistice. On the 7th July the Peace of Tilsit was concluded, by which the King of Prussia received back half of his dominions, and Russia undertook to close her ports against British vessels. The Duchy of Warsaw was erected into a kingdom and given to the King of Saxony; the Kingdom of Westphalia was formed and bestowed upon Jérôme, Napoleon's youngest brother; and Russia obtained a part of Prussian Poland, and by secret articles was allowed to take Finland from Sweden. As Portugal had refused to respect the Berlin Decrees, Napoleon sent Junot to occupy Lisbon (30th November, 1807). The administrative affairs of Spain having fallen into confusion, Napoleon sent an army under Murat into that kingdom, which took possession of the capital, and by the Treaty of Bayonne Charles IV. resigned the Spanish crown, which was given to Joseph Bonaparte, Murat receiving the vacant sovereignty of Naples. The great body of the Spanish people rose against this summary disposal of the national crown, and Britain aided them in their resistance. Thus was commenced the Peninsular war, which lasted seven years. A French squadron was captured by the British at Cadiz (June 14, 1808); General Dupont surrendered at Baylen with 18,000 men (22d July); Junot was defeated by Sir Arthur Wellesley (Wellington) at Vimeira (21st August). But Napoleon rushed to the scene of action in October at the head of 180,000 men, and entered Madrid in spite of all resistance by the Spaniards on the 4th December. The British troops, now under Sir John Moore, were driven back upon Corunna, where they made a successful stand, but lost their general (16th January, 1809). In the meantime Austria again declared war and got together an army in splendid condition under the Archduke Charles. Napoleon hurried into Bavaria, encountered the archduke at Eckmühl (22d April), and completely defeated him; on the 13th May he again entered Vienna. On May 21st and 22d he was himself defeated at Aspern and Esslingen; but on the 6th July the Austrians were crushed at Wagram, which enabled Napoleon to dictate his own terms of peace; these were agreed to on the 14th October at Schönbrunn. On his return to Paris Napoleon was divorced from Joséphine who had borne him no children, and on the 2d April, 1810, he was married to the Archduchess Maria Louisa of Austria. The fruit of this union was a son.

The years 1810 and 1811 were the period of Napoleon's greatest power. On the north he had annexed all the coast-line as far as Hamburg, and on the south Rome and the southern Papal provinces. But now the tide began to turn. Russia found it impossible to carry out the continental blockade and give due effect to the Berlin decrees; so in May 1812 Napoleon declared war against that country, and soon invaded it with an army of about 500,000 men. The Russians retired step by step, wasting the country, carrying off all supplies, and avoiding as far as possible general engagements. The French pushed rapidly forward, defeated the Russians at Borodino and elsewhere, and entered Moscow only to find the city on fire. It was impossible to pursue the Russians farther, and nothing remained but retreat. The winter was uncommonly severe, and swarms of mounted Cossacks incessantly harassed the French, now sadly demoralized by cold, famine, disease, and fatigue. Of the invaders only about 25,000 left Russia. Napoleon immediately ordered a fresh conscription, but the spirit of Europe was now fairly roused. Another coalition, consisting of Prussia, Russia, Breat Britain, Sweden, and Spain, was formed, which early in 1813 sent its forces toward the Elbe. Napoleon had still an army of 350,000 in Germany. He defeated the allies at Lützen, at Bautzen, and at Dresden; but the last was a dearly-fought victory for the French, who were now so outnumbered that their chief was compelled to fall back on Leipzig. There he was completely hemmed in, and in the great "Battle of Nations," which was fought on the 16th, 18th, and 19th October, he was completely defeated. He succeeded in raising a new army, and from January to March, 1814, he confronted the combined hosts of the allies. But numbers were against him; and Wellington, having driven the French out of the Peninsula, was advancing from the south. On the 30th March the allies captured the fortifications of Paris, and next day they entered the city. On 4th April Napoleon abdicated at Fontainebleau. He was allowed the sovereignty of the island of Elba, with the title of emperor and a revenue of 6,000,000 francs, and Louis XVIII. was restored. After a residence of ten months he made his escape from the island, and landed at Fréjus on the 1st March, 1815. Ney and a large part of the army joined him, and he made a triumphal march upon Paris; but it was mainly the army and the rabble that he now had on his side. The allied armies once more marched toward the French frontier, and Napoleon advanced into Belgium to meet them. On the 16th June he defeated Blücher at Ligny, while Ney held the British in check at Quatre-Bras. Wellington fell back upon Waterloo, where he was attacked by Napoleon on the 18th, the result being the total defeat of the French. The allies marched without opposition upon Paris. Napoleon abdicated in favor of his son, and tried to escape from France, but failing he surrendered to the captain of a British man-of-war. With the approval of the allies he was conveyed to the island of St. Helena, where he was confined for the rest of his life. He died in May, 1812, and was buried in the island, but in 1840 his remains were

transferred to the Hôtel des Invalides, Paris.

NAPOLEON II., Napoleon François Joseph Charles Bonaparte, only son of the preceding, was born in Paris 1811; died at Schönbrunn 1832. In his cradle he was proclaimed King of Rome. On the first abdication of the emperor he accompanied his mother, Maria Louisa of Austria, to Vienna. His title there was Duke of Reichstadt. He never assumed the title of Napoleon II.; but on the accession of his cousin Louis Napoleon in 1852, some title being necessary, the late emperor took that of Napoleon III., which being recognized by the governments of Europe, implied the recognition of the former title.

NAPOLEON III., Charles Louis Napoleon Bonaparte, Emperor of the French was born at Paris 1808; died at Chiselhurst, England, 1873. He was the youngest son of Louis Bonaparte, brother of Napoleon I. and king of Holland, and of Hortense de Beauharnais. His early life was spent chiefly in Switzerland and Germany. By the death of his cousin the Duke of Reichstadt (Napoleon II., see above) he became the recognized head of the Bonaparte family, and from this time forward his whole life was devoted to the realization of a fixed idea that he was destined to occupy his uncle's imperial throne. In 1836 an attempt was made to secure the garrison of Strasburg, but the affair turned out a ludicrous failure. The prince was taken prisoner and conveyed to Paris, and the government of Louis Philippe shipped him off to the United States. The death of his mother brought him back to Europe, and for some years he was resident in England. In 1840 he made a foolish and theatrical descent on Boulogne; was captured, tried and sentenced to perpetual confinement in the fortress of Ham. After remaining six years in prison he escaped and returned to England. On the outbreak of the revolution of 1848 he hastened to Paris, and securing a seat in the national assembly, he at once commenced his candidature for the presidency. On the day of the election, 10th December, it was found that out of 7,500,000 votes Louis Napoleon had obtained 5,434,226; Cavaignac, who followed second, had but 1,448,107. On the 20th the prince-president, as he was now called, took the oath of allegiance to the republic. He looked forward to a higher position still, however, and pressed for an increase of the civil list from 600,000 franc first to 3,000,000, then to 6,000,000, with his term of office extended to ten years, and a residence in the Tuileries. At last, on the evening of the 2d December, 1851, the president declared Paris in a state of siege, a decree was issued dissolving the assembly, 180 of the members were placed under arrest, and the people who exhibited any disposition to take their part were shot down in the streets by the soldiers. Another decree was published at the same time ordering the re-establishment of universal suffrage, and the election of a president for ten years. When the vote came to be taken, on the 20th and 21st of the same month, it was discovered that 7,439,218 suffrages were in favor of his retaining office for ten years, with all the powers he demanded, while only 640,737 were against it. As soon as Louis Napoleon found himself firmly seated he began to prepare for the restoration of the empire. In January, 1852, the national guard was revived, a new constitution adopted, and new orders of nobility issued; and at last, on the 1st of December, Louis Napoleon Bonaparte was proclaimed emperor under the title of Napoleon III. On the 29th January, 1853, the new sovereign married Eugénie Marie de Montijo, countess de Teba; the result of this union being a son, Napoleon-Louis, born 16th March, 1856. In March, 1854, Napoleon III., in conjunction with England, declared war in the interest of Turkey against Russia. (See Crimean War.) In April, 1859, war was declared between Austria and Sardinia, and Napoleon took up arms in favor of his Italian ally, Victor Emanuel. The allies defeated the Austrians at Montebello, Magenta, Marignano, and Solferino. By the terms of the Peace of Villafranca Austria ceded Lombardy to Italy, and the provinces of Savoy and Nice were given to France in recognition of her powerful assistance (10th March, 1860). In 1860 the emperor sent out an expedition to China to act in concert with the British; and in 1861 France, England, and Spain agreed to despatch a joint expedition to Mexico for the purpose of exacting redress of injuries, but the English and Spaniards soon withdrew. The French continued the quarrel and an imperial form of government was initiated, Maxmilian, archduke of Austria, being placed at its head with the title of emperor. Napoleon, however withdrew his army in 1867, and the unfortunate Maxmilian, left to himself, was captured and shot. On the conclusion of the Austro-Prussian war of 1866 Napoleon, jealous of the growing power of Prussia, demanded a reconstruction of frontier, which was per-emptorily refused. The ill-feeling between the two nations was increased by various causes, and in 1870, on the Spanish crown being offered to Leopold of Hohenzollern, Napoleon demanded that the king of Prussia should compel that prince to refuse it. Notwithstanding the subsequent renunciation of the crown by Leopold war was declared by France (19th July). (See Franco-German war.) On the 28th July Napoleon set out to take the chief command, and on 2d September the army with which he was present was compelled to surrender at Sedan. One of the immediate consequences of this disaster was a revolution in Paris. The empress and her son secretly quitted the French capital and repaired to England, where they took up their residence at Camden House, Chiselhurst. Here they were rejoined by the emperor (who had been kept a prisoner of war for a short time) in March, 1871, and here he remained till his death. His only child, the prince imperial, who had joined the British army in South Africa as a volunteer, was killed by the Zulus 2d June, 1879.

NARCIS'SUS, according to Greek mythology the son of the river-god Cephissus. The young Narcissus was of surpassing beauty, but excessively vain and inaccessible to the feeling of love. Echo pined away to a mere voice because her love for him found no return. Nemesis determined to punish him for his coldness of heart, and caused him to drink at a certain fountain, wherein he saw his own image, and was seized with a pas-

Narcissus.

sion for himself of which he pined away. The gods transformed him into the flower which still bears his name.

NARCIS'SUS, an extensive genus of bulbous plants. The species are numerous, and from their hardiness, delicate shape, gay yellow or white flowers, and smell, have long been favorite objects of cultivation, especially the daffodil, the jonquil and white narcissus.

NARCOT'IC, derived from a Greek term signifying numbness or torpor, is the name given to a large class of substances which, in small doses, diminish the action of the nerves. Most narcotics are stimulating when given in moderate doses; in larger doses they produce sleep; and in poisonous doses they bring on stupor, coma, convulsions, and even death. Opium, hemlock, henbane, belladonna, aconite, camphor, digitalis, tobacco, alcohol, leopard's-bane, and a variety of other substances, are narcotics.

NARSINGHPUR, chief town of district of the same name, Central Provinces of India. Pop. 10,222. The district has an area of 1916 sq. miles, and pop. 313,829.

NARVAEZ (når-vä'eth), Ramon Maria, Duke of Valencia, Spanish statesman and general, born 1800, died 1868. Early in life he entered the Spanish army and he rapidly acquired distinction. When Gomez, the Carlist general, was engaged in his adventurous march through Spain in 1836, Narvaez, who then commanded a division under Espartero, was directed to pursue him, and totally routed him near Arcos. Having taken part in an unsuccessful rising of the progressista party in 1838, he fled to France and remained there five years. In 1843 he hastened to Spain, put himself at the head of an insurrection, and entered Madrid victorious (July, 1843). In the following year he formed his first ministry, and received from Queen

Isabella the rank of marshal and the title of Duke of Valencia. His government was overthrown in 1846, but he was soon recalled, and during the remainder of his life was several times intrusted with the formation of a cabinet.

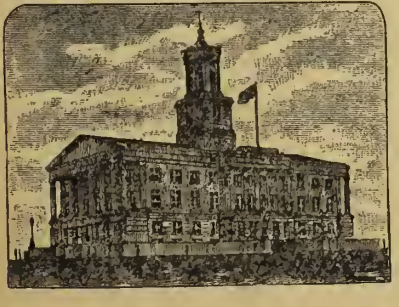
NARWHAL, a cetaceous mammal found in the northern seas, averaging from 12 to 20 feet in length. The body color is whitish or gray spotted with darker patches. There is no dorsal fin. The dentition of the narwhals differs from that of all other members of the dolphin family. In the female both jaws are toothless, but the male narwhal has two canines in the upper jaw, which are

Narwhal or sea-unicorn.

sometimes developed into enormous projecting tusks, though commonly only the one on the left side is so developed, being straight, spiral, tapering to a point and in length from 6 to 10 feet. It makes excellent ivory. From the frequency with which the narwhal appears as having a single horn it has obtained the name of the Sea-unicorn, Unicorn-fish, or Unicorn Whale. The food of the narwhal appears to consist chiefly of mollusca, and notwithstanding its formidable armature it is said to be inoffensive and peaceable. The Greenlanders obtain oil from its blubber, and manufacture its skin into useful articles.

NASH'UA, a manufacturing town in New Hampshire, county of Hillsborough, 35 miles south of Concord, at the junction of Merrimac and Nashua rivers. It has several extensive cotton manufactories, and manufactures of steam-engines, locks, guns, tools, shuttles, carpets, etc. Pop. 25,382.

NASHVILLE, the capital of the State of Tennessee and of Davidson co., on the left bank of the Cumberland, on



State capitol, Nashville, Tenn.

rocky bluffs rising above the river. The state capitol on Capitol Hill is a fine building. The town has no fewer than four universities: Nashville University, with a specially important medical school; Vanderbilt University; Fisk University for colored students; and Roger Williams (Baptist) University. Nashville is a great commercial center, having a large trade in cotton and tobacco. There are cotton factories and other works. Pop. 1909, 135,000.

NASHVILLE, UNIVERSITY OF, situated at Nashville, Tenn., one of the leading educational institutions of the southwest. The university has a collegiate department with an attendance of over 600, a medical school, and a preparatory department with over 300 students in each.

NASIK, a district in Bombay, British India; area, 5940 sq. miles. Pop. 781,206. The chief town is Nasik, which ranks among the most sacred places of Hindu pilgrimage, and is a place of considerable industrial importance. Pop. 21,490.

NASMYTH, James, born in Edinburgh 1808. The steamhammer, which has rendered possible the immense forgings now employed, was invented by him in 1839. The steam piledriver, and the safety foundry ladle, are among his other inventions. He was also a skilled astronomer. He died in 1890.

NASR-ED-DEEN, Shah of Persia, born 1829, succeeded 1848. In 1856 his occupation of Herat involved him in war with Britain. He made two journeys to weastern Europe, in 1873 and 1889. In his reign telegraphic communication between Europe and India through Persia was secured. He was assassinated in 1896.

NAST, Thomas, American illustrator, born at Landau, Bavaria, in 1840. He came to the United States with his parents in 1846. He went to England in 1860 and then traveled to Italy to follow Garibaldi, making sketches of the war. Returning to America, he formed a connection with Harper's Weekly. In 1862 his drawings of scenes from the American civil war, published in Harper's periodicals, attracted wide attention. In 1872 he started Nast's Illustrated Almanac, and illustrated The Tribute Book, Nasby's Swinging 'round the Cerkle, and other works, including Dickens' Pickwick Papers and Pictures from Italy. In 1894 he was with the Pall Mall Magazine, London. On May 1, 1902, he was appointed as consul-general to Guyaquil, Ecuador, where he died on December 7th of the same year.

NASTUR'TIUM, the genus to which the water-cress belongs. Also a popular name for Indian cress, an American climbing annual with pungent fruits and showy orange flowers.

NATAL', a British colony on the southeast coast of Africa, bounded on the land side by Cape Colony, Basutoland, Orange River Colony, Transvaal, and Portuguese territory; area, including Zululand and the Vryheid district, etc., detached from the Transvaal in 1902, is 36,450 sq. miles. The only spot where sheltered anchorage can be obtained is at Port Natal, a fine circular bay near the center of the coast. Pop. 993,000, comprising 73,000 whites, 70,000 Indians, and 850,000 natives (chiefly Kaffirs).

NATCHEZ, a city of the United States in the state of Mississippi and on the river Mississippi, 279 miles above New Orleans. It is built on a bluff 150 feet above the water, and on the narrow strip of land between the foot of the hill and the river. Natchez is a great cotton mart, and has an increasing trade. Pop. 13,870.

NAT'ICA, a genus of gasteropodous molluscs, forming the type of the family Naticidæ. The shell is globular, with few whorls. Seven or eight species are British.

NATION, either a people inhabiting a certain extent of territory and united by common political institutions, such as the English nation; or an aggregation of persons of the same ethnological family and speaking the same or a cognate language.

NATIONAL AIRS, any class of airs peculiarly identified with the music of some particular people, and especially a tune which by national selection or consent is adapted to words which represent or reflect a sentiment, taste, or habit of a nation, and which is usually sung or played on certain public occasions.

NATIONAL CHURCH, the established church of a country or nation. In England the national church is Protestant and Episcopalian; in Scotland, Protestant and Presbyterian. See Established Church.

NATIONAL DEBT, the sum which is owing by a government to individuals who have advanced money to the government for public purposes, either in the anticipation of the produce of particular branches of the revenue, or on credit of the general power which the government possesses of levying the sums necessary to pay interest for the money borrowed or to repay the principal. See Funds.

NATIONALISTS, the term applied to the Irish political party whose programme includes the more or less complete separation of Ireland from Great Britain. See Home Rule.

NATIONAL LEAGUE. See Land League.

NATIONAL PARK. See Yellowstone, Yosemite, Northwest Territories.

NATIONS, LAW OF. See International Law.

NATIVITY. See Astrology.

NATRON LAKES, several lakes or pools rich in natron in the vicinity of Zakook, a village about 60 miles w.n.w. of Cairo.

NATTERJACK, Natterjack Toad, the Bufo calamita, a species of toad found in various parts of western Europe, in certain parts of Asia (including Tibet), and not uncommon in England. The general color is lightish-brown, spotted with patches of a darker hue. A line or streak of yellowish tint passes down the middle line of the back. It does not leap or crawl like the common toad, but rather runs, whence it has the name of walking or running toad. It has a deep and

hollow voice, audible at a great distance. It is often found in dry situations.

NATTOR', a town of India, in Bengal, on the Nadar river, an offshoot of the Ganges. Pop. 9094.

NATURAL GAS, a gas found issuing naturally from crevices in the earth's surface in various localities. It burns like ordinary coal gas, and consists of a mixture of various hydro-carbons, the chief ingredient being marsh-gas (fire-

Natterjack.

damp). It has long been known and utilized to some extent as an illuminant, but only in recent years has it attained much importance, being now largely employed in the United States both for lighting purposes and as a fuel. It is most abundant in the petroleum regions.

NATURAL HISTORY, in its widest sense, that department of knowledge which comprehends the sciences of zoology and botany, chemistry, natural philosophy or physics, geology, palæontology, and mineralogy. It is now, however, commonly used to denote collectively the sciences of botany and zoology, and it is sometimes restricted to denote the science of zoology alone.

NATURALISM, the doctrine that all the operations in the universe, moral as well as physical, are carried on in accordance with fixed laws, and without the interference of any supernatural power.

NATURALIZATION. See Alien.

NATURALIZATION LAWS OF THE UNITED STATES, the conditions under and the manner in which an alien may be admitted to become a citizen of the United States are prescribed by sections 2, 165–74 of the revised statutes of the United States.

The alien must declare upon oath before a circuit or district court of the United States or a district or supreme court of the territories, or a court of record of any of the States having common law jurisdiction and a seal and clerk, two years at least prior to his admission, that it is, bona fide, his intention to become a citizen of the United States, and to renounce forever all allegiance and fidelity to any foreign prince or state, and particularly to the one of which he may be at the time a citizen or subject.

He must at the time of his application to be admitted declare on oath, before some one of the courts above specified, "that he will support the constitution of the United States, and that he absolutely and entirely renounces and abjures all allegiance and fidelity to every foreign prince, potentate, state or sovereignty, and particularly, by name, to the prince, potentate, state, or sovereignty of which he was before a citizen or subject," which proceedings must be recorded by the clerk of the court.

If it shall appear to the satisfaction of the court to which the alien has applied that he has made a declaration to become a citizen two years before applying for final papers, and has resided continuously within the United States for at least five years, and within the state or territory where such court is at the time held one year at least; and that during that time "he has behaved as a man of good moral character, attached to the principles of the constitution of the United States, and well disposed to the good order and happiness of the same," he will be admitted to citizenship. If the applicant has borne any hereditary title or order of nobility he must make an express renunciation of the same at the time of his application.

Any alien of the age of twenty-one years and upward who has been in the armies of the United States, and has been honorably discharged therefrom, may become a citizen on his petition, without any previous declaration of intention, provided that he has resided in the United States at least one year previous to his application, and is of good moral character. (It is judicially decided that residence of one year in a particular state is not requisite.)

Any alien under the age of twenty-one years who has resided in the United States three years next preceding his arriving at that age, and who has continued to reside therein to the time he may make application to be admitted a citizen thereof, may, after he arrives at the age of twenty-one years, and after he has resided five years within the United States, including the three years of his minority, be admitted a citizen; but he must make a declaration on oath and prove to the satisfaction of the court that for two years next preceding it has been his bona fide intention to become a citizen.

The children of persons who have been duly naturalized, being under the age of twenty-one years at the time of the naturalization of their parents, shall, if dwelling in the United States, be considered as citizens thereof.

The children of persons who now are or have been citizens of the United States are, though born out of the limits and jurisdiction of the United States, considered as citizens thereof.

The naturalization of Chinamen is expressly prohibited by section 14, chapter 126, laws of 1882.

Section 2,000 of the revised statutes of the United States declares that "all naturalized citizens of the United States while in foreign countries are entitled to and shall receive from this government the same protection of persons and property which is accorded to native-born citizens."

The right to vote comes from the state, and is a state gift. Naturalization is a federal right and is a gift of the Union not of any one state. In nearly one-half of the Union aliens (who have declared intentions) vote and have the right to vote equally with naturalized or native-born citizens. In the other half only actual citizens may vote. The federal naturalization laws apply to the whole Union alike, and provide that no alien may be naturalized until after five years' residence. Even after five years' residence and due naturalization he is not entitled to vote unless the laws of the state confer the privilege upon him, and he may vote in several states six months after landing, if he has declared his intention, under United States law, to become a citizen.

The inhabitants of Hawaii were declared to be citizens of the United States under the act of 1900 creating Hawaii a territory. Under the United States supreme court decision in the insular cases, in May, 1901, the inhabitants of the Philippines and Porto Rico are entitled to full protection under the constitution, but not to the privileges of United States citizenship until congress so decrees, by admitting the countries as states or organizing them as territories.

NATURAL PHILOSOPHY, originally the study of nature in general; but now commonly restricted to the various sciences classed under Physics.

NATURAL SELECTION, a phrase frequently employed in connection with Darwin's theory of the origin of species, to indicate the process in nature by which plants and animals best fitted for the conditions in which they are placed survive, propagate, and spread, while the less fitted die out and disappear; this process being combined with the preservation by their descendants of useful variations arising in animals or plants. Mr. Darwin's theory takes origin from the fact that all species vary to a greater or less extent. These variations, through particular or "selected" members of the species, become perpetuated. What was at first a mere individual variation becomes in this way and through transmission a perpetuated "variety" or a "race." These "races" are subject to a similar process of variation, and varieties of the race may in turn appear; and thus through the variety we in time arrive at forms which present characters so widely different from those of the original species that they may be regarded structurally and functionally as new species. In the domestication and breeding of cattle and sheep, in the numerous varieties of dogs, pigeons, and other animals, man, it is believed, through artificial selection, has imitated nature in her process, and has produced varieties or breeds which differ widely from the original stock or specific type.

NATURAL THEOLOGY is that department of ethics which deals with those propositions relating to the existence and attributes of God and the duty of man which can be demonstrated by human reason, independent of written revelation.

NATURE PRINTING is the art of giving an exact reproduction of natural objects by printing from impressions of the objects themselves formed by pressure on metallic plates The only objects to which the art can be applied with success are those with tolerably flat surfaces, such as dried and pressed plants, especially ferns and seaweeds, embroidery and lace, the grain of wood, etc. In one method the object is placed between a plate of copper and one of lead, when a perfect intaglio impres-

sion is made on the leaden plate, from which an electrotype is taken, and from this the impressions are taken.

NAUGATUCK, a town in New Haven co., Conn., on the Naugatuck river, and on the Naugatuck Division of the N.Y., N.H. and Hart. Railroad; 5 miles s. of Waterbury. Its manufactures include rubber and woollen goods, malleable iron, paper boxes, pins, buttons, belt-lacing, and electro-plated ware. Pop. 12,421.

NAU'SEA, the sensation of sickness, or inclination to vomit, similar to that produced by the motion of a ship at sea. Though the feeling is referred to the stomach, it frequently originates in disorder of other and remote parts of the body, such as the brain, kidney, womb, etc.

NAU'TILUS, a genus of cephalopods with polythalamous or many-chambered shells. The shell of the pearly nautilus is a spiral with smooth sides. The turns or whorls are contiguous, the outer whorl covering the inner. The chambers of the shell are separated by transverse septa, and one after the other have been the residence of the

Nautilus shown in section.

animal, being successively abandoned as it has grown. The animal thus always resides in the cavity of its outermost or external chamber. A siphuncle connects the body with the air-chambers, passing through each transverse septum till it terminates in the smallest chamber at the inner extremity of the shell. These internal chambers contain only air. By means of the siphuncle the animal is enabled to sink itself or to swim. The nautilus is an inhabitant of the tropical seas. Only three or four existing species are known, though the fossil species exceed a hundred. The name is often loosely applied to the shells of different genera of mollusca. The animal which has been said to sail in its shell upon the surface of the water is the paper-nautilus or argonaut. See Argonaut.

NAVAJO INDIANS (nä-vä'hō), a tribe of American Indians numbering about 12,000, many of whom are engaged in civilized pursuits. They occupy a reservation in the n.w. of New Mexico and the n. e. of Arizona.

NAVAL ACADEMY UNITED STATES, the school situated at Annapolis, Md., founded in 1845 at which are educated the executive officers of the United States navy.

The students of the naval academy are called midshipmen. Two midshipmen are allowed for each senator, representative, and delegate in congress, two for the district of Columbia, and five each year from the United States at large. The appointments from the district of Columbia and five each year at large are made by the president. One midshipman is allowed from Porto Rico, who must be a native of that island. The appointment is made by the president, on the recommendation of the governor of Porto Rico. The congressional appointments are equitably distributed, so that as soon as practicable each senator, representative, and delegate in congress may appoint one midshipman during each congress. The course for midshipmen is six years—four at the academy, when the succeeding appointment is made, and two years at sea, at the expiration of which time the examination for graduation takes place. Midshipmen who pass the examination for final graduation are appointed to fill vacancies in the lower grade of the line of the navy and of the marine corps, in the order of merit as determined by the academic board of the naval academy. Candidates allowed for congressional districts, for territories, and for the district of Columbia must be actual residents. Candidates at the time of their examination must be physically sound, well formed, and of robust constitution. Attention will also be paid to the stature of the candidate, and no one manifestly under size for his age will be received at the academy. The height of candidates for admission shall not be less than 5 feet 2 inches between the ages of 16 and 18 years, and not less than 5 feet 4 inches between the ages of 18 and 20 years; and the minimum weight at 16 years of age shall be 100 pounds, with an increase of not less than 5 pounds for each additional year or fraction of a year over one-half. Any marked deviation in the relative height and weight to the age of a candidate will add materially to the consideration for rejection. Candidates must be unmarried, and any midshipman who shall marry, or who shall be found to be married, before his final graduation, shall be dismissed from the service. All candidates must, at the time of their examination for admission, be between the ages of 16 and 20 years. The pay of a midshipman is $500, beginning at the date of admission.

NAVAL CADETS. See Naval Academy.

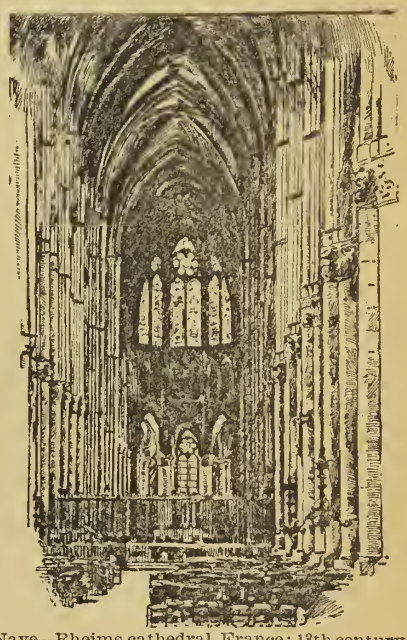
NAVAL HOSPITALS. See Hospital.

NAVARRE, a former kingdom, now a province of Spain, between Aragon, Old Castile, and Biscay; area, 4045 sq. miles; pop. 321,015.

NAVE, in Gothic architecture, that part of a church extending from the western entrance to the transept, or to the choir and chancel, according to the nature and extent of the church

NAVEL, or UMBILI'CUS, the aperture or passage in the abdomen which in the adult is normally closed, but in the fœtus or embryo gives passage to the umbilical vessels, by means of which the fœtus communicates with the parent through the placenta. The cicatrization or healing of the navel produces the contracted and depressed appearance so familiar in the external aspect of the structure.

NAVIGATION, the science or art of conducting ships or vessels from one place to another. The management of the sails, rudder, etc., or the working of the ship generally, though essential to the practice of navigation belongs rather to seamanship, navigation being more especially the art of directing and measuring the course of ships, the method of determining their position, etc., by the laws of geometry, or by astronomical principles and observations. In order to the accomplishment of this the ship must be provided with accurate charts of seas, plans of ports and harbors, etc., compasses, chronometer, sextant, log and log-line, various mathematical instruments, leads and



Nave—Rheims cathedral, France; 13th century.

lead-lines, log-book, etc. It is by the compass that the direction in which the ship sails or should sail is determined. Though it points in a northerly direction, it does not generally point to the true north, but has a certain variation which must be taken into account. The rate of speed at which a vessel is sailing is found by means of the log, which is heaved usually at the end of every hour. By noting the rate of sailing, the direction of the course, and the time occupied, the ship's position may be estimated, allowance being made for deviation caused by currents, and by the wind driving the vessel to leeward. The position thus determined is said to be found by dead-reckoning. It is not safe to trust to dead-reckoning for any length of time, and a more accurate method of finding the vessel's position at any time is required. This consists in taking observations of the heavenly bodies with the sextant, and these being compared with data given in the Nautical Almanac, while correct Greenwich time is given by the chronometer, the latitude and longitude, or true position, is easily found. In navigating a ship a certain knowledge of trigonometry is required; but the operations can be much shortened by tables and instruments. In directing a ship's course, and applying it on a chart, several methods of what are called sailings are employed, as plane sailing (the earth being regarded as having a plane surface), Mercator's

sailing, great circle sailing (sailing on a great circle of the sphere), etc.

NAVIGATION LAWS are based upon the right of a state to regulate the navigation of its own waters and to protect its own commerce, and may be divided into two classes.

The first class includes all those laws, once so numerous, designed to secure a commercial monopoly to the state which enacted them. Any advantages which a British ship has, e.g., the right of claiming protection for her flag, the non-attachment to her of a maritime lien for necessaries supplied in a British port, are not directly connected with the policy under which the navigation acts have become obsolete. These advantages are not secured to a British ship until she is registered. American law agrees with British in this respect. The United States have imitated the policy of England and other commercial nations in conferring peculiar privileges upon American-built ships and owned by our own citizens. The object of the registry acts is to encourage our own trade, navigation, and ship-building by granting peculiar or exclusive privileges of trade to the flag of the United States, and by prohibiting the communication of those immunities to the shipping and mariners of other countries. It may be noticed that an alien is generally incapable of becoming the owner of a ship. This incapacity is specially preserved in the case of British ships by the naturalization act, 1870.

The second class of navigation laws includes those which deal with the navigation of any waters over which a state has any control, and embraces all that is necessary for the due use of such waters, as rules of the road, management of harbors and lighthouses, and licensing and control of pilots. Such laws may deal with (1) the high seas, (2) tidal waters other than the high seas (3) non-tidal waters.

NAVIGATOR'S ISLANDS. See Samoa.

NAVY, the ancient method of naval warfare consisted, in great part, in the driving of beaked vessels against each other; and therefore skill and celerity in manœuvring, so as to strike the enemy at the greatest disadvantage, were of the utmost importance. This mode of conflict has been attempted to be revived at the pretsent time, and vessels called "steam-rams" are specially constructed for this species of conflict. The earliest powers having efficient fleets appear to have been the Phœnicians, Carthaginians, Persians, and Greeks; the Greeks had fleets as early as the beginning of the 7th century B.C.—the first sea-fight on record being that between the Corinthians and their colonists of Corcyra, 664 B.C. The earliest great battle in which tactics appear to have distinctly been opposed to superior force, and with success, was that of Salamis (480 B.C.), where Themistocles, taking advantage of the narrows, forced the Persian fleet of Xerxes to combat in such a manner that their line of battle but little exceeded in length the line of the much inferior Athenian fleet. The Peloponnesian War, where "Greek met Greek," tended much to develop the art of naval warfare. But the destruction of the Athenian marine power in the Syracusan expedition of 414 B.C., left Carthage mistress of the Mediterranean. The Roman power, however, gradually asserted itself, and after two centuries, became omnipotent by the destruction of Carthage. For several following centuries, the only sea-fights were occasioned by the civil wars of the Romans. Toward the close of the empire, the system of fighting with pointed prows had been discontinued in favor of that which had always co-existed—viz., the running alongside, and boarding by armed men, with whom each vessel was overloaded. Onagers, balistæ, etc., were ultimately carried in the ships, and used as artillery; but they were little relied on, and it was usual, after a discharge of arrows and javelins, to come to close quarters. A sea-fight was therefore a hand-to-hand struggle on a floating base, in which the vanquished were almost certainly drowned or slain.

The northern invaders of the empire, and subsequently the Moors, seem to have introduced swift-sailing galleys, warring in small squadrons and singly, and ravaging all civilized coasts for plunder and slaves. This—the break-up of the empire—was the era of piracy, when every nation, which had more to win than lose by freebooting, sent out its cruisers. Foremost for daring and seamanship were the Norsemen who penetrated in every direction from Bosporus to Newfoundland. Combination being the only security against these marauders, the medieval navies gradually sprang up; the most conspicuous being—in the Mediterranean, those of Venice, Genoa, Pisa, Aragon; on the Atlantic sea-board, England and France. In the Mediterranean, Venice, after a long struggle with the Genoese, and subsequently with the Turks, became the great naval power. The Aragonese fleet gradually developed into the Spanish navy, which, by the epoch of Columbus, had a rival in that of Portugal. Many struggles, left in the 16th and 17th centuries, the principal naval power in the hands of the English, French, Dutch, Spaniards, and Portuguese.

Dating the modern navies of the world from the 16th century, we find the British navy rising from insignificance by the destruction of the Spanish Armada in 1588; a blow which Spain never recovered, and which the Dutch whose naval force had acquired tremendous strength in their struggle for independence, increased the weight of, by their triumph in 1607, in the Bay of Gibraltar. At this time there was no decisive superiority of the fleet of England over that of France; but each was inferior to the Dutch navy. The Commonwealth and reign of Charles II. was signalized by the struggle for mastery between the English and Dutch; when victory, after many alternations, finally sided with the former. Through the 18th century, the English and French were the principal fleets; but Louis XVI. gave a decided superiority to the navy of France; and at the period of the American war, the naval power of England was seriously threatened. Spain, Holland, and Russia (now for the first time a naval power) had meanwhile acquired considerable fleets; and the "armed neutrality," to which the northern powers gave their adherence, rendered the British position most critical.

Camperdown broke the Dutch power; many battles weakened the French navy; and at Trafalgar, in 1805, it, with the Spanish power, was swept from the ocean. The United States had in the meantime augmented their fleet, and in the war of 1812–1814, maintained a glorious struggle. During the American war of secession, many gun-boats, "monitors," and ironclads of all classes,

Order of Rank	Powers	1st Class Battleships	2d and 3d Class Battleships	Coast Defense Ships	Armored Cruisers	Protected or 1st Class Cruisers	Other Cruisers (2d and 3d Class)	Sea-Going Gunboats	River Gunboats	Torpedo Boat Destroyers	Torpedo Boats	Transports, Hospital, Special Service Ships, Tugs, Etc.	Subsidized and Auxiliary Ships	School and Training Ships	Officers	Men
1	Great Britain	49	20	7	37	30	119	98	18	184	290	386	70	30	6,756	96,492
2	France	22	19	8	19	37	14	38	30	41	329	219	27	11	3,590	52,193
3	United States	28	1	22	12	22	16	11	*31	16	†41	103	15	5	2,257	32,211
4	Germany	18	11	6	12	19	17	30	12	43	86	116	22	17	2,719	33,820
5	Japan	‡18	8	13	13	29	38	23	18	43	87	99	63	7	2,869	30,490
6	Italy	9	11	4	7	11	22	19	3	19	141	87	9	4	1,560	25,800
7	Russia	8	11	12	5	6	22	10	11	68	192	67	69	10	2,600	50,000
8	Austria-Hungary	1	15	7	3	4	12	15	4	3	80	27	..	3	868	11,000
9	Chile	2	2	1	3	2	2	2	..	1	18	26	..	2	660	7,290
10	Turkey	..	12	1	..	..	6	1	..	4	27	21	..	..	690	20,000
11	Greece	..	4	..	..	1	5	12	..	2	44	15	..	1	585	6,870
12	Denmark	..	10	..	..	4	..	8	..	1	30	48	..	4	361	6,426
13	Sweden	1	7	..	2	1	3	9	8	2	31	27	..	3	640	7,612
14	Netherlands	..	8	15	..	9	5	34	44	..	92	11	..	3	830	25,000
15	Norway	1	7	6	1	7	5	12	16	2	38	9	..	2	270	4,360
16	Spain	..	4	..	4	3	31	9	20	5	14	20	10	7	749	5,892
17	Brazil	..	5	5	2	4	4	6	13	..	22	13	..	2	420	5,000
18	Argentine Republic	..	3	2	6	3	4	10	..	..	32	3	3	1	464	4,826
19	Portugal	..	..	3	1	3	21	20	21	..	41	17	1	1	280	3,200
20	English Colonies	..	..	..	..	9	7	14	16	..	23	7	2	..	181	2,000
21	China	..	..	..	..	3	15	13	14	..	14	11	2	..	300	5,400
22	Peru	..	..	..	..	..	3	5	..	..	...	...	..	..	142	1,245
23	Mexico	..	..	..	..	..	1	9	..	..	...	...	..	..	149	1,390
24	Colombia	..	..	..	..	..	..	7	..	..	...	...	..	..	80	600
25	Belgium	..	..	..	..	..	..	7	..	..	...	9	..	..	230	920

* Includes captured vessels from Spain. † Includes scout vessels. ‡ Includes captured Russian vessels.

were created; but chiefly adapted for river and coast service. The Emperor Napoleon III. greatly enlarged and improved the French navy, yet in the war of 1870–1871 it had no opportunity of proving its effectiveness.

The contest between the attack and defense which has been going on for some time, appears to have attained its limits in the 100-ton guns of the Italian navy, and the 24-inch armor-plate of the British; and a new departure seems already to have been taken which points in the direction of steel-plates and speed, and a more special adaptation of ships for particular services. The torpedo system has introduced a new element into naval warfare, particularly in harbors, rivers, and inland waters, which can hardly be said to be yet fully developed; and the catastrophes of the Vanguard of the British navy, and the Grosser Kurfürst of the German, have pointed out dangers connected with the ram system that had not been calculated upon.

The table on page 866 gives the comparative strength of the chief navies of the world.

NAVY, The New American. The Indiana, Massachusetts and the Oregon were the first battleships rated as first-class built for the American navy—the Maine and Texas authorized in 1886 being rated as only second class. The three were sister ships, each having a displacement of 10,288 tons, and each carrying four 13-inch guns, eight 8-inch guns and four 6-inch guns in their main batteries. The Oregon was built on the Pacific coast, in pursuance of a policy adopted by congress in 1888, of having a part of the new ships for the navy constructed on the west coast. The Indiana and Massachusetts played important parts in the naval operations in Cuban waters during the war with Spain in 1898. The Oregon earned worldwide fame by its remarkable cruise of 10,800 miles, from San Francisco to Jupiter Inlet, Florida, around Cape Horn. It was the most notable voyage ever undertaken by a battleship of its class in the history of modern navies.

In 1891 congress provided but for one addition to the navy—the protected cruiser Minneapolis—a sister ship of the commerce destroyer Columbia. In 1893, however, congress added the armored cruiser Brooklyn and the first-class battleship Iowa to the navy. Both ships represented a distinct advance in naval construction. The Brooklyn was larger and more heavily armed than the New York, the only armored cruiser in the navy at that time, while the Iowa had a displacement of 11,340 tons as against the 10,288 tons of the Indiana, Massachusetts, and Oregon. Both ships rendered valuable service in the Spanish-American war. The Brooklyn was the flagship of Rear Admiral Schley, second in command at the battle of Santiago, and was hit oftener by Spanish shells than any other American vessel in the engagement. The Iowa took part in the same battle.

Three gunboats, the Helena, Nashville, and Wilmington, and a submarine torpedo boat, the Plunger, were authorized by congress in 1893. The Nashville fired the first hostile shot in the war with Spain, capturing the Spanish ship Bonaventura on the morning of April 22, 1898, only a few hours after war was declared and while Sampson's fleet was on its way from Key West to begin the blockade of Havana. Congress in 1894 authorized only the construction of three torpedo boats, the Foote, Rodgers and Winslow. The Winslow won distinction in the Spanish-American war in the action at Cardenas on May 11, 1898. The Winslow had entered the bay to assist in cable cutting operations and came under range of the Spanish shore batteries. Ensign Worth Bagley and four sailors were killed, this being the first American blood shed by the Spaniards in the war.

The congress of 1895 made a notable increase in the navy, providing for the construction of no less than eleven vessels, including two first-class battleships, six gun boats and three torpedo boats. The battleships were the sister ships Kentucky and Kearsarge and offered a radical departure from any type of battleship ever before constructed in any navy. Both were supplied with superimposed turrets—a pair of 13-inch guns in the lower turret and a pair of 8-inch guns in a smaller turret mounted upon the larger turret. The gunboats provided in the same naval program were the Annapolis, Marietta, Newport, Princeton, Vicksburg, and Wheeling. They are all small cruising vessels, each of 1000 tons displacement, built for West Indian and Caribbean sea service. The torpedo boats included the Dupont, Porter and Roman.

Congress in 1896 added the three first-class battleships Alabama, Illinois, and Wisconsin, and ten torpedo boats, and in 1897 three more torpedo boats and a training ship to the navy. In 1898, the naval program was the largest ever authorized at a single session of congress. The list included three first-class battleships larger than any before designed for the American navy, sixteen torpedo boat destroyers—the first ever built by the United States, twelve torpedo boats, four coast defense monitors and one gunboat. The Spanish-American war undoubtedly was the direct moving cause of this generous expansion of the navy. The war had demonstrated the fact that the United States could not claim immunity from war with a foreign power and that the naval combats of the future were to be fought with first-class battleships.

The additions to the navy authorized in 1898 were three first-class battleships, the West Virginia, Nebraska, and Georgia, three great armored cruisers, the California, Pennsylvania and Virginia, and six protected cruisers, and in 1900 provided for two more first-class battleships, the New Jersey and Rhode Island, three armored cruisers, the South Dakota, Maryland and Colorado, three protected cruisers of a new and advanced type, the Charleston, Milwaukee and St. Louis, each of 9,700 tons displacement.

Congress in 1900 also made a new departure in naval construction by providing for seven submarine torpedo boats.

Two first-class battle-ships, the Connecticut and the Louisiana, two armored cruisers, the Tennessee and Washington, two gunboats, the Dubuque and Paducah, were added in 1902. The congress of 1903 authorized no less than five first-class battleships of 16,000 tons displacement each, the equals of any fighting ships afloat in any navy. In 1904 a first-class battleship and three swift cruisers were added to the navy, and in 1905 two more first-class battleships were added.

No limit has been fixed by naval authority, congressional action, or public sentiment. The general naval board at the head of which stands Admiral Dewey is on record officially as stating that the work of construction should continue without interruption until at least 48 first-class battleships and 48 first-class armored cruisers of the heaviest class and highest type should be in commission.

NAVY, ARMY AND, RELATIVE RANK IN THE UNITED STATES. Generals rank with admirals, lieutenant-generals rank with vice-admirals, major-generals rank with first nine rear-admirals, brigadier-generals rank with rear-admirals after the first nine and commodores, colonels rank with captains, lieutenant-colonels rank with commanders, majors rank with lieutenant-commanders, captains rank with lieutenants, first lieutenants rank with lieutenants junior grade, second lieutenants rank with ensigns, cadets rank with midshipmen.

NAVY, Department of the, one of the nine executive departments of the United States government, created by act of congress of April 30, 1798, and charged with the general control and administration of the navy. At the head of the department is a secretary, who is a member of the cabinet, appointed by the president with the advice and consent of the senate, and receives an annual salary of $8000.

It is his duty to execute such orders as the president may give relative to the administration of naval affairs, including the procurement of naval supplies and the construction, armament, equipment, and employment of vessels of war. He makes annual report to the president of the operations of the navy department. His deputy is the assistant secretary, who is appointed by the persident, and who during the absence or incapacitation of the secretary acts in his stead, taking the title of acting secretary.

NAVY-YARDS. 1. Brooklyn navy-yard, Brooklyn, N. Y., 2. Charleston navy-yard, Boston, Mass. 3. Portsmouth navy-yard, near Norfolk, Va. 4. Kittery navy-yard, opposite Portsmouth, N. H. 5. League Island navy-yard, Philadelphia, Pa. 6. Mare Island navy-yard, near San Francisco, Cal. 7. Washington City navy-yard, Washington, D. C. 8. Puget Sound navy-yard Bremerton, Wash.

There are naval stations at Port Royal, S. C.; Charleston, S. C.; Key West, Fla.; Pensacola, Fla.; Algiers, La.; Great Lakes, North Chicago, Ill.; a torpedo and training station at Newport, R. I., and a training station on Yerba Buena Island, Cal., and the naval

War college, Newport, R.I. Naval stations have been established at Tutuila, Samoa, Island of Guam; San Juan, Porto Rico; Culebra, W. I.; Guantanamo, Cuba, Honolulu, H. I., and Cavite, Philippine islands. The latter has become an important naval base for the Asiatic squadroon.

NAZARINES, a designation given to the early Christians from the town of Nazareth, where Christ dwelt. The name was also applied to a sect which arose at the end of the 1st century, and existed chiefly in Egypt. They are supposed to have retained a judaizing adherence to the Mosaic law, and to have held a low opinion about the divinity of Christ.

NAZ'ARETH, a small town in Palestine, 65 miles north of Jerusalem, celebrated as the residence of our Savior during his youth. It is surrounded on all sides by hills. The houses are of stone, well built, with flat roofs. There is a Franciscan convent and fine church; an English mission church, school, and orphanage; a Greek church, and a mosque. Pop. about 6000.

NEBO, or **NABU,** an ancient Assyrian and Babylonian deity, lord of the planet Mercury, and ruler of the hosts of

Nebo.

heaven and earth, according to Babylonian inscriptions, especially honored in Borsippa. Statues of Nebo have been found in Nineveh, showing him with long beard and hair, and clad in a long robe.

NEBRAS'KA, one of the United States, bounded by South Dakota, Iowa, Missouri, Kansas, Colorado, and Wyoming; area, 76,855 sq. miles. It lies in the region of the great plains skirting the eastern slope of the Rocky mountains, toward whose foothills it rises in a gentle undulating incline. The whole western half of the state lies at an elevation of more than 2500 feet above the sea.

The climate is dry and exhilarating. The mean temperature for January is 19.7° and for July 74.8°. The extremes are very great, the mercury sometimes falling to —42° and at times rising to 114° The nights are cool. The annual rainfall is 23 inches, but this is very unevenly distributed. In the east it is sufficient to support agriculture, ranging from 30 inches on the average to a local maximum as high as 50 inches. In the western half it is below 20, and in the extreme west as low as 12 inches, so that here agriculture cannot be carried on successfully without irrigation. On the n.w. it is a desolate tract known as the Mauvaises Terres or Bad Lands, rich in interesting fossil remains. Timber has been extensively planted of late. The principal rivers are the Missouri, which forms the boundary on the east;

Seal of Nebraska.

its great affluent, the Nebraska or Platte, which, formed by two main forks, a northern and a southern, both from the Rocky Mountains, traverses the territory in an eastern direction; and the Republican Fork of Kansas river, traversing the southern part of the state. The soil, except in the northwest and southwest, is a deep rich loam underlaid by a porous clayey subsoil, and is thus admirably adapted to withstand drought. Nebraska ranks as one of the most important agricultural states. 60.8 per cent of the total land area is included in farms, and of this 61.6 per cent is improved. Irrigation in the arid areas of the west has been attended with success. In some regions there are supplies of underground water, which can be utilized by means of windmills and small reservoirs.

Corn is the leading crop, nearly one-half of the cultivated acreage of the state being devoted to it. The acreage devoted to wheat is about one-third that of corn and there have been large increases in the area devoted to oats and rye during each of the last two decades of the nineteenth century; rye, however, is of only minor importance. Grasses cut for hay are chiefly wild, salt, or prairie grasses, but millet, alfalfa, and other cultivated grasses are also grown. Potatoes and other vegetable crops are extensively grown. In the last decade of the past century a rapid increase was made in the cultivation of sugar beets. The growing of orchard fruits is mainly confined to the southeastern part of the state. Cattle and horses require little protection or hand feeding during winter. Manufactures are as yet generally restricted to the supply of local wants. The railway system centers in Omaha, the chief city, the Union Pacific railway passing through the state. Limestone, sandstone, and gypsum are abundant; coal is found in limited quantity; and there is a good supply of salt. The chief towns are Omaha (by much the largest) and Lincoln (the state capital). At the head of the educational establishments stand the State university at Lincoln, the Protestant Episcopal college in Nebraska City, and the Congregational college at Crete. In all the principal towns there are graded and high schools supported by general and local taxation, and a generous share of the public lands has been set apart for educational purposes.

Nebraska was probably first visited by Europeans in 1541, in July of which year the Spanish general and explorer Coronado penetrated from New Mexico to a country which he called Quivira, and described as lying about the fortieth parallel, and abounding in buffalo, which corresponds with the region of the Platte. About the middle of the 18th century French missionaries from Canada came to the Missouri, and still later a few traders found their way here. It constituted a portion of the Louisiana territory which was purchased by Jefferson from France in 1803. At that time Indian tribes still occupied the whole region. At some earlier period a more civilized race lived here who made pottery and skillful carvings, built houses and fortifications, and reared mounds which often contain the ashes of their dead. When Nebraska came into possession of the United States the Sioux Indians were most numerous. The Pawnees, Otoes, and Omahas were next in numbers and in importance.

The first settlement by whites was made in 1847 at Bellevue, on the Missouri, nine miles south of Omaha. Here a trading post of the American Fur company was conducted. The Mormon emigration, begun in 1847, traversed several paths, one of which lay through Nebraska, which thus became generally known throughout the country. During the overland traffic to California that commenced in 1849, depots of supply were established at Bellevue, Plattsmouth, Nebraska City, and in the interior at Fort Kearney.

The act constituting Nebraska a distinct territory, and opening its lands to settlement, was approved May 30, 1854. Its area then embraced 351,558 sq. miles, extending from the fortieth parallel to British America on the north, its eastern line connecting the Missouri river on the southeast with the Red river on the north, and its western line being the summit of the Rocky mountains. In 1861 Nebraska was shorn of its extended territory by the cutting off of portions of it to form Dakota and Colorado territories. In 1863 it was still further reduced by the formation of Idaho territory. These curtailments left Nebraska a purely prairie state. During the first five years after the organization of the territory the settlements rapidly increased along the Missouri. Great numbers who rushed to Pike's Peak in 1859 when the gold excitement was at its height, on their return, disappointed and disgusted, stopped and opened farms in the state. In 1863 the Union Pacific railroad and in 1864 the Burlington and Missouri River railroad began to sell portions of their land in Nebraska, received from the general government and this became a most potent factor

in turning a tide of emigration into the state.

At the breaking out of the civil war in 1861 the population of the territory comprised less than 30,000. Yet Nebraska furnished to the Union army during the war 3,307 officers and men.

In 1866 the legislature prepared a constitution for a state government, which a vote of the people confirmed. The first legislature under the state constitution met July 4, 1866. The bill to admit Nebraska as a state was passed over the president's veto, and proclaimed on March 1, 1867.

The first capital of Nebraska was at Bellevue. It was removed to Omaha in 1855, where it remained until Nebraska became a state, when it was taken to Lancaster, a town of half a dozen houses, whose name was then changed to Lincoln. The present state constitution was framed in 1875, and was ratified in the same year by the people. The first legislature under the new constitution met in January, 1877. The house of representatives consists of eighty-four, and the senate of thirty members; and the legislature meets biennially.

Politically Nebraska has been republican in national elections with the exception of 1896 and 1908, when it was carried by the democratic candidate, William Jennings Bryan, a resident of the state. Pop. 1,350,000.

NEBRASKA CITY, the capital of Otoe co., Nebraska, on the Missouri, about 35 miles s. of Omaha. It contains the Nebraska college (Episcopal), and the trade is active. Pop. 10,161.

NEBRASKA, University of, a co-educational state university at Lincoln, Neb., founded in 1869. It comprises the graduate school; the college of literature, science, and arts; the industrial college, the college of law; the college of medicine, the school of fine arts; and the affiliated school of music. There is also a summer session. The regents have intrusted to its charge the United States agricultural experiment station, the state museum, the botanical and geological surveys, and the superintendency of farmers' institutes. Students are admitted on examination or on certificates from accredited schools. Military drill is compulsory for first and second year male students in the college, and physical training for all first and second year woman students.

NEBUCHADNEZZAR, a king of Babylon, celebrated as the conqueror of Judah. He reigned from 604 to 561 B.C. He was the son of Nabopolassar, by whom the kingdom of Babylon was definitely made independent of the Assyrian monarchy. In the fourth year of Jehoiakim, king of Judah (605–4 B.C.), he defeated Pharaoh-Necho, king of Egpyt, at Carchemish (Circesium), on the Euphrates, after which he subjugated Syria and Palestine, carrying off with him the sacred vessels of the temple and the chief Jews into captivity. He destroyed Tyre in 585, and some years later he invaded and ravaged Egypt. During the peaceful years of his reign he rebuilt in a magnificent manner Babylon and many of the other cities of the empire, and constructed vast temples, aqueducts, and palaces, whose ruins still testify to his grandeur. His insanity and the events preceding are only known to us from the book of Daniel. Several inscriptions relating to his reign have recently been found.

NEB'ULA, pl. Nebulæ, in astronomy, the name given to certain celestial objects resembling white clouds, which in many cases, when observed through telescopes of sufficient power, have been resolved into clusters of distinct stars. As more and more powerful telescopes have been employed, the number of resolvable nebulæ has become greater and greater, and it is probable that many nebulæ irresolvable at present may yet be shown to be star clusters in telescopes more powerful than those now employed. On the other hand, the spectroscope has shown that many nebulæ, among which are several that had hitherto appeared to be well-authenticated clusters, consist, in part at least, of masses of incandescent gas. The recent researches of Sir J. Norman Lockye render it probable that nebulæ include clouds of meteors, which, by their continual impact against one another, produce the heat, light, and gaseous matter that are detected by our telescopes and spectroscopes. A few of the great nebulæ such as those of Orion, Argo Navis, and Andromeda, are visible to the naked eye; but most are telescopic and of these upward of 5000 are now known to astronomers. Nebulæ have been classified as follows: (1) Resolvable nebulæ, and such as apparently only require instruments of increased power to resolve them into separate stars; (2) Irresolvable nebulæ, showing no appearance of stars; (3) Planetary nebulæ, so called because they slightly resemble in appearance the larger planets; (4) Stellar nebulæ, those having in their center a condensation of light; and (5) Nebulous stars, a bright star often seen in the center of a circular nebula, or two bright stars associated with a double nebula, or with two distinct nebulæ near each other.

NEBULAR HYPOTHESIS, a theory by means of which Laplace (before the existence of nebulous matter in the universe had been discovered by means of the spectroscope) accounted for those features of the solar system which must be regarded as accidental in the Newtonian philosophy. This theory supposes that the bodies composing the solar system once existed in the form of a nebula; that this had a revolution on its own axis from west to east; that the temperature gradually diminishing, and the nebula contracting by refrigeration, the rotation increased in rapidity, and zones of nebulosity were successfully thrown off in consequence of the centrifugal force overpowering the central attraction. These zones being condensed, and partaking of the primary rotation, constituted the planets, some of which in turn threw off zones which now form their satellites. The main body being condensed toward the center, formed the sun. The theory was afterward extended so as to include a cosmogony of the whole universe, and though open to certain objections, is now generally received by astronomers.

NECK, the part of the body which is between the head and the trunk, and connects them. The bones of the neck in man, and in nearly all other mammals, are the seven cervical vertebræ.

NECKER, Jacques, French minister of finance, born at Geneva 1732 died 1804. In 1776 he received an appointment to the treasury, the direction of which he retained for five years. Malversation under the preceding reign had caused a large deficit, to which the American war made great additions. Necker endeavored to meet the exigency by loans and reforms, and above all to fund the French debt, and establish annuities under the guarantee of the state. His suppression of abuses had created him many enemies at court, and shortly after the publication of his famous Compte Rendu, in which he furnished a clear statement of the condition

Necker.

in which he had found things of what he had done and what he intended to do, he resigned and retired to Switzerland, where he published his Administration of the Finances, which had an immense circulation. In 1788 he was recalled as controller-general. The states-general were summoned to meet on the 1st of May, 1789; but not long after the advisers of the king succeeded in inducing him to give Necker his dismissal, and to order him to leave the kingdom. No sooner was his removal known than all Paris was in a ferment. The storming of the Bastille followed (July 14), and the king found himself compelled to recall the banished minister. His return to Paris resembled a triumphal procession. His first object was to restore tranquility and security of person and property. But he was not equal to the political or even the financial crisis, and resigned in September, 1790. He passed the rest of his life in Switzerland, where he occupied himself in writing political and religious treatises. Necker's daughter was the well-known Madame de Staël.

NEC'ROMANCY, the divination of the future by questioning the dead. This superstition originated in the East, and is of the highest antiquity. We find mention made of necromancy in the Scriptures, where it is strongly condemned. In the Odyssey Homer has made Ulysses raise the shade of Tiresias from the infernal regions. In many parts of Greece there were oracles of the dead, the origin of which is lost in the obscurity of history. Although this practice has been condemned by the Christian

Church from the very first, it has not yet entirely ceased. Modern spiritualism embodies all the elements of necromancy The term is often extended so as to include the general art of magic.

NECROP'OLIS (literally, "city of the dead"), a name originally applied to a suburb of Alexandria devoted to the reception of the dead, and hence extended to the cemeteries of the ancients generally. The name has also been given to some modern cemeteries in or near towns.

NECRO'SIS (literally, "mortification"), a medical term signifying the death of the bone substance. It is a condition of the bone substance corresponding to what gangrene is in the soft parts, thus distinguished from caries, which corresponds to ulceration in the soft parts. Necrosis is usually a result of inflammation of the bone, and is often attributed to cold, but frequently it is due to constitutional disease.

NECTAR, in Greek mythology, the drink of the gods, which was imagined to contribute much toward their eternal existence. It was said to impart a bloom, a beauty, and a vigor which surpassed all conception, and together with ambrosia (their solid food) repaired all the decays or accidental injuries of the divine constitution.

NEC'TARINE, a fruit which differs from the peach only in having a smoother rind and firmer pulp, being indeed a mere variety of peach. See Peach.

NEEDLE, a small instrument of steel, pointed at one end, and having an eye or hole in it through which is passed a thread, used for sewing. From very ancient times needles of bone, ivory, wood, and bronze, have been used. The manufacture of steel needles was first introduced into England in the reign of Elizabeth. The operations that an ordinary sewing-needle goes through are very numerous, though of late many improvements have been introduced which reduce the number of separate operations, and many of the needle-making processes are performed by machinery at a great saving of time and labor. The chief of the ordinary operations that a sewing-needle goes through in their proper order are such as follow: The cutting of the steel wire into lengths sufficient for two needles; the pointing of these at both ends on a grindstone by fifty or sixty at a time; the cutting of each length through the middle to give two needles; the flattening of the heads by a blow with a hammer; the piercing of the eyes with a punch applied first on one side then on the other; the trimming of the eyes; the grooving and rounding of the head; hardening, tempering, straightening; polishing, which is done by making up some 500,000 needles into a cigar-shaped bundle along with emery and oil and rolling them backward and forward under a weight. Modifications of the ordinary sewing-needle are used in the various forms of sewing machines, in sailmaking, bookbinding, glovemaking, darning, staymaking, etc. The name is also applied to implements of iron or steel, bone, wood, etc., used for interweaving or interlacing a thread or twine in knitting, netting, embroidery, jacquard-loom weaving, etc., and formed in various ways, according to the purpose for which they are intended; as also to sundry long and sharp-pointed surgical instruments, some employed for sewing, others for other purposes, as in couching for cataract. The small piece of steel pointed at both ends and balanced on a pivot, as in the magnetic compass and some forms of telegraphic instruments is also called a needle, and the term is used for various other objects.

NEEDLE-GUN, a breech-loading rifle the cartridge of which contained a small quantity of detonating powder which was exploded by the rapid darting forward of a needle or small spike. It is now superseded by weapons of superior efficiency. See Rifle.

NE'GATIVE, in photography, is that kind of photographic picture in which the lights and shadows of the natural object are transposed; the high lights being black, and the deep shadows transparent, or nearly so. Negatives are taken on glass and paper by various processes, and should indicate with extreme delicacy, and in reverse order, the various gradations of light and shade which occur in a landscape or portrait. A negative differs from a positive inasmuch as in the latter case it is required to produce a deposit of pure metallic silver to be viewed by reflected light; while in the former, density to transmitted light is the chief desideratum; accordingly inorganic reducing and retarding agents are employed in the development of a positive, while those of organic origin are used in the production of a negative. The possession of favorable conditions of well-directed light being secured, all that is necessary is to establish a proper and harmonious relation between the collodion bath, developer, and time of exposure. A recently-iodized collodion will generally be tolerably neutral, in which case, if the developer be at all strong, and the weather warm, the bath should be decidedly acid or fogging will be the result. Should the collodion, however, be red with free iodine, a mere trace of acid in the bath will suffice, while the development may be much prolonged, even in warm weather, without fogging. If the simple fact be borne in mind that the presence of acid either in the bath collodion or developer, retards the reducing action of the developer, it will suffice to guide the operator in many difficulties. The value of a negative consists in the power it gives of multiplying positive proofs.

NEGLIGENCE, in law, the omission to do that which ought to be done. When such want of care results in injury to another, or involves a wrong done to society, it renders the party guilty of negligence liable to either an action for damages or trial for misdemeanor. In law there are recognized three degrees of negligence: ordinary, the want of ordinary care or diligence; slight, the want of great care or diligence and gross, the want of slight care or diligence. The person charged with negligence must have been under an obligation to exercise care or diligence either assumed by contract or imposed by law. An alleged act of negligence must always be the proximate cause of the injury sustained; but any injury caused to a person by another who at the time is exercising due care is not actionable. The question of negligence is usually one for a jury, and the onus of proof rests on the pursuer, except when the thing resulting from the negligence speaks for itself.

NEGRI'TOS, or **NEGRILLOS,** the name given to several negro-like races inhabiting the islands, etc., of Southeastern Asia, and often confounded with the Papuan race. The chief tribes are the Aëtas, the indigenous people of the Philippine Archipelago, still inhabiting the interior of the islands of Luzon, Negros, Panay, Mindoro, and Mindanao; the Samangs of Malacca; and the Mincopies inhabiting the Andaman Archipelago. They are dwarfish in stature, averaging from 4 feet 6 inches to 4 feet 8 inches in height; the nose small, flattened or turned up at the apex, and the hair soft and frizzled. The various tribes speak distinct and mutually unintelligible dialects.

NEGRO, the name of numerous rivers, both large and small. See Rio Negro.

NEGROES, a race of the human species indigenous to the African Soudan, though the term is often extended so as to cover all the tribes inhabiting Africa from the southern margin of the Sahara as far as the territory of the Hottentots and Bushmen, and from the Atlantic to the Indian Ocean. These tribes are all dark-colored, yellow, copper-red, olive, or dark-brown, passing into ebony-black. The typical negro, however, is described as having a black skin, woolly or crisp hair, a protuberant mouth with thick lips, nose thick and flat, thick narrow skull, flat and receding forehead, hair of the face scanty, thorax compressed, flat buttocks, long arms, knees bent outward, calves weak, and feet comparatively flat with long heels. The brain, though essentially similar to that of the white races, is not so large, averaging about 5 ounces less than that of the white man. The negro as a rule differs as much from the whites in mental as in physical characteristics, though there are many individual exceptions. He is very receptive, and in that which requires imitation he is well developed, but in that which requires independent thought he stands on a low stage. He has less nervous sensibility than the white man, and can flourish in climates fatal to the higher races, and the race does not diminish in contact with civilization. Certain negro tribes of Africa present a surprising picture of barbaric civilization from contact with Mohammedanism. The slave system has alienated great numbers of negroes from their native country mostly to America and the West India Islands, where there has been considerable intermixture of races. There are upwards of 7,000,000 negroes in the United States, many of whom hold good positions in society, as negroes also do in the West Indies and elsewhere.

NEGRO MINSTRELSY, a species of music of a quaint and simple kind, which originated among the negroes of the southern United States, and was first made popular at public entertain-

ments by E. P. Christy, the originator of the troupes of imitation negro musicians. The words of the songs are generally in broken English, and the harmony almost entirely limited to the chords of the tonic and dominant. The bones and banjo are the chief accompanying instruments.

NE'GROPONT. See Eubœa.

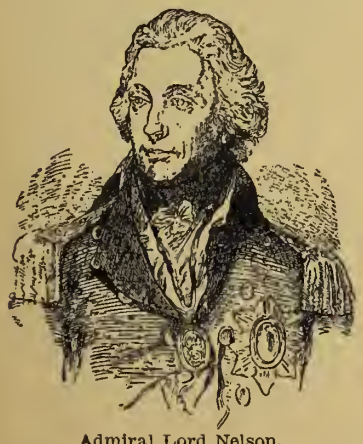
NEGROS, an island in the Asiatic Archipelago, belonging to the Philippines, and separated from Panay by a strait about 15 miles wide. Length 130 miles, average width 24 miles; area about 3800 sq. miles. In the central mountainous part of the island are a considerable number of Negritos, but the inhabitants are chiefly Malays. Sugar is the chief product. Pop. 400,000.

NEGUS, a drink made of port or sherry wine mixed with hot water, sugar, nutmeg, and lemon-juice; so called from Colonel Negus, the inventor.

NEHEMI'AH, a distinguished and pious Jew, who was born in captivity, but was made the cup-bearer of Artaxerxes Longimanus, king of Persia. He was sent, B.C. 444, as governor to Jerusalem, with a commission to rebuild the walls and gates of this city. He accomplished his purpose, but not without difficulties, arising partly from the poverty of the lower classes of the people, and partly from the opposition of the Ammonites and other foreign settlers. The Book of Nehemiah contains Nehemiah's account of his proceedings, with other matter which forms a supplement to the narration contained in the Book of Ezra.

NEILGHERRY (nēl'ge-ri) **HILLS,** a district and range of mountains in Madras Presidency, South Hindustan. Area, 957 sq. miles. Pop. 91,034.

NELSON, Horatio, Viscount, a great British admiral, was born Sept. 29, 1758, at Burnham Thorpe, in Norfolk; died Oct. 21, 1805. On the commencement of the war with the French Republic he was made commander of the Agamemnon, of sixty-four guns (1793), with which he joined Lord Hood in the



Admiral Lord Nelson.

Mediterranean, and assisted at the siege of Bastia (May, 1794). At the siege of Calvi (July 10, 1794) he lost an eye. For his gallantry at the battle of Cape St. Vincent (Feb. 14, 1797) he was made rear-admiral of the blue, and appointed to the command of the inner squadroon at the blockade of Cadiz. His next service was an attack on the town of Santa Cruz, in the Island of Teneriffe, in which he lost his right arm. In 1798 he joined Lord St. Vincent (Admiral Jervis), who sent him to the Mediterranean to watch the progress of the armament at Toulon. Notwithstanding his vigilance, the French fleet which conveyed Bonaparte to Egypt escaped. Thither Nelson followed, and after various disappointments he discovered the enemy's fleet moored in the Bay of Aboukir, where he obtained a most complete victory, all the French ships but two being taken or destroyed (August 1, 1798). This achievement was rewarded with the title of Baron Nelson of the Nile. His next service was the restoration of the King of Naples. In 1801 he was employed on the expedition to Copenhagen under Sir Hyde Parker, in which he effected the destruction of the Danish ships and batteries. On his return home he was created viscount. When hostilities recommenced after the Peace of Amiens Lord Nelson was appointed to command the fleet in the Mediterranean, and for nearly two years he was engaged in the blockade of Toulon. In spite of his vigilance the French fleet got out of port (March 30, 1805), and being joined by a Spanish squadron from Cadiz, sailed to the West Indies. The British admiral hastily pursued them, and they returned to Europe and took shelter at Cadiz. On the 19th of October the French, commanded by Villeneuve, and the Spaniards by Gravina, ventured again from Cadiz, and on the 21st they came up with the British squadron off Cape Trafalgar. An engagement took place, in which the victory was obtained by the British, but their commander was wounded in the back by a musket-ball, and shortly after expired. His remains were carried to England and interred in St. Paul's Cathedral.

NELUM'BIUM, a genus of aquatic plants inhabiting the fresh waters of the

Nelumbium.

temperate parts of the world, type of the natural order Nelumbiaceæ, having large polypetalous flowers with numerous stamens. The best-known species is the Hindu and Chinese lotus, a magnificent water-plant of the rivers and ditches of all the warmer parts of Asia, the Malay Archipelago, Australia, and also found in the Nile. The numerous canals of China are filled with it, its tubers being there used as a culinary vegetable. It is a most beautiful plant, with peltate leaves and handsome rose-colored flowers on tall stalks, and is frequently cultivated in hothouses. In Asia it is generally deemed sacred, and figures in religious rites. The yellow water-bean of the southern states, has starchy rhizomes, with tubers like those

Ripe receptacle of nelumbium.

of the sweet-potato, which are used for food.

NEM'ESIS, a female Greek divinity who appears to have been regarded as a personification of the righteous anger of the gods, inflexibly severe to the proud and insolent, i.e. retributive justice. In the theogony of Hesiod she is the daughter of Night, the avenging Fate who checks and punishes the favorites of Fortune.

NEOLITH'IC, in archæology, a term applied to the more recent of the two periods into which the stone age has been subdivided, as opposed to palæolithic. During this period there is found no trace of the knowledge of any metal excepting gold, which it would seem had sometimes been used for ornaments. The Neolithic stone implements are finely shaped and polished, and are found in connection with the remains of extinct animals.

NE'OPHRON, a genus of birds of the vulture family, one species of which in-

Egyptian vulture, or Pharaoh's hen.

habits Southern Europe, Egypt, and Asia. It is known as the Alpine or Egyptian vulture, Pharaoh's chicken, etc.

NEO-PLATONISM. See New Platonists.

NEPAL', NIPAL', or **NEPAUL',** a small independent state situated on the n.e. frontier of Hindustan; area, about 54,000 sq. miles. The country is a tableland from 3000 to 6000 feet above the level of the sea. It contains within its boundaries the highest mountains in the world—Mount Everest, Dhawalagiri, and on its eastern borders Kanchinjinga. The principal products are rice, wheat,

barley, pulse, sugar-cane, buckwheat, hemp, cotton, tobacco, and madder. Pop. estimated at about 2,000,000.

NEPEN'THE, a drug which was fabled by the ancient poets to banish the remembrance of grief and to cheer the soul. It is thought by many to have been opium.

NEPTUNE, the chief marine divinity of the ancient Romans. When the Greek mythology was introduced into Rome he was completely identified with the Greek Poseidōn, all the traditions relating to whom were transferred by the Romans to their own deity. In art he is usually represented as armed with a trident, and the horse and the dolphin are his symbols. See Poseidōn.

NEPTUNE, in astronomy, the most distant of the known planets, its mean distance from the sun being 2,745,998,000 miles, and its least distance from the earth 2,629,000,000 miles. The eccentricity of its orbit is .00872; its inclination to the plane of the ecliptic is 1° 47′. Its apparent diameter is about 2.7″. Its real diameter is estimated at 36,600 miles, and it seems to have very little polar compression. Its mass is about 16⅔ times that of the earth, and it revolves round the sun in 164.6 years It has one satellite, whose period is 5 days 21 h. 2 m. 44 s., and whose mean distance from the planet is 230,000 miles. Neptune was discovered in 1846 in a position indicated independently by Leverrier and Adams, and deduced from a series of recondite mathematical calculations to find a body which could account for the long-observed perturbations of Urănus.

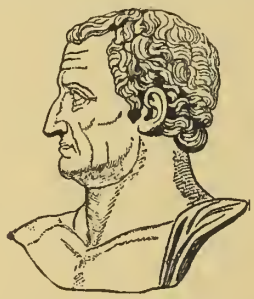
NERBUDDA, or **NARBADA** (nar-bădä), a river of Hindustan. In religious sanctity it ranks second only to the Ganges. Nerbudda is also the name of a division of the Central Provinces of India; area, 17,513 sq. miles; pop. 1,881,147.

NERO, Lucius Domitius Ahenobarbus (after his adoption by the Emperor Claudius called Nero Claudius Cæsar Drusus Germanicus), Roman emperor, the son of Cneius Domitius Ahenobarbus and Agrippina, the daughter of Germanicus. He was born in 37 at

Nero.

Antium, and after the marriage of his mother, in third nuptials, with her uncle, the emperor Claudius, was adopted by that prince, and married to his daughter Octavia. When Nero was about seventeen years of age his abandoned mother poisoned her husband, Claudius, and succeeded in raising her son to the throne, over whom she expected to exercise the most absolute control. Nero became emperor in 54, and the year following disposed of the rightful heir, Britannicus, by poison. For the first few years his public conduct, under the control of Burrhus and Seneca, was unexceptionable; in private, however, he disgraced himself by the most odious vices, and his mother endeavored to retain her influence by shamefully complying with his inclinations. In 59 Nero caused this detestable woman to be murdered, and then, fearing no rival in power, gave full scope to the darkest traits of his character. In 62 he repudiated his wife Octavia. In 64 the burning of Rome occurred, which has been charged, with great probability, upon Nero himself, who, however, accused the Christians of the act, and made it the occasion of the most dreadful cruelties toward them. His debaucheries and cruelties occasioned an almost general conspiracy against him, known as that of Piso, in 65, the discovery of which led to more tortures and bloodshed. The revolt of Vindex was also suppressed. That of Galba in 68 succeeded, and Nero escaped arrest by stabbing himself, being then in the thirty-first year of his age and the fourteenth of his reign. He was a lover of arts and letters, and possessed much taste as a poet and histrionic performer.

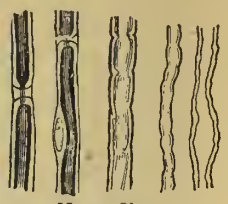
NERVA, the successor of Domitian, and one of the most virtuous of the Roman emperors. He was born in



Nerva—antique gem.

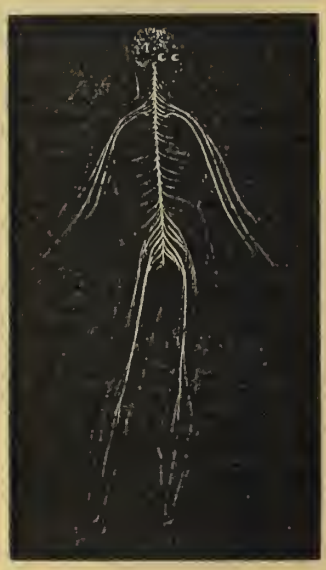
Umbria in 32 A.D., died A.D. 98. He was twice consul, and was elected emperor on the death of Domitian in 96. He adopted Trajan, who succeeded him.

NERVE, Nervous System. A nerve is one of the fibres which proceed from the brain and spinal cord, or from the central ganglia of lower animals, and ramify through all parts of the body, and whose function is to convey impulses resulting in sensation, motion, secretion, etc. The aggregate of these nerves, and the centers from which they proceed, forms the nervous system, the medium through which every act or detail of animal life is inaugurated and directed. The essential idea of any nervous system involves the necessary presence, firstly, of a nerve center or centers, which generate the nervous force or impulse; secondly, of conducting fibres or cords, the nerves; and thirdly, of an organ, part, or structure to which the impulse or impression may be conveyed. The nerve-centers of man and vertebrates generally are disposed so as to form two chief sets, which are to be regarded as essentially distinct. The brain and spinal marrow together (see Brain) constitute the first of these centers, and are collectively included under the name cerebro-spinal system or axis. The second system is the sympathetic or ganglionic. From each of these systems nerve-cords are given off—the cerebral and spinal nerves from the former; and the so-called



Nerve-fibres.

sympathetic fibres from the latter. The brain and spinal cord are contained within the continuous bony case and canal formed by the skull and spinal column; while the chief masses of the sympathetic system form an irregularly disposed chain, lying in front of the spine, and contained within the cavities of the thorax or chest and abdomen. The general functions of the cerebro-spinal system are those concerned with volition and muscular movements, with



Main nerves of the human body.

the control of the senses, and in higher forms with the operations of the mind. The nerves of the sympathetic system in chief are distributed to the viscera, such as the heart, stomach, intestines, blood-vessels, etc.; and the operation of this system is in greater part of involuntary kind, and without the influence or command of the will. The cranial or cerebral nerves pass from the brain through different openings in the skull, and are all in pairs, the first pair being the olfactory nerves or nerves of smell; the second, the optic nerves, or nerves of sight; while others have to do with hearing, taste, general sensibility, and muscular motion. The spinal nerves, after issuing from their openings in the vertebral column, split into two divisions, one of which proceeds to supply parts behind the spine, while the other

passes toward the front. The first eight spinal nerves on each side are called cervical, the next twelve are dorsal, the next five lumbar, then five sacral, and one coccygeal.

All nervous structures consist of two elements, nerve-cells and nerve-fibres. The cells and fibres are combined and associated in various ways, and are imbedded in and supported by fine connective tissue so as to form a connected structure. The cells vary in size from $\frac{1}{5000}$ to $\frac{1}{400}$ of an inch, and consist of masses of protoplasm containing a nucleus and nucleolus. Processes or poles pass from the cell, branching outward.

Various forms of nerve-cells.

Nerve-fibres are of a glossy transparency and of a tubular form. They consist of a rod passing down the center, called the axis-cylinder, which is surrounded on all sides by a white substance, the whole being inclosed in a delicate sheath (neurilemma). The axis-cylinder is a continuation of the nerve-cell process, and acts in an analogous manner to an electric conductor. The nerve-fibres may exhibit a diameter so great as the $\frac{1}{1500}$th of an inch; but their average breadth may be stated to vary from $\frac{1}{2000}$th to the $\frac{1}{3000}$th of an inch. The largest fibres are those of the nerve-trunks themselves; and they diminish in size in the neighborhood of the nerve-centers—brain and spinal marrow—and as they approach to the periphery of the body or to their ultimate terminations. The nerve-fibres of the brain and spinal marrow do not exhibit a limiting membrane; and in the gray matter of the brain and cord the fibres are of exceedingly small size, not exceeding the $\frac{1}{10000}$th or $\frac{1}{14000}$th of an inch in diameter.

The general functions of nerve-fibres may be briefly considered under two aspects. The fibres may convey impressions from the brain or nerve-centers to their peripheral extremities, or to the parts to which they are distributed. Or secondly, they may transmit impressions from the periphery, or from the parts they supply, to their centers. A double series of nerve-fibres, each set subserving one or other of the preceding functions, exists in the cerebro-spinal as well as in the sympathetic nervous system. These series are therefore known as sensory, afferent, or centripital nerves, when they transmit impressions from their peripheral extremities to the brain or centers; and as motor, efferent, or centrifugal nerves, when they carry impressions from the centers to their peripheral terminations. Stimuli of various kinds applied to the nerves arouse the so-called excitability of the fibres, and through this property nerves convey impressions thus made upon them. Impressions have been calculated to pass along a nerve at the rate of about 200 feet per second. Nerve-fibres in any case—motor or sensory—can carry one kind of impulse only, corresponding to the kind of fibre. In certain nerves the impulses or impressions are of a limited or specialized kind, as in the nerves of special sense—for example, sight, hearing, smell—whereby certain distinct sensations, of light, sound, or odors, are produced. And such nerves, therefore, respond only to stimuli of a special kind. The various nerve-centers of the body which originate, or at any rate direct and dispose, the nerve-force, may be viewed as simply ganglia, or as collection of ganglia, or nervous masses. The brain itself falls under this latter division. The general functional relations existing between the nerve-centers and the nerves may be simply illustrated by the phenomena comprehended under the name of reflex action. When a peripheral nerve-fibre is irritated a sensory or centripetal impression is conveyed toward the nerve-center. Arriving at the center the impression is converted into a motor or centrifugal one, and travels along the motor nerve-fibres, to excite, it may be, a muscle or other part to action. The general functional relation of the nervous system may be summarized by stating that its functions comprehend the reception and distribution of impressions; that these impressions originate either from influences acting on the periphery, or from the nerve-centers, brain, or mind; that these impressions respectively influence or stimulate the mind or nerve-centers, and the muscles or secreting structures; and lastly, that all nervous phenomena are exerted through or accompanied by nervous action, and that this latter is, so far as physiology has yet been able to determine, of a uniform and similar kind. See also Eye, Ear, Nose, etc.

The Invertebrata possess no such specialization of the nervous centers as is seen in Vertebrates, in which the brain and spinal cord are inclosed within their bony case and canal, and thus shut off from the general cavity of the body. The great and distinctive feature between the nervous system of Vertebrata and that of lower forms consists in the absence of a defined or chief nervous center, through which consciousness may intervene to render the being intelligent, and aware of the nature of the acts it performs.

NERVOUS DISEASES, are diseases due either to actual changes in the structure of nerve-fibres or nerve-centers, or to some irregularity of nerve function without actual structural change. Thus nervous diseases may be due to inflammation or degeneration of nerve substance; to the pressure on some part of the nervous system of tumors, effused blood, or other fluid; to the death of some part by the cutting off of its blood supply, etc.; or may be the result of lowered nervous action as a part of general bad health.

NERVOUS SYSTEM. See Nerve.

NEST, the abode or habitation, varying greatly in form, materials, and situation, constructed by birds chiefly for the purpose of incubation and the rearing of the young. The nests of birds are of the most diverse character, some birds making little or no nest, while others construct receptacles for the eggs requiring a vast amount of skill and industry. The materials used are also extremely various, being such as mud or clay, twigs, or branches, leaves, grass, moss, wool, feathers, etc. Some birds, for the sake of protection, excavate burrows in banks or sandy cliffs in which to make their nests. Many mammals also are nest-builders, notably mice, moles, dormice, squirrels, foxes, weasels, badgers, rabbits, etc.; and nests are also constructed by certain fishes, reptiles, crustaceans, insects, etc. See Birds' Nests, Edible.

NESTOR, one of the Greek heroes at Troy, son of Neleus, king of Pylos. He took part in the hunting of the Calydonian boar, and in the Argonautic expedition. He is noted as the wisest adviser of the chiefs before Troy, after the fall of which he retired to Pylos, where he lived to a great age.

NET, a term applied to that which remains of a weight, quantity, etc., after making certain deductions. Thus net weight is the weight of merchandise after allowance has been for casks, bags, or any inclosing material.

NET, an open fabric made of thread, twine, or cord, woven into meshes of fixed dimensions, firmly knotted at the intersections. Nets are used for a great variety of purposes, as for protecting fruit-trees, for collecting insects for hammocks, screens, etc., but chiefly for hunting and fishing. The chief kinds of nets used in fishing are the trawl, the drift, the seine, the kettle or weir, and the trammel or set nets. The trawl is a triangular bag with an arrangement for keeping its mouth open, drawn along the bottom of the water. The drift and seine nets are very long in proportion to their breadth, and differ from one another only in the manner in which they are employed. The seine has a line of corks along one of its long borders, and a line of leaden weights along the other; so that when thrown into the water it assumes a perpendicular position. It is used near the shore, being dragged to land with any fish it may enclose, by ropes fastened to the ends. The drift-net is not loaded with lead, but floats in the water, and is used especially in herring-fishing, the fishes as they drive against it becoming caught by the gills. Kettle and weir nets are structures fixed on stakes placed along the coast between high and low water. Trammel or set nets are also fixed between stays, but act like drift-nets.

NETHERLANDS, The, or **HOLLAND,** a kingdom of Europe which lies on the North Sea, n. of Belgium and w. of part of Northern Germany. Its area is 12,648 sq. miles; its pop. in 1901 was 5,263,267. The country is divided into eleven provinces: North Brabant, Gelderland, South Holland, North Holland, Zeeland, Utrecht, Friesland, Overijssel, Groningen, Drenthe, and Limburg. The ruler is also sovereign (grand-duke) of the Grand-duchy of Luxemburg. In addition to her European territories Holland

possesses extensive colonies and dependencies in the Asiatic archipelago and America; including Java, Sumatra, great part of Borneo, Celebes, part of New Guinea, Surinam or Dutch Guiana, the West Indian islands of Curaçao, Saba, St. Eustatius, etc. Estimated colonial pop. about 38,200,000.

The Netherlands (or Low Countries, as the name implies) form the most characteristic portion of the great plain of northern and western Europe. It is the lowest part of this immense level, some portions of it being 16 to 20 feet below the surface of the sea, and nearly all parts too low for natural drainage. The coast-line is very irregular, being marked by the great inlet of the Zuider Zee, as well as by various others, and fringed by numerous islands. In great part the coast is so low that were it not for massive sea-dykes large areas would be inundated and lost to the inhabitants. The highest elevation, 656 feet, is in the extreme southeast. The general aspect of the country is flat, tame, and uninteresting, and about a fifth of the whole surface consists of marsh, sand, heath, or other unproductive land.

The chief rivers of the Netherlands are the Rhine, Maas (or Meuse), Scheldt, and Ijssel. The navigable canals are collectively more important than the rivers, on which indeed they depend but they are so numerous as to defy detailed description. The chief are the North Holland, Canal between Amsterdam and the Helder, length 46 miles; and the more important ship canal, 15 miles long, 26 feet deep and 197 wide, from the North Sea to Amsterdam, and connected by locks with the Zuider Zee. Lakes are also very numerous. The climate of the Netherlands is humid, changeable, and disagreeable. Wheat, of excellent quality, is grown only in favored portions of the south provinces-Rye, oats, and buckwheat, with horse. beans, beet, madder, and chicory, are more common crops; and tobacco is cultivated in the provinces of Gelderland, South Holland, and Utrecht; flax in North Brabant, South and North Holland, Friesland, and Zeeland; and hemp, sugar-beet, oil-seeds, and hops in various parts of the kingdom. Culinary vegetables are cultivated on a large scale, not merely for the sake of supplying the internal demand, but, also for the exportation of the seeds which form an important article of Dutch commerce. But it is in stock (cattle, horses, sheep, swine, goats), and dairy produce in particular, that the rural industry of the Netherlands shows its strength.

The commerce of the country was at one time the most important in the world, and is even yet of great importance and activity. The external commerce is chiefly carried on with Great Britain, Germany, Belgium, and the Dutch colonics in the East. Among imports from the United Kingdom the chief are cottons and woolens, metal goods and machinery; the chief exports, butter and bútterine, live animals, wine and spirits, silks, sugar. The foreign trade centers chiefly in Amsterdam and Rotterdam. The industrial occupations are varied. Shipbuilding and subsidiary trades are among the chief. Of textile manufactures that of linen is the most important; but silks and velvets, as well as woolens and cottons, are produced in considerable quantity. Pigments, brandy, gin, paper, glass, earthenware, etc., are among the more important products. Large numbers of the seaboard population are employed in the deep-sea fisheries. Railways have a length of 1725 miles.

The stock to which the people belong is the Teutonic, the great majority of the inhabitants being descendants of the old Batavians. They comprise over 70 per cent of the population, and are chiefly settled in the provinces of North and South Holland, Zeeland, Utrecht, and Gelderland. The Flemings of North Brabant and Limburg, and the Frisians, inhabiting Friesland, Groningen, Drenthe, and Overijssel, form the other groups. The majority of the people belong to the Dutch Reformed Church (a Presbyterian body); the remainder being Roman Catholics, Old Catholics, Jews, etc. All religious bodies are on a perfect equality. The government is a constitutional monarchy, the executive being vested in the king, and the legislative authority in the states-general, sitting in two chambers. The upper chamber, fifty in number, is elected by the provincial councils or assemblies of the eleven provinces; the lower chamber, 100 in number, is elected directly, the electors being all males of twenty-three years of age taxed at a certain figure. The members of the lower house are paid. Elementary schools are everywhere established, and are partly supplied by the state, but education is not compulsory. Higher class schools are in all the chief towns; while there are state universities, namely, at Leyden, Utrecht and Groningen, and the municipal university at Amsterdam. The commercial capital of the country is Amsterdam, but the seat of government and residence of the sovereign is the Hague.

The southern portion of the Low Countries belonged at the beginning of the Christian era to Belgic Gaul. (See Gaul.) The northern portion, inhabited by the Batavians and Frisians (see those articles), formed part of Germany. The southern portion as far as the Rhine was held by Rome up to A.D. 400, after which it came under the rule of the Franks, as did also subsequently the rest of the country. In the 11th century the territory comprised in the present kingdoms of Belgium and the Netherlands formed a number of counties, marquisates, and duchies corresponding more or less with the modern provinces. By the latter part of the 15th century all these had been acquired by the Duke of Burgundy, and passed to the house of Hapsburg on the marriage of the daughter of Charles the Bold of Burgundy to the son of the Emperor Frederick III. On the abdication of Charles V. in 1556 they passed to his son Philip II. of Spain. In consequence of religious persecution in 1576 Holland and Zeeland openly rebelled, and in 1579 the five northern provinces—Holland, Zeeland, Utrecht, Guelders, and Friesland concluded the celebrated Union of Utrecht by which they declared themselves independent of Spain. They were joined in 1580 by Overijssel, and in 1594 by Groningen. After the assassination of William of Orange, July 10, 1584, Maurice became stadtholder (governor). His victories at Nieuport and in Brabant, the bold and victorious exploits of the Dutch admirals against the navy of Philip II., the wars of France and England against Spain, and the apathy of Philip II., caused in 1609 the Peace of Antwerp. But Holland had yet to go through the Thirty Years' war before its independence, now recognized by all the powers except Spain, was fully secured by the Peace of Westphalia. In the middle of the 17th century the United Netherlands were the first commercial state and the first maritime power in the world, and for a long time maintained the dominion of the sea. The southern provinces alternated between the rule of Spain and Austria till 1797, when they came under the power of the French Republic. In 1806 Louis Napoleon became king of Holland, but in 1810 it was incorporated with the French Emipre. In 1814 all the provinces both of Holland and Belgium were united by the Treaty of Paris to form the Kingdom of the Netherlands. This arrangement lasted till 1830, when the southern provinces broke away and formed the Kingdom of Belgium. King Willem I. attempted to reduce the revolted provinces by force; but the great powers intervened, and finally matters were adjusted between the two countries in 1839. (See Belgium.) The king abdicated in 1840, and was succeeded by his son Willem II. (1840–49), he being again succeeded by his son Willem III., who died in 1890, leaving his ten-year-old daughter Wilhelmina as queen.

NETTLE, a genus of plants consisting chiefly of neglected weeds, having oppo-

Upper part of a fruiting stem of nettle. *a*, the male flower; *b*, the female flower; *c*, a stinging hair, taken from the leaf, highly magnified.

site or alternate leaves, and inconspicuous flowers, which are disposed in axillary racemes. The species are mostly herbaceous, and are usually covered with extremely fine, sharp, tubular hairs, placed upon minute vesicles filled with an acrid and caustic fluid, which by

pressure is injected into the wounds caused by the sharp-pointed hairs Hence arises the well-known stinging sensation when these plants are incautiously handled.

NETTLE-RASH, a common disease of the skin, an eruption closely resembling nettle-stings both as to appearance and and as to the sensation it originates. It consists of small wheals, either red or white, sometimes both, having the centers white and the margins red. The disease may be either acute or chronic. When it is acute generally more or less of fever accompanies it. In almost all cases it arises from a disordered condition of the digestive organs, produced either by indigestible food, or in some persons by particular kinds of food which others eat with complete impunity.

NEUFCHATEL (neu-shä-tel), Neuchâtel, a Swiss canton, bounded by France, Vaud, the Lake of Neufchâtel, and Bern, with an area of 312 sq. miles. Several ridges of the Jura run through the country. The Lake of Neufchâtel, 24 miles long by 8 broad, communicates through the Aar with the Rhine. Grazing and dairy-farming are extensively carried on in the canton; wine, fruits, hemp, and flax are produced. The chief manufactures are lace, cotton, watches, and clocks. The religion is Protestant. The language is French, but German is also spoken. Pop. 126,279.—The capital, which has the same name, lies 24 miles west of Bern, on a steep slope above the northwestern shore of Lake Neufchâtel. Pop. 21,354.

NEURAL'GIA, the name given to that species of morbid pains which occur only in the course of one or more distinct nerves, and by this locally are distinguished from other pains. In neuralgia of the fifth nerve the pain is in one half of the face, and if the central branch is affected the pain is confined to the upper jaw; neuralgia of the chief nerve of the thigh (sciatic nerve) extends along the buttocks and back of the thigh down to the knee, and is called sciatic. It also affects the front, back, and outside of the leg, and the whole foot except its inner border; while neuralgia of the intercostal nerves manifests itself in a belt or circle of pain around the breast. The presence of neuralgia almost invariably indicates a week state of the system. The most common and best ascertained of the neuralgias are those of the nerves of the skin (dermalgia); but nerve pains occur also in other parts, as in the joints, muscles, and in the bowels (enteralgia). Many of the internal parts may be the seat of similar local affections; such, for example, are nervous affections of the heart and respiratory organs, which, however, do not usually manifest themselves by acute pain, but by special symptoms. The primary causes of the injury to the nerve producing neuralgia may be very various. It may be inflammation of the nerve itself, a swelling in or upon it, irritation of it produced by an ulcer or suppuration or swelling of the adjacent parts, especially the cavities of the bones, etc. Thin-blooded persons and those of weak nerves are most liable to be affected by neuralgia, which varies much both in degree and duration. It is often chronic, and often suddenly occurs during the progress of other acute diseases, as in typhus or intermitting fevers. The treatment also of course varies with the nature of the different cases, some admitting of easy cure by the administration of nourishing food, and by the use of iron and quinine, and other tonics, while for others the aid of surgery has to be called in.

NEURASTHE'NIA, is sometimes called the American diseasc, but now recognized as a world wide malady, is perhaps the most frequent of the acquired nerve diseases. All forms of nervous energy are as a rule reduced and fatigue quickly follows the exercise of any of the functions. It occurs principally during the productive period of life but sometimes occurs in neurotic children and nervous adults of advanced years. High altitudes, extremes of climatic conditions, wasting diseases, vicious habits, physical illness, injury, shock, and fright, or protracted anxiety, grief, worry, and excitement, are competent causes. Excesses of all varieties, and finally and most important of all, overwork, must be added to the list. The only essential element in the causation of neurasthenia is overstrain and this is a quantity relative to the inherent capacities of the individual and often correlated with hereditary tendencies or defects.

NEURI'TIS, inflammation of a nerve. Tenderness in the course of the nerve and pain recurring in paroxysms are among the symptoms. Paralysis may occur as a result, and in the case of a special nerve of sense loss of the particular sense. Neuritis of the optic nerve, for instance, is a frequent cause of blindness.

NEUROL'OGY, the branch of science concerned with the anatomy, physiology, disorders and diseases of the nervous system.

NEURO'SIS, a morbid, nervous state, either functional or organic. Neuroses are classed as disorders of motion, sensory disorders, disorders of nutrition, of heat perception, of circulation and mixed neuroses. Among the latter are certain disorders effecting the extremities and the sexual organs.

NEUROT'IC, a term introduced into medicine to indicate some relationship to the nervous system. Thus a neurotic disease is a nervous disease. So medicines that affect the nervous system, as opium, strychnine, etc., are called neurotics.

NEUTER, in zoology, a term applied to indicate those insect forms—represented chiefly among the ants, bees, and wasps—in which the characteristics of sex are either present in a rudimentary condition or may not be developed at all. Thus among the ants the community consists of males, females, and neuters or "workers" as they are also termed. These ant-neuters are simply (sexually) undeveloped females, and upon these forms the performance of all the laborious duties of the ant-colony devolves. In the bees the neuters, or workers, are similarly sterile females. The differences between the fertile females and neuters —both of which are developed from fertilized ova—appear to be produced through differences in the food upon which the respective larvæ are fed, and through similar and surrounding circumstances which affect the nutritive development of the larvæ. Plenty of food is thus said to produce females, and a scantier or different dietary males or neuters. See Parthenogenesis, Ant, Bee, Wasp.

NEUTRAL'ITY, means, in the law of nations, that state of a nation in which it does not take part, directly or indirectly, in a war between other nations. To maintain itself in this state a nation is often obliged to assume a threatening position, to be able to repel, in case of necessity, every aggression on the part of either of the belligerents. Such neutrality is termed an armed neutrality. In maritime wars the treatment of effects of the enemy on board neutral vessels, or neutral effects on board a hostile vessel, gives rise to very important questions. In former times the principle was pretty generally admitted, that the ownership of the goods on board of the vessels was the only point to be considered, and not the property of the vessels themselves. The belligerents, therefore, seized merchandise belonging to the enemy on board of neutral vessels; but they restored neutral property seized under the enemy's flag. But the endless investigations which this system caused, since a consequence of it was the searching of neutral vessels, produced by degrees a new and totally contrary principle, that the flag protects the cargo. The plenipotentiaries of Great Britain, Austria, France, Prussia, Russia, Sardinia, and Turkey, assembled at Paris in April, 1856, agreed that the neutral flag should cover an enemy's goods, with the exception of contraband of war; and that neutral goods, with the exception of contraband of war, are not liable to capture under the enemy's flag. In the arbitration (in 1872) at Geneva of the Alabama claims of the United States against Great Britain, three rules were agreed to by the parties, to the effect that a neutral government is bound to use due diligence to prevent the fitting out in, or departure from, any of its ports of a vessel which it has reasonable ground to believe is intended to carry on war with a power with which it is at peace; that it is bound not to permit a belligerent to make use of its ports as a basis of naval operations, or a source of recruitment of men or military supplies that it is bound to exercise due diligence in its own ports or waters, and as to all persons within its jurisdiction, to prevent any violation of these duties and obligations.

NEUTRAL TINT, a pigment used in water-colors, of a dull grayish hue partaking of the character of none of the bright colors. It is prepared by mixing together blue, red, and yellow in various proportions.

NEVA'DA (ne-vä'da), one of the United States. It is bounded on the north by Oregon and Idaho, on the east by Utah and Arizona, the Arizona boundary being continued on the southeast by the Colorado river as far as the 35th parallel, while a straight line running from the latter point north-

west to Lake Tahoe in latitude 39° n. and thence along the 120th meridian separates Nevada from California on the southwest and west. It ranks fourth in size among the states of the Union. The area is 110,700 sq. miles. It is rather mountainous, having the slopes of the Sierra Nevada.

Nevada owed her early development to mining. Immensely rich lodes of silver and gold were discovered, one of which—the Comstock lode—produced as high as $38,000,000 worth of bullion in one year. With the apparent exhaustion of the Comstock lode, the industry decreased considerably. Gold, copper, lead, and iron ore are also mined. The other minerals found in the state are antimony, mercury, nickel, sulphur, gypsum, salt, and borax.

Agriculture is less developed in Nevada than in any other state. It is the most arid of the states and at the same time contains the most meagre

Seal of Nevada.

sources for an artificial water supply. The most extensive irrigated areas are along the Humboldt river and in the west-central part of the state. The industry centers about stock-grazing, the tilling of the soil being a mere adjunct to it. The animal products, together with the hay and forage and other products fed to live stock, comprise 80.6 per cent of the total value of farm products. Stock-raising being so prominent, hay and forage are naturally the most important of the crops grown. Alfalfa, wheat, barley, oats, and potatoes are also cultivated.

The railroad mileage is a little over 1000 miles. The principal line is the Southern Pacific, running from east to west through the state. There are no navigable streams.

The first settlement in Nevada was made at Genoa, at the foot of the Sierra Nevada, in 1850, though as early as 1848 the Mormons traveling between Salt Lake and California had established a temporary camp at that place. The Mormons made two or three small settlements in the valleys along the base of the Sierra, and until 1859, when the silver mines of the Comstock were discovered, they were the principal white inhabitants. The discovery of silver caused great crowds of miners of all nationalities to pour over the Sierra Nevada from California, and in that year and 1860 several towns were laid out and rapidly built up. In a few years new mineral belts were discovered to the eastward, and soon there were founded many interior towns and camps. When Utah territory was formed, September 9, 1850, the western boundary was fixed as the summit of the Sierra Nevada mountains and so included much of the present state, but the territorial organization did not extend at once to the extreme west, and the inhabitants organized a government of their own. A petition for territorial government was sent to congress in August, 1857, and in 1858 a provisional government was formed. In 1860 another petition was sent to congress and the territorial delegate applied for admission. Meanwhile the Comstock lode had been discovered in June, 1859, and miners flocked thither from every direction. The new territory was separated from Utah, March 2, 1881, being bounded on the east, however, by the 116th meridian. Another degree was cut from Utah, July 14, 1862, and on May 5, 1866, the eastern boundary was extended to the 114th meridian and that part of the state lying below 37° was taken from Arizona. Congress in March, 1864, passed an enabling act and in July the constitution was accepted, and the state was admitted October 31st. Politically the state is swayed largely by local interests. It was republican in national elections until 1892, when it was carried by the people's party. In 1896, 1900 and 1908, it voted for the free-silver candidate, William Jennings Bryan. The capital is Carson City, but Virginia City (pop. 6500) is the largest town. Pop. 132,000.

NEVADA, a city and the county seat of Vernon co., Mo., 100 miles south of Kansas City; on the Missouri Pacific and the Missouri, Kansas and Texas railroads. Nevada became the county seat in 1858, and was incorporated in 1870. Pop. 10,000.

NEVADA, Emma, an American dramatic soprano, born in Austin, Nev., in 1861. She first appeared in opera in London and subsequently sustained leading parts in the leading cities of the continent, making her first professional tour of the United States in 1884–85. She had a wide repertoire, but perhaps her most successful rôle was Mignon, which part she sang for an entire year in Paris.

NEVADA STATE UNIVERSITY, the head of the educational system of the state of Nevada and the only institution of collegiate grade within the state; founded at Elko in 1873 and removed to Reno in 1885. The university comprises the college of agriculture, including departments of dairying and domestic arts and sciences, the college of arts and science, the college of applied science, with departments of mining and metallurgy and mechanical and civil engineering, the State Normal School, and the University High School. Military instruction forms part of the curriculum and a uniform is worn by the students. The degrees conferred are those of B. A., B. S., M. A., M. S., and mining, mechanical and civil engineer.

NEW, for names beginning with this adjective not given here, see the articles under the name which follows it.

NEW ALBANY, a city in Indiana, on the Ohio, opposite Louisville, Ky., with which it is connected by several bridges. Steamboat building is carried on, and there are iron-foundries, rolling-mills, woolen factories, glass-works, etc., Pop. 24,114.

NEW AND LATTER HOUSE OF ISRAEL, See Jezreelites.

NEW ARCHANGEL. See Sitka.

NEWARK, the capital of Licking co, Ohio, on the Balt. and Ohio, and the Pitts., Cin., Chi. and St. L. railways, and the Ohio and Erie Canal; 33 miles n.e. of Columbus. The car-shops of the Balt. and Ohio railroad are located here, and there are also manufactories of glass, portable engines, stoves, iron-bridge work, paper, wire-cloth, carriages, flour, lumber, and soap. Pop. 21,216.

NEWARK, a city and port, the capital of Essex co., New Jersey, 9 miles west of New York City, finely situated on the west side of Passaic river, about 4 miles from its mouth in Newark bay. It is the largest city in the state, and is regularly laid out with wide, straight streets, generally intersecting at right angles. Broad street, the principal thoroughfare, is more than 120 feet broad, shaded with elms, and divides the city into two nearly equal parts. Newark is distinguished as a manufacturing town, the goods including furniture, machinery and castings, leather, boots and shoes, saddlery, oil-cloth, hardware, clothing, india-rubber goods, etc.; there are also textile factories (cotton, woolen), and an extensive sewing-machine factory. There is a considerable coasting trade and constant steamboat communication with New York. Pop. 1909 about 300,000.

NEW BEDFORD, a city and port of Massachusetts, 55 miles south from Boston, on the estuary of the Acushnet, which opens into Buzzard's bay. It has cotton-factories, iron and copper works, oil and candle works, shoe factories, etc. It was at one time the center of the American whale-fishery, but this industry has much declined. Pop. 100,000.

NEWBERN, a city of North Carolina, the port of entry for Pamlico district, on the estuary of the Neuse, which opens into Pamlico Sound. It has a large trade in lumber, tobacco, cotton, and naval stores. Newbern was founded by Swiss settlers in 1710. Pop. 10,210.

NEW BRIGHTON, a part of Richmond borough, New York City, on Staten Island, 6 miles southwest of Manhattan. It contains the "Sailor's Snug Harbor" for aged and disabled seamen of the port of New York, an institution for destitute children of seamen, and many fine residences of New York men of business. Pop. 25,331.

NEW BRITAIN, a city in Hartford co., Conn., on the N. Y. and N. E. and the N. Y., N. H. and Hart. railways; 9 miles s.w. of Hartford. The industries include the manufacture of iron and brass goods, artistic bronze house-trimmings, builders' hardware, cutlery, hosiery, joiners' tools, and brick. Pop. 33,112.

NEW BRUNSWICK, a province of the Dominion of Canada, on the east coast

of North America. Its coast-line is interrupted only at the point of junction with Nova Scotia, where an isthmus of not more than 14 miles in breadth connects the two territories, and separates Northumberland Strait from the Bay of Fundy. The principal rivers are the St. John, 450 miles in length, and navigable for vessels of 100 tons to Fredericton, 90 miles from its entrance into the Bay of Fundy; and the Miramichi, 225 miles in length, which falls into the bay of the same name, and is navigable for large vessels 25 miles from the gulf. New Brunswick is one of the most amply wooded countries in the world, and the forests supply three-fourths of the total exports, now including wood pulp for paper. The fisheries are very valuable. The minerals exported include coal, gypsum, antimony ore, copper ore, manganese, plumbago, and unwrought stone Owing to its cheap coal and proximity to the markets of the world, New Brunswick is expected to develop as a manufacturing country, especially now that the railway system has been completed throughout the interior of the province. The affairs of the province are administered by a lieutenant-governor (appointed by the governor-general in council), aided by an executive or advisory council consisting of seven members, and a legislative assembly of forty-six representatives of the people. The province has ten seats in the Dominion senate and fourteen in the House of Commons. The capital is Fredericton, but the chief commercial center is St. John, which has one of the finest harbors on the North Atlantic. Pop. in 1891, 321,263; in 1901, 331,120.

NEW BRUNSWICK, a city in New Jersey, on the Raritan, which here becomes navigable, 29 miles southwest of New York. The Dutch Reformed Church has here Rutger's College and a theological seminary There are manufactures of india-rubber goods, paper-hangings, machinery, etc. Pop. 24,116.

NEW'BURG, a city of New York state, occupying a commanding position on the west bank of the Hudson river, 60 miles north of New York City. It has a large river trade, especially in coal and timber. Here is the theological seminary of the Associate Reformed Church. Here also is Hasbrouck House, Washington's headquarters in 1782–83. Pop. 29,715.

NEW'BURYPORT, a city and port of Massachusetts, about 3 miles above the mouth of the Merrimac. It contains the University of Modern Languages and has cotton-mills, shoe-factories, and ship-building yards. Pop. 15,895.

NEW CALEDONIA, an island in the Pacific, situated about 800 miles east of Australia. It was discovered by Captain Cook in 1774, and appropriated by the French as a convict settlement in 1854. With the adjacent Loyalty Islands the area is estimated at 6724 sq. miles, and the population at 60,703.

NEW'CASTLE, the principal shipping port of New South Wales after Sidney, situated at the mouth of the Hunter river, about 75 miles northeast from Sydney, on ground rising somewhat steeply from the sea. The principal export is coal from the extensive mines of the neighborhood, which give employment to over 5000 men. Pop. 53,741.

NEWCASTLE, Duke of. See Cavendish.

NEW CASTLE, the capital of Lawrence co., Pa., at the confluence of the Shenango and the Neshannock rivers, which here form the Beaver river, and on the Erie, the Penn., the Pitts. and Lake Erie, the Pitts. and W., and the W. N. Y. and Penn. railways; 52 miles n. by w. of Pittsburg. It is in a bituminous coal, limestone, fire-clay, iron-ore, and sandstone region, and has numerous blast furnaces and mills. Pop. 33,160.

NEWCASTLE-UNDER-LYME, a municipal and parliamentary borough of England, Staffordshire, close to the Potteries and 19 miles n.n.w. of the town of Stafford. Pop. of municipal borough, 19,914; of parliamentary borough 60,667.

NEWCASTLE-UPON-TYNE, a municipal, parliamentary, and county borough in the county of Northumberland, but forming a county in itself. Among the public buildings are the Cathedral of St. Nicholas, an ancient Gothic structure; the Roman Catholic church and Cathedral of St. Mary; the town-hall, the Moot hall in which the assizes for the county are held; the castle, the Central railway-station, the public library and the general market. Some of the more important of its industries are ship-building; and the manufacture of locomotive and marine engines, cannon, shot, tools, fire-bricks, hemp and wire ropes, cables, anchors, sails. Situated in the midst of one of the largest coal-fields in England, it exports immense quantities of coal. Pop. 214,-881.

NEWCOMB (nū'kom), Simon, American astronomer and mathematician, born in Wallace, Nova Scotia, in 1835. He came to the United States in 1853. In 1861 he was appointed professor of mathematics in the United States navy. He was secretary of the Transit of Venus Commission in 1871–74, observed the transit of Venus at the Cape of Good Hope in 1882, and directed several eclipse expeditions, beginning in 1860. He was professor of mathematics in Johns Hopkins University in 1894–1901 and editor of the American Journal of Mathematics. He was a member of nearly all the Imperial and Royal Societies of Europe and of the various scientific associations of this country. He was awarded the Copley, the Huygens, the Royal Society, and the Bruce medal; and numerous other prizes and honorary degrees.

NEW'COMEN, Thomas, a locksmith at Dartmouth, in Devonshire, toward the close of the 17th century, and one of the inventors of the steam-engine. Newcomen conceived the idea of producing a vacuum below the piston of a steam-engine after it had been raised by the expansive force of the steam, which he effected by the injection of cold water to condense the vapor. The merit of first applying the steam-engine to practical purposes is thus due to Newcomen, who, in conjunction with Captain Savery and John Cowley, took out a patent for the invention in 1705. See Steam-engine.

NEW ENGLAND, the northeast portion of the United States, comprising the states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. Originally called North Virginia when granted by James I. to the Plymouth Company in 1606, it received the name of New England from Captain John Smith, who explored and made a map of the coast in 1614.

NEW'FOUNDLAND, a large island of British North America, in the Atlantic Ocean, at the mouth of the Gulf of St. Lawrence, and nearer to Britain than any other part of America—the distance from the port of St. John's to the harbor of Valentia, in Ireland, being only about 1918 miles. Area, excluding the territory of Labrador on the mainland, which belongs to this colony, 40,000 sq. miles. The famous banks of Newfoundland around the coasts swarm with almost every variety of fish, particularly cod. The cod-fishery is prosecuted from June to November, and may be said, with the other fisheries, of seal, lobster, herring, and salmon, to form the stable occupation of the inhabitants. Cod-fish is far the largest export. The trade is chiefly with Britain, Canada, and the United States. The affairs of the colony are administered by a governor, appointed by the crown; an executive council composed of the governor and six responsible ministers; a legislative council of fifteen members, nominated by the governor; and a house of assembly of thirty-six members, elected by manhood suffrage (according to act of 1889). Newfoundland was discovered by John Cabot in 1497, and the first English colony was planted in 1621. A struggle for supremacy took place between the English and the French; but in 1713 Newfoundland and its dependencies were declared, by the Treaty of Utrecht, to belong wholly to Great Britain, the French reserving a right to fish and cure on certain parts of the coast. Responsible government was granted in 1833. The colony, as yet, declines to join the Canadian Confederation. The only noteworthy town on the island is St. John's, the capital. Pop. 216,615.

NEW GRANADA. See Colombia.

NEW GUINEA, or **PAPUA,** a large island in Australasia, next to Australia

Natives of New Guinea.

the largest on the globe; area, 305,900 sq. miles; length about 1500, breadth from 200 to 400 miles. The island is rich in tropical products, possesses a copious and peculiar flora and fauna (birds of paradise being especially numerous and gorgeous), and is suitable for tropical agriculture. On the west coast there are numerous Malay settlements, but the

bulk of the inhabitants are Papuas, a race resembling the negroes of Guinea. The discovery of New Guinea was made by the Portuguese early in the 16th century, but little was known of it till recently. The naturalists were the first to make incursions into its interior, and among these Mr. A. R. Wallace, who visited it in 1858, was the pioneer. The delimitation and division of the island between Great Britain, Germany, and Holland was settled in 1885. That part of the island lying west of the 141st meridian is assigned to Holland, and comprises 150,755 sq. miles; the northern part of the rest of the island is assigned to Germany, and the southern to Great Britain. The German territory, called Kaiser Wilhelm's Land contains 68,785 sq. miles, the English territory 86,457 sq. miles, estimated pop. 135,000. The government of the British portion is in the hands of an administrator appointed by the crown, assisted by an executive and a legislative council. New South Wales, Victoria, and Queensland each contribute to the expense of the government. A German chartered company whose object is to develop the resources of the country has stations in German New Guinea. The Dutch have done little or nothing for their portion of the island. Estimates of the total population vary between 500,000 and 2,500,000.

NEW HAMPSHIRE, one of the United States, bounded on the north by Canada, east by Maine, southeast by the Atlantic, south by Massachusetts, and west by Vermont, from which it is separated by the river Connecticut; area, 9305 sq. miles. This state has a sea-coast of only 18 miles. It ranks fortieth in size among

Seal of New Hampshire.

the United States. New Hampshire is more mountainous than the average state on the Atlantic slope. The easternmost extension of the Appalachian system traverses the state lengthwise and culminates in the White Mountains. Among the peaks whose rocky summits reach above the timber line is Mount Washington with an altitude of 6293 feet. Every part of the state is well drained by numerous streams, the narrow western portion by the Connecticut river, the remainder by rivers flowing to the Atlantic Ocean. The northern part of the state is drained by the Androscoggin river. The principal river after the Connecticut is the Merrimac. The Merrimac probably turns more spindles than any other river in the world. The southeastern corner of the state is drained by streams flowing into the Piscataqua estuary, this being the only harbor on the coast. New England abounds in lakes, the largest being Lake Winnipiseogee. The climate is severe, the ground being snow covered, and the rivers frozen from autumn to spring. Mica, granite, scythe stones, copper, lead, zinc, tin, arsenic, and iron are among the chief minerals of the state. The principal crops are Indian corn, oats, and barley; buckwheat, hay, hops, tobacco, potatoes, flax, beans, and pease are also raised. Apple and pear trees are abundant in the cultivated districts; and the hilly and mountainous regions are still covered with extensive forests of pine, oak, beech, birch, sugar-maple, etc. Manufactures are actively carried on, the principal being cotton, woolen, and worsted goods, boots and shoes, leather, lumber, iron, machinery, furniture, etc. The mileage of railways is greater in proportion to population and wealth than in any other New England state. Education is well attended to. There is but one university, Dartmouth college, Hanover. Earliest settlements in New Hampshire were made near Dover and Portsmouth in 1623. New Hampshire was a part of the Massachusetts colony from 1641 to 1679, from 1689 to 1692, and from 1699 to 1741. During the intervening dates and until 1775 this territory was under colonial governors of its own. The people of New Hampshire took an active part in the revolutionary war. In 1776 a provisional government was founded, and in 1784 a state constitution was adopted. New Hampshire was the ninth state to ratify the federal constitution, which it did on June 21, 1788. The popular name is Granite state. The capital of the province of New Hampshire was Portsmouth. Until 1805 it was migratory but at that date Concord was chosen. New Hampshire was federalist in national politics till 1816, with the exception of 1804, when it voted for Jefferson. From 1816 to 1852 it was consistently democratic. Since 1856 it has been stanchly republican. The capital is Concord, the largest city and the chief manufacturing center is Manchester, and the only port is Portsmouth. Pop. 443,588.

NEW HAVEN, a seaport town in Connecticut, on a bay of same name in Long Island Sound, 72 miles northeast of New York. There are important manufactories of carriages, arms, wire, etc., and there is a large foreign trade, particularly with the West Indies. New Haven is widely known as the seat of Yale College (which see). Pop. 128,117.

NEW HEBRIDES, a long chain of volcanic islands in the Pacific, lying northwest of Fiji and northeast of New Caledonia, and embracing an area of about 3000 sq. miles. The natives (70,000) are of Melanesian race.

NEW JERSEY, one of the eastern United States, bounded on the north by New York, east by the Atlantic Ocean and the Hudson river, south by Delaware and Pennsylvania, from which it is separated by the Delaware river; area, 7815 sq. miles. Though the state lies wholly within the Atlantic slope, it is crossed in the northwest by several ranges of the Appalachian system. There are four distinctly marked topographical regions running in parallel bands across the state from southwest to northeast. The first, the Kittatinny range, an extension of the Blue Mountains of Pennsylvania, runs in a continuous ridge into New York. The second includes the Highlands, an outlying Appalachian range consisting of plateau-like masses, rising to a height of 1200 to 1400 feet. The third is the Piedmont plain, nearly as wide as the first two

Seal of New Jersey.

combined. The fourth constitutes the coastal plain and includes the entire southern half of the state south of a line running from Trenton to Newark Bay.

The western slope of the state is drained by short tributaries into the Delaware river, but by far the greater portion drains directly into the Atlantic Ocean or its inlets. The principal rivers are the Passaic and Hackensack, the Raritan, the Mullica and Great Egg. Lakes are confined chiefly to the northern section.

The most extensively utilized of the state's diversified geological resources are its clays. New Jersey ranks second in the production of pottery and third in the total output of clay products. Brick clay is found in most parts of the state. A variety of stone is quarried in the northwestern counties, and constitutes another important source of wealth. The production of granite has increased rapidly. New Jersey ranks second in the production of Portland cement. Iron has been mined continuously in the northwestern part until the present time. The iron is mined with greater difficulty than in the larger iron-producing regions, but the saving of the cost of transportation makes it profitable. The state has an extensive fishery industry. Next to oysters, the principal species with respect to value are clams, shad, squeteague, bluefish, and cod. The middle portion of the state is agreeably diversified by hills and valleys; the southern part is level and sandy, and to a great extent barren, yielding naturally little else than shrub-oaks and yellow pine. The other portions of the state have a good soil, and produce Indian corn and other cereals, buckwheat, potatoes, etc. The fruits are good, especially apples, pears, cherries, plums, and peaches. The cli-

mate is mild, and nowhere is the cold severely felt in winter except in the mountainous regions of the north, where the finest cattle are reared, and large quantities of butter and cheese made. New Jersey ranks high among the states in manufacturing and chemical industries, while in some industries, as silk, pottery, and glass, it stands first, although it is only sixteenth in population, and forty-sixth in area. It is rich in metals, especially iron and zinc. The principal seat of education is the New Jersey college, Princeton, one of the principal colleges in the United States. There is a state normal school at Trenton. The principal towns are Newark, Jersey City, Paterson, Camden, and Trenton (the capital). The territory included within the limits of the present state was settled by the Dutch from New York between 1614 and 1620. It was one of the original thirteen states of the Union.

Cornelius May ascended the Delaware in 1623, and built a fort 4 miles below the site of Camden. The Swedes, who had conquered and expelled the English colonists from that region in 1638, were in turn conquered by Peter Stuyvesant in 1655. In 1664 the territory was granted by Charles II. to the Duke of York, and by him to Sir George Carteret and Lord John Berkeley. There was no trouble with the Indians, whose titles were peacefully purchased. The proprietors soon divided the territory into East and West Jersey. In 1674 Quakers settled Salem and Burlington and in 1682 a society under Penn bought the Carteret rights in East Jersey. The two provinces were reunited in 1702; and from 1738 New Jersey had its own governors. It bore its part in the colonial wars, contributed 10,726 men to the continental army, besides militia. New Jersey suffered heavily during the revolution, and was the scene of several important campaigns and battles. The state took an active part in the war of 1812, and the civil war. The popular name is Jersey Blue State. Politically, the state has generally inclined toward the democratic party. In 1796, 1800, and 1812, it supported the federalist candidates; from 1836 to 1848 it was whig; in 1860 it gave four votes to Lincoln, and three to Douglas; in 1872 it cast its vote for Grant; and in 1896, 1900 1904 and 1908, it went republican. Pop. 2,500,000.

NEW JERSEY, COLLEGE OF. See Princeton University.

NEW JERUSALEM CHURCH. See Swedenborgians.

NEW LEON, or NUEVO LEON, a Mexican state bounded by Cohahuila, Zacatecas, San Luis Potosi, and Tamaulipas; area, 23,626 sq. miles. It is mountainous but fertile, and lead, gold, silver, and salt are worked; chief town, Monterey. Pop. 327,937.

NEW LONDON, a city in Connecticut, on the Thames, 3 miles from its entrance into Long Island Sound, 42 miles e.n.e. of New Haven. The seal, cod, and mackerel fisheries employ many of the inhabitants. New London is a fashionable summer resort. Pop. 20,298.

NEWMAN, John Henry, Cardinal, born at London 1801. He took part with Keble and Pusey in originating the Oxford movement; was a leader in the propaganda of High Church doctrines, and contributed largely to the celebrated tracts for the Times. The last of these, on the elasticity of the Thirty-nine Articles, was censured by the university authorities, and was followed by Newman's resignation of his livings (1843) and secession to the Church of Rome (1845). In 1879 he was created a cardinal. He has written some remarkable works sustaining the doctrines of the Church of Rome, particularly the Apologia pro Vitâ suâ (1864), and the Reply to Mr. Gladstone (1875) on the Vatican Decrees. He died in 1890.

NEWMAN, John Philip, American clergyman, bishop of the Methodist Episcopal church, was born in New York in 1826. In 1860 he visited Egypt and Palestine, embodying the results of this trip in From Dan to Beersheba, or the Land of Promise as it Now Appears. In 1872 he was appointed by President Grant inspector of consulates in Asia. In 1881 he was a delegate to the first Ecumenical Methodist Conference in London. In 1888 he was elected bishop of the Methodist Episcopal church with his official residence at Omaha, Neb. He died in 1899.

NEW MEXICO, one of the territories of the United States, bounded on the north by Colorado, east by Texas, south by Texas and Mexico, and west by the territory of Arizona; area, 122,580 sq. miles. New Mexico exceeds in size every state in the Union except Texas, California, and Montana. The surface is generally mountainous, being traversed from north to south by the Rocky Mountains. A central valley extends across the whole territory from north to south, with an average breadth of 20

Seal of New Mexico.

miles, traversed by the Rio Grande, and hemmed in either by the main chain or by ramifications of the Rocky mountains. To the south of the town of Santa Fé they average from 6000 to 8000 feet high, but in the vicinity of the town and north of it some snowy peaks rise to the height of 10,000 or 12,000 feet. The higher ranges are covered in many places with pine forests and the lower with cedars and occasional oaks. The climate is generally temperate and salubrious. The soil is often sandy, but an extensive system of irrigation canals is projected; as it is, about half the surface consists of good average agricultural land, producing abundant crops of alfalfa, Indian corn, wheat, and pulse. Fruits are abundant, and the vine is largely cultivated. Considerable attention is paid to the rearing of cattle. There are enormous deposits of coal; and iron, lead, zinc, copper, silver, and gold are found in important quantities.

The first explorers of the region were Spanish. Santa Fé was founded between 1605 and 1616. The Indians revolted about 1680, and kept their independence for ten years. The mines were worked and towns and missions were founded. This region became a province of Mexico when that country gained its independence of Spain in 1821. A small United States force under Gen. Stephen Kearney captured Santa Fé, gained control of the whole territory, and secured its cession to the United States in 1848. The territory when originally organized in 1850 included Arizona and a part of Colorado and California. In 1850 a convention was held and a state constitution adopted, but the dread on the part of the north of another slave state prevented the admission of New Mexico. Frequent efforts to secure admission have been made since. In 1894 congress passed an enabling act, and in the fifty-seventh congress (1901–03) an act of admission passed the house, but did not reach a vote in the senate. The construction of railroads, begun in 1878, had a marked influence in its development. The popular name is the Sunshine State. Many of the inhabitants are of Mexican origin. Pop. 193,777.

NEW MEXICO, University of, a coeducational institution of higher learning at Albuquerque, New Mexico, incorporated by an act of the territorial legislature in 1889, and indicated by statute as the future state university. The collegiate, normal, and preparatory departments were opened in 1892. Science, music, art, and commercial schools were afterward added. The degrees of bachelor of arts and pedagogy, of master of arts and sciences, and of doctor of philosophy are conferred. The Hadley Climatological Laboratory is an organization for research especially with reference to the influence of the climate of the arid and plateau region of the United States upon disease.

NEW MEXICO COLLEGE OF AGRICULTURE AND MECHANIC ARTS, a coeducational state institution at Mesilla Park, N. M., established in 1889. It is supported mainly by a territorial tax and by the Morrill and Hatch funds.

NEW ORLEANS, a city and port of the United States, Louisiana, chiefly on the left bank of the Mississippi, 100 miles above its mouth. The alluvial flat on which it stands is a mere swamp, and the town is only saved from the inundations of the river by a strong levee or embankment, built along the city front, and 200 miles above and 50 miles below, extending also around the city in the rear. The nucleus of the town is built around a bend of the river, from which it derives its popular sobriquet "the Crescent City." The streets

in this portion are mostly narrow, but many of those in the suburbs are spacious and handsome, and lined with shade-trees. The public buildings are neither numerous nor remarkable, and the manufactures are inconsiderable. New Orleans is simply the outlet for the produce of the countries drained by the Mississippi—sugar, molasses, rice, tobacco, Indian corn, wheat, oats, flour, and above all, cotton. Ships of the largest size can now reach the city docks. The yellow fever has often caused great mortality, but these epidemics have been greatly mitigated by

the adoption of sanitary measures and drainage on a grand scale. In 1908 a fire destroyed $1,500,000 of property. New Orleans was founded by the French in 1717, and finally passed with Louisiana to the Union in 1803. Pop. 400,000.

NEW PLATONISTS, a philosophical sect, so called because they founded their speculations on those of Plato; also called the Alexandrian Platonists, because their chief seat was at first in Alexandria. Their doctrines (Neaplatonism) had a tendency to unite Platonic ideas with Oriental mysticism, and borrowed elements from various schools.

NEWPORT, a flourishing city in Kentucky, on the river Ohio, opposite Cincinnati, of which it is practically a residential suburb. Its chief manufactures are in iron and steel. Pop. 32,161.

NEWPORT, a seaport of one of the capitals of Rhode Island, finely situated on its southwest shore, at the main entrance of Narragansett bay, 26 miles south by east of Providence, a most fashionable watering-place. For over 240 years it has been the annual meeting-place of the Society of Friends. Pop. 26,133.

NEWPORT NEWS, a rising American seaport in Warwick co., Virginia, near the extremity of the peninsula formed by the York and James rivers. Newport News exports cotton, lumber, wheat and flour, tobacco, etc. Pop. 23,460.

NEW ROCHELLE, a town in Westchester co., N. Y., on the inlet of Long Island Sound, locally known as New Rochelle harbor, and on the N. Y., N. H. and Hart. railroad; 20 miles n.e. of the New York city-hall. Pop. 16,522.

NEW SOUTH WALES, a colony of Great Britain, which at one time comprised the eastern half of Australia, but is now bounded by Queensland on the n., Victoria on the s., the Pacific ocean on the e., and South Australia on the w., area, 310,700 sq. miles. The coal-fields extend over an area of 10,000,000 acres, with an output of some 4,600,000 tons. Copper ore of the richest quality has been found in great abundance, but is not yet extensively worked. Tin exists in large quantities, and iron is very generally distributed. But the chief mineral product of the colony has been gold, the total value of which hitherto obtained is estimated at $300,000,000. Much silver and lead are now obtained. As the area of the colony extends over eleven degrees of latitude, and as it contains a good deal of elevated ground, nearly every variety of climate is to be found. The agricultural land is chiefly under wheat and maize, oats and barley, and there is also a considerable area under sugar, vines, fruit-trees, etc. Fruits and vegetables in great variety are grown. But the rearing of sheep and cattle are the chief employments of the people, and wool is the most important article of export. The manufacturing industries of the colony are naturally not of much importance as yet, but they are increasing; and the industrial works embrace tanneries, woolen factories, soap and candle works, breweries, steam saw-mills, shipyards, foundries, machine-works, clothing factories, etc. There are about 3000 miles of open railway besides what is in course of construction; the telegraphic wires extend over 13,700 miles. The constitution of New South Wales vests the legislative power in a parliament of two houses, the legislative council namely, and the legislative assembly. The former consists of not fewer than 21 (at present of 75) members nominated by the crown for life; and the latter of 125 members chosen triennially by 125 constituencies on a basis of manhood suffrage. The governor, nominated by the crown, has a cabinet of ten ministers. The colony sends six representatives to the federal senate and twenty-six to the federal house of representatives. It celebrated its centenary in January, 1888. Pop. 1908, 1,571,300.

NEWSPAPERS, although something like an official newspaper or government gazette existed in ancient Rome, and Venice in the middle of the 16th century had also official news sheets, the first regular newspaper was published at Frankfort in 1615. In England no genuine newspaper of the 16th century has been preserved, and it is not till 1622 that we find The Weekly News from Italy, Germany, etc., which may be regarded as the first specimen of the regular newspaper that appeared in England. Other journals followed, and one of these, published in November, 1641, under the title of Diurnal Occurrences, or the Heads of Several Proceedings in both Houses of Parliament, is noticeable as the first which furnished a report of the proceedings in parliament. The oldest existing newspaper in England is the government paper, the London Gazette, the first number of which was issued on the 7th of November, 1665, at Oxford, whither the court had retired in consequence of the plague then raging in London.

The increase of rapid communication generally; the development of telegraphic communication, and the system of telegraphic news-agencies, established first by Julius Reuter in 1849; the vast improvement in printing, the repeal of the stamp-duty (originally imposed in 1712) in 1855, and of the paper-duty in 1861, and the enormous growth of advertisements, have given a great impetus to this branch of literature. Penny weekly and penny daily papers are now exceedingly numerous; even half-penny newspapers are not uncommon. Special industries and professions are now represented by organs of their own, and the number of special illustrated domestic and literary papers is enormous.

The Boston News-Letter, started in 1704, was the first regularly established American newspaper. By the commencement of the revolutionary war in 1775 the number of newspapers published in the New England states amounted to thirteen. In 1889 there were published in the United States and Canada about 2000 daily and 11,500 semi-weekly and weekly newspapers. Since 1840 New York has been the acknowledged metropolis of the newspaper and periodical press of America.

The total number of newspapers published in the world at present is estimated at about 60,000, distributed as follows: United States and Canada, 23,461; Germany, 8,049; Great Britain, 9,500; France, 6,681; Japan, 1,000;

Italy, 2,757; Austria-Hungary, 2,958; Asia, exclusive of Japan, 1,000; Spain, 1,000; Russia, 1,000; Australia, 1,000; Greece, 130; Switzerland, 1,005; Holland, 980; Belgium, 956; all others, 1,000. Of these more than half are printed in the English language.

NEWT, or **EFT,** the popular name applied to various genera of amphibians. Water-newts, or "water-salamanders" as they are sometimes termed, possess a compressed tail, adapted for swimming. These forms are oviparous, and though aquatic in their habits they are

Great water-newt.

yet strict air-breathers. The larval gills are cast off on maturity being reached, or about the third month of existence. The larval tail is retained throughout life. The male animals are distinguished by the possession of a crest or fleshy ridge borne on the back. The food consists chiefly of aquatic insects, larvæ, etc.

NEW TESTAMENT. See Bible.

NEWTON, a city in Middlesex co., Massachusetts, on the Charles river, 8 miles w. of Boston, a favorite residence, of Boston merchants. It is the seat of the Newton Theological Institution (Baptist). Pop. 36,587.

NEWTON, Hubert Anson, American astronomer and mathematician, was born at Sherburne, N. Y., in 1830. The study of the law of meteoroids and of comets and their interrelation, began with the attempt to contribute to the theory advanced by Professor Olmsted of Yale in 1833, that meteors were a part of a mass of bodies moving round the sun in a fixed orbit. His authority on these subjects became world-wide, the National Academy of Sciences awarding him the Smith gold medal. He died in 1896.

NEWTON, Sir Isaac, the most distinguished mathematician of modern times, was born at Woolsthorpe, Lincolnshire, December 25, 1642. In 1663–64 he discovered the formula known as Newton's Binomial Thereom (see Binomial); and before 1665 he had established his doctrine of fluxions. Some years later Leibnitz also discovered this invaluable method, and presented it to the world in a different form—that of the differential calculus. About this time (1665), being obliged to quit Cambridge on account of the plague, he retired to Woolsthorpe, where the idea of universal gravitation is said to have first presented itself to him, from observing the fall of an apple in his garden. In 1666 he returned to Cambridge, was chosen fellow of his college (Trinity college) in 1667, and the next year was admitted A.M. By this time his attention had been drawn to the phenomena of the refraction of light through prisms, and to the improvements of telescopes. His experiments led him to conclude that light is not a simple and homogeneous substance, but that it is composed of a number of rays of unequal refrangibility, and possessing different colors. In 1669, being appointed professor of mathematics at Cambridge, and preparing to lecture on optics, he endeavored to mature his first results, and composed a treatise on the subject. In 1672 Newton was chosen a fellow of the Royal Society, to which he communicated a description of a new arrangement for reflecting telescopes, which rendered them more convenient by diminishing their length without weakening their magnifying powers; and soon after, the first part of his labors on the analysis of light. This led him into controversies with Hooke, Huygens, and several eminent foreigners, Newton maintaining the corpuscular theory, now generally given up in favor of the undulatory theory. In 1675 he addressed another paper to the Royal Society, completing the account of his results and of his views on the nature of light. This treatise, united with his first paper on the analysis of light, afterward served as the base of the great work, Treatise on Optics (1704). He had before this deduced from the laws of Kepler the important law that gravity decreased with the square of the distance, a law to which Sir Christopher Wren, Halley, and Hooke had all been led by independent study. No demonstration

Sir Isaac Newton.

of it, however, had been given, and no proof obtained that the same power which made the apple to fall, was that which retained the moon and the other planets in their orbits. Adopting the ordinary measure of the earth's radius, Newton had been led to the conclusion that the force which kept the moon in her orbit, if the same as gravity, was one-sixth greater than that which is actually observed, a result which perplexed him, and prevented him from communicating to his friends the great speculation in which he was engaged. In June, 1682, however, he had heard of Picard's more accurate measure of the earth's diameter, and repeating with this measure his former calculations, he found, to his extreme delight, that the force of gravity, by which bodies fall at the earth's surface, 4000 miles from the earth's center, when diminished as the square of 240,000 miles, the moon's distance, was almost exactly equal to that which kept the moon in her orbit. Hence it followed that the same power retained all the other satellites round their primaries and all the primaries round the sun. Two years were spent in penetrating the consequences of this discovery, and in preparing his immortal work Philosophiæ Naturalis Principia Mathematica, commonly called "Newton's Principia," which was printed in 1687 at the expense of Dr. Halley. In 1687 Newton was one of the delegates sent by the University of Cambridge to maintain its rights before the High Commission Court when they were attacked by James II., and in 1688 he was elected by the university to the Convention Parliament. In 1696 he was appointed warden of the mint, and in 1699 master. In 1701 he was again returned to parliament by his university; in 1703 he was chosen president of the Royal Society; and in 1705 was knighted by Queen Anne. In his later years he took great interest in chemistry, and in the elucidation of the sacred Scriptures. His health was good until his eightieth year, when he suffered from a calculous disorder, which occasioned his death, March 20, 1727. He was interred in Westminster Abbey. The most important of Newton's philosophical works are his Principia; his Arithmetica Universalis; his Geometria Analytica; his Treatise on Optics, published in 1705; and his Lectiones Opticæ, published after his death. His literary and theological works are his Chronology; his Observations on the Prophecies of Holy Writ, viz.: Daniel and the Apocalypse; and his Historical Account of two Notable Corruptions of Scripture.

NEWTON'S LAWS OF MOTION. See Dynamics.

NEW YEAR'S DAY, the first day of the year, from the earliest times observed with religious ceremonies or festive rejoicing. New Year's Day, being the eighth day after Christmas, is the festival of Christ's circumcision.

NEW YORK, "the Empire State," one of the thirteen original United States of North America, having Canada on the north and northwest, from which it is almost entirely separated by the St. Lawrence, Lake Ontario, the Niagara river, and Lake Erie; south, Pennsylvania, New Jersey, and the Atlantic; and east, Connecticut, Massachusetts, and Vermont. Long Island belongs to the state, whose seaboard otherwise is very small. Total area, 49,170 sq. miles. It is the twenty-sixth in point of size among the states. The surface in the southeast is traversed by several mountain ranges from New Jersey, one of which, crossing the Hudson, presents a bold and lofty front on both banks, and forms magnificent scenery. The Catskill mountains have the greatest average height, and in Round Top attain 3800 feet; but the culminating point is Mount Marcy, which belongs to the Adirondack group, and has a height of 5467 feet. In the west the large tract extending between Lake Ontario on the north and Pennsylvania on the south is generally level. The principal rivers are the Hudson, Delaware, Susquehanna,

Mohawk, Oswego, Genesee, Niagara, Alleghany, and St. Lawrence. The falls of Niagara partly belong to the state. Besides the frontier lakes Ontario and Erie, there are many lakes of very considerable size, such as Lakes Champlain, George, Oneida, Cayuga, Seneca, etc. The climate is somewhat variable, but with some local exceptions very healthy. The greater part of the soil is arable, and New York occupies a foremost place in agriculture. The largest crops are hay, oats, Indian corn, wheat, beans, barley, and, to a greater extent than any other state, potatoes. Grapes are grown in the Chemung Valley. A large income is annually obtained from the products of floriculture. Much attention is paid to the rearing of stock, both for feeding and for dairy purposes, more milk, butter and cheese being produced

Seal of New York.

than in any other state. The forest trees present a great variety, but the forest area, which used to include nearly half the state, has been much reduced of late years. The most important mineral is iron. Lead ore is also found, and a vast amount of salt is made from the salt springs. Granite, marbles, sandstones, limestones, clay, sand, and all building materials are abundant. The mineral springs of Saratoga are the most celebrated in America. The manufactures include nearly a sixth of all the manufactures of the United States. The foreign and internal trade are of great importance. About 60 per cent of the imports and 40 per cent of the exports of the entire nation pass through the port of New York. The internal trade is carried on chiefly by canals and railroads in conjunction with the Hudson. Of the canals the most important is the Erie Canal, which connects Lake Erie with the Hudson. The length of railways is over 9000 miles. The principal railroad systems crossing the state are the New York Central and Hudson River, the Erie, the Lackawanna, the New York, Chicago, and St. Louis (with the West Shore), the New York, Ontario and Western, and the Lehigh Valley. Other important systems enter at the east and west. Among religious denominations the Protestant Episcopalians, Roman Catholics, Episcopal Methodists, Baptists, and Presbyterians are the most important. For the higher branches of education ample provision has been made, there being some thirty universities and colleges, and primary education is free. The oldest and most important university is Columbia in New York City. There is no state university, but Cornell university in Utica awards certain state scholarships. Other important institutions are Union college, in Schenectady, Hamilton college, Clinton, New York university at New York. Vassar college at Poughkeepsie, is one of the leading women's colleges in the country. The most noted of the fifteen theological seminaries is Union in New York City. There are seven law schools, twelve medical schools, three dental and four schools of pharmacy. Albany is the capital, though it is far below New York, Buffalo, Rochester, and Syracuse in population.

The first European discoverers and explorers found the eastern slope of the continent under the denomination of the Iroquois tribes. John Smith met with them on the north waters of Chesapeake Bay in 1607, and Hudson found them in 1609 on the banks of the river to which he gave his name. The chief seat of this powerful nation, whose sway was recognized from the St. Lawrence to the Tennessee and from the Atlantic to the Mississippi, was in the wide and fertile region of western and northern New York. They organized the political league or confederacy known as the Five Nations. These were the tribes of Mohawks, Onondagas, Cayugas, Senecas, and Oneidas. The confederacy was at the height of its power about the year 1700. In 1715 they were joined by the Tuscaroras, driven out from North Carolina, and were afterward known as the Six Nations. The American revolution proved fatal to them. The political history of the province records one continued struggle between the royal governors and the general assembly—the assembly withholding money grants, and the governors exercising the power to dissolve it at will. The quartering of British troops became a constant irritation between the people and the officers, and the need of money by the authorities caused as severe a struggle between the governors and the assembly. A general congress of the colonies held in New York in 1765 protested against the stamp act and other oppressive ordinances, and they were in part repealed. On the breaking out of hostilities, New York immediately joined the patriot cause; the English authority was overthrown, and the government passed to a provincial congress. In May, 1775, Forts Ticonderoga and Crown Point, which commanded Lakes Champlain and George, and secured the northern frontier, were captured by the Americans. New York City became the headquarters of the continental army under command of General Washington. On July 9, 1776, the provincial congress reassembled at White Plains, and formally took the name of the representatives of the state of New York. The same day they proclaimed their adhesion to the Declaration of Independence. The defeat of the Americans on Long Island, August 27, 1776, was followed by the abandonment of the city. The movement of Howe to White Plains, and his subsequent successful operations, compelled the withdrawal of the Americans to New Jersey. In 1777 the advance of Burgoyne from Canada was checked at Saratoga and his entire army captured. An attempt of Clinton to aid Burgoyne, in which he captured the forts at the entrance to the Hudson Highlands, failed; West Point continued to command the passage of this important line of communication. On April 20, 1777, the state assembly adopted the first constitution. Gen. George Clinton was elected governor, and held the office till the close of the war. In 1779 (July 16) Stony Point was captured by the Americans. In 1780 the failure of Arnold's treason put an end to the schemes of the British to command the river. On the conclusion of the war New York was evacuated, November 25, 1783. In 1788 (July 26) New York adopted the federal constitution, became the most important member of the national union, and received popularly the name of the Empire State. The seat of government was transferred from New York City to Albany in 1797. The progress of the state met with no interruption until the war with Great Britain in 1812, when its northern frontier became the seat of operations by land and water. The treaty of Ghent put an end to the war, and important schemes for the development of the internal navigation to bring the products of the state to tidal water were rapidly consummated. Steamboat navigation began on the Hudson in 1807, and the canal system was perfected in 1825 in the completion of the Erie canal, which opened the country from the lakes to the sea. After 1840, the anti-slavery feeling was strong in the agricultural parts of the state, and in 1848 the democrats, led by Van Buren, broke away to aid in forming the free-soil party. The whigs and know-nothings gained and lost power in swift succession before the civil war. The mercantile and manufacturing classes in 1860 advocated peace at any price, but the mass of the people were Unionist. The reaction following upon the disasters of the first year and a half of the war put the democrats into power. The war measures of President Lincoln were denounced violently by the state authorities, and the election of 1864 was bitterly fought, the outcome being decided in favor of the republicans by the votes of the men at the front.

The rise of the labor party in 1886 was the cause of much important labor legislation. In 1892 laws limiting the hours of daily work and protecting women and children in factories and shops were passed. In 1867 the public schools of the state were made entirely free, and in 1875 primary education was made compulsory.

New York is an uncertain state both in national and state elections, and the influence exerted by its large electoral vote on the outcome of presidential contests has given it the well-earned name of the "pivotal state." New York voted for the republican candidates from 1796 to 1808. In 1812 it cast its vote for De Witt Clinton, who had been nominated by the section of the republican party opposed to the domination of the congressional caucus, and had been in-

dorsed by the federalists. It voted for Monroe in 1816 and 1820, divided its vote among Adams, Crawford, Clay, and Jackson in 1824 (26 out of 36 for Adams), and between Adams and Jackson in 1828 (20 out of 36 for Adams). It was democratic in 1832, 1836, 1844, and 1852, and whig in 1840 and 1848. From 1856 to 1864, it was republican, and then entered on a course of vacillation. It voted for Seymour (democrat) in 1868, Grant (republican) in 1872, Tilden (democrat) in 1876, Garfield (republican) in 1880, Cleveland (democrat) in 1884, Harrison (republican) in 1888, and Cleveland (democrat) in 1892. The state went decidedly republican in 1896, 1900, 1904 and 1908. Pop. 8,468,640.

NEW YORK, the chief city and seaport of the state of New York, and of the United States, and in respect of population and commerce the metropolis of the American continent, and after London, Eng., the largest city in the world. The city is admirably situated at the confluence of the Hudson river from the north, and the East river from the northeast (the latter a prolongation of Long Island Sound), their united waters expanding into New York bay, which forms a magnificent harbor. The approach from the sea is either by the East river and Long Island Sound, or by the wide channel between Sandy Hook and Long Island, and thence by "the Narrows" between Staten Island and Long Island. In the bay are several islands, on some of which are forts, and on one the colossal statue of Liberty, the largest statue of modern times, 151.41 feet in height, stands upon a pedestal 155 feet high. The chief portion of the city is situated on Manhattan Island, 13¾ miles long and generally about 1¾ broad, and separated by the narrow channel of Harlem river from the mainland; while on the opposite shores of the East river are Brooklyn and Long Island City, and on those of the Hudson, Jersey City, Hoboken, etc. Since January, 1898, Brooklyn, Long Island City, Staten Island, etc., have been incorporated in New York.

The plan upon which the newer portion of the city is laid out consists of parallel avenues, 100 feet or more in width, named numerically from first to eleventh, and running from south to north as far as the northern extremity of Manhattan island, intersected at right angles by streets also numerically named, and crossing the city from east to west. Fifth avenue (7 miles long, 100 feet wide) is the great central avenue, and all the streets running east from it have the prefix east, and those running west the prefix west, and the houses are numbered accordingly. The main business thoroughfare is Broadway (5 miles long and 80 feet wide), which in the activity and variety of its traffic, the elegance of its shops, and the massiveness and grandeur of many of its public and private buildings, is one of the most interesting streets in the world. Madison avenue, next east of Fifth avenue, vies with it as a street of costly private houses and beautiful churches. The streets are traversed by innumerable electric street cars, supplemented by elevated railroads with steam motors giving a speed of 10 miles per hour; and a four track trunk line underground railroad from City Hall Park through Elm street, Fourth avenue, 42nd street and Broadway to 96th street; a two track southern extension line from the City Hall loop, through Broadway to South Ferry, whence it is to connect with the tunnel under the East river to Brooklyn. A three two track northern extension to Van Cortland Park (in operation to 219th street), to the Harlem river at 139th street and from 135th and Lennox avenue under the Harlem river and on to Bronx Park. Ferry-boats cross the Hudson and East rivers at all hours. A bridge across Harlem river and a massive viaduct take the trains of the New York Central and Hudson River R. R. to the Grand Central Depot. East river bridge, one of the largest suspension-bridges existing, connects New York with Brooklyn. This bridge, 5989 feet long and 85 wide, costing over $20,000,000, was opened in 1883. The Williamsburg bridge with entrance at Clinton street in New York and Havemeyer street in Brooklyn, was opened in 1903; exclusive of real estate the cost was $12,000,000. The work of construction on Manhattan bridge commenced in 1901 and the anchorages, the towers, cables and suspended superstructure are now under way. Work on Blackwell's Island bridge commenced in 1901 and the cantilever spans are now under way. The great width of the Hudson opposite the city, and the necessity of keeping it an unimpeded highway of commerce, renders piers at intervals across the river inadmissible, but a great cantilever bridge is spoken of. Considerable progress has been made in the construction of a double tunnel beneath the Hudson, by which the trains of southern and western railroads will pass under the river directly into the city. Of the public parks the most important is Central park, situated near the center of Manhattan island. Its length is 2½ miles and its width a little more than half a mile, giving an area of 840 acres. Originally an unpromising stretch of rocky ledges and stagnant swamps, it has been made one of the most picturesque and beautiful pleasure-grounds with which any city in the world is adorned. The next important is Prospect park in Brooklyn, and the third is Bronx park, occupying an area of 661 acres on both sides of the Bronx river. More than a dozen small public parks and squares are scattered over the city, the finest of the latter being Union Square on the east side of Broadday, and Madison Square on the east side of Fifth avenue.

The circumstance that the city is hemmed in by water, and the high price of ground, have stimulated the building of very lofty structures for business premises and to some extent for dwellings. The buildings most worthy of notice, in an architectural aspect, are the treasury, in white marble with Doric porticoes; the city hall, also of white marble, in Italian style, attractively set in the center of an ornamental park; the postoffice, at the south end of City Hall park; the Academy of Design, Columbia college, numerous palatial private houses on Fifth avenue, Madison avenue, and other streets adjacent to Central park, and several of the new "apartment houses," some of which cover entire city blocks and attain a height of 10 and 12 stories. Among the important office buildings may be mentioned the Produce Exchange, with a tower 225 feet high, the Consolidated Stock and Petroleum Exchange, the Broad-Exchange, the Equitable Life Assurance Society, the World Tribune and Times buildings. Of the newer buildings the most notable is the Flat Iron at the triangle of Broadway and Fifth avenue, a twenty story wedged shaped building visible for miles. The churches of all denominations number about 500. Of the numerous church buildings worthy of notice the most conspicuous are: Trinity church (Episcopal), on Broadway, a noble Gothic structure of brown sandstone; Grace church (Episcopal), a handsome Gothic building in white marble; St. George's (Episcopal); St. Thomas's (Episcopal); Fifth Avenue Presbyterian church, in the decorated Gothic style, on Fifth avenue; All Souls (Unitarian); St. Patrick's (R.C.) cathedral, built of white marble in the decorated style of the 13th century, the largest and most imposing church edifice in the country; the Jewish Temple Emmanuel, the finest example of Moorish architecture in the states. New York is generously provided with hospitals, asylums, and institutions of all kinds for the relief of human suffering. The public school system is very complete. By law the attendance of children from 8 to 14 years of age is made compulsory, and the schools offer a superior education free of cost to children in all grades. The most important seat of learning in the city is Columbia college, founded by charter of George II. in 1754. The college has 60 instructors and about 1500 students. The university of New York City, founded in 1831, has a large corps of instructors. Among the public monuments are statues of Washington, Lincoln, Farragut, Franklin, Shakespeare, Burns, Scott, etc., an ancient Egyptian obelisk presented by the Khedive of Egypt; Bartholdi's great Statue of Liberty. Among the numerous public libraries may be noted the Astor Free library, containing 250,000 volumes; the Mercantile library, with 210,000 volumes, a fine circulating library belonging to its members, but accessible also to others; the Lennox library, with a collection of rare books numbering 30,000 valuable manuscripts, choice paintings, sculptures, ceramics, etc. Theaters and other places of amusement are numerous, the principal ones being the Metropolitan Opera House, the Broadway, the Casino, the Criterion, Daly's, the Knickerbocker, the Empire, the Herald Square, the Garrick, Wallacks, the Savoy, the Victoria, Belasco's, the New York, the Majestic. New York has about 40 hotels that may be ranked as first-class. The largest and best known is the Waldorf-Astoria. Among the others are the Buckingham, the Holland, the Murray Hill, the Manhattan, the Netherland, the Savoy, the Fifth Avenue, the Hoffman, the Imperial.

The most luxurious restaurants in the city are Delmonico's and Sherry's. In summer there is a great exodus to watering-places and other adjacent pleasure resorts.

New York is primarily a commercial city and a center of distribution of domestic and foreign products, but it is also the center of a vast manufacturing interest. The industries, however, are more of a varied character than individually important, the chief being connected with clothing, meat-packing, printing and publishing, brewing, etc. Immense numbers of immigrants from Europe arrive here. The water supply is furnished from Croton Lake, an artificial reservoir supplied by Croton river, from which the water is conveyed by an aqueduct of stone masonry of a capacity of 115,000,000 gallons per day a distance of 40 miles to New York.

By the act of 1897, under which Greater New York was constituted, the whole city is under a mayor, elected for four years, who appoints heads of departments; a president of the council, elected for four years also, who acts as deputy-mayor; and a council and board of aldermen. Each of the five constituent boroughs (Manhattan, Bronx, Queens, Brooklyn, Richmond) has its own president and borough board.

The first regular line of packet ships to Liverpool was started in 1817. The opening of the Erie Canal in 1825 gave a great stimulus to internal commerce. Since that date the progress of New York has been wonderful. Pop. in 1830, 202,589; in 1850, 515,547; in 1870, 942,292; in 1880, 1,206,600; in 1890, 1,513,501; in 1900, 3,437,202, and in 1909 over 4,400,000.

NEW ZEALAND, a group of islands belonging to Great Britain in the South Pacific Ocean. Pop. 818,973.

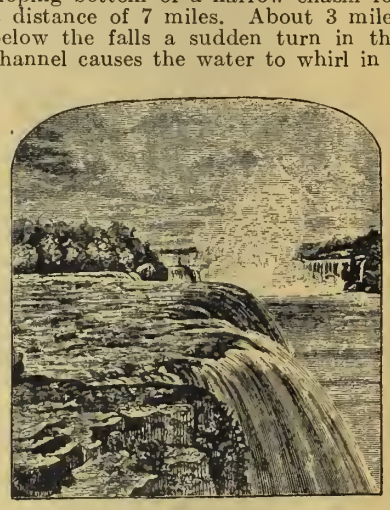
With mineral wealth New Zealand is liberally supplied. Coal is obtained in many parts, and copper has been worked on a small scale. Gold is worked both in North and South Island. It was first practically discovered in 1861, and is obtained in two forms, namely, as veins in quartz reefs, and as alluvial gold. Extending through 12° of latitude, and having a greatly diversified surface, New Zealand has necessarily a very varied though a remarkably healthy climate. In temperature it resembles France and North Italy, but the humidity is considerably greater.

The original natives of New Zealand, called Maoris, a people of Polynesian origin, are supposed to have emigrated from the Navigators' or the Sandwich Islands some centuries ago. Split up into numerous petty tribes, and wasting each other by internecine feuds, their numbers have been so reduced that they do not now much exceed 40,000. Stock-rearing and agriculture are the most important industries, though mining is also an important occupation. There are about 20,000,000 sheep and the most important export is wool, frozen meat being the next largest export. Gold is another valuable export. New Zealand was first discovered by Tasman in 1642, but little was known of it till the visits of Cook in 1769 and 1774. The first permanent settlement was made by missionaries in 1815, but no regular authority was established by the British government till 1833, when a resident was appointed, with limited powers, and subordinate to the government of New South Wales. In 1840 New Zealand was erected into a colony; in 1841 it was formally separated from New South Wales and placed under its own independent governor; and in 1852 it received a constitution and responsible government. In 1873 the Public Works Policy was inaugurated, and large loans were raised for immigration, harbors, railways, roads, etc. In 1876 the provinces were abolished; the colony was divided into 63 counties, and all government centralized at Wellington.

NEY (nā), Michel, Duke of Elchingen, Prince of the Moskwa, marshal and peer of France, was born in 1769 at Sarre-Louis, in the department of the Moselle He entered the military service in 1788 as a private hussar, and rose by degrees to the rank of captain in 1794, adjutant-general in 1796, general of division in 1798, and as such he distinguished himself in the Rhine campaign. Appointed marshal of the empire by Napoleon in 1805, he achieved victory over the Austrians at Elchingen, and took part in the battle of Jena. During the Russian campaign he commanded the third division at the battle of the Moskwa, and conducted the rear-guard in the disastrous retreat. In the campaign of 1813 his skill and courage decided the victory of Lützen, and assisted at Bautzen and Dresden. When Napoleon abdicated and the Bourbon dynasty was established Ney took the oath of allegiance to the king and received a command; but when the emperor landed from Elba his old general joined him at Lyons and opened the way to Paris. In the campaign which followed it was Ney who led the attack on the British center at Waterloo, and after five horses had been killed under him he only retired from the field at nightfall. When the allies entered Paris he escaped in disguise to the provinces, but was finally arrested, brought back to Paris, tried for treason, and found guilty. The sentence was executed 7th December, 1815.

NGANHWUY (ngân-hwī'), province of China, bounded by the provinces of Kiangsu, Honan, Hupeh, Kiangsi, and Chekiang. Pop. 20,596,988. Capital Ngan-king-foo, on the left bank of the Yang-tse-kiang; pop. 40,000.

NIAG'ARA, a river of North America, separating Ontario from the state of New York, and conveying the waters of Lake Erie into Lake Ontario. It is 33½ miles long, and varies in breadth from 1 to 4 miles, being about the former where it issues from Lake Erie, near the city of Buffalo. It is occasionally interspersed with low wooded islands, the largest of which, Grand Island, has an area of 17,000 acres. The total descent in the river's course between the two lakes is 331 feet. About 15 miles from Lake Erie a sudden narrowing and descent in the channel causes what are called the Rapids, below which the river, here divided by Goat Island, is precipitated over the celebrated Falls. The rush of the river is such that the water is shot a clear 40 yards from the cliff, leaving a narrow pathway for a short distance below for the adventurous. The cataract on the south side of the island, called the American Fall, is 162 feet high, width 1125 feet; that on the Canadian side, called the Great or Horse-shoe Fall, is 149 feet high, width 2100 feet. Below the falls the river rushes with great velocity down the sloping bottom of a narrow chasm for a distance of 7 miles. About 3 miles below the falls a sudden turn in the channel causes the water to whirl in a



Niagara Falls, from the U. S. side.

vast circular basin before renewing its journey. Logs and other floating material sometimes continue whirling here for many days. About one-eighth of a mile below the falls a suspension bridge 1190 feet long and 190 feet above the water crosses the river, and another 245 feet above the water has been constructed for railway and ordinary passenger traffic about 2 miles below the falls An international reservation of the land round the falls, to be preserved in a state of nature, was effected in 1885

NIAGARA FALLS, a city in Niagara co., N. Y, 22 miles north by west of Buffalo; on the Niagara river, and on the Erie, the Michigan Central, the Lehigh Valley, the New York Central and Hudson River, the West Shore, the Grank Trunk, and the Wabash railroads. The New York State Reservation here, which includes Prospect park, is 107 acres in extent; and there are three notable bridges connecting with Canada, one cantilever and two steel arch bridges. It is developing into an important manufacturing center, its growth being due to the utilization of the extraordinary power of the Niagara river, and falls. Pop. 22,173

NIAS, an island in the Malay Archipelago, lying west of Sumatra; length about 70, breadth about 20 miles. Rice, sugar, and pepper are grown extensively. It belongs to the Dutch. Pop. 100,000.

NIBELUNGENLIED (nē'bė-lung-ėn-lēt; "Lay of the Nibelungen"), German epic written in the Middle High German dialect, and dating from about the 12th century. It is divided into thirty-nine sections, contains some 6000 lines, and is constructed in four-lined rhymed

stanzas. The tale, briefly told, is this: Kriemhild lives with her brother Gunther, king of Burgundy, at Worms. To his court comes Siegfried, son of Siegemund, king of the Netherlands. This Siegfried is possessed of the Nibelungen gold hoard, a magic sword, a cloak of darkness, besides great strength and courage. Thus equipped he comes to the court and wins the love of Kriemhild. In gratitude for his success Siegfried undertakes to assist Gunther, the brother of his bride, in his efforts to win the hand of Brunhild, an Icelandic princess. Together they sail for the far north, and there Gunther succeeds, with the help of Siegfried's cloak of darkness, in winning the three test games of skill which the lady played with him. Still on the bridal night the princess mocked at Gunther her husband, wrestled with him, bound him, and hung him up scornfully against the wall. But the next night Gunther, with the invisible help of his friend Siegfried, overcomes the bride, and the latter carries away her girdle and ring. Siegfried and his wife Kriemhild next appear on a visit to the Burgundian court at Worms, where Gunther the king now resides with his wife Brunhild. While there the two ladies quarrel, and in her rage Kriemhild taunts Brunhild with having had dealings with her husband Siegfried, and in proof thereof she produces the ring and girdle which he took from her chamber on the bridal night. Brunhild bitterly resents this calumny and meditates vengeance. This she accomplishes by the hand of Hagen, one of her husband's warriors, who slays Siegfried in his sleep. With rage and grief in her heart the widowed Kriemhild broods over the possibility of revenge. Thirteen years pass and then Kriemhild marries Etzel, king of the Huns. Again thirteen years pass, and then at her instigation Etzel invites Gunther and Hagen with 10,000 warriors to visit the capital of the Huns. This they accept, and while they are seated at a great feast the Burgundians are all massacred by the Huns, with the exception of Gunther and Hagen. These two are delivered up to Kriemhild, who completes her vengeance by slaying them both, while she in her turn is killed by a Hunnish warrior who is enraged at her cruelty. This epic has been produced in modern German by Simrock, Bartsch, and Gerlach, and translated into English by Birch and Lettsom, while a resumé will be found in one of Carlyle's miscellanies.

NICARAG'UA, a republic of Central America, extending from the Pacific Ocean to the Caribbean Sea, and having on the north and northeast the state of Honduras, and on the south Costa Rica; area, about 49,500 sq. miles. Veins of silver, copper, and gold occur. The climate is on the whole healthy, the interior and mountainous parts being more dry and cool than on the coasts. The vegetable productions include indigo, sugar, coffee, cacao, cotton, corn, rice, etc. Fruits of various kinds are plentiful. One of the principal sources of wealth consists in cattle, of which there are great numbers, the high plains affording excellent pasturage. The capital is Managua. In 1821 Nicaragua joined Gautemala, Costa Rica, Honduras, and San Salvador in revolting against Spain, and after a sanguinary civil war it achieved independence. It has been the scene of various revolutions and counter-revolutions. The republic is governed by a president elected every four years, a senate and a house of representatives elected by universal suffrage. The principal exports are caoutchouc, coffee, hides, dye-wood, and indigo. Corinto on the Pacific and San Juan del Norte or Greytown on the Caribbean Sea are the chief ports. The population, which consists in great part of Indians and half castes, is estimated at 480,000.

NICARAGUA, Lake of, an extensive sheet of water in Central America, in the state of same name, 90 miles long northwest to southeast; greatest breadth, 40 miles; mean, 30 miles; 110 feet above the Pacific from which it is separated by a strip of land 12 miles wide.

NICARAGUA CANAL, a canal that is to be constructed for the purpose of providing a waterway for ships across Central America from the Pacific to the Atlantic, passing through Nicaragua, and utilizing Lake Nicaragua and the San Juan river. A beginning has recently been made, and the total length of the route will be 170 miles from Greytown on the Caribbean sea to Brito on the Pacific. Of this 64½ miles will consist of free navigation in the San Juan river, and 56½ of free navigation in Lake Nicaragua, total 121 miles. There will be 16 miles of excavation on the east side, 11¼ miles on the west, with ¾ mile for six locks, making a total excavation of 28 miles. In basins now existing or to be constructed by means of dams and embankments there will be navigation for 21 miles. Besides the six locks on the west side there will be three on the east. The work is now at a stand-still, and how it will be completed remains to be seen.

NICE (nēs), a city and seaport of France, on the Mediterranean, capital of the department of Alpes Maritimes. The exports consist principally of oil, wine, and silk, with essences, perfumes, etc. Nice belonged to Italy previous to 1860. Pop. 125,099.

NICE, Councils of, ecclesiastical councils held at Nice or Nicæa, in Asia Minor in 325 and 787. The object of the first Council of Nice, which was convened by Constantine, was to settle the controversies which had arisen in regard to the doctrine of the Trinity. The session lasted about two months. A creed was adopted by the council in its later form known as the Nicene Creed (which see). The council of 787 was summoned by the Empress Irene, with the concurrence of the pope, and it decreed that images were to be used as aids to devotion.

NICENE CREED, a summary of Christian faith adopted by the Council of Nice against Arianism A.D. 325, altered and confirmed by the Council of Constantinople, A.D. 381. Its characteristics are the insertion of the term "of one substance with the Father," directed against the Arian heresy; the insertion of the words "and the Son;" and the omission of the clause "He descended into Hell." It is recited both in the Roman Catholic and in the Angelican Church liturgies.

NICHOLAS I. (Nikolai Pavlovich), Emperor of Russia, third son of the Emperor Paul I., was born 1796, died 1855. He ascended the throne in 1825. He made war with Persia in 1827–28; joined in the Treaty of London, which secured the independence of Greece; and made one of the allied powers who destroyed the Turkish fleet at Navarino in 1827. This affair led to war between Russia and Turkey, in which the latter was defeated, paid indemnity, and signed the treaty of peace at Adrianople in 1829. He suppressed the Polish insurrection which broke out in the following year with relentless severity. In 1848 Nicholas assisted Austria with an army corps in putting down the rising in Hungary. Early in 1852 began the Russian effort to take over the holy places and assume the protectorate of the Christians in Palestine. This led to the Crimean war, before the close of which Nicholas died from lung disease.

NICKEL, a metal of a white color, of great hardness, very difficult to be purified, always magnetic, and when perfectly pure malleable and ductile. It unites in alloys with gold, copper, tin, and arsenic, which metals, it renders brittle. With silver and iron its alloys are ductile. Nickel is chiefly found in the United States, New Caledonia, and Germany; nickel is extracted from several pyrites, compounds of nickel, cobalt, antimony, arsenic, sulphur, or iron. The salts of nickel are mostly of a grass-green color, and the ammoniacal solution of its oxide is deep blue. Nickel mixed with brass in varying proportions is now well known and largely used as German silver or nickel silver. Another important use of the metal is for coating articles by the electro-plate process. See Nickel-plating.

NICKEL-PLATING is the process by which a coating of nickel is placed upon another metal, and the essentials of the process, as in electro-plating, are a proper solution of the metal and an electric battery.

NICOT (nē-kō), Jean, born 1530, died 1600; was French ambassador at the court of Portugal, where he was presented with some seeds of the tobacco plant, which he introduced into France about 1560. The botanical term for tobacco (Nicotiana) is derived from his name.

NIC'OTINE, a volatile alkaloid, base obtained from tobacco. It forms a colorless, clear, oily liquid, which has a strong odor of tobacco. It is highly poisonous, and combines with acids, forming acrid and pungent salts.

NICTITATING MEMBRANE, or **"THIRD EYELID,"** a thin membrane by which the process of winking is performed in certain animals, and which covers and protects the eyes from dust or from too much light. It is chiefly found in birds and fishes, and is represented in a rudimentary condition in man, and higher mammals generally, by the "semi-lunar folds," situated at the inner or nasal angle of the eye.

NIEBELUNGENLIED. See Nibelungenlied.

NIEL (ni-el), Adolphe, French marshal, born 1802, died 1869. He took part in the expedition against Constantine in Algeria; assisted as head of the staff of engineers at the siege of Rome in 1849 during the revolutionary movement under Garibaldi; commanded the engineers and planned the operations against Sebastopol in 1854–55; distinguished himself in the Italian campaign of 1859, and was thereafter made a marshal of France by Napoleon III.

NIEVRE (nyāvr), a department of Central France, bounded by Yonne, Cher, Allier, Saône-et-Loire, and Côte-d'Or; area, 2631 sq. miles. Pop. 347,645.

NIGER, the name of a great river of Western Africa, which rises north of Sierra Leone and Liberia, flows north and northeast, afterward turns southeast and south until, by various channels, it enters the Gulf of Guinea, its total length being about 2600 miles.

NIGHT-BLINDNESS, a defect of vision in which the eyes can see only in daylight and not by artificial light.

NIGHT-HAWK, a species of goatsucker, a bird universally known in the

Common night-hawk.

United States, 9½ inches in length and 23 in extent of wing. It is a bird of strong and vigorous flight, and its prey consists of beetles and other large insects. The other American species are the "chuck-will's widow" and the "whip-poor-will," both of which, like the night-hawk, arrive in May, and leave in September.

NIGHT-HERON, a wading bird of several species belonging to the family Ardeidæ. The species occur in Europe, Asia, Africa, and America. It is about

Night-heron.

20 inches in length, and has three long narrow feathers proceeding from the nape of the neck, and hanging backward.

NIGHTINGALE, a well-known passerine bird of the thrush family. The nightingale sings at night, and its famed chant is the love-song of the male, which ceases when the female has hatched her brood. It is a native of many parts of Europe and Asia, and of the north of Africa. It is migratory, extending its summer migrations as far north as the

Nightingale.

south of Sweden. It feeds on caterpillars and other larvæ, frequents hedges and thickets, and builds its nest on the ground or near it, laying four or five eggs of a blue color. The young are hatched in June, and are prepared to accompany their parents in their southward migration in August. It is solitary in its habits, and its coloring is very inconspicuous.

NIGHTINGALE, Florence, was born at Florence 1823. During the Crimean war (1854) the hospital accommodation was found to be very defective, and Miss Nightingale promptly volunteered to organize a select band of nurses at Scutari. The offer was accepted by the war office, and within a week Miss Nightingale was on her way to the east, where she rendered invaluable service to the sick and wounded by her incessant labors in nursing and hospital reform. The strain, both mental and physical, which this work demanded permanently injured her health to a serious extent. A sum of $250,000 was raised by public subscription in recognition of her services, and this she devoted to the founding of an institution for training nurses, attached to St. Thomas's Hospital, London.

NIGHTMARE, a state of oppression or feeling of suffocation which sometimes comes on during sleep, and is accompanied by a feeling of intense anxiety, fear, or horror, the sufferer feeling an enormous weight on his breast and imagining that he is pursued by a phantom, monster, or wild beast, or threatened by some other danger from which he can make no exertion to escape. The sufferer wakens after a short time in a state of great terror, the body often covered with sweat. The proximate cause of nightmare is said to be irregularity of the circulation in the chest or brain, and the disorder is generally due to repletion and indigestion, but sometimes to the fact of the sufferer lying in an awkward position in bed.

NIGHTSHADE, the name of various species of plants, chiefly of the genus to which the potato belongs. The root and leaves of woody nightshade are narcotic, and have been applied to various medicinal uses. The berries, if not absolutely poisonous, are suspicious. The common nightshade is fetid and narcotic, and has also been employed medicinally. Deadly nightshade is Atrŏpa Belladonna. (See Belladonna.)

NIGRITIA. See Soudan.

NI'HILISTS, the name at first applied specifically to the revolutionary party in Russia who accepted the destructively negative philosophy of Bakunin and Herzen, but now applied indiscriminately to Russian revolutionists. This name was given to the party by Tourgenieff in his stories of Russian society, and accepted by them as descriptive of their character. Their object was to destroy all forms of government, overturn all institutions, annihilate all class distinctions, sweep away all traditions. They left to future generations the task of constructing society out of the ruins left by their relentless destructive policy. For some years this propaganda was spread in printed and oral forms among the newly enfranchised serfs by thousands of young people of both sexes. About 1874, however, the Russian government began to interfere, the newspapers which advocated the Nihilist doctrine were suppressed, foreign pamphlets seized, and large groups of the revolutionists summarily tried and condemned to death and exile. Hitherto the Nihilists had spread their principles by peaceful means, but after the trial in 1877, in which 99 persons were sent to Siberia, a secret and sanguinary struggle between armed assassins and the government began. The first startling indication of the new departure was the murder of General Trepoff by a young woman named Vera Sassulitch, and this was followed by the assassination of Generals Mezentzoff and Drenteln, Prince Krapotkin, and Commander Heyking. The incendiary followed the assassin. In June, 1879, no fewer than 3500 fires broke out in St. Petersburg and other large towns, most of which were attri-

buted to the Nihilists. Various attempts were made to assassinate the emperor. Four shots were fired at him by Solovieff, a train in which he was supposed to travel was wrecked by Hartmann, an apartment in the Winter Palace at St. Petersburg was blown up, and at last, in March, 1881, Alexander II. was murdered by a bomb thrown beneath his carriage in the street near the palace. Several other murders followed, and also attempts on the life of Alexander III. Latterly, however, their activity has chiefly found expression in spreading socialism among the workmen of the towns, and is not strictly Nihilistic.

NIIGATA (nē-i-gä'tä), the chief town of the province of Echigo, Japan, situated on the west coast of the island of Hondo and on the left bank of the Shinano. This port was opened to foreign trade by the treaty of 1860. The town is well built, the streets are traversed by canals, there is an hospital and a college, and a considerable coasting trade. Pop. 53,366.

NIJNI-NOV'GOROD (nizh'nē), a town in Russia, capital of the government of same name, at the confluence of the Oka and Volga, 255 miles east of Moscow. Pop. 95,124.—The province has an area of 19,704 sq. miles. Pop. 1.482,471.

NILE, a great historic river in Africa, the main stream of which, known as the Bahr-el-Abiad, or White Nile, has its chief source in the equatorial lake Victoria Nyanza. What is known as the Bahr-el-Azrek, or Blue Nile, a much smaller stream, joins the White Nile at Khartoom, lat. 15′ 40° n. The source of the Blue Nile was discovered in the Abyssinian Highlands by Bruce in 1770, while the source of the other, or true Nile, was for long the subject of speculation and exploration. The discoveries, however, of Speke and Grant in 1861–62, and of Sir Samuel Baker in 1863–64, and subsequent explorers, have established the fact that the headwaters of the Nile are collected by a great lake situated on the equator, called Ukerewe or Victoria Nyanza. The Nile, near where it flows out of Lake Victoria, forms the unimportant Ripon Falls, then flows generally northwest; about lat. 1° 40′ n. it expands into Lake Ibrahim Pasha, afterward forms the Falls of Karuma and the Murchison Falls, and then enters another lake, the Albert Nyanza, at an elevation of about 2550 feet. This lake, as was first definitely ascertained by Stanley, receives the waters of another lake further to the southwest, Lake Muta Nzige or Albert Edward, the channel of communication being the river Semliki. From the Albert Nyanza to the Mediterranean the general course of the Nile is in a northerly direction, with numerous windings. Above Gondokoro, about lat. 5° n., the river forms a series of cataracts; but between these falls and the Albert Nyanza, a distance of 164 miles, the river is broad, deep, and navigable. Not far below Gondokoro the Nile begins to flow more to the west till it reaches lat. 9° n., where it receives the Bahr-el-Ghazal, one of its chief tributaries. On receiving this affluent it turns due east for about 100 miles, and then after receiving the Sobat from the southeast flows almost due north to Khartoom. It receives its last tributary, the Atbara, from the Abyssinian frontier, for the rest of its course (some 1500 miles) being fed by no contributory stream. Between this point and the frontiers of Egypt occur several rapids or cataracts presenting greater or less obstacles to navigation, there being also another cataract some distance below Khartoom. In Egypt, at the head of the Delta near Cairo, it divides into two main branches, leading down respectively to Rosetta and Damietta, where they enter the Mediterranean. As rain scarcely ever falls in the greater part of the valley of the Nile the river owes its supplies to the copious rains and the vast lake areas of the tropical regions in which it takes its rise, and its volume thus depends upon the season. It begins to increase in June, attains its greatest height about September, and then subsides. The ordinary rise at Cairo is about 25 feet. During the flood a great portion of the Delta, and of the valley higher up, is inundated. This annual inundation, now controlled by the great Assouan dam and other works, with all the bounty which it brings, is watched and waited eagerly, and in ancient times caused the Nile to be worshipped as a god alike by Egyptians, Greeks, and Romans. Its length is nearly 4200 miles, or rather less than that of the Mississippi-Missouri.

NILE, Battle of the. See Aboukir.

NILSSON, Christine, born at Hassaby, near Wexiö, in Sweden, 1843. In 1857 her talent attracted the attention of a wealthy gentleman, who had her educated as a singer at Stockholm, and afterward at Paris. In 1864 she made her first appearance as Violetta in La Traviata at the Théâtre Lyrique, Paris, and she appeared in 1867 for the first time at Her Majesty's Theater, London. On several occasions she has visited America with the utmost success. Among her most famous impersonations are Ophelia in Thomas's Hamlet, and Margaret in Gounod's Faust. In 1872 she married M. Auguste Rouzaud, who died in 1882; in 1886 she married Count A. de Miranda.

NIMBUS, a term applied in art, especially in sacred art, to a kind of halo or disc surrounding the head in representations of divine or sacred personages; as also to a disc or circle sometimes depicted round the heads of emperors and other great men. The nimbus in representations of God the Father is of a triangular form, with rays diverging from it all round, or in the form shown in the cut; the nimbus in representations of Christ contains a cross more or less enriched, that of the Virgin Mary consists of a circlet of small stars, and that of angels and saints is a circle of small rays. When the nimbus is depicted of a square form it indicates that the person was alive at the time of delineation. Nimbus is frequently confounded with aureola and glory.

NIMES, or **NISMES** (nēm), a city of Southern France, capital of the department of Gard, 62 miles northwest of Marseilles. Nîmes is chiefly remarkable for its Roman remains, including an ancient temple, with thirty beautiful Corinthian columns, now serving as a museum and known as the Maison Carrée; the ampitheater, a circus capable of seating 20,000 persons; the temple of Diana; the ancient Tour Magne, on a hill outside of the city, supposed to have been a mausoleum; and a Roman gateway. In the 16th century it became a stronghold of Calvinism, and suffered much during the civil wars, as also by the revocation of the Edict of Nantes,

The nimbus as variously represented in sacred and legendary art.—1, God the Father. 2 and 3, Christ. 4, Charlemagne. 5, Emperor Henry II.

and during the revolution; but latterly it has become a busy manufacturing center. Pop. 80,355.

NIMROD, described in Gen. x. 8 to 12 as a descendant of Ham, a son of Cush, a mighty hunter before the Lord, and the beginning of whose kingdom was Babel, Erech, Accad, and Calneh in the land of Shinar.

NIN'EVEH, an ancient ruined city, formerly capital of the Assyrian Empire, in Asiatic Turkey. The first recorded notice of Nineveh is in Genesis x. Again it is spoken of in the book of Jonah as a "great city." It remained the capital of Assyria till about 606 B.C., when it was taken and burned by the Babylonian Nabopolassar and the Median Cyaxares. It was maintained as a local tradition that this ancient capital of Assyria lay buried on the left bank of the Tigris opposite Mosul; but the fact was not definitely settled until in 1841 M. Botta began excavations in the vast mounds which there existed. He was followed in this by Mr (afterward Sir Henry) Layard, who explored a great portion of the large angle formed by the Tigris and the Zab. In the mounds of Koyunjik opposite Mosul he excavated the palaces of Sennacherib, Assurbanipal, and Esarhaddon. The walls of the city, which the inscriptions describe as Ninua, stretch along the Tigris for 2½ miles, and the elaborate outworks, moats, and defenses can still be traced. The important discoveries made by Layard were continued by Loftus, Hormuzd Rassam, and G. Smith, and the result of their labors deposited in the British Museum. See Assyria.

NINGPO, a large city of China, in the province of Che-kiang, one of the ports open to foreign commerce. The principal exports are tea, silk, and raw

cotton; and the principal imports, sugar and opium. Pop. 240,000.

NI'OBE, in Greek mythology, the daughter of Tantalus, married to Amphion, king of Thebes. Proud of her numerous progeny, she provoked the anger of Apollo and Artemis (Diana), by boasting over their mother Leto (Latona), who had no other children but those two. She was punished by having all her children put to death by those two deities. She herself was metamorphosed by Zeus (Jupiter) into a stone which shed tears during the summer. This fable has afforded a subject for art, and has given rise to the beautiful group in the tribune at Florence, known by the name of Niobē and her Children.

NIO'BIUM, or **COLUMBIUM,** a rare metal discovered in 1801 in a black mineral called columbite from North America. It forms a black powder insoluble in nitric acid, but readily soluble in a mixture of nitric and hydrofluoric acids.

NIP'IGON, or **NEP'IGON** a lake of Canada, in Ontario, about 30 miles northwest of Lake Superior. It is about 70 miles long and 40 miles broad, with rugged headlands, deep bays, and many islands. It is connected with Lake Superior by the Nipigon river.

NIPIS'SING, Lake, a lake of Canada, in Ontario, n.e. of Lake Huron, irregular in coast-line; breadth, about 30 miles; length, 48 miles. It contains numerous islands, and finds its only outlet by French river into Lake Huron.

NIPPLE. See Mammary Glands.

NIRVA'NA. See Buddhism.

NITRATE, a salt of nitric acid. The nitrates are generally soluble in water, and easily decomposed by heat. Deposits of nitrates are present in small quantities in almost all soils, but enormous accumulations exist in Chile and Peru. These latter deposits, which are known as Chile saltpeter, cubic nitre, or nitrate of soda, are found near the coast, and are probably produced from remains of marine animals and birds. The great value of this nitrate is in its application to agriculture as a fertilizer on impoverished soil; for it is now well known that crops require large quantities of nitrogen to secure their full development. It has been found by experiment, for instance, that with a soil poor in nitrogen the crop of wheat per acre was 2090 lbs., whereas when the same soil was dressed with nitrogenous manure, the return was 6982 lbs. So also with potatoes, the poor soil yielded 4452 lbs. as compared with 17,192 lbs. when dressed with nitrate. The nitrates, of which nitrate of soda is now considered the best, should not be used on light porous soils where the rain will sink the manure below the range of the roots. They make an excellent top-dressing in the spring, especially for root-crops.

NITRATE OF SILVER, a substance obtained by cooling, in the shape of tabular crystals, from the solution produced when silver is oxidized and dissolved by nitric acid diluted with two or three times its weight of water. When fused the nitrate is of a black color, and it may be cast into small sticks in a mould; these sticks form the lunar caustic employed by surgeons as a cautery. It is sometimes employed for giving a black color to the hair, and is the basis of the indelible ink for marking linen. Its solution is always kept in the laboratory as a test for chlorine and hydrochloric acid.

NITRATE OF SODA, a salt analogous in its chemical properties to nitrate of potash or nitre. It is largely used as a manure, and as a source of nitric acid and nitre. See Nitrate.

NITRE, a salt, called also saltpetre, and in the nomenclature of chemistry nitrate of potassium or potassic nitrate. It is produced by the action of microbes in soils containing potash and nitrogenous organic matters, and forms an efflorescence upon the surface in several parts of the world, and especially in the East Indies, whence much nitre is derived. In some parts of Europe it is prepared artificially from a mixture of common mould or porous calcareous earth with animal and vegetable remains containing nitrogen. It is also manufactured on a large scale by chrystallization from a hot solution of chloride of potassium and nitrate of soda. It is a colorless salt with a saline taste, and crystallizes in six-sided prisms. It is employed in chemistry as an oxidizing agent and in the formation of itric acid. Its chief use in the arts is in the making of gun-powder. It also enters into the composition of fluxes, and is extensively employed in metallurgy; it is used in the art of dyeing, and is much employed in the preservation of meat and animal matters in general. In medicine it is prescribed as cooling, febrifuge, and diuretic. Cubic nitre. See Nitrate.

NITRIC ACID, the most important of the five compounds formed by oxygen with nitrogen. When pure it is a colorless liquid, very strong and disagreeable to the smell, and so acrid that it cannot be safely tasted without being much diluted. It is known in the arts as aqua fortis, and is commonly obtained by distilling nitre (potassium nitrate) or Chile saltpetre (sodium nitrate) with strong sulphuric acid. Nitric acid contains about 76 per cent of oxygen, a great part of which it readily gives up to other substances, acting thus as a powerful oxidizer. Thus many metals—such as copper, tin, silver, etc.—when brought into contact with this acid are oxidized at the expense of the acid with the production of lower oxides of nitrogen and an oxygenated metallic salt. Nitric acid, when moderately dilute, acts on organic bodies so as to produce a series of most useful substances, notably acetic, oxalic, and picric acids, isatin or white indigo, etc. Nitric acid is employed in etching on steel or copper; as a solvent of tin to form with that metal a mordant for some of the finest dyes; in metallurgy and assaying; also in medicine, in a diluted state, as a tonic and as a substitute for mercurial preparations in syphilis and affections of the liver; and also in form of vapor to destroy contagion.

NITRO-BENZOL, a liquid prepared by adding benzol drop by drop to fuming nitric acid. It closely resembles oil of bitter almonds in flavor, and is largely employed as a substitute for that oil in the manufacture of confectionery and in the preparation of perfumery. It is important as a source of aniline.

NITROGEN, an important elementary principal, the basis of nitric acid and the principal ingredient of atmospheric air. The name nitrogen was applied to it by Chaptal, because of its entering into the composition of nitre, nitric acid, etc. The atmosphere contains about four-fifths of its volume of nitrogen, the rest being principally oxygen; nitre contains nearly 13 per cent, and nitric acid about 22 per cent by weight of this substance. Nitrogen is inodorous, tasteless, incumbustible, and a very inert substance in itself, although many of its compounds, such as nitric acid and ammonia, are possessed of great chemical activity. By reason of its inertness and general slowness of chemical action it acts the part of a diluent of oxygen in the atmosphere. Having no marked action of its own on living beings, its admixture with the oxygen of the air serves to moderate the otherwise too violent action of the latter gas. Under certain circumstances nitrogen may be induced to combine with other elements, especially with hydrogen, oxygen, and carbon, with titanium, tantalum, and tungsten. Nitrogen is allied in many of its chemical properties to the other elementary substances—phosphorus, arsenic, antimony, and bismuth; and it has the power of combining with one, three, or five atoms of a monovalent element or radicle. The oxides of nitrogen are five in number. The first oxide of nitrogen (nitrogen monoxide) contains 28 parts by weight of nitrogen united with 16 parts by weight of oxygen. The next oxide (dioxide) contains 28 parts by weight of nitrogen united with 32 parts by weight of oxygen. In the third oxide (trioxide) 28 parts of nitrogen is united with 48 parts of oxygen while the fourth and fifth oxides (tetroxide, pentoxide) contain respectively 64 and 80 parts of oxygen, united in each case with 28 of nitrogen. These oxides may be all produced from nitric acid. The trioxide forms a dark-blue liquid, which, when added to water at 0°, combines therewith, forming nitrous acid. This solution acts as a reducing agent, inasmuch as it eliminates gold and mercury as metals from several of their salts; on the other hand, it also exercises an oxidizing action on such salts as ferrous sulphate, potassium, iodide, etc. By replacement of the hydrogen in nitrous acid a series of metallic salts is obtained, called nitrites. Nitrogen monoxide is better known by the name of "laughing-gas," from the peculiarly exhilarating effect which it produces when breathed along with a little air. If the gas be pure, its inspiration soon brings about total insensibility, which does not continue long, and generally produces no bad effects upon the person who breathes it; hence it is much used as an anæsthetic in minor surgical operations, such as teeth-drawing, etc.

NITRO-GLYCERINE, an explosive substance appearing as a colorless or yellowish oily liquid, heavier than and insoluble in water, but dissolved by alcohol, ether, etc. It may be prepared by add-

ing to 350 parts by weight of glycerine 2800 parts by weight of a cooled mixture of 3 parts of sulphuric acid of 1.845 specific gravity and 1 part of fuming nitric acid. The liquid is poured into ten or twenty times its bulk of cold water, when the heavy nitro-glycerine sinks to the bottom. When violently struck nitro-glycerine explodes, being resolved into water, carbonic acid, nitrogen oxides, and nitrogen. The volume of gas produced is about 10,000 times the initial volume of the nitro-glycerine. Explosion can also be effected by heating to about 500° F. one portion of a mass, whereby partial decomposition is set agoing which almost immediately propagates itself throughout the liquid. The explosive force of nitro-glycerine compared with that of an equal volume of gunpowder is as 13:1. If any traces of acid be allowed to remain in nitro-glycerine it is liable to undergo spontaneous explosion; hence it is an exceedingly dangerous article to transport or store under such conditions. It is advisable to prepare the substance on the spot where it is to be used, and only in such quantities as may be required for immediate consumption. This method is adopted in many quarries and engineering undertakings, especially in America. Nitro-glycerine has for some time been used in the form of dynamite, to produce which it is mixed with some light absorbent substance. See Dynamite.

NOAH, one of the patriarchs of the Old Testament, son of Lamech, is described in the book of Genesis as being chosen by God for his piety to be the father of the new race of men which should people the earth after the deluge. Having been warned by God of the coming flood, he built a vessel (the ark) by his direction, and entered it with his family and all kinds of animals. (See Deluge.) After the waters had subsided the ark rested on Mount Ararat, where Noah offered a thank-offering to God, and was assured that the earth should never again be destroyed by a flood, as sign whereof God set the rainbow in the clouds. Noah died at the age of 950 years, 350 years after the flood. While modern accounts place Mount Ararat in Armenia, older traditions locate it in the mountains of the Kurds, east of the Tigris.

NIXON, Lewis, an American naval architect, born in Leesburg, Va., in 1861. He was superintending constructor of the navy at Cramp's shipyard and assistant constructor at the Brooklyn Navy Yard, and in 1890 designed the battleships of the Indiana class. In 1898 he was appointed president of the New York East River Bridge Commission. In 1901 he was named head of Tammany Hall, but resigned the post in May of the next year after five months service. He became president of the United States Shipbuilding Company of New York City in 1902.

NOCTURNE (nok-tėrn'), in painting, a night-piece; a painting exhibiting some of the characteristic effects of night light. In music, a composition in which the emotions, particularly those of love and tenderness, are developed. The nocturne has become a favorite style of composition with modern pianoforte composers.

NODE, in astronomy, one of the points in which two great circles of the celestial sphere, such as the ecliptic and equator, the orbits of the planets and the ecliptic, intersect each other; and also one of the points in which the orbit of a satellite intersects the plane of the orbit of its primary. The node at which a heavenly body passes or appears to pass to the north of the plane of the orbit or great circle with which its own orbit or apparent orbit is compared is called the ascending node; that where it descends to the south is called the descending node. At the vernal equinox the sun is in its ascending node, at the autumnal equinox in its descending node. The straight line joining the nodes is called the line of the nodes. The lunar nodes are the points at which the orbit of the moon cuts the ecliptic.

NODE, in physics, a point in a vibrating body, or system of vibrating particles, where there is no movement. When a body is vibrating the vibratory motion is conveyed from one place to another by the action of the molecular forces of the particles on one another. Now when all the forces acting on a certain particle are at any instant in equilibrium, and the particle consequently remains at rest, there is said to be a node at the particle. If a plate of glass or metal be held in the hand, and a bow be drawn across the edge, particles of fine sand, previously placed on the plate, will arrange themselves in line, along which it is evident no vibration has taken place. These lines, called nodal lines, generally form geometrical figures.

NON-COMMISSIONED OFFICER, a soldier with the rank intermediate between that of the private and the commissioned officer. The following classification are the various non-commissioned grades of the United States army: (1) Sergeant-major, regimental, and sergeant-major, senior grade, artillery corps; (2) quartermaster-sergeant, regimental; (3) commissary-sergeant, regimental; (4) ordnance sergeant, post-commissary-sergeant, post-quarter-master-sergeant, electrician sergeant, hospital steward, first-class sergeant signal corps, chief musician, chief trumpeter, and principal musician; (5) squadron and battalion sergeant-major, and sergeant-major, junior grade, artillery corps; (6) first sergeant and drum-major; (7) sergeant and acting hospital steward; (8) corporal. In each grade, date of appointment determines the order of precedence.

NOME (nōm), the largest city of Alaska, in the Northern District; situated at the mouth of the Snake river, 13 miles west of Cape Nome, on the north shore of Norton Sound, Bering Sea. It is the center of the productive Cape Nome gold-mining district, which extends west along the coast for about 20 miles from Cape Nome. Pop. 15,320.

NOLLE PROSEQUI (nol'le pros'e-kwī), in law, a stoppage of proceedings by a plaintiff, an acknowledgment that he has not cause of action.

NOMADS, tribes without fixed habitations, generally engaged in the tending and raising of cattle, and changing their abode as necessity requires or inclination prompts. North Africa, the interior of North and South America, and the northern and middle parts of Asia, are still inhabited by nomadic tribes, some of whom are little better than bands of robbers.

NOMINATIVE CASE, in grammar, that form of a noun or pronoun which is used when the noun or pronoun is the subject of a sentence.

NON COMPOS MENTIS ("not of sound mind"), an expression used of a person who is not of sound understanding, and therefore not legally responsible for his acts.

NONSUIT, a term in law. When a person has commenced an action, and at the trial fails in his evidence to support it, or has brought a wrong action, he is nonsuited. A nonsuited plaintiff may afterward bring another action for the same cause, which he cannot do after a verdict against him.

NORD, a department in the north-east of France, bordering with Belgium; area, 2170 sq. miles. The principal minerals are coal and iron, which are extensively wrought; and the occupations connected with or depending on them render this department among the most important in France. The capital is Lille. Pop. 1,670,184.

NORDENSKIOLD (nor'den-sheuld), Nils Adolf Erik, Baron, a Swedish naturalist and explorer, born at Helsingsfors Nov. 18, 1832. He devoted himself to science, and was appointed to some important posts, but becoming obnoxious to the Russian authorities he settled in Sweden. Aided by the King

Baron Nordenskiöld.

of Sweden and others, Nordenskiöld was enabled, July 1878, to sail in the Vega, which was the first vessel to double the most northern point of the Old World, Cape Tchelyuskin, and after passing through Bering's Straits, reached Japan Sept. 2, 1879. On his return Nordenskiöld was enthusiastically welcomed in Europe, and created a baron by the King of Sweden. He died in 1901.

NOR'DICA, Lillian, an American soprano, born in 1859 at Farmington, Maine. She accompanied Gilmore's band to Europe in 1878, and later took up the study of opera with San Giovanni. After touring Germany and Russia, she appeared in 1881 in Paris, where her success was absolute. In 1887 she appeared in London, and in 1895 made

her first appearance in opera in her native land, at the Metropolitan Opera House, New York. She achieved her greatest successes in Aïda, Les Huguenots, and the soprano parts in the Wagnerian operas.

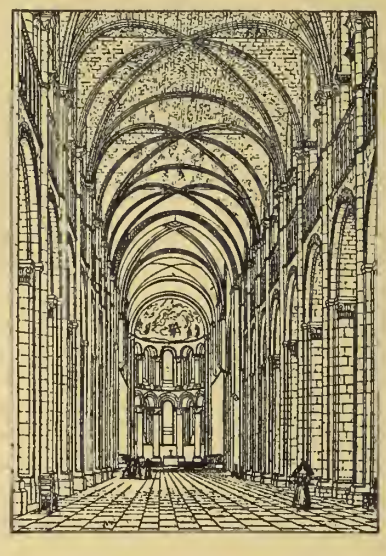
NORFOLK (nor'fok), a county of England. Area, 1,356,173 acres, of which 1,095,195 acres are arable, meadow, and pasture. The county town is Norwich; the chief seaport is Yarmouth. Pop. 460,040.

NORFOLK, a city and port in the county of the same name, Virginia, on on the river Elizabeth, 32 miles from the ocean. The harbor is safe and commodious, and a large trade is done in cotton. Norfolk and Portsmouth on the opposite site of the river constitute the largest naval station in the United States. Pop. 50,210.

NORFOLK-CRAG, in geology, an English tertiary formation belonging to the older Pliocene, resting on the chalk and London-clay. It consists of irregular beds of ferruginous sand-clay, mixed with marine shells and mastodon and elephant remains.

NORMAL SCHOOLS, called also Training Colleges, schools in which teachers are instructed in the principles of their profession and trained in the practice of it. The name is derived from the French écoles normales, established at the close of 18th century. These schools are now numerous in all countries that have a well-organized system of education. They may be either for teachers in elementary schools or for those of the secondary schools, and may be for males or females only or for both combined.

NORMAN ARCHITECTURE, the round-arched style of architecture, a variety of the Romanesque, introduced at the Norman Conquest from France into Britain, where it prevailed till the end of the 12th century. In its earlier stages it is plain and massive with but few mouldings, and those principally confined to small features; as the style advanced greater lightness and enrichment were introduced, and some of the later examples are highly enriched. The chevron, billet, nail-head, and lozenge mouldings are distinctively characteristic of this style. The more specific characteristics of churches in this style are: cruciform plan with apse and apsidal chapels, the tower rising from the intersection of nave and transept; semi-cylindrical vaulting; the doorways, deeply recessed, with highly decorated mouldings; the windows small, round-headed, placed high in the wall, and opening with a wide splay inside; piers massive, generally cylindrical or octagonal, and sometimes enriched with shafts; capitals cushion-shaped, sometimes plain, more frequently enriched; butresses broad, with but small projection; walls frequently decorated by bands of arcades with single or interlacing arches. It course of time the arches began to assume the pointed character; the piers, walls, etc., to be less massive; short pyramidal spires crown the towers; and altogether the style assumes a more delicate and refined character, passing gradually into the Early English. Besides ecclesiastical buildings, the Normans reared many castellated structures, the best remaining specimen of which is the Keep of the Tower of London. The Norman architects were not distinguished for science in construction. The walls of their buildings were of great thickness, and the piers supporting their arches were



Norman architecture.—Abbaye aux Dames, Caen.

usually of immense girth, yet notwithstanding this massiveness their works frequently gave way. The Abbaye aux Hommes and the Abbaye aux Dames at Caen, Normandy, afford excellent examples of this style; as also parts of the cathedrals of Durham, Peterborough, Norwich, and Canterbury, as well as many smaller churches.

NORMAN CONQUEST, in English history, the successful attempt made by William of Normandy in 1066 to secure the English crown from his rival Harold, son of Earl Godwin. It was no real conquest of the land and people by an alien race, but rather resembled in its chief characteristics the accession of William of Orange to the throne in 1688.

NOR'MANDY, an ancient province in the north of France, now divided into the department of Siene-Inférieure, Eure, Orne, Calvados, and Manche. On the decline of the Roman Empire it was seized by the Franks, and afterward in the 10th century, wrested from them by the Normans or Northmen, from whom it received its name. (See North men.) Charles the Simple gave his sanction to the conquest made by the Normans, and Rollo, their chief, received the title of Duke of Normandy. William the Bastard, sixth in succession from Rollo, having become king of England in 1066, Normandy became annexed thereto. On the death of William it was separated from England and ruled by his son Robert, and was afterward ruled by the kings of England until Philip Augustus wrested it from John and united it to France in 1203. Although several times invaded by the English, it was finally recovered by the French in 1450. Normandy is one of the richest and most fertile parts of France.

NORMANS, the descendants of the Northmen who established themselves in Northern France, hence called Normandy. Besides the important place occupied in history by the Normans in Normandy and England, bands of Normans established themselves in S. Italy and Sicily, and Norman princes ruled there from the middle of the 11th till the end of the 12th century. See Normandy and Northmen.

NORRISTOWN, a city in Pennsylvania, on the Schuylkill, 16 miles n.w. of Philadelphia. It has extensive woolen and cotton factories, rolling-mills, foundries, etc. Pop. 26,172.

NORSE, the language of Scandinavia. Old Norse is represented by the classical Icelandic, and still with wonderful purity by modern Icelandic. The literature includes the early literature of the people of Norway, Sweden, and Iceland.

NORTE (nor'tā), Rio Grande del, a river of North America, forming for a long distance the boundary between Mexico and the United States, and falling into the Gulf of Mexico. It is shallow and of little use for navigation. Length about 2000 miles.

NORTH, one of the cardinal points, being that point of the horizon or of the heavens which is exactly in the direction of the North Pole. See Pole.

NORTH, Christoper. See Wilson, John.

NORTH, Frederick, Lord, Earl of Guildford, the eldest son of Francis, second earl of Guildford, born in 1732, died 1792. He belongs to English history as chief of the administration during the American war of Independence. In 1770 he succeeded the Duke of Grafton as minister, when his retention of the tea-duty, imposed upon the American colonists, led to the rising in America, and to the declaration of independence, 4th July, 1776. Lord North resigned on the 20th of March, 1782. He became Earl of Guildford by the death of his father in 1790.

NORTH ADAMS, a town in Berkshire co., Massachusetts, on the Hoosac river, near the west end of the great Hoosac Tunnel; has manufactures of cotton and woolen-goods, boots, shoes, paper, and nitro-glycerine. Pop. 26,710.

NORTH AMERICA, the northern half of the western continent, or New World. Under America a general description of North America has been given, more especially as compared and contrasted with South America, but some additional information may here be given.

The mainland of North America, in the widest sense of the name, is united to South America by the Isthmus of Panama, and extends from lat. 7° n. to lat. 72° n. In a narrower sense, and excluding the southern portion often spoken of as Central America, it extends only from lat. 15° n. To it on the north belongs an extensive archipelago of arctic islands, to the northeast of which lies Greenland, the latter generally regarded as belonging to America. The figure of North America is very irregular, and in that respect it resembles Europe. On the north is the

great indentation of Hudson Bay, almost an inland sea, connected with the Atlantic by Hudson Strait. On the east are the Gulf of St. Lawrence, with the island of Newfoundland and the peninsula of Nova Scotia at its entrance; and the Gulf of Mexico, having on one side of its entrance the peninsula of Florida, on the other that of Yucatan. From the entrance of the gulf stretch eastward Cuba and others of the West India Islands. The chief features of the Pacific coast are the Gulf of California and peninsula of Lower California—further north Vancouver Island and the chain of other islands lining the coast. The continent terminates in a peninsular extension forming Alaska territory separated from Asia by Bering's Sea and Strait, the latter about 50 miles wide. The area of North America (excluding Greenland but including the West Indies) is about 8,150,000 sq. miles, or considerably more than double that of Europe. As regards its surface and physical features generally it presents various points of similarity with Europe —numerous large rivers, elevated mountain chains, and large plains suited for the growth of cereals and other crops; but most of its physical peculiarities are on a scale of greater magnitude than those of Europe. Thus its greatest mountain system, that of the Cordilleras (of which the Rocky Mountains strictly speaking form only a part), extends along the entire western side of the continent for a distance of at least 5000 miles, and rises to the height of 19,500 feet; the great plains which stretch on the east of these mountains from the Arctic Ocean to the Gulf of Mexico are also of far greater magnitude than those of Europe, contain the largest bodies of fresh water in the world, and are intersected by a series of rivers, one of which, the Mississippi-Missouri, is the longest of all rivers (length 4200 miles). The basin of the Mississippi-Missouri is bounded on the east by the Appalachian chain, one of much less comparative magnitude, but forming an important feature of the surface conformation of the continent. In its great navigable rivers and lakes North America possesses an immense system of inland navigation. As the great water-shed of North America is formed by the Rocky Mountains, all the chief rivers, with the exception of the St. Lawrence, have their sources on its slopes or plateaus, whence they flow to the Gulf of Mexico, the Pacific, the Arctic Ocean, or Hudson Bay. At more than one point in the system the water-parting is formed by a lake or marsh sending a stream on one side to the Pacific and on the other side to the Atlantic. The Nelson, Mackenzie, and Yukon are the chief rivers which flow into the Arctic Ocean, the last named having only recently been recognized as one of the great rivers of the world. The St. Lawrence is the largest of those which flow directly to the Atlantic. The lakes drained by the St. Lawrence, namely, Superior, Michigan, Huron, Erie, and Ontario, together cover an area of 97,000 sq. miles (or more than that of Great Britain). The largest, Lake Superior, has an area equal to that of Ireland. Other large lakes further to the north include Winnipeg, Athabasca, Great Bear Lake, and Great Slave Lake. The principal islands on the east are Newfoundland, Anticosti, Prince Edward's Island, and Cape Breton, all at the mouth of the St. Lawrence; the Bahama Islands, Cuba, Hayti, Porto Rico, and Jamaica. On the northwest coast the principal islands are Vancouver's Island, Queen Charlotte's Island, and King George III.'s Archipelago. The only others of any importance are the Aleutian Islands, stretching west from the peninsula of Alaska; the islands in the Arctic Ocean are almost inacessible.

The climate admits of a vast variety of vegetable products being grown, and though in the far north extremely rigorous, as a whole it is healthy and well suited to the peoples of Teutonic origin who now form so large a portion of the inhabitants. As regards minerals and other products North America is exceptionally favored, possessing abundance of all those that are most valuable —gold, silver, copper, iron, lead, and coal. Immense quantities of gold and silver have been produced. The coal fields are of prodigious extent, the Appalachian stretching without interruption 720 miles. The Pittsburg seam is 225 miles in length and 100 in breadth. Iron is worked in many parts, as are also copper and lead. Salt and petroleum are abundant. The forests are of vast extent, and include a great variety of the most useful timber trees, as pines, oak, ash, hickory, beech, birch, poplar, sycamore, chestnut, walnut, maple, cedar, etc. Maize or indian-corn is the only important farinaceous plant peculiar to the New World, but almost all fruits and grains known to Europe are cultivated to perfection in North America, to which Europe is now indebted for immense quantities of agricultural and dairy produce, as well as provisions of various kinds, and raw materials such as cotton, etc.

The political divisions of North America are the United States, the Dominion of Canada, Newfoundland, Mexico, and the Central American States. Canada occupies almost the whole of the continent north of the great lakes and lat. 49° n. The territory of the United States extends from the the British possessions to Mexico and the Gulf of Mexico, and from the Atlantic to the Pacific Ocean. Alaska territory belonging to the United States, occupies the northwest corner of the continent. The republican form of government prevails everywhere except in the British dominions. The areas and population are as follows:

	Area, sq. miles.	Pop.
British North America...	3,816,145	5,522,500
United States (including Alaska).....	3,507,640	88,912,058
Mexico	767,005	15,000,000
Central America (including British Honduras)..	181,527	3,550,100
West Indies.....	81,816	6,366,405
	8,354,133	119,351,063

The population now consists most largely of people of British or at least Teutonic origin, though the French and Spanish elements are also well represented. In the United States people of negro race number nearly 9,000,000. The aboriginal tribes of North America, known as Red Indians, are of a hardy and warlike character, but they are gradually dying out before the march of the white man. They have all so strong a resemblance to each other in physical formation and in intellectual character as to leave no doubt of their belonging to one family. (See Indians, American.) In Mexico, a people, perhaps of same race, the Aztecs, had made considerable progress in civilization before the arrival of the Europeans. In the extreme north we find the Esquimaux, who differ considerably from the Indians, but are often classed along with them as people of Mongoloid origin.

America is now believed to have been visited by Norsemen in the 10th and 11th centuries; but the modern discovery is due to Columbus, who reached one of the West Indies in 1492. Following his lead the first to reach the mainland was John Cabot, who, with his son Sebastian, sailed from Bristol in 1497, and on June 24 came in sight of Labrador. In 1512 Sebastian Cabot sailed again for America; but a mutiny on board his vessels compelled him to return before more had been accomplished than a visit to Hudson's Bay. In the same year Florida was discovered by Ponce de Leon. Giovanni Verazzano, a Florentine sent out by Francis I. of France in 1524, surveyed upward of 2000 miles of coast, and discovered that portion now known as North Carolina. Ten years afterward, Jacques Cartier, a seaman of St. Malo, sailed from that port for Newfoundland, the north coast of which he surveyed and minutely described. He subsequently made several voyages, and was the first European to enter the St. Lawrence, ascending it as high as Montreal. The Spaniards had previously conquered Mexico, and a desire to extend their dominion (1519–21) in a northerly direction led to further discoveries in North America. The coast of California was discovered by Ximenes, and in 1539 the Gulf of California was first entered by Francisco de Ulloa. In 1578 Drake visited the northwest coast. These discoveries were followed by those of Davis in 1585–87, Hudson in 1610, Bylot and Baffin in 1615–16, all in the northeastern seas. By this time settlements had been made by the French, English, and Dutch. The French occupied Nova Scotia and Canada, and latterly Louisiana. Captain Behring, who was sent out in 1725 by the Empress Catharine, set at rest the disputed point whether Asia and America were separate continents. Other names associated with American maritime discovery are Cook, Meares, Van couver, Kotzebue, and, more recently, Ross, Parry, Franklin, Beechey, and M'Clintock; inland travelers and discoverers include Hearne, M'Kenzie, Back, Rae, Simpson, Schwatka, etc. (See also North Polar Expeditions.) The Canadian authorities have in recent years done much in the way of survey and exploring the less-known portions of the Dominion, and Alaska is being made known by the efforts of expeditions from the United States. For general history see Canada, United States, Mexico, etc.

NORTHAMP'TON, a parl., county, and municipal borough of England, capital of the county of same name. Pop. 87,021.—The county is bounded by Lincoln, Rutland, Leicester, Warwick, Oxford, Bucks, Bedford, Huntingdon, and Cambridge; area, 629,912 acres, of which 560,000 acres are under crops. Pop. 338,064.

NORTHAMPTON, a town in Hampshire co., Massachusetts, situated on the right bank of the Connecticut, 93 miles west of Boston, has woolen, cotton, and silk factories, paper-mills, etc. Pop. 21,525.

NORTH BORNEO, the territory occupying the northern part of the island of Borneo under the jurisdiction of the British North Borneo Company, having been ceded by the Sultans of Sulu and Brunei in 1877–78 and the company having received a royal charter in 1881. The territory embraces 31,000 sq. miles, and has a pop. of 150,000. The exports comprise wax, edible birds'-nests, cocoa-nuts, gutta-percha, sago, tobacco, rattans, india-rubber, and timber. With a good climate and a fertile soil there is believed to be a great future before North Boreno. Along with Brunei and Sarawak the territory was made a British protectorate in 1888.

NORTH CAROLINA, one of the original states of the Union, is bounded on the n. by Virginia, on the n.w. by Tennessee, on the s. by Georgia and South Carolina, and on the e. by the Atlantic Ocean. It stretches 500 miles east, and west across the entire breadth of the

Seal of North Carolina.

Atlantic slope of the Appalachians in a long, narrow, rudely triangular belt, its western extremity, less than 20 miles wide, resting on the highest plateau and summits of that continental system of mountains, while its eartern end spreads out to a breadth of 200 miles, in a low, level and gently undulating plane on the Atlantic coast, with a curving shore line of more than 300 miles. Its area is 52,286 sq. miles, of which 3620 are covered with water. The highest mountains in the United States east of the Mississippi are in North Carolina, Mitchell's Peak, which is 6707 feet, being the highest point. The greater part of the state belongs to the Atlantic slope, but the western mountain region beyond the Blue Ridge belongs to the Mississippi basin, being drained by the headstreams of the Tennessee river, chief among which are the Little Tennessee and the French Broad river. The eastern slope of the Blue Ridge in this state is the watershed for nearly all the Atlantic rivers of both North and South Carolina, all of them having a general southeast course. In the northern half of the state the Roanoke, the Tar, and the Neuse enter Albemarle and Pamlico sounds through deep and wide estuaries. The southern portion is drained by the Cape Fear river, and the western part of the Piedmont plain by the Yadkin or Great Pedee and the Catawba, both of which flow into South Carolina.

North Carolina lies in the warmer part of the temperate zone. The climate becomes almost sub-tropical in the southeastern corner. The rainfall is abundant and very evenly distributed, both in regard to seasons and localities, though the central region receives somewhat less rain than the coast and mountain regions, and the summer somewhat more than the other seasons. North Carolina is unrivaled by any state east of the Mississippi in the variety of its plant life. The bald cypress, white cedar, live oak, long leaf pine, and hickories are indigenous as well as blueberries, sumacs, alders, wild grapes, and palmettos.

Mining has long given occupation to a portion of the population. Gold was first discovered in 1819, and between that date and 1850, hundreds of gold and copper mines were opened in the middle and western sections. In the last few years mining industries have received a new impulse. Iron ores are mined on a considerable scale for export, many new gold and copper mines have been opened, and the amount of the various mining industries is increasing very notably. Mica mining began several years ago in the mountain region, and has grown to considerable importance, much the larger part of this material found in commerce being produced here. Fishing is the most important industry in the eastern part of the state. Shad and oysters are by far the most prominent. Of the many other varieties the more important are squeteague, alewife, mullet, striped bass, clams, and bluefish. Agriculture is the leading industry. Yet the largest part of the swampy coast land is unreclaimed, and there is also much waste land in the mountainous area of the west. The crops which stand out prominently as to acreage is corn, the acreage for 1900 exceeding 47 per cent. of the total crop area, and the receipts equaling 25.2 per cent of the total crop receipts. Corn, wheat, oats, rye, cotton, and tobacco are the principal crops. The state ranks about eighth as a cotton state. The state holds third rank in the production of peanuts and second in the production of sweet potatoes. Watermelons, cabbages, and other vegetables, and strawberries and other small fruits are grown in abundance. Orchard fruits are most common in the western part of the state, the apple being the principal variety. Peaches are raised, but not in such great quantities as in other southern states. Rice is raised along the tidewater rivers, where the construction of dikes makes possible a system of flooding and draining. Some horses, mules and asses are raised. The manufactures include cotton goods, cotton-seed oil and cake, tobacco, flouring and grist mill products, leather and lumber and timber products. Education is not in an advanced stage. Only a small part of the school age population is provided with schools. The chief institution for higher education is the University of North Carolina at Chapel Hill. North Carolina was first visited by the English in 1584 under a charter granted by Queen Elizabeth.

The First Provincial congress met in defiance of Governor Josiah Martin in 1774, and sent delegates to the continental congress. The colony was the first to authorize her delegates in congress to vote for independence, on April 12, 1776, and a state constitution was adopted on December 18, 1776. North Caorlina troops took part in many of the important battles of the war, and in 1780–81 the state was invaded by the British. In 1791 the capital was located at Raleigh. In 1795 the State University was opened for students. The state opposed secession, but with President Lincoln's demand for troops to coerce the seceding states sentiment changed. An ordinance of secession was passed May 20th. North Carolina furnished more than 120,000 soldiers to the confederate cause, nearly twice her proportion. With the beginning of reconstruction in 1867 the civil authority was superceded by the military. Another convention was called in 1868, and a constitution allowing negro suffrage was adopted. In this year the Ku-Klux-Klan appeared, and Alamance and Granville counties were placed under martial law. The conservative democrats secured the legislature in 1870. The present constitution was adopted in 1876, and in 1900 a clause intended to restrict negro suffrage was added. The state has been democratic in national elections since the beginning of parties, with the exception of the years 1840–48, when it voted for the whig candidates, and 1868–72, when its vote was cast for Grant. Population, 2,100,000.

NORTH CAROLINA, Uniyersity of, a state institution at Chapel Hill, N. C., chartered in 1789 and opened in 1795. It comprises a college and school of law, medicine, pharmacy, together with a summer school for teachers. It confers the bachelors degree in arts, science, philosophy, and law, the degree of graduate in pharmacy, the master's degree in philosophy, and medicine. Free instruction is offered to graduates of colleges and universities, to candidates for the ministry, to teachers and young men who are preparing to teach and to those who are laboring under bodily infirmities.

NORTH DAKOTA, one of the north central states of the Union, is bounded on the n. by Canada, on the e. by Minnesota, on the s. by South Dakota, and on the west by Montana. Its extreme breadth from north to south is a little over 210 miles; extreme length from east to west 360 miles; area, 74,312 sq. miles. It ranks fourteenth in size among the states of the Union. The state is

almost entirely an undulating prairie, with no prominences of note. It is divided naturally into the Red river and James river valleys, the Devil's lake, and Turtle mountain regions, and the Mouse river, Missouri slope, and the North Dakota counties. The geological features of the state are full of variety and interest. A very large proportion of the surface is covered by glacial and alluvial drift, and much of the country bears evidence of having been more than once submerged.

North Dakota has a typical continental climate characterized by enormous extremes of temperature. The average annual rainfall of 17.29 inches would scarcely suffice for the needs of agriculture were it not for the fact that fully three-fourths of the precipitation falls during the growing season (April

Seal of North Dakota.

to September). Forest growth is found only along the river banks, and on the Turtle mountains in the north, and in some sections of the Red river valley. The remainder of the state is a treeless prairie covered with numerous species of grasses and other forage plants. The principal trees are cottonwood along the rivers, and oak, elm, birch, ash, and poplar in the Turtle mountains.

Wheat is the dominant crop. The Red river valley, which extends entirely across the eastern end of North Dakota, is perhaps the most famous wheat-producing region in the world. Oats is the next most important cereal. The cultivation of flax has increased from a few thousand acres to an acreage exceeding that of any other state. Barley is most extensively produced in the northeastern counties and corn in the southeastern. Potatoes yield abundantly and are an important crop. But very little fruit is raised. The prairie lands afford excellent pasturage, and large areas of wild salt and prairie grasses are annually cut for winter feed. Cattle and horses, mules, asses, sheep, and swine in the order named are the principal varieties of animals raised. Little manufacturing is carried on.

The eastern part of the state is well supplied with railroad facilities. The Great Northern crosses the northern part, and the Northern Pacific the southern part. In addition, the St. Paul, Minneapolis and Sault Ste. Marie enters the state at the southwest corner and extends in a northwest direction entirely across the commonwealth. The principal mineral resource of the state is brown coal, the measures of which extend beneath the whole country west of the Missouri river. In many places the croppings are so exposed that the settlers mine their own fuel. In the Red river region, salt, limestone, and hydraulic lime are abundant.

North Dakota has a uniform public school system which extends from the primary grade to and including the normal and collegiate course. Besides the common schools, all the towns have graded and high schools. The state has a university located at Grand Forks, and there are colleges at Tower City, Fargo, Jamestown, Grand Forks, and Bismark. There is a deaf and dumb asylum at Devil's Lake, a state reform school at Mandan, a state hospital for the insane, and a home for the feeble-minded at Jamestown, a soldiers' home at Lisbon, a blind asylum in Pembina co., an industrial school and school for manual training at Ellendale, and school of forestry.

The population is about 600,000. Canadians and Swedes are the chief foreign nationalities represented. At the head of the educational establishments of the state are the University of North Dakota, Fargo college, Red River Valley university, and the Agricultural college at Fargo. The two chief towns are Fargo and Grand Forks. The territory of Dakota was named after a family of Indians, and was obtained by the United States through the Louisiana Purchase in 1803. The first real and permanent white settlement in this territory was probably established by French-Canadian settlers near Pembina in 1807. In 1812 Lord Selkirk, by mistake, built his fort south of the Canadian line. There were fur-trading posts established as early as 1808. Lewis and Clark in their expedition of 1804–06 spent the first winter near Mandan. Frémont in 1839 explored much of the country and Lieutenant Warner in 1855 made a report on the region for the government. The part east of the Missouri river was first attached to the territory of Minnesota in 1849. The part west, together with much of Idaho, Wyoming, and Montana, became part of Nebraska territory in 1854. On March 2, 1861, the territory of Dakota was organized. The territory was divided into two (see South Dakota) on February 22, 1889, congress authorized the calling of conventions to form constitutions. On November 2d President Harrison declared the state admitted. Politically the state has been republican from its admission, with the exception of one election (1892), when a fusion of the Farmers' Alliance with the democrats gave them control.

NORTH DAKOTA, University of, a coeducational state institution at Grand Forks, N. D., established in 1883. By the enabling act of congress under which the state was admitted, the university received a grant of 86,080 acres of land, and the School of Mines, a grant of 40,000 acres. The university comprises a college of arts, a normal college, and departments of law, mining engineering, mechanical and electrical engineering, military science, and pharmacy, together with a preparatory department.

NORTHEAST PASSAGE. See Polar Research.

NORTHEAST TERRITORY, a territory of Canada on the east of Hudson bay, and extending south to Quebec province. It forms part of the peninsula of Labrador, and is little known. It is intersected by Rupert's river, East Main river, Big river, Great and Little Whale river, etc., all flowing west to Hudson bay, and containing numerous lakes. Furs are the only commodity as yet obtained from it. See Canada.

NORTHERN-DRIFT, in geology, a name formerly given to boulder-clay of the Pleistocene period, when its materials were supposed to have been brought by polar currents from the north.

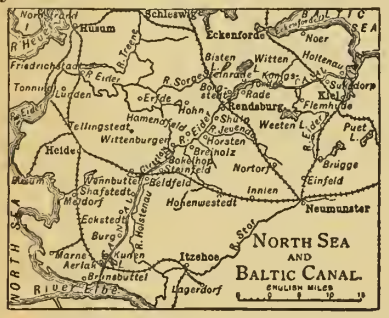
NORTHERN LIGHTS. See Aurora.

NORTHMEN, the inhabitants of ancient Scandinavia, or Norway, Sweden, and Denmark, who in England were also called Danes. They were fierce and warlike tribes, who as early as the 8th century made piratical expeditions to all parts of the European seas, these piratical robbers being known among themselves as vikings. In 795 the Scandinavians established themselves in the Faröe Isles and in Orkney; toward the middle of the 9th century they founded the governments of Novgorod and of Kiev, in Russia; and after the discovery of Iceland certain powerful Norwegian families, taking refuge from the persecutions of Harold, king of Denmark, settled in that island (in 870). In the 9th century they made repeated incursions into France, and it became necessary to purchase their retreat with gold. In that country latterly bands of them settled permanently and Charles the Simple was obliged (912) to cede to them the province afterward called Normandy, and to give his daughter in marriage to Rollo, their chief. Rollo embraced the Christian religion and became the first Duke of Normandy. The course of events was somewhat similar in England. Egbert, in the beginning of the 9th century, had no sooner made some approaches toward a regular government than the Danes made their appearance. Under Alfred (871–901) they overran great parts of England, but were finally defeated, and those of them who remained in the country had to acknowledge his sway. But they returned, under his successors, in greater force, obtained possession of the northern and eastern part of the country, and in the beginning of the 11th century three Scandinavian princes (Canute, Harold, and Hardicanute) ruled successively over England. The Saxon line was then restored; but in 1066 William, duke of Normandy, a descendant of Rollo, obtained the English throne, an event known as the Norman Conquest. According to the Saga narratives the Northmen were the first discoverers of America. The coasts of Spain, Italy, Greece, and Asia Minor were ravaged by them, and in Byzantium the body-guard of the emperors long consisted of Northmen known as Varangians, being recruited chiefly from those who had established themselves in Russia. See also Normandy, Normans.

NORTH POLAR EXPEDITION. See Polar Explorations.

NORTH POLE. See Pole.

NORTH SEA, or **GERMAN OCEAN,** a large branch of the Atlantic ocean lying between Great Britain and the continent of Europe, having the former and the Orkney and Shetland islands on the west; Denmark and part of Norway on the east; Strait of Dover, part of France, Belgium, Holland, and Germany on the south; and the Northern ocean on the north. Extreme length, from the Strait of Dover to Unst, the most northern of the Shetland Isles, about 700 miles; greatest breadth, between Haddingtonshire, Scotland, and Denmark, about 420 miles; area, not less than 140,000 sq. miles. The North Sea is deepest on the Norwegian side, where the soundings give 190 fathoms; but its mean depth is no more than 31 fathoms. The bed of this sea is traversed by several enormous banks or elevations, of which the greatest is the Dogger bank. The shores of the sea are for the most part low, except in Scotland and Norway. They present numerous estuaries and other inlets, and are studded with numerous important towns, the sea being the highway for an immense maritime traffic. The fisheries, especially of herring, cod, ling, haddock, flat-fish, etc., are exceedingly valuable. The rise and fall of the tide is very great at certain places. The navigation, on account of sand-banks, winds, fogs, etc., is rather dangerous, but numerous lighthouses help to render it safer. There are numerous islands along the coasts of Holland, North Germany, Denmark, and Norway.



NORTH SEA AND BALTIC CANAL, a great ship canal quite recently constructed at the cost of the German Empire, from Brunsbüttel at the mouth of the Elbe to the southernmost part of the Eider, and thence close along the course of that river, past Rendsburg, latterly following the same course as the old Eider canal to where it joins the Baltic at Holtenau, near Kiel. The waterway measures 197 feet wide at the surface and 72 feet at the bottom, with a depth of 29½ feet, and is intended for the passage of men-at-war as well as merchant ships, serving thus a double purpose. Its length is about 60 miles. The foundation-stone of the new works was laid by the Emperor William I. in June, 1887, and the last stone was laid by the Emperor William II. in June, 1895. The total cost of the construction was about 156,000,000 marks ($39,000,000), toward which Prussia has contributed fifty million marks.

NORTH-STAR, the north polar star, the star *a* of the constellation Ursa Minor. It is close to the true pole, never sets, and is therefore of great importance to navigators in the northern hemisphere.

NORTH STAR, Order of, a Swedish order of knighthood, established in 1748 mainly as a recognition of important scientific services.

NORTHUM'BERLAND, a northern maritime county of England, bounded south and southwest by the counties of Durham and Cumberland; east by the North sea, and north and northwest by Scotland. Area, 1,290,312 acres, of which about 717,000 acres are arable, meadow, and pasture. Coal-measures occupy an area of 180 sq. miles; and yield immense quantities of coal; lead, iron, limestone, and freestone are also wrought. The chief industries include ship-building and rope-making; forges foundries, iron, hardware, and machine works, chemical works, potteries, glass-works, etc. The coast abounds in cod, ling, haddock, soles, turbot, herrings, and a variety of other fishes. Northumberland is divided into four parliamentary divisions, Wansbeck, Tyneside, Hexham, and Berwick-upon-Tweed, each returning one member. Principal towns, Newcastle, Tynemouth, Shields, Morpeth, and Alnwick. Pop. 602,859.

NORTHWESTERN UNIVERSITY, a coeducational institution at Evanston, Ill., affiliated with the Methodist Episcopal Church. It was founded in 1851 and comprises a college of liberal arts, schools of law, medicine, pharmacy, dentistry, music and oratory. The college of liberal arts and the school of music are at Evanston, the professional schools in Chicago. The courses in the college lead to the bachelor's and master's degree in arts, philosophy, science, and letters, and to the degree of doctor of philosophy. The college course is largely elective after the second year, and provision is made for advanced credits by which the time required for subsequent professional studies may be shortened. The Garrett Biblical Institute, under Methodist Episcopal control, forms the theological department of the university.

NORTHWEST PASSAGE, a passage for ships from the Atlantic ocean into the Pacific by the northern coasts of the American continent, long sought for, and at last discovered in 1850–51 by Sir R. MacClure. See North Polar Expeditions.

NORTHWEST PROVINCES, a political division (lieutenant-governorship) of British India, bounded on the n. by Tibet, on the n.e. by Nepaul and Oudh, on the s. by the Chutia Nagpur district and the Central Provinces, and on the w. by Gwalior, Rajputána, and the Punjab; area 86,983 sq. miles. In 1902 the name was changed to United Provinces of Agra and Oudh. Pop. 47,691,782.

NORTHWEST TERRITORIES, that portion of northwestern Canada outside the provinces of Ontario, Quebec, Manitoba, British Columbia, Alberta and Saskatchewan, formerly the Hudson's Bay territory; estimated area, 2,648,000 square miles. This region is governed by a lieutenant-governor, assisted by an advisory council, there being also a legislative assembly elected by the people. Regina is the seat of government. The southern part of this vast territory has been divided into the districts of Assiniboia and Athabasca, and the provinces of Alberta and Saskatchewan, with the Yukon and Mackenzie districts farther north. The agricultural and other capabilities of at least a third of this region are very great, there being vast areas adapted for wheat, oats, barley, etc., or for stock-rearing; and land in the districts just mentioned is being rapidly taken up. Coal is abundant, and is now being worked; petroleum also is abundant; copper, silver, iron, salt, and gold have been found in various localities. Great quantities of furs are obtained, especially by the agents and employees of the Hudson Bay company to whom the whole territory formerly belonged, and who have many outlying forts and stations. There are many lakes and rivers, the former including Athabasca, Great Slave lake, Great Bear lake, etc.; and the latter the Saskatchewan, Athabasca, Peace, Mackenzie, etc., giving 10,000 miles of navigable rivers. (See also Canada.) The Canadian Pacific railway crosses the southern part of this magnificent territory, and towns and villages are rapidly being formed along its course. There are several other railways made or to be made, one running northwest from Regina to Battleford and Edmonton. Schools are being established in the more thickly-settled parts and education is free. In the Rocky mountain region five tracts of land have been reserved as national parks, on account of their interesting scenery. One of these, 260 sq. miles in area, presents a remarkable aggregate of lake, river, and mountain scenery, including the hot mineral springs of Banff, which are already being taken advantage of by persons suffering from various ailments. Pop. about 20,000.

NORWAY (Norwegian, Norge), a country in the north of Europe, bounded on the northeast by Russian Lapland, and east by Sweden, and washed on all other sides by the sea—by the Arctic ocean on the north, the Atlantic and the North Sea on the northwest and west, and the Skager-Rack on the south. It is about 1080 miles in length, and its greatest breadth is about 275 miles, but toward the north it narrows so much as to be in some places not more than 20 miles; area, 122,280 sq. miles, or rather more than the British Isles. The total population on Dec. 3, 1906, was returned at 2,231,088. The country is divided into twenty perfectures, of which the capital Christiania forms one, and the city of Bergen another. Other important towns are Trondhjem, Stavanger, and Drammen.

The coast consists chiefly of bold precipitous cliffs, and is remarkable both for the innumerable islands by which it is lined, and the bays or fiords which cut deeply into it in all directions. The surface is very mountainous, particularly in the west and north. Very commonly the mountain masses assume the form of great plateaux or table-lands,

called fjelds or fields, as the Dovre Fjeld, Hardanger Fjeld, etc. The highest summits belong to the Sogne Fjeld, a congeries of elevated masses, glaciers, and snow-fields in the center of the southern division of the kingdom, where rise Galdhoepig (8400 feet), the Glitretind (8384), and Skagastölstind (7879). Immense snow-fields and glaciers are a feature of Norwegian scenery. The few important rivers that Norway can claim as exclusively her own have a southerly direction, and discharge themselves into the Skager-Rack; of these the chief are the Glommen (400 miles), and its affluent the Lougen. The most important river in the north is the Tana, which forms part of the boundary between Russia and Norway, and falls into the Arctic ocean. Lofty waterfalls are numerous. Lakes are extremely numerous, but generally small. The principal is the Miösen Vand. The prevailing rocks of Norway are gneiss and mica-slate, of which all the loftier mountains are composed. The most important metals are iron, copper, silver, and cobalt, all of which are worked to a limited extent. The climate of Norway is on the whole severe. The harbors on the west, however, are never blocked up with ice; but in places more inland, though much farther south, as at Christiania, this regularly happens. The forests are estimated to cover about a fifth of the whole surface, and form a very important branch of national wealth. The principal forest tree is the pine. Only about 1000 sq. miles is under the plow. The chief cereal crop is oats. Barley ripens at 70° of latitude; rye is successfully cultivated up to 69°; oats to 68°; but wheat not beyond 64°, and that only in the most favorable seasons. Potatoes are grown with success even in the far north. The farms are generally the property of those who cultivate them, and commonly include a large stretch of mountain pasture, often 40 or 50 miles from the main farm, to which the cattle are sent for several months in summer. The rearing of cattle is an extensive and profitable branch of rural economy. The horses are vigorous and sure-footed, but of a diminutive size; the ponies are among the best of their kind, and are often exported. The reindeer forms the principal stock in the extreme north. Among the larger wild animals are the wolf, bear, elk, deer. The fisheries of Norway are of very great value; they include the cod, herring, mackerel, salmon, shark, walrus, seal, and lobster, the cod and herring fisheries being by far the most important. The rivers and lakes abound with salmon and salmon-trout, and make Norway one of the best angling countries in the world. Manufactures include cotton, woolen, flax, and silk tissues. Distilleries, brick-works, saw and flour-mills, are numerous; and there are foundries, machine-works, lucifer-match works, tobacco-factories, and sugar-refineries. The export trade includes fish, timber, wood-pulp, whale and seal oil, metals, skins, feathers, furs, lucifer-matches, etc. The exports in 1907 were $44,274,000. The chief imports are grain, textile goods, wool, sugar, coffee, tobacco, wine, brandy, petroleum, etc. Imports in 1899, $86,246,000. The chief trade is with Britain and Germany; Sweden, Denmark, and Russia coming next. The Norwegians are famous as sailors, and in the tonnage of its mercantile navy, Norway is surpassed only by Britain and Germany in Europe Bergen, Christiania, and Trondhjem are the chief ports. Railways are about 1200 miles. The monetary system is the same as that of Denmark.

Norway is a limited hereditary monarchy. The king is not allowed to nominate any but Norwegian subjects to offices under the crown. On a new succession the sovereign must be crowned King of Norway at Trondhjem. The members of the legislative assembly or Storthing are elected every three years by voters who have themselves been elected by the citizens possessing a certain qualification. It subdivides itself into two chambers—one, the Lagthing, consisting of one-fourth of the members; the other, the Odelsthing, has the remaining three-fourths. The chambers meet separately and each nominates its own president and secretary. Every bill must originate in the Odelsthing. When carried in that body it is sent to the Lagthing, and thence to the king, whose assent makes it a law. The great body of the people are Protestants of the Lutheran confession, which is the state religion. Other sects are tolerated, although government offices are open only to members of the Established Church. Elementary education is free and compulsory. Besides primary schools there are numerous secondary schools. There is but one university, that of Christiania. The army is raised mainly by conscription. The nominal period of service is thirteen years, five in the line, four in the Landvœrn (liable to be called to defend the country), and four in the Landstorm (for local defense) The troops of the line number 30,000. The navy comprises four iron-clads besides other vessels. The people are almost entirely of Scandinavian origin. A small number of Lapps (called in Norway Finns) and Qvaens, reckoned at 20,000 in all, dwell in the northern parts. The Norwegian language is radically identical with the Icelandic and with the Danish. For centuries Danish was generally employed as the literary and educated language of the country, as it still is; but during last century a vernacular literature has sprung up, the chief names connected with which are Wergeland, Welhaven, Asbjörnsen, Björnson, Ibsen, etc.

In the earliest times Norway was divided among petty kings or chiefs (jarls), and its people were notorious for their piratical habits. (See Northmen.) Harold Fair-hair (who ruled from 863 to 933) succeeded in bringing the whole country under his sway, and was succeeded by his son Erick. He was ultimately driven from the throne, which was seized in 938 by his brother, Hako I., who had embraced Christianity in England. Magnus the Good, the son of St. Olaf and Alfhild, an English lady of noble birth, was called to the throne in 1036; and having in 1042 succeeded also to the throne of Denmark united both under one monarchy. (See Denmark.) After his death the crowns of Norway and Denmark again passed to different individuals. In 1319 the crowns of Norway and Sweden became for a short time united in the person of Magnus V. Erick of Pomerania succeeded, by separate titles, to Norway, Sweden, and Denmark; and in 1397 was crowned king of the three kingdoms. Sweden then for a time became a separate kingdom; but the union between Denmark and Norway was drawn closer and closer, and very much to the disadvantage of the latter, which was ultimately degraded into a mere dependency of the former. The subsequent history of Norway becomes for a long period merely a part of that of Denmark. After the defeat of Napoleon by the allies in 1813 it was arranged by the treaty of Vienna in 1814 that Denmark must cede Norway to Sweden, and the result was the union of the two countries under the Swedish crown. The union was accompanied with a certain amount of friction, partly owing to the entirely democratic character of the the constitution of Norway, in which country titles of nobility were abolished early in the 19th century, and was dissolved in 1905, and Haakon VII. was proclaimed king.

NORWICH (nor'ich), a municipal, parl., and county borough and bishop see in England, capital of the county of Norfolk, on the Wensum, where it joins the Yare, 98 miles n.n.e. of London. The cathedral, founded in 1094, was originally in the Norman style, but now exhibits also later styles. The castle, a noble feudal relic, reputed to have been built by Uffa about 1066, is finely situated on a lofty eminence, and still surmounted by its massive donjon tower in the Norman style. St. Andrew's Hall originally the nave of the Blackfriars' Church, the Guildhall, and the bishop's palace, also deserve mention. Manufactures, of which worsted and mixed goods are the staple, are extensive, including also mustard and starch, boot and shoe making, iron-working, brewing, etc. Pop. 111,728.

NORWICH, a city in Connecticut, on the Thames, 13 miles north of New London. The falls of the river afford extensive water-power, and there are considerable manufactures of cotton and woolen goods, paper, fire-arms, machinery, etc. Pop. 20,115.

NOSE, the organ in man and the higher animals exercising the olfactory sense, or that of smell, and concerned through its apertures or passages in the function of respiration and in the production of voice. The bones of the nose comprise the boundaries of the nasal fossæ or cavities, which open in front in the nasal apertures, and behind into the pharynx or back part of the mouth. The front nostrils, or openings of the nose, are in the skeleton of an oval or heart shape, while the openings of the posterior nostrils are of a quadrilateral form. The bones which enter into the entire structure of the nose number fourteen. In addition there are certain cartilaginous pieces which assist in forming the structure of the nose, lateral cartilages on either side, and a cartilaginous sep-

tum in the middle between the two nostrils. There is also a bony septum which unites with the cartilaginous septum to form the complete partition of the nose Several special muscles give a certain mobility to the softer parts of the organ. The nostrils and nasal cavities are lined by the mucous membrane (pituitary membrane) richly furnished with arteries and veins and covered with a copious mucous secretion which keeps it in the moistened state favorable to the due exercise of the function of smell. The proper nerves of smell, the olfactory nerves, form the first pair of cerebral nerves or those which take origin from the cerebrum; while the nerves of common sensibility of the nose belong to the fifth pair of cerebral nerves. The olfactory nerves are distributed in the mucous membrane of either side in the form of a sort of thick brush of small nerve-fibres. The study of the comparative anatomy of the nasal organs shows us that man possesses a sense of smell greatly inferior in many instances to that of the lower animals. The distribution of the olfactory nerves in man is of a very limited nature when compared with what obtains in such animals as the dog, sheep, etc. All Vertebrates above fishes generally resemble man in the essential type of their olfactory apparatus. In most fishes the nostrils are simply shut or closed sacs, and do not communicate posteriorly with the mouth. The proboscis of the elephant exemplifies a singular elongation of the nose, in which the organ becomes modified for tactile purposes. In the seals and other diving animals the nostrils can be closed at will by sphincter muscles or valvular processes. The most frequent diseases or abnormal conditions which affect the nose comprise congenital defects, and tumors or polypi.

NOSOLOGY (from the Greek nosos, disease), in medicine, that science which treats of the systematic arrangement and classification of diseases, with names and definitions, according to the distinctive character of each class, order, genus, and species. Many systems of nosology have been proposed at different times, but that of Dr. William Farr has been very generally adopted as practically useful.

NOSTALGIA. See Home-sickness.

NOTARY, an officer authorized to attest contracts or writings, chiefly in mercantile matters, to make them authentic in a foreign country; to note the non-payment of foreign bills of exchange, etc. Often called a Notary Public.

NOTATION, Arithmetical, Algebraic Chemical, Musical. See Arithmetic, Algebra, Chemistry, Music.

NOTE, in music, a character which, by its place on the staff, represents a sound, and by its form determines the relative time or continuance of such sound. See Music.

NOT GUILTY is the general issue or plea of the accused in a criminal action. When a prisoner has pleaded not guilty he is deemed to have put himself forward for trial, and the court, may order a jury for the trial of such person accordingly. Should he refuse to plead, the court may direct the proper officer to enter a plea of not guilty on his behalf. On an indictment for murder a man cannot plead that it was in his own defense, but must answer not guilty; the effect of which is, that it puts the prosecutor to the proof of every material fact alleged in the indictment, and it allows the prisoner to avail himself of any defensive circumstance as fully as if he had pleaded them in a specific form. In England and the United States a jury can only give a verdict either of guilty or not guilty, and the latter often really means that there is not sufficient evidence to convict.

NOTRE DAME (nō-tr dâm), a title of the Virgin Mary, is the name of many churches in France, and particularly of the great cathedral at Paris, which was founded in the 12th century, and forms a prominent object in the city.

NOTTINGHAM, a town near the middle of England, capital of the county of same name, on the Leen, near its junction with the Trent, 110 miles northwest of London. The castle, which crowns the summit of a rock, rising 133 feet above the level of the Leen, was originally built by William the Conqueror as a means of overawing the outlaws frequenting the recesses of Sherwood Forest. The principal educational and literary institutions are the University college and Technical school, high-school for boys, the Blue-coat school, the school of art, the People's hall, and the Mechanic's institute. An arboretum covering 18 acres is a feature of the town. The staple manufactures are hosiery and lace, the latter being a sort of specialty. There are also manufactures of cotton, woolen, and silk goods, and of articles in malleable and cast iron. Pop. 239,753.—Nottinghamshire, or Notts, is an inland county, bounded north by York, east by Lincoln, south by Leicester, and west by Derby. Area, 526,176 acres, of which about 454,000 are arable, meadow, and pasture. Pop. 514,537.

NOUN (from the Latin nomen, name), in grammar, a word that denotes any object of which we speak, whether that object be animate or inanimate, material or immaterial. Nouns are called proper or meaningless when they are the names of individual persons or things, as George, Berlin, Orion; common, when they are the name of a class of things, as book, page, ball, idea, emotion; collective, when they are the names of aggregates, as fleet, army, flock, covey, herd; material, when they are the names of materials or substances, as gold, snow, water; abstract, when they are the names of qualities, as beauty, virtue, grace, energy. Some of the older grammarians included both the noun and the adjective under the term noun, distinguishing the former as noun-substantive and the latter as noun-adjective.

NOVA SCOTIA, a province of the Dominion of Canada, consisting of a peninsula or portion properly called Nova Scotia, and the Island of Cape Breton, which is separated from the mainland by the Strait or Gut of Canso. It is bounded on the north by Northumberland strait and the Gulf of St. Lawrence; northeast, south, and southeast by the Atlantic; west by the Bay of Fundy; and north by New Brunswick, with which it is connected by an isthmus only 11 miles broad (traversed by a ship railway); area, 20,907 sq. miles, or over 13,000,000 acres. The wild animals include bear, foxes, moose, caribou, otter, mink, etc., and excellent sport may be had. The minerals are also valuable. Granite, trap, and clay slate rocks predominate. Coal, with iron in combination abounds in many places, and more than 1,500,000 tons is raised annually. Gold is also found, and is being worked. Copper ore exists, as also does silver, lead, and tin; and gypsum is plentiful. Petroleum has been recently discovered, and wells have been sunk in Cape Breton. Wheat, potatoes, and oats are important crops; and buckwheat, rye, barley, Indian corn, and field-pease are extensively cultivated. Great quantities of hay are made, and a good deal is exported. The apple-orchards of the western counties are very productive, and extend along the highway in an unbroken line for 30 miles. Apples are now largely exported. Cattle and sheep are raised in considerable numbers, and are exported both to New Brunswick and Newfoundland. There are extensive fisheries of cod, haddock, mackerel, herrings, etc. The manufactures are comparatively unimportant, but a good deal of capital is invested in saw-mills, flour-mills, shipbuilding, tanning, etc. The foreign trade is comparatively large, more shipping being owned in proportion to population than in any other country. The imports consist principally of British and American manufactures; spirits, sugar, wines, coffee, etc. The principal articles of export are fish, timber, and coal. Education is widely and equally diffused and is free to all classes. There are four degree-conferring colleges or universities. The public affairs of the colony are administered by a lieutenant-governor, council, and house of assembly. It sends ten members to the senate and twenty to the House of Commons of the Dominion parliament. The laws are dispensed by a supreme court and district courts as in Canada. Halifax, the capital, possesses one of the finest harbors in America. The province is well provided with railways. Pop. 459,116; of the capital, 40,787.

NOVEL, a prose narrative of fictitious events connected by a plot, and involving portraitures of character and descriptions of scenery. In its present signification the term novel seems to express a series of fictitious narrative somewhat different from a romance, yet it would be difficult to assign the exact distinction, though the former is generally applied to narratives of everyday life and manners; while the romance deals with what is ideal, marvelous, mysterious, or supernatural. Prose fiction written for entertainment is of considerable antiquity.

NOVEM'BER, formerly the ninth month of the year, but according to the Julian arrangement, in which the year begins on 1st January, November became the eleventh month, and comprised 30 days. See Calendar.

NOV'GOROD, a town of Russia, capital of the government of same town, on the Volkhov, near the point where it issues from Lake Ilmen, 103 miles s.s.e. St. Petersburg. It was during the middle ages the largest and most important town of Northern Europe. Novgorod was the cradle of the Russian monarchy, and a monument was erected in 1864 to commemorate the thousandth anniversary of the foundation of the Russian State by Rurik. The trade and manufactures are now unimportant. Pop. 20,599.—The government has an area of 47,236 sq. miles. The principal crops are rye, barley, oats, flax, and hemp. Pop. 1,194,078.

NOVICE, a candidate of either sex for a religious order; the novitiate being the time in which the novice makes trial of a monastic life before taking the final vows. The term of probation is at least one year, and may extend to two or three. The order is not bound to receive a novice at the end of his novitiate, neither can a novice be hindered to leave the order when the term of novitiate is expired. The age for commencing a monastic life is fixed by the Council of Trent at sixteen years.

NOVUM OR'GANUM, the second part of Bacon's great projected work the Instauratio Magna, published in 1620. It is written in Latin, and along with the Advancement of Learning forms the foundation of the inductive or Baconian system of philosophy.

NUBIA, a name given, in a more or less restricted sense, to the countries of N.E. Africa bounded n. by Egypt, e. by the Red Sea, s. by Abyssinia, Senaar, and Kordofan, and w. by the Libyan Desert. With the exception of the valley of the Nile the country is generally desert. The Nubians belong to the

Nubians.

Arabian and Ethiopian races, who converge in the Nile basin; they are a handsome race, of dark-brown complexion, bold, frank, cheerful, and more simple and incorrupt in manners than their neighbors either up or down the river. Their language is various dialects of the Negro speech of Kordofan. Pop. estimated at 1,000,000 or 1,500,000. Among the towns are Dongola, Khartoom, Berber, etc. See Egypt, Soudan.

NUDIBRANCHIATA, the section of "Naked-gilled" Molluscs. They have no shells in their adult state, and the gills are completely exposed, existing

Nudibranchiata.

for the most part as branched or arborescent structures on the back or sides of the body. The sea-lemons, sea-lugs, etc., are examples.

NUISANCE, a legal term used to denote whatever incommodes or annoys; anything that produces inconvenience or damage. Nuisances are of two kinds —public or common and private. Public nuisances are: annoyances in the highways, bridges, and public rivers; injurious and offensive trades and manufactures, which, when hurtful to individuals, are actionable, and when detrimental to public health or convenience, punishable by public prosecution, and subject to fine according to the nature of the offense. A private nuisance may be defined as an injury or annoyance to the person or property of an individual. Whatever obstructs passage along the public ways, or whatever is intolerably offensive to individuals in their homes, constitutes a nuisance. Causing inconvenience to one's neighbors may not in itself be a nuisance at law; there must be positive discomfort or danger. As regards the power for the removal of public and private nuisances, a statue was passed in 1855 for England, called the Nuisances Removal Act, which has been amended by subsequent acts. By these acts authority is given to some local board, local officers or overseers of the parish, to carry out the provisions of the act. The local authority is to appoint a sanitary inspector, who is empowered to remove or remedy nuisances, such as the carrying on of noisome trades or manufactures; may be empowered on reasonable complaint, to demand an entrance into any private premises so as to inspect their condition; and may order the removal of the nuisance. If the offender refuse to do so the local board may remove the nuisance at his expense, and sue him for such expenses. The Public Health Act of 1867 created a number of statutory nuisances. The law in the United States differs little from that of England.

NULLIFICATION ACTS is a term used with reference to certain acts adopted by the legislature of South Carolina in 1830–32, by which it was sought to nullify various acts of congress in relation to the tariff.

Andrew Jackson was president of the United States when the state of South Carolina undertook its nullification proceedings, and he made short work of them. After the South Carolina legislature had several times declared, each time in stronger language, what it would or could or might do if a tariff bill were passed, congress repealed the act of 1828, and adopted a new scale to take effect March 3, 1833. President Jackson had already declared in emphatic terms that he would see to the execution of the laws, and the state legislature had declared his statement to be an unauthorized interference with the affairs of South Carolina. Finally on November 24, 1832, a convention called by the legislature adopted an ordinance "to nullify certain acts of the congress of the United States, purporting to be laws laying duties and imposts on the importation of foreign commodities." It declared the tariff laws of 1828 and 1832 to be unconstitutional and void and the collections of duties unlawful, and finally declared that if any attempt should be made by the federal government to coerce the state, they would hold themselves absolved from all obligations to maintain their political connection with the Union and would organize a separate government. This document was sent out to other states as the declaration of South Carolina.

Jackson replied with a proclamation declaring the ordinance an act of nullification and secession, denying the right of any state to annul a law, and declaring his determination "to execute the laws, to preserve the Union by all constitutional means, to arrest, if possible, by moderate and firm measures, the necessity of a resort to force."

The South Carolina legislature protested, exhorted the people to ignore the president's proclamation, and, on December 20, 1832, passed an act to carry the ordinance into effect by providing judicial remedies in the state courts for the recovery of goods seized or held for dues under the act of congress. On March 2, 1833, congress amended the act of 1832 by a compromise act reducing certain duties, and followed it on the next day by a Force Act, empowering the president to use military force to secure the collection of duties. Twelve days later the convention came together again and repealed its ordinance of nullification, but three days later it adopted another ordiannce declaring the Force Act null and void. But, as the original ordinance had been repealed and the duties were collected without trouble, General Jackson could afford to treat the last ebullition as mere brutum fulmen and did so, although he is credited with an expressed desire to hang John C. Calhoun, the leader of the nullification movement.

NUMA POMPILIUS, the second king of Rome, who is said to have reigned from 714 to 672 B.C. He was regarded as the founder of the most important religous institutions of the Romans, and left writings explanatory of his system, which were burnt by order of the senate when accidentally discovered 400 years after his time.

NUMBER, a single unit considered a part of a series, or two or more of such units. An abstract number is a unit or assemblage of units considered independently of any thing or things that they might otherwise be supposed to represent. For example, 5 is an abstract number while it remains independent; but if we say 5 feet or 5 miles it becomes a concrete number. Cardinal numbers

are numbers which answer the question, "How many?" as one, two, three, etc., in distinction, from first, second, third, etc., which are called ordinal numbers. A prime number is a number which can be divided exactly by no number except itself and unity. A number is even when it is divisible by two, otherwise it is odd. See Arithmetic.

NUMBER, in grammar, that distinctive form which a word assumes according as it is spoken of or expresses one individual or several individuals. The form which denotes one or an individual is the singular number; the form that is set apart for two individuals (as in Greek and Sanskrit) is the dual number; while that which refers indifferently to two or more individuals or units constitutes the plural number.

NUMBERING-MACHINE, a machine for impressing consecutive numbers on account-books, coupons, railway-tickets, bank-notes, etc. One of the principal forms of the apparatus consists of discs or wheels decimally numbered on their peripheries, the whole mounted on one axle, upon which they turn freely, acting upon each other in serial order. The first wheel of the series, containing the units, is moved one figure between each impact, and when the units are exhausted the tens come into action and act in coincidence with the units; so on of the hundreds, thousands, etc.

NUMBERS, Book of, the fourth of the books of the Pentateuch. It takes its name from the records which it contains of the two enumerations of the Israelites, the first given in chaps. i.–iv. and the second in chap. xxvi. It contains a narrative of the journeyings of the Israelties from the time of their leaving Sinai to their arrival at the plains of Moab, and portions of the Mosaic Law. Formerly the authorship was implicitly attributed to Moses, but some modern scholars resolve the book into various parts, to each of which is assigned a separate author. See Pentateuch.

NUMERAL, a figure or character used to express a number; as the Arabic numerals, 1, 2, 3, etc., or the Roman numerals, I, V, X, L, C, D, M, etc. See Arithmetic.

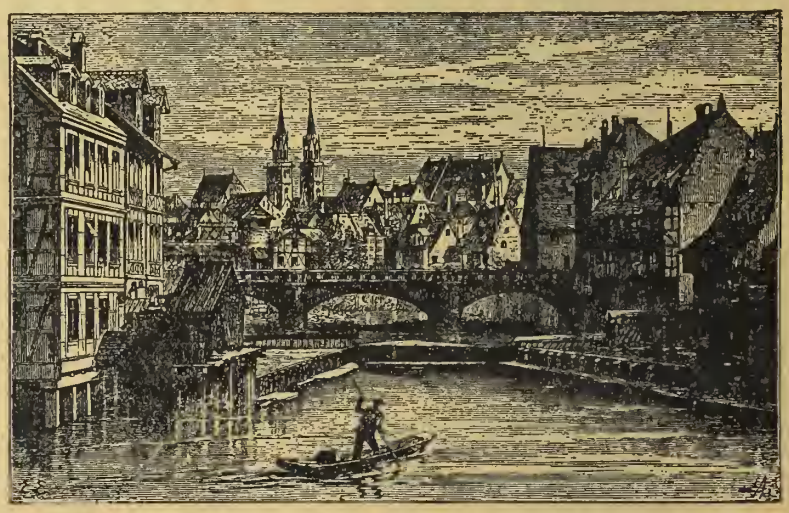
NUMERATION, the art of expressing in characters any number proposed in words, or of expressing in words any number proposed in characters. The chief terms used for this purpose are the names of the digits from one to ten, a hundred, a thousand, a million, etc. The term billion is of uncertain use: in Brittain it is a million of millions; in France, America, etc., a thousand millions.

NUMID'IA, an ancient country of North Africa, corresponding roughly with modern Algeria. It was divided among various tribes, but after the second Punic war it was united under Massinissa, and several of its rulers became noted in Roman history In B.C. 46 it became a Roman province.

NUMISMAT'ICS, or **NUMISMATOLOGY,** the science of coins and medals, the study of which forms a valuable and important adjunct to that of history. The word coin is in modern times applied to those pieces of metal struck for the purpose of circulation as money; while the word medal signifies pieces of metal similar to coins not intended for circulation as money, but struck and distributed in commemoration of some person or event. Ancient coins, however, are often termed medals. They are of gold, silver, bronze, electrum, or billon, and in ancient times served not only the purposes of a currency, but as chronicles of political events, and abstracts of the times. It is also from coins alone that we derive our knowledge of some of the most celebrated works of ancient art, particularly of ancient statuary. In ancient, as in modern times, while the coins of empires or kingdoms were (at least in later times) distinguished by the head of the reigning prince, those of free states were distinguished by some symbol. Thus, Egypt was distinguished by a sistrum, an ibis, a crocodile, or a hippopotamus; Arabia by a camel; Africa by an elephant; Athens by an owl; Syracuse and Corinth by a winged horse. There were also a number of symbols having a general signification. Thus, a patera signified a libation, and indicated the divine character of the person holding it in his hand; the shaft of a spear denoted sovereign power; an ensign on an altar, a new Roman colony; and so forth. Mediæval coins include the Byzantine, the coins of the various European states from the fall of Rome to the accession of Charlemagne; the Carlovingian currency from Charlemagne to the fall of the Swabian house (1268); early Renaissance to 1450; and classical Renaissance from then till 1600. Modern coins are classed geographically and chronologically. Oriental coins are those of Ancient Persia, Arabia, Modern Persia, India, China, etc.

NUN, a word of unknown origin, but supposed to be connected with a Coptic word signifying "pure," applied in the Roman Catholic church to a female who retires from the world, joins a religious sisterhood, takes upon herself the vow of chastity and the other vows required by the discipline of her convent, and consecrates herself to a life of religious devotion. Nearly all the masculine orders or rules had corresponding feminine institutions, while there were also numerous independent orders of nuns. At present the number of nuns is largely in excess of that of monks. The first nunnery is said to have been that founded by a sister of St. Anthony about A.D. 270; and the first in England was founded at Folkstone by Eadbald, king of Kent, in 630.

NUN'CIO, an ambassador of the first rank (not a cardinal) representing the pope at the court of a sovereign entitled to that distinction. A papal ambassador of the first rank, who is at the same time a cardinal, is called a legate. The title of internuncio is given to an ambassador of inferior rank, who represents the pope at minor courts. Formerly the papal nuncios exercised the supreme spiritual jurisdiction in their respective districts. But now, in those Catholic kingdoms and states which hold themselves independent of the court of Rome in matters of discipline, the nuncio is simply an ambassador.



Nuremberg—The Pegnitz and St. Lawrence church.

NUREMBERG (nu'rem-berg), a town in Bavaria, 93 miles n.n.w. of Munich. Within the walls it is one of the best-preserved specimens of a mediæval town in existence. The houses are generally lofty and picturesque, and many of them have three ranges of dormer-windows on their steep roofs. The town, which is very densely built, rises gradually to a height on the north side, on which the old castle is situated. The Pegnitz, traversing the town from east to west, divides it into two nearly equal parts—the north, and the south, which communicate by numerous bridges. It contains a large market-place and several interesting churches, among the finest of which are the Gothic churches of St. Lawrence and St. Sebaldus, both dating from the 13th century. Other places of worship are the 14th century Marienkirche (Roman Catholic), and the Jewish synagogue in oriental style (1867-74). The castle dates from the reign of Frederick Barbarossa (1158); part of the interior was fitted up in Gothic style (1854-56) as a royal

residence. Nuremberg has extensive breweries, railway-carriage and lead-pencil manufactories, and produces fancy articles in metal, carved wood, ivory, etc., toys, chemicals, clocks and watches, cigars, playing-cards, etc. Printing and bookbinding are also extensively carried on, and the hop-market is the most important on the continent. The town is celebrated, in connection with its industry, for the invention of watches. Pop. 261,022.

NURSE, one who tends or takes care of the young, sick, or infirm; specifically a female hospital attendant. There are now numerous institutions where active, intelligent, and physically able women are thoroughly trained for this work. The system of sending trained nurses to a seat of war originated with Miss Florence Nightingale during the Crimean war, and organizations for military nursing during the war are now common to all civilized countries. See Red Cross.

NUT, in botany, a one-celled fruit containing when mature only one seed, and enveloped by a pericarp of a hard, woody, or leathery texture, rarely opening spontaneously when ripe. Among the best known and most valuable nuts are the hazel-nut, the Brazil-nut, the walnut, chestnut, and cocoa-nut, all of which are edible. Various other kinds of nuts are used for special purposes. Thus valonia-nuts, gall-nuts, (not strictly speaking, nuts—see Galls), and myrobalan-nuts are used in tanning and dyeing, the last two also in ink-making; betel-nuts in making tooth-powder and tooth-paste; and coquilla-nuts and vegetable-ivory (the kernel of the nut of the Peruvian palm), being very hard and capable of taking on a fine polish, are used in making small ornamental articles of turnery.

NUT'CRACKER, the name of an insessorial bird. It is generally referred to the crow family, and so placed as to approximate either the woodpeckers or starlings. The European nutcracker is about the size of the jackdaw, but with a longer tail. It combines to a considerable extent the habits of the woodpeckers and those of the omnivorous birds. It has received the name of nutcracker from its feeding upon nuts. An American species is noted for the diversified beauty of its plumage, frequents rivers and sea-shores in America.

NUTGALLS. See Galls.

NUT'HATCH, the common European nuthatch is a scansorial bird, of shy and solitary habits, frequenting woods and feeding on insects chiefly. It also eats the kernel of the hazel-nut, breaking the shell with great dexterity. The female lays her eggs in holes of trees, and hisses like a snake when disturbed. Four distinct species are found in the United States; the Carolina or white-bellied, the Canada or red-bellied; the brown-headed nuthatch of the southern states and the pygmy nuthatch of the southwest.

NUTMEG, this fruit is a nearly spherical drupe of the size and somewhat the shape of a small pear. The fleshy part is of a yellowish color without, almost white within, and 4 or 5 lines in thickness, and opens into two nearly equal

White-bellied nuthatch.

longitudinal valves, presenting to view the nut surrounded by its arillus, known to us as mace. The nut is oval, the shell very hard and dark-brown. This immediately envelops the kernel, which is the nutmeg. The tree producing this fruit grows principally in the islands of Banda in the East Indies, and has been introduced into Sumatra, India, Brazil, and the West Indies. It reaches the height of 20 or 30 feet, producing numerous branches. The color of the bark of the trunk is a reddish-brown; that of the young branches a bright green. The nutmeg is an aromatic, stimulating in its nature, and possessing narcotic properties, very grateful to the taste

Nutmeg.

and smell, and much used in cookery. Nutmegs yield by distillation with water about 6 per cent of a transparent oil having a specific gravity .948, an odor of nutmeg, and a burning, aromatic taste.

NU'TRIA, the commercial name for the skins of the coypou of S. America. The overhair is coarse; the fur, which is used chiefly for hat-making, is soft, fine, and of a brownish-ash color.

NUTRITION, the act or progress by which organisms, whether vegetable or animal, are able to absorb into their system their proper food, thus promoting their growth or repairing the waste of their tissues. It is the function by which the nutritive matter already elaborated by the various organic actions loses its own nature, and assumes that of the different living tissues—a process by which the various parts of an organism either increase in size from additions made to already formed parts, or by which the various parts are maintained in the same general conditions of form, size, and composition which they have already by development and growth attained. It involves and comprehends all those acts and processes which are devoted to the repair of bodily waste, and to the maintenance of the growth and vigor of all living tissues.

NUTRITIVENESS OF FOODS, average quantity of nutritive matter in 1,000 parts of varieties of animal and vegetable food.

Cucumber	25	Pears	160
Melons	30	Apples	170
Turnips	42	Haddock	180
Milk	72	Gooseberries	190
Cabbage	73	Peaches	200
Carrots	98	Codfish	210
White of egg	140	Sole	210
Beet-root	148	Pork	240
Cherries	250	Mutton	290
Veal	250	Tamarinds	340
Beef	260	Almonds	650
Potatoes	260	Oats	742
Apricots	260	Rye	792
Grapes	270	Rice	880
Chicken	270	Barley	920
Plums	290	Wheat	950

NUX-VOMICA, the fruit of a species of plants growing in various places in

Strychnos nux-vomica.

the East Indies It is about the size and shape of a small orange, and has a very bitter acrid taste. It is known as a very virulent poison, and is remarkable for containing the vegeto-alkali strychnia. See Strychnine.

NYAN'ZA. See Albert Nyanza and Victoria Nyanza.

NYAS'SA, a large lake in south-eastern Africa; discovered by Livingstone in 1859. The length of the lake is nearly 400 miles, and it varies in breadth from 15 to more than 50. The surface is 1570 feet above the sea-level; its waters abound in fish. On the west lies British territory, on the east the territories of Portugal and Germany. The British Central Africa protectorate occupies the western and southern shores and extends toward the Zambesi. Pop. 845,000.

Nylghau.

NYLGHAU, a species of antelope as large as or larger than a stag, inhabiting

the forests of Northern India, Persia, etc. The horns are short and bent forward; there is a beard under the middle of the neck; the hair is grayish-blue. The female has no horns. The nylghau is much hunted as one of the noblest beasts of the chase, the skin of the bull being in demand for the manufacture of native shields. The name nylghau literally means "blue ox," and has, doubtless, been applied to this animal from the ox-like proportions of its body. They are known to breed freely in confinement.

NYMPH, a term sometimes applied to denote the pupa or chrysalis stage in the metamorphosis of insects and other animals.

NYMPHÆA'CEÆ, aquatic plants; the water-lilies of various parts of the world. The leaves are peltate or cordate and fleshy; the stalks both of flowers and leaves vary according to the depth of the water on the top of which the leaves

Nymphœa Lotus (white Egyptian water-lily).

float. The stems are bitter and astringent, and the seeds, which taste like those of the poppy, may be used as food, and hence the Victoria Regia is called water-maize in South America. The species are mostly prized for the beauty of their flowers; as the white water-lily which grows in pools, lakes, and slow rivers.

NYMPHS, in mythology, a numerous class of inferior divinities, imagined as beautiful maidens, not immortal, but always young, who were considered as tutelary spirits not only of certain localities, but also of certain races and families. They occur generally in connection with some other divinity of higher rank, and they were believed to be possessed of the gift of prophecy and of poetical inspiration. Those who presided over rivers, brooks, and springs were called Naiads; those over mountains, Oreads; those over woods and trees, Dryads, and Hamadryads; those over the sea, Nereids.

O

O, the fifteenth letter and the fourth vowel in the English alphabet. In English O represents six or seven sounds and shades of sound: (1) as in note, go, etc. (2) The similar short sound as in tobacco. (3) The sound heard in not, gone. (4) The same sound lengthened as in mortal. (5) The sound in move, do, tomb, prove. (6) The same sound but shorter as in wolf, woman. (7) The sound of u in tub, as in come, done, love. It is also a common element in digraphs, as oo, oa, ou.

O', in Irish proper names, a patronymic prefix corresponding to the Mac of the Highlands of Scotland; thus O'Connel means "the son of Connell."

OAJACA, or **OAXACA** (ō-à-hä'kà), a state of Mexico, on the Pacific Ocean and the Gulf of Tehuantepec; area, 33,978 sq. miles. The inhabitants are chiefly Indians. Pop. 948,633.—The capital, which has the same name, stands near the river Verde, 218 miles s.s.e. of Mexico, 4800 feet above the sea. Pop. 35,049.

OAK, the general name of the trees and shrubs, having monœcious flowers, those of the males forming pendulous catkins, those of the females solitary or in clusters, and having an involucre which forms the well-known "cup" of the fruit—the acorn. The oak from the remotest antiquity has obtained a preeminence among trees, and has not unjustly been styled the "monarch of the woods." The species of oak are very numerous, generally natives of the more temperate parts of the northern hemisphere, but found also in Java, Mexico, and S. America. They have alternate simple leaves, which are entire in some, but in the greater number variously lobed and sinuated or cut; evergreen in some, but more generally deciduous. For more than a thousand years ships were mainly built of common oak. The common oak attains a height of from 50 to 100 or even 150 feet, with a diameter of trunk of from 4 to 8 feet. The oak subserves a great number of useful purposes, the wood being hard, tough, tolerably flexible, strong without being too heavy, not readily penetrated by water. The bark of the common oak-tree and of several others is preferred to all other substances for the purpose of tanning on account of the amount of tannic and gallic acid it contains. Oak galls, morbid growths caused by insects, are also much used in tanning, especially those of Q. infectoria. Oak bark is also used medicinally as an astringent.

OAKLAND, a town of the United States in California, on the east side of San Francisco bay, opposite San Francisco. It has some extensive industrial establishments, and is rapidly increasing. Pop. 80,000.

OAKUM, the substance of old tarred or untarred ropes untwisted and pulled into loose fibres; used for caulking the seams of ships, stopping leaks, etc. That formed from untarred ropes is called white oakum.

OAR, a long piece of timber flat at one end and round at the other, used to propel a boat, barge, or galley through the water. The flat part, which is dipped into the water, is called the blade; the other end is the handle; and the part between the two is called the loom. Oars are frequently used for steering, as in whale-boats. Sweeps are large oars used in small vessels sometimes to assist the rudder, but usually to assist the motion of the ship in a calm. A scull is a short oar of a length such that one man can manage two, one on each side.

OA'SIS, the name of the fertile spots in the Libyan desert where there is a spring or well and more or less vegetation, but now applied to any fertile tract in the midst of a waste, and often used figuratively. The oases of Northern Africa are generally river valleys, the waters of which are for the most part underground, or depressions surrounded by short ranges of hills, from which small brooks descend, sometimes forming a lake in the center. In recent times oases have been formed in the Northern Sahara by sinking artesian wells. There are many important oases in the Western Sahara, in the Libyan desert, in Arabia, Persia, and in the Desert of Gobi in Central Asia. In ancient times the most celebrated oasis was that to the west of Egypt, containing the temple of Jupiter Ammon, now called the Oasis of Siwah.

OAT, or **OATS,** a genus of edible grasses cultivated extensively in all temperate climates, and though principally grown as food for horses largely used when ground into meal as human food. There are about sixty species. The cultivated species of oats are subdivided into a large number of varieties, which are distinguished from each other by color, size, form of seeds, quality of straw, period of ripening, adaptation to particular soils and climates, and other characteristics. The yield of oats varies from 20 bushels to 80 bushels per acre according to soil, etc. The weight per bushel varies from 35 to 45 lbs., and the meal product is about half the weight of the oats. Oatmeal is a cheap and valuable article of food, and its value seems to be becoming more appreciated among the wealthier classes as it is being neglected by the poorer.

OATH, a solemn assertion or promise, with the invocation of God to be a witness of the truth of what we say. Various forms have been associated with oath-taking. Thus, men have proclaimed and symbolized their promise by chopping a fowl in two, by standing within a circle of rope, by placing the hand under another's thigh, by dipping weapons into or drinking blood, or by stretching the hand upward toward the sky, and this latter gesture has established itself throughout Europe. Among the early Christians the question of oath-taking was a matter of much controversy, objection to it being founded upon Christ's command of "Swear not at all" (Matt. v. 34); but this injunction was held by Athanasius and others only to prohibit colloquial as distinct from judicial swearing. This objection is still maintained, however, by Mennonites, Quakers, Anabaptists; and the Secularists in England, upon other grounds, refuse the judicial oaths. In the United States a witness may either swear or affirm. False testimony in either case amounts to perjury.

OBADI'AH, one of the twelve minor prophets, who foretells the speedy ruin of the Edomites. The prophecy was probably uttered during the period which elapsed between the fall of Jerusalem (586 B.C.) and the conquest of Edom by Nebuchadnezzar (583 B.C.).

OB'ELISK, a column of a rectangular form, diminishing toward the top, generally terminating in a low pyramid. The proportion of the thickness to the height is nearly the same in all obelisks;

Obelisks of Thothmes and Hatasou, at Karnak (Thebes), Egypt.

that is, between one-ninth and one-tenth; and the thickness at the top is never less than half, nor greater than three-fourths of the thickness at the bottom. Egypt abounded with obelisks, which were always of a single block of hard stone; and many have been removed thence to Rome and other places. They seem to have been erected to record the honors or triumphs of the monarchs. The two largest obelisks were erected by Sesostris in Heliopolis; the height of these was 180 feet. They were removed to Rome by Augustus. A fine obelisk from Luxor was erected in Paris in 1833 and the two known as Cleopatra's Needles are now in London and New York. Besides those of Egypt, monoliths of this appearance, but smaller in size, have been found in the ruined cities of Nineveh and Nimrûd. The obelisks which were common to Rome, Florence, etc., had all been removed from Egypt during its domination by the Roman emperors. See Monoliths.

OB'ELUS, a mark, usually of this form — —, or this ÷, in ancient MSS. or old editions of the classics, and indicating a suspected passage or reading.

OBERAM'MERGAU, a village in Upper Bavaria, celebrated for the performance, every ten years, of the passion-play of Christ's crucifixion and ascension. The performance takes place every Sunday during the summer, on a large wooden stage open to the sky, and it usually lasts eight hours. Primarily regarded by these Bavarian villagers as a religious exercise, it has become in their performances a mystery play of impressive beauty. Latterly, however, it has taken the character of a European amusement and a source of profit.

O'BERON, in popular mythology, a king of the elves or fairies, and husband of Titania. He appears first in the old French poem Huon of Bordeaux, but is best known from Shakespeare and from Weber's opera of Oberon.

OBESITY. See Corpulence.

OBJECT-GLASS, in a telescope or microscope, the lens which first receives the rays of light coming directly from the object, and collects them into a focus. In the finest refracting telescopes the object-glass consists of an achromatic combination of lenses, formed of substances having different dispersive powers, and of such figures that the aberration of the one may be corrected by that of the other. The substances chiefly used are crown-glass and flint-glass.

OBJECTIVE. See Object.

OBLIGATION is a term in law which describes the bond under which a person binds himself to pay within a certain time and in the breaking of which a penalty is involved; or the tie in general by which a person is legally bound to the performance of anything.

OBLIGA'TO, or **OBBLIGATO,** in music, a part or accompaniment in a composition for a particular instrument of such character and importance that it is indispensable to the proper performance of the piece.

OBOE (ō'boi), a musical wind-instrument resembling a clarionet in shape, and sounded through a double reed. It consists of three joints besides the mouthpiece, and its compass is generally from B below the treble clef to F in alt,

Oboe.

with the intermediate semitones, being a compass of two octaves and one fifth. The name oboe is from the Italian; the French form, hautboy, was formerly more frequently used.

O'BRIEN, William Smith, Irish nationalist, born 1803, died 1864. He entered parliament in 1826, and subsequently joined the Young Ireland group of politicians, and advocated the use of physical force. In an endeavor (1848) to effect a rising in Tipperary, he was surrounded, arrested, tried by special commission at Clonmel, and sentenced to death, but in the end this was commuted to transportation. He was set at liberty in 1854, and fully pardoned in 1856.

OBSERVATORY, a building devoted to the observation of astronomical, magnetic, meteorological, or other natural phenomena. The astronomical observatory is the one of most general interest. Astronomical observation began at an early date in China; the pyramids in Egypt seem in some way to have been associated with stellar observation; and the first historical observatory was founded in Alaxandria 300 B.C. Its work was begun by Aristillus, and continued by Timocharis, Hipparchus, Aristarchus, and others. The first European observatory was built at Nuremberg by Bernhard Walther in 1472, and this was followed in the 16th century by Tycho Brahe's famous observatory on the island of Hveen near Copenhagen, while another was erected by the Landgrave of Hesse at Cassel in 1561. Through the labors of Brahe practical astronomy became associated with the universities, so that Leyden and Copenhagen founded observatories. These were followed by the construction of the Royal Observatory at Paris (1667), the Greenwich Royal Observatory (1675), the Tusculan Observatory near Copenhagen (1704), Berlin (1705; new observatory 1835), Vienna (1756), Dublin (1785), Königsberg (1813), Sydney (1820), Cape of Good Hope (1820), Edinburgh (1825), Pulkova near St. Petersburg (1839), Cambridge, United States (1839), Washington, United States (1845), Melbourne (1853), Lick Observatory, California (1888), Yerkes Observatory, Wisconsin (1896). The chief observatory instruments are the telescope, equatorial and mural circle, and transit instrument, together with the sidereal and the solar clock. In the larger observatories the application of spectrum analysis, photography, photometry, etc., has greatly increased the number and variety of observations. The observatory building must be constructed in a very stable manner, and as the instruments must be out of contact with the walls they are attached to stone pillars that rest on foundations separate from the rest of the building.

OBSTETRICS. See Midwifery.

OCCIDENT, the western quarter of the hemisphere, so called from the decline or setting of the sun; the west: used in contradistinction to orient.

OCCULTATION is the term used in astronomy for the hiding of a star or planet from our sight by passing behind some other of the heavenly bodies, and specifically applied to the eclipse of a star or planet by the moon. The word denotes also the time during which a star or planet is so hidden from our sight.

OCCULTISM, an "occult" property of matter is, in mediæval phraseology, a property that requires to be made manifest by experimentation; and occult science is simply experimental science. The term has undergone a curious transformation of meaning. As such science was the occupation of the few, and was not seldom suspect to the reigning theology, the word "occult" gradually assumed the significance that it now possesses, of something magical or uncanny or supernormal.

OCCUPANCY, in law, the taking possession of a thing not belonging to any person, and the right acquired by such taking possession.

OCEAN, or **SEA,** the vast body of water which covers more than three-fifths of the surface of the globe. Although no portion of it is completely detached from the rest, the ocean has often been divided into several great basins or areas, viz. the Pacific ocean, which separates Asia and Australia from America; the Atlantic ocean, which separates America from Europe and Africa; and the Indian ocean, which intervenes between Africa and Australia, together with the Arctic and the Antarctic oceans, round the north and south poles respectively. Between these no

very definite limits can be drawn; thus it is impossible to say where the Atlantic or the Pacific ends and the Antarctic or Southern ocean begins. The bed of the ocean appears to present the same irregularities as the surface of the land, being diversified by rocks, mountains, plains, and deep valleys. The deepest soundings at present known are 5155 fathoms (in the South Pacific), 4655 fathoms (northeast of Japan), and 4561 fathoms (north of Porto Rico). (See Atlantic Ocean, Pacific Ocean, etc.) The waters of the ocean vary as greatly in temperature as they do in depth. This is partly due to the ordinary effects of isolation; but the abrupt changes and anomalous distribution of temperature is chiefly owing to currents. (See Currents, Marine.) The Pacific and Indian oceans are both warmer in low latitudes than the Atlantic, and the mean temperature of the equatorial areas at the surface is assumed to be 81°.5; the warmth of the North Atlantic is anomalous, and due to the influence of the Gulf Stream. This high temperature only applies to the surface water of the ocean, for experience shows that in both hemispheres and in all latitudes the basic water of the ocean is exceedingly cold. In low latitudes water at 32° has been drawn from great depths; while in high latitudes water at 26° has been found. This phenomenon is accounted for by the supposition that the cold water at the poles, by reason of its specific gravity, sinks to the bottom and spreads throughout the ocean basin. The saltness of the ocean is due to the presence of various saline ingredients (chiefly chloride of sodium or common salt), which are generally found in the proportion of from 30 to 40 per thousand. Recent observations have shown that the color and transparency of the water of the ocean are in a large measure dependent on the degree of saltness. In general it is found that the greater the saltness the greater the transparency, and also that where the saltness is very great the water is of a dark-blue color, that where it is less the water is of lighter blue, inclining to green, and that in the neighborhood of rivers (where the saltness is reduced to a minimum) the water is as a rule of a greenish-yellow.

OCEA'NIA includes all the islands of the Pacific between Asia on the northwest, the Indian ocean on the west, the Antarctic ocean on the south, and America on the north and east. It is usually divided into Australasia, Polynesia, and Malaysia or the Malay Archipelago.

OCE'ANUS, in Greek and Roman mythology, the eldest of the Titans, regarded as the god of the ocean or the river surrounding the earth, and the parent of the Oceanides or ocean nymphs.

O'CELOT, a digitigrade carnivorous mammal of the cat kind peculiar to the American continent. It attains a length of about 3 feet, while the tail measures some 18 inches more. The ocelot inhabits great forests; its food consists mainly of birds and rodents; and it is timid but bloodthirsty.

OCHRE, a combination of peroxide of iron with water; but the name is generally applied to clays colored with the oxides of iron in various proportions. Considerable quantities of ochre are obtained from the ferruginous mud separated from tin and copper ores; and it is also found in natural beds some feet thick in the more recent formations. Ochres vary in color from a pale sandy yellow to a brownish red, and are much used in painting.

Ocelot.

O'CONNELL, Daniel, Irish agitator born in Kerry in 1775. He studied for the Irish bar, and soon became distinguished for legal skill and oratory. Turning his energy to Irish politics he advocated Catholic Emancipation; skillfully kept the agitation within constitutional lines; became member for Clare in 1828; and attained his triumph in the following year when the government of the Duke of Wellington granted the Catholic claims. After the Reform Bill he became conspicuous as the head of a parliamentary body called "O'Connell's Tail." In 1841 he developed his policy, called together enormous meetings throughout Ireland, and loudly raised a cry for the Repeal of the Union. This agitation Sir R. Peel and the government determined to put down. They arrested O'Connell, obtained a conviction, and sentenced him to twelve months' imprisonment with a fine of $10,000. In a few months the House of Lords quashed this judgment. Meanwhile, however, a new and more advanced party had sprung up in the Repeal Association, and the health of O'Connell was broken down. He made his last speech in parliament April, 1847, and died the following month at Genoa, on his way to Rome.

OC'TAGON, in geometry, is a figure of eight sides and angles, which when the sides and angles are all equal is called a regular octagon, and when they are not equal an irregular octagon.

OCTAHE'DRON, in geometry, a solid contained by eight equal and equilateral triangles. It is one of the five regular bodies.

OC'TANT, in astronomy, that position or aspect of a heavenly body, as the moon or a planet, when half-way between conjunction or opposition and quadrature, or distant from another point or body the eighth part of a circle or 45°. The word is also applied to an instrument for measuring angles, resembling a sextant or quadrant in principle, but having an arc the eighth part of a circle, or 45°

OCTAVE, in music, an interval of seven degrees or twelve semitones above or below some sound counted from; or one sound eight tones higher than another. The octave is the most perfect of the chords, consisting of six full tones and two semitones major. It contains the whole diatonic scale. The most simple perception that we can have of two sounds is that of unisons, or sounds of the same pitch, the vibrations beginning and ending together. The next to this is the octave, where the more acute sound makes precisely two vibrations while the grave or deeper makes one; consequently, the vibrations of the two meet at every single vibration of the more grave one. Hence the ratio of the two sounds that form the octave is as 1 to 2. See Music.

OCTA'VIA, daughter of Caius Octavius and of Atia, and sister to the Emperor Augustus, illustrious for her virtues, her beauty, and her accomplishments, was the widow of Claudius Marcellus, by whom she had a son and two daughters, when she was married, at the instance of her brother, to the triumvir Mark Antony. The latter neglected her for Cleopatra, queen of Egypt; notwithstanding which, Octavia displayed the most noble fidelity to his house and fortunes, and devoted herself to the education of all his children, until he divorced and ordered her to leave his house, a command she obeyed without complaint. She died in 11 B.C.

OCTAVIUS, or **OCTAVIANUS** See Augustus.

OCTA'VO, the size of one leaf of a sheet of paper folded so as to make eight leaves: usually written 8vo; hence, a book having eight leaves to the sheet. There are different sizes of octavo, arising from the different sizes of paper employed; as, foolscap 8vo, demy 8vo, imperial 8vo.

OCTOBER, originally the eighth month in the Roman calendar, whence its name, which it still retained after the beginning of the year had been changed from March to January.

OC'TOPUS, familiarly known as cuttle-fishes. They have eight arms, each with two rows of suckers, which are sessile or unstalked. The prominent head is joined to the body by a distinct neck, and the body itself is short, generally more or less rounded in shape, and unprovided with side or lateral

The common octopus or cuttle.

fins. They have attained a notoriety from tales circulated concerning their ferocity and the existence of gigantic members of the genus, though the largest cuttle-fishes that have been met with have belonged to other genera. The common cuttle is found on the British shores, but is more common in the Mediterranean. It is said to reach a length of 9 feet and a weight of 68 pounds, the arms being long and slender.

ODDFELLOWS, a large and extensively ramified friendly society, having its headquarters in Manchester. It was originally an association of a convivial kind, modeled on freemasonry, and still retains watchwords and secret signs. It assumed its present form at a convention in Manchester (1813), and has spread widely in Britain and elsewhere. The organization was introduced into the United States in 1819, and severed its connection with the British Union in 1842. Branch societies connected with England or the United States have been founded in Australia, New Zealand, South Africa, South America, etc.

ODE, a poem of lyrical character, supposed to express the poet's feelings in the pressure of high excitement, and taking an irregular form from the emotional fervency which seeks spontaneous rhythm for its varied utterance. The Greeks called every lyrical poem adapted to singing—and hence opposed to the elegiac poem—an ode (ōdē, that is, song). The principal ancient writers who employed this form of verse were Pindar, Anacreon, Sappho, Alcæus, among the Greeks, and Horace among the Romans. As employed by English writers the ode takes either the Pindaric form of strophe, antistrophe, and epode irregularly arranged and contrasted; or, as in its later development, the form of a regular series of regular stanzas. The former style is found in Dryden's Ode for St. Cecilia's Day, while the latter is seen in Shelley's Ode to a Skylark. The masters of English poesy who have carried the ode to its highest achievements are Milton, Dryden, Collins, Gray, Coleridge, Wordsworth, Keats, and Shelly.

ODES'SA, a Russian seaport in the government of Kherson, situated on the Black Sea, between the mouth of the Dnieper and Dniester, on the bay of Odessa. Odessa is one of the chief wheat ports in the East, while wool, timber, hemp, flax, iron, coal, etc., are among the staple exports. Besides the maritime trade, Odessa carries on a large overland trade by rail with Germany, Austria, France, Switzerland, and Italy. Pop. 405,041.

ODIN, or **WODEN,** the chief god of Scandinavian mythology, the omniscient ruler of heaven and earth, having his seat in Valaskjalf, where he receives through his two ravens tidings of all that takes place in the world. As war-god he holds his court in Valhalla, where all brave warriors arrive after death and enjoy the tumultuous pleasures they delighted in while on earth. His wife is Frigga. The fourth day of the week, Wednesday, derived its name from this deity.

ODOA'CER, the first barbarian king or ruler of Italy after the fall of the Western Empire, A.D. 476 to 493. He was chosen head of the barbarian confederates, and having overthrown Romulus Augustulus, the last of the Roman emperors, he assumed the title of king in 476. He ruled with vigor and wisdom. In 489 Italy was invaded by the Ostrogoths under Theodoric, and in repeated battles Odoacer was defeated, being latterly besieged in Ravenna, on the fall of which he was assassinated.

ODONTOGLOS'SUM, an extensive genus of orchids, natives of Central America, much prized by cultivators

Odontoglossum.

for their magnificent flowers, which are remarkable both for their size and beauty of their colors.

ODYSSEUS (o-dis'ūs). See Ulysses.

OD'YSSEY, an epic poem attributed to Homer, in which the adventures of Odysseus (Ulysses) are celebrated. See Homer.

ŒCUMEN'ICAL, universal, an epithet applied to the general councils of the church. From the time of the Council of Chalcedon (451) the patriarchs of Constantinople took the title of œcumenical, in the same sense as the epithet Catholic is used in the Western Church. See Council.

Œ'DIPUS, in ancient Greek legend, son of King Laius of Thebes, was exposed as an infant—on account of an oracle saying that Laius would be killed by his son—and was brought up at the court of Corinth. Having solved the riddle of the Sphinx he became king of Thebes, unknowingly killed his own father and married his mother Jocasta a fate foretold by the Delphic oracle. On realizing what had been done Jocasta hanged herself, and Œdipus put out his own eyes. This story has been used by the poets to symbolize the helplessness of man before Fate. The Œdipus of Æschylus and Euripides are lost, but the King Œpidus and Œdipus at Colonos of Sophocles remain. The story has also been made the subject of tragedies by Corneille, Voltaire, Chénier, Dryden and Lee.

ŒSOPH'AGUS, or **GULLET,** the membraneous and muscular tube which leads from the pharynx or back part of the mouth to the stomach. In man the length of the gullet is from 9 to 10 inches. It begins at the fifth cervical or neck vertebra, at a point corresponding with the cricoid cartilage of the larynx, and it runs in a slightly deviating course downward to the stomach. Thus in the neck it lies close behind the windpipe; while in the chest it bends to the right side and then to the left before it pierces the midriff or diaphragm—which forms the floor of the chest—by a special aperture existing in that structure. Internally the gullet is lined by mucous membrane, and between the mucous and muscular layers cellular tissue exists. The mucous or lining membrane is thick and of pale color, and is arranged in longitudinal furrows or folds. In the lower animals the modifications of the œsophagus are various. In birds, for instance, it presents the expansion known as the crop.

OFEN. See Budapest.

OFFA, a distinguished king of Mercia, who attained the throne after Ethelbald, on defeating the ursurper Beornred, A.D. 757. He founded the Abbey of St. Albans, and was a liberal patron to the church. He died in 796.

OFFENBACH, Jacques, French composer, born of Jewish parents at Cologne in 1819, died 1880. He entered the Paris Conservatoire in 1835; became proficient on the violoncello, and for some time played on this instrument in the orchestra of the Théâtre Comique. In 1847 he became conductor at the Théâtre Français, and subsequently opened the "Bouffes Parisiens," where he enjoyed immense popularity as the composer of such operas as Orphée aux Enfers, La Grande Duchesse, La Belle Hélène, Madame Favart, La Barbe Bleue, Geneviève de Brabant, and La Princesse de Trebizonde.

OFFERTORY, that portion of the service of the Eucharist in which the offerings of the congregation are made, whether these consist of bread and wine or alms. The term is used in the Roman Catholic Church to denote that portion of the mass which is being sung when the priest offers the bread and wine; while in the Church of England it is applied to the sentences read from the service when the alms are being collected, or is applied to the alms themselves.

OFFICERS, Military and Naval. In the army, general officers are those whose command extends to a body of forces composed of several regiments, as the general, lieutenant-general, major-generals, and brigadiers. Staff-officers, those who belong to the general staff, as the quartermaster-general, adjutant-generals, aides-de-camp, etc. See Navy, Army and Relative Rank In.

OFFING, a nautical term signifying the position of a vessel, or of a portion of the sea within sight of land, relatively to the coast. The offing may be taken to represent that part of the sea beyond the midline between the coast and the horizon.

OG, king of Bashan at the time of the conquest of Canaan by the Israelites, by whom he and his people were destroyed. He has been transformed by rabbinical fables into one of the giants who lived before the flood, and escaped the general inundation by taking refuge on the roof of Noah's ark.

OGDEN, the capital of Weber co., Utah, at the confluence of the Ogden and Weber rivers, the mouth of Ogden cañon, and the foot-hills of the Wasatch mountains; on the Union Pac., the Central Pac., and the Rio Grande West. railways; 37 miles n. of Salt Lake City. It derives excellent power for industrial purposes from the rivers, has an abundant supply of water from mountain springs, and is in an agricultural, fruit-growing, iron, salt, lime, buildingstone, and coal region. Pop. 19,512.

OGDENSBURG, a city in St. Lawrence co., N. Y., at the confluence of the St. Lawrence and the Oswegatchie

rivers; on the Central Vt. and the Rome, Watertown and Ogdensburg railways; opposite Prescott, Canada, with which it is connected by steam ferry; 175 miles n.n.w. of Albany. The city is the headquarters of a line of screw steamers plying between Chicago and intermediate lake ports, and annually handles a large amount of grain and lumber, besides general lake and river freight. Pop. 14,272.

OGLESBY (o'g'lz-bĭ), Richard James, American soldier and politician, was born in Oldham co., Ky., in 1824. He moved to Illinois and served as a lieutenant in the Mexican war, participating in the battles of Vera Cruz and Cerro Gordo. During the gold excitement of 1849 he crossed the continent to the mining districts of California, but returned in 1851. In 1860 he was elected state senator but preferred to join the Union forces in the civil war. He was made major-general. In 1864 he was elected governor of Illinois, and re-elected in 1872. He was United States senator from 1873 to 1879, and was again elected governor in 1885. He died in 1899.

OHI'O, a river in the United States of America, formed by the confluence of the Alleghany from the north and the Monongahela from the south, at Pittsburg in Pennsylvania, where it is a navigable stream 600 yards broad. It flows w.s.w., separating the states of W. Virginia and Kentucky on the south from Ohio, Indiana, and Illinois on the north, and enters the Mississippi at Cairo. Its length from Pittsburg to its junction with the Mississippi is 975 miles; area of basin, 214,000 sq. miles. The width of the river varies from 400 to 1400 yards; average width, about 800 yards, at its mouth 900 yards. Its principal affluents are the Miami, Kentucky, Wabash, Cumberland, and Tennessee.

OHIO, a state in the American Union which ranks fourth in point of population and agricultural products, is bounded on the north by Lake Erie and the state of Michigan, west by Indiana, south by Kentucky, southeast and east by West Virginia, and northeast by Pennsylvania; area, 20,760 sq. miles. It ranks thirty-second in size among the states. In the north the surface is generally level, and in some places marshy; in the east and southeast it is rugged and broken by hills, but never rises into mountains. In its natural state Ohio was covered with dense forests; now they cover but about one-fifth, the trees most abundant being several varieties of oak, maple, ash, black and white walnut, chestnut, beech, poplar, sycamore, linden, etc. The drainage is divided between the Ohio and Lake Erie. The former, which receives the far larger share, bounds the state partly on the east and wholly on the south, and is augmented from within it by the Mahoning, Beaver, Muskingum, Hockhocking, Scioto, and the Great and Little Miami; the latter, which washes the northern frontier for 160 miles, receives the Maumee, Portage, Sandusky, Huron, Cuyahoga, Grand, and Ashtabula. The climate is pleasant and healthful, though variable. The average annual rainfall is 39.35 inches, very evenly distributed through the year.

In the southeastern part the soil is formed directly from the decomposition of the underlying rocks, while in the remaining area, covering nearly two-thirds of the state, it consists of glacial drift of great fertility. This soil contains a great percentage of limestone material in the west, while in the northeast it consists chiefly of clay, and is well adapted for wheat-growing. The alluvial soil deposited along the river courses is excellent for the raising of Indian corn. The extreme northwestern part of the state exhibits certain features of prairie country. Both the upper and lower coal measures contains several workable

Seal of Ohio.

seams interbedded between strata of shale, limestone, sandstone, and clay, and ranging in thickness from two to over a dozen feet. The interbedding strata of the coal measures yield fire-clay and building stone, and here also are found the iron ores of the carbonate variety. Gypsum and salt deposits also occur at various places. One of the most remarkable events in the mineralogical development of Ohio was the discovery in 1884 of petroleum in the Trenton limestone formation of Lower Silurian age. This formation as well as the Upper Silurian inclosed also considerable reservoirs of natural gas.

Petroleum was discovered in 1884 and the output of the state exceeds that of any other. The petroleum is obtained in two sections of the state, the southeast and northwest. The former is known as the eastern district, and the latter—the more important—as the Lima district. In a third region, known as the Mecca-Belden district, small quantities of lubricating oil are obtained. The utilization of the state's natural gas resources is also of recent development. There are two gas fields corresponding in a general way with those of petroleum.

Ohio ranks first in the annual value of clay products, contributing 17.3 per cent of the total output for the country. The state regularly ranks first in the figures for the sandstone product. Limestone, iron, and the carbonate variety of ore are found in many places; 93.9 per cent of the total land area is in farms. The proximity of large city markets and the excellence of the transportation facilities help to stimulate agriculture. The area of corn, wheat, and hay each exceeds three million acres. Oats are also extensively grown, but this crop decreased in area during that decade. Rye, barley, and buckwheat are not extensively raised. Ohio is one of the largest producers of Irish potatoes, sweet corn, tomatoes, cabbage and tobacco. Ohio is probably the largest producer of temperate zone orchard fruits. The region around Lake Erie is especially favored for fruit-raising. This region has become noted for its numerous and extensive vineyards. Large quantities of small fruits are grown. Horses, sheep, cattle, and swine are reared in great numbers. Coal and iron are abundant, particularly in the northeast, while salt, marble, limestone, freestone, and gypsum are found in many districts. The more important manufactures are bar, sheet, and railway iron, machinery, hardware, and various articles in metal; leather, woolen, cloth, paper, and spirits. Cotton, silk, flax, and mixed goods are also made to some extent. The foreign trade, carried on chiefly with Canada across Lake Erie, is comparatively small; but a very extensive inland trade is carried on both by the Ohio and by numerous canals and railways, which traverse the country in every direction. Ohio ranks fifth in its total railroad mileage, and in its mileage per 100 sq. miles of area, 21.61 miles, it is exceeded by only one other of the large states. Among the higher educational establishments are the university at Athens; several denominational universities and colleges; schools of law, medicine, and theology. Ohio sends two senators and twenty-one representatives to Congress, and has twenty-three votes in the presidential election.

Ohio was discovered by La Salle, probably as early as 1670, and the French took formal possession of the whole northwest in 1671. A few years later conflicting claims arose between the French and the English regarding this territory, which were set at rest by the Treaty of Paris in 1763, by which France surrendered to Great Britain all her lands in the north and west as far as the Mississippi. In 1787 the Ohio Company of Associates was organized in New England by those who had served in the war of the revolution, and under their auspices a large tract of land was purchased from the government in the territory northwest of the Ohio river. This was the first public sale of land by the United States government. In connection with its sale the famous "Ordinance of 1788," was passed, guaranteeing forever in the territory civil and religious freedom, the system of common schools, trial by jury, and the right of inheritance. In 1288 Marietta and Cincinnati were founded, and till 1791 settlements in the southern part of the territory increased rapidly. In that year the Indians became troublesome. Late in 1794 a victory was gained by Gen. Anthony Wayne over the Indians at "Fallen Timbers" on the Maumee river. The year after, a treaty of peace was concluded, the Indians ceding a great portion of the territory, which settlers began at once to fill. Chillicothe was made the seat of government for the

territory, and a capitol building erected. In 1802 a constitution was adopted for the eastern division of the territory northwest of the Ohio, to be known as "Ohio," and on Feb. 19, 1803, Ohio was admitted into the Union.

The state supplied more than its quota of troops for the Mexican war, and at the outbreak of the civil war was exceedingly active. Seventy regiments responded to the first call for troops, though only thirteen were asked. Soldiers were sent into Virginia and helped to save West Virginia to the Union, and the prompt action of Governor Dennison had its influence upon Kentucky also. A large number of the most successful federal officers were natives of the state, as Grant, Sherman, McDowell, Rosecrans, Garfield, and others.

Ohio was democratic in national elections from the time of its admission to 1836. In that year it voted with the whigs and since then has been whig and republican with the exception of the years 1848 and 1852 when it cast its vote for Cass and Pierce. The two largest towns are Cincinnati and Cleveland, others being Toledo and Dayton and Columbus. Pop. about 4,600,000.

OHIO STATE UNIVERSITY, a coeducational state institution at Columbus, Ohio. It was founded in 1870 as the Ohio Agricultural and Mechanical college, and opened in 1873. The university comprises six colleges: Arts, philosophy and science; agriculture and domestic science; engineering; law; pharmacy; veterinary science. The college confers the bachelor's degree in course in the various departments, and the engineer's, master's, and doctor's degrees for advanced work. Military instruction and the wearing of a uniform are required of the students. A laboratory is maintained at Sandusky for summer work.

OHIO UNIVERSITY, a coeducational state institution at Athens, Ohio, organized in 1804. Besides the collegiate department, the university has schools of music and commerce, a preparatory department, and a normal college. The bachelor's degree in arts, philosophy, science, and pedagogy is given in course and the master's degree after one year's graduate work. Tuition is free.

OHM (ōm), Georg Simon, German physicist, born 1787, died 1854. He became successively professor of physics at Cologne, director of the Polytechnic at Nuremberg, and professor of physics at the University of Munich. He was the discoverer of what is known as "Ohm's Law" in electricity.

OHM, the unit of resistance to the passage of electricity. A piece of pure copper wire 485 meters long and 1 millimeter in diameter at 0° C. has a resistance of about one ohm. A "megohm" is a resistance equal to 1,000,000 ohms, and a microhm is a resistance equal to one-millionth of an ohm.

OHM'S LAW, an important law in electricity, deduced by Professor Ohm, to the effect that the intensity of the electric current is directly proportional to the whole electro-motive force in operation, and inversely proportional to the sum of the resistances in the circuit.

OIL-CAKE, a cake or mass of compressed linseed or rape, poppy, mustard, cotton, and other seeds from which oil has been extracted. Linseed-cake is much used as a food for cattle, its value as a fattening substance being greater than that of any kind of grain or pulse. Rape-cake is used as a fattening food for sheep. These and other oil-cakes are also valuable as manures.

OIL CITY, a city in Venango co., Pa., at the junction of the Allegheny river and Oil creek; on the Allegheny Valley, the Erie, the Lake Shore and Mich. South., and the West. N. Y. and Pa. railways; 8 miles e.n.e. of Franklin, the county seat, 18 miles s. of Titusville. It is in the center of the great petroleum-oil district. Pop. 15,310.

OIL-GAS, the inflammable gas and vapor (chiefly hydrocarbon) obtained by passing fixed oils through red-hot tubes, and which may be used like coal-gas for purposes of illumination. The oil in its passage through the retorts is principally decomposed, with the production of ethylene, marsh-gas, hydrogen, carbonic oxide, benzene, etc., a gas being thus produced which has the great advantages of being pure from sulphureous contamination, and of supporting a very brilliant flame with a very small expenditure.

OIL OF VITRIOL, the common name of strong sulphuric acid.

OIL-PAINTING. See Painting.

OIL-PALM, an African tree abounding on the west coast of that continent, whose fruit yields palm-oil. See Palm-oil.

OILS, a term given to substances formed within living animal or vegetable organisms, liquid at ordinary temperatures, having a more or less viscid consistence, insoluble in and lighter than water, taking fire when heated in air, and burning with a more or less luminous flame. The oils are usually divided into the fat or fixed oils, and the volatile or essential oils. Another division would be into vegetable oils, by far the most numerous, and animal oils; and as a third popular division, the mineral oils (petroleum, naphtha). The fat or fixed oils are subdivided into the drying and the non-drying oils. The former class includes all oils which thicken when exposed to the air, through the absorption of oxygen, and are converted thereby into varnish, as, for example linseed, nut, poppy, and hemp-seed oil. All the drying oils are of vegetable origin. The non-drying oils (which are partly of vegetable, partly of animal origin) when exposed to the air also undergo a change resulting in the formation of acrid, disagreeably-smelling, acid substances, but though they thicken they do not become dry. The fixed vegetable oils (whether drying or non-drying) are generally prepared by subjecting the seeds of the plant to pressure, with or without heat, and they may also be extracted by means of certain solvents. The animal oils are, for the most part, the fluid parts of the fat of the animal, and are separated by heat alone. Vegetable fixed oils all consist of one or more proximate principles. Thus olive-oil contains chiefly olein, with a little stearin; linseed-oil is composed mainly of linolein. The most important of the drying oils are linseed, hemp, walnut, poppy, candle-nut, sesame, sunflower, madia, safflower. Of the non-drying oils the chief are olive, cotton-seed, colza, rape, ground-nut, castor, croton, etc. A certain number of the vegetable oils are also known as vegetable fats, from their consistency at ordinary temperatures, such as palm-oil, cocoanut oil, shea-butter. The animal oils comprise neat's-foot oil, train-oil, seal-oil, sperm-oil, porpoise-oil, cod-liver oil, shark-oil, etc. The uses of the fixed oils are very various. Many are used as articles of food, others are used in medicine, numbers as lubricants, some in the composition of paints and varnishes; some are important sources of artificial light, and generally when acted on by an alkali they form soaps. A use of oil now coming into some importance is as an agent for calming the waves of the sea in certain circumstances, more especially to prevent them from breaking over a boat and so swamping her.

Volatile oils are generally obtained by distilling the vegetables which afford them with water; they are acrid, caustic, aromatic, and limpid; they are mostly soluble in alcohol, forming essences. They boil at a temperature considerably above that of boiling water, some of them undergoing partial decomposition. A few of them are hydro-carbons the greater number, however, contain oxygen as one of their ultimate elements. They are chiefly used in medicine and perfumery; and a few of them are extensively employed in the arts as vehicles for colors, and in the manufacture of varnishes, especially oil of turpentine. They are very numerous, among them being the oils of anise, bergamot, clove, cinnamon, cajeput, lavender, lemon, lime, orange, mint, peppermint, nutmeg, marjoram, rosemary, thyme, etc.

OISE, a northern department in France, Beauvais is the chief town. Pop. 403,146.

OKLAHO'MA, one of the United States, bounded on the N. by Kansas, on the E. by Missouri and Arkansas, on S. by Texas, on W. by Texas and New Mexico, area, 70,430 sq. miles. It exceeds in area twelve of the states, or an area greater than the whole of New England. It has mostly the character of a prairie, and considerable portions are bare and arid, though others are very fertile. Its rivers are chiefly the Red river and its tributaries, and the Canadian river, the Cimarron and other tributaries of the Arkansas. It produces crops of wheat, corn, oats, cotton, sorghum, millet, etc., while large numbers of cattle are reared. Oklahoma is making extraordinarily rapid advances in prosperity, and now possesses well-built towns, an extensive system of railways, many public schools and institutions.

The soil is formed by the decomposition of the underlying rock formations, and consists chiefly of red clay and sandstone material. In the river valleys these are mixed with a rich black alluvium, and the soils are generally of sufficient depth to be of almost inexhaustible fertility. There are some

forests of oak, walnut, and hickory in the east, but the western plains are generally treeless, and covered with grama drop-seed, and bunch grasses, while in the extreme west are found sage-brush, yucca, and cactus.

Oklahoma is preëminently an agricultural and stock-raising region. The development of agriculture since the territory was opened to settlement has been phenomenal. The cotton yield per acre is in excess of that of any other state or territory. Corn and wheat lead in importance. Other cereal crops are oats, Kafir corn, barley, and rye. Hay and forage, potatoes, sorghum, melons, peanuts, castor beans, and broom corn

Seal of Oklahoma.

are also produced. Fruit is also grown, over 6,000,000 peach trees bearing fruit. The western part of the state is given up to cattle-raising, which flourished before the region was ope ed to settlement. The number of cattle has increased prodigiously since that time. Horses, mules, and swine are also important, and some sheep are raised. The flouring and grist-mill industry is the most prominent of the manufactures. Cotton-ginning and the manufacture of cotton-seed oil are next in importance. Wheat is much the largest export. Coal, asphalt, oil, natural gas, granite, marble, gypsum, lead, and zinc, are produced. The state has nearly 6,000 miles of railroad.

Oklahoma was a part of the Louisiana Purchase, and was included in the "unorganized or Indian country" set apart by congress in 1834. The Creek Indians (June 14, 1866) ceded to the United States the western part of their domain in Indian Territory, for 30 cents an acre, while the Seminoles gave up their entire holdings for 15 cents an acre. The Sacs and Foxes, Cheyennes, and other tribes were settled upon part of these lands, but great tracts remained unoccupied. In 1890 the territory of Oklahoma was created. In 1891 almost 300,000 acres of land, formerly belonging to the Sac and Fox, Pottawatomie, Shawnee, Cheyenne, and Arapahoe Indians, was thrown open to settlement, and in 1893 the Cherokee strip of 6,000,000 acres was also opened. The first Legislature met at Guthrie, August 27, but spent almost the entire session quarreling over the location of the capital, which remained at Guthrie. The agitation for statehood began in 1891, and a bill admitting Oklahoma as a State passed the House of the Fifty-seventh Congress, but failed to reach a vote in the Senate. In June, 1906, it was provided by Congress that Oklahoma and the Indian Territory might adopt a constitution and become a state.

In September, 1907, the constitution was submitted to the people and was adopted by an overwhelming majority. In November, 1907, the state was admitted to the union. In 1908 the state went Democratic.

Indians of various tribes form an important element in the population. Guthrie is the capital. Oklahoma City is also an important center. Pop. 1,414,042.

OKLAHOMA CITY, a city and capital of Oklahoma co., Okl., on the North Canadian river, and the Atch., Top. and Santa Fé railroad; 25 miles s. of Guthrie. The city is the largest cotton-market in Oklahoma; contains flour-mills, cotton-gins, brick-yards, packing-houses, and several hotels; and has a large trade in agricultural products and lumber. Pop. 12,415.

OLAF, or **ST. OLAF,** one of the most celebrated of the Norwegian kings, great-great-grandson of Harald Haarfager, and son of Harald, chief of the district of Gränland, was born about 995. He was a friend of the Normans, and fought as an ally of Ethelred's in England. He afterward established himself on the throne of Norway, and was a zealous supporter of Christianity. Canute the Great having landed in Norway with an army, Olaf fled to Russia, and in attempting to recover his dominions he was defeated and slain at the battle of Stiklestad (1030). Since 1164 he has been honored as the patron saint of Norway. The order of St. Olaf, a Norwegian order given in reward for services rendered to king and country or to art and science, was founded in 1847.

OLBERS, Heinrich Wilhelm Matthæus, a German astronomer, born in 1758, died 1840. He directed his attention particularly to comets, and in 1815 he discovered a new one, which bears his name. Another discovery for which he is still better known is that of two minor planets, Pallas in 1802, and Vesta in 1807.

OLDENBURG, a grand-duchy in the north of Germany, consisting of three separate and distinct territories, viz.: the duchy of Oldenburg, the principality of Lübeck, and the principality of Birkenfeld; total area, 2479 sq. miles. Pop. Oldenburg, 318,434; Lübeck, 37,340; Birkenfeld, 43,406; total, 399,180. The capital is Oldenburg (see next article).

OLDENBURG, a town of Germany, capital of the grand-duchy of same name, 24 miles w.n.w. of Bremen, on the Hunte (which is navigable). It has fine promenades on the site of the old fortifications, a grand-ducal palace, public library of 150,000 volumes, picture-gallery, gymnasium, manufactures of glass, leather, earthenware, etc. Pop. 26,797.

OLDHAM, a town of England, in Lancashire, 6 miles northeast of Manchester. Pop. parl. bor. 194,197; mun. bor. 137,238.

OLD RED SANDSTONE, a geological term made popular by the writings of Hugh Miller, and applied by him to the red sandstone which underlies the carboniferous system, in contradistinction to the New Red Sandstone, which overlies the latter. It is now generally included in the Devonian system. See Geology.

OLD STYLE. See Calendar.

OLD TESTAMENT. See Bible.

OLEAN'DER, a plant known also by the name of rose-bay, a beautiful evergreen shrub, with flowers in clusters, of a fine rose or white color but of an indifferent smell. The plant, especially the bark of the root, is medicinal and poisonous.

OLEAS'TER, also called wild olive tree, a small tree of the south of Europe and west of Asia, cultivated especially for its blossoms, which are very fragrant.

OLEF'IANT GAS, the name originally given to ethylene or heavy carburetted hydrogen. It is a compound of carbon and hydrogen and is obtained by heating a mixture of two measures of sulphuric acid and one of alcohol. It was discovered in 1796. It is colorless, tasteless, and combustible, and has an aromatic odor not unlike that of oil of caraways.

OLE'IC ACID, an acid resulting from the action of olive and some other oils upon potash. It enters largely into the composition of soaps, forming with potash soft soap and with soda hard soap.

OLENEK', a river of Northern Siberia which rises under the polar circle, and enters the Arctic ocean to the west of the Lena delta; length, about 1200 miles.

OLEOMARGARIN. See Margarine.

OLFAC'TORY NERVES, the nerves of smell, the first pair of cerebral nerves or nerves from the brain. They arise chiefly in connection with the cerebral hemispheres, and numerous filaments from them, perforating the ethmoid bone, are distributed over the mucous membrane of the nose. See Nose.

OL'IGARCHY, that form of government in which the supreme power is placed in the hands of a small exclusive class.

OL'IGOCLASE, a soda-lime felspar, the soda predominating; it occurs in granite, porphyry, and other igneous rocks.

OLIPHANT, Mrs. Margaret, maiden name Wilson, novelist, born near Musselburgh, Scotland, 1828; died 1897. Her first novel appeared in 1849 under the title of Passages in the Life of Mrs. Margaret Maitland, and since then she has maintained a high place as a novelist. Besides this she has written a Life of Edward Irving, lives or memoirs of Francis of Assisi, The Makers of Florence, The Makers of Venice, The Makers of Modern Rome a Literary History of England in the Nineteenth Century, etc.

OLIVA'REZ, Gaspar de Guzman, Count of, Spanish statesman, born in 1587, died 1645. He was educated at the University of Salamanca, afterward appointed gentleman of the bed-chamber to the Prince of Asturias, and when his royal master succeeded to the throne as Philip IV. Olivarez was appointed prime-minister. For twenty-two years (1621-43) his power was almost unlimited, but the severity of his adminis-

tration ultimately caused revolt in Catlonia and Andalusia, while the Portuguese threw off the Spanish yoke. The end of his policy was public discontent and his own private disgrace. He was confined by the king at Toro, where he died.

OLIVE, a fruit-tree of which there are several species, the most important being the common olive. It is a low branching evergreen tree, in height from 20 to 30 feet, with stiff narrow dusky-green or bluish leaves. The flowers are small and white and are produced in axillary racemes. The fruit is a berried drupe of an oblong spheroidal form, with a thin, smooth, and usually blackish skin, containing a greenish soft pulp adherent to a rough, oblong, and very hard stone. It is bitter and nauseous, but replete with a bland oil. The olive is a native of Syria and other Asiatic countries, and flourishes only in warm and comparatively dry parts of the world. It grows slowly, and is very long-lived. The olive-tree has in all ages been

Olive.

held in peculiar estimation. It was anciently sacred to Minerva. Olive wreaths were used by the Greeks and Romans to crown the brows of victors, and it is still universally regarded as an emblem of peace. The wood of the olive-tree is beautifully veined, and has an agreeable smell. It is in great esteem with cabinet-makers on account of the fine polish of which it is susceptible. But the olive-tree is principally cultivated for the sake of its oil, which is contained in the pericarp or pulp. It is cultivated for this purpose in Italy, France, Spain, Malta, European and Asiatic Turkey, the Ionian Islands, etc., and is easily propagated either by seed, grafting, or slips. It is very tenacious of life. The fruits are also used at table, not in the natural state, but generally pickled, the green unripe fruits being deprived of part of their bitterness by soaking them in water, and then preserved in an aromatized solution of salt. Another species of olive inhabits China, Japan, and Cochin-China. The flowers are used by the Chinese to mix with and perfume their tea, and also, together with the leaves, for adulterating tea. The only American species is in some districts called devil-wood on account of the excessive hardness of the wood and the extreme difficulty of splitting it.

OLIVE-OIL, a fixed oil obtained by expression from the pulp of the ripe fruit of the olive. It is an insipid, inodorous, pale-yellow or greenish-yellow, viscid fluid, unctuous to the feel, inflammable, incapable of combining with water, and nearly insoluble in alcohol. It is the lightest of all the fixed oils. Olive-oil is much used as an article of food in the countries in which it is produced, and to a smaller extent in other countries, to which it is exported also for medicinal and manufacturing purposes, etc. The best olive-oil is made in the vicinity of Aix, in France; the kind known by the name of Florence oil is also of a superior quality, and is mostly used for culinary purposes. By far the largest portion of olive-oil is imported from Italy. Spain also sends a large quantity. The oil is also known as Sweet-oil.

OLIVES, MOUNT OF, or **MOUNT OLIVET,** a hill on the east side of Jerusalem, from which it is separated by the Valley of Jehoshaphat and the brook Kedron. The principal summit has the name of Mount of Ascension, and here stands the modern Armenian church of that name. But according to the Scriptures the scene of the ascension was near to Bethany (Luke xxiv. 50), which is on the further side of the hill from Jerusalem. A short way above Bethany is a nearly flat part of the hill on which hundreds of people might congregate, and there is little doubt that that is truly the place from which our Lord ascended. At the foot of the hill lay the Garden of Gethsemane, and round its eastern and southern side is the road by which our Lord made his triumphal entry into Jerusalem.

OL'IVINE, called also chrysolite, is a mineral, olive-green in color, occurring in lava, basalt, and certain meteorites. Analysis proves it to be a silicate of iron and magnesium.

OLLA PODRI'DA, the name of a favorite dish with all classes in Spain. It consists of a mixture of all kinds of meat cut into small pieces, and stewed with various kinds of vegetables. Hence the term is also applied to any incongruous mixture or miscellaneous collection.

OLLIVIER (o-lĭv-i-ā), Emile, born at Marseilles 1825. When the empire was established in France Ollivier gradually severed himself from his former political associates, and the severance was final when he, in January, 1870, accepted Napoleon's invitation to form a ministry. It was this ministry which declared war with Germany in July, 1870, and which was overthrown with disgrace in August, 1870. He is the author of numerous works.

OLMSTED, Frederick Law, American landscape architect, was born in 1822. In 1848 he purchased a fruit-farm on Staten Island, near New York, and while successfully managing it, studied landscape gardening. In 1850 he made a pedestrian tour through England and portions of the Continent, an account of which was given in his Walks and Talks of an American Farmer in England, 1852. In 1855 he made a tour through France, Italy, and Germany, for the purpose of observing parks and rural grounds. In 1856 he secured the prize for the best plan of laying out the New York Central Park, and was appointed architect and chief engineer. From 1864 to 1866 he spent in California, when he was made one of the commissioners of the National Park of the Yosemite. He returned to New York in 1866, and had charge of the laying out of the Brooklyn Prospect Park. He has since been associated in designs for parks and other public works at Washington, Chicago, San Francisco, and other cities. He planned also the approach from Pennsylvania avenue to the capitol in Washington, was first commissioner of the Yosemite Park, and prominent in the Niagara Falls Reservation committee, and in devising the system of parks and parkways in and around Boston. He died in 1903.

OLNEY, Richard, American politician, born in Oxford, Mass., in 1835. He was admitted to the Boston bar in 1859. Olney rose rapidly in his profession, and was for many years chief counsel for the Eastern railroad, and later for other roads. He was a democratic member of the lower house of the Massachusetts legislature in 1874. In 1893 he was offered the place of attorney-general of the United States by President Cleveland and accepted it. Upon the death of Gresham, in 1895, Olney became secretary of state, and continued to hold that position until the end of Cleveland's administration in 1897. His famous letter to Bayard, Minister to England, for the information of the English government as to the American position in the Venezuelan dispute, attracted great attention both in this country and in Europe.

OLYM'PIA, a locality in Greece, the scene of the famous Olympic games, a beautiful valley or plain lying in the middle portion of the ancient district of Elis, in the western part of the Peloponnesus (Morea). Here were collected thousands of statues of the gods and of victors in the games, treasure-houses full of votive offerings, temples, altars, tombs, and in a word the most precious treasures of Grecian art. Among the buildings were the Olympiēum or great temple of Zeus, containing the colossal statue of the god by Phidias; the Heræum or temple of Hera; the Metroum or temple of the mother of the gods; the twelve treasure-houses; the Prytanēum, in which the Olympic victors dined after the contest; the Bouleuterion, in which all the regulations regarding the games were made; and these were all surrounded with walls, having a length of about 1800 feet and a breadth of 1500. Recent excavations have brought to light numerous valuable works of art, besides remains of ancient buildings, etc.

OLYM'PIADS, the periods of four years between each celebration of the Olympic games, by which the Greeks computed time from 776 B.C., the first year of the first Olympiad, till 394 A.D., the second year of the 293d Olympiad.

OLYM'PIAS, the wife of Philip II., king of Macedonia, and the mother of Alexander the Great. Her haughtiness and more probably her infidelity, led Philip to repudiate her, and to marry Cleopatra, the niece of King Attalus.

The murder of Philip, which soon followed this disgrace (B.C. 336), some have attributed to the intrigues of Olympias. After the death of her son and his successor Antipater she was besieged by Cassander in Pydna, and, having to surrender, she was put to death after a mock trial (316 B.C.).

OLYMPIC GAMES, the great national festival of the ancient Greeks, celebrated at intervals of four years in honor of Zeus, the father of the gods, on the plain of Olympia (which see). The festival commenced with sacrifices, followed by contests in racing (foot, horse, charoit), wrestling, boxing, etc.; and closed on the fifth day with processions, sacrifices, and banquets to the victors. The victors by way of prize were merely crowned with garlands of wild olives; and on their return home they were received with extraordinary distinction, and enjoyed numerous honors and privileges.

OLYM'PUS, the name given to several mountain ranges by the ancients. The most celebrated of them was situated in Thessaly, at the eastern extremity of the range called the Cambunian Mountains, and now called by the Greeks Elymbos or Olymbos. It rises to the height of 9700 feet above the level of the sea, and was the highest mountain in ancient Greece. The earliest Greeks looked upon it as the highest of all mountains, as the central point of the earth's surface, and as the place where the gods dwelt. In after-times, when the ideas of men respecting the universe and the gods were enlarged, the supreme beings were said to reside in the exterior sphere of the heavens revolving round the space which embraced the planets; and this new abode of the gods above the firmament of heaven received the name of Olympus. The other most important elevation bearing this name was the Mysian Olympus, a range of lofty mountains in the northwest of Asia Minor, now called Kheshish Dagh, Ala Dagh, Ishik Dagh, and Kush Dagh. Olympus in Cyprus may also be mentioned.

O'MAHA, the capital of Douglas co., Nebraska, situated on the Missouri, about 600 miles from its confluence with the Mississippi and 500 miles west of Chicago. It is an important railway center for the northwest. It possesses large silver-smelting works, steam engine and boiler works, soap-works, breweries, etc., and it is the center of a large mining and agricultural district. The population, which in 1880 was 30,000 is now 145,555. South Omaha, a suburb of the above, is now one of the largest pork and beef packing centers in the states, its population being estimated at 15,000.

OMAN (o-män'), or **MUSKAT,** a sultanate in the southeast of Arabia, partly on the Persian gulf, partly on the Indian ocean. The capital is Muskat. Pop. (estimated), 1,600,000.

OMAR KHAYYAM', Persian poet, astronomer, and mathematician, born at Nishapur in Khorasan, died there 1123 A.D. His scientific works, which were of high value in their day, have been eclipsed by his Rubaiyat, a collection of about 500 epigrams in praise of wine, love, and pleasure, and at the same time, depressingly pessimistic. There is an admirable poetic translation of the Rubaiyat or Quatrains by Edward Fitzgerald (1859).

OM'EGA, the name for the Greek long o. The last letter in the Greek alphabet, as alpha is the first; and from the expression in Revelation (chap. i. 8), "I am Alpha and Omega, the beginning and the ending." Inscriptions on tombstones, public documents, etc., very often began with these two letters, meaning, "In the name of God."

O'MENS, certain signs or phenomena supposed to portend some impending good or evil fortune. Among the ancient Romans the taking of omens was a public institution of great importance. See Augurs, Auspices.

OMNIBUS, a Latin word signifying "for all," and now applied in several languages to the well-known vehicle used for the conveyance of passengers. The first conveyances of the kind were those which came into use in Paris (March, 1662) in consequence of an edict of Louis XIV., but they soon fell into disuse, and were not again reintroduced until 1827. A Mr. Shillibeer started the first omnibus in London in 1829, and they were introduced into New York in 1830, and Amsterdam in 1839.

OMNIBUS BILL, a term applied to single legislative acts in which are incorporated a number of loosely related measures. The term was first applied to a bill for the admission of California to the Union with a constitution prohibiting slavery. Many omnibus bills were passed by state legislatures, but provisions requiring that single statutes shall deal with but one main subject, which shall be clearly indicated in the title have proved fatal to the "omnibus bill."

ONEIDA (o-nī'da), a lake in the state of New York, United States, the western and lower end of which is about 18 miles southeast of Lake Ontario. It is 20 miles long, 4 miles broad, and its waters find a vent by Oneida river into Lake Ontario at its southeast corner, after they have united with the Seneca and formed the Oswego river.

ONEIDA COMMUNITY, a religious communistic society, otherwise known as Perfectionists (which see).

ONEIDAS, once a North American Indian tribe or nation belonging to the confederacy of the Hurons, and inhabiting Central New York. A remnant of them now inhabit a reservation in Wisconsin, and are well advanced in civilization.

O'NEILL, Peggy (Margaret O'Neill Eaton), was born in Washington in 1796. As the wife of Major J. H. Eaton, Jackson's secretary of war, she was the subject of a social war in government circles owing to certain charges connecing her name with that of Major Eaton while she was still wife of Purser Timberlake, her first husband. It was said that from this social disturbance an estrangement arose between Gen. Jackson and Calhoun, leading to the nomination of Van Buren for the presidency of 1836. She died in 1879.

ONION, a well-known liliaceous plant, the bulbous root of which is much used as an article of food. It is a biennial herbaceous plant with long tubulated leaves, and a swelling, pithy stalk. The peculiar flavor varies much according to the size of the bulb, the small reddish onions having much more pungency than the larger ones. The onion may be grown from the tropics to the coldest verge of the temperate zone. There are at least twenty varieties, the Strasburg, Spanish, and Portuguese being among the most esteemed.

ONTA'RIO, formerly called Upper Canada and Canada West, a province of the Dominion of Canada, having Manitoba on the west; Keewatin and James bay on the north; Quebec on the east; and on the southeast, south, and southwest the St. Lawrence river, and Lakes Ontario, Erie, Huron, and Superior; area, 220,000 sq. miles. Besides the great lakes just mentioned, which partly belong to the Canadian Dominion and partly to the United States, Ontario has numerous other lakes, such as Simcoe, Nipissing, Nipigon, Lake of the Woods, etc. The chief rivers are boundary rivers: the Ottawa, Niagara, and Albany, the latter entering James bay, part of Hudson bay. The Falls of Niagara in part belong to the province. There are no mountains of importance. Agriculture is the chief occupation, and for the most part the soil is of excellent quality. A large part of the province is covered with timber, and this, with the water facilities, make lumbering one of the chief industries. The climate is inclined to the extreme of hot and cold during summer and winter respectively, but the dryness of the atmosphere makes it very healthy. The minerals include copper, iron, nickel, gypsum, marble, salt, and petroleum. The richest, most thickly settled, and most highly cultivated portion of the province is the peninsula between the St. Lawrence and Lakes Ontario, Erie, and Huron. The crops raised are chiefly wheat, barley, oats, Indian corn, and potatoes, and the fruit-growing farms of some districts yield a plentiful crop of apples, plums, pears, peaches, and grapes. Latterly the farmer here has turned his attention to stock-raising and dairy-farming with encouraging results, which are largely due to the easy accessibility of markets by rail, supplemented by the lake, river, and canal navigation. Chief among the manufactures are woolens, cotton, linen, hardware, paper, soap, agricultural implements, steam-engines, etc. The educational system of the province provides for the free education of all children in the common schools, and there is also liberal government provision for high schools and colleges, technical institutions, and a university; while there are also colleges and universities not under provincial control. The government is administered at Toronto by a lieutenant-governor, assisted by an executive council of seven; while there is also a legislative assembly, elected by ballot for four years, and constituting with the lieutenant-governor the legislature or parliament. Pop. 2,250,678.

ONTARIO, Lake, the most easterly of the great lakes of North America, lying along the northeast side of the state of New York, and forming part of the boundary between the United States

and Canada; greatest length, 190 miles; greatest breadth, about 55 miles; area, 5400 sq. miles. It receives the waters of Lake Erie by the Niagara, and discharges its waters by the St. Lawrence into the Atlantic, 1000 miles distant. The Hudson, and the Oswego and Erie canals, form a connection through the United States between it and the Atlantic. It is navigable throughout its whole extent and at all seasons. The most important places on its shores are Toronto, Hamilton, Kingston, and Coburg, in Canada, and Oswego in the United States.

ONTOL'OGY, the doctrine of being; a name given to that part of the science of metaphysics which investigates and explains the nature and essence of all things or existences, their qualities and attributes. It is also used as equivalent to metaphysics.

ONYX, a semi-pellucid gem with variously-colored zones or veins. Any stone exhibiting layers of two or more colors strongly contrasted is called an onyx, as banded jasper, chalcedony, etc., but more particularly the latter when it is marked with white and stratified with opaque and translucent lines. The ancients valued it very highly, and used it much for cameos, many of the finest cameos in existence being of onyx.

ONYX MARBLE, a very beautiful translucent limestone of stalagmitic formation discovered by the French in the province of Oran, Algeria, and first brought into general notice at the London exhibition of 1862. It is used for the manufacture of ornamental articles.

OPAL, a precious stone of various colors, which comes under the class of pellucid gems. It consists of silica with about 10 per cent of water, and is very brittle. It is characterized by its iridescent reflection of light. It is found in many parts of Europe, especially in Hungary, in the East Indies, etc. The substance in which it is generally found is a ferruginous sandstone. There are many varieties or species, the chief of which are: (a) precious or noble opal, which exhibits brilliant and changeable reflections of green, blue, yellow, and red; (b) fire opal, which simply affords a red reflection; (c) common opal, whose colors are white, green, yellow, and red, but without the play of colors; (d) semi-opal, the varieties of which are more opaque than common opal; (e) hydrophane, which assumes a transparency only when thrown into water; (f) hyalite, which occurs in small globular and botryoidal forms, with a vitreous luster; (g) menilite, which occurs in irregular or reniform masses, and is opaque or slightly translucent. Formerly the opal was believed to possess magical virtues; thus it was believed to confer invisibility when wrapped in a bay-leaf.

OPEN-BILL, an African bird of the stork family, so named from the odd formation of the beak, which at the anterior end exhibits a gap between the mandibles as if part of them were worn away though they meet at the points. Their chief food is molluscs, and perhaps this formation of bill has something to do with the opening of the shells. Another species inhabits the East Indies.

OPEN DOOR, a term in international politics which came into general use in 1899, and has reference to the equality of commercial opportunity in China of all nations. The enunciation of the open-door policy had its origin in the acquisition by various European powers of commercial ports in China and the insistence of the United States that such ports should be open to all the world on equal terms.

Open-bill.

OP'ERA, a musical drama, that is, a dramatic composition set to music and sung on the stage, accompanied with musical instruments and enriched by the accessories of costumes, scenery, dancing, etc. The component parts of an opera are recitatives, solos, duets, trios, quartettes, choruses, etc., and they are usually preceded by an instrumental overture. The lighter kind of opera, as well as the French opera comique, is of a mixed kind —partly spoken, partly sung. The chief varieties of opera are the grand opera or opera seria, the name given to that kind which is confined to music and singing, of which the recitative is a principal feature; the romantic opera, or opera drammatica of the Italians, embracing an admixture of the grave and lively; the comic opera, or opera buffa; as well as many intermediate varieties. Though the Greek dramas were operatic in character, the opera proper is of modern date and of Italian origin, and would seem to have developed naturally from the miracle-play of the middle ages, the first operas dating from the 16th century.

OPERA BOUFFE (buff), a farcical form of opera buffa in which the characters, subject-matter, and music is intended to burlesque the more serious style of opera. Offenbach was the creator as well as the chief master in this art. The comic operas of Gilbert and Sullivan, both in the character of the music and the libretti, stand by themselves.

OPERA-GLASS, a small binocular telescope of a low magnifying power, so called from its use in theaters. The two tubes are connected together, and have their foci adjustable by turning a milled-headed screw between them. See Telescope.

OPHICLEIDE (of'i-klīd), a brass wind-instrument of music invented to supersede the serpent in the orchestra and in military bands. It generally consists of a wide conical tube, terminating in a bell like that of a horn, with a mouth piece and ten holes or ventages which are stopped by keys. Ophicleides are of

Ophicleide.

two kinds, the bass and the alto; the former has a compass of three octaves and one note, ranging from B on the third space below the bass-staff to C on the third space of the treble-staff, including all the intermediate semitones. The alto ophicleide (an inferior instrument) has the same extent of compass but starts an octave higher.

OPHTHALMIA, an inflammation of the mucous membrane which covers the globe of the eye, and of the corresponding surface of the eyelids. It is either acute or chronic, and its commonest cause is the presence of irritating matter between the eyelids or the exposure of the membrane to sudden cold. Its characteristic marks are pain, redness, a feeling as if sand were in the eye, and a copious flow of matter.

OPHTHALMOSCOPE, an instrument for observing the internal structure of the eye. It consists of a mirror (plane in that of Coccius, concave in that of Desmarres), by which light from an artificial source is directed into the eye of the patient, and a double-convex lens, by which the illumined parts of the structure of the eye are magnified in order that they may be more easily examined, the observer looking through a hole in the center of the mirror. The light is usually placed to the side of and slightly behind the patient's head.

OPIUM, the inspissated juice of a species of poppy cultivated on a large scale principally in Hindustan and in Asiatic Turkey, but well known in many places as a garden plant, being an annual with white, red, or violet flowers and glaucous leaves. The opium is the juice that flows from incisions made in the green heads or seed-capsules of the plant after the fall or removal of the petals, and the best flows from the first incision. The juice is at first a milky liquid, but soon solidifies and turns black, and is then scraped off and collected. It is one of the most energetic of narcotics, and at the same time one of the most precious of all medicines, and is employed in a great variety of cases, but most commonly for the purpose of procuring sleep and relief from pain. In medicine it is very commonly used in the form of laudanum, which is a simple tincture or extract in spirits of wine; it is also an ingredient in various patent and other remedies. Another opium preparation is morphine. In its natural state opium is heavy, of a dense texture, of a brownish-yellow color, not perfectly dry, but easily receiving an impression from the finger; it has a faint smell, and its taste is bitter and acrid. The chief active principle of opium is morphia, or morphine in combination with meconic acid. The principal part of our supply of opium is brought from Turkey, whence it is imported in flat pieces or cakes, covered

with leaves. In the case of many temperaments opium produces such agreeable effects, whether a delightful dreamy calm, a state of pleasant exhilaration, or beatific visions, that numbers of persons are led to use it habitually, as others use alcohol in some form, though over-indulgence in it is attended with at least as evil effects as over-indulgence in the latter. But like tobacco it is taken by vast numbers without any apparent result one way or other. Some habitual takers of opium can take as much in a day as would kill ten or twenty persons unaccustomed to it. It is taken in two ways, known as opium-eating and opium-smoking. The habitual use of opium is most common in China, the southeast of Asia, and the Malay Archipelago, where it is chiefly smoked in a special pipe. The pipe, or rather the stem of the pipe, is about the length and size of an ordinary flute; the bowl is generally made of earthenware. The smoker, who is always lying, or at least reclining, takes a small portion of opium about the size of a pea on the end of a spoon-headed needle, heats it at a lamp, and then places it in the bowl of the pipe, the pellet of opium having pre-

Opium poppy.

viously been perforated with the needle. He them brings the opium to the flame of the lamp, inhales the smoke in several inspirations, and is then ready to repeat the process with a fresh quantity of opium until the desired intoxication ensues. Large quantities of opium are consumed in China, a great part of which comes from India, though probably as much or more is produced in China itself. The Indian opium, however, is preferred to their own by the best judges among the Chinese.

OPOR'TO, a large city and seaport of Portugal, the second in the kingdom, capital of the province of Entre Douro e Minho, on a steep declivity on the right bank and about 2 miles from the mouth of the Douro, 170 miles north of Lisbon. Pop. 172,421.

OPOS'SUM, the name of several species of marsupial mammals, having four hands and a long prehensile tail. They are nocturnal animals, arboreal in their habits, living constantly on trees, and there pursuing birds, insects, etc., although they do not despise fruit. The females of certain species have an abdominal pouch in which are the mammæ, and in which they can inclose their young. The best-known species of opossum is common in the United States. It is almost the size of a large cat, the general color whitish-gray, and the whole hair of a wool-like softness. On the ground the motions of the opossum are awkward and clumsy, but on the branches of a tree it moves with

Common opossum.

great celerity and ease, using the prehensile tail to assist its motions. When caught or threatened with danger the opossum counterfeits death, and "playing 'possum" has on this account passed into a proverb as used to indicate any deceitful proceeding. The female has from ten to fifteen young, which are for a long time nourished in the pouch, to which they resort when alarmed.

OPPOSITION, in astronomy, the situation of two heavenly bodies when diametrically opposed to each other, or when their longitudes differ by 180°. Thus there is always an opposition of sun and moon at every full moon; also the moon or a planet is said to be in opposition to the sun when it passes the meridian at midnight. See Conjunction.

OPS, the Roman female divinity of plenty and fertility. She was regarded as the wife of Saturn, and, accordingly, as the protectress of everything connected with agriculture.

OP'TATIVE, in grammar, that form of the verb in which wish or desire is expressed, existing in the Greek and some other languages, its force being conveyed in English by such circumlocutions as "may I," "would that he," etc.

OPTICS is the branch of physics which treats of the transmission of light, and its action in connection with the laws of reflection and refraction, including also the phenomena of vision. A

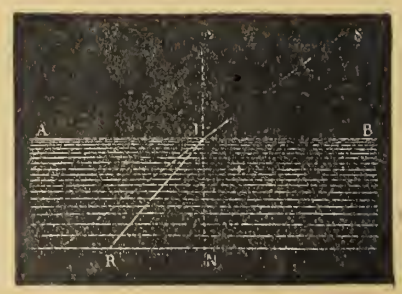


Fig. 1.—Refraction.

ray of light is the smallest conceivable portion of light, and is represented by the straight line along which it is propagated. A pencil of light is a collection of such rays; it is parallel when all the component rays are parallel to each other; converging when they all proceed to a single point; and diverging when they all proceed from a single point. The focus of the pencil is the point to or from which the rays proceed. Any space or substance which light can traverse is in optics called "a medium." When light falls on any surface a certain portion of it is reflected or sent back, and it is owing to this reflected light that objects are visible. When light falls upon the surface of a solid substance or medium that it can traverse (a transparent substance), one portion greater or less is directed or reflected back into the medium whence it came; another portion is transmitted through the solid medium, but undergoes a change called refraction; while a third portion is absorbed in the new medium. When all the minute parts of a surface give out rays of light in all directions we call it a luminous surface, whether it is self-luminous or is merely reflecting the light from a self-luminous body such as the sun. The law of reflection is that the angle of incidence and that of reflection are in the same plane, and that the angle of reflection is equal to the angle of incidence, and on the opposite side of the perpendicular. The law holds true whatever be the nature of the reflecting

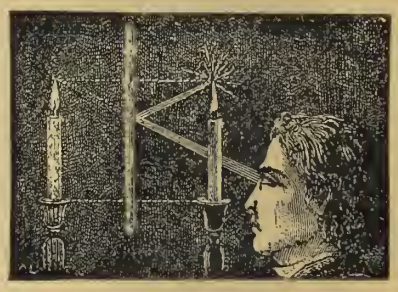


Fig. 2.—Reflection (plane mirror).

surface or the origin of the light which falls upon it. The law of refraction comes into operation when a ray of light passes through a smooth surface bounding two media not homogeneous, such as air and water, or when rays traverse a medium, the density of which is not uniform, as the atmosphere. When the ray of light passes from a rarer into a denser medium, it is bent or refracted toward the perpendicular line drawn through the point of incidence, or the angle of refraction is less than the angle of incidence. On the contrary, when a ray of light passes from a denser into a rarer medium the refraction is from the perpendicular, or the angle of refraction is greater than the angle of incidence. If one medium is a liquid and the other air, as in the accompanying figure (fig. 1), the ray ri in the liquid will make a smaller angle with the normal nin than the ray si in air, and vice versa.

The law of reflection is illustrated especially by the action of mirrors. When a pencil of rays from a luminous point falls on a plane mirror each ray is reflected according to the law given above, and it is easy to show by geometry that the pencil which was divergent

before incidence has exactly the same divergence after reflection; but the rays now seem to have proceeded from a point behind the mirror. This point is called the "virtual image" of the first point (being not a real image of it); the line joining the points is at right angles to and is bisected by the mirror. Now a luminous object is made up of points, each of which sends a divergent pencil to the mirror, which seems after reflection to proceed from a point behind the

Fig. 3.—Reflection (concave mirror).

mirror, and hence a luminous object sends rays to a plane mirror which after reflection seem to have proceeded from a luminous object behind the mirror. An eye receiving a ray (or a small pencil or rays) gets the impression that the luminous point from which it was sent is somewhere in the line of the ray just before reaching the eye, and hence an eye in such a position as to receive after reflection a few rays from every point of the object sees the image of the object. (See fig. 2.) Besides plane mirrors concave and convex mirrors are often used in optics. When a mirror is not plane the incident rays from a luminous point in general neither converge to a single point after reflection nor diverge as if they had come from a virtual image. But when a concave mirror forming a small portion of a spherical surface is used we find that all the rays falling upon it from a luminous point converge so nearly to a luminous point after reflection that their "aberration" (as the non-convergence of the rays is called) may be neglected in practice. The line joining the center of the spherical sur-

Fig. 4.—Magnification of near object by convex lens.

face with the "pole" of the mirror (that is, the middle point of the reflecting surface) is called the principal axis. Any bundle of rays parallel to the principal axis converges after reflection to a point in the axis called the principal focus; and any bundle of parallel rays converges after reflection to a focus which is at the same distance from the mirror as the principal focal distance. When the object from which the rays proceed is at a considerable distance, an inverted image of it will be formed midway between the center of curvature and the mirror. When the object is only at a moderate distance, but exceeding half the radius of curvature, an inverted image is still formed in front of the mirror, being diminished when nearer the mirror than the object is, and magnified when farther away than the object. The image of an object placed nearer a concave mirror than the principal focus is erect and larger than the object, and is "virtual' as in fig. 3, where a b is the object, ba its image (inverted), f the focus, c the center of curvature. The image of any object in a convex mirror is also virtual and erect; it is, however, smaller than the object.

When the two faces of a piece of glass through which light is refracted are both of them plain, it is called a plate if they are parallel, and a prism if they are not parallel. When the faces are curved, or one of them curved and the other plain, it is called a lens. Prisms are the essential parts of the apparatus used for decomposing light and examining the properties of its component parts, as in spectrum analysis. (See Light.) A lens may be regarded as consisting of an unlimited number of prisms, the angles between their faces gradually diminishing the father away from the axis of the lens. It is the property of convex lens to diminish the divergency of the pencils of light, of concave lenses to increase that divergency. It is the duty of a convex lens to make rays parallel to the axis falling on one face of its converge accurately to one point after emerging from the other face. This point is called the principal focus, and is the point where a "real" image would be formed. When rays parallel to the axis pass through a concave lens they diverge, and if produced backward in the direction from which they come they would meet at one point, which in this case also is called the principal focus; but it is only a virtual focus, because the rays themselves do not pass through it, but only their backward productions. Thus concave lenses bend rays from the axis, and convex ones bend them toward it. When we look through a concave lens it makes objects seem smaller whatever their distances are. When we look through a convex lens at an object between the lens and the principal focus it appears larger than it really is, and hence the use of such lenses in magnifying glasses, microscopes, and telescopes. The rule as to the relative size of object and image will be understood from fig. 4, where the small arrow a b is the object, and the large arrow its image, o being the center of the lens, f f its foci. Rays from a b are refracted toward the axis by the lens, and as the visual angle, or angle made by the rays at the eye, is larger than if there were no lens, the object appears magnified. The length of the object and the image will be directly as their distance from o; so that if the image is three times as far from the lens as the object, it will be three times as long and three times as broad. Convex lenses are used in spectacles for long-sighted (or old-sighted) persons, because the lens of their eye is too much flattened and does not of itself cause a sufficient convergency of the rays to make an image on the retina, but one that would fall behind it. Concave lenses, again, are used by near-sighted persons, because the rays in their case converge so much as to make an image in front of their retina instead of on it. See Eye, Light, Microscope, Telescope, Spectroscope, etc.

OP'TIMISM, that philosophical doctrine which maintains that this world, in spite of its apparent imperfections, is the best possible. It is an ancient doctrine; among modern philosophers Leibnitz is its principal advocate.

OPTOM'ETER, an instrument for measuring the extent of the limits of distinct vision in different individuals, and consequently for determining the focal lengths of lenses necessary to correct imperfections of the eye.

OR'ACLES, the answers which the gods of the Greeks, Romans, Egyptians, etc., were supposed to give, by words uttered or otherwise, to those who consulted them upon any occasion; also the places or sources whence these answers were received. The credit of oracles was so great that vast numbers flocked to them for advice. Scarcely any war was waged, or peace concluded, or new forms of government instituted, or new laws enacted, without the advice and approbation of some oracle. The Greek oracles were the most celebrated, the earliest being that of Zeus (Jupiter) at Dodona. Of the other gods Apollo had many oracles, but that at Delphi held the first place, and it was often applied to for explaining obscure answers obtained at Dodona. Another famous oracle of Apollo was in the island of Delos. The Romans had no important oracles of their own, but had recourse to those of Greece and Egypt. The early Christians ascribed the oracles in general to the operation of the devil and his agents; but the practices of the priests, the manner and circumstances of delivering the oracles, the ambiguity of their answers, and the art of accommodating them to all events, amply demonstrate their human origin; yet they long maintained their standing, and sunk only with the freedom and independence of Greece. Under the reign of Theodosius the temples of the prophetic deities were shut up or demolished.

ORAN, a seaport of Algeria, capital of department of same name. Pop. 88,235, of whom about three-fourths are Europeans.—The department, forming a long belt along the Mediterranean, has an area of 74,510 sq. miles, and a population of 1,107,354.

ORANG', or **ORANG-OUTANG**, a quadrumanous mammal, one of the anthropoid or man-like apes or monkeys. This animal seems to be confined to Borneo, Sumatra, and Malacca. It is one of those animals which approach most nearly to man, being in this respect only inferior to the chimpanzee and gorilla. It is utterly incapable of walking in a perfectly erect posture. Its body is covered with coarse hair of a brownish-red color; in some places on its back it is 6 inches long, and on its arms 5 inches. The face is destitute of hair save at the sides. It attains the height of from 4 to 5 feet, measured in a straight line from the vortex to the heel. The arms reach to the ankle-joint. The hind-legs are

short and stunted, the nails of the fingers and toes flattened. They swing themselves along from tree to tree by the aid of their long arms, but their gait on the ground is awkward and unsteady. At birth the head of the orang resembles

Female orang-utan.

that of the young child. These apes are remarkable for strength and intelligence, and capable of being highly domesticated if captured young. They feed chiefly on fruits and sleep on trees. See also Man, Apes, Monkeys.

ORANGE, the fruit of the Citrus Aurantium, and the shrub or tree itself. The orange is indigenous in China, India, and other Asiatic countries, and was first introduced in Portugal about 1520. It is now extensively cultivated in Southern Europe. In Portugal and Spain the fruit forms an important article of commerce. Large quantities are also produced in the Azores, in Africa, America (especially in Florida and California), and the West Indies, in Australia and the Pacific Islands. The tree is a middle-sized evergreen, with a greenish-brown bark. The leaves are ovate, acute, pointed, and at the base of the petiole are winged. The white flower exhibits a calyx with five divisions, a corolla with five imbricate petals, stamens equal in number to the petals or a multiple of them, and along with the petals inserted on a hypogynous disc, the filaments being united in several bundles. The fruit is globose, bright yellow, and contains a pulp which consists of a collection of oblong vesicles filled with a sugary and refreshing juice; it is divided into eight or ten compartments, each usually containing several seeds. The principal varieties are the common sweet or China orange, the bitter or Seville, the Maltese or red-pulped, the Tangerine, the Mandarin or clove, and the St. Michael's. The leaves, flowers, and rind yield fragrant oils much used in perfumery and for flavoring essences. The wood is fine-grained, compact, susceptible of a high polish, and is employed in the arts. The citron and lemon are allied fruits.

ORANGE CITY, a city in New Jersey, 16 miles west of New York. It is picturesquely situated on elevated ground, and contains many fine residences, being a favorite resort of New York City men. Pop. 26,115.

ORANGE-LILY, a species of lily having a scaly bulb, a leafy stem 2½ feet high, small dark brown bulbs in the axils of the leaves, and large orange-colored flowers.

ORANGEMEN, the members of a secret society founded in the north of Ireland in 1795, to uphold the Protestant religion and political ascendency, and to oppose the Catholic religion and influence and their secret societies. The title of the association was adopted in honor of William III. of England, prince of Orange. The head of the association is the Imperial Grand Lodge with its imperial grand-master; then there are grand lodges, grand county lodges, districts and subordinate lodges, spread over Ireland, Great Britain, and some of the colonies, especially Canada, but the chief strength is in the north of Ireland. In 1835 the society was dissolved in consequence of intrigues in the army, but revived in 1845. Great demonstrations take place annually on the 12th of July, the anniversary of the battle of Aghrim.

ORANGE RIVER, or **GARIEP,** a river in South Africa, forming part of the north boundary of Cape Colony, and falling after a total course of about 650 miles into the Atlantic.

ORANGE RIVER COLONY, a British possession in South Africa, having the Cape Colony on the s. and s.w., Transvaal on n. and n.w., Natal and Basutoland on e. and s.e., area about 50,000 sq. miles; pop. 207,503, of whom about 78,000 are whites.

ORATO'RIO, a sacred musical composition consisting of airs, recitatives, duets, trios, quartets, choruses, etc., with full orchestral and sometimes organ accompaniment, the subjects being generally taken from Scripture.

ORBIT, in astronomy, the path of a planet or comet; the curve-line which a planet describes in its periodical revolution round its central body. The orbits of the planets are elliptical, having the sun in one of the foci; and the planets all move in these ellipses by this law, that a straight line drawn from the center of the sun to the center of any one of them, termed the radius vector, always describes equal areas in equal times. Also, the squares of the times of the planetary revolutions are as the cubes of their mean distances from the sun. The satellites also move in elliptical orbits, having their respective primaries in one of the foci. The elements of an orbit are those quantities by which its position and magnitude, for the time, are determined; such as the major axis and eccentricity, the longitude of the node, and inclination of the plane to the ecliptic, and the longitude of the perihelion.

ORCHARD, an inclosure devoted to the culture of fruit-trees, especially the apple, the pear, the plum, the peach, and the cherry. The most suitable position for an orchard is a declivity lying well exposed to the sun and sheltered from the colder winds, but yet not too much shut in. The soil should vary according to the kind of fruit cultivated, and it is generally allowed to produce only grass besides the fruit-trees.

ORCHESTRA (or'kes-tra), the space in theaters between the seats occupied by the spectators and the stage, appropriated by the Greeks to the chorus and the musicians, by the Romans to the senators, and in our modern theaters to the musicians. The name is also used for the part of concert-rooms assigned to the vocal and instrumental performers; and, lastly, is applied to the instrumental performers, collectively taken. A modern orchestra in the last sense consists of stringed, wind, and percussion instruments, in varied proportions, according to the number of instrumentalists.

ORCHIDACEÆ (or-ki-dā'sē-ē), or **ORCHIDS,** an extensive order of endogens (nearly 2000 species being known), consisting of herbaceous plants or shrubs, with fibrous or tuberous roots; a short stem or a pseudo-bulb; entire, often sheathing leaves; and showy flowers, with a perianth of six segments in two rows, mostly colored, one, the lowest, generally differing in form from the rest, and often spiral. The essential form of these flowers is determined by the presence of this six-segmented perianth, the three outer segments of which are a kind of calyx, the three inner forming a kind of corolla. By adhesion or absorption the parts of the perianth are sometimes reduced to five or three, and springing from its sides are the six stamens whose anthers contain pollen-grains. They are natives of all countries, but very cold and dry climates produce but few species; some of them grow in the ground, but a large number are epiphytes, growing upon trees; and it is above all in the great virgin forests of South America and of the East Indies that the orchids abound. The orchids attract much attention, and are cultivated with zeal on account

Butterfly orchid.

of the beauty or curious shapes of the flowers (which often assume the forms of reptiles, insects, and other denizens of the animal kingdom), or for their not infrequently fragrant smells. The nutritive substance called salep is prepared from the roots and tubers of several species; the fragrant vanilla is obtained from two species of a genus of that name.

ORCUS, a name among the Romans for Tartarus or the infernal regions.

ORDEAL, an ancient form of trial to determine guilt or innocence, practiced by the rude nations of Europe, in the East, and by the savage tribes of Africa. Fire-ordeal was performed either by taking in the hand a piece of red-hot iron, or by walking barefoot and blindfold over glowing coals or over nine

red-hot ploughshares laid lengthwise at unequal distances; and if the person escaped unhurt, he was adjudged innocent, otherwise he was condemned as guilty. Water-ordeal was performed either by plunging the bare arm to the elbow in boiling water, escape from injury being considered proof of innocence; or by casting the person suspected into a river or pond, and if he floated without an effort to swim it was an evidence of guilt, but if he sunk he was acquitted. Besides these ordeals there were a variety of others practiced in many countries, such as the corsned or hallowed morsel trial, the trial by touching the dead body of a person murdered, which was supposed to bleed if touched by the murderer, the ordeal by swallowing certain herbs and roots, etc. Ordeals are still found in many nations out of Europe, as in West Africa and other parts of that continent. In Madagascar till lately trial by ordeal (swallowing the poison of the tree Tanghinia venenosa) was in regular use. The Chinese still retain the ordeal of fire and water, and various ordeals are practiced among the Hindus

OR'DERLIES, are privates and non-commissioned officers selected to attend upon general and other officers, for the purpose of bearing their orders and rendering other services. The orderly officers, or officer of the day, is the officer of a corps or regiment, whose duty is to superintend its interior economy, as cleanliness, quality of the food, etc. An orderly book is provided by the captain of each company or troop, in which the general or regimental orders are entered.

ORDER OF THE DAY, in parliamentary language, is a bill or other matter which is to be discussed on a particular day.

ORDERS, Holy, a term applied to the different ranks of ecclesiastics. The Angelican and other Reformed Episcopal churches recognize only the three orders of bishops, priests, and deacons. The Roman Catholic church admits of seven orders: four minor or secular—doorkeeper, exorcist, reader, and acolyte and three major—deacon, priest, and bishop. The Greek church has also the distinction of major and minor orders, but the functions of the four minor orders of the Roman Catholic church are united by the Greeks in the single order of reader. The term holy orders, or simply orders, is also used as equivalent to the clerical character or position as "to take orders," "to be in orders."

ORDERS, Military, fraternities or societies of men banded together in former times for military and partly for patriotic or Christian purposes. Free birth and an irreproachable life were the conditions of admission. The chief were the Templars, the Teutonic Knight and the order of St. John of Jerusalem.

ORDERS, Religious, are associations, the members of which bind themselves to lead strict and devotional lives, and to live separate from the world. Prior to their formation there were only the Hermits or Anchorites. (See Monastery.) The entry into religious orders from their foundation to the present time, is preceded by the taking of the monastic vow, which enjoins residence in a monastery, celibacy, renunciation of worldly pleasures, the duty of prayer, fasting, and other austerities, and unconditional obedience to superiors. These conditions form the basis of the majority of orders, some being more austere in their observances than others. The first properly constituted religious order was founded in the 4th century by St. Basil. The Basilians are now chiefly confined to the Greek church in the East. In the time of Justinian (530) St. Benedict established a new order, the Benedictines, under a set of rules based principally on those of St. Basil, and for some 600 years after the greatest number of European monks followed his statutes. According to some authorities as many as 23 orders sprung from this one. About 1220 the Dominicans and Franciscans originated by taking amended rules from their leaders. In the 8th century the monks began to be viewed as members of the clerical order, and in the 10th, by receiving permission to assume the tonsure, they were formally declared clergymen. Indeed, public opinion and several papal bulls placed them, as superior in sanctity, above the secular clergy, who for this reason often became monks. As the secluded life of the monks, soon after the origin of monasteries, had given rise to similar associations of pious females, so nuns commonly banded together as new orders of monks arose, and formed societies under similar names and regulations. There were also congregations of nuns who united with certain orders of monks without adopting their names. The Ursuline and Hospitaller nuns, or Sisters of Mercy, are female orders existing independently of any male orders, and living according to the rules of St. Augustine. At the head of every religious order stands a general or governor, who is chosen every three years from the officers of the institution, resides at Rome, and is responsible only to the pope. The counsellors of the general are the officers to whom the supervision and government of monasteries is committed.

ORDERS OF ARCHITECTURE, the chief styles or varieties exhibited in the architecture of the Greeks and Romans. Technically the chief feature of the order is the column—including base, shaft and capital—and its superincumbent entablature (consisting of architrave, frieze, and cornice). The character of the order, however, is displayed not only in its column, but in its general forms and detail, of which the column is, as it were, the regulator. There are five classic orders, namely Grecian: Doric, Ionic, and Corinthian; Roman: Tuscan, and Roman or Composite. See Architecture, Columns, and the articles on the various orders.

ORDINANCE, in its broadest sense, any law or statute enacted or promulgated by a governmental authority, but more commonly used to designate laws or regulations passed by the governing bodies of municipalities. In the United States the term is almost exclusively applied to the laws or regulations passed by the common councils, boards of aldermen, or other governing bodies of municipalities. An ordinance differs from a resolution, which is an expression of the will of any organized body, generally to carry out some ministerial act relating to its own internal management, or other matter not affecting the general public, as a resolution of respect in honor of a deceased person. The formalities for the enactment, publication, enforcement, and repeal of ordinances are largely regulated by statutes.

ORDINATION, the initiating of a Christian minister or priest into his office. The English Church considers ordination as a real consecration; the high-church party maintaining the dogma of the regular transmission of the episcopal office from the apostles down to the bishops of the present day. For ordination in the English church, subscription to the thirty-nine articles is requisite. The ceremony of ordination is performed by the bishop by the imposition of hands on the person to be ordained. In most Protestant countries with a state church, ordination is a requisite to preaching; but in some sects it is not held necessary. In the Presbyterian and Congregational churches ordination means the act of settling a licensed preacher over a congreagtion, or conferring on him general powers to officiate wherever he may be called.

ORDNANCE. See Cannon, Artillery, Howitzer, Mortar, etc.

ORDNANCE DEPARTMENT OF THE U. S. ARMY. Its duties consist in the establishment and maintenance of arsenals, armories, and depots for the manufacture and storage of ordnance. The regulations define ordnance and ordnance stores as including cannon and artillery carriages and equipments; apparatus and machines for the service and manœuvre of artillery; small arms, ammunition, and accoutrements; horse equipments and harness for the artillery; tools, machinery, and materials for the ordnance service.

ORE, the compound of a metal and some other substance, as oxygen, sulphur, or carbon (forming oxides, sulphides, carbonates, etc.), by which its distinctive properties are disguised or lost. Metals found free from such combination and exhibiting their natural character are called native. Metals are commonly obtained from their ores by smelting, the ores having been previously oxidized by roasting. Ores are commonly found in veins or lodes. See Mining, and the articles on the different metals.

OR'EGON, one of the United States, on the Pacific coast, having on the north the Columbia river; east, the territory of Idaho; south, Nevada and California; and west, the North Pacific ocean; area, 96,030 sq. miles. It ranks seventh in size among the states. The 300 miles of coast-line are generally rugged and precipitous, and offer but few harbors. The interior consists of wide and elevated plateaux, rich in pastures and pine forests. Two great ranges divide the whole territory into three distinct portions. The first of these portions stretches north and south along the Pacific, and east from it for a width of 100 miles to 150 miles;

and is then hemmed in by a lofty mountain-chain, which is called the Cascade Range, and occupies the whole breadth of the territory from s.s.w. to n.n.e. The other two portions, much more irregular in shape, are formed by a range which, under the names of the Blue mountains and the Klamath finally bends round to the southwest, and becomes linked to the Cascade range. The influence of topography on climate is very apparent in Oregon. The winds from the ocean are deprived of nearly all their moisture by the coast and Cascade ranges, which also bar out the tempering influence of the sea, so that the portion west of the Cascades has a moist and equable insular climate, while east of the mountains the climate is dry and continental, with great extremes. In the west the rainfall is abundant, and in some places excessive. On the eastern plateau it is insufficient for the needs of agriculture. Salmon fishing and canning is one of the most important industries, and is unequaled by any other state. Sturgeon, halibut, oysters, and other varieties of fish are caught in less quantities.

The different sections of the state, varying so distinctly in climate, topography, and soil, naturally vary in agricultural development. The two leading crops are wheat and hay. The area devoted to wheat doubled between 1880 and 1900. During the same period the acreage of hay and forage gained over threefold. Oats are grown principally in the Willamette valley, and barley in the northeast counties. Oats have a large acreage. Potatoes produce abundantly and are an important crop. Sugar beets are also raised. The state ranks second in the production of hops, their culture being confined principally to the Willamette valley. The region between the Cascade and Coast ranges, particularly Jackson and Douglas counties, has become noted for the production of fruit. Though the quantity of arable land is comparatively small, the pastures are large and rich; the forests abound with pines of almost unrivalled magnificence, and the metalliferous fields which have made California so famous are traced into Oregon. Gold is the only mineral extensively mined. It is produced chiefly in the Blue mountain region in the northeastern part of the state. Other minerals found are chrome iron, limonite or brown hematite iron ore, copper, magnetite nickel, mercury, platinum, iridium, lead and antimony, as well as clay, salt, and alkali deposits. Small quantities of silver, borax, and coal are mined. Horses, cattle, swine, and sheep are raised in great numbers. Large sections of the state are fit only for grazing. The natural grasses cure on the ground and supply nutritive pasturage all the year. The Pacific ocean, the Columbia river, and Snake river provide three sides of the state with the advantages of water communication. Along the coast are nine inlets which offer harbor facilities. Large ocean going vessels pass up the Columbia as far as Portland. The construction of a canal at Cascade Locks allows river steamers to go as far as The Dalles, above which point it is again naviagable. The Snake river is navigable beyond the point where it leaves the boundary. The Union Pacific and the Southern Pacific own the greater portion of the total mileage which is very low, being only about 1700 miles. The chief exports consist largely of wheat and lumber products. Salem is the capital. Portland is the largest city in the state.

The accounts of the early exploration of the western Pacific coast are conflicting and unreliable. The Spanish explorer Ferrelo possibly reached the southern boundary of Oregon in 1543, and Sir Francis Drake touched here in 1570. The English navigator, Captain Cook in 1778 landed at Nootka Sound,

Seal of Oregon.

which he so named. In 1805–06 Lewis and Clark explored much of the country. The northwestern boundary between the United States and Canada was fixed by the convention of 1818 as the line of 49° from the Lake of the Woods to the Rocky Mountains. The Oregon question claimed the attention of congress after 1820, and the sentiment for demanding "all of Oregon" grew. By the negotiations with Russia (1824–25) that country agreed to make no settlement south of 54° 40′, and the idea gained ground that this was the proper northern boundary. The settlement of the northeastern boundary had been unsatisfactory, and in 1844 a popular rallying cry of the democrats was "Fifty-four forty, or fight." It was finally agreed in 1846 that the boundary should be 49° to the channel between Vancouver and the mainland, thence down the middle of this channel, through the Straits of San Juan de Fuca to the sea. Oregon territory, including the present Washington and much of Idaho, was organized on August 14, 1848. The state was admitted February 14, 1859, with the present boundaries. The state has given its electoral vote for the republican ticket except in 1868, and one vote in 1892, though usually by small majorities. In 1892 the democrats indorsed one populist elector, and the vote that year was: republican, 3; populist, 1. Pop. 1909 about 650,000.

OREGON, University of, a coeducational State institution at Eugene, Ore., founded in 1872 and opened in 1876. It comprises the university academy; the college of literature, science, and the arts, with a school of commerce, and courses in law, journalism, and teaching; the college of science and engineering, with courses preparatory to medicine and dentistry; the school of music; the graduate school; and the schools of law and medicine, the last two at Portland.

OREGON QUESTION, in American history the dispute between the United States and Great Britain over the delimitation of their possessions on the Northwest coast, leading to the determination of the present boundary.

OREGON RIVER, a river in North America. See Columbia River.

OREL, a central government of Russia, south of the Tula and Kaluga; area, 18,042 sq. miles. Its trade in grain, dairy produce, and cattle with Moscow and St. Petersburg is very extensive. Manufactures are also increasing, and the town is making rapid progress. Pop. 78,091. Pop. of government, 1,963,706.

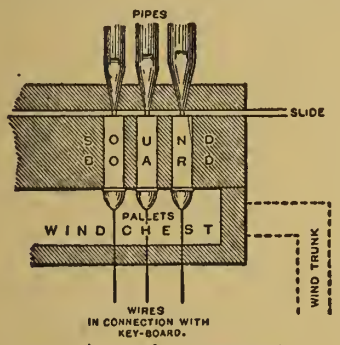
O'RENBURG, a government of Eastern Russia, partly in Europe, and partly in Asia, with an area of 73,816 sq. miles; pop. 1,609,388. The capital, Orenburg, on a slope above the right bank of the Ural, has, besides vast tallow-melting establishments, woolen, soap, and leather factories, and a large caravan trade with Khiva and Bokhara. Pop. 72,740.

ORENSE, a city of N. W. Spain, Galicia, capital of the province of same name, and see of a bishop, on the left banks of the Minho, here crossed by an old and remarkable bridge, built in 1230. Pop. 15,250.—The province has an area of 2739 sq. miles, and a population of 404,311.

ORES'TES, in Greek mythology, the son of Agamemnon and of Clytemnestra, the avenger of his father, by becoming the murderer of his mother. For this murder he is relentlessly pursued by the Eumenides or Furies, and only succeeds in appeasing these terrible goddesses by carrying out the instructions of the Delphian oracle to bring back the statue of Diana from Tauris to Argos. Married to Hermione, daughter of Menelaus, Orestes ruled over his paternal kingdom of Mycenæ, and over Argos, upon the death of its king. Orestes is an important figure in the Choëphori and the Eumenides of Æschylus, the Electra of Sophocles, and the Orestes and Iphigenia in Tauris of Euripides.

ORGAN, a wind-instrument of music, the grandest of musical instruments, the introduction of which into the church service has undoubtedly exercised a powerful influence on the development of musical art. It is stated to be of very ancient origin, but is most probably the offspring of the hydraulicon or water organ of the Greeks. The early organs were very imperfect instruments, but improvements were naturally made from time to time, the most notable being those of the 16th century, when the bellows were much improved and the division of all the pipes into different stops invented, and the tone of the instrument adapted to the choir. The invention of the wind-chest in the 17th century, by which an equal pressure of wind can be obtained from all the bellows, led chiefly to the present

perfect state of the organ. The three essentials of an organ are: (1) a chest of compressed air; (2) a set of pipes producing musical sounds in communication with this chest; and (3) a keyboard or clavier, by means of which this communication may be opened or closed at pleasure. The air is forced into the wind-chest by means of bellows. To the upper part of each wind-chest is attached a sound-board, a contrivance for conveying the wind to any particular

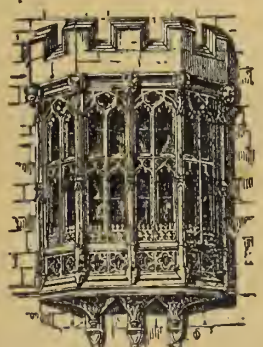


Organ—internal arrangements.

pipe or pipes at pleasure, and divided into as many grooves as there are keys. Air is admitted into these grooves by means of valves or pallets, which are connected with the keys; the transmission of air being regulated by the register or slide. The series of pipes above each slider is called a stop. The principal stops of an organ are the open, stopped, and double diapasons; the principal, dulciana, twelfth, fifteenth, flute, trumpet, clarion, bassoon, cremona, oboe, and vox humana. An organ may have several wind-chests filled by the same bellows, and several key-boards each key-board and wind-chest representing a distinct organ. In the largest instruments the number of these organs generally amounts to five; viz.: the great organ, the choir organ, the swell organ, the solo organ, and the pedal organ. The key-boards for the hand are termed manuals, that for the feet the pedal. The most usual compass of the manuals is from CC to F in alt, four octaves and a half; that of the pedal from CCC to E or F, two and a quarter to two and a half octaves. There are two kinds of organ-pipes—flute pipes or mouth pipes, and reed pipes, of each of which there are several species, the character and quality of their sound depending mainly on the material employed in their manufacture (wood or metal), their shape, and dimensions. A hydraulic engine has been adapted, with success, to the purposes of working the bellows, and it is now pretty generally adopted. In 1863 a contrivance was patented for transferring some of the work from mechanism to electro-magnetism. An organ built on this principle is termed an electric organ. The principal advantages of this description of organ are that it facilitates the playing, and enables the organist to sit at a key-board at a distance from the instrument. Among the largest organs are those in St. Peter's in Rome, of the Seville Cathedral, of Weingarten in Suabia, of Haarlem, and of Notre Dame, Paris. The largest organ ever constructed is that built in 1870 for the Royal Albert Hall, London. There are five rows of keys for the choir, great, swell, solo, and pedal organs; 138 stops nearly 10,000 pipes. The bellows are inflated by steam power. A free-reed instrument was introduced about 1860 by Mason and Hamlin of New York, known as the American organ, differing from the harmonium in having smaller and more curved reeds and in drawing the air inward. It is more easily blown than the harmonium, and its tones are of a more organ-like quality, but it is inferior to the latter instrument in variety of tone and power of expression.

ORGAN, Organization. In biology, the term organ is applied to all the definite parts with special functions, forming as a whole the structure of a living body, whether animal or vegetable. The dissimilarity between the organs of which a living being is composed forms a very striking contrast to the structure of lifeless bodies. A lifeless body—such as a mineral—exhibits generally a sameness or homogeneity of structure. Its intimate parts or particles are usually of a similar kind or nature. Hence this broad and patent distinction has resulted in the employment of the terms organic and organized to express the characteristics of living beings; while to the lifeless part of creation the opposing term inorganic is applied. Organization thus means the possession of definite organs, structures, or parts, which have definite relations to each other; and an organism is a whole, an animal or plant, possessing such organs.

ORIEL WINDOW, a window projecting from the outer face of a wall, in plan semi-hexagonal, semi-octagonal, or rectangular, thus having three or more sides, divided by mullions and


Oriel window, Balliol college, Oxford.

transoms into different bays and other projections, and supported by brackets or corbels. A projecting window rising from the ground is sometimes called an oriel, but is more properly a bay-window.

ORIENTAL LANGUAGES, the general designation at the present day for the languages of the nations of Asia, as also of the Mohammedan countries of Europe and Africa.

ORIFLAMME, until Charles VII.'s reign, the royal standard of France originally the banner of the abbey of St. Denis and its lord protector. When the French kings chose St. Denis as their patron saint, they made the oriflamme the principal banner of their armies. It was a piece of red taffeta fixed on a golden spear, in the form of a banner, and cut into three points, each of which was adorned with a tassel of green silk.

ORIGEN (or'i-jen), Origines, surnamed Adamantios, one of the greatest and most influential of the Greek fathers born at Alexandria, A.D. 185, died at Tyre 254. He lectured with much success in Alexandria, and gained the patronage of Bishop Demetrius. His studies were pursued with extraordinary zeal; he lived an ascetic life, and in order to be free from the lusts of the flesh he mutilated himself. A journey to Rome (211–212) greatly increased his reputation. In 228 he went to Palestine; he was so well received, and so many favors were bestowed on him, that his patron became jealous, recalled him to Alexandria, and finally deprived him of his priestly office, charged him with heresy, and expelled him from the city. These persecutions never ceased until the death of Demetrius in 231. In a new persecution, under the Emperor Decius, Origen, who was viewed as a pillar of the church, was thrown into prison, and subjected to the most cruel sufferings, ultimately resulting in his death. He is credited with some 6000 works, including smaller tracts, but only a few have been transmitted to us, and some of these only in a distorted form. His work against Celsus is considered as the most complete and convincing defense of Christianity of which antiquity can boast.

ORIGINAL SIN, in theology, the first sin of Adam, namely, the eating of the forbidden fruit; hence, either the imputation of Adam's sin to his posterity, or that corruption of nature and tendency to sin inherited from him. The Greek fathers held that a perverted will and sin are co-ordinate with the human race, and that death has dominion over it by reason of its origination from Adam after the fall. In the Latin church the doctrine was more fully developed than in the Greek church. Tertullian, in accordance with his doctrine of Traducianism, which holds that the soul as well as the body is generated by the parents, asserted that sin and death were alike propagated from Adam; he accordingly held an oiginis vitium, but without regarding it as actual sin or denying to man the possibility of goodness. Pelagius held that no change whatever had been brought about by the fall, that death was a part of man's original constitution, and that all men could render faultless obedience to the law of God, if they wished. Augustine succeeded in getting this doctrine condemned in favor of his own, which inculcated that "Death was brought into the world by Adam's sin; man's free-will, the reflex of the divine will, was lost to him by the fall as regards good; there remained only spontaneity, the negative of outward constraint, and free-will as regards evil." Pelagianism, however, sprung up again in a modified form, called semi-Pelagianism, and

according to this view death and a taint of corruption were inherited from Adam as a disease might be, but man still retained a power for good without the aid of divine grace; a doctrine which obtained much support in the church. The reformers of the 16th century upheld the Augustinian view of original sin, though by no means unanimously, in opposition to the Roman Catholics, who at the council of Trent gave their adhesion to the semi-Pelagian view of the doctrine. In recent times orthodox theologians, such as Olshausen, Hengstenberg, and others, have stood up for the Augustinian doctrine, while those of the more liberal school have modified it in various ways. Philosophers as well as theologians have taken part in this controversy about original sin.

ORIGIN OF SPECIES. See Species.

ORINO'CO, a river of South America, one of the largest in the world, its principal mouth being 6 leagues wide; length about 1500 miles. The scenery on its banks is magnificent beyond description. Two remarkable rapids occur in the upper part of the Orinoco, and from these the river is navigable to its mouth (about 780 miles).

O'RIOLE, a name popularly applied to two groups of birds. The American orioles are nearly allied to the starlings. The Baltimore oriole, or golden robin, is a familiar species of this group. Another, the orchard oriole is distributed very generally over the United States. The orioles proper, or those of the Old

Baltimore oriole.

World are nearly related to the thrushes. They are found in Asia, Africa, the islands of the Indian Archipelago, and Southern and Eastern Europe. The golden oriole is the typical form, and the only European member of the group. The wings and tail of the males are black, and contrast powerfully with the golden color of the body. In size it resembles a common thrush or blackbird. It chiefly inhabits Southern Europe, but is occasionally found in Britain. The song is loud, and resembles the sound of the flute.

ORI'ON, a hero of Greek mythology. According to Homer he was a beautiful youth, of whose charms Eōs (Aurora) became enamored. The gods were jealous of her love, and Artemis slew him with her arrows. According to other writers he was a great hunter of colossal stature, and died of the sting of a scorpion. The hero after his death was placed with his hounds in the heavens as a constellation, which bears his name.

ORI'ON, a constellation situated in the southern hemisphere with respect to the ecliptic, but the equinoctial passes nearly across its middle. This constellation is represented by the figure of a man with a sword by his side. It contains seven stars, which are very conspicuous to the naked eye; four of these form a square, and the three others are situated in the middle of it in a straight line, forming what is called the Belt of Orion. Orion also contains a remarkable nebula, and thousands of stars which are only visible through powerful telescopes.

ORIS'SA, a maritime province of Hindustan, lying on the Bay of Bengal, between Bardwan and the Madras Presidency, forming a division or commissionership under the jurisdiction of the Lieut.-governor of Bengal. It has an area of 9853 sq. miles, and includes the districts of Balasore, Cattack, Puri, the Angul and Khand Mehals, besides tributary states. Pop. 4,350,372.

ORKNEY ISLANDS, a group lying off the northern coast of Scotland, and separated from it by a channel called the Pentland Firth, about 6 to 8 miles broad; aggregate area, 375 sq. miles. There are 67 islands and islets, 28 of which are inhabited. James III. of Scotland received the islands as a dowry with Margaret of Norway in 1469, and ever since they have belonged to Scotland. Pop. 28,699.

ORLEANS (or-lā-ăn), a city of France, formerly capital of Orléanais, now of the department of the Loiret, situated on the right bank of the Loire, 68 miles southwest of Paris. In 1428 the city sustained a siege against the English, and was relieved by the Maid of Orléans (see Joan of Arc), whose statue in bronze stands in one of the public squares. It was taken and retaken more than once in the Franco-German war in the latter part of 1870. Pop. 67,539.

ORLEANS, a French royal family, two houses of which have occupied the throne of France. (1) On the death of Charles VIII. without issue in 1498, Louis, duke of Orléans, great-grandson of their common ancestor Charles V., and grandson of the first Duke of Orleans, being the nearest heir, ascended the throne under the title of Louis XII. Henry III. (died 1589) was the last sovereign of this house, or the Valois-Orléans branch. (2) The house of Bourbon-Orléans is descended from Philip, duke of Orléans, son of Louis XIII. and younger brother of Louis XIV. His son Philip, duke of Orléans, was regent of France during the minority of Louis XV. His grandson Louis-Philippe Joseph, who assumed the surname of Egalité, was beheaded in 1793. Louis Philippe, duke of Chartres, afterward king of the French, was the son of Egalité. The grandson of Louis-Philippe the Comte de Paris (1838–94), became head of the royal house and royalist party, leaving a son, the Duke of Orleans, to inherit his claims. See Bourbon and Paris, Comte de.

ORLEANS, Jean Baptiste Gaston, Duke of, third son of Henry IV. of France, and Mary of Medici, born 1608, died at Blois 1660. By his first marriage, with Mary of Bourbon, heiress of the house of Montpensier, he had a daughter, the author of some interesting memoirs. During the disturbances of the Fronde he joined De Retz, the soul of the Fronde, who, however, soon saw through the character of his fickle and feeble confederate. After the termination of the troubles (1648) the duke was banished to Blois.

ORLEANS, Louis Philippe Joseph, Duke of (Egalité), great-grandson of the regent, Philippe, duke of Orléans, was born in 1747; married in 1769 the daughter of the Duke of Penthièvre. In 1787 he was exiled for the part he took in the Assembly of Notables; in 1789 he was one of the nobles who joined the Tiers Etat (Third Estate); in 1792 he went over to the revolutionary party without reserve, took the name of Philippe Egalité ("Philip Equality"), and voted for the death of Louis XVI. It did not save him from being arrested as a Bourbon, condemned and beheaded, 6th November, 1793.

ORLEANS, Maid of. See Joan of Arc.

ORLEANS, New. See New Orleans.

ORLEANS, Philippe, Duke of, only brother of Louis XIV. of France, and founder of the house of Bourbon-Orléans, which for a short time held the throne of France, was born in 1640, died 1701. In his twenty-first year he married Henrietta of England, sister of Charles II. The second marriage of the duke, with the Princess Elizabeth of the Palatinate (1671), was arranged by Louis to secure the neutrality of the Elector Palatine in the approaching war against Holland. In this war the duke distinguished himself in spite of his effeminacy.

ORLEANS, Philippe, Duke of, Regent of France, son of Philippe, Duke of Orleans and the Princess Palatine Elizabeth, born 1674, died 1723. He made his military début at the siege of Mons (1691), and in 1693 distinguished himself at Neerwinden, but only to arouse the jealousy of Louis XIV., his uncle, who compelled him to retire from the army. In 1692 he married Mdlle. de Blois, the legitimated daughter of Louis. In 1707 he was appointed to succeed the Duke of Berwick in Spain, and completed the subjugation of that country. On the death of the king (1st September, 1715) he was appointed regent. He resigned the government to Louis XV. on 13th February, 1723.

ORNE, a department in Normandy, France; area, 2354 sq. miles. It manufactures needles, pins, wire, porcelain, cotton and linen cloths, and has valuable granite quarries. Alençon is the capital. Pop. 367,248.

ORNITHOL'OGY, that branch of zoology which treats of birds. Birds form the second class of the great division of vertebrate animals, the connecting link between the Mammalia and Reptilia, but are more closely allied to the latter. In common with the Mammalia they have warm blood, though of a higher and uniform temperature (8°–12° higher), a heart with two auricles and two ventricles, and breathe by lungs; but differ from them in having feathers for a covering, two feet, wings, by means of which most of

ORNITHOLOGY

them are enabled to fly, a horny bill, and reproduction by eggs. The feathers, the development of which resembles essentially that of hair, constitute appendages of a unique kind, as being developed only in connection with the bird-class. The under-plumage of most birds is formed by a thick coating of small shaftless feathers, embedded in the skin and called down. Various names are given to feathers according to their position; thus the long quills on the part of the wing corresponding to the hand are called primaries, those on the lower fore-arm secondaries, and those on the upper part of the fore-arm tertiaries, those on the shoulder-blade and humerus scapulars. The feathers covering the bases of the wing-quills are called wing-coverts, and those covering

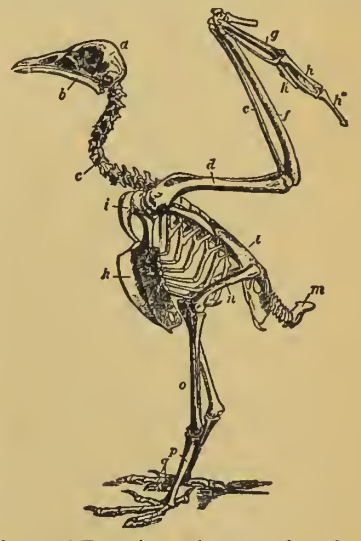
Plumage of bird—Bohemian chatterer.

a, primaries; *b*, secondaries: *c*, coverts; *d*, scapulars; *e*, tail feathers; *f*, forehead; *g*, sinciput; *h*, occiput.

the rectrices, or great feathers of the tail, tail-coverts. Birds moult or renew their feathers periodically, and in many cases the winter plumage displays a different coloring from the summer plumage. The plumage in most cases is changed frequently before it attains its characteristic and full-grown state.

The mouth of birds takes the form of a beak or bill; the jaws or mandibles are hard and horny, and more or less prolonged into a point, while there are no fleshy lips, and no teeth (except in certain fossil birds); a horny sheathing generally smooth, but sometimes serrated, takes the place of the latter. The beak is variously modified in accordance with the habits of the bird and the nature of the food on which it subsists. The sense of taste is not keen, their tongue being generally slender, pointed, and more or less horny, though some birds, as the parrots, have it fleshy. The nostrils open upon the side, or at the base of the beak. Their sense of smell is often very delicate. A circle of naked skin called the cere in many birds surrounds the base of the mandibles. The sight of birds is extremely keen, and equally adapted for near and for distant objects. A peculiar feature in the eye is the nictitating membrane, a sort of third translucent eyelid which rests in the inner angle of the eye, but can be drawn over it so as to protect it from too strong a light. Birds have no external ear, with the exception of the nocturnal tribes; these have a large exterior conch in the form of a thin leathery piece of flesh. The internal ear is very large, and the sense of hearing very quick.

The bone-tissue of birds is light and compact. The bones are whiter and contain a larger proportion of phosphate of lime than those of the mammalia and lower vertebrates. The bones of most birds are pneumatic, that is, contain air instead of marrow, to adapt them for flight; the air being admitted by means of special apertures which are connected with certain sacs, termed air-cells, filled with air from the lungs. In many birds, however, the long bones are filled with marrow, as are also all the bones of young birds. The humeri, cranial bones, and sternum are most generally pneumatic, the femora more rarely so. The vertebræ vary considerably in number in different species. The neck is always more or less elongated and flexible, and consists of from 9 to 23 vertebræ. The dorsal region, or region of the back, is composed of from 4 to 9 vertebræ, and is generally firm, forming a support for the movements of the wings. In all birds the neck is of sufficient length to reach the oil-gland situated at the tail, the secretion of which is used for "preening" or dressing the feathers. The vertebræ interposed between the dorsal vertebræ and those of the tail are united to form the sacrum, the number of vertebræ which may thus coalesce varying from 9 to 20. The caudal or tail vertebræ may number ten, the last two or more of which unite to form a bone, called from its shape "plough-share" bone. In some species this bone is absent, undeveloped, or modified. The bones of the skull become firmly united at an early period, so as to leave few or no sutures or lines of union, as in mammals, a complete bony case being thus formed. The skull is joined, as in reptiles, to the spinal column by a single process, or condyle, of the occipital bone, or hindermost bone of the skull. The chest or thorax is inclosed posteriorly by the dorsal vertebræ, laterally by the ribs, and in front by the sternum or breast-bone and the sternal ribs. The ribs correspond in number with the dorsal vertebræ, from 6 to 9 pairs of ribs being thus found in birds, the first two being generally unattached, that is, they do not reach the sternum in front. The sternum is large and strong, and serves as the point of attachment for the most powerful of the muscles by which the wings are set in motion. It is provided with a medial crest or keel, which is most prominent in the birds of most powerful flight, and is altogether absent in the ostrich and cassowary, birds which do not fly. Upon the upper or anterior portion of the sternum the coracoid bones are borne, which form the chief supports of the fore-limbs. At its upper portion each coracoid bone articulates with the scapula or shoulder-blade, and with one of the clavicles. The clavicles or collar-bones are united in most birds to form the furculum or merry-thought. The wing of the bird exhibits the essential skeletal elements found in the fore-limb of all other vertebrates. The humerus, or bone of the upper arm, is generally short; the forearm, composed of the radius and ulna, being the longest segment of the fore-limb. The ulna is larger and better developed than the radius, which is slender and attenuated. In the bones which form the extremity of the wing we recognize the rudiments of a thumb and two fingers, one of which has two phalanges and the other only one. The femur or thigh is short, the tibia or shin-bone forming the chief element in the leg; while the fibula is attenuated and generally ossified to the tibia. The toes generally number four; the hallux or great-toe, when present, being composed of two phalanges, and the other toes of three, four, and five phalanges respectively. The muscles



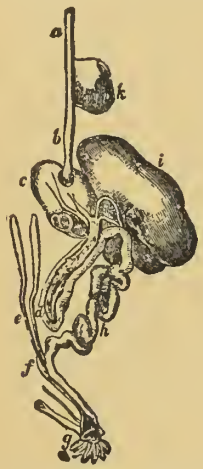
Skeleton of Egyptian vulture to show bones of bird.

a, post-orbital process; *b*, lower jaw; *c*, cervical vertebræ; *co*, coracoid bone; *d*, humerus; *e*, radius; *f*, ulna; *g*, metacarpus; *h*, second phalanx of chief digit of wing; *h'*, phalanges of lower digit; *h''*, first phalanx of chief digit; *i*, clavicle; *k*, sternum; *l*, pelvis; *m*, coccyx; *n*, femur; *o*, tibia; *p*, tarso-metatarsus; *q*, phalanges of foot.

of birds are firm and dense, and are generally colored deep red. The chief body-muscles are the pectorals, or those of the breast, which are devoted to the movements of the wings.

There are three stomachs or stomachic dilatations in birds; the first is the crop, a considerable pouch attached to the œsophagus or gullet; then the ventriculus succenturiatus, a slight dilatation of the œsophagus, with thick and glandular walls; then immediately after this is the gizzard, a strong and muscular cavity. In granivorous birds the crop is large, and serves as a reservoir for the seeds swallowed by them, which are here moistened by a secretion before passing into the gizzard. In these birds the gizzard is extremely strong, having to perform the task of grinding down the hard substances subjected to its action, a process which is facilitated by the small stones which these birds generally swallow. The ventriculus secretes the gastric juice, and so far represents a real stomach. In birds which live on flesh or fish the gizzard is weaker and less distinct from the ventriculus; while the crop becomes smaller, and in some species completely disappears. The intestinal canal is relative-

ly smaller than in mammalia and presents fewer circumvolutions. It terminates in an opening called the cloaca, which is also the common termination of the ureters and oviduct. The liver is generally large, and colored a distinct brownish hue, which is deepest in aquatic birds. A gall-bladder is absent in a few cases only, as in the ostrich, pigeons, and some parrots. The kidneys are two in number, of large size and



Digestive system of common fowl.

a, gullet; *b*, proventriculus; *c*, gizzard; *d*, duodenum; *e*, cæcal appendages; *f*, large intestine; *g*, cloaca; *h*, small intestines; *i*, liver; *k*, crop.

elongated shape. The urine consists in greater part of earthy matters, and contains but a small proportion of water, hence its whitish appearance. The spleen is usually of small size, rounded or oval, but may also be elongated or broad and flattened. The heart is highly muscular, four-chambered; the blood, deep-red in color, circulates rapidly and vigorously. The lungs are confined to the back portion of the body, and are attached to the ribs instead of being free, as in mammalia. They are not divided into lobes, and are usually of a bright-red color. They are enveloped in a membrane pierced with large holes, which permit the air to pass into the cavities in the breast and in the abdomen, and, in some species, even into the interior of the bones. The trachea or windpipe is of great relative length in birds, and is adapted to the length of the neck. The nervous system evinces a marked superiority over that of reptiles. The cerebrum, or true brain, is larger than in the latter, but its surface is not convoluted, as in most mammalia. The generative organs consist of the essential organs or testes of the male, accompanied in some cases by an intromittent organ. The female organs consist of an ovarium and oviduct. The eggs are hatched by the process of incubation. Very great differences exist in the size, form, and number of eggs which may be produced by birds, and in the time required for their hatching. The varieties of nests in which they are deposited, as to mode and materials used in construction, are endless.

Many birds migrate at certain seasons from one country to another, and a recent report on migration shows, that with very few exceptions there is scarcely a bird of either the palæarctic or nearctic regions that is not, to a greater or less degree, migratory in some part or other of its range. See Migration.

Birds are not numerous as fossil organisms. Among the most important and interesting bird fossils we at present possess are the two specimens of archæopteryx found in the slate-quarries of Solenhofen (Bavaria). This bird differed from all existing birds in the elongated reptilian nature of its tail, which was composed of simple vertebræ, each bearing a single pair of quill-feathers. It had also teeth. They certainly tend to prove the evolution of birds from reptiles. Other two most interesting fossil birds are the ichthyornis and the hesperornis, both found in the cretaceous formations of North America and both provided with teeth; but while the former must have had powerful wings the latter was quite wingless.

ORNITHORHYNCHUS, the duck-billed water-mole of Australia. With the echidna or porcupine ant-eater of Australia it forms the order Monotremata—the lowest division of the mammalian class. This curious animal was first described by Shaw in 1792, and caused no little excitement among zoologists. It presents a quadruped, of the shape and size of a small otter, covered with short brown fur; a horny flat bill like a duck; a short flat tail; short legs with five-toed and webbed feet, terminated by claws. The eyes are small; external ear wholly wanting. The skull is bird-like in conformation; brain without convolutions; coracoid bones as in birds well developed. Its young are produced from eggs, are born blind and

Ornithorhynchus or water-mole.

hairless, and suckled from milk-glands destitute of nipples. It forms large burrows in river and lake banks, rising from near the surface of the water to a height of perhaps twenty feet above it, the nest being at the higher end. It swims for its food, which consists of insects, worms, larvæ, etc.

ORPHAN ASYLUM, or **ORPHANAGE,** an establishment in which orphans are provided for and educated. In all well-regulated states the duty of taking care of destitute orphans was recognized at an early age, and it appears that the cities of Thebes, Athens, and Rome had establishments in which orphaned, deserted, and illegitimate children were supported and educated at the public expense. In the laws of Emperor Justinian there is frequent mention of such institutions. In the middle ages such asylums were numerous and generally under the direction of the clergy. In recent times public orphanages have been substituted or supplemented by the farming-out system, that is, the children are brought up in private families willing to undertake their charge. This system, with due care in the selection of guardians and judicious supervision, has proved satisfactory wherever it has been tried. It is more economical, and the example of respectable family life cannot fail to have a beneficial moral influence, which is absent in the public establishments.

ORPHEUS (or'fūs), a personage of great importance in the mythology of Greece, surrounded by a multitude of legends, which invariably associate him with Apollo and the Muses. To him is attributed the application of music to the worship of the gods. Apollo presented him with his lyre, and the Muses instructed him to use it, so that he moved not the beasts only, but the woods and rocks with its melody. Having lost his wife Eurydice by the bite of a serpent he descended to Hades to try and get her back. His music so moved the infernal deities Pluto and Proserpine that they consented to her return to earth, only her husband, whom she was to follow, must not look back till they had reached the upper world. This condition the impatient Orpheus violated and lost his wife forever. He is said to have met his death at the hands of a band of furious women engaged in the mystic rites of Bacchus. He is represented as one of the Argonauts, and to him is ascribed the origin of the so-called Orphic mysteries connected with the worhsip of Bacchus. A considerable literature was connected with the name of Orpheus, the oldest portions of which were not earlier than 530 B.C. In part it yet exists, there being still extant a mythological poem called Argonautica, certain hymns, etc.

ORRIS ROOT, or **IRIS ROOT,** the root of several species of Iris. One species, on account of its violet-like smell, is employed in perfumery and in the manufacture of tooth-powder. It is also used in pharmacy as a pectoral.

ORSI'NI, one of the most illustrious and powerful families in Italy. It became known about the 11th century, and had already acquired high rank and extensive possessions in the papal states when one of its members, Giovanni Gaetano, was raised to the pontificate under the title of Nicholas III. (1277–80). The feud between the Orsini and Colonna families is celebrated in history; it commenced toward the close of the 13th century, and is distinguished for bitterness, unscrupulousness, and violence, assassination being not unfrequently resorted to. Many of the Orsini became famous military chiefs. Vincenzo Marco Orsini (Benedict XIII.) succeeded Innocent XIII. as pope in 1724. The Orsini family is now divided into two branches, the Orsini-Gravina at Rome and the Orsini of Piedmont.

ORSTED, or **OERSTED** (eur'sted) Hans Christian, Danish physicist, born in 1777, died at Copenhagen 1851. His fame first became diffused over the

scientific world in 1819 by the discovery of the fundamental principles of electro-magnetism. In 1829 he became director of the Polytechnic School of Copenhagen, and on the occasion of his jubilee festival in 1850 he was created a privy-councillor.

OR'THODOX, the opposite of heterodox (which see), generally applied to what is regarded as the established opinion, or that which is commonly considered as right. The term is chiefly used in religious controversies to designate certain religious faiths or doctrines.

ORTHO'EPY, that branch of grammatical knowledge which deals with correct pronunciation.

ORTHOGRAPHY, that part of grammar which treats of the nature and properties of letters, and their proper application in writing words, making one of the four main divisions or branches of grammar.

ORTHOPÆ'DIA, a branch of medical science relating to the cure of natural deformities. Hippocrates already occupied himself with the correction of deformed bones, but it was not until a comparatively recent epoch that this important subject met with the serious attention it deserves. Several institutions for the cure of bodily malformations were founded in France and Germany in the early part of this century. Orthopædia is divided into prophylactic or preventive, and therapeutic or curative. The object of the former is to prevent deformities in infants, and is obtained by hygienic means, such as pure air, careful nursing, and suitable food, clothing, and exercise; that of the latter to correct deformities already existing by mechanical treatment, which is most successful when resorted to as soon as any deviation from natural shape manifests itself. In our time the manufacture of orthopædic apparatus has become highly developed, and forms an important branch of trade.

ORTHOP'TERA, an order of insects in which the metamorphosis is incomplete. They have four wings, the anterior pair being semicoriaceous or leathery, usually with numerous nervures, the wings sometimes overlapping and sometimes meeting like the roof of a house. The feelers are generally straight, filiform organs. The limbs vary in conformation according to their methods of movement. In their metamorphosis the larvæ and pupæ are both active, and the pupæ generally resembles the perfect insect, the wings being undeveloped. These insects are divided into Running and Leaping Orthoptera. Of the former division the coachroaches, earwigs, mantis insects, walking-stick insects, and walking leaves form the chief families. The Saltatoria are represented by the locusts, some of which want wings entirely, crickets, and grasshoppers. See also Entomology.

OR'TOLAN, a bird of the bunting family, a native of Northern Africa and Southern Europe. The colors are yellow on the throat and around the eyes, the breast and belly being of reddish hue, while the upper part of the body is brown varied with black. Its delicate flesh is much esteemed by epicures, and large quantities are annually caught and fattened for the table in the south of France, Italy, and Cyprus.

Ortolan.

OSAGE, a river in the United States, which rises in Kansas, flows through Missouri, and after a winding course of 500 miles joins the Missouri 10 miles below Jefferson City. The river gave name to an Indian tribe, the remnant of which now inhabit the Indian territory.

OSAGE ORANGE, a tree of the nat. order Moraceæ (mulberry), indigenous to North America, where it is frequently used as a hedge-plant. It produces a large yellow fruit of a woody texture, somewhat resembling an orange, but not edible.

OSA'KA, or **OHOSA'KA,** the second city and a free port of Japan, in the island of Hondo, on the estuary of the Yodo Gawa, 28 miles s.s.w. of Kioto. Pop. 821,235.

OSCAR I., Joseph François Bernadotte, King of Sweden and Norway, son of Bernadotte (Charles XIV.), born at Paris in 1799, died 1859. In 1823 he married Joséphine, eldest daughter of Prince Eugène Beauharnais. During the reign of his father he was three times (in 1824, 1828, and 1833) viceroy of Norway, where he made himself popular by his good administration. He acceded to the throne in 1844; reformed the civil and military administration of the state; abolished primogeniture; established complete liberty of conscience; encouraged education and agriculture; promoted railways, telegraphs, etc. He took little part in foreign politics. He resigned in favor of his eldest son in 1857.

OSCAR II., King of Sweden and Norway, born 1829; succeeded his brother, Charles XV., in 1872. In 1905 the union of Sweden and Norway was dissolved, since which time Oscar has been King of Sweden only. He is a writer of some merit; has translated Goethe's Faust into Swedish, and published a volume of poems under the pen-name of Oscar Frederik. He died in 1907.

OSCILLATION, the act of swinging to and fro. The term is often indiscriminately applied to all sorts of forward and backward motions, but it has special reference to the movements of the pendulum, which are subject to well-established laws. See Pendulum.

OSHKOSH, the capital of Winnebago co., Wisconsin, on Lake Winnebago, at the mouth of the Fox river. It has numerous saw and shingle mills, sash, door, and window factories, with other industrial establishments. Pop. 33,190.

OSI'RIS, one of the great Egyptian divinities. He was the brother and husband of Isis, and the father of Horus. He is styled the Manifestor of Good, Lord of Lords, King of the Gods, etc. In the Egyptian theogony he represented the sum of beneficent agencies, as Set of evil agencies. Osiris, after having established good laws and institutions throughout Egypt, fell a prey to the intrigues of his brother Set, the Typhon of the Greeks. He became afterward the judge of the dead. There are a multitude of traditions, both Greek and Egyptian, about Osiris. He is represented under many different forms, and compared sometimes to the sun and sometimes to the Nile. His soul was supposed to animate the sacred bull Apis, and thus to be continually present among men. The worship of Osiris extended over Asia Minor, Greece, and Rome, but the attacks of the philosophers and the rise of Christianity put an end to it.

Osiris.

OSKALOOSA (ŏs'kȧ-lōō'sȧ), the county seat of Mahaska co., Ia., 60 miles southeast of Des Moines. Pop. 11,012.

OSLER THEORY, William Osler, professor of medicine in Johns Hopkins University, and later of Oxford, in 1904 made the statement that man's best work was done before forty. This statement perverted became the basis of what is known as the Osler theory that men past that age have outlived their usefulness.

OSMAN. See Caliph and Ottoman Empire.

OSMAN DIGNA, a Soudanese slave merchant and lieutenant to the Mahdi, said to have been born of French parents at Rouen in 1836. He has proved himself one of the ablest leaders on the Mahdist side. In 1884 he defeated an Egyptian force under Baker Pasha near the Red Sea coast of the Soudan. He was defeated soon after by a British force, but continued to give trouble till in January, 1900, he was captured.

OSMAN PASHA, Turkish general born at Tokat in Asiatic Turkey, 1832; entered the Turkish army in 1853; his great achievement was the defense of Plevna during the Russo-Turkish war (1877). He afterward held the office of war minister and other high posts. He died in 1900.

OSPREY, a well-known raptorial bird, called also fishing-hawk, fishing-eagle, and sea-eagle. It occurs both in the Old and New World, near the shores of the sea or great rivers and lakes, and builds its nest in high trees and

cliffs. It lives on fish, and pounces with great rapidity on its prey, as it happens to come near the surface of the water, the toes being armed with strong curved nails. The general body-color is a rich brown, the tail being banded with light and dark (in the old birds the tail is pure white), head and neck whitish on their upper portions, and a brown stripe extends from the bill down each side of the neck; under parts of the body whitish, legs of a bluish tint. In length the osprey averages about 2 feet, the wings measuring over 4 feet from tip to tip. The female lays three or four eggs. The American bald-eagle pursues the osprey, who drops his prey with the

Osprey.

view of escaping, when the eagle immediately pounces after the descending fish, and seizes it ere it touches the water.

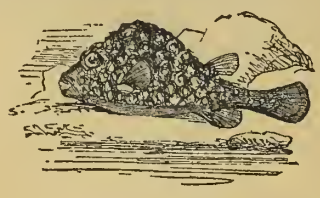
OSSIFICATION, the process of bone formation, which in all cases consists of the deposition of earthy or calcareous matter. It may take place by the deposition of osseous material in fibrous membranes, and thus the flat bones of the skull are developed; or by deposition in cartilage, as in the case of the long bones of the skeleton. The process of ossification in cartilage begins at various well-marked points called centers of ossification, where proliferation of cartilage cells and a deposit of lime salts occurs. (See also Bone). Most organs of the body may become the seat of abnormal ossification. Deposits of limy matter take place frequently within the coats of arteries, making them easily ruptured; but this process is rather one of calcification.

OS'SOLI, Margaret Sarah Fuller, an American authoress, born in 1810, remarkable for her precocious and extensive linguistic attainments. She became associated with Emerson and other eminent literary men. She visited Europe in 1846, married in 1847 the Marchese Ossili; embarked with her husband for New York, but they were wrecked, and both perished off Long Island, July 16, 1850. She wrote several works, including Women in the Nineteenth Century, etc.

OSTEOL'OGY, the department of anatomical science specially devoted to a description of the bony parts or skeleton of the body, and included under the wider science of anatomy (which see, as also Skeleton, Bone, etc.).

OSTEOP'ATHY, a method of treating disease by manipulation, the purpose and result of which is to restore the normal condition of nerve control and blood supply to every organ of the body, by removing physical obstruction or by stimulating or inhibiting activity as the condition may require.

OSTRA'CION, the scientific name of the fishes known as trunk-fishes. The



Ostracion or trunk-fish.

body is inclosed in a literal armor-casing of strong bony plates or scales of the ganoid variety, which are immovably united, and invest every part of the body save the tail, which is movable, but is itself inclosed in a bony casing. These fishes do not attain a large size, and are common in tropical seas.

OS'TRACISM, a political measure practiced among the ancient Athenians by which persons considered dangerous to the state were banished by public vote for a term of years (generally ten), with leave to return to the enjoyment of their estates at the end of the period. It takes this name from the shell or tablet on which each person recorded his vote. Among the distinguished persons ostracized were Themistocles, Aristides, and Cimon, son of Miltiades, who were afterward recalled.

OSTRICH, a cursorial bird that inhabits the sandy plains of Africa and Arabia, and is the largest bird existing, attaining a height of from 6 to 8 feet. The head and neck are nearly naked; the general body plumage is black, the wing and tail feathers white, occasionally with black markings; the quill-feathers of the wings and tail have their barbs wholly disconnected, hence their graceful appearance. The legs are extremely strong, the thighs naked. There are only two toes, the hallux or hind toe being wanting. The pubic bones are united,

African ostrich.

a conformation occurring in no other bird. The wings are of small size and are incapable of being used as organs of flight, but the birds can run with extraordinary speed, outdistancing the fleetest horse. The bill is broad and of a triangular depressed shape. The food consists of grass, grain, etc., and substances of a vegetable nature, and to aid in the trituration of this food the ostrich swallows large stones, bits of iron and glass, or other hard materials that come in the way. Ostriches are polygamous, each male consorting with several females, and they generally keep together in flocks. The eggs average 3 lbs. in weight, and several hens often lay from ten to twelve each in the same nest, which is merely a hole scraped in the sand. The eggs appear to be hatched mainly by the exertions of both parents relieving each other in the task of incubation, but also partly by the heat of the sun. The South African ostrich is often considered as a distinct species. Three South American birds of the same family are popularly known as the American ostrich, and are very closely allied to the true ostrich, differing chiefly in having the head feathered and three-toed feet, each toe armed with a claw. (See Rhea.) The ostrich has been hunted from the earliest ages for its feathers, which have always been valued as a dress decoration. The feathers of the back are those most valued, the wing and tail feathers rank next. The black plumes are obtained by dyeing.

OSTROGOTHS. See Goths.

OSWE'GO, a city and port in Oswego co., New York, on the Oswego, which here falls into Lake Ontario. It is beautifully situated, regularly and handsomely built, and is the great emporium for the traffic to New York from Canada and the west. It is famous for its vast starch factory, and has extensive mills, tanneries, foundries, machine-shops, and ship-yards. The river supplies ample water-power. The entrance to the port is guarded by Fort Ontario. Pop. 25,230.

OTA'GO, one of the provincial districts of New Zealand, including the whole of the southern part of South Island, south of the districts of Canterbury and Westland, being surrounded on the other three sides by the sea; area about 15,000,000 acres. Pop. 173,111.

OTAL'GIA, a painful affection of the ear. It may be due to inflammation of the ear; it may be a symptom of other diseases; or, it may be a species of neuralgia. It is often associated with other nervous ailments such as toothache, and neuralgic pains in the face; and as its intensity and duration generally depend upon the condition of the latter, otalgia is probably only a local symptom of the other troubles. Children, especially during their fast-growing period, are frequently subjected to otalgic pains. The treatment adopted in neuralgic affections is usually and with success also applied to this complaint.

OTIS, Elwell Stephen, American soldier, was born at Frederick, Md., in 1838. He served throughout the civil war, rising to the rank of lieutenant-colonel. In 1866 he was appointed lieutenant-colonel of the Twenty-second Infantry in the regular army, and by successive promotion became major-general in the regular army in 1900. In 1898 he was sent to the Philippines, where he relieved Major-General Wesley

Merrit as commander of the United States forces and military governor of the islands. He was a member of the first Philippines commission in 1899. In 1900 he was recalled to the United States and assigned to the command of the Department of the Lakes, and in March, 1902, was retired from the service

OTIS, Fessenden Nott, American surgeon, born at Ballston Spa, N. Y., in 1825. He invented many surgical instruments, of which the more important are the urethrometer, the dilating catheter, and an evacuator for use after lithotrity. He died in 1900.

OTIS, George Alexander, American military surgeon, born in Boston, Mass., in 1830. He was appointed surgeon of United States Volunteers, in 1864 and was assigned to duty as curator of the Army Medical Museum and custodian of the Division of Surgical Records at Washington. Owing to his zeal and energy the museum came to possess the most valuable surgical and anatomical collections in the world. He died in 1881.

OTIS, Harrison Gray, American politician, was born in 1765 in Boston. In 1796 he was elected to the state legislature, and the next year was sent to congress as a federalist. In 1817 he was elected United States senator and mayor of Boston in 1829. His brilliant oratorical powers made him a leader in the senate, where he opposed the further extension of slavery. He died in 1848.

OTIS, James, American statesman, born in West Barnstable, Mass., in 1725. He became prominent by resigning his office of advocate-general in 1761 rather than argue in favor of writs of assistance, i.e., general search warrants for the discovery of smuggled goods into the colony. In 1762 he was elected to the legislature. In 1765 he made a motion which was carried that a congress of representatives from the various colonies be convened. The Stamp Act Congress of 1765 was the result. In 1769 he was accused in England of treason which he publicly denounced. In 1771 he was again returned to the legislature. He died in 1783.

OTI'TIS, inflammation of the ear, accompanied with intense pain. Within the tympanum it is called internal, beyond it external otitis; and like all other inflammations it may be acute or chronic. Scrofulous and syphilitic constitutions are particularly liable to this diesase. Internal otitis is often a serious malady, producing fever and delirium, and ending in suppuration, and generally in the rupture of the tympanum and more or less deafness. The treatment is similar to that of other inflammatory ailments.

OTTAR OF ROSES. See Attar.

OT'TAWA, a river in the Dominion of Canada, forming for a considerable part of its length the boundary between the provinces of Quebec and Ontario.

OTTAWA, a city in the prov. of Ontario, capital of the Dominion of Canada, on the right bank of the Ottawa about 90 miles above its confluence with the St. Lawrence, 100 miles west of Montreal, and on the Canadian Pacific railway. The city, divided into the Upper and Lower town by the Rideau Canal, has wide streets crossing at right angles, and some of the finest buildings in the Dominion. The chief are the government buildings, constructed of light-colored sandstone in the Italian-Gothic style. The educational institutions include a Roman Catholic College, the Canadian Institute, the Mechanics' Institute and Athenæum, etc. Ottawa has important and increasing manufacturers, and is the great center of the lumber trade. It is connected with Hull, on the Quebec side of the Ottawa, by a suspension bridge. In 1858 it became the capital of Upper and Lower Canada. Part of it was destroyed by fire in 1900. Pop. 59,902.

OTTAWA, a town in Illinois, at the junction of the Illinois and Fox rivers, 84 miles southwest of Chicago. Pop. 12,424.

OTTER, a carnivorous mammal. There are several species differing chiefly in size and fur. They all have large flattish heads, short ears, webbed toes, crooked nails, and tails slightly flattened horizontally. The common river-otter of Europe inhabits the banks of rivers, feeds principally on fish, and is often very destructive, particularly to salmon. The under fur is short and woolly, the outer is composed of longer

Canada otter.

and coarser hairs of dark brown hue. They burrow near the water's edge, line their nests with grass and leaves, and produce from four to five young. The weight of a full-grown male is from 20 to 24 lbs.; length from nose to tail 2 feet, tail 15 to 16 inches. The American or Canadian otter averages about 4 feet in length inclusive of the tail. It is plentiful in Canada, and furnishes a valuable fur, which is a deep reddish-brown in winter, and blackish in summer. The sea-otters represented typically by the great sea-otter, inhabit the coasts of the North Pacific Ocean, but are of comparatively rare occurrence. The tail is short, measuring about 7 inches only; weight 60 to 70 lbs. The fur is soft, and of a deep lustrous black, or of a dark maroon color when dressed, and much prized. In general appearance the sea-otter somewhat resembles a small seal.

OTTO, German sovereign. See Otho.

OTTOMAN EMPIRE, the Turkish Empire, the territories in Europe, Asia, and Africa more or less under the sway of the Turkish sultan. In Europe, besides the immediate provinces in the Balkan Peninsula, are Bulgaria (with Eastern Roumelia), and Bosnia, Herzegovina, etc., held by Austria; in Asia, Asia Minor, Syria, including Palestine, Mesopotamia, part of Arabia, Candia, and others of the islands of the Archipelago; in Africa, Egypt, over which there is a nominal suzerainty, and the vilayet of Tripoli. Formerly the empire was much more extensive, even in recent times comprising Greece, Roumania, Servia, Bessarabia, Tunis, etc. We shall here give a brief sketch of the history of the Ottoman Empire, referring to the article Turkey for information regarding the geography, constitution, etc., of Turkey proper.

The Ottoman Turks came originally from the region of the Altai mountains, in Central Asia, and in the 6th century A.D. pushed onward to the west in connection with other Turkish tribes. Early in the 8th century they came in contact with the Saracens, from whom they took their religion, and of whom they were the first slaves and mercenaries, and finally the successors in the caliphate. In the 13th century they appeared as allies of the Seljukian Turks against the Mongols, and for their aid received a grant of lands from the Seljuk sultan of Iconium in Asia Minor. Their leader, Othman or Osman, of the race of Oghuzian Turkomans, became the most powerful emir of Western Asia, and after the death of the Seljuk sultan of Iconium in the year 1300 he proclaimed himself sultan. He died in 1326. Thus was founded upon the ruins of the Saracen, Seljuk, and Mongol power the Empire of the Osman or Ottoman Turks in Asia; and after Osman, the courage, policy, and enterprise of eight great princes, whom the dignity of caliph placed in possession of the standard of the prophet, and who were animated by religious fanaticism and a passion for military glory, raised it to the rank of the first military power in both Europe and Asia (1300–1566).

In the latter part of the 16th century, and most of the 17th century, the chief wars were with Venice and with Austria. The battle of Lepanto (1571), in which the Ottoman fleet was overthrown by the combined fleets of Venice and Spain, was the first great Ottoman reverse at sea; and the battle of St. Gothard (1664), near Vienna, in which Montecuculi defeated the Vizier Kiuprili, the first great Ottoman reverse on land. In 1683 Vienna was besieged by the Turks, but was relieved by John Sobieski and Charles of Lorraine; in 1687 the Turks were again defeated at Mohacz, and in 1697 (by Prince Eugene at Szenta. Then followed the Treaty of Carlowitz in 1699, by which Mustapha II. agreed to renounce his claims upon Transylvania and a large part of Hungary, to give up the Morea to the Venetians, to restore Podolia and the Ukraine to Poland, and to leave Azov to the Russians. Eugene's subsequent victories at Peterwardein and Belgrade, obliged the Porte to give up, by the Treaty of Passarowitz in 1718, Temeswar, Belgrade, with a part of Servia and Walachia; but the Turks on the other hand took the Morea from Venice, and by the Treaty of Belgrade in 1739 regained Belgrade, Servia, and Little Walachia, while for a time they also regained Azov.

Russia, which had been making steady advances under Peter the Great

and subsequently, now became the great opponent of Turkey. In the middle of the 18th century the Ottoman Empire still embraced a large part of Southern Russia. The victories of Catharine II.'s general Romanzoff in the war between 1768 and 1774 determined the political superiority of Russia, and at the Peace of Kutchuk-Kainargi, in 1774, Abdul-Hamid was obliged to renounce his sovereignty over the Crimea, to yield to Russia the country between the Bog and the Dnieper, with Kinburn and Azov, and to open his seas to the Russian merchant ships. By the Peace of Jassy, 1792, which closed the war of 1787–91, Russia retained Taurida and the country between the Bog and the Dniester, together with Otchakov, and gained some accessions in the Caucasus. In the long series of wars which followed the French revolution the Ottoman Empire first found herself opposed to France, in consequence of Bonaparte's campaign in Egypt, and finally to Russia, who demanded a more distinct recognition of her protectorate over the Christians, and to whom, by the Peace of Bucharest, May 28, 1812, she ceded that part of Moldavia and Bessarabia which lies beyond the Pruth. In 1817 Mahmud II. was obliged to give up the principal mouth of the Danube to Russia. Further disputes ended in the Porte making further concessions, which tended toward loosening the connection of Servia, Moldavia, and Walachia with Turkey. In 1821 broke out the war of Greek independence. The remonstrances of Britain, France, and Russia against the cruelties with which the war against the Greeks was carried on proving of no avail, those powers attacked and destroyed the fleet of Mahmud at Navarino (1827). In 1826 the massacre of the Janizaries took place at Constantinople, after a revolt. In 1828–29 the Russians crossed the Balkans and took Adrianople, the war being terminated by the Peace of Adrianople (1829). In that year Turkey had to recognize the independence of Greece. In 1831–33 Mehemet Ali, nominally Pasha of Egypt, but real ruler both of that and Syria, levied war against his sovereign in 1833, and threatened Constantinople; when the Russians, who had been called on for their aid by the sultan, forced the invaders to desist. In 1840 Mehemet Ali again rose against his sovereign; but through the active intervention of Great Britain, Austria, and Russia, was compelled to evacuate Syria, though he was, in recompense, recognized as hereditary viceroy of Egypt.

The next important event in the history of the Ottoman Empire was the war with Russia in which Turkey became involved in 1853, and in which she was joined by England and France in the following year. This war, known as the Crimean war (which see), terminated with the defeat of Russia, and the conclusion of a treaty at Paris on the 30th of March, 1856, by which the influence of Russia in Turkey was greatly reduced. The principal articles were the abolition of the Russian protectorate over the Danubian principalities (the Moldavia and Walachia, united in 1861 as the principality of Roumania), the rectification of the frontier between Russia and Turkey, and the cession of part of Bessarabia to the latter power.

In 1875 the people of Herzegovina, unable to endure any longer the misgovernment of the Turks, broke into rebellion. A year later the Servians and Montenegrins likewise took up arms, and though the former were unsuccessful and obliged to abandon the war, the Montenegrins still held out. Meantime the great powers of Europe were pressing reforms on Turkey, and at the end of 1876 a conference met at Constantinople with the view of making a fresh settlement of the relations between her and her christian provinces. All the recommendations of the conference were, however, rejected by Turkey; and in April following Russia, who had been coming more and more prominently forward as the champion of the oppressed provinces and had for months been massing troops on both the Asiatic and the European frontier of Turkey, issued a warlike manifesto and commenced hostile operations in both parts of the Turkish Empire. She was immediately joined by Roumania, who on the 22d of May (1877) declared her independence. The progress of the Russians was at first rapid; but the Turks offered an obstinate resistance. After the fall of Kars, however, November 18, and the fall of Plevna, December 10, the Turkish resistance completely collapsed, and on the 3d of March, 1878, Turkey was compelled to agree to the Treaty of San Stefano, in which she accepted the terms of Russia. The provisions of this treaty were, however, considerably modified by the Treaty of Berlin concluded on the 13th of July following by which Roumania, Servia, and Montenegro were declared independent; Roumanian Bessarabia was ceded to Russia; Austria was empowered to occupy Bosnia and Herzegovina; and Bulgaria was made a principality. (See Berlin, Treaty of.) The main events in the history of the Ottoman Empire since the Treaty of Berlin are the French invasion of Tunis in 1881, leading to a French protectorate; the treaty with Greece, executed under pressure of the great powers in 1881 by which Greece obtained Thessaly and a strip of Epirus; the occupation of Egypt by Britain in 1882; and the revolution at Philippopolis in 1885, by which Eastern Rumelia became united with Bulgaria. More recent events include the massacres of Armenians in 1895–96; the Cretan insurrection and the consequent war with Greece in 1897, resulting in the defeat of the latter; the granting of autonomy to Crete in 1898; and the Macedonian revolt of 1903. Bosnia and Herzegovina were annexed by Austria. Bulgaria proclaimed its independence; the sultan proclaimed a constitution in 1908.

OT'TUMWA, a city in Iowa, on the Des Moines river, 75 miles n.w. of Burlington, an important railroad center and a place of growing commercial and industrial activity. Pop. 18,197.

OUBLIETTE (ö'bli-et), a dungeon existing in some old castles and other buildings, with an opening only at the top for the admission of air. It was used for persons condemned to perpetual imprisonment or to perish secretly.

OUDH, or **OUDE** (oud), a province of British India, bounded on the north by Nepaul, and on the other sides by the province of Agra; area, 24,246 sq. miles. Lucknow is the capital, and the main center of population and manufactures. Pop. 12,833,077 (mostly Hindus), giving the large average of 521 to the sq. miles.

OUDH (formerly Ayodhya), an ancient town in Faizabad district, Oudh, adjacent to Faizabad, on the river Gogra. In remote antiquity it was one of the largest and most magnificent of Indian cities, and is famous as the early home of Buddhism and of its modern representative, Jainism. A great fair, attended by about 500,000 people, is held every year. Pop. 11,643.

OUDINOT (ö-di-nō), Charles Nicolas, Duke of Reggio, peer and marshal of France, born in 1767. In 1791 he was elected commandant of a volunteer battalion. In 1792 he was colonel of the regiment of Picardy, in 1793 brigadier-general, and in 1799 general of division. Masséna made him chief of the general staff, and under his command he decided the battle of the Mincio. In 1804 Napoleon gave him the command of a grenadier corps of 10,000 men, which was to form the advance-guard of the main army. At the head of these troops he performed many exploits, winning the battle especially of Ostrolenka, and deciding the fate of three great battles—Austerlitz, Friedland, and Wagram. After the last-named battle Napoleon made him a marshal and Duke of Reggio. After Napoleon's abdication he gave in his adhesion to the Bourbons, to whom he ever afterward remained faithful, and who heaped upon him every honor. He died in 1847.—His eldest son, Nicolas Charles Victor (born 1791), commanded the troops which effected the capture of Rome from Garibaldi in 1849. He died in 1863.

OUIDA (wē'da). See Ramée, Louisa de la.

OUNCE, in Troy weight, is the twelfth part of a pound, and weighs 480 grains; in avoirdupois weight is the sixteenth part of a pound, and weighs 437½ grains Troy.

OUTRAM (ou'tram), Lieutenant-General Sir James, was born at Butterley Hall, Derbyshire, 1803. In 1842 he was appointed commissioner to negotiate with the Ameers of Sind. In 1856 he was nominated chief commissioner of Oudh. He was commander-in-chief of the British forces in the Persian war of 1856–57. Although of higher rank than Havelock, he fought under him until Lucknow was relieved by Sir Colin Campbell. In the following March he commanded the first division of infantry when Sir Colin finally regained possession of Lucknow. His services were rewarded with a baronetcy, the rank of lieutenant-general, the order of the grand-cross of the Bath, and the thanks of parliament; and statues were erected in his honor in London and Calcutta. He died at Pau in 1863, and was buried in Westminster Abbey.

OUT'RIGGER, an iron bracket fixed on the side of a boat, with a rowlock at its extremity, so as to give an increased

SIX MILLION WOMEN

Approve 3 Types of KOTEX

to meet the personal needs of all women

■ "Any size" napkin will *not* do, just as one size shoe, or hat, or dress will not fit every woman.

For the ordinary needs of most women REGULAR KOTEX, in the BLUE BOX, is ideal. It gives full protection and complete comfort. The millions of women who are completely satisfied with Regular will have no reason to change.

Usually the menstrual flow is heavier on the second and third days, causing women to change napkins oftener. SUPER KOTEX, in the BROWN BOX, removes this difficulty by giving you *greater absorbency* and protection. Although Super has extra layers of Cellucotton (not cotton) it is no longer or wider than Regular.

Toward the end of the period, and for any day when the flow is light, many women prefer the comfort of a smaller napkin. Try JUNIOR KOTEX, in the GREEN BOX, for such times. You are certain to like the convenience of a smaller napkin, especially when you can be sure of the adequate protection which *all* types of Kotex provide.

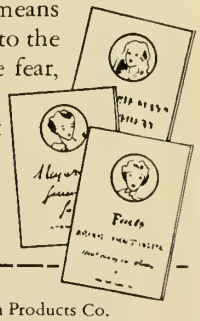
Printed in U. S. A. Form 7-A-1-p

FREE BOOKLETS

for You and Your Daughter

Two of these booklets, "Marjorie May's 12th Birthday" and "Marjorie May Learns About Life" have helped millions of Mothers in the difficult task of giving necessary information to their growing daughters. Menstruation is discussed simply and naturally, in terms suitable for younger girls and girls in their teens.

"Facts About Menstruation that every Woman should Know," a booklet by an Eminent Medical Authority, has been prepared for women in the hope that they will find, through it, a means of living each day to the full . . . free of the fear, doubt, illness and discomfort that too often accompany menstruation.



Request the ones you want.

Mary Pauline Callender
International Cellucotton Products Co.
Room 1445
919 North Michigan Ave., Chicago, Ill.

Please send me a free copy of:

☐ "Marjorie May's 12th Birthday"
☐ "Marjorie May Learns About Life"
☐ "Facts About Menstruation"

Name .....

Address .....

City .....

State .....

THE MAKERS OF KO

KURB

ANODYNE TABLETS FOR CERTAIN DAYS

12 FOR 25c . . . . . PACKED IN HANDY PURSE-SIZE CONTAINER

● The medicinal action of Kurb Anodyne Tablets is such that they lessen the perception of pain and distress; their use generally results in increased comfort *during menstruation.* Also recommended for the relief of simple headaches, and muscular aches and pains.

DOSE: 1 or 2 tablets with water; if necessary, repeat with 1 in 3 hours.

If your dealer does not have Kurb Tablets, send us 25c together with your dealer's name and address.

FIBS

INVISIBLE SANITARY PROTECTION FOR THE WANING DAYS

12 FIBS 25c

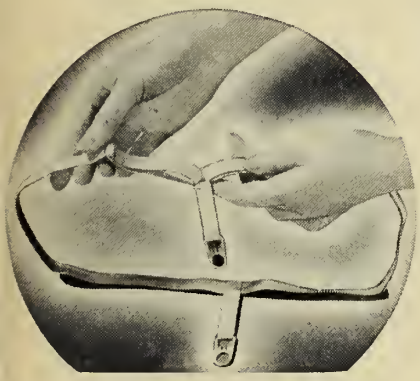
● Tampon-type protection—absolutely safe—invisible and secure—to shorten the inconveniences of each menstrual period by at least one day or more. Fibs are also recommended by physicians as ideal for white secretions due to overactive glands and for functional Leucchorea. Package of 12 Fibs, with complete instructions on how to use, is priced at **25c.** Buy Fibs where you buy Kotex.

If your dealer does not have Fibs, send us 25c together with your dealer's name and address.

EX PRESENT . . . .

KOTEX BELT

TO END WAISTLINE CONSCIOUSNESS



KOTEX WONDERFORM BELT 25c

This narrow, adjustable Kotex Belt is small and inconspicuous, yet extra safe and secure in every way. Dainty, unbreakable fasteners prevent slipping which is the most frequent cause of chafing.

Because this belt is flat and thin, woven to fit the body, it is self-balancing! That means you can bend every-which-way without harness-like restraint. And you end waist-line consciousness!

The patented clasp is even more secure than safety pins. And it's so easy to use! You simply draw the gauze end of your Kotex pad through the notched hole until secure, then down through the round hole, and you have a balanced pad. Buy a Kotex Belt with Kotex.

QUEST

POSITIVE DEODORANT POWDER FOR PERSONAL DAINTINESS

2-OUNCE CAN 35c

A NEW DEODORANT that you will want to use with Kotex. Quest deodorizes sanitary napkins completely. In fact, this soothing powder *destroys* body odors of all types and does not irritate or chafe. Being unscented it does not cover up one odor with another or interfere with the fragrance of your perfume. Buy Quest when you buy Kotex.

WONDERSOFT KOTEX

Can't Chafe . . . Can't Fail . . . Can't Show . . . **and *only* KOTEX can offer you these advantages.**

1. Moisture-Proof Edges. A special moisture-proof strip is under the Wondersoft cotton edge. No accidents, because the *edges stay dry!* Examine the pad and you'll see the moisture-proof edges are there.

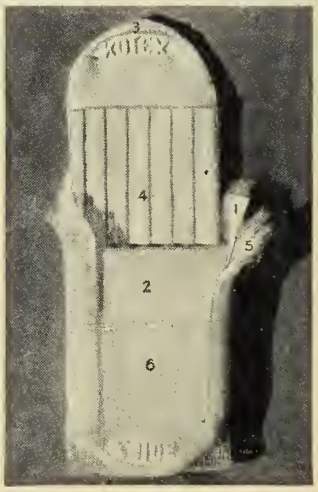
2. Soft Cushion Top. There is a smooth, super-soft tissue cushion under the gauze. It's on both top and bottom, prevents chafing, gives more comfort than ever without adding thickness.

3. The Rounded Ends of Kotex are also flattened and tapered. With Kotex there are never any tell-tale wrinkles . . . even under your closest fitting dresses.

4. The Center layer has channels which guide moisture lengthwise, *away from the edges.* This "Equalizer" gives extra security without extra bulk. Makes Kotex hold its shape—no twisting or roping.

5. Wondersoft Edges. To guard against chafing and irritation, a soft, downy layer of cotton cushions the edges only. The surface is left free to absorb.

6. Kotex is made from Cellucotton (not cotton), the world's *finest absorbent.* Ask any hospital nurse.



FOR MORE COMFORT AND SATISFACTION

—follow these directions

1. Although Kotex may be worn on either side, we suggest you wear the gauze fold *away from the body.* Then there is no possibility of cutting or burning, no chance for irritation when walking.

2. For utmost comfort and protection, curve the edges of Kotex downwards when putting it on. Do not try to wad the pad together.

3. Wear Kotex snugly, close to the body. Pin or fasten the gauze so the pad can't slip and twist to one side. Wearing it too loosely may result in roping and twisting, also allow the edges to become soiled. This is the most frequent cause of chafing and irritation along the thighs, greatly increases your discomfort, and adds danger of soiled clothing. Remember always that a pad firmly fastened offers you better protection.

4. If you use a narrow adjustable belt with patented clasps, always gather the gauze lengthwise. Fold gauze ends on a bias if you use a belt with safety pins. . . . Pin through *all* thicknesses of the gauze.

5. To dispose of Kotex, first remove the inside filler from the gauze and flush it away. Then cut the gauze in two with a pair of scissors; flush one half away . . . then flush the remainder away.

leverage to the oar without widening the boat; hence, a light boat for river matches provided with such apparatus. The name is also applied to a contrivance in certain boats and canoes, consisting of a projecting framework or arrangement of timbers for counterbalancing the heeling-over effect of the sails, which are large in proportion to the breadth of the vessel.

OUZEL (ou'zl), a genus of insessorial or perching birds, included in the family

Ring-ouzel.

of the thrushes. The specific name of the common or ring ouzel is derived from the presence of a broad semilunar patch or stripe of white extending across its breast. The water ouzel belongs to a different family. (See Dipper.) Ouzel is also an old or poetical name for the blackbird.

OVAL, an egg-shaped curve or curve resembling the longitudinal section of an egg. The oval has a general resemblance to the ellipse, but, unlike the latter, it is not symmetrical, being broader at one end than at the other.

OVA'RIAN TUMOR, a morbid growth in the ovary of a woman, sometimes weighing as much as 30, 50, or upward of 100 lbs. or more, consisting of a cyst containing a thin or thick ropy fluid, causing the disease known as ovarian dropsy, which is now generally cured by the operation of ovariotomy.

OVARIOT'OMY, the operation of removing the ovary, or a tumor in the ovary (see above); a surgical operation first performed in 1809, and long considered exceedingly dangerous, but latterly performed with great and increasing success, especially since the adoption of the antiseptic treatment inaugurated by Lister.

O'VARY, or **OVARIUM,** the essential part of the female generative apparatus in which the ova or eggs are formed and developed. The ovary in the female corresponds to the testis of the male. In adult women the ovaries exist as two bodies of somewhat oval shape, and compressed from side to side, of whitish color and uneven surface. They are situated one on each side of the womb, and are attached to the hinder portion of the body of the womb by two thin cord-like bands—the ovarian ligaments, and by a lesser fibrous cord to the fringed edge of the fallopian tube. Each ovary is about 1½ inch in length, and about 1½ drachms in weight, and contains a number of vesicles known as ovisacs or Graafian follicles, in which the ova are developed. The functions of the ovary, which are only assumed and become active on the approach of puberty, are the formation of ova, their maturation, and their final discharge at periodic menstrual epochs into the uterus or womb. There the ovum may be impregnated and detained, or pass from the body with the menstrual flow. The ovaries are subject to diseased conditions, chief among which are cancer and the occurrence of tumors and cysts. See Ovarian Tumor, Ovariotomy.

O'VARY, in botany, is a hollow case inclosing ovules or young seeds, containing one or more cells, and ultimately becoming the fruit. Together with the style and stigma it constitutes the female system of the vegetable kingdom. When united to the calyx it is called inferior; when separated, superior.

OVATION. See Triumph.

OVEN, a close chamber of any description in which a considerable degree of heat may be generated, used for baking, heating, or drying any substance.

OVEN BIRDS, birds belonging to the family Certhidæ or Creepers, found in South America. They are all of small size, and feed upon seeds, fruits, and insects. Their popular name is derived

Oven-bird.

from the form of their nest, which is dome-shaped, and built of tough clay or mud with a winding entrance.

OVENS RIVER, a river in the north-east of the Australian colony of Victoria, a tributary of the Murray. The district is an important gold-mining and agricultural one.

OVERLAND ROUTE to India, the route via Dover, Calais, Paris, Macon, the Mont Cenis Tunnel, Modena, to Brindisi, thence by steamer to Port Said, through the Suez Canal, and down the Red Sea to the destined Indian port. Alternative routes are from Marseilles or Trieste by steamer to Alexandria, and thence by rail to Ismailia.

OVERSHOT WHEEL, a wheel driven by water shot over from the top. The buckets of the wheel receive the water as nearly as possible at the top, and retain it until they approach the lowest point of the descent. The water acts principally by its gravity, though some effect is of course due to the velocity with which it arrives.

O'VERTURE, in music, an introductory symphony, chiefly used to precede great musical compositions, as oratorios and operas, and intended to prepare the hearer for the following composition, properly by concentrating its chief musical ideas so as to give a sort of outline of it in instrumental music. This mode of composing overtures was first conceived by the French. Overtures are, however, frequently written as independent pieces for the concert-room.

Overshot water-wheel.

OVIBOS. See Musk-ox.

OVID, in full Publius Ovidus Naso, a celebrated Roman poet, born 43 B.C. He enjoyed a careful education, which was completed at Athens, where he gained a thorough knowledge of the Greek language. He afterward traveled in Asia and Sicily. He never entered the senate, although by birth entitled to that dignity, but filled one or two unimportant public offices. Till his fiftieth year he continued to reside at Rome, enjoying the friendship of a large circle of distinguished men. By an edict of Augustus, however (A.D. 8), he was commanded to leave Rome for Tomi, a town on the inhospitable shores of the Black Sea, near the mouths of the Danube. Ovid died at Tomi in the year 18 A.D. His works include love elegies; letters of heroines to their lovers or husbands; Art of Love, Love Remedies, the Metamorphoses, in fifteen books; Fasti, a sort of poetical calendar; Tristia; Epistolæ ex Ponto, Epistles from Pontus, etc.

OV'IDUCT, the name given to the canal by which, in animals, the ova or eggs are conveyed from the ovary to the uterus or into the external world. In mammals the oviducts are termed Fallopian tubes, being so named after the anatomist who first described them.

OVIEDO (ō-vi-ā'dō), a town of Spain, capital of a province of same name, 230 miles northwest of Madrid. Pop. 48,-103.—The province, area 4080 square miles, pop. 627,069, is situated on the Bay of Biscay, and bounded by the provinces of Santander, Leon, and Lugo.

OVUM, the "egg" or essential product of the female reproductive system, which, after impregnation by contact with the semen or essential fluid of the male, is capable of developing into a new and independent being. The essential parts to be recognized in the structure of every true ovum or egg consist, firstly, of an outer membrane known as the vitelline membrane. Within this is contained the vitellus or yolk, and imbedded in the yolk-mass the germinal vesicle and smaller germinal spot are seen. See Ovary, Reproduction.

OWEN, John, D D., English Nonconformist divine, born at Stadham, Oxfordshire, in 1616. He was appointed to preach at Whitehall the day after the execution of Charles I.; accompanied

Cromwell in his expeditions both to Ireland and Scotland; in 1651 was made dean of Christ Church College, Oxford, and in 1652 was nominated by Cromwell, then chancellor of the university, his vice-chancellor, offices of which he was deprived in 1657. He died in 1683.

OWEN, Sir Richard, K.C.B., comparative anatomist and palæontologist, was born at Lancaster 1804. Having settled in the metropolis he became assistant curator of the Hunterian Museum. In 1834 he was appointed professor of comparative anatomy at St. Bartholomew's hospital; in 1836 professor in anatomy and physiology

Sir Richard Owen.

at the Royal College of Surgeons, and in 1856 superintendent of the natural history department in the British Museum, from which last post he retired in 1883. He died in 1892. He was the greatest palæontologist since Cuvier, and as a comparative anatomist was a worthy successor to Hunter. He was a voluminous writer on his special subjects, and an honorary fellow of nearly every learned society of Europe and America.

OWEN, Robert, philanthropist and social theorist, born at Newtown, Montgomeryshire, North Wales, in 1771, died there 1858. In 1812 he published New Views of Society, or Essays upon the Formation of Human Character; and subsequently a Book of the New Moral World, in which he completely developed his socialistic views, insisting upon an absolute equality among men. He had three opportunities of setting up social communities on his own plan—one at New Harmony in America, another at Orbiston in Lanarkshire, and the last in 1844, at Harmony Hall in Hampshire, all of which proved signal failures. In his later years Mr. Owen became a firm believer in Spiritualism. His eldest son, Robert Dale Owen (1801–77), for a time resident minister of the United States at Naples, is chiefly known as an exponent of spiritualism. He was author of several works on that and other subjects. Another son, David Dale Owen (1807–60), acquired reputation as a geologist.

OWEN, Robert Dale, social reformer, was born at Glasgow, Scotland, in 1801. He came to the United States in 1825. He was elected to the Indiana legislature in 1835. He was a member of congress in 1843–47. He took a leading part in the settlement of the Northwestern boundary, in the Oregon question, and in founding the Smithsonian Institution. From 1853 to 1858 he was chargé d'affaires and minister at Naples. He served in the ordnance commission and the Freedmen's Bureau during the civil war. Owen was a zealous advocate of Spiritualism. His chief publications are: Outlines of the System of Education at New Lanark, Moral Physiology, Footfalls on the Boundary of Another World, The Wrong of Slavery, Debatable Land Between This World and the Next. He died in 1877.

OWENSBORO, the capital of Daviess county, Kentucky, on the Ohio, 160 miles from Louisville, is extensively engaged in the curing of tobacco and the manufacture of whisky. Pop. 15,325.

OWENS COLLEGE, Manchester, was established under the will of John Owens, a Manchester merchant, who died in 1846, and left about $500,000 for the purpose of founding an institution for providing a university education, in which theological and religious subjects should form no part of the instruction given.

OWL PARROT, the type and only known representative of a peculiar group of the parrot family, is a large bird, a native of the South Pacific Islands, and especially of New Zealand. In aspect and in nocturnal habits it resembles the owl. It feeds on roots, which it digs out of the earth with its hooked beak. It seldom flies; it is generally to be seen resting in hollow stumps and logs, and is said to hibernate in caves.

OWLS, a group of birds forming a well-defined family, which in itself represents the Nocturnal Section of the

Barn-owl.

order of Raptores or Birds of Prey. The head is large and well covered with feathers, part of which are generally arranged around the eyes in circular discs, and in some species form horn-like tufts on the upper surface of the head. The beak is short, strongly curved and hooked. The ears are generally of large size, prominent, and in many cases provided with a kind of fleshy valve or lid, and their sense of hearing is exceedingly acute. The eyes are very prominent and full, and project forward, the pupils being especially well developed—a structure enabling the owls to see well at dusk or in the dark. The plumage is of soft downy character, rendering their flight almost noiseless. The tarsi are feathered, generally to the very base of the claws, but some forms, especially those of fish-catching habits, have the toes and even the tarsi bare. The toes are arranged three forward and one backward; but the outer toe can be turned backward at will, and the feet thus converted into hand-like or prehensile organs. In habits most species of owls are nocturnal, flying about during the night, and preying upon the smaller quadrupeds, nocturnal insects, and upon the smaller birds. Mice in

Long-eared owl.

particular form a large part of their food. During the day they inhabit the crevices of rocks, the nooks and crannies of old or ruined buildings, or the hollows of trees; and in these situations the nests are constructed. They vary greatly in size, the smallest not being larger than a thrush. In their distribution the owls occur very generally over the habitable globe, both worlds possessing typical representatives of the group. The common white or barn owl is the owl which has the greatest geographical range, inhabiting almost every country in the world. The tawny or brown owl is the largest of the species indigenous to Britain, and is strictly a woodland bird, building its nest in holes of trees. The genus Asio contains the so-called horned owls, distinguished by elongated horn-like tufts of feathers on the head. The long-eared owl appears to be common to both Europe and America. It inhabits woods. The short-eared owl frequents heaths, moors, and the open country generally to the exclusion of woods. It has an enormous geographical range. The eagle owl is rare in Britain, but occurs in Norway, Sweden, and Lapland, and over the continent of Europe to the Mediterranean. A similar species extends over the whole of North America. Owls of diurnal habits are the hawk owl and the snowy owl. The hawk owl mostly inhabits the Arctic regions, but migrates southward in winter, as does the snowy owl, which is remarkable for its large size and snowy plumage. The

Burrowing owl.

little owl, the bird of Pallas Athena, is spread throughout the greater part of Europe, but is not a native of Britain. One of the most remarkable of owls is

the burrowing owl of America and the West Indies, which inhabits the burrows of the marmots (which see), or prairie-dogs—the owls possessing them-

Nest of burrowing owl.

selves of these burrows and breeding therein, much to the discomfort of the original possessors of the abodes.

OX, the general name of certain well-known ruminant quadrupeds. The characters are: the horns are hollow, supported on a bony core, and curved outward in the form of crescents; there are eight incisor teeth in the under jaw, but none in the upper; there are no canines or dog-teeth; the naked muffle is broad. The common ox is one of the most valuable of our domestic animals. Its flesh is the principal article of animal food; and there is scarcely any part of the animal that is not useful to mankind; the skin, the horns, the bones, the blood, the hair, and the very refuse of all these, have their separate uses. Having been specially domesticated by man from a stock which it is probably impossible to trace, the result has been the formation of very many breeds, races, or permanent varieties, some of which are valued for their flesh and hides, some for the richness and abundance of their milk, while others are in great repute both for beef and milk. The name of ox is used also in a more restricted sense to signify the male of the bovine genus castrated, and full-grown, and nearly so. The young castrated male is called a steer. He is called an ox-calf or bull-calf until he is a year old, and a steer until he is four years old. The same animal not castrated is called a bull.

OXAL'IC ACID, an acid which occurs, combined sometimes with potassium or sodium, at other times with calcium, in wood-sorrel and other plants; and also in the animal body, especially in urine, in urinary deposits and in calculi. Many processes of oxidation of organic bodies produce this substance. Thus sugar, starch, cellulose, etc., yield oxalic acid when fused with caustic potash, or when treated with strong nitric acid. Sawdust is very much used for producing the acid. Oxalic acid is a solid substance, which crystallizes in four-sided prisms, the sides of which are alternately broad and narrow, and the summits dihedral. They are efflorescent in dry air, but attract a little humidity if it be damp. They are soluble in water, and their acidity is so great that, when dissolved in 3600 times their weight in water, the solution reddens litmus paper, and is perceptibly acid to the taste. Oxalic acid is used chiefly as a discharging agent in certain styles of calico-printing, for whitening leather, as in boot-tops, and for removing ink and iron mould from wood and linen. It is a violent poison. Oxalates are compounds of oxalic acid with bases; one of them, binoxalate of potash, is well known as salts of sorrel, or salts of lemon.

OXFORD, a city and county borough in England, capital of Oxford county, and seat of one of the most celebrated universities in the world is situated about 50 miles w.n.w. London, on a gentle acclivity between the Cherwell and the Thames, here called the Isis. Oxford, as a city of towers and spires, of fine collegiate buildings old and new, of gardens, groves, and avenues of trees, is unique in England. Of the university buildings the most remarkable are Christ's Church, the largest and grandest of all the colleges, with a fine quadrangle and other buildings, a noble avenue of trees (the Broad Walk), the cathedral serving as its chapel; Magdalen college, considered to be the most beautiful and complete of all; Balliol College, with a modern front (1867–69) and a modern Gothic chapel; Brasenose college; and New college (more than 500 years old), largely consisting of the original buildings, and especially noted for its gardens and cloisters; besides the Sheldonian theater, a public hall of the university; the new examination schools, new museum, Bodleian library, Radcliffe library, and other buildings belonging to the university. Pop. 49,413.—Oxford county is bounded by Northampton, Warwick, Gloucester, Berks, and Buckingham; area, 483,621 acres, of which more than five-sixths are under crops or in grass. Manufactures are of little importance. The principal rivers are the Thames or Isis, Thame, Evenlode, Cherwell, and Windrush. Pop. 182,768.

OXFORD UNIVERSITY, one of the two great English universities, established in the middle ages, and situated in the city of Oxford (which see). Like Cambridge it embraces a number of colleges forming distinct corporations, of which the oldest is believed to be University college, dating from 1253, though Merton college was the first to adopt the collegiate system proper. The following list contains the name of the colleges, with the time each was founded:

1.	University college	1253
2.	Balliol college	1268
3.	Merton college	1274
4.	Exeter college	1314
5.	Oriel college	1326
6.	Queen's college	1340
7.	New college	1379
8.	Lincoln college	1427
9.	All Souls' college	1437
10.	Magdalen college	1458
11.	Brasenose college	1509
12.	Corpus Christi college	1516
13.	Christ Church college	1546
14.	Trinity college	1554
15.	St. John's college	1555
16.	Jesus college	1571
17.	Wadham college	1612
18.	Pembroke college	1624
19.	Worcester college	1714
20.	Keble college	1870
21.	Hertford college	1874

Students enter as commoners or as "scholars" or "exhibitioners," according as they obtain some of the numerous scholarships or exhibitions which may be competed for. The degrees conferred are those of Bachelor and Master in Arts, and Bachelor and Doctor in Music, Medicine, Civil Law, and Divinity. Twelve terms of residence are required for the ordinary degree of B.A. No further residence is necessary for any degree, and no residence whatever is required for degrees in music. Women were admitted to the examinations in 1884, but do not receive degrees. Three colleges for women have been established: Somerville hall, Lady Margaret hall, and St. Hugh's hall. Mansfield college, for the education of men for the nonconformist ministry, was established in 1888. The total number of students is about 3000. The total number of professorships, etc., in the university is about fifty. The institutions connected with the university include: the Bodleian library (the second in the kingdom), the Ashmolean museum, Botanic gardens, Taylor institution for modern languages, University museum, Radcliffe library, Observatory, and Indian institute. Affiliated colleges are: St. David's college, Lampeter (1880); University college, Nottingham (1882); and Firth College, Sheffield (1886).

OXIDES, the compounds of oxygen with one other element; thus hydrogen and oxygen form oxide of hydrogen or hydrogen oxide, oxygen and chlorine form a series of oxides of chlorine, oxygen and copper form oxide of copper or copper oxide, and so on. When two oxides of the same element exist, the name of that which contains the greater proportion of oxygen ends in ic, while the name of the oxide containing less oxygen ends in ous; thus we have nitrous oxide, and nitric oxide. If there be several oxides they may be distinguished by such prefixes as hypo, per, etc., or by the more exact prefixes mono, di, tri, tetra, etc. For the different oxides see the articles on the individual chemical elements.

OXUS, a large river in Central Asia. The principal head-stream of the Oxus is by some considered to be the Panja river, which rises in a lake of the Great Pamir, at a height of 13,900 feet. The Oxus for a considerable distance forms the boundary between Afghanistan and Bokhara. Total course, 1300 miles.

OXYGEN, a gas which is the most widely distributed of all the elements. Eight-ninths by weight of water, one-fourth of air, and about one-half of silica, chalk, and alumina consist of oxygen. It enters into the constitution of nearly all the important rocks and minerals; it exists in the tissues and blood of animals; without it we could not live, and by its agency disintegration of the animal frame is carried on after death. All processes of respiration are carried on through the agency of oxygen, all ordinary processes of burning and of producing light are possible only in the presence of this gas. Oxygen is invisible, inodorous, and tasteless; it is the least refractive, but the most magnetic of all the gases; it is rather heavier than air, having a specific gravity of 1.1056, referred to air as 1.00; it is soluble in water to the extent of about three volumes in 100 volumes of water at ordinary temperatures. Oxygen was liquefied for the

first time in 1877 by the application of intense cold and pressure; it has even been solidified. It is possessed of very marked chemical activity, having a powerful attraction for most of the simple substances, the act of combining with which is called oxidation. Some substances when brought into contact with this gas unite with it so violently as to produce light and heat; in other cases oxidation is much more gradual, as in the rusting of metals. The presence of oxygen is, so far as we know, one of the physical conditions of life. In inspiring we receive into the lungs a supply of oxygen; this oxygen is carried by the blood to the various parts of the body, and there deposited to do its work of tissue-forming, etc.; the deoxygenated blood returns to the lungs, and again receives a fresh supply of the necessary oxygen. Trees and plants evolve oxygen, which is formed by the decomposition of the carbonic acid absorbed by the leaves from the atmosphere. This is due to the action of the sun's rays and the chlorophyll or green coloring matter of the leaves. When oxygen unites with another element the product is called an oxide. The oxides form a most important series of chemical compounds (see Oxides and the articles on the various chemical elements). The power of supporting combustion is one of the leading features of oxygen and until the discovery of oxygen no well-founded explanation of the facts of combustion was known. Oxygen exists in another form different from that of the ordinary gas; in this form it exhibits many marked peculiarities. See Ozone.

OXYHYDROGEN LIGHT, or **LIME-LIGHT,** a brilliant light produced when a jet of mixed oxygen and hydrogen gas is ignited and directed on a solid piece of lime. It is commonly used in magic lantern exhibitions; and the two gases are kept in separate air-tight bags, or iron cylinders into which the gas is forced under very high pressure. From these receptacles tubes conduct the gases to meet in a common jet.

OXYHYDROGEN MICROSCOPE, one in which the object is illuminated by means of the oxyhydrogen light, and a magnified image of it thrown on a screen.

OYER AND TERMINER, in English law, is a commission directed to two of the judges of the circuit and other gentlemen of the county to which it is issued by virtue of which they have power, as the terms imply, to hear and determine certain specified offenses. The commissions of oyer and terminer are the most comprehensive of the several commissions which constitute the authority of the judges of assize on the circuits.

OYSTER, an edible mollusc, and a near ally of the mussels, etc. It is distinguished by the possession of an inequivalve shell, the one half or valve being larger than the other. The shell may be free, or attached to fixed objects, or may be simply imbedded in the mud. The foot is small and rudimentary, or may be wanting. A single (adductor) muscle for closing the shell is developed. The common oyster is the most familiar member of the genus. The fry or fertilized ova of the oyster are termed "spat," and enormous numbers of ova are produced by each individual from May or June to September—the spawning season. The spat being discharged, each embryo is found to consist of a little body enclosed within a minute but perfectly formed shell, and possessing vibratile filaments or cilia, by which the young animal at first swims freely about, and then attaches itself to some object. In about three years it attains its full growth. The oysters congregate together in their attached state to form large submarine tracts or "oyster-beds," as they are termed. In England the Gravesend beds, and those extending along the coasts of Kent and Essex, are celebrated; in Scotland the beds in the Firth of Forth; in France, those of Rochelle, Rochefort, Ré and Oléron, Cancale, and Granville; in Denmark the Schleswig beds and those at the north point of Jutland; in America the beds of Virginia, of Georgia, and of Long Island. The most common American species is found on the Atlantic coast from the Gulf of St. Lawrence to the Gulf of Mexico. The most favorable bottom and locality for oyster-beds appear to be those situated in parts where the currents are not too strong, and where the sea-bed is shelving, and covered by mud and gravel deposits.

The United States and France are the chief seats of the oyster industry. In the United States the natural oyster beds are still a source of great wealth, while in Europe the native beds have long since been practically destroyed. Large quantities of American oysters are now sent to Europe; and the American are generally larger than the European.

OZONE, a modified—technically an allotropic—form of oxygen. Two volumes of ozone contain three volumes of oxygen condensed to two volumes. Ozone exists in small quantities in pure country air, and is produced in various ways. When an electric machine is set in operation a peculiar smell may be perceived; after a discharge of lightning the same smell is perceptible. The substance which manifests this odor is ozone, and in each of those cases ozone is produced. Ozone acts as a very powerful oxidizer; for this reason it is of great service in the atmosphere, as it so readily oxidizes, and thus renders comparatively unhurtful, animal effluvia and other obnoxious products of animal or vegetable decomposition. Ozone rapidly bleaches indigo, converting it into a white substance called isatin, which contains more oxygen than the indigo itself.

P

P, the sixteenth letter and twelfth consonant in the English alphabet. It is one of the mutes and labials, and represents a sound produced by closely compressing the lips till the breath is collected, and then letting it issue. See B.

PACA, a genus of rodents. The common paca is one of the largest of the

The brown paca.

rodents, being about 2 feet long and about 1 foot high. In form it is thick and clumsy, and the tail is rudimentary. In habits the pacas are chiefly nocturnal and herbivorous. They excavate burrows, run swiftly, and swim and dive with facility. They are found in the eastern portion of South America, from Paraguay to Surinam. The flesh is said to be savory.

PACE, a measure of length, used as a unit for long distances. It is derived from the Latin passus, which was, however, a different measure, the Latin passus being measured from the mark of the heel of one foot to the heel of the same foot when it next touched the ground, thus stretching over two steps; while the English pace is measured from heel to heel in a single step. The Latin pace was somewhat less than 5 feet; the English military pace at the ordinary marching rate is 2½ feet, and at double quick time 3 feet.

PACER, the ambling gait of the pacer, smooth, and lateral, as distinguished from the diagonal gait of the trotter, has been appreciated from the earliest antiquity. The time for a paced mile has gradually been reduced from 2:28, until in 1905 Dan Patch made it in 1:55¼. The gaits of trotting and pacing are practically interchangeable, though it is still true that a fast trotter becomes a faster pacer.

PACHA. See Pasha.

PACIFIC OCEAN (formerly called also the South Sea), that immense expanse of water which extends between the North and South American continents and Asia and Australia. It is the largest of the oceans, exceeding in compass the whole of the four continents taken together, and occupying more than a fourth part of the earth's area and fully one-half of its water surface. On the west it extends to the Indian ocean, and has several more or less distinct seas connected with it—the China sea, Yellow sea, Sea of Japan, Sea of Okhotsk, etc.; on the north it communicates with the Arctic ocean by Behring's straits, on the south it is bounded by the Antarctic ocean, and on the east it joins the Atlantic at Cape Horn. Within this enormous circumference it includes the numerous islands composing the groups of Australasia and Polynesia, and those adjoining America and Asia. The average depth of the Pacific appears to

be greater than that of the Atlantic, and its bed more uniform. Recent soundings between the Friendly islands and New Zealand gave depths of from 5022 up to 5155 fathoms (nearly six miles) not far from Kermadec islands. The greatest depth previously known was 4655 fathoms n.e. of Japan. (See Ocean.) In the Pacific the tides never attain the maximum heights for which some parts of the Atlantic and Indian oceans are celebrated. On all the west coast of America the rise of the tide is usually below 10 feet, and only in the Bay of Panama does it vary from 13 to 15 feet. The trade winds of the Pacific are not so regular in their limits as those of the Atlantic, and this irregularity extends over a much wider region in the case of the southeast trade winds than in the case of the northeast. The cause of this is the greater number of islands in the South Pacific ocean, which, especially in the hot season, disturb the uniformity of atmospheric pressure by local condensations. The northeast trade wind remains the whole year through within the northern hemisphere. The southeast trade wind, on the other hand, advances beyond the equator, both in summer and winter, still preserving its original direction. In the region stretching from New Guinea and the Solomon islands southeastward, there are no regular winds. The zones of the two trade winds are separated by regions of calms and of light winds, the limits of which vary of course with the varying limits of these zones. In the Chinese seas the terrible typhoon occasionally rages, and may occur at any season of the year. As to the chief currents of the Pacific see Currents, Marine. The Portuguese were the first Europeans who entered the Pacific, which they did from the east. Balboa, in 1513, discovered it from the summit of the mountains which traverse the Isthmus of Darien. Magellan sailed across it from east to west in 1520–21. Drake, Tasman, Behring, Anson, Byron, Bougainville, Cook, Vancover, Lapérouse, and others, traversed it in different directions in the 17th and 18th centuries.

PACK-ICE, in the Arctic seas, an immense assemblage of large floating pieces of ice. When the pieces are in contact the pack is said to be closed; when they do not touch, though very near each other, it is said to be open.

PACK-SADDLE, contrivances for the transportation of merchandise or military stores. The pack-saddle in most general use consists of crossed sticks, fastened to saddle-bars of long bearing. In the United States army pack-animals are usually supplied with the aparejo. Ammunition mules are equipped with pack-saddles, specially adapted for the carrying of ammunition boxes, which are placed in such a way as to admit of easy access when the animal is employed in supplying troops in action.

PACKING INDUSTRY, the slaughtering of cattle, sheep, and hogs, and the utilization of their carcasses is an important industry. The best parts of the animals are shipped in refrigerator cars and vessels for consumption as fresh meat to all parts of the world, while other parts are cured, by smoking or salting. The fatty portions are converted into lard and commercial grease. The bones are converted into glue or fertilizers, and the hoofs and horns are used or sold for other purposes.

The animals are killed, hooked by the nose to an endless chain, passed through scalding vats, and then through an automatically adjusted scraper which deprives them of hair and bristles in a few seconds. The animals are then hoisted, head down, upon an inclined rail and disemboweled, beheaded, washed, trimmed and whirled to the chill-rooms at the rate of twenty a minute. In dressing hogs, about 20 per cent is offal and the rest is used as meat, of which only about 10 per cent is sold as fresh meat. The other parts are cured, usually by pickling in brine for seven or eight weeks, and then smoking for twenty-four hours. The most profitable part of the industry is the manufacture of sausage. The meat used is chiefly trimmings, which are obtained from all parts of the establishment. The meat is chopped, mixed with potato flour and water. Certain spices are added, including sage, pepper, salt, ginger, and mustard. The intestines are used for sausage casings.

One of the most important parts of the pork-packing industry is the manufacture of lard. Two grades of lard are made—leaf lard and steam lard. In the leaf lard of commerce, not only the pure leaf, but all sorts of trimmings from the belly of the animal are used. Steam lard is made from scraps taken from all parts of the animal, particularly from the feet, or even the feet themselves and the head bones.

In dressing cattle, the parts intended to be sold as fresh beef are allowed to cool for forty-eight hours and then shipped. In the canning of fresh beef, inferior meat is used, either poorer grade of cattle or poorer cuts. Since 1891 the whole packing industry has been under vigilant government inspection.

PADDLE-FISH, a large fish allied to the sturgeons, so named from the elongated broad snout with which it stirs up the soft muddy bottom in search of food. It often reaches a length of from 5 to 6 feet. The paddle-fishes are exclusively North American in their distribution, being found in the Mississippi, Ohio, and other great rivers of this continent.

PADDLE-WHEEL, in steam-ships one of the wheels (generally two in number, one placed on each side of the vessel) provided with boards or floats on their circumferences, and driven by the engine for the ship's propulsion through the water. On rivers liable to such obstructions as floating trees, etc., a single paddle-wheel placed at the stern of the vessel is employed. The ship is propelled by the reaction of the water upon the floats. Most power is gained when the floats are vertical, passing through the water perpendicular to the direction of greatest pressure. The paddle-wheel is now almost entirely confined to river-boats; in ocean-going steamers it has given place to the screw.

PADEREWSKI (pä'dĕ-rĕf'ske), Ignace Jan., Polish pianist and composer, was born in Poland in 1860. He received his musical education at Warsaw and Berlin, and was made professor of music in the Conservatory of Music in Warsaw at the age of eighteen. At the age of twenty-four he was made professor in the Conservatory of Strasburg. Later he studied in Vienna and began professional tours. For his three-months season in the United States 1895–96 he received $200,000. He has made four American tours—in 1891, 1893, 1896, and 1899. His compositions for the piano have become widely known; they include: Prelude and Minuet, Elegie op. 4, Danses, Polonaises.

PAD'UA, a city in Italy, capital of the province of the same name, 22 miles west of Venice. The university, said to have been founded by the Emperor Frederick II. in 1238, was long renowned as the chief seat of law and medicine in Italy; and very many names famous in learning and art are connected with Padua, such as Galileo, Scaliger, Tasso, Giotto, Lippo Lippi, and Donatello. Pop. 82,283. The province of Padua has an area of 854 sq. miles, and pop. of 443,227.

PADU'CAH, a town in M'Cracken co., Kentucky, on the Ohio, not far from the mouth of the Tennessee. Pop. 21,315.

PÆAN, in Greek, a hymn to Apollo or to other deities, or a song in praise of heroes. A pæan was sung, previous to battle, in honor of Ares (Mars), and after a victory, in praise of Apollo.

PÆ'ONY. See Peony.

PAGANI'NI, Niccolo, a celebrated violinist, born in 1784 at Genoa, died at Nice, 1840. His father, who had some knowledge of music, and discerned the talents of his son, put him at a very early age under the best masters (Costa, Rolla, Paer) to learn music, and particularly the violin. With this instrument his progress was so rapid that at the age of nine he was able to perform in public at Genoa. His first engagement was in 1805, at Lucca, where he found a patroness in Princess Eliza, Bonaparte's sister. In 1813 he left Lucca for Milan, and in 1828 visited Vienna. From this period his fame was world-wide. The wonder which he excited was caused not merely by the charm of his execution and his extraordinary skill, but also by his external appearance, which had something weird and even demoniacal in it. After visiting almost all the great towns of Germany he made a musical tour through France and Great Britain, realizing immense gains. His last years were spent at a villa near Parma.

PAGANS, the worshippers of many gods, the heathen; so called by the Christians because after Christianity had become predominant in the towns the ancient polytheistic faith still lingered in the villages (pagi) and country districts.

PAGE, Thomas Nelson, American novelist, was born in 1853. His first noteworthy literary effort was Marse Chan published in 1884 and incorporated with Meh Lady and other stories in Ole Virginia. Among those of his other works the following are the best known: Two Little Confederates, Red Rock, and Gordon Keith.

PAGING-MACHINE, a machine for printing consecutive numbers on the pages of a book, bank-notes and cheques, railway-tickets, etc. Several machines of this kind have been invented, all of which consist essentially of a number of revolving discs bearing the ten digits in raised figures on their circumference, with various contrivances for making the first disc describe one-tenth of a revolution after every figure is printed, for making the second disc describe one-tenth of a revolution, every time the first makes a complete revolution, and so on, as well as for supplying the figures with ink at each impression. Provision is also made for the printing of duplicate and alternate numbers if this is required.

PAGO'DA, the name given to Hindu and Buddhist temples. The temple proper is generally of pyramidal form, and of a number of stories, of great size

Great Pagoda at Bhuvaneswar, Orissa, India.—Fergusson.

and height, and embellished with extraordinary splendor Connected with it may be various other structures, open courts, etc., the whole forming architecturally a very imposing group. Pagodas are numerous not only in Hindustan but also in Burmah, Siam, and China. The statues in the temple are often of a colossal size.

PAHANG', a state on the east coast of the Malay Peninsula; area, 10,000 sq. miles; pop. 83,419. By the treaty concluded between Great Britain and the Sultan of Pahang in 1888 the control of the foreign relations of that state was conveyed to the government of the Straits Settlements; and Pahang is now practically a dependency of that colony.

PAHLANPUR, or **PALANPUR,** a town in India, presidency of Bombay, province of Gujerat. Pop. of town, 17,799; of agency, 467,691.

PAIN, an uneasy sensation of body, resulting from particular impressions made on the extremities of the nerves transmitted to the brain. Physical pain may be produced by various causes—by injuries to the organs in which the pain is localized; by a peculiar state of the brain and nerves; or by the sympathetic affection of an organ at some distance from that which has been injured. It is often of great service in aiding the physician at arriving at a correct diagnosis of a disease, and still more obviously in frequently being the only intimation which a patient has of the fact of there being a disease which demands a remedy. The degree of pain, however, is rarely in direct proportion to the gravity of a disease, and is often altogether absent when there are other symptoms of a serious malady.

PAINE, Robert Treat, an American patriot, was born in 1731 in Boston, Mass. He was a delegate in 1768 to a convention called by prominent citizens after Governor Bernard had dissolved the legislature for refusing to rescind its circular letter to the other colonies, and in 1770 he managed, in the absence of the attorney-general, the prosecution of Captain Preston and his men for firing upon the citizens on March 5th. In 1773–74 he was a member of the Massachusetts assembly; was one of the representatives of Massachusetts in the continental congress from 1774 to 1778; and was a signer of the declaration of independence. He was one of the founders (1780) of the American Academy of Arts and Sciences. He died in 1814.

PAINE, Thomas, political and deistical writer, born in 1737 at Thetford in Norfolk. In 1774 emigrated to America, with a letter of introduction from Franklin. Paine threw himself heart and soul into the cause of the colonists, and his pamphlet entitled Common Sense, written to recommend the separation of the colonies from Great Britain, and his subsequent periodica called the Crisis, gave him a title to be considered one of the founders of American independence. In 1787 he returned to England, and in answer to Burke's Reflections on the French Revolution wrote his Rights of Man. A prosecution was commenced against him as the author of that work, but while the trial was pending he was chosen member of the national convention for the department of Calais, and, making his escape, set off for France, where his Rights of Man had gained him

great popularity, and arrived there in September, 1792. On the trial of Louis XVI. he voted against the sentence of death, proposed his imprisonment during the war and his banishment afterward. This conduct offended the Jacobins, and toward the close of 1793 he was excluded from the convention, arrested, and committed to prison, where he lay for ten months, escaping the guillotine by an accident. Just before his confinement he had finished the first part of his work against revelation, entitled the Age of Reason; it was published in London and Paris in 1794, by which step he forfeited the countenance of the greater part of his American connections. He remained in France till August, 1802, when he embarked for America, where he spent the remainder of his life, occupied with financial questions and mechanical inventions. He died at New York in 1809.

PAINTER'S COLIC. See Lead-Poisoning.

PAINTING is the art of representing the external facts of and objects in nature by means of color. A study of the art requires a knowledge of form, animate and inanimate; of perspective; and of light and shade. Considered in relation to the subjects treated, painting may be divided into decorative, historical, portrait, genre (scenes of common or domestic life), landscape with seascape, architectural, still life. According to the methods employed in the practice of the art it is termed oil, water-color, fresco, tempera or distemper, and enamel painting, and in mosaics, on glass, porcelain, terra-cotta, and ivory (this last being called minature-painting.) Decorative works, usually in fresco or tempera, but sometimes in oil, are generally executed upon the parts of a building. For the basis of easel pictures, wood-panels prepared with a coating of size and white were used solely up to the 14th century for both oil and tempera, and are still sparingly employed; but canvas covered with a priming of size and white-lead, and tightly nailed over a wooden frame called a "stretcher," is now almost universally adopted for oil-painting. For water-colors paper alone is employed. The tools used by an artist are charcoal, colored crayons, and lead-pencils for outline purposes; colors, a palette for holding the same, a palette-knife for mixing them; brushes for laying them on; and an easel with adjustable heights for holding the canvas. A wooden mannikin, with movable joints, and termed a "lay-figure," is sometimes used on which to arrange costumes and draperies.

The term "oil-colors" is employed to denominate colors ground with oil, and water-colors those wherein gum and glycerine have been employed. Both are ground solid, an oil medium being used in the first case and water in the second to thin out the colors when on the palette. Fresco-painting is executed on wet plaster. Mosaic work is formed by small cubes of colored glass, called tesseræ, fixed in cement; in tempera the colors are mixed with white; in encaustic, wax is the medium employed; and in enamel the colors are fired. Egyptian, Greek, and early Roman paintings were executed in tempera; Byzantine art found its chief expression in mosaics, though tempera panels were executed; and early Christian art up to and partly including the 14th century adopted this last method. The vehicle employed in mixing the colors was a mixture of gum and white of egg, or the expressed juice of fig-tree shoots. The introduction of oil-painting was long attributed to the Van Eycks of Bruges (circa 1380–1441), but painting in oil is known to have

been practiced at a much earlier period, and it is now generally held that the invention of the Van Eycks was the discovery of a drying vehicle with which to mix or thin their colors, in place of the slow-drying oil previously in use. This new vehicle was composed of a thickened linseed-oil mixed with a resinous varnish, and it was its introduction that effected so great a revolution in the art of painting. For an account of special methods of painting see articles Fresco-painting, Mosaic, Encaustic Tiles, Enamel, etc.

PAINTING ON GLASS. See Glass-painting.

PAINTS. See Pigments.

PAISLEY, a municipal and parliamentary burgh of Scotland, in the county of Renfrew. Paisley has been long noted for its manufactures, especially of textile goods. The shawl manufacture, introduced about the beginning of the 19th century, and long a flourishing industry, is not now a staple, but the textile manufacture is still large, though the chief industry is that of sewing cotton, for which Paisley is celebrated all over the world. Among the other manufactures are tapestry, embroidery, tartans, and carpets. Pop. 79,355.

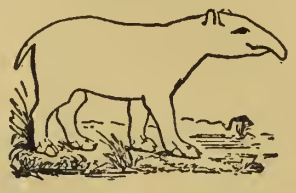
PAL'ADIN, a term originally applied to the Count of the Palace, or Count Palatine, the official who superintended the household of the Carlovingian sovereigns, and then to the companions in arms of Charlemagne, who belonged to his court. Latterly it was used in a more general sense.

PALÆARCTIC REGION, in zoology, one of six divisions of the world based upon their characteristic fauna. It embraces Europe, Northern Asia, and Africa north of the Atlas range.

PALÆOG'RAPHY, is the science by means of which ancient inscriptions, and the writings and figures on ancient monuments, are deciphered and explained; as distinguished from diplomatics, which deals with written documents.

PALÆONTOL'OGY is the science which treats of the living beings, whether animal or vegetable, that have inhabited the globe in the successive periods of its past history. The comparison of the fossil remains of plants and animals, belonging for the most part to extinct species, has given a powerful impulse to the science of comparative anatomy, and through it a truer insight has been obtained into the natural arrangement and subdivision of the classes of animals. But the science which has profited in the highest degree from palæontology is geology. Palæontology, apart from its importance as treating of the past life-history of the earth, assists the geologist in his determination of the chronological succession of the materials composing the earth's crust. As a general result of united geological and palæontological researches, it has been found possible to divide the entire series of stratified deposits into a number of rock-systems or formations, each of which is defined by possessing an assemblage of organic remains which are not associated in any other formation. These systems as a whole are divided into three great divisions, based on the characters of their organic remains, and thus representing three successive life-periods, as follows: Palæozoic, or ancient life epoch, which includes the Laurentian, Cambrian, Silurian, Devonian, Old Red Sandstone, Carboniferous, and Permian rock systems. Mesozoic, or middle life epoch, including the Triassic, Jurassic or Oolitic, and Cretaceous rock systems. Cainozoic, or recent life epoch, which comprises the Eocene, Miocene, Pliocene, and Post-tertiary rock systems. The fossil remains of the first two divisions mostly belong to extinct species. The Cainozoic fossils belong mostly to living species or species only recently extinct. See Geology.

PALÆOTHE'RIUM, an extinct genus of Ungulate or Hoofed Quadrupeds with three toes. These animals resembled tapirs, and varied in size from a sheep



Palæotherium restored.

to a horse. They had twenty-two teeth in each jaw, and, in all probability, a short mobile snout or proboscis. This genus forms the type of the family Palæotheridæ, which occur as fossils in Eocene and Miocene strata.

PALÆOZOIC. See Palæontology.

PALAIS-ROYAL (pâ-lā-rwâ-yâl), a popular resort of the Parisians, originally a royal palace as the name implies. The original palace was built (1629–36) by Richelieu, and by him presented to Louis XIII. It was confiscated by the republicans in 1793, and the Tribunal sat in the palace during the Reign of Terror. At the Restoration it was repurchased by the Duke of Orleans, but in the revolution of 1848 it was again appropriated to the state. In 1871 it was set on fire by the Communists, but has since been restored. The Théâtre Français and several shops now form parts of the buildings of the Palais-Royal.

PALANQUIN, PALANKEEN (pal-an-kēn'), a covered conveyance used in India, China, etc., borne by poles on the

Palanquin.

shoulders of men, and in which a single person is carried from place to place. The palanquin proper is a sort of box about 8 feet long, 4 feet wide, and as much in height, with wooden shutters on the venetian-blind principle. It used to be a very common conveyance in India, especially among the Europeans, but the introduction of railways and the improvement of the roads have almost caused its discontinuance.

PAL'ATE, the name applied to the roof of the mouth. It consists of two portions, the hard palate in front, the soft palate behind. The former is bounded above by the palatal bones, in front and at the sides by the alveolar arches and gums, being lined by mucus membrane; behind it is continuous with the soft palate. It supports the tongue in eating, speaking, and swallowing. The soft palate is a movable fold suspended from the posterior border of the hard palate. It consists of mucous membranes, nerves, and muscles, and forms a sort of partition between the mouth and the hinder nostrils. Its upper border is attached to the posterior margin of the hard palate; its lower border is free. The uvula hangs from the middle of its lower border, and on each side are two curved folds of mucous membrane called the arches or pillars of the soft palate. Between these on either side of the pharynx are the two glandular bodies known as tonsils. The upper surface of the soft palate is convex, the lower surface is concave with a median ridge, the latter pointing to the early or embryo stage of its formation, when it consists of two distinct parts. Non-union of these halves and of those of the hard palate constitutes the deformity known as cleft palate, often associated with hare-lip. Glands are abundant in the soft palate, secreting the mucus which serves to lubricate the throat during the passage of food. The soft palate comes into action in swallowing, and also in speaking, being of great importance in the utterance of certain sounds. The special use of the uvula is not well known. It is often relaxed or enlarged, causing a troublesome cough.

PALAT'INATE, a division of the old German Empire, under the rule of counts-palatine, consisting of two separate portions distinguished as the Upper and Lower Palatinate. The Upper or Bavarian Palatinate was bounded mainly by Bohemia and Bavaria, and its capital was Amberg. The Lower or Rhenish Palatinate lay on both sides of the Rhine, surrounded by Baden, Alsace-Lorraine, etc., its chief towns being Heidelberg and Mannheim. The counts-palatine were in possession of the Palatinate and the districts belonging to it as early as the 11th century, and were long among the most powerful princes of the German Empire. At the peace of Westphalia (1648) the Lower Palatinate was separated from the Upper, Bavaria getting the latter, while the former now became a separate electorate of the empire, and was henceforth generally known as the Palatinate. By the treaties of Paris (1814–15) the Palatinate was split up; Bavaria received the largest part, and the remainder was divided between Hesse-Darmstadt and Prussia. The name Palatinate now belongs to the detached portion of Bavaria on the west of the Rhine, while the Upper Palatine forms

another portion of the monarchy. See Bavaria.

PALATINE. See Palatinate and Count Palatine.

PALATINE HILL. See Rome.

PALE, in heraldry, the first and simplest kind of ordinary. It is bounded by

A pale azure.

two vertical lines at equal distances from the sides of the escutcheon, of which it incloses one-third.

PALEN'CIA, a town of Spain in Leon, capital of a province of same name. Pop. 16,118.—The province of Palencia is fertile and watered by the Carrion and Pisuerga. Area, 3128 sq. miles; pop. 192,473.

PALER'MO, a seaport town, the capital of Sicily, beautifully situated on the north side of the island. The city is ornamented by numerous fountains, and has many public edifices, including a cathedral of the 10th century which contains monuments in porphyry of the Emperor Frederick II. and King Roger the Norman. The manufactures consist chiefly of silks, cottons, oil-cloth, leather, glass, and gloves. The principal exports are sumach, wine and spirits, fruits, sulphur, skins, oil, essences, cream of tartar, liquorice, and manna; imports, colonial produce, woolen, cotton and silk tissues, hardware, earthenware, etc. The fisheries are very productive, and give employment to nearly 40,000 hands. Pop. 310,352.—The province of Palmero contains an area of 1963 sq. miles. Pop. 785,016.

PAL'ESTINE, Antique, or the **HOLY LAND,** a maritime country of Asiatic Turkey, in the southwest of Syria, having on the north the mountains of Lebanon and Anti-Lebanon, east the Arabian Desert, south Arabia, and west the Mediterranean; length, north to south, about 140 miles; breadth, about 80 miles; area, nearly 10,000 sq. miles (or one-third the size of Scotland). The coast has no indentations except the Bay of Acre in the north. The chief feature of the interior, besides its generally irregular character, is the deep valley of the Jordan, a river which intersects the country from north to south, and connects three lakes, the Dead Sea, Lake of Gennesaret, and Lake Merom. The surface is generally mountainous, or consists of a series of plateaux, both on the west and the east of the valley of the Jordan. With the exception of Mount Hermon in the north (9050 feet) few of the heights exceed 3000 feet. The most remarkable are Carmel, on the southwest side of the Bay of Acre; Jebel Tur (Tabor), farther inland; Ebal and Gerizim, about the middle of the country; Zion, Moriah, and the Mount of Olives, in and near Jerusalem. Palestine has comparatively few plains, though in few countries is there such endless variety of valley as to size, shape, color, and fertility. The maritime or coast plains of Sharon and Philistia, the river plain of Jordan, and the plain of Esdraelon in the north, are all that are worthy of mention. The maritime plains are well peopled and cultivated. The Jordan plain is nearly a waste of sand. The plain of Esdraelon or valley of Jezreel is of great fertility. The principal river is the Jordan (which see). This river has a length of 200 miles, including windings, but its direct course is only about 70. Its course from Merom to the Dead Sea is mostly below the sea-level. Most of the so-called rivers of Palestine are merely winter torrents which run dry in summer. Of the few permanent rivers emptying into the Mediterranean, the most important are the Kishon, which drains the plain of Esdraelon; and the Aujeh farther south. The chief tributary of the Jordan is the Zerka or Jabbok. The most remarkable lake is the Dead Sea (which see), 46 miles long, 9 or 10 broad, and about 1292 feet below the Mediterranean. The other lakes are Bahr-el-Huleh (Merom), 5 miles long and 4 miles broad, about 6 feet above the Mediterranean; and Lake Gennesaret or the Sea of Galilee, 682 feet below it, 12½ miles long, 7½ broad. In Palestine the wells and springs are numerous, and are all counted worthy of note. Among the most interesting are the springs of hot water which issue forth on both sides of the Jordan Valley. Of these there are five or six with a temperature varying from 109° to 144° F. As regards geology the chief rock formation of the country on both sides of the Jordan is limestone, full of caves. Sandstone also occurs, with basalt and other volcanic rocks, the latter being especially common on the east side of Jordan. Signs of volcanic action are abundant, and earthquakes are still common. The year may be divided into two seasons, summer and winter. During the former, which lasts from April to November, little or no rain falls; during the latter there is a considerable fall of rain, the annual average at Jerusalem being about 60 inches. In the Jordan valley and along the Mediterranean lowlands the summer heat is apt to be oppressive. During the winter the ground is seldom, if ever, frozen except on the higher elevations. Palestine was once very fertile and were the same attention paid, as formerly, to artificial irrigation, and the construction of reservoirs and water-courses, it might be so again. Among the products, besides the usual cereals, are grapes, figs, olives, oranges, and apricots. The flora of Palestine is rich in flowering plants, including the scarlet anemone, ranunculus, narcissus, crocus, pheasants eye, etc. The country was once well timbered, but it is now, as a whole, bare and desolate, though forests of pine and oak exist on the east of the Jordan. On the west side of the river, however, there are few trees. The most common tree is the oak, including the prickly evergreen oak and two deciduous species. Other trees are the olive, palm, oleander, sycamore walnut, ash, cedar. The wild animals include the leopard, hyæna, bear, wolf, jackal, boar, antelope, gazelle, porcupine, coney, jerboa, etc. The domestic animals of burden are the ass, mule, and camel, the horse being little used. The cattle are not generally very numerous. Sheep and goats are abundant. Among the birds are eagles, vultures, hawks—birds of prey being very numerous—ravens, bee-eaters, hoopoes, storks, and nightingales. Fish abound in the Sea of Galilee and the Jordan. There are many species of reptiles, among them being the chamæleon, land and water tortoise, lizards, and serpents, and even the crocodile.

The name Palestine, from the Hebrew Pelescheth, means the land of the Philistines. It is properly only applicable to the southwest part of the country. The ancient name of the country was Canaan and when thus named, in the time of the patriarchs, it was parcelled out among a number of independent tribes, all probably Semitic. In the time of Moses the district east of the Jordan was taken and divided among the tribes of Reuben and Gad, and the half-tribe of Manasseh; and latterly the whole territory was apportioned among the twelve Jewish tribes. For the subsequent history see the article Jews. In the time of our Saviour Palestine was held by the Romans, and divided into the four provinces of Galilee, Samaria, Judea, and Perea. In 606 Palestine was taken by the Saracens under Omar. The severites exercised toward Christians gave rise to the Crusades, but Mohammedanism prevailed, and the country sank into a degraded state. The sultan of Egypt ruled it till 1517, when it was incorporated with the Turkish Empire.

It is only within a comparatively recent period that the exploration of Palestine has been carried out systematically and with some attempt at thoroughness, though much yet remains to be done. The most valuable results have been those achieved under the direction of the "Palestine Exploration Fund," a society organized in 1865 for the purpose of making an exhaustive exploration and an exact survey of the Holy Land. In 1870 the American Palestine Exploration society was organized, and it was agreed that the English society should confine itself to the western side of the Jordan, and the American society to the eastern. The triangulation of Western Palestine was begun in 1871 and finished in 1877. A large and detailed map of the country has been published and an immense mass of valuable information regarding topography, natural history, etc., accumulated. The present population of the country is estimated at 650,000, the Arab element being probably the prevailing one, and the Arabic language generally in use. The people consist partly of the fellahin or settled cultivators, artisans, etc.; partly of the nomad Bedouin, who live by rearing cattle or by less reputable means. The country exports some grain, olive-oil, oranges, etc. Jaffa and Acre are the chief ports, Jerusalem (connected by the railway with Jaffa) and Nablus the largest towns. See also Jerusalem, Crusades, etc.

PALEY, William, English theological and philosophical writer, was born at Peterborough in 1743, died 1805. His chief works are: The Principles of Moral and Political Philosophy (1785); Horæ

Paulinæ (1790); A View of the Evidences of Christianity (1794); Natural theology or Evidences of the Existence and Attributes of the Deity collected from the Appearance of Nature (1802). As a writer he had little claim to originality but was distinguished by clearness and cogency of reasoning, lucidity of arrangement, and force of illustration. His system of moral philosophy is founded purely on utilitarianism.

PAL'IMSEST, a manuscript prepared by erasure for being written on again, especially a parchment so prepared by washing or scraping. This custom was brought about by the costliness of writing materials, and was practiced both by the Greeks and Romans, and in the monasteries, especially from the 7th to the 13th centuries. That which replaced the ancient manuscripts was nearly always some writing of an ecclesiastical character. The parchments which have been scraped are nearly indecipherable. Those which have been washed have often been revived by chemical processes. Fragments of the Iliad and extensive portions of many Greek and Roman writers have been recovered by these means.

PALISADE, a fence or fortification consisting of a row of strong stakes or posts set firmly in the ground, either perpendicularly or obliquely, for the greater security of a position, and particularly for the closing up of some passage or the protection of any exposed point.

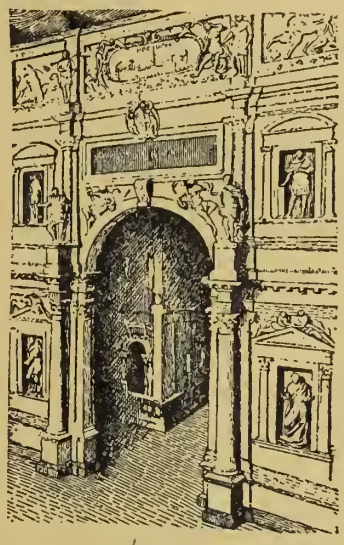
PALISSY, Bernard, a French artist and philosopher, born about 1510. He was apprenticed in a glass-work at Agen, where he learned the art of painting on glass. After sixteen years of unremunerated labor (1538–54), he obtained a pure white enamel, affording a perfect ground for the application of decorative art, and his enamelled pottery and sculptures in clay became recognized as works of art. He suffered persecution as a Huguenot, and was arrested in 1589 and thrown into the Bastille, where he is said to have died in 1590. He left several philosophical works.

PALISSY-WARE, a peculiar kind of French art pottery invented by Bernard Palissy. The surface is covered with a jasper-like white enamel, upon which animals, insects, and plants are represented in their natural forms and colors. Specimens of this ware are much valued and sought after by collectors.

PALLADIAN ARCHITECTURE, a species of Italian architecture founded upon the Roman antique as interpreted by the writings of Vitruvius, but rather upon the secular buildings of the Romans than upon their temples. It is consequently more applicable to palaces and civic buildings than to churches. A characteristic feature of the style is the use of engaged columns in façades, a single range of these often running through the two principal stories. It was introduced into England by Inigo Jones, a follower of the Venetian school of Palladio

PALLA'DIUM, a metal discovered by Wollaston in 1803, and found in small quantity associated with native gold and platinum. It presents a great general resemblance to platinum, but is harder, lighter, and more easily oxidized. It is useful on account of its hardness, lightness, and resistance to tarnish, in the construction of philosophical instruments.

PALLAS, of the minor planets revolving round the sun between Mars and Jupiter, that whose orbit is most



Palladian architecture.—Teatro Olimpico. Vicenza, Italy.

inclined to the ecliptic. It was discovered in 1802 by Olbers at Bremen. It revolves round the sun in 4.61 years; diameter 172 miles.

PALLAS ATHENE, the Greek goddess of wisdom, subsequently identified with the Roman Minerva. See Athena.

PALLISER, Sir William, born in Dublin 1830. He was the inventor of projectiles and guns which bear his name, and was the author of many improvements in fortifications, etc. He was knighted in 1873 and died in 1882.

PALM, the tree. See Palms.

PALMA, an episcopal city of Spain, capital of the Island of Majorca, 130 miles south of Barcelona. Pop. 63,937.

PALMA, La, the most northwesterly of the Canary Islands; area, 224 sq. miles; capital, Santa Cruz de la Palma, the principal port. Pop. 38,822.

PALMA CHRISTI, a name frequently applied to the castor-oil plant.

PALMER, John McAuley, American soldier and political leader, was born at Eagle Creek, Scott co., Ky., in 1817. He removed to Illinois, and was admitted to the bar in 1840. He served in the state senate, and in 1860 was a republican presidential elector. In April, 1861, he was appointed colonel of an Illinois volunteer regiment, served at Island No. 10, Stone river, and Chickamauga, and was promoted major-general of volunteers. He led the fourteenth army corps through the Atlanta campaign, May till September, 1864. From 1870 until 1873 he served as governor of Illinois. In 1890 he was elected United States senator, and in 1896 accepted the nomination for president from the gold democrats. He died in 1900.

PALMER, Ray, American clergyman and hymn-writer, was born at Little Compton, R. I., in 1808. He was called to the pastorate of the Central Congregational church, Bath, Maine, in 1835. In 1866 he relinquished pastoral work and became secretary of the American Congregational Union at New York. He is chiefly remembered as a writer of hymns, one of which—My faith looks up to Thee—exists in twenty different languages. He died in 1887.

PALMERSTON (pä'mėr-stun), Henry John Temple, Viscount, English statesman, was born in Westminster 1784, died 1865. In 1802 he succeeded his father in the title (an Irish one). In 1807 he was returned as member for Newport, I. of Wight, and became junior lord of the admiralty in the Duke of Portland's administration. In 1809 he became secretary of war, and two years later he was elected member for Cambridge university. He was a supporter of Catholic emancipation, and retired from office in the Wellington ministry in 1828 with others of the Canning party. He had already made a reputation for his command of foreign policy, and in 1830 he was made foreign secretary in the whig ministry of Earl Grey. From this time he continued to be a member and leader of the liberal party. In 1831 he was returned for Bletchingley, and after the reform bill (1832) for South Hants. He retired from office in December, 1834, but in April, 1835, he resumed his former appointment under Lord Melbourne. He continued in office as foreign secretary until 1841. It was during this period that he gained his great reputation for vigilance and energy in the conduct of foreign affairs. In 1845 he supported the repeal of the

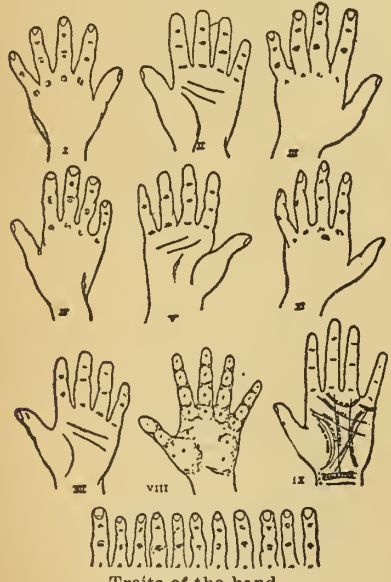
Viscount Palmerston.

corn-laws, and in 1846 he was foreign secretary in the Russell ministry. Several causes of dissatisfaction, the chief being his recognition of Louis Napoleon without consulting his colleagues, led to Palmerston's resignation in December, 1851. In Februrary, 1852, he became home secretary in the coalition ministry of Lord Aberdeen. On the resignation of this ministry he became prime minister, which position he held, with a brief interruption, for the remainder of his life.

PALMET'TO PALM, a common name of several palms, especially of the cabbage-palm, which grows in the West

Indies and in the southern states of North America. It attains the height of 40 or 50 feet, and is crowned with a tuft of large leaves. It produces useful timber, and the leaves are made into hats, mats, etc.

PALMISTRY, a pseudo-science, the professors of which claim that the mental traits of an individual are indicated by the shape, markings, and other characters of the hand. The more ardent advocates of palmistry hold that the future of the individual can be "read" in this way. Palmistry is a very ancient science and may have some real basis of fact under it, although the respectability attaching to it thus far has been very dubious. Palmistry, like astrology, has a very complex system of ideas and a difficult nomenclature into which it is impossible more than barely to enter here. The drawing shows different types of hand, the types, in the numbered order being the "bilious" hand, indicating brute instinct rather than reason; the "square" or stubborn hand; the "spatulate" or energetic hand; the philosophic hand; the artistic, the idealistic, and the diplomatic hand. Figure 9 shows the principal lines of the palm. The row of fingers from No. 1 to No. 11 may



Traits of the hand.

be described as follows: Large fingers, indicating a vulgar and cruel disposition; small, thin fingers, a keen, active mind; long, thin fingers, love of detail; fat fingers, sensuality; smooth fingers, artistic ability; knotty fingers, truthfulness and good business ability; pointed fingers, enthusiasm; square fingers, strong-mindedness; spatulate fingers, positiveness; mixed fingers, adaptability; obtuse fingers, coarseness.

PALMIT'IC ACID, a fatty acid occurring in many fats, whether of the animal or vegetable kingdom, such as palm-oil, butter, tallow, lard, etc., and existing partly in a free state but generally in combination with glycerin (as a glyceride).

PALM-OIL, a fatty substance obtained from several species of palms, but chiefly from the fruit of the oil-palm, a native of the west coast of Africa. This tree grows to the height of 80 feet, bears a tuft of large pinnate leaves, and has a thick stem covered with the stumps of the stalks of dead leaves. The fruits, which are borne in dense clusters, are about 1½ inches long by 1 inch in diameter, and the oil is ob-

Palm-oil tree.

tained from their fleshy covering. In cold countries it acquires the consistence of butter, and is of an orange-yellow color. It is employed in the manufacture of soap and candles, for lubricating machinery. By the natives of the Gold Coast this oil is used as butter; and when eaten fresh is a wholesome and delicate article of diet. It is called also Palm-butter.

PALMS, the Palmaceæ, a nat. order of arborescent endogens, chiefly inhabiting the tropics, distinguished by their fleshy, colorless, six-parted flowers, inclosed within spathes; their minute embryo lying in the midst of albumen, and remote from the hilum; and their rigid, plaited or pinnated leaves, sometimes called fronds. The palms are among the most interesting plants in the vegetable kingdom, from their beauty, variety, and associations, as well as from their great value to mankind. While some have trunks as slender as the reed, or longer than the longest cable (500 feet), others have stems 3 and even 5 feet thick; while some are of low growth, others exhibit a stem towering from 160 to 190 feet high, as wax-palm of South America. About 600 species are known, but it is probable that many are still undescribed. Wine, oil, wax, flour, sugar, sago, etc., are the produce of palms; to which may be added thread, utensils, weapons, and materials for building houses, boats, etc. There is scarcely a single species in which some useful property is not found. The cocoanut, the date, and others are valued for their fruit; the cabbage-palm, for its edible terminal buds; the fan-palm, and many more, are valued for their foliage, whose hardness and durability render it an excellent material for thatching; the sweet juice of the Palmyra and others, when fermented, yields wine; the center of the sago-palm abounds in nutritive starch; the trunk of the wax-palm exudes a valuable wax; oil is expressed in abundance from the oil-palm; many of the species contain so hard a kind of fibrous matter that it is used instead of needles, or so tough that it is manufactured into cordage; and, finally, their trunks are in some cases valued for their strength, and used as timber, or for their elasticity or flexibility.

PALM SUNDAY, the last Sunday before Easter, on which Christ's entry into Jerusalem, when palm branches were strewed before him, is celebrated. It is still celebrated with much solemnity by the Roman Catholics, and branches are strewed in the churches.

PALMY'RA PALM, the common Indian palm, a tree ranging from the northeastern parts of Arabia through India to the Bay of Bengal. In India and other parts of Asia it forms the chief support of 6,000,000 or 7,000,000 of population. Its fruit is a valuable food, its timber is excellent, and it furnishes thatch, cordage, and material for hats, fans, umbrellas, etc. It produces sugar and arrack, and its leaves are used for writing-tablets. The young shoots are boiled and eaten, the seeds are edible, and the fruit yields a useful oil. A full-grown palmyra is

Palmyra palm.

from 60 to 70 feet high, and its leaves are very large.

PALPITATION consists of repeated attacks of violent and spasmodic action of the heart. When palpitation arises from organic lesion of the heart it is called symptomatic; when it is caused by other disorders disturbing the heart's action it is called functional. Disor-

ders which may cause palpitation include nervous affections, anæmia, chlorosis, protracted mental emotion, excessive use of stimulants, etc.

PALSY, paralysis, especially a local or less serious form of it. See Paralysis.

PAMPAS, a name given to the vast treeless plains of South America in the Argentine Republic, Paraguay, and Uruguay. The pampas are generally covered with grass and other herbage, and in many parts with gigantic thistles, but with the heat of summer the vegetation is much burned up. Shallow lakes or swamps occur in some parts, and parts have the character of a salt steppe. The pampas are roamed over by various tribes of Indians, as well as by herds of wild horses and cattle. In many parts there are now cattle ranches, and large flocks of sheep are also reared.

PAMPAS-GRASS, a grass which grows in the pampas in the southern parts of South America. It has panicles of silvery flowers on stalks more than 10 feet high, and its leaves are from 6 to 8 feet long. The male and female flowers are on separate stalks.

PAN, a rural divinity of ancient Greece, the god of flocks and herds, represented as old, with two horns, pointed ears, a goat's beard, goat's tail and goat's feet. The worship of Pan was well established particularly in Arcadia. Pan invented the syrinx or pandean pipes. From him comes the expression panic fear, because he was believed to cause sudden and often inexplicable terror.

PANAMA, a town of the Republic of Colombia, capital of the department of the same name, on the Gulf of Panama and on the Pacific coast of the Isthmus of Panama. The city lies on a tongue of land, across which its streets stretch from sea to sea. The harbor is shallow, but affords secure anchorage. Panama is chiefly important as the terminus of the interoceanic railway and also of the Panama canal. The railway, which has been in operation since 1855, runs across the isthmus from Panama to Colon or Aspinwall on the Atlantic, and accommodates a large traffic. Pop. 25,000. The department occupies the Isthmus of Panama. Agriculture and cattle-breeding are the leading industries, but the climate is generally unhealthful. The prosperity of the department depends largely upon its favorable geographical position, which facilitates transit from the Atlantic to the Pacific. Area, 31,890 square miles. Pop. 285,000.

PANAMA CANAL, a canal in process of construction across the Isthmus of Panama to connect the Atlantic and Pacific oceans. The first step to build this canal was the concession to Lieut. Lucien N. B. Wyse given by the government of Colombia, granting to him and his associates the exclusive privilege for 99 years to use the territory of the country for this purpose. Wyse drew Ferdinand de Lesseps into his project and a company was organized in France with de Lesseps as president. Work was begun in 1881 and by 1882 $6,500,000 had been sunk in the work. The disruption of the plan and the Paris scandals arising out of it are well known. The receivers of the company organized a new concern and in 1899 the United States government appeared in the enterprise. Negotiations begun at that time ended in 1903 with the acquisition by the United States of the company's rights and property for $40,000,000.

In 1905 a committee of engineers appointed by President Roosevelt recommended that a sea-level canal be built but on recommendation of the president a lock canal was authorized, beginning in the Bay of Limon, a mile northwest of the city of Colon on the Atlantic side, with a channel 500 feet in width and 41 feet in depth at mean tide, running due south to the shore line of Limon bay, at the mouth of the Mindi river. This distance is 4½ miles. Then the canal passes through low and swampy ground in a southerly direction three miles to the town of Gatun, the width for this stretch being 500 feet and the depth 45 feet. At Gatun there is a space between the hills of over 7,000 feet, through which the waters of the Chagres river and its tributaries flow to the sea. This space is buttressed on either side with rocks and hills, and about midway in this space there is a mountain of rock and earth, in which it is proposed to excavate a diversion channel through which the Chagres river will flow during the construction of the earth dam. The plan is to construct this dam across the entire space at a height of 135 feet above sea level and create a lake. Vessels are to be raised to the level of the lake, to be known as Lake Gatun, by three duplicate locks ranging in a flight of steps, each lock being 900 feet interior length, 110 feet wide, 40 feet deep over the miter sills, with a lift in each lock of 28 2-3 feet. These six locks, constructed of a mass of masonry and concrete, will be buried in Gatun hill and founded on rock throughout. Lake Gatun, when created by the construction of this dam, will be 171 square miles in area and will form the summit level of the canal, which will be 85 feet above sea level. The total length of the lake will be 30 miles, of which 23 miles will be navigated by ships crossing the isthmus. Its depth will be about 75 feet in the immediate vicinity of the dam, this being maintained with little reduction to Bohio (a distance of about 10 miles), and thence reducing gradually toward Obispo, where the depth of 45 feet will be obtained with but little excavation, the bed of the river being about 45 feet below the surface of the future lake.

For 15.69 miles above the Gatun locks the deep portion of the lake will have generally a width exceeding half a mile and only a small amount of excavation will be required to provide a navigable channel no where less than 1,000 feet wide at the bottom and 45 feet deep. Farther up the lake as the amount of excavation required to obtain a depth of 45 feet increases, the minimum width of the channal will be decreased, first to 800 feet for a distance of 3.86 miles from San Pablo to Juan Grande, then to 500 feet for 3.73 miles to Obispo, and to 300 feet for 1.55 miles from Obispo to Las Cascades, where the channel will be further narrowed to 200 feet through the heaviest portion of the great central mass known as Culebra.

For a distance of 4.7 miles through the deep portion of the Culebra cut the channel is to have a bottom width of 200 feet and to have nearly vertical sides below the water line and then will become 300 feet wide for 1.88 miles to the Pedro Miguel locks, where the summit level will end. The duplicate locks at Pedro Miguel will have one lift of 31 feet. Passing the locks the channel will be 500 feet wide for 1.64 miles, then increasing to 1,000 feet or more for the further distance of 3.38 miles to the Sosa locks on the shore of Panama bay. This broad navigation will be in an artificial lake created by three dams, to be subsequently described. There are to be duplicate flights of locks on the west side of Soca hill near La Boca with two lifts of about 31 feet each from ordinary low tide to the level of Lake Sosa. From the Sosa lock to the 7-fathom curve in Panama bay a distance of four miles, the channel is to be 300 feet wide at the bottom and 45 feet deep below mean tide.

The waterway may be summarized with reference to the channel widths as follows:

Width	Length, miles.	Per cent of route.
1,000 feet	19.08	38.4
800 feet	3.86	7.8
500 feet	12.29	24.7
300 feet	7.21	14.5
200 feet	4.70	9.4
Locks and approaches	2.58	5.2
Total	49.72	100.0

The estimated cost of the canal is $150,000,000.

PANAMA, Isthmus of, formerly called the Isthmus of Darien, has a breadth of from 30 to 70 miles, connects North with South America, and separates the Pacific from the Atlantic. The coast is rocky and lofty along the Carribean sea, but low and swampy along the Pacific.

PANAMA HATS, hats made from the immature unexpanded leaves of the stemless screw-pine, a native of Central America and Colombia. After special treatment to remove the soft parts of the leaf, the fibre is soaked to render it pliable, and the weaving is done under water. The hats most valued are those made from single leaves.

PAN-AMERICAN CONGRESS, owing to the efforts of James G. Blaine, delegates from the republics of Mexico and the Central and South American states assembled at Washington, Oct. 2, 1889, for the purpose of discussing the formation of an American Customs Union, under which the trade of American nations with each other might be maintained. The congress continued without final adjournment for five months, and voted to recommend the establishment of regular communications between the ports of the several American states, from trade and customs regulations, weights and measures, patent, copyright, and trade mark laws, a common, legal-tender silver coin, and a plain arbitration of all questions and disputes.

The congress adjourned April 19, 1890. In 1900 the United States government invited all the American republics to meet in a similar congress in October, 1901. An invitation to meet in the City of Mexico was accepted, and the congress was held in October, 1902.

PAN-AMERICAN EXPOSITION, an exposition held in Buffalo, N. Y., from May 1, to November 2, 1901. Its purpose was to illustrate the progress of the countries in the Western Hemisphere during the nineteenth century. A site in the northern part of Buffalo covering an area of 350 acres and within three miles of the business center of the city, was chosen. The color treatment gained for the exposition the name of the Rainbow City, or the Tinted City. The Triumphal Causeway was perhaps the most ornate feature. It represented the apotheosis of the United States, an allegorization of national pride, while the Electric Tower at the other end symbolized the great waters, suggesting that the importance, growth, and prosperity of Buffalo were due chiefly to the Great Lake system and waterways on which it was located. The total attendance was given as 8,179,674. On September 6th President William McKinley was shot down by an assassin while holding a public reception in the Temple of Music, and he died eight days later at the house of John J. Milburn, the president of the exposition.

PANAY, an island of the Philippines, between Mindoro and Negros. It is of triangular form, about 100 miles broad and 100 miles long. It is mountainous but very fertile, and the inhabitants have made considerable progress in civilization. Capital Iloilo. Pop. 735,000.

PANCAKE, a thin cake of batter fried or baked in a pan. Pancakes are regarded as specially the dish to be eaten on Shrove Tuesday.

PAN'CREAS, the sweet-bread of animals; one of the viscera of the abdomen. In man it lies behind the stomach in front of the first and second lumbar vertegræ. The pancreas is an oblong gland about 8 inches long, 1½ inch broad, and from ½ to 1 inch thick. Its right extremity, called the head, lies in a bend of the duodenum. The tail or left extremity extends to the spleen. The structure of the pancreas is similar to that of the salivary glands. It is composed of lobules throughout. The secretion of this gland is conveyed to the intestines by the pancreatic duct. This duct runs from right to left, and is of the size of a quill at its intestinal end. The pancreatic juice is a clear, ropy fluid. The functions of the pancreatic juice in digestion are devoted to the conversion of starchy elements into sugar and to the assimilation of fatty matters. It also acts upon albuminoid matters.

PANDA, or **Wah,** an animal of the bear family found in the woody parts of the mountains of Northern India, about equal to a large cat in size. It is chestnut-brown in color, and dwells chiefly in trees, preying on birds, small quadrupeds, and large insects.

PANDI'ON. See Osprey.

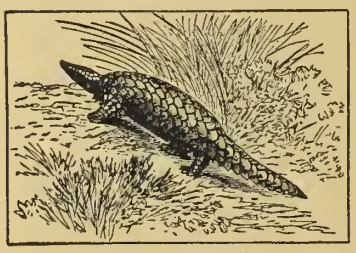
PANDIT, or **PUNDIT,** a learned Brahman; one versed in the Sanskrit language, and in the sciences, laws, and religion of the Hindus.

PANDO'RA, in Greek mythology, the first woman on earth, sent by Zeus to mankind in vengeance for Prometheus's theft of heavenly fire. Each of the gods gave her some gift fatal to man. Ac-

Panda.

cording to later accounts the gods gave her a box full of blessings for mankind, but on her opening the box they all flew away, except hope. Epimetheus, brother of Prometheus, married her.

PAN'GOLIN, the name applied to the Scaly Ant-eaters. They occur in Southern Asia and Africa; have the body invested by a covering of imbricated scales of horny material; vary from 3 to 4 feet in length, and defend themselves by assuming the form of a ball. The tail is long, and the feet are provided with strong curved claws, which



Four-toed pangolin.

assist the animals in burrowing. The jaws are destitute of teeth, and the tongue is of great length. The food consists of insects. The four-toed pangolin inhabits West Africa.

PANORA'MA, a painting in which all the objects that can be seen naturally from one point are represented on the concave side of a whole or half cylindrical wall, the point of view being the axis of the cylinder. A painting of this kind when well mounted produces a complete illusion, and no other method is so well calculated to give an exact idea of an actual view.

PANSY. See Violet.

PAN'TAGRAPH. See Pantograph.

PAN'THEISM, in philosophy, the doctrine of the substantial identity of God and the universe, a doctrine that stands midway between atheism and dogmatic theism. The origin of the idea of a God with the theist and the pantheist is the same. It is by reasoning upon ourselves and the surrounding objects of which we are cognizant that we come to infer the existence of some superior being upon whom they all depend, from whom they proceed, or in whom they subsist. Pantheism assumes the identity of cause and effect. Matter, not less than mind, is with it the necessary emanation of the Deity. The unity of the universe is a unity which embraces all existing variety, a unity in which all contradictions and all existing and inexplicable congruities are combined. Pantheism has been the foundation of nearly all the chief forms of religion which have existed in the world. It was represented in the East by the Sankhya of Kapila, a celebrated system of Indian philosophy. The Persian, Greek, and Egyptian religious systems were also pantheistic. Spinoza is the most representative pantheist of modern times. A twofold division of pantheism has been proposed: 1. That which loses the world in God, one only being in whose modifications are the individual phenomena. 2. That which loses God in the world and totally denies the substantiality of God.

PAN'THEON (pan-thē'on), a celebrated temple at Rome, built in 27 B.C. by Marcus Agrippa. It is a large edifice of brick, built in circular form, with a portico of lofty columns. It has the finest dome in the world (142½ feet internal diameter, 143 feet internal height), and its portico is almost equally celebrated. It is now a church, and is known as Santa Maria Rotonda. Raffael and other famous men are buried within its walls. The Pantheon in Paris, for some the time church of St. Geneviève, is a noble edifice with a lofty dome, devoted to the interment of illustrious men.

PANTHER, one of the Felidæ or cat tribe, of a yellow color, diversified with roundish black spots, a native of Asia and Africa. The panther is now sup-

Panther.

posed to be identical with, or a mere variety of the leopard. The name panther (in vulgar language painter) is given to the puma in America.

PAN'TOGRAPH, also called Pantagraph and Pentagraph, an instrument consisting of four limbs joined together by movable joints, and so constructed that by means of it maps and plans may be copied mechanically either on the scale on which they are drawn or on an enlarged or reduced scale. It is made in a variety of forms.

PAN'TOMIME, properly a theatrical representation without words, consisting of gestures, generally accompanied by music and dancing. The modern pantomime is a spectacular play of a burlesque character, founded on some

popular fable, and interspersed with singing and dancing, followed by a harlequinade, the chief characters in which are the harlequin, pantaloon, columbine, and clown, which may be traced back to the Italian pantomime, although their present development is almost entirely modern.

PAPACY. See Popes.

PAPAL STATES, the name given to that portion of Central Italy of which the pope was sovereign by virtue of his position. The territory extended irregularly from the Adriatic to the Mediterranean, and latterly comprised an area of 15,289 sq. miles with 3,126,000 inhabitants. Rome was the capital. The foundation of the Papal States was laid in 754, when Pepin le Bref presented the exarchate of Ravenna to Stephen II., bishop of Rome. Benevento was added in 1053, and in 1102 Matilda of Tuscany left Parma, Modena, and Tuscany to the pope. In 1201 the Papal States were formally constituted an independent monarchy. Subsequently various territories were added to or subtracted from the pope's possessions, which were incorporated with France by Napoleon in 1809, but restored to the pope in 1814. A revolution broke out in Rome in 1848, and the pope fled to Gaeta, but he was reinstated by French troops, and Rome was garrisoned by French soldiers until 1870. In the meantime one state after another threw off its allegiance to the pope and joined the kingdom of Italy, and when the French left Rome in August, 1870, King Victor Emanuel took possession of the city, declared it the capital of Italy, and thus abolished the temporal power of the pope.

PAPAW', a tree of South America, now widely cultivated in tropical countries. It grows to the height of 18 or 20 feet, with a soft herbaceous stem, naked nearly to the top, where the

Papaw.

leaves issue on every side on long footstalks. Between the leaves grow the flower and the fruit, which is of the size of a melon. The juice of the tree is acrid and milky, but the fruit when boiled is eaten with meat, like other vegetables. The juice of the unripe fruit is a powerful vermifuge; the powder of the seed even answers the same purpose. The juice of the tree or its fruit, or an infusion of it, has the singular property of rendering the toughest meat tender, and this is even said to be effected by hanging the meat among the branches. The papaw of North America produces a sweet edible fruit.

PAPER, a thin and flexible substance, manufactured principally of vegetable fibre, used for writing and printing on, and for various other purposes. Egypt, China, and Japan are the countries in which the earliest manufacture of paper is known to have been carried on. The Egyptian paper was made from the papyrus (whence the word paper), but this was different from paper properly so called. (See Papyrus.) According to the Chinese the fabrication of paper from cotton and other vegetable fibres was invented by them in the 2d century B.C. From the East it passed to the West, and it was introduced into Europe by the Arabs. Spain is said to have been the first country in Europe in which paper from cotton was made, probably in the 11th century; and at a later period the manufacture was carried on in Italy, France, and Germany. It cannot now be ascertained at what time linen rags were first brought into use for making paper; but remnants of Spanish paper of the 12th century appear to indicate that attempts were made as early as that time to add linen rags to the cotton ones.

Paper is made either by the hand or by machinery. When it is made by the hand the pulp is placed in a stone vat, in which revolves an agitator, which keeps the fibrous particles equally diffused throughout the mass; and the workman is provided with a mould, which is a square frame with a fine wire bottom, resembling a sieve, of the size of the intended sheet. These moulds are sometimes made with the wires lying all one way, except a few which are placed at intervals crosswise to bind the others together, and sometimes with the wires crossing each other as in a woven fabric. Paper made with moulds of the former kind is said to be laid, and that made with those of the latter kind wove. The so-called water-mark on paper is made by a design woven in wire in the mould. Above the mould the workman places a light frame called a deckle, which limits the size of the sheet. He then dips the mould and deckle into the pulp, a portion of which he lifts up horizontally between the two, gently shaking the mould from side to side, to distribute the fibers equally and make them cohere more firmly, the water, of course, draining out through the wire meshes. The sheets thus formed are subjected to pressure, first between felts, and afterward alone. They are then sized, pressed once more, and hung up separately on lines in a room to dry. The freedom with which they are allowed to contract under this method of drying gives to hand-made paper its superior firmness and compactness. After drying they are ready for making up into quires and reams, unless they are to be glazed, which is done by submitting the sheets to a very high pressure between plates of zinc or copper.

In paper-making by machinery, a process patented in France in the end of 18th century, the pulp is placed in wooden or iron vessels at one end of the machine, and is kept constantly agitated by a revolving spindle with arms attached to it. From these the pulp passes to the pulp-regulator, by which the supply of pulp to the machine is kept constant, thence through sand-catchers and strainers till it reaches the part of the machine which corresponds to the hand-mould. This consists of an endless web of brass wire-cloth, which constantly moves forward above a series of revolving rollers, while a vibratory motion from side to side is also given to it, which has the same object as shaking the mould in making by the hand. Meanwhile its edges are kept even by what are called deckle or boundary straps of vulcanized india-rubber. At the end of the wire-cloth the pulp comes to the dandy-roll, which impresses it with any mark that is desired. The fabric is now received by the felts, also, like the wire part of the machine, an endless web, the remaining water being pressed out in this part of the machine by four or five consecutive rollers. If intended for a printing-paper, or any other kind that requires no special sizing, it is dried by being passed round a succession of large hot cylinders, with intermediate smoothing rolls. It is then rendered glossy on the surface by passing between polished cast-iron rollers called calenders, and is finally wound on a reel at the end of the machine, or submitted to the action of the cutting machinery, by which it is cut up into sheets of the desired size. If the paper is to be sized, the web, after leaving the machine is passed through the sizing-tub, and is then led round a series of large skeleton drums (sometimes as many as forty) with revolving fans in the inside, by the action of which it is dried. If the paper were dried by hot cylinders after the sizing, there would be a loss of strength in consequence of the drying being too rapid. After being dried the paper is glazed by the glazing-rollers, and then cut up. In some cases the sizing is done after the paper has been cut into sheets, these being then hung up to dry on lines, like hand-made paper, acquiring in the process something of the same hardness and strength. The total length of a paper-machine, from the beginning of the wire-cloth to the cutters, is frequently more than 100 feet.

Blotting and filtering paper are both made in the same way as ordinary paper except that the sizing is omitted. Copying paper is made by smearing writing paper with a composition of lard and black-lead, which, after being left alone for a day or so, is scraped smooth and wiped with a soft cloth. Incombustible paper has been made from asbestos, but since fire removes the ink from a book printed on this material, the invention is of no utility, even though the paper itself be indestructible. Indelible cheque paper has been patented on several occasions. In one kind of it the paper is treated with an insoluble ferrocyanide and an insoluble salt of manganese, and is sized with acetate of alumina instead of alum. Parchment paper or vegetable parchment is made from ordinary unsized paper by treatment with sulphuric acid or oil of vitriol and ammonia. The so-called rice paper

is not an artificial paper, but a vegetable membrane imported from China, and obtained apparently from the pith of a plant. Tissue paper is a very thin paper of a silky softness used to protect engravings in books and for various other purposes. Tracing paper is made from tissue paper by soaking it with Canada balsam and oil of turpentine or nut-oil and turpentine.

In recent times the uses of paper have greatly multiplied. Besides being largely employed for making collars, cuffs, and other articles of dress, it is sometimes used for making huts in the backwoods of America; for making boats, pipes, and tanks for water; cuirasses to resist musket-bullets, wheels for railway-carriages, and even bells and cannons. Paper wheels have been used for Pullman cars, and have worn out one set of tires. Cannons made of paper have actually been tried with success. In the production of paper England, America, Germany, and France take the lead.

PAPER-HANGINGS, ornamental papers often pasted on the walls of the rooms in dwelling-houses. The staining of papers for this purpose is said to be a Chinese invention, and was introduced into France at the beginning of the 17th century. It is now common everywhere, but more especially in France, England, and the United States. Most of the processes in paper-staining are now usually done by machinery; but there is still much hand-work in the finer qualities, especially those produced in France. The first operation is that of grounding, which consists in covering the surface with some dull color, the tint of which varies. Papers with a glazed ground are usually glazed immediately after receiving the ground tint. The designs on the surface of paper-hangings are applied by hand processes and machines exactly similar to those employed in calico-printing.

PAPER MONEY. See Currency.

PAPER-MULBERRY. See Mulberry.

PAPER-NAUTILUS. See Argonaut.

PAPIER MACHE (pāp-yā mă-shā), a substance made of cuttings of white or brown paper boiled in water, and beaten in a mortar till they are reduced into a kind of paste, and then boiled with a solution of gum Arabic or of size to give tenacity to the paste. Sulphate of iron, quicklime, and glue or white of egg, are sometimes added to enable the material to resist the action of water, and borax and phosphate of soda to render it to a great extent fire-proof. It is used for making all sorts of useful and ornamental articles that can be formed in moulds. Another variety of papier mâché is made by pasting or gluing sheets of paper together, and pressing them when soft into the form which it is desired to give them.

PAPILLÆ, the name applied in physiology to small or minute processes protruding from the surface of the skin, or of membranes generally, and which may possess either a secretory or other function. The human skin exhibits numerous papillæ, with divided or single extremities, and through which the sense of touch is chiefly exercised. The papillæ of the tongue are important in connection with the sense of taste. See Skin and Tongue.

PAPPENHEIM, Gottfried Heinrich, Count of, imperial general in the Thirty Years' war, born in 1594 at Pappenheim, in Bavaria. In 1626 he conquered with the assistance of the Bavarians, 40,000 peasants in Upper Austria, and in 1630 joined Tilly, who ascribed the loss of the battle of Leipzig in 1631 to his impetuosity. He appeared on the field of Lützen on the side of Wallenstein, but was mortally wounded, and died the day after the battle, 1632.

PAPY'RUS, an aquatic plant. It has acquired celebrity from furnishing the paper of the ancient Egyptians. The root is very large, hard, and, creeping; the stem is several inches thick, naked, except at the base, 8 to 15 or more feet

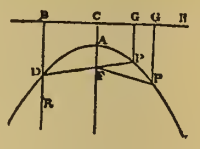
Egyptian papyrus.

high, triangular above, and terminated by a compound, wide-spreading, and beautifull umbel, which is surrounded with an involucre composed of eight large sword-shaped leaves. The little scaly spikelets of inconspicuous flowers are placed at the extremity of the rays of this umbel. Formerly it was extensively cultivated in Lower Egypt, but is now rare there. It is abundant in the equatorial regions of Africa in many places, and is found also in Western Africa and in Southern Italy. The inhabitants of some countries where it grows manufacture it into various articles, including sail-cloth, cordage, and even wearing apparel and boats. Among the ancient Egyptians its uses were equally numerous, but it is best known as furnishing a sort of paper. This consisted of thin strips carefully separated from the stem longitudinally, laid side by side, and then covered transversely by shorter strips, the whole being caused to adhere together by the use of water and probably some gummy matter. A sheet of this kind formed really a sort of mat. In extensive writings a number of these sheets were united into one long roll, the writing materials being a reed pen and ink made of animal charcoal and oil. Thousands of these papyri or papyrus rolls still exist (many of them were found in the ruins of Herculaneum), but their contents, so far as deciphered, with a few exceptions, have only been of moderate value.

PARA, or BELEM, a city and seaport in Brazil, the capital of the state of Pará. The principal buildings are the governor's palace, the cathedral, and the churches of Santa Anna and Sao Joao Baptista. It is the seat of the legislative assembly of the state. The principal exports are caoutchouc, cacao, Brazil-nuts, copaiba, rice, piassava, sarsaparilla, annotto, cotton, etc. Pop. 50,064.

—The state of Pará, the most northerly in Brazil, comprises an area of 443,790 sq. miles on both sides of the lower Amazon, and consists chiefly of vast alluvial plains connected with this river and its tributaries. Pop. 407,350.

PARAB'OLA, one of the curves known as conic sections. If a right cone is cut by a plane parallel to a slant side, the



Parabola.

section is a parabola. It may also be defined as the curve traced out by a point which moves in such a way that its distance from a fixed point, called the "focus," is always equal to its perpendicular distance from a fixed straight line, called the "directrix." In the figure b h is the directrix and f the focus, while p is a point that moves so that the perpendicular gp is always equal to the line p f; the curve p a d described by a point so moving is a parabola. The line f a c through the focus is the axis or principal diameter; any line parallel to it as b d r is a diameter. The path of a projectile in vacuo, when not a vertical straight line, is parabolic.

PARACEL'SUS, or PHILIPPUS AUREOLUS THEOPHRASTUS BOMBASTUS VON HOHENHEIM, empiric and alchemist, born at Einsiedeln, in the canton of Schwyz, in Switzerland, in 1493. Dissatisfied with the means of acquiring knowledge in his native country, he traveled over the greater part of Europe, everywhere seeking to add to his knowledge. In the course of his travels he became acquainted with remedies not in common use among physicians (probably preparations of mercury), by means of which he performed extraordinary cures, and obtained great reputation. He died at the hospital of St. Sebastian at Salzburg in 1541. For a long time he was regarded as little better than a charlatan, but he enriched science, particularly chemistry and medicine, with some valuable discoveries, and, indeed, is sometimes looked upon as the founder of modern therapeutics.

PARACHUTE (pa'ra-shöt), an apparatus of an umbrella shape and construction, usually about 20 or 30 feet in diameter, attached to balloons, by means of which the aeronaut may descend slowly from a great height. It is shut when carried up, and expands of itself when the aeronaut begins to descend; but it is not altogether to be depended on, and accidents in connection with its use have been frequent. The earliest mention of a machine of this kind is in a MS. describing experiments made with one in 1617. In 1783 the French physician Lenormand made several further experiments at Montpellier; and shortly after the machine

became well known through the descents of Blanchard in Paris and London. See Aeronautics.

PARADISE, the garden of Eden. The word is originally Persian, and signifies a park. It was introduced into the Greek language by Xenophon, and has been introduced into modern languages

Parachute.

as a name for the garden of Eden (and hence of any abode of happiness) through its use in that sense in the Septuagint.

PARADISE, Bird of. See Bird of Paradise.

PAR'ADOX, a statement or proposition which seems to be absurd, or at variance with common sense, or to contradict some previously-ascertained truth, though, when duly investigated, it may prove to be well founded.

PAR'AFFIN, a solid white substance of a waxy appearance which is separated from petroleum and ozokerit, and is also largely obtained by the destructive distillation of various organic bodies, such as brown coal or lignite, bituminous coal, shale, etc. In Scotland the paraffin industry is highly important. The process generally consists in heating bituminous shale in iron retorts at a low red heat; condensing the tarry products, and purifying these by distillation, washing successively with soda, water, and acid, and again distilling. Those portions of the oil which solidify in the final distillations are collected separately from the liquid portions, washed with soda and acid, and crystalized or again distilled. The partially purified paraffin (called paraffin scale) is now again treated with acid, allowed to solidify, submitted to the action of centrifugal machines, and finally strongly pressed in order to remove any liquid oil which may still adhere to it. The refined paraffin is largely manufactured into candles, which may be either white or colored, and may be mixed with a certain quantity of wax, etc. The liquid oils obtained in the process come into commerce under the general name of paraffin-oil, the lighter oils being used for illuminating and the heavier for lubricating purposes. Paraffin has received its name on account of its remarkable indifference to or want of affinity with other substances. Besides being used for candles, it is used for vestas and tapers, for water-proofing, sizing, and glazing fabrics, as an electric insulator, as a coating for the inside of beer barrels, etc.

PARAGUAY (pâ'râ-gwī), a republic of South America, surrounded by the Argentine Republic, Brazil, and Bolivia; area, 97,600 sq. miles. The climate is agreeable, the mean annual temperature being about 75°. The natural fertility of the soil is shown by a vegetation of almost unequalled luxuriance and grandeur. In the forests are found at least sixty varieties of timber-tree, besides dye-woods, gums, drugs, perfumes, vegetable oils, and fruits. Many of the hills are covered with the yerba maté or Paraguay tea. The larger plains are roamed over by immense herds of cattle, which yield large quantities of hides, tallow, bones, etc.; and on all the cultivated alluvial tracts sugar-cane, cotton, tobacco, rice, corn, etc., are raised in profusion. Asuncion, the capital, and Villa Rica are connected by a railway about 90 miles long.

Paraguay was originally a Spanish colony, the first settlement being made in 1535. In 1608 a number of Spanish Jesuits established a powerful and well-organized government, which lasted till 1758, when it was overthrown by the Brazilians and Spaniards. Early in the 19th century its isolated position enabled it by a single effort to emancipate itself from Spanish rule. In 1844 Don Carlos Antonio Lopez was elected president for ten years, and soon after the country was declared free and open to both foreigners and foreign commerce. Don Carlos Lopez remained president of Paraguay till his death in 1862, when he was succeeded by his son Don Francisco, who concluded treaties of commerce with Enlgand, France, the United States, Brazil, etc., and did all in his power to promote the growth of agriculture and industry in the land. A popular constitutional government has been established, and the state is making rapid progress in population and prosperity. The people are largely half-breeds or of Indian blood. Pop. 635,571.

PARAGUAY, a river of South America rises in the Brazilian state of Matto Grosso, takes a course generally southward, and joins the Paraná at the south-west angle of the state of Paraguay after a course of some 1300 miles. It receives the Pilcomayo, Vermejo, and other large rivers, and is a valuable highway of trade to Paraguay and Brazil.

PARAKEETS, or PARROQUETS, a sub-family or group of the parrots, characterized by their generally small size and their long tail-feathers. The islands of the Eastern Archipelago form the chief habitat of these birds, but species also occur in India and Australia. Among the most familiar forms are the rose-ringed and Alexandrine parakeets. The former, found in India and on the eastern coasts of Africa, has a bright-green body and a pink circle round the neck. The Alexandrine parakeet of India is a nearly allied species. These birds may be taught to speak with distinctness. The ground parakeets of Australia live among the reeds and grass of swamps, generally in solitary pairs. The common ground parakeet of Australia possesses a green and black plumage, the tail being similarly colored, and the body-feathers having each a band of dark-brown hue. The grass parakeets of Australia, of which the small warbling parakeet is a good example, inhabit the central flat lands of Australia, and feed on the seeds of the grasses covering the plains. They perch on the eucalypti or gum-trees during the day, and the nests are situated in the hollows of these trees. Contrary

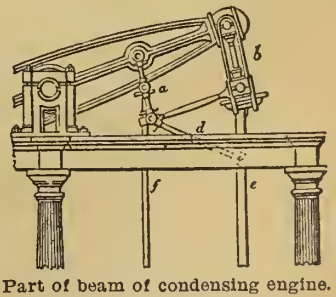
Rose-ringed parakeet.

to most parrots they have an agreeable voice.

PAR'ALLAX, the apparent change of place which bodies undergo by being viewed from different points. Thus an observer at a sees an object b in line with an object c, but when he moves to d it is in line with e, and seems to have gone backward. The term has become technical in astronomy, and implies the difference of the apparent positions of any celestial object when viewed from the surface of the earth and from the center of either the earth or the sun. The term "parallax" is also employed to denote the non-coincidence of the cross fibers in a telescope with the focus of the eye-glass.

PARALLEL LINES, in geometry, straight lines in the same plane which never meet, no matter how far produced.

PARALLEL MOTION, a mechanical contrivance employed by Watt to communicate the alternate pushes and pulls of the piston-rod of a steam-engine to the end of a vibrating beam, and which prevents the action of forces tending to



Part of beam of condensing engine.
a b c d, Parallel motion. *e*, Piston-rod.
f, Pump-rod.

destroy the right-line motion of the piston-rod. The motion given to the end of the rod is not accurately in a straight line, but it is very nearly so. Watt's parallel motion is still employed in all stationary beam-engines. In marine beam-engines the arrangement

employed differs somewhat in form, but is the same in principle as Watt's contrivance.

PARALLELOGRAM OF FORCES, an important dynamical principle, deduced by Newton, which may be stated thus: If two forces acting in different directions on a particle at the same time be represented in magnitude and direction by two straight lines meeting at the particle, their resultant effect in giving motion to the particle is that of a force represented in magnitude and direction by the diagonal (terminating in the particle) of the parallelogram, of which the two former lines are two sides.

PARALLELS OF LATITUDE. See Latitude.

PARAL'YSIS, a bodily ailment, which in its effect consists in loss of power in moving or loss of feeling, or in both, and it is caused by disease of the brain, spinal cord, or nerves, or it may be due to lead-poisoning. When the paralysis is limited to one side of the body, and the voluntary power of moving the muscles is lost, this is due to disease of the brain and receives the specific name of hemiplegia. It is generally caused by the bursting of a blood-vessel in the brain; it may also be due to a blood-vessel being blocked by a clot of blood. The paralysis may be sudden and without unconsciousness, or it may be gradual and attended with sickness, fainting, and confusion of mind. In ordinary cases it will be found that one side of the body is powerless, the face twisted, the speech thick and indistinct. Recovery may be complete, or partial, or the attack may prove fatal. In any case the shock is apt to be repeated. When one side of the body and the opposite side of the face is affected, the disease, which has its seat in the region of the medulla oblongata, receives the name of cross paralysis, and is considered more dangerous than ordinary hemiplegia. When, again, the disease is situated in the spinal cord, the paralysis, which receives the name of paraplegia, may affect either the upper or lower part of the body, or motion may be lost on one side and sensation on the other. Local paralysis is the term used when disease or injury affects a specific nerve-trunk, and has no connection with disease of the brain or spinal cord. The effect of this local paralysis is to deprive the muscles of their nerve-supply, in which case they lose their power, becoming weak and faint.

PARANA, a river in South America, the largest except the Amazon, and draining a larger basin than any other river in the New World except the Amazon and the Mississippi. Its length, from its sources to its junction with the Paraguay, is probably 1500 miles, and thence to the sea 600 miles more.

PARANA, a state of Southern Brazil, having on the north the state of Sao Paulo, on the east the Atlantic Ocean, south the state of Santa Catharina, and west Paraguay and the province Matto Grosso; area, 85,429 sq. miles. Its chief town is Curitiba. Pop. 187,548.

PAR'ANOI'A, a form of insanity in which for years the intellect of the patient remains unimpaired, though dominated by a systematized delusion. An acquired or transmitted neuro-degenerative taint is almost invariably present, though a sudden or severe injury to the nervous system may be the cause. It may follow a severe fever or an injury to the head. It may equally well be caused by great emotional strain or a constantly harassing thought.

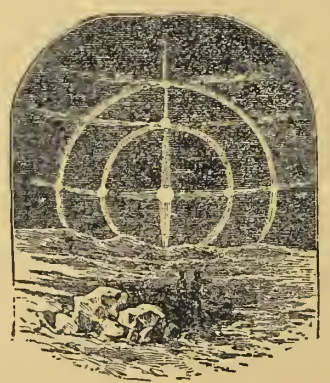
Paranoiacs usually present somatic evidences of degeneration, such as a deformed or asymmetrical skull, badly developed teeth, strakbismus, atrophy of one side of the body, and differences in size of hands or feet.

PARAPET, in fortification, a work, usually of earth, intended to protect the troops within the ramparts, as well as the pieces of artillery used in the defense. In order to fire the defenders ascend a ledge called a banquette, about half-way up the parapet. In architecture the term parapet is applied to the structures placed at the edges of platforms, balconies, roofs of houses, sides of bridges, etc., to prevent people from falling over.

PARAPHERNALIA, in law, a woman's apparel, jewels, and other things, which, in the lifetime of her husband, she wore as the ornaments of her person, and to which she has a distinct claim.

PARASELENE (pa-ra-se-lē'nē), a luminous ring or circle sometimes seen round the moon, or there may be more than one ring as well as certain bright spots, bearing some resemblance to the moon. Paraselenæ or mock moons are analogous to parhelia or mock suns. See Parhelion.

PAR'ASITES, the name applied to animals which attach themselves to the exterior or inhabit various situations in the interior, of the bodies of other



Paraselenæ.

animals, including such forms as tape-worms, flukes, scolices or hydatids, fish-lice, bird-lice, common lice, etc. True parasites obtain their nourishment from the animals on which they live, but there is another class of parasites that only obtain a lodging or abode at the expense of the animals they accompany.

PARBUCKLE, a method of raising or lowering any cylindrical body, such as a barrel, by an inclined plane and a rope, the rope being doubled, the double placed round a post at the top of the plane, and the ends passed under and round the object to be raised or lowered, when by pulling or slackening this can be accomplished.

PARCHMENT, the skins of sheep, she-goats, and several other animals so dressed or prepared as to be rendered fit for writing on. This is done by stretching the skin on a frame, separating all the flesh and hair from the skin, reducing its thickness with a sharp instrument, and smoothing the surface with pumice-stone covered with pulverized chalk or slaked lime. After it is reduced to something less than half its original thickness, it is smoothed and slowly dried for use. The name parchment signifies literally paper of Pergamus (Asia Minor), where parchment was first extensively brought into use about 200 B.C. Vellum is a finer kind prepared from the skins of calves or kids. Parchment is now chiefly used for writing important legal documents on.

PARCHMENT, Vegetable. See Paper.

PARDON, the remission of the penalty of a crime or offense. In England, in nearly all cases of crime except where there is an impeachment, a pardon from the crown may be granted before a trial as well as after; and it stops further progress in the inquiry and prosecution at whatever time it is granted. In America the constitution provides that the president "shall have power to grant reprieves and pardon for offenses against the United States, except in cases of impeachment." The senate has the whole power of trying impeachments.

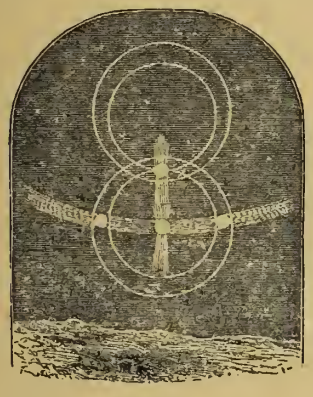
PAREGORIC ELIXIR, known also as the camphorated tincture of opium, is a solution of powdered opium, camphor, benzoic acid, and oil of anise. When used carefully it is found to be an excellent anodyne and anti-spasmodic.

PARESIS, popularly but improperly called softening of the brain, is more common in males than in females. It occurs most frequently between the ages of thirty and fifty-five. Few cases show hereditary tendency. While in general the disease is said to be more frequent among the lower classes, in this country it is most common among the middle and upper classes. About 80 per cent of cases give a syphilitic history. Alcoholic and sexual excesses and severe mental or emotional strains may also be mentioned as factors.

PAREN'THESIS, pl. Parentheses, an explanatory or qualifying sentence, or part of a sentence, inserted into the midst of another sentence, without being grammatically connected with it. It is generally marked off by upright curves ( ), but frequently by dashes — —, and even by commas.

PARHE'LION, a mock sun, having the appearance of the sun itself, and seen by the side of that luminary. Parhelia are sometimes double, sometimes triple, and sometimes more numerous. They appear at the same height above the horizon as the true sun, and they are always connected with one another by a white circle or halo. They are the result of certain modifications which light undergoes when it falls on the crystals of ice, rain-drops, or minute particles that constitute suitably situated clouds. Parhelia which appear on the same side of the circle with the true sun are often tinted with prismatic colors.

PA'RIAH, a name somewhat loosely applied to any of the lowest class of people in Hindustan, who have, properly speaking, no caste, hence, one despised and contemned by society; an outcast. Properly, however, Pariah (a Tamil name) is applied to the members of a somewhat widely spread race in Southern India, generally of the Hindu religion, and though regarded by the Hindus as of the lowest grade, yet



Parhelia.

superior to some ten other castes in their own country. They are frequently serfs to the agricultural class, or servants to Europeans.

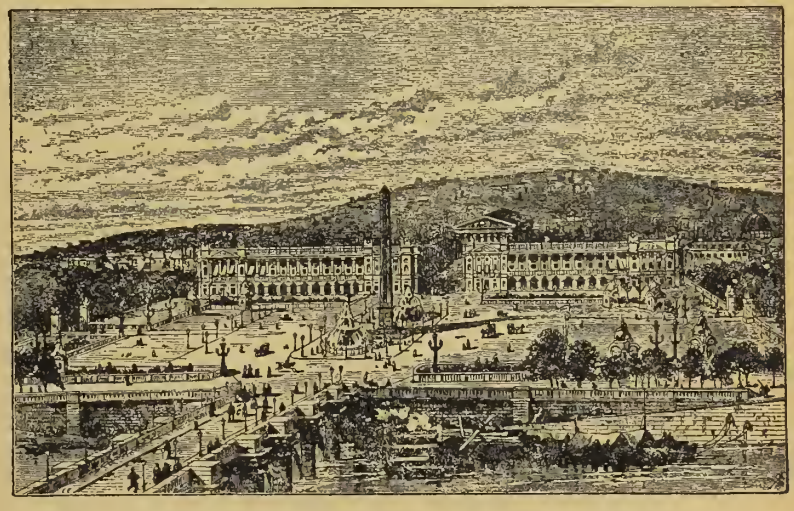
PARIAN MARBLE, a mellow-tinted marble, highly valued by the ancients, and chosen for their choicest works. The principal blocks were obtained from Mount Marpassus, in the island of Paros.

PARIS, the capital of France and of the department of the Seine, lies in the Seine valley surrounded by heights. Through the valley the river runs from east to west, inclosing two islands, upon which part of the city is built. It is navigable by small steamers. The quays or embankments, which extend along the Seine on both sides, being built of solid masonry, protect the city from inundation and form excellent promenades. The river, which within the city is fully 530 feet in width, is crossed by numerous bridges, the more important being Pont Neuf, Pont des Arts, Pont du Carrousel, Pont Royal, Pont de l'Alma, etc. The city is surrounded by a line of fortifications which measures 22 miles; outside of this is the enceinte, while beyond that again are the detached forts. These now form two main lines of defense. The inner line consists of sixteen forts, the outer line of eighteen forts besides redoubts; the area thus inclosed measuring 430 sq. miles, with an encircling line of 77 miles. The water supply of the city is derived from the Seine, the Marne, the Vannes, the Ourcq canal, from artesian wells, and from springs, but is still very defective.

In the older parts of the city the streets are narrow and irregular, but in in the newer districts the avenues are straight, wide, and well-paved. What are known as "the boulevards" include the interior, exterior, and military. That which is specifically called The Boulevard extends in an irregular arc on the north side of the Seine, from the Place de la Bastille in the east to the Place de la Madeleine in the west. It includes the Boulevards du Temple, St. Martin, St. Denis, des Italiens, Capuchins, Madeleine, etc., and its length of nearly 3 miles forms the most stirring part of the city. Here may be noted also the triumphal arches of the Porte St. Denis and the Porte St. Martin, the former of which is 72 feet in height. On the south side of the Seine the boulevards are neither so numerous nor so extensive, the best known being the Boulevard St. Germain, which extends from the Pont Sully to the Pont de la Concorde. The exterior boulevards are so named because they are outside the city limits of 1860; and the military boulevards, still further out, extend round the fortifications. After the boulevards mentioned the best streets are the Rue de Rivoli, Rue Castiglione, Rue de la Paix, Rue de la Chaussée d'Antin, the Rue des Pyramides, and twelve fine avenues radiating from the Place de l'Etoile. There are six passenger stations for the railways to the various parts of the country, and a railway around the city (the ceinture), by means of which interchange of traffic between the different lines is effected. There are also tramway lines to Versailles, St. Cloud, and other places in the suburbs.

The most notable public squares or places are the Place de la Concorde one of the largest and most elegant squares in Europe, adorned by an Egyptian obelisk, fountains, and statues; Place de l'Etoile, in which is situated the Arc de Triomphe, a splendid structure 152 feet in height; the Place Vendôme, with column to Napoleon I.; Place des Victoires, with equestrian statue of Louis XIV.; Place de la Bastille, with the Column of July; Place de la République, with colossal statue of the Republic, etc. Within the city are situated the gardens of the Tuileries, which are adorned with numerous statues and fountains; the gardens of the Luxembourg, in which are fine conservatories of rare plants; the Jardin des Plantes, in which are the botanical and zoological gardens, hothouses, museums, etc., which have made this scientific institution famous; the Buttes-Chaumont Gardens, in which an extensive old quarry has been turned to good account in enhancing the beauty of the situation; the Parc Monceaux; and the Champs Elysées, the latter being a favorite promenade of all classes. But the most extensive parks are outside the city. Of these the Bois de Boulogne, on the west, covers an area of 2150 acres, gives an extensive view toward St. Cloud and Mont Valérien, comprises the racecourses of Longchamps and Auteuil, and in it are lakes, cascades, ornamental cafés, and the Jardin d'Acclimatation. The Bois de Vincennes, on the east, even larger, is similarly adorned with artificial lakes and streams, and its high plateau offers a fine view over the surrounding country. The most celebrated and extensive cemetery in Paris is Père la Chaise (106½ acres), finely situated and containing the tombs of many celebrities. The Catacombs are ancient quarries which extend under a portion of the southern part of the city, and in them are deposited the bones removed from old cemeteries now built over.

Of the churches of Paris the most celebrated is the Cathedral of Notre Dame, situated on one of the islands of the Seine, called the Ile de la Cité. It is a vast cruciform structure, with a lofty west front flanked by two square towers, the walls sustained by many flying-buttresses, and the eastern end octagonal. The whole length of the church is 426 feet, its breadth 164 feet. The foundation of Notre Dame belongs to the 6th century; the present edifice dates from 1163, but it was not finished till early in the 14th century, being restored in 1845. The church of La Madeleine, a modern structure in the style of a great Roman temple, with a peristyle of lofty Corinthian columns, stands on an elevated basement fronting the north end of the Rue Royale; the church of St. Geneviève, built about the close of the last century, was after its completion set apart, under the title of the Panthéon, as the burying-place of illustrious Frenchmen. We may also



Paris.—The Place de la Concorde and Montmartre from the Chamber of Deputies.

name St. Eustache (1532–1637), an interesting example of French Renaissance architecture; St. Germain l'Auxerrois; St. Gervais; St. Roch; St. Sulpice; Notre Dame de Lorette; St. Vincent de Paul; etc. On the very summit of Montmartre is the Church of the Sacred Heart, a vast new structure in the Byzantine style estimated to cost $5,000,000. The chief French Protestant churches are the Oratoire and Rédemption. There are several churches belonging to English, Scotch, and American denominations, a Russian Greek church, and several synagogues.

Notable among the public buildings of Paris are its palaces. The Louvre, a great series of buildings within which are two large courts, is now devoted to a museum which comprises splendid collections of sculpture, paintings, engravings, bronzes, pottery, Egyptian and Assyrian antiquities, etc. The palace of the Tuileries was set on fire in 1871 by the Communists. The ruins have been removed, but a few of the architectural details have been preserved. The Palais du Luxembourg, on the south side of the river, has very extensive gardens attached to it, and contains the Musée du Luxembourg, appropriated to the works of modern French artists. The Palais Royal is a famed resort. The Palais de l'Elysée, situated in the Rue St. Honoré, with a large garden, is now the residence of the president of the republic. The Chambre des Députés—known under the Empire as the Palais du Corps Législatif—is the building in which the deputies meet. The Palais de l'Industrie, built for the first international exhibition in 1855, is used for the annual salon of modern paintings, etc. The Hôtel de Ville is situated in the Place de l'Hôtel de Ville, formerly Place de Grève, on the right bank of the river. It was destroyed by the Communists in 1871, but has now been re-erected on the same site with even greater magnificence. It is a very rich example of Renaissance architecture. The Hôtel des Invalides, built in 1670, is now used as a retreat for disabled soldiers, and is capable of accommodating 5000. The church attached has a lofty and finely-proportioned dome. It contains the burial-place of the first Napoleon. The Palais de Justice is an irregular mass of buildings occupying the greater part of the western extremity of the Ile de la Cité. Opposite the Palais de Justice is the Tribunal de Commerce, a quadrangular building inclosing a large court roofed with glass. The mint (Hôtel des Monnaies) fronts the Quai Conti, on the south side of the Seine, and contains an immense collection of coins and medals. The other principal government buildings are the treasury (Hôtel des Finances), in the Rue de Rivoli; the record office (Hôtel des Archives Nationales). The Exchange (La Bourse) was completed in 1826; it is in the form of a parallelogram, 212 feet by 126 feet, surrounded by a range of sixty-six columns. The extensive markets form a striking feature of Paris, the most important being the Halles Centrales, where fish, poultry, butcher-meat and garden produce are sold. A notable and unique structure is the Eiffel Tower, built in connection with the Paris Exhibition of 1889. It is a structure of iron lattice-work 984 feet high, and having three stages or platforms. It is as yet the highest building in the world.

The chief institution of higher education is the academy of the Sorbonne, where are the university "faculties" (see France, section Education) of literature and science, while those of law and of medicine are in separate buildings. There are, besides, numerous courses of lectures in science, philology, and philosophy delivered in the Collége de France, and courses of chemistry, natural history, etc., in the museum of the Jardin des Plantes. Of the libraries the most important is the Bibliothèque Nationale, the largest in the world. The number of printed volumes which it contains is estimated at 2,500,000, besides, 3,000,000 pamphlets, manuscript volumes, historical documents, etc. Among other libraries are those of the Arsenal, St. Geneviève, Mazarin, De la Ville, De l'Institut, and De l'Université (the Sorbonne).

There are many hospitals in Paris devoted to the gratuitous treatment of the indigent sick and injured; and also numerous establishments of a benevolent nature, such as the Hôtel des Invalides, or asylum for old soldiers, the lunatic asylum (Maison des Aliénés, Charenton), blind asylums; the deaf and dumb institute (Institution des Sourds-Muets); two hospitals at Vincennes for wounded and convalescent artisans; the crèches, in which infants are received for the day at a small charge; and the ouvroirs, in which aged people are supplied with work.

The theaters of Paris are more numerous than those of any other city in the world. The most important are the Opera House, a gorgeous edifice of great size, built between 1861–75; the Théâtre Français; the Odéon; the Théâtre de la Gaîté, for vaudevilles and melodramas: Théâtre des Folies Dramatiques, Théâtre du Châtelet, Théâtre du Vaudeville, Théâtre des Variétés, Théâtre de la Porte St. Martin, and the Théâtre de l'Ambigu Comique.

The most important manufactures are articles of jewelry and the precious metals, trinkets of various kinds, fine hardware, paper-hangings, saddlery and other articles in leather, cabinet-work, carriages, various articles of dress, silk and woolen tissues, particularly shawls and carpets, Gobelin tapestry, lace, embroidery, artificial flowers, combs, machines, scientific instruments, types, books, engravings, refined sugar, tobacco (a government monopoly), chemical products, etc. That which is distinctively Parisian is the making of all kinds of small ornamental articles, which are called articles de Paris. A large trade is carried on by the Seine both above and below Paris as well as by canals.

The first appearance of Paris in history is on the occasion of Cæsar's conquest of Gaul, when the small tribe of the Parisii were found inhabiting the banks of the Seine, and occupying the island now called Ile de la Cité. It was a fortified town in 360 A.D., when the soldiers of Julian here summoned him to fill the imperial throne. In the beginning of the 5th century it suffered much from the northern hordes, and ultimately fell into the hands of the Franks, headed by Clovis, who made it his capital in 508. In 987 a new dynasty was established in the person of Hugo Capet, from whose reign downward Paris long continued to be the residence of the kings of France. In 1437 and 1438, under Charles VII., Paris was ravaged by pestilence and famine, and such was the desolation that wolves appeared in herds and prowled about the streets. Under Louis XI. a course of prosperity again commenced. In the reign of Louis XIV. the Paris walls were leveled to the ground after having stood for about 300 years, and what are now the principal boulevards were formed on their site (1670). Only the Bastille was left (till 1789), and, in place of the four principal gates of the old walls, four triumphal arches were erected, two of which, the Porte St. Denis and Porte St. Martin, still stand. Many of the finest edifices of Paris were destroyed during the revolution, but the work of embellishment was resumed by the directory, and continued by all subsequent governments. The reign of Napoleon III. is specially noteworthy in this respect; during it Paris was opened up by spacious streets and beautified to an extent surpassing all that had hitherto been effected by any of his predecessors. Among modern events in the history of Paris are the siege of the city by the Germans in the war of 1870–71, and the subsequent siege by the French national government in order to wrest the city from the hands of the Commune. Paris was the scene of international exhibitions in 1855, 1867, 1878, and 1889, but the greatest was that of 1900, which presented an epitome of the progress of the nineteenth century. It was visited by 47,000,000 persons, or about two-thirds more than the number who visited that of 1889. Pop. 2,750,000.

PARIS, in Greek mythology, also called Alexander, the second son of Priam, king of Troy, by Hecuba. His mother dreamed before his birth that she had brought forth a firebrand, which was interpreted to mean that he would cause the destruction of Troy. To prevent this the child was exposed on Mount Ida, where he was discovered by a shepherd, who brought him up as his own son. Here his grace and courage commended him to the favor of Œnone, a nymph of Ida, whom he married. At the marriage of Peleus and Thetis a dispute arose whether Hera, Athena, or Aphroditē was the most beautiful, and as such entitled to the golden apple. Paris was chosen judge, and decided in favor of Aphroditē, who had promised him the fairest woman in the world for his wife. Subsequently he visited Sparta, the residence of Menelaus, who had married Helena (or Helen), the fairest woman of the age, whom he persuaded to elope with him. This led to the siege of Troy, at the capture of which he was killed by an arrow.

PARIS, Louis Albert Philippe d'Orleans, Comte de, son of the Duc d'Orleans, and grandson of Louis-Philippe,

born 1838. After the revolution of 1848 he resided chiefly in Claremont, England, where he was educated by his mother. During the American civil war of 1861 he, along with his brother the Duc de Chartres, volunteered into the northern army, and served for some time on the staff of General McClellan. On his return to Europe the following year he married his cousin the Princess Marie-Isabelle, eldest daughter of the Duc de Montpensier. After the Franco-German war he was admitted a member of the first national assembly. On the death of the Comte de Chambord, the Comte de Paris was recognized as head of the royal house of France. Under the expulsion bill of 1886 he, along with the other royal princes, was forbidden to enter France. He published a history of the Civil War in America, and a work on English Trade-unions. He died in 1894.

PARIS, the capital of Lamar co., Tex., on the Gulf, Col. and S. Fé, the St. L. and San. Fran., and the Tex. and Pac. railways; 15 miles s. of the Red river, 64 miles, e. of Sherman. It is in a wheat and cotton growing region and is the trade center of a large territory. Pop. 11,410.

PARIS, Treaties of, of the numerous treaties bearing this designation a few only of the most important can be mentioned here. On February 10, 1763, a treaty of peace was signed between France, Spain, Portugal, and England, in which Canada was ceded to Great Britain. On February 6, 1778, was signed that between France and the United States, in which the independence of the latter country was recognized. A treaty was signed between Napoleon I. and the allies, ratified April 11, 1814, by which Napoleon was deposed and banished to Elba. The treaty for the conclusion of peace between Russia on the one hand, and France, Sardinia, Austria, Turkey, and Great Britain on the other, at the end of the Crimean war, was ratified March 30, 1856. Lastly, the treaty of peace with Germany, at the end of the Franco-German war, was concluded May 10, 1871, and modified by the convention of October 12, 1871.

PARIS, University of, came into existence in the beginning of the 13th century, and was long the most famous center of learning in Europe. It was suppressed in 1793 along with the other French universities, a new system being then introduced. It had long ceased, however, to maintain its old position. See France.

PARIS BASIN, in geology, the great area of tertiary strata on which Paris is situated. Besides a rich fossil fauna of marine and fresh-water mollusca, the remains of mammals are abundant and interesting.

PARIS BLUE, a bright blue obtained by exposing a mixture of rosaniline, ten times its weight of aniline, and some benzoic acid to a temperature of 180° C.

PARIS GREEN, a preparation of copper and arsenic employed in making artificial flowers, in wall-papers, etc. It is a virulent poison.

PARK, Mungo, African traveler, born near Selkirk in Scotland 1771, died 1806. He was educated at Edinburgh for the medical profession; received an appointment as assistant-surgeon on board an East Indiaman and made a voyage to India. Returning to England in 1793 he was engaged by the African Society to trace the course of the Niger. He reached the Gambia at the end of 1795, and advancing northeastward arrived at the Niger near Segu. After exploring part of the course of the river he returned home, and published his Travels in the Interior of Africa in 1799. He settled at Peebles as a country doctor, but in 1805 accepted command of a government expedition to the Niger. Having advanced from Pisania on the Gambia to Sansanding on the Niger, he built a boat at the latter place, with the intention of following the Niger to the sea. It was afterward ascertained that the expedition advanced down the river as far as Boussa, where it was attacked by the natives. It is supposed that Mungo Park was drowned in his efforts to escape. The Journal of his second expedition as far as the Niger was published in 1815.

PARKER, Theodore, American divine, son of a Massachusetts farmer, born at Lexington 1810, died at Florence 1860. He studied at Harvard University, and in 1837 was settled as a Unitarian preacher at West Roxbury. Although his doctrine was accounted heterodox, yet such was his eloquence and ability that he soon became famous as a preacher and lecturer throughout New England. In 1843 he visited England, France, Italy, and Germany, and settled as a preacher in Boston on his return. He was a prominent advocate of the abolution of slavery. The principal of his published works are: Occasional Sermons and Speeches; and Sermons on Theism, Atheism, and the Popular Theology.

PARKERSBURG, the capital of Wood co., W. Va., at the confluence of the Ohio and the Little Kanawha rivers; on the Balt. and O., the Balt. and O.S. W., and the Ohio River railways; 96 miles s. by w. of Wheeling. It is in a rich oil and natural-gas region. Pop. with suburbs, 15,210.

PARKES, Sir Henry, son of a Warwickshire farmer, born 1815; emigrated to Sydney in 1839, and entered the New South Wales Parliament in 1854. He became colonial secretary in 1866, and prime minister in 1872–75, and several times subsequently. He was author of the N.S. Wales public schools act, and advocated free-trade, Australian federation, and imperial federation. He died in 1896.

PARKHURST, Charles Henry, an American Presbyterian clergyman, pastor of the Madison Square Presbyterian church, New York, and noted reformer. Dr. Parkhurst was born in Massachusetts and graduated from Amherst college in 1866. His first charge was as pastor of the Lenox (Mass.) Congregational church. In 1891 he became prominent as a prosecutor of vice in New York City and his investigations brought about the appointment of the Lexow committee in 1894. He is a dramatic preacher and an able lecturer.

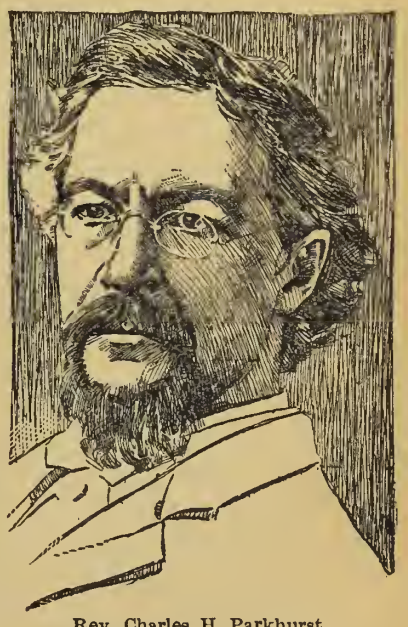
PARKMAN, Frances, American historian, was born in Boston in 1823. He selected as his life work the writing of the rise, decline and fall of the French power in America. His works include The Conspiracy of Pontiac, Pioneers of France in the New World, The Jesuits in North America, La Salle and the Discovery of the Great West, The Old Regime in Canada, Count Frontenac and New France Under Louis XIV., and Montcalm and Wolfe. He died in 1893.

PARLIAMENT, the supreme legislative assembly and court of law in Britain. See Britain.

PARMA, a city of North Italy, capital of the province of Parma, on the small river Parma, 72 miles southeast of Milan. The manufactures are of silk, cottons, woolens, felt-hats, etc. Pop. 49,370.—The province lies on the right bank of the Po; area, 1235 sq. miles; pop. 277,842.

PAR'MESAN CHEESE, a cheese made of skimmed milk in the neighborhood of Parma by a peculiar process, flavored with saffron, and celebrated for its keeping qualities. Indeed, it becomes so hard as to require to be grated when used.

PARNAS'SUS, or **LIAKU'RA,** a mountain of Greece, situated in Phocis, 65 miles northwest of Athens. It has two



Rev. Charles H. Parkhurst.

prominent peaks, one of which was dedicated to the worship of Bacchus and the other to Apollo and the Muses, while on its southern slope was situated Delphi and the Castalian fount. Its height is 8068 feet, and a magnificent view is obtained from its top.

PARNELL, Charles Stewart, born at his father's estate of Avondale, co. Wicklow, Ireland, in 1846. He became member of parliament for Meath in 1875; organized the "active" Home Rule party, and developed its obstruction tactics; and in 1879 formally adopted the policy of the newly-formed Land League, was an active member of it, and was chosen president of the organization. At the general election of 1885 he was re-elected for Cork, and

next year he and his followers supported the Home Rule proposals introduced by Mr. Gladstone, while he also brought in a bill for the relief of Irish tenants that was rejected. He made a disgraceful appearance in a divorce case, and was cast off by the Gladstonian party, and denounced by the Irish priesthood. He died in 1891.

PAR'ODY, a kind of literary composition, usually in verse, in which the form and expression of grave or serious writings are closely imitated, but adapted to a ridiculous subject or a humorous method of treatment.

PAROLE', a promise given by a prisoner of war that he will not try to escape if allowed to go about at liberty; or to return, if released, to custody at a certain time if not discharged; or not to bear arms against his captors for a certain period; and the like.

PARO'TID GLAND, in anatomy, one of the salivary glands, there being two parotids, one on either side of the face, immediately in front of the external ear, and communicating with the mouth by a duct.

PAR'QUETRY, a species of inlaid woodwork in geometric or other patterns, and generally of different colors, principally used for floors.

PARR, Catharine. See Catharine Parr.

PARROT, a name common to birds of the family of climbers. The bill is hooked and rounded on all sides, and is much used in climbing. The tarsi are generally short and strong, the toes being arranged two forward and two backward. The tongue, unlike that of most other birds, is soft and fleshy

Gray parrot.

throughout its whole extent. The wings are of moderate size, but the tail is often elongated, and in some cases assists in climbing. The plumage is generally brilliant. Parrots breed in hollow trees, and subsist on fruits and seeds. Several species can not only imitate the various tones of the human voice, but also exercise in some cases actual conversational powers. Some live to a great age, instances being known of these birds reaching seventy and even ninety years. The species are numerous, and are known under the various names of parrots, parakeets, macaws, lorikeets, lories, and cockatoos, the name parrot, when used distinctively, being generally applied to species of some size, that have a strongly hooked upper mandible and a tail short or of medium length. They are natives of both tropical and sub-tropical regions, and even extend northward into the United States, and south to the Straits of Magellan, New Zealand, and Tasmania. The best-known species is the gray parrot of Western Africa, which can be most easily trained to talk. The green parrots are also common as domestic pets, being brought from the

Psittacidæ.

1, Head and foot of macaw. 2, Do. of blue-bellied lorikeet. 3, Do. of Goliath aratoo. 4, Head of gray parrot.

tropical regions of South America. The Carolina parrot is found in the United States, and is gregarious in its habits.

PARSEES', the name given in India to the fire-worshipping followers of Zoroaster, chiefly settled in Bombay, Surat, etc., where they are among the most successful merchants. They have a great reverence for fire in all its forms, since they find in it the symbol of the good deity Ahurâ-Mazda (Ormuzd). To this divinity they have dedicated "fire-temples," on whose altar the sacred flame is kept continually burning. Benevolence is the chief practical precept of their religion, and their practice of this finds its evidence in their many charitable institutions. One of the most curious of their customs is in the disposal of their dead. For this they erect what are called "towers of silence," built of stone, about 25 feet high, and with a small door to admit the corpse. Inside is a large pit with a raised circular platform round it on which the body is exposed that it may be denuded of flesh by vultures, after which the bones drop through an iron grating into the pit below. The number of Parsees in India at last census was 94,190.

PARSLEY, a plant, one species of which, the common parsley, is a well-known garden vegetable, used for communicating an aromatic and agreeable flavor to soups and other dishes.

PARSNIP, a plant of which there are many varieties. It is a tall erect plant, with pinnate leaves and bright-yellow flowers, and much cultivated for its roots, which have been used as an esculent from a very early period. They are also cultivated as food for the use of cattle.

PARSON, in English ecclesiastical law, is the rector or incumbent of a parish; also, in a wider sense, any one that has a parochial charge or cure of souls. Four requisites are necessary to constitute a parson, viz. holy orders, presentation, institution, and induction. His duties consist chiefly of performing divine service and administering the sacraments.

PAR'THENON, a celebrated Grecian temple of Athena, on the Acropolis of Athens, one of the finest monuments of ancient architecture. It is built of marble, in the Doric style, and had originally 8 columns on each of the two fronts, with 17 columns on the sides, or 46 in all, of which 32 are still standing; length 228 feet, breadth 101, and height to the apex of the pediments 64 feet; height of columns 34 feet 3 inches. The pediments were filled with large statues, the metopes adorned with sculptures in relief. After serving as a Christian church and as a mosque, it was rendered useless for any such pur-

Southwest angle of the Parthenon, from the Museum hill.

pose in 1687 by the explosion of a quantity of gunpowder which the Turks had placed in it during the siege of Athens by the Venetians. Though the more precious pieces of sculpture have been dispersed among various European collections the Parthenon still bears an imposing aspect.

PARTICIPLE, in grammar, a part of speech, so called because it partakes of the character both of a verb and an adjective. The participle differs from the adjective in that it implies time, and therefore applies to a specific act, whereas the adjective designates only an attribute, as an habitual quality or characteristic, without regard to time. When we say, "he has learned his lesson," we have regard to a specific act done at a certain time; but in the phrase "a learned man," learned designates an habitual quality. In the former case learned is a participle; in the latter, an adjective. There are two participles in English: the present—ending in -ing, and the past—ending, in regular verbs, in -ed.

PARTICLES, such parts of speech as are incapable of any inflection, as, for

instance, the preposition, conjunction, etc.

PARTNERSHIP is the association of two or more persons for the purpose of undertaking and prosecuting conjointly any business, occupation, or calling; or a voluntary contract by words or writing, between two or more persons, for joining together their money, goods, labor, skill, or all or any of them, upon an agreement that the gain or loss shall be divided in certain proportions among them, depending upon the amount of money, capital stock, etc., furnished by each partner. Partnership may be constituted by certain acts connected with the undertaking apart from any deed or oral contract. The duration of the partnership may be limited by the contract or agreement, or it may be left indefinite, subject to be dissolved by mutual consent. The members of a partnership are called nominal when they have not any actual interest in the trade or business, or its profits; but, by allowing their names to be used, hold themselves out to the world as apparently having an interest; dormant or sleeping, when they are merely passive in the firm, in contradistinction to those who are active and conduct the business as principles, and who are known as ostensible partners. A partnership may be limited to a particular transaction or branch of business, without comprehending all the adventures in which any one partner may embark, but such reservation must be specified in the deed of contract. For in the usual course each member of a partnership is liable at common law for the debts of the firm, and a sleeping partner is responsible for all debts of the firm which have been contracted during his partnership. Each partner may also sue the firm as if it were a distinct person, and the firm may be made bankrupt without the goods of any of the partners being sequestrated. The partners are, however, liable jointly and severally to creditors in payment of its debts.

PARTRIDGE, William Ordway, American sculptor and author, born in Paris in 1861. He was educated at Columbia university, in New York City, and studied modeling under Galli in Florence, and Welonski in Rome. Some of his larger works are the bronze statue of Hamilton in front of the Hamilton Club, Brooklyn, N. Y., Shakespeare in Lincoln Park, Chicago, and the equestrian statue of General Grant in Brooklyn. His publications include: Art for America; Song Life of a Sculptor, The Technique of Sculpture, The Angel of Clay, a novel; and Nathan Hale. For a time he was professor of fine arts at Columbian University, Washington, D. C.

PARTRIDGE, a well-known rasorial bird of the grouse family. The common partridge occurs in nearly all parts of Europe, in North Africa, and in some parts of Western Asia. The wings and tail are short, the tarsi as well as the toes naked, and the tarsi not spurred. The greater part of the plumage is ash-gray finely varied with brown and black. They feed on grain and other seeds, insects and their larvæ and pupæ. The name partridge is applied in the United States to several North American species of quails.

PARTRIDGE-BERRY, a plant inhabiting North America, also known as wintergreen. The name is also applied to another North American shrub, a

Red-legged partridge.

pretty little trailing plant, with white, fragrant flowers and scarlet berries, natural order Rubiaceæ.

PARTS OF SPEECH are the classes into which words are divided in virtue of the special functions which they discharge in the sentence. Properly speaking there are only seven such classes, namely the noun, adjective, pronoun, verb, adverb, preposition, and conjunction; for the article, which is usually classed as a separate part of speech, is essentially an adjective, while the interjection can hardly be said to belong to articulate speech at all. Each of the parts of speech will be found separately treated under their several heads throughout the work.

PASADENA, city in Los Angeles co., Cal., on the Los Angeles Terminal and the Southern Pac. railways; 9 miles n.e. of Los Angeles. It is at the foot of the Sierra Madre Mountains, at an elevation of 850 feet above sea-level, and is in the beautiful San Gabriel valley, noted for its orange and lemon groves and the cultivation of smaller fruit. Pop. 11,215.

PASCAL, Blaise, a French philosopher and mathematician, born at Clermont, in Auvergne, 1623, died 1662. In early youth he showed a decided inclination for geometry, and so rapid was his advance that while yet in his sixteenth year he wrote a treatise on conic sections, which received the astonished commendation of Descartes. His studies in languages, logic, physics, and philosophy were pursued with such assiduity that his health was irrecoverably gone in his eighteenth year. In 1647 he invented a calculating machine, and about the same time he made several discoveries concerning the equilibrium of fluids, the weight of the atmosphere, etc. He now came under the influence of the Jansenists Arnauld and others, and from 1654 he lived much at the monastery of Port Royal, and partly accepted its rigorous rule, though he never actually became a solitaire. About 1655 he wrote, in defense of his Jansenist friend Arnauld, his famous Provincial Letters (Lettres Ecrites par Louis de Montalte à un Provincial de ses Amis), and after his death his Pensées or Thoughts were published as the fragments of an unfinished apology for Christianity.

PAS-DE-CALAIS (pä-dė-kà-lā), a maritime department of Northern France; area, 2550 sq. miles. The principal harbors are Boulogne and Calais. The chief minerals are indifferent coal, good pipe and potter's clay, and excellent sandstone. There are numerous iron-foundries, glass-works, potteries, tanneries, bleach-works, mills, and factories of all kinds. The capital is Arras. Pop. 955,391.

PASHA, in Turkey, an honorary title originally bestowed on princes of the blood, but now conferred upon military commanders of high rank and the governors of provinces. There are three grades, each distinguished by a number of horse-tails waving from a lance, the distinctive badge of a pasha. Three horse-tails are allotted to the highest dignitaries; the pashas of two tails are generally the governors of the more important provinces; and the lowest rank, of one tail, is filled by minor provincial governors.

PASSAIC, a city in Passaic co., N. J., on the Passaic river, and the Erie, the Del., Lack. and W., and Susquehanna railways; 5 miles s.c. of Paterson, the county seat, 12 miles n.w. of New York City. Pop. 30,125.

PASSAGE, Birds of. See Migration.

PASSENGER PIGEON, a bird of the pigeon family, which abounds in America. It is distinguished from the common pigeon chiefly by its long graduated tail. It is about 15 inches in length, with finely-tinted plumage, small head, and long wings. The multiplication of these pigeons is so rapid, and their destructive power so great, that they are obliged to migrate from place to place in vast flocks to obtain their food. They fly in dense columns at a great height, and such a column, one mile broad and 140 miles long, has been observed. The larger breeding-places are said to cover a forest area of about 40 miles.

PASSENGERS, in law, the railway and other public carriers contract to carry passengers without any negligence on their (the carriers') part. In case of accident it lies on the carrier to show that it was from no fault or negligence on his part, or on the part of his servants, that the accident occurred. Hence all passengers injured (or in case of death their nearest relatives) have a claim for compensation, unless it can be proved that the accident was due to the fault of the passenger. Passengers by sea are carried subject to the same general law as those by land: the carriers are bound to observe all due precautions to prevent accident or delay.

PASSION, The, a name for the crucifixion of Jesus and its attendant sufferings.

PASSION-FLOWER, a large genus of twining plants. They are all twining plants, often scrambling over trees to a considerable length, and in many cases are most beautiful objects, on account of their large, rich, or gaily-colored flowers, which are often succeeded by orange-colored edible fruits, for which indeed they are chiefly valued in the countries where they grow wild.

PASSIONISTS, a religious order in the Church of Rome, founded in 1737. The members practice many austerities; they go bare-footed, rise at midnight to

recite the canonical hours, etc. It is also known as the Order of the Holy Cross and the Passion of Christ.

PASSION-PLAY, a mystery or miracle play representing the different scenes in the passion of Christ. The passion play is still extant in the periodic representations at Oberammergau.

PASSION-WEEK. See Holy Week.

PASSIVE, in grammar, a term applied to certain verbal forms or inflections expressive of suffering or being affected by some action, or expressing that the nominative is the object of some action or feeling; as, she is loved and admired.

PAS'SOVER, a feast of the Jews, instituted to commemorate the providential escape of the Hebrews in Egypt, when God, smiting the first-born of the Egyptians, passed over the houses of the Israelites, which were marked with the blood of the paschal lamb. It was celebrated on the first full moon of the spring, from the 14th to the 21st of the month Nisan, which was the first month of the sacred year. During the eight days of the feast the Israelites were permitted to eat only unleavened bread, hence the passover was also called the "feast of unleavened bread." Every householder with his family ate on the first evening a lamb killed by the priest, which was served up without breaking the bones. The passover was the principal Jewish festival.

PASSPORT, a warrant of protection and authority to travel, granted to persons moving from place to place, by a competent authority. In some states no foreigner is allowed to travel without a passport from his government, and in all cases the visitor to the continent of Europe is wiser to provide himself with one, if only as a means of indentification. In Russia, and Turkey in particular, a passport is indispensable.

PASTA, Giuditta, operatic singer, born at Como, near Milan, in 1798, of Jewish parents, died 1865. She appeared at first without success, but in 1819–22 her reputation steadily increased, and up till 1833 she held one of the foremost places on the lyric stage, which she then quitted. She was specially distinguished in the tragic opera; Bellini wrote for her his Norma and Sonnambula, and she made the roles of Medea, Desdemona, and Semiramide her own.

PASTE, a composition in which there is just sufficient moisture to soften without liquefying the mass, as the paste made of flour used in cookery. The term is also applied to a highly refractive variety of glass, a composition of pounded rock-crystal melted with alkaline salts, and colored with metallic oxides: used for making imitation gems.

PASTEL, or **PASTIL,** a colored crayon. Pastel painting. See Crayon.

PASTERN, the part of a horse's leg between the joint next the foot and the coronet of the hoof; it answers to the first phalanx of a man's finger.

PASTEUR (pâs-teur), Louis, French chemist and bacteriologist, born at Dôle, Jura, 1822, died 1895; educated chiefly at the Ecole Normale, Paris, where in 1847 he took his degree as doctor. The following year he was appointed professor of physics in Strasburg, where he devoted much research to the subject of fermentation; in 1857 he received the appointment of dean in the Faculty of Sciences, Lille; in 1863 he became professor of geology, chemistry, and physics at the Ecole des Beaux-Arts, Paris; and in 1867 professor of chemistry at the Sorbonne. He became a member of the French academy in 1882. He has been especially successful in proving the part played by microbes in fermentation and decomposition, in introducing a successful treatment of disease in silkworms

M. Louis Pasteur.

and cattle, and has achieved great success in his efforts to check hydrophobia by means of inoculation. To enable him to deal with this disease under the best conditions a Pasteur Institute was opened in Paris, where patients are received from all parts of Europe. Pasteur Institutes have also been opened in many of the large cities of the Union. See Hydrophobia.

PASTORAL POETRY, poetry which deals, in a more or less direct form, with rustic life. It has generally flourished in highly-corrupted artificial states of society. Thus it was that Theocritus, the first pastoral poet, made artistic protest against the licentiousness of Syracuse; and Virgil wrote his Bucolics and Eclogues in the corrupt Roman court. In the 16th century pastoral poetry received its most notable expression in the Arcadia of G. Sannazaro, the Aminta of Tasso, and the Pastor Fido of Guarini. This tendency, which was so potent in Italy, spread to England, and influenced the Shepherd's Calendar of Spenser, the Arcadia of Sidney, the Faithful Shepherdess of Fletcher, As You Like It of Shakespeare, and the Comus of Milton.

PASTURES, land under grass and herbage, which is eaten as it grows by horses, oxen, sheep, and other herbivorous animals. First-class pastures are used for feeding heavy oxen; second class for inferior or dairy cattle; while hill-sides, moors, and uplands are utilized for sheep.

PATA'GIUM is the name applied to the expansion of the skin or integumentary membrane by means of which bats, flying squirrels, flying lizards, and other semi-aerial forms support themselves in the air. This membrane is not a true wing, but is used as a kind of parachute for temporary support.

PATAGO'NIA, is the name applied to that extreme portion of South America which is bounded e. by the Atlantic, w. by the Pacific, s. by the Strait of Magellan, and n. by the Rio Negro. Since 1881 this large territory has been, by treaty, divided between Chile and the Argentine Republic, so that the portion west of the Andes (63,000 sq. miles) belongs now to the former, and the portion east of the Andes (360,000) belongs to the latter. The Straits of Magellan form a southern boundary of 360 miles, and separate the mainland from the innumerable islands of Tierra del Fuego. Here the Chilian government have established the settlement of Punta Arenas, with stations along the coast. The Patagonians are a tall, muscular race averaging fully 6 feet in height, with black hair, thick lips, and skin of a dark-brown color. They are a nomad race, divided into numerous tribes, whose chief occupation is in hunting and cattle-breeding.

Patagonians.

This native population, however, never numerous, is rapidly disappearing. Colonization is encouraged by the Argentine government, and there are many tracts suitable for European settlement. The country was first discovered by Magellan in 1520.

PATE DE FOIE GRAS (pä-tā dē fwâ gra), a dish made from the enlarged livers of overfed geese, and much relished by epicures. It is made in the form of a pie, and from its oily nature is very indigestible.

PATEL'LA, the name applied in anatomy to the "knee-cap" or "knee-pan," the sesamoid bone of the knee.—The name is also applied to a genus of gasteropodous molluscs comprising the limpets.

PA'TENT, a privilege from the government, granted by letters patent (whence the name), conveying to the individual or individuals specified therein the sole right to make, use, or dispose of some new invention or discovery for a certain limited period, which in the United States may run to seventeen years should the inventor be able to prove that the invention, though of great public utility, has been up till that time almost unprofitable to him. Letters patent are obtained upon application to

the commissioner of patents, Washington, D. C., setting forth that the petitioner has, after great labor and expense, made a certain discovery which he describes, and which he believes will be of great public utility, and that he is the first inventor. The person applying for a patent must furnish a provisional specification along with his application, giving a general account of the nature of the article or invention he wishes to be patented. The application and specification are submitted to an examiner connected with the patent office, and if he report that everything is satisfactory and done in due form, the application is accepted, otherwise the party may have to make amendments in his application and specification. Before doing so, however, he is allowed to appeal to the commissioner of patents who decides the matter. Finally an appeal lies to the supreme court of the District of Columbia. The fee upon filing an application is $15; on issuing the patent, $20; on application for extension of a patent, $50; on granting an extension $50. A prior patent by the inventor in a foreign country does not debar him from receiving a patent in the United States, provided the application be made within seven months of the application for the foreign patent.

Where a person has made an invention, but has not completed the details to his satisfaction, or feels that he can improve on it, he may protect himself against a patent being granted meanwhile for the same thing, by filing a "caveat" in the patent office. A caveat is a notice which contains a description of the thing claimed as an invention, and concludes with a request that the inventor's rights be protected until he has completed his invention and has an opportunity to apply for a patent. A caveat is kept secret by the patent office, and entitles the caveator to notice of the filing of an interfering application for a period of one year. If such notice is sent him, the caveator, to retain his rights, must file his application, specifications, and, if necessary, models or samples, within three months thereafter. Where he does this his invention is considered to date back to the date of filing the caveat. When the rights of a patentee are being infringed he can protect them by a civil process at law, and his suit will be upheld if he can prove that the main elements of his invention have been infringed. A patent once granted can be revoked if anyone can show that the patentee is not the inventor. The patent laws vary considerably in foreign countries.

PATERNOSTER (Latin, "Our Father"), the opening words of the Latin version of the Lord's Prayer, hence employed to designate the prayer itself. See Lord's Prayer.

PAT'ERSON, the capital of Passaic co., New Jersey, on both sides of the Passiac, near its celebrated falls, and 16 miles northwest from New York. The town was founded in 1792, and now possesses numerous churches, a court-house, jail, library, etc. The falls, 72 feet high, are within the city limits and supply abundant water-power to the numerous cotton, silk, and woolen factories, dye and print works, iron-foundries, machine-shops, tanneries, saw, paper, and fulling mills, etc. Pop. 120,114.

PATERSON, William, financier and founder of the Bank of England, was born in Dumfriesshire 1665, died in London 1719. He went through England as a pedlar, settled for a time at Bristol, subsequently resided in the Bahama Islands. Returning to London he engaged in trade with success, and in 1694 proposed and founded the Bank of England, being one of its first directors.

PATHOLOGY, that part of medicine which explains the nature of diseases, their causes and symptoms, comprehending nosology, etiology, and symptomatology. Pathology may be divided into general pathology, which regards what is common to a number of diseases taken as a class; and special pathology, which treats of individual diseases.

PATIA'LA, an Indian native state in the jurisdiction of the Punjab government, the larger part of which is situated south of the Sutlej and the other part in the hill country near Simla; area, 5887 sq. miles. Pop. of the state, 1,583,521. The capital is Patiala, 130 miles s.e. of Amritsir. It was founded in 1752 by Sardar Ala Singh, and has a pop. of 53,545.

PATNA, a city of Hindustan, in the lieutenant-governorship of Bengal. By reason of its central position and natural advantages the city is an important business center, and the chief seat of the opium trade. Pop. 134,785.—The district of Patna has an area of 2079 sq. miles, for the most flat and exceedingly fertile. The staple crop is rice, and the other products are wheat, barley, cotton, tobacco and sugar-cane. Pop. 1,623,856.

PATNA, a native state in the Central Provinces of India. Area 2400 sq. miles. It is now under direct British supervision. Pop. 277,566.

PATOIS (på-twä), a French word of unknown origin used to denote a dialect spoken by the rustic, provincial, or uneducated classes.

PATRIARCHS are the antediluvian heads of families, and the three fathers of the Hebrew race, Abraham, Isaac and Jacob. The term at a later period became the title of the presidents of the sanhedrim, which exercised a general authority over the Jews of Syria and Persia after the destruction of Jerusalem. From them the title was adopted by the Christians, who applied it, from the beginning of the 5th century, to the bishops of Rome, Constantinople, Alexandria, Antioch, and Jerusalem. The Patriarch of Rome became the supreme pontiff of the west (see Popes), the four heads of the eastern church preserving the title of patriarch. The patriarch of Constantinople is the primate of the Greek church in the Ottoman empire, and bears the title of æcumenical.

PATRICIANS, the name given by the Romans to the members and descendants by blood or adoption of the original gentes, houses or clans who, after the plebians became a distinct order, constituted the aristocracy of the city and territory. See Rome.

PATRICK (Patricius), St., the apostle of Ireland, was born about 396 in the British Roman province of Valentia, probably at Nemthur on the Clyde where Dumbarton now is. His father, a decurion in the Roman army, retired to a farm on the Solway, whence, at the age of sixteen, Patrick was carried off by a band of marauders and sold as a slave to the Irish Picts of county Antrim. After six years he made his escape, and, resolving to devote himself to the conversion of Ireland, prepared himself for the priesthood, probably at the monastic institution founded by St Ninian at Candida Casa (Whithorn) in Galloway. Having been ordained a bishop and received the papal benediction from Celestine I., he went over to Ireland about the year 432. Here he is said to have founded over 360 churches, baptized with his own hand more than 12,000 persons, and ordained a great number of priests. The date of his death is probably 469; it took place at a place called Saul, near Downpatrick, and his relics were preserved at Downpatrick till the time of the reformation. His authentic literary remains consist of his Confessions and a letter addressed to a Welsh chief named Corotic. The existence of two other Irish apostles, Patrick or Palladius, and Senn (old) Patrick, about the same time has caused much confusion in the history of the early Irish church.

PATRICK, St., Order of, an Irish order of knighthood, instituted in 1783 by George III., originally consisting of the sovereign, the lord-lieutenant of Ireland for the time being (who is the grandmaster of the order), and fifteen knights; but by a statute in 1833 the order was enlarged and the number of knights raised to twenty-two. The badge of the order is of gold, oval in shape, with the cross of St. Patrick surmounted by a shamrock in the center, and round this is a blue enamelled band bearing the motto "Quis separabit." The badge is suspended to a collar of roses and harps by means of an imperial crown and gold harp. The mantle and hood are of sky-blue tabinet, lined with white silk.

PATROL', a walking or marching round by a guard in the night to watch and observe what passes, and to secure the peace and safety of a garrison, town, camp, or other place; also, the guard or persons who go the rounds for observation.

PA'TRON, in the Roman republic, a patrician who had plebeians, called clients, under his immediate protection and whose interests he supported by his authority and influence. In later times the term patron was applied to every protector or influential promoter of the interests of others; hence the saints who were believed to watch over the interests of particular persons, places, or trades were called patron saints.

PATTI, Adelina Maria Clorinda, opera-singer, born at Madrid in 1843; received her musical training from her brother-in-law, Maurice Strakosch; made her first appearance in New York in 1859 as Lucia; and in 1861 made a brilliant début at Covent Garden, London, in the parts of Amina, Violetta, Zerlina, and Martha. Since then she has successfully established her reputation

as an artist in the chief cities of Europe and America. In 1868 she married the Marquis de Caux, but got divorce in 1883. In 1886 she married Signor Nicolini, and in 1899 Baron Cederström.

PATTISON, Mark, English writer, born in 1813, died in 1884. He was a contributor to the famous Essays and Reviews, and published an edition of Pope's Epistles and Satires (1869), a work on Isaac Casaubon (1875), a memoir of Milton in the Men of Letters Series (1879), the Sonnets of Milton (1883), and numerous articles in reviews, etc.

PAUL, the apostle, commonly called Saint Paul, was born of Jewish parents at Tarsus, in Cilicia, and inherited the rights of a Roman citizen. He received a learned education, and early went to Jerusalem to study under Gamaliel, one of the most celebrated Jewish rabbins. Thus prepared for the office of teacher, he joined the sect of the Pharisees, and became a persecutor of the Christians, to crush whom the sanhedrim employed him both in and out of Jerusalem. He was present at and encouraged the stoning of Stephen, and it was only when he was overtaken by a vision on his way to Damascus that he became a convert to Christianity. His sudden conversion was indicated by the change of his name from Saul to Paul, and he engaged in the work of an apostle with an ardor that overcame every difficulty. Arabia, Syria, Asia Minor, Greece, and the islands of the Mediterranean were the scenes of his labors. The churches of Philippi in Macedonia, of Corinth, Galatia, and Thessalonica, honored him as their founder; and he wrote epistles to these churches, and to the churches in the chief cities of Greece and Asia Minor. By admitting the Gentiles to the church he incurred the hatred of the Jews, who persecuted him as an apostate. Undismayed, the apostle went to Jerusalem and was there arrested and brought to Cæsarea, where he was kept a prisoner for two years by the Roman governors Festus and Felix. He appealed, as a Roman citizen, to the emperor; and on his way to Rome, where he arrived in the year 62, he was shipwrecked on the island of Melita. At Rome he was treated with respectful kindness, and there is reason to believe that he for some time regained his liberty. According to the tradition of the early church the apostle suffered martyrdom during the reign of Nero.

PAUL I., Emperor of Russia, son of Peter III. and Catharine II., was born in 1754. On the death of Catharine in 1796 he succeeded to the throne, and began his reign with acts of generosity. He put an end to the war with Persia, and liberated the Poles who were in confinement in Russia. He joined the coalition of crowns against France, and sent 100,000 men, under Suwaroff and Korsakoff, to Italy and Switzerland, and partly to Holland, but he afterward favored the cause of Napoleon. Paul caused himself to be declared grand-master of the Knights of Malta (1798), but Britain, having conquered the island in 1800, refused to surrender it to the Russian emperor. He therefore laid an embargo on all British ships in the Russian ports, and prevailed upon the Swedish, Danish, and Prussian courts to enter into a convention against Great Britain. At length (1801) the internal administration and his increasing acts of tyranny gave rise to a strong popular discontent, and he was murdered in his bed March 24, 1801.

PAUL, St., Minnesota. See Saint Paul.

PAULDING, James Kirke, miscellaneous writer, born in Dutchess co., New York, 1779; died 1860. He removed to New York, where he became intimately acquainted with Washington Irving, and published in connection with him a series of humorous and satirical essays, entitled Salmagundi. For some years he was secretary of the United States navy. He published a second series of Salmagundi, entirely his own composition; several novels, among which are Konigsmarke, and the Dutchman's Fireside; a Life of Washington; and many political pamphlets, poems, etc.

PAUL'S (St.) **CATHEDRAL,** London, is situated on Ludgate Hill, an elevaton on the north bank of the Thames. The site of the present building was originally occupied by a church erected by Ethelbert, king of Kent, in 610. This was destroyed by fire in 1087, and another edifice, Old St. Paul's, was shortly afterward commenced. The structure was in the Gothic style, in the form of a Latin cross, 690 feet long, 130 feet broad, with a lead-covered wooden spire rising to the height of 520 feet. The middle aisle was termed Paul's Walk, from its being frequented by idlers as well as money-lenders and general dealers. Old St. Paul's was much damaged by a fire in 1137, by lightning in 1444, again by fire in 1561, and was utterly destroyed by the great fire in 1666. The ruins remained for about eight years, when the rebuilding was taken in hand by the government of Charles II. (1675–1710). The whole building was completed at a total cost of $7,500,000 under one architect (Sir Christopher Wren), one master-mason (Thomas Strong), and one Bishop of London (Dr. Henry Compton). The building is of Portland stone, in the form of a cross. Its length is 510 feet; the width from north to south portico 282 feet; the general height is 100 feet. The whole is surmounted by a great dome raised on eight arches. Above the dome is a lantern or gallery, terminated above by a ball and gilded cross, 404 feet from the pavement beneath. The elevated portico forming the grand entrance consists of twelve Corinthian columns, with an upper series of eight pillars of the composite order, supporting a pediment; the front being flanked by two bell-towers 120 feet in height. The entablature represents in relief the conversion of St. Paul, a work of Francis Bird. Upon the south front, which corresponds with the north, is a phœnix rising from the flames with the motto, "Resurgam" (I shall rise again). The pavement of the interior is composed of slabs of black and white marble. The crypt under the name contains the burying-places of many illustrious personages, and some interesting relics of old St. Paul's. Various decorative, structural and other improvements have recently been made on the interior of the cathedral.

PAUNCEFOTE, Sir Julian, was born at Munich, Bavaria, September 13, 1828, and educated at Paris, Geneva, and and at Marlborough college. He was called to the bar of the Inner Temple in 1852, joined the Oxford circuit, and also practiced as a conveyancer. He was appointed attorney-general of Hong-Kong in May, 1865, and acted as chief justice of the supreme court in 1869, and in 1874 was knighted by patent. He was appointed chief justice of the Leeward islands in 1873, and assistant under-secretary of state for the colonies in 1874. In 1876 he was appointed assistant (legal) under-secretary of state for foreign affairs. He was created a C.B. and a K.C.M.G. in 1880, and in 1882 he succeeded the late Lord Tenterden as permanent under-secretary of state for foreign affairs, In 1885 he received the grand cross of the Order of St. Michael and St. George. In 1888 he was appointed British ambassador at Washington. In the Bering Sea, the Venezuelan, and other difficulties between Great Britain and the United States, Pauncefote's tact in dealing with international affairs was powerful, and his friendliness to the United States was shown in his efforts to have the Clayton-Bulwer treaty abrogated. He was a British delegate to the peace conference at The Hague in 1899, and for his services there was raised to the peerage as Baron Pauncefote of Preston. He died in 1902.

PAUPERISM. See Poor and Poor's Laws.

PAUSA'NIAS, a Lacedæmonian general, nephew of Leonidas. He commanded the allied Greeks against the Persians at the battle of Platæa in 479 B.C. To himself alone he ascribed the victory, and his pretensions became insupportable when he afterward, with a combined Greek fleet, delivered Greece, Cyprus, and finally Byzantium from the Persian rule. At length he entered into secret negotiations with Xerxes, and conceived the design of making himself master of Greece. To escape arrest he sought shelter in the temple of Athene at Sparta, where he was shut in by the enraged people and starved to death (B.C. 467).

PA'VIA (pä-vē'ä), a city of Italy, in Lombardy, 22½ miles from Milan, capital of a province of the same name. Pop. 35,447.—The province, which extends on both sides of the Po, has an area of 1285 sq. miles, partly covered by the Apennines. Pop. 496,832.

PAVILION, in architecture, a turret or small building, usually isolated, having a tent-formed roof, whence the name. A projecting part of a building, when it is carried higher than the general structure and provided with a tent-formed roof, is also called a pavilion.

PAWL, a short piece or bar moving round a pivot at one end, so as to catch in a notch or projection of a revolving body and prevent motion in one direction, as in the capstan or windlass of a ship.

PAWTUCK'ET, a town in Providence co., Rhode Island, 39 miles s.s.w. of Boston. It occupies a pleasant site;

has cotton-mills, print-works, machine-shops, etc.; manufactures of boots, shoes, carriages, and an extensive trade. Pop. 43,110.

PAX, an ecclesiastical utensil in the Roman Catholic church, formed usually of a plate of metal, chased, engraved, or inlaid with figures representing the Virgin and Child, the crucifixion, etc., which, having been kissed by the priest during the Agnus Dei of the high mass, is handed to the acolyte, who presents it to be kissed by each of the ecclesiastics officiating, saying to them Pax tecum (peace to thee). The decorations of the pax are frequently very rich.

PAX-WAX, the name given to the strong, stiff tendons running along the sides of the neck of a large quadruped to the middle of the back, as in an ox or horse. It diminishes the muscular effect needed to support the head in a horizontal position.

PAYMASTER, an officer in the United States army and navy, from whom the officers and men receive their wages, and who is intrusted with money for that purpose. In matters of general discipline the paymaster is subordinate to the commanding officer of his regiment; but in regard to the immediate duties of his office he is directly responsible to the war-office. The paymaster of a ship in the navy has a general charge of the financial department in the vessel.

PAYMASTER-GENERAL, a British government officer whose duties were formerly limited to the army, but who now acts as paymaster-general of all the services. Formerly it was a lucrative, but it is now an unpaid office. The paymaster-general is ex-officio a privy councillor.

PAYNE, Henry B., American politician and capitalist, born at Hamliton, N. Y., in 1810. In 1849 he was elected to the state senate by the democrats, and was their candidate for United States senator in 1851 and for governor in 1857. In 1872 he led the Ohio delegation at the Baltimore convention which nominated Horace Greeley for the presidency. In 1875 he was elected to congress by a fusion of democrats and liberal republicans, and was one of the representatives of the house on the electoral commission in 1877. He was elected United States senator in 1884 and served from 1885 until 1891. He died in 1896.

PAYNE, Henry Clay, American politician, was born in Ashfield, Mass., in 1843. In 1863 he removed to Milwaukee, Wis., and from 1875 to 1885 was postmaster of Milwaukee. In 1880 he became a member of the republican national committee, and in the presidential campaigns of 1896 and 1900, as vice-chairman, conducted the republican campaign in the west. In 1897 he was offered the post of ambassador to Germany by President McKinley, but declined. In January, 1902, he succeeded Charles Emory Smith as postmaster-general in President Roosevelt's cabinet.

PAYNE, John Howard, best known as the author of Home, Sweet Home, was born in New York in 1791. He made his début at the Park theater, New York, February 24, 1809, as Young Norval in Douglas. Payne adapted many plays from the French and produced a number of original ones, among them Brutus, or the Fall of Tarquin, Thérèse, Virginia, and the comedy of Charles II. The song Home, Sweet Home, occurs in his opera of Clari, or the Maid of Milan, which was produced at the Covent Garden theater in May, 1823. He was appointed American consul at Tunis, Africa, in 1842; was recalled in 1845; and reappointed in 1851. He died there April 9, 1852, and was buried in the Cemetery of Saint George at Tunis. In 1883 his remains were brought to Washington.

PEA, a well-known leguminous plant of many varieties. It is a climbing annual plant, and has been cultivated from remote antiquity. It forms one of the most valuable of culinary vegetables; contains much farinaceous and saccharine matter, and is therefore highly nutritious. Its seed-vessel is a pod containing one row of round seeds, which are at first soft and juicy, in which state they are used for the table under the name of green peas. They afterward harden and become farinaceous. A whitish sort, which readily split when subjected to the action of mill-stones, is used in considerable quantities for soups.

PEABODY, a town in Essex co., Mass., five miles northwest of Salem. It adopted its present name in 1868 in honor of the philanthropist, George Peabody, who was born in the township. Peabody institute, which is located here, contains various memorials of its founder. Pop. 12,258.

PEABODY, George, philanthropist, was born at Danvers (now Peabody) Mass., February 18, 1795. Through his energy and skill he found himself in 1830 at the head of one of the largest mercantile concerns in the world. About 1837 he established himself in London, England, as merchant and money-

George Peabody.

broker, and in 1843 he withdrew from the concern in America. It is, however, as a philanthropist that Peabody has made his name a household word. The number of his great benefactions to public objects is too great for mention here. It must suffice to name among the more important a gift of $125,000 for educational purposes at Danvers; $500,000 to found and endow an institution for science in Baltimore, a sum afterward increased by a second donation of $500,000; of various sums to Harvard university; and of $1,750,000 for the erection of dwelling-houses for the working-classes in London, which sum was increased by his will to $2,500,000. He received from the Queen the offer of a baronetcy, but declined it. In 1867 the United States congress awarded him a special vote of thanks for his many large gifts to public institutions in America. He died at Eaton Square, London, November 14, 1869.

PEABODY COLLEGE FOR TEACHERS, a coeducational training school in Nashville, Tenn., founded in 1875 through a benefaction of $1,000,000 by George Peabody, planned to foster the cause of intellectual development in the south. Nashville was selected as the most favorable location, and upon the offer of the trustees the buildings and endowment of the University of Nashville were accepted as the foundation. The university confers the degrees of bachelor and master of arts, sciences, and letters. The college is supported by the state, the University of Nashville, and the Peabody board, which maintains nearly 200 scholarships, distributed by the general agent of the Peabody fund.

PEACE, Breach of. See Breach.

PEACE, Justice of. See Justice.

PEACH, a tree and its fruit, of the almond genus, of many varieties. This is a delicious fruit, the produce of warm or temperate climates. The tree is of moderate stature, but varies in this respect according to soil and climate. The varieties of the fruit, which is a large downy drupe containing a stone, are very numerous, differing in size, flavor, and time of ripening, but they are principally of two sorts, the free-stones and the cling-stones, so called according as the stone separates readily or adheres to the flesh. The peach-tree is supposed to have been introduced into Europe from Persia. In the southern parts of England it is grown out of doors, and in the United States it is extensively cultivated, great quantities being canned for export. The ripe fruit is distilled and made into peach brandy. The nectarine is a smooth variety of the peach.

PEACOCK, called also Peafowl, a large and beautiful gallinaceous bird of the

Peacock.

genus Pavo, properly the male of the species, the female being, for distinction's sake, called a peahen. The common peacock is a native of India and

southeastern Asia. This bird is characterized by a crest of peculiar form, and by the tail coverts of the male extending far beyond the quills, and being capable of erection into a broad and gorgeous disc. The shining, lax, and silky bards of these feathers, and the eye-like spots which decorate their extremities, are known to every one. The colors and plumage are said to be more brilliant in the wild than in the domesticated state. The wild peahen lays from twenty-five to thirty eggs, and produces only a single brood in each year. The young birds of both sexes are feathered alike for the first two years; and in the third year the tail-coverts of the male begin to be developed and to assume their lustrous appearance.

PEANUT, an annual plant, also called groundnut, earthnut, goober, etc. It grows from one to two feet high with thick, greenish, hairy, stems and branches. After the flower has fallen the peduncle bends downward and pushes into the ground where the fruit or pod develops. The pods are pale straw colored, wrinkled, slightly curved, and often contracted in the middle, and contain one or two seeds. Since 1866 it has been an important crop in the United States, and is mainly grown in Virginia, North Carolina, Georgia, and Tennessee.

Peanuts are used as a forage crop and as hay. The ripe nuts and the cake which remains after the oil is pressed are also fed. Peanut kernels resemble other leguminous seeds in being rich in protein. The fat content is also high. If immature pods are left on the vines, no other food is necessary during the winter. Peanut cake mixed with less concentrated feeds has been found to be a useful cattle food. A material called "peanut meal" is made by grinding peanut hulls, immature peanuts, and those of an inferior grade. Of the 4,000,000 bushels of peanuts raised yearly in the United States, 3,000,000 bushels are used as roasted peanuts. Many nuts are used in the manufacture of confectionery and peanut butter. The latter is prepared by grinding the nut and generally mixing it with a little water. Peanut oil is made in large quantities in Europe from African-raised nuts. The shelled nuts contain 30 to 50 per cent of oil, which, if carefully made, is of good flavor, and is used for various culinary purposes and in the arts.

PEAR, a tree growing wild in many parts of Europe and Asia, and from which the numerous cultivated varieties have originated. The fruit is characterized by a saccharine aromatic juice, a soft and pearly liquid pulp, melting in the mouth, as in the butter-pear; or by a firm and crisp consistence, as in the winter bergamots. The pear is chiefly propagated by grafting or budding on the wild pear stock, or on stocks raised from the seeds of cultivated pears, called free stocks. It is also grafted on the quince, medlar, and the white thorn. At the present day more than 200 varieties are enumerated, and constant accessions are made every year. France and the north of Italy are celebrated for the perfection to which they have carried the culture of this fruit. Numerous varieties are cultivated solely for the purpose of making perry, a liquor analogous to cider, and prepared nearly in the same manner. The wood is fine-grained, of a yellowish color, and susceptible of a brilliant polish. In the early ages of Greece it was employed in statuary; now it is used for musical instruments, the handles of carpenter's tools, in wood-engraving, etc.

PEARL, the name applied to a concretion produced within the shells of certain species of bivalve molluscs as the result of some abnormal secretory process. These concretions are highly valued, and are classed among the gems. The production of a pearl is generally begun by the introduction of some foreign body, such as a grain of sand, within the mantle-lobes. The presence of this body has the effect of setting up an irritant action, resulting in the deposition by the mantle of a quantity of nacreous material over the offending particle. This material, in certain species of molluscs, is of such a texture and character, and is so deposited in regular laminæ or layers, that in due time the structure known as a "pearl" varying in worth and brilliancy, is formed. Chief among such molloscs are the pearl-oyster, the pearl-mussel, and the fresh-water mussels.

The chief pearl-oyster fisheries are those of Ceylon, which, together with the fisheries in the Persian Gulf, were known to the ancients. The chief seat of the Ceylon fishery is in the Gulf of Manaar, on the northeast of the island, The best pearls are found about Ceylon, Persia, and other eastern coasts, and inferior ones on the tropical coasts of America. The pearl-oyster occurs throughout the Pacific. Very fine pearls are obtained from the Sulu Archipelago on the northeast of Borneo. Of late years pearl-fishing has been started with considerable success in Australian seas; and it is carried on also in the Gulf of Mexico, upon the coast of California, and in the vicinity of Panamá.

Pearls have formed valued articles of decoration and ornament from the earliest times. Julius Cæsar presented Servilia, the mother of Marcus Brutus, with a pearl valued in modern computation at $240,000; while Cleopatra was said to have swallowed one gem valued at $300,000. A pearl purchased by the traveler Tavernier is alleged to have been sold by him to the Shah of Persia for $900,000. The "Pilgrim" pearl of Moscow is diaphanous in character, and weighs 24 carats.

Artificial pearls are largely made in France, Germany, and Italy. They are very well imitated by the scales of certain fishes. A substitute for black pearls is found in close-grained hæmatite, not too highly polished, and pink pearls are imitated by turning small spheres out of the rosypart of the conch-shell.

PEARL, Mother of. See Mother-of-Pearl.

PEARL-ASH, the common name for carbonate of potassium. See Potash.

PEARL STONE, a felspathic mineral, consisting of silicate of aluminium with varying quantities of iron, lime, and alkalies; it occurs in spherules, which have a pearly luster.

PEARLY NAUTILUS, a name for the common nautilus. See Nautilus.

PEAT, a kind of turfy substance consisting of vegetable matter which has accumulated by constant growth and decay in hollows or moist situations on land not in a state of cultivation, always more or less saturated with water, and consisting of the remains, more or less decomposed, of mosses and other marsh plants. Peat is generally of a black or dark-brown color, or when recently formed, of a yellowish-brown; it is soft and of a viscid consistence, but it becomes hard and darker by exposure to the air. When thoroughly dried it burns, giving out a gentle heat without much smoke, accordingly it is used as fuel in those countries where it abounds, as in Scotland and Ireland. It often covers large areas, forming what is called peat-bogs, and in these the accumulation of solid peat may reach a great depth, sometimes 50 feet or more. When prepared for fuel in the ordinary way it is dug from the bog in rectangular brick-like masses, which are set up to dry on the spot, and when sufficiently dried are carried away and stacked. Peat, as it is cut from the bog, contains from 80 to 90 per cent of water, and when air-dried it retains a proportion of water equal to from 15 to 25 per cent of the whole weight. To increase its value as fuel several methods have been adopted; but in any successful process for treating peat it must be condensed by artificial means, and the water must be expelled and dried out. See Fuel.

PEARY, Robert Edwin, American Arctic explorer, was born at Cresson, Pa., in 1856. In 1887–8 he was engineer-in-chief of the Nicaragua ship canal. In 1891 he started on his first Arctic expedition and made a brilliant record of achievements, not the least of which were the results of his studies and minute experimentation in the field covering every phase of the equipment for Arctic work. He proved that the northern extension of the great interior ice-caps end below latitude 82° n. He also established the insularity of Greenland and ascertained the existence of detached ice-free land masses north of the mainland and the fact that the east and west coasts rapidly converge north of the seventy-eighth parallel. In 1893–95 he made another voyage to the same region. In the spring of 1902 he started over the frozen Arctic ocean from Cape Hecla, on the north coast of Grant Land, in his attempt to reach the North Pole. At his farthest camp in latitude 84° 17′ n. the polar pack became impracticable and further efforts to advance were given up. He had attained the nearest approach to the pole in the American Arctic. Commander Peary was elected president of the American Geographical Society in December, 1902.

PEARY LAND, a name given to the northern coast region of Greenland which was first explored by Peary in 1892.

PEA-WEEVIL. See Pea-beetle.

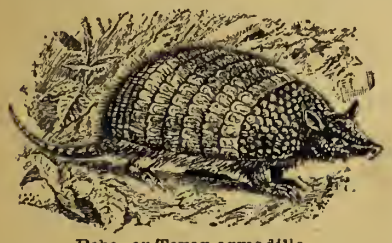
PEBA, a species of the armadillo found in various parts of South America. Its flesh is much valued by the natives.

PEBBLE, in jewelry, a name commonly given to an agate. Scotch agates

are commonly known as Scotch pebbles.

PECAN', Pecan-nut, a species of hickory and its fruit, growing in North America. It is a large tree, with hard, very tough wood, pinnate leaves, and catkins of small flowers.

PEC'CARY, a genus of ungulate quadrupeds, included in the even-toed section of that order, and nearly allied to



Peba, or Texan armadillo.

the swine, in which family the genus is classified. These animals are exclusively confined to America, in which continent they represent the true swine of the Old World. In general form the peccaries resemble small pigs. The best-known species are the collared peccary and the white-lipped peccary. The former occurs abundantly in South America, and also extends into North America, living generally in small flocks, which do not hesitate to attack with their tusks any

Collared peccary.

one who meddles with them. Their food consists of maize, potatoes, sugar-canes, and similar materials; and cultivated fields suffer much from their raids. This species of peccary is readily domesticated. The flesh is savory, and less fat than pigs' flesh. The peccary possesses a glandular sao or pouch, situated in the loins, which secretes a strongly-smelling fluid of fœtid nature. This must be cut away immediately on killing a peccary, to avoid contaminating the flesh.

PECK, the fourth part of a bushel; a dry measure of 8 quarts for grain, pulse, etc. The standard or imperial peck contains 2 gallons or 554.548 cubic inches.

PECK, Harry Thurston, American editor and critic, born in 1856 in Stamford, Conn. His publications include The Semitic Theory of Creation, Suetonius, Latin Pronunciation, and he also edited University Bulletin, A Dictionary of Classical Literature and Antiquities, Classical Studies, Roman Life in Latin Prose and Verse, Trimalchio's Dinner, and a series of Latin classics for college use. In 1890 he became editor-in-chief of The International Encyclopædia, continuing as such until 1901, when, with President Gilman and Professor F. M. Colby, he edited The New International Encyclopædia. In 1895 he became editor of the Bookman.

PECOS RIVER, a river of New Mexico and Texas, which has a southeasterly course of about 600 miles, and falls into the Rio Grande del Norte, but in summer is generally dry.

PECQUET (pek-ā), Jean, born at Dieppe about 1620, died 1674; studied medicine, and especially anatomy, at Montpelier. He discovered and demonstrated the course of the lacteal vessels in the human body.

PED'ALS, parts of the mechanism of a musical instrument acted on by the feet. Pedals are used for different purposes in different instruments. In the organ they are used in two distinct ways: first, to act on the swell and stops when the instrument is played with the hands; second, to act upon a distinct set of pipes, called the pedal organ, and which are played independently. On the pianoforte there was at first only one pedal, used to raise the dampers and prolong the sound after the fingers were lifted from the keys; a second was used to soften the notes, and is called the soft or una-corda pedal; a third has of late years been introduced, which arrests the sound immediately after the note is struck, and produces an artificial staccato. In the harmonium the pedals supply the instrument with wind.

PED'ESTAL, an insulated basement or support for a column, a statue, or a vase. It usually consists of a base, a dado, and a cornice. When a range of columns is supported on a continuous pedestal the latter is called a stylobate.

PED'IGREE. See Genealogy.

PED'IMENT, in classic architecture, the triangular mass resembling a gable, above the entablature at the end of buildings or over porticos. The pediment is surrounded by a cornice, and is often ornamented with sculpture. The triangular finishings over doors and windows are also called pediments. In the debased Roman style the same name is given to the same parts, though not triangular in their form. In the architecture of the middle ages small gables and triangular decorations over openings, niches, etc., are called pediments.

PEDOM'ETER, is an instrument like a watch, which serves to indicate the distance a pedestrian traveler has gone, or rather the number of paces he has made.

PEDRO II., ex-Emperor of Brazil, was born at Rio Janeiro 1825; succeeded to the throne on the abdication of his father, Dom Pedro I., in 1831; and married the Princess Theresa Christina Maria (died 1890), sister of Francis I., king of Naples, in 1843. Brazil prospered greatly under the rule of Pedro II., who did much to develop its resources in every direction. In 1871 he issued an imperial decree for the gradual abolition of slavery, which totally ceased in Brazil in May, 1888. He was deposed by the revolution of November, 1889, and died at Paris in 1891.

PEDUN'CLE, in botany, the stem or stalk that supports the fructification of a plant, i. e., the flower and the fruit.

PEEKSKILL, an industrial town of the United States, state of New York, on Hudson river, 43 miles north of New York City. Pop. 11,917.

PEEL, Arthur Wellesley, Viscount, youngest son of Sir Robert Peel, born 1829. He was educated at Eton and Oxford; was member for Warwick (1865–1895); parl. sec. to Poor-law board (1868–71); sec. to Board of Trade (1871–73); patronage sec. to treasury (1873–74); under sec. for Home department (1880); succeeded Sir Henry Brand in 1884 as speaker of the House of Commons, retiring in 1895; was chairman of the Licensing commission of 1896–1900 and drafted the minority report.

PEEL, Sir Robert, British statesman, was born 5th February, 1788, near Bury in Lancashire. Immediately on attaining his majority he was elected member of parliament for Cashel; in 1810 he became under-secretary of state for the colonies, and in 1812–18 he was chief secretary for Ireland. In 1822, under the Liverpool ministry, he

Sir Robert Peel.

became home secretary, and continued in this office till the dissolution. Refusing to take office under Canning, he joined the ministry of the Duke of Wellington in 1828 as home secretary. The principal act of this ministry was the passing of the Roman Catholic relief bill, which cost Peel his seat for Oxford. Peel also passed the New Metropolitan Police Act, which gave rise to the new nicknames Bobbies and Peelers for the London police. In 1830 he succeeded his father as baronet. In the election of 1832 he was returned for Tamworth, for which he continued to sit during the remainder of his life. On the dismissal of the Whig government in 1834 Peel undertook the government but his party in the house being in a minority the task was hopeless. After a brief struggle the ministry resigned, and were succeeded by the Whig ministry of Lord Melbourne, which lasted from 1835 to 1841. The general election of 1841 gave a large majority to Sir Robert Peel, and the formation of a conservative ministry could no longer be delayed. In the session of 1842 the most important measures were the sliding-scale, by which a considerable reduction was made on the duties on the importation of corn; the imposition of an income-tax for three years, but

which, with various alterations, has continued to be levied to the present time; and a revision of the tariff. In 1844 and 1845 he passed his celebrated English and Scotch Banking Acts. During the recess in 1845 the potato-rot and famine in Ireland brought the question of the corn-laws to a crisis, and Peel declared in favor of their total repeal. The act repealing corn-laws (after a modified duty for three years) was passed 26th June, 1846. On the same day the ministry was defeated in the House of Commons on the Irish Coercion bill, and on the 29th of June Sir Robert Peel resigned. As leader of the opposition he supported many of the measures of the government of Lord John Russell, who succeeded him; but the policy of Lord Palmerston after the revolution crisis of 1848–49 evoked from him a more active hostility to the ministry. On 29th June, 1850, he was thrown from his horse, and received injuries of which he died on 2d July. By his will he renounced a peerage for his family, as he had before declined the Garter for himself.

PEER, in general, signifies an equal, one of the same rank and station. In this sense it is used by the common law of England, which declares that every person is to be tried by his peers. Peer also signifies in Britain a member of one of the five degrees of nobility that constitute the peerage (duke, marquis, earl, viscount, baron), or more strictly a member of the House of Lords. The dignity and privileges of peers originated with the growth of the feudal system, the peers being originally the chief vassals holding fiefs directly from the crown, and having, in virtue of their position, the hereditary right of acting as royal counselors. Subsequently not all the crown vassals appeared at court as advisers of the king, but only those who were summoned to appear by writ. This custom grew at length into a rule, and these summonses were considered proofs of hereditary peerage. Latterly the honor of the peerage has been exclusively conferred by patent. As regards their privileges all peers are on a perfect equality. The chief privileges are those of a seat in the House of Lords, of a trial by persons of noble birth in case of indictments for treason and felony, and misprison thereof, and of exemption from arrest in civil cases. The British peerage collectively consist of peers of England, of Scotland, of Great Britain, of Ireland, and of the United Kingdom, but only a portion of the Scotch and Irish peers are peers of parliament. The lords spiritual, though sitting in the House of Lords, are not considered peers.

PEF'FER, William Alfred, an American lawyer, born in 1831 in Cumberland co., Pa. In 1865 he removed to Kansas, established the Fredonia Journal and the Coffeyville Journal. In 1874 he was elected to the state senate, in 1880 was a republican presidental elector, and in 1881 assumed the editorship of the Kansas Farmer. From 1891 to 1897 he represented the people's party in the United States senate, and in 1898 was nominated by the prohibitionists for governor of Kansas. Among his publications are:

Peffer's Tariff Manual, The Way Out, The Farmer's Side, Americanism in the Philippines, Rise and Fall of Populism in the United States.

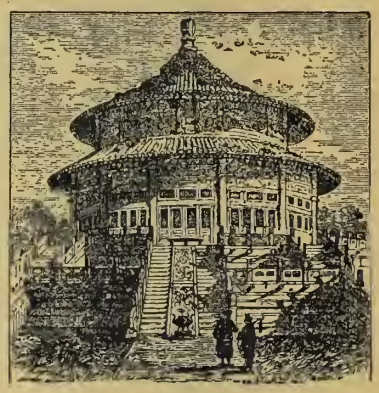
PEG'ASUS, in Greek mythology, a winged horse, the offspring of Poseidon and Medusa. Bellerophon made use of Pegasus in his fight with the Chimæra. With the stroke of his hoof Bellerophon called forth the sacred well Hippocrene, on Mount Helicon, from which he was in later times called the horse of the muses.

PEGU (pe'gö), now a division of Lower Burmah, but previous to 1757 a powerful and independent kingdom, and from that period up to 1853 a province of the Burmese empire, from which it was severed and annexed to the British dominions in 1853. The province comprised the whole delta of the Irrawady; area, 25,964 sq. miles; pop. 2,323,512. The modern division of Pegu lies mainly on the east of the lower Irrawady; area, 9159 sq. miles; cultivated area, 2043 sq. miles; pop. 1,818,845. Chief town, Rangoon.

PEI-HO (pe-i-hō'), a river of Northern China, rises near the Great Wall, and flows southeast to the Gulf of Pechelee. It is navigable for boats to within 20 miles of Peking, which it passes at the distance of about 10 miles.

PEIRCE, Benjamin, born in Salem, Mass., April 4, 1809; died October 6, 1880. He graduated in 1829 at Harvard, where he became professor of mathematics and natural philosophy, and afterward of astronomy, holding the latter chair until his death. Professor Pierce was for many years connected with the United States coast survey and made several valuable observations of eclipses and other celestial phenomena. He achieved great note as a mathematician, was a member of the American Academy of Arts and Sciences, of the Royal Astronomical society, and of many other learned bodies. His writings on mathematics are text-books in all American colleges. He died in 1880.

PEKING', or **PEKIN',** the capital of the Chinese empire, in the province of Chih-le or Pechelee, on an extensive, barren, sandy plain, between the rivers Pei-ho and Hoen-ho, about 40 miles from the Great Wall, and 100 miles from the Gulf of Pechelee. The entire circuit of the walls and suburbs of Peking is reckoned at 30 miles. There are in all sixteen gates leading into the city, each protected by a semicircular enciente, and a higher tower built in galleries. The city consists of two portions, the north or Tartar city, and the south or Chinese city. The former is built in the shape of a parallelogram, and consists of three inclosures, one within the other, each surrounded by its own wall. The innermost inclosure ("the forbidden city") contains the imperial palace, and buildings connected with it, in which the emperor and royal family reside. The second inclosure ("the imperial city") is the residence of the imperial princes and officials of the highest rank. The outer or Tartar city proper is the seat of the six supreme tribunals, and contains the legations of Great Britain, France, the United States, and Russia. In the Chinese city broad straight streets run from gate to gate, intersecting each other at right angles, but they are unpaved, and in rainy weather impassable from mud. Among the principal public buildings of Peking are the Temple of Eternal Peace, belonging to the lamas; the Mohammedan mosque; the observatory; the temple of agriculture and the temple of heaven. In the latter temple the emperor periodically offers sacrifice. It occupies a commanding position, and is approached from the different sides by magnificent alabaster stairs. There are religious edifices appropriated to many forms of religion, the principle of toleration being here



Temple of Heaven, Peking.

carried to the utmost extremity. Among the institutions of Peking are the national college, the medical college, astronomical board, and the imperial observatory. Peking is regarded by the the Chinese as one of their most ancient cities, but it was not made the capital of the country until its conquest by the Mongols about 1282. In the war of 1860 Peking was occupied by the British and French. In 1900 the foreign colony was besieged, and, was relieved by an international force after severe fighting. Pop. variously estimated at from 500,000 to 1,650,000.

PELEE (pā-lā'), Mont, an active volcano of the island of Martinique, situated in its northwestern part, in about latitude 14° 48′ n. The elevation of the culminating point previous to May, 1902, was about 4300 feet; of the newly formed cone, with its extended "plug" or obelisk, in May, 1903, 5200 feet. The historically recorded eruptions of Mont Pelée are those of 1762, August, 1851, and 1902-03. The great eruptions of 1902 were from the basin of the Etang Sec, or "Dry Lake." The active opening of this crater was on April 25, 1902; on May 5th, descended the "avalanche" of boiling black mud that destroyed the sugar estate of Guérin, and buried beneath its mass thirty or more, and on May 8th the black cloud of explosive and exploded superheated steam, destroyed Saint Pierre, and about 30,000 people. The second death-dealing eruption of Mont Pelée took place on August 30th at about 9 p.m. The loss of life in this later explosion has been estimated at from 2000 to 2500.

PELEUS (pē'lūs), in Greek mythology,

son of Æăcus, king of Ægina. After many adventures he became master of a part of Thessaly, and married the nymph Thetis, by whom he became the father of Achilles. The nuptials were celebrated on Mount Pelion, and honored with the presence of all the gods, who brought rich bridal presents. After his death he received divine honors.

PELEW' ISLANDS, a group belonging to the Caroline Archipelago, in the North Pacific ocean. They are about twenty in number, extend nearly n.n.e. and s.s.w. 87 miles, and are completely encircled by reefs. They are fertile, and enjoy a good climate The inhabitants are Polynesians, and have generally got a high character from visitors. Pop. 6000.

PE'LIAS, a genus of serpents, including the common víper or adder.

PEL'ICAN the name of several web-footed birds. They are larger than the swan, have a great extent of wing, and are excellent swimmers. Pelicans are gregarious, and frequent the neighborhood of rivers, lakes, and the sea-coast, feeding chiefly on fish, which they capture with great adroitness. They have a large flattened bill, the upper mandible terminated by a strong hook, which curves over the tip of the lower one; beneath the lower mandible, which is composed of two flexible, bony branches meeting at the tip, a great pouch of naked skin is appended, capable of holding a considerable number of fish, and thus enabling the bird to dispose of the superfluous quantity which may be taken during fishing expeditions, either for its own consumption or for the nourishment of its young. The species are found in Europe, Asia, Africa, and America. They sometimes perch upon trees; the nest is of rough construction, usually placed close to the water. The common or white pelican is colored a delicate white, tinged with rose or pink. The young birds are fed by the parents with fishes from the pouch, and the males are said to feed the incubating females in a similar manner. The common pelican inhabits Europe, Asia, and

Pelican.

Africa. About the middle of September flocks repair to Egypt. During the summer months they take up their abode on the borders of the Black Sea and the shores of Greece. They are rare in France and unknown in Britain. The pelican is not only susceptible of domestication, but may even be trained to fish for its master.

PELISSIER (pā-lēs-yā), Jean Jacques Amable. Duc de Malakoff, Marshal of France, was born in 1794, died in Algeria 1864. In 1855 he replaced Canrobert as commander-in-chief of the French army in the Crimea; and by the vigor with which he pushed the siege he justified the expectations which had been formed of him. On the capture of the Malakoff and the fall of Sebastopol Pélissier received his marshal's baton, and an annual pension of 100,000 francs. He was afterward vice-president of the senate, a privy-councillor, and ambassador to England (1858). In 1860 he was appointed governor-general of Algeria.

PELOPONNE'SUS, the peninsula which comprehends the most southern part of Greece, now called the Morea. Peloponnesus was anciently divided into six states: Messenia, Laconia (Sparta), Elis, Arcadia, Achaia, and Argolis, to which some add Sicyon. See Greece and articles on the different states.

PE'LOPS, in Greek mythology, son of Tantalus, king of Lydia. He married Hippodamia, a daughter of King Œnomaus of Elis, and succeeded his father-in-law in that kingdom. Peloponnesus received its name from him. Of his sons, Atreus and Thyestes are most celebrated. Many and very different myths are connected with his name.

PELVIS (Latin, pelvis, a basin), the bony basin formed by the "haunch-bones" and sacrum of Vertebrata, which

Pelvis.

a, Ilium; *b*, ischium; *c*, pubis; *d*, symphysis pubis; *e*, sacrum; *f*, coccyx; *g*, acetabulum or cavity for head of thigh-bone.

constitutes the girdle or arch giving support to the lower or hinder limbs. The pelvis thus corresponds to the shoulder-girdle of the upper or fore limbs; and forms a cavity or basin in which several of the abdominal viscera, and organs relating to reproduction and the urinary functions, are protected and contained. The pelvis of man differs materially from that of woman, the differences having chiefly reference to the greater capacity required for the womb during pregnancy and for the expulsion of the child at birth. It also varies somewhat in the different races of men.

PEM'BROKE, a parliamentary and municipal borough and seaport of South Wales, a capital of the county of the same name, on a creek on the southern side of Milford Haven, 206 miles west of London. The county is bounded by Cardiganshire, Carmarthenshire, the Bristol Channel, and St. George's channel; area, 391,181 acres, of which about 300,000 acres are under cultivation. Pop. 88,749.

PEM'ICAN, originally a North American Indian preparation consisting of the lean portions of venison dried by the sun or wind, and then pounded into a paste and tightly pressed into cakes. Pemican made of beef has sometimes been used by travelers.

PEN, an instrument for writing with a fluid. Pens of some sort have been in use from very early times, adapted to the material on which the characters were to be inscribed. The metallic stilus for the production of incised letters was probably the earliest writing implement. It was used by the Romans for writing on tablets coated with wax; but both they and the Greeks also used what is the true ancient representative of the modern pen, namely, a hollow reed, as is yet common in eastern countries. It has been asserted that quills were used for writing as early as the 5th century A.D. In Europe they were long the only writing implement, the sorts generally used being those of the goose and swan. Up till the end of the first quarter of the present century these formed the principal materials from which pens were made. In 1803 Mr. Wise produced steel pens of a barrel form, mounted in a bone case for carrying in the pocket. Joseph Gillott commenced the manufacture about 1820, and succeeded in making the pen of thinner and more elastic steel, giving it a higher temper and finish. Improvements have so reduced the cost and raised the quality, that a gross of better pens are now sold by the same makers at one-sixth of the price of a single pen in 1821. Gold pens tipped with minute particles of iridium are now in somewhat extensive use, and a good one will last for years. Fountain pens and penholders, to carry a considerable supply of ink and to discharge it in an equal manner, were invented by Joseph Bramah. The most successful form of fountain pen yet introduced is the stylograph patented in the United States by Cross 1878, and by Mackinnon 1879.

PENAL LAW. See Criminal Law.

PENANCE, in theology, a punishment accepted or self-imposed by way of satisfaction and in token of sorrow for sin. In the early Christian church penances were of three kinds—secret, public, and solemn. The first consisted of such actions as are commonly imposed by confessors at the present day, as the repetition of certain prayers, etc. Public penance was in use from the earliest days of the church. It was often very severe, and the penitents had to make a public confession of their sins in the church. It became gradually the custom of the bishops to commute the canonical penances for pious works, such as pilgrimages, alms-deeds, and other works of charity—and these again were exchanged for indulgences. In the Roman Catholic church penance is one of the seven sacraments. The matter of it consists of the three acts of the penitent: 1, Contrition, or heartfelt sorrow for sin as being an offense against God; 2, Confession to an authorized priest; and 3, Satisfaction, or the acceptance and performance of certain penitential works in atonement of the sin; and the form of the sacrament is the sentence of absolution from sin pronounced by the priest who received the confession, and has been satisfied of the earnest repentance of the sinner. According to the doctrine of the Protestants there is no such sacrament; they consider repentance and

faith as the only requisites for forgiveness.

PENANG', Pulo-Penang, or Prince of Wales Island, an island belonging to Great Britain, lying at the north entrance of the Straits of Malacca, off the west coast of the Malay Peninsula, from which it is separated by a channel 2 to 5 miles across; area, 107 sq. miles. The island produces cocoa-nuts and arecanuts, nutmegs and cloves, rice, sugar, coffee, and pepper. Georgetown, or Penang (pop. 84,948), the capital and port of the settlement, is a handsome town, rapidly increasing in size, and has a large commerce. Pop. of Penang, 128,830.

PENCIL, an instrument used for painting, drawing, and writing. The first pencils used by artists were probably pieces of colored earth or chalk cut into a form convenient for holding in the hand. On the introduction of moist colors, however, delicate brushes of fine hairs were used. Pencils of this kind, and of various degrees of fineness are now almost solely used by painters for laying on their colors; but in China and Japan they are generally employed, instead of pens, for writing. The hairs used for these pencils are obtained from the camel, badger, squirrel, sable, goat, etc. Black-lead pencils, for writing or drawing, are made of graphite or plumbago (otherwise known as black-lead), generally cased in cedar wood. The comparative hardness and blackness of pencils are attained by the degree of heat to which they are subjected and the proportions of graphite and clay in the leads. Nuremberg is the great center of the lead-pencil trade. Colored pencils are prepared from various chalks, such as are used for crayons, instead of the graphite. Pencils for writing on slate are made by cutting slate into small square pieces and rounding them, or into narrow slips and incasing them in wood.

PENDEN'TIVE, in architecture, the portion of a dome-shaped vault which descends into a corner of a quadrangular opening when a ceiling of this kind is placed over a straight-sided area; in

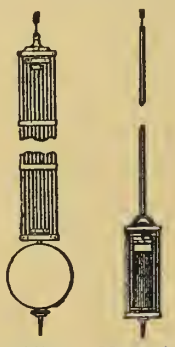
Pendentive roof, Salisbury cathedral *a a a*, pendentives.

Gothic architecture, the portion of a groined ceiling springing from one pillar or impost, and bounded by the ridges or apices of the longitudinal and transverse vaults.

PENDLETON, Edmund, American statesman, was born in Carolina co., Va., in 1721. He was a delegate to the First Continental congress and was president of the Virginia conventions of 1775 and 1776. The resolution of May, 1776, instructing the state delegates to introduce a declaration of independence in congress was written by him. In 1788 he presided over the Virginia convention which ratified the federal constitution, he himself taking an active part in the debate and being largely responsible for the final decision. He died in 1803.

PENDLETON, George Hunt, born in Cincinnati, Ohio, July 15, 1825. He practiced law in Cincinnati, served in the state senate, and from 1856 until 1865 sat in congress as a democrat. In 1864 he was nominated for vice-president of the United States on the democratic ticket, headed by George B. McClellan. From 1879 until March, 1885, he was United States senator from Ohio, and in the latter year was appointed by President Cleveland, minister to Germany. He died in 1889.

PENDULUM, in the widest sense, a heavy body suspended so that it is free to turn or swing upon an axis which does not pass through its center of gravity. Its only position of stable equilibrium is that in which its center of gravity is in



Gridiron pendulum. Mercurial pendulum.

the same vertical plane with the axis. If the body is displaced from this position it will tend to return to it, and it will oscillate or swing from one side of that position to the other until its energy is destroyed by friction, and it at length comes to rest. A small, heavy body suspended from a fixed point by a string, and caused to vibrate without much friction, is called a "simple pendulum." A true simple pendulum is a mathematical abstraction: a heavy particle, an inextensible and inflexible weightless string, and no friction; these conditions are only approximated to in nature. The ordinary pendulum is what is properly a "compound pendulum." A compound pendulum, as seen in clocks, is usually a rigid, heavy, pendulous body, varying in size according to the size of the clock, but the "seconds" pendulum may be considered the standard. The pendulum is connected with the clockwork by means of the escapement, and is what renders the going of the clock uniform. In a clock it is necessary that the period of vibration of the pendulum should be constant. As all substances expand and contract with heat and cold, the distance from the center of suspension to the center of gravity of a pendulum is continually altering. Pendulums constructed so that increase or diminution of temperature do not affect this ratio are called compensation pendulums. These take particular names, according to their forms and materials, as the gridiron pendulum, the mercurial pendulum, etc. The former is composed of a number of rods so connected that the expansion or contraction of certain of them is counteracted by that of the others. The mercurial pendulum consists of one rod with a vessel containing mercury at the lower end, so adjusted in quantity that whatever alterations take place in the length of the pendulum, the center of oscillation remains the same, the mercury ascending when the rod descends, and vice versâ.

PENEL'OPE, in Greek mythology, the wife of Odyssus (Ulysses) and mother of Telemachus, who was but an infant when his father sailed against Troy. During the protracted absence of Odysseus, Penelopē was surrounded by a host of suitors, whom she put off on the pretext that before she could make up her mind she must first finish a large robe which she was weaving for her father-in-law Laërtes. To gain time she undid by night the work she had done by day. Her stratagem was at last communicated to the suitors by her servants, and her position became more difficult than before; but fortunately Odysseus returned in time to protect his spouse, and slay the obnoxious wooers who had been living in riot and wasting his property.

PENGUIN, a family of natatorial or swimming birds adapted for living almost entirely in the water. They possess only rudimentary wings, destitute of quill-feathers, and covered with a scaly integument or skin. Although useless as organs of flight the wings are very effective aids in diving, and on land they may be used after the fashion of fore-limbs. The legs are placed at the hinder extremity of the body, and the birds assume an erect attitude when on land. The toes are completely webbed. They inhabit chiefly the high southern latitudes, congregating sometimes in

Emperor penguin.

colonies of from 30,000 to 40,000. There are three different types of penguins, represented by the king penguin, the jackass penguin, and the rockhopper. The jackass penguin and the rockhopper are about 2 feet 3 inches in height, and

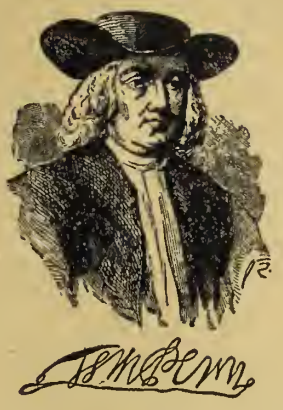
the king penguin somewhat larger; but a fossil penguin of the upper Eocene stood from 6 to 7 feet high.

PENIN'SULA, a portion of land almost surrounded by water, and connected with the mainland by a narrow neck or isthmus.

PENINSULAR WAR, The, was caused by the intrigues and ambition of Napoleon, who proposed the partition of Portugal (1807), and placed his brother Joseph upon the throne of Spain. For a time the whole peninsula was occupied by French troops, but the Spanish and Portuguese peoples rose in defense of their liberties, and waged a fierce guerilla warfare against the invaders. Britain joined the patriots in 1808. Of the memorable struggle which ensued the main features were the retreat of Sir John Moore to Coruña, and his glorious death there; the accession of Sir Arthur Wellesley (afterward Duke of Wellington) to the supreme command, his formation of the celebrated lines of Torres Vedras, where he held the French armies in check until he had accomplished the complete liberation of Portugal; and his subsequent victorious march through Spain, marked by the great battles of Salamanca (1812) and Vittoria (1813). In the spring of 1814 the tide of war rolled through the passes of the Pyrenees into the south of France, where this great struggle was concluded by the crowning victory of Toulouse.

PENITENTIARY, a prison in which convicted offenders are confined and subjected to a course of discipline and instruction with a view to their reformation. Penitentiaries, in this latter sense, were instituted by act 19 George III. cap. vii. See Prison.

PENN, William, the founder of the state of Pennsylvania, was born in London in 1644. From his father he had inherited a claim upon the government of $80,000, and in settlement of this claim the government in 1681 granted him large territories in North America, the present state of Pennsylvania, with right to found a colony or society with such laws and institutions as expressed his views and principles. The following year Penn came over to America and laid the foundations of his colony on a democratical basis, and with a greater degree of religious liberty than had at that time been allowed in the world. A great number of settlers, not only Quakers, but members of all denominations, Englishmen, Germans, Swedes, gathered together; the city of Philadelphia was laid out upon the banks of the Delaware, and the colony soon came into a most flourishing condition. He remained in the province about two years, adjusting its concerns, and establishing a friendly intercourse with his colonial neighbors. Soon after Penn returned to England King Charles died (1685); and the respect which James II. bore to the late admiral, who had recommended his son to his favor, procured to him free access at court. He made use of this advantage to solicit the discharge of his persecuted brethren, 1500 of whom remained in prison at the decease of the late king; and his influence is thought to have hastened, if it did not occasion, the proclamation for a general pardon, and the repeal of religious tests and penalties. At the revolution in 1688 Penn's intimacy with the abdicated monarch created suspicions, in consequence of which he was accused of



treason, and withdrew from public notice till 1693. In 1699 he again sailed for Pennsylvania, intending to make it the place of his future residence; but he returned to England again in 1701. He died at Ruscombe, Berks, 30th July, 1718.

PENNON, a small triangular flag carried by the knights of the middle ages near the points of their lances, bearing their personal devices or badges, and sometimes richly fringed with gold.

PENNSYLVANIA, one of the United States of North America, bounded by New York, Lake Erie, Ohio, W. Virginia, Maryland, Delaware, and New Jersey; area, 45,215 sq. miles. Except on the east, where the river Delaware forms an irregular boundary line, its sides form an almost exact parallelogram facing the cardinal points. The surface is traversed southwest to northeast by the Alleghany chain, and covered by many smaller ranges, which are more or less parallel to it. On the east side the Alleghanies are rugged and steep, but on the west descend very gradually, and then stretch out into an extensive

Seal of Pennsylvania.

table-land. The principal rivers are the Delaware, which receives the Lehigh and the Schuylkill; the Susquehanna; and the Alleghany, which unites at Pittsburg with the Monongahela to form the Ohio. Pennsylvania is one of the healthiest states of the Union. The soil has various grades of fertility, but is in general well adapted for agricultural operations. The richest and most highly cultivated tract is southeast of the mountains on both banks of the Susquehanna.

Pennsylvania's agriculture is highly varied and quite large. The state leads the country in the production of rye and is second in buckwheat, having one-third of the total acreage of the country in that staple. Potatoes, sweet corn, and cabbage form a large part of its products. Its fruit industry is also large. Sixty-six per cent of its fruit trees are apple trees. The state ranks fourth in dairy products, and its poultry production is very large.

In manufactures Pennsylvania ranks second. It furnishes 54 per cent of all the iron manufactures of the country. It ranks first in foundry and machine-shop products, furnishing more than one-half the locomotives of the country. A different group of industries, less dependent upon the material resources of the state, is the manufacture of textiles, in which the state takes second rank. Philadelphia, the principal seat

of the industry, is the largest textile center in the country. Pennsylvania ranks second in the manufacture of woolen goods and hosiery. In 1900 Pennsylvania manufactured 48 per cent of the total carpet product of the United States. More ingrain carpets are probably made in Philadelphia than in any other city in the world.

Coal, iron, and salt are found in almost exhaustless abundance. In the mountain districts of the south and east to the west of the Susquehanna an anthracite coal-field occurs over an area estimated at 472 sq. miles; while to the west of the Alleghanies a vast bituminous coal-field, of which Pittsburg may be considered the center, has been traced over an area of 12,300 sq. miles. The annual output of coal alone exceeds in value the total mineral product of any other state. Anthracite has been mined continuously since 1820. The anthracite coal fields of Pennsylvania yield almost the entire product for the United States, and represent the only high-grade anthracite producing region in the world. It was not until about 1875 that bituminous coal began to be extensively used in iron-smelting, but since then it has far exceeded anthracite in annual tonnage. There are about 100,000 employees engaged in coal mining.

Pennsylvania has always ranked first in the production of coke, usually yielding about two-thirds of the total for the United States. Pennsylvania is without a rival in the stone-quarrying industry. The production of slate is about two-thirds that for the whole country. Pennsylvania also ranks first in the amount of limestone quarried. About two-fifths of the limestone is used for flux, and a somewhat less amount is burned into lime. Pennsylvania stands second in the value of its clay products and first in the output of brick. The state produces in value over half the total product of Portland cement for the United States. Some rock cement is also produced. Other products worthy of note are metallic paint, mineral water, salt, and ochre. The strata of both coal fields contain many valuable seams of ironstone, and both the smelting and working of iron have long been regarded as the most important interest of the state. An accession of immense value was the discovery of petroleum in 1859. In railroad mileage Pennsylvania is exceeded by only one state, having upward of 10,500 miles of road, with proportional passenger and freight traffic.

Philadelphia and Erie are ports of entry. Philadelphia ranks third among the Atlantic coast ports in the value of its foreign trade. Erie has one of the best harbors on Lake Erie, and carries on a large import trade in Michigan iron and Canadian lumber, and exports large quantities of coal. Pittsburg has an immense inland trade, while its local shipyards build large numbers of steamboats for use on the western streams.

The largest religious denomination is the Methodist Episcopal. Education is free but not compulsory. Among the higher educational institutions are the University of Pennsylvania, Philadelphia, and Pennsylvania college, Gettysburg. Harrisburg, though an insignificant place compared with Philadelphia, Pittsburg, and several other towns, continues to be the capital.

Pennsylvania was settled by the Dutch when, on Aug. 28, 1609, Henry Hudson anchored in Delaware Bay in his ship the Half Moon. The grant of the extensive territory called Pennsylvania, made by Charles II. in 1681 to William Penn, carried with it full proprietorship and dominion, saving only the king's sovereignty. In 1682, when Penn crossed the sea to take possession, he found the western bank of the Delaware already occupied by nearly 6,000 Swedes, Dutch, and English, the Swedes having begun a settlement in 1638. To these, as to settlers from all nations, he conceded equal liberties. English Quakers, Scotch and Irish Presbyterians, German Mennonites, French Huguenots, men of all religions, were alike welcome; the population increased for a few years at the rate of one thousand a year; then more rapidly, so that at the end of seventy-five years it exceeded 200,000. Though stout against the Stamp Act of 1765 and other parliamentary encroachments, Pennsylvania was not swift to move; a committee of safety seized the reins till the people could speak through a representative convention. The convention espoused the revolution; in September, 1776, a state constitution was promulgated, in 1778 the old charter was formally annulled and the Penn claims silenced by payment of $650,000. During the war Pennsylvania was the scene of important events—the deliberations of the congress and the declaration of independence in 1776; the battles of Brandywine and Germantown in 1777; the British occupation of Philadelphia, and the encampment of Washington at Valley Forge, in 1777–78. A brief but violent mutiny of the unpaid soldiery of Pennsylvania in 1781 led congress to adopt a better system of finance, under the wise guidance of Robert Morris of Philadelphia. In 1812, at the outbreak of war with Great Britain, Pennsylvania promptly furnished its quota of troops. Internal improvements were projected early, and the Schuylkill canal was begun in 1815 and completed in 1825. From 1829 to 1836 the projected improvements called for the construction of 292 miles of canal and 126 miles of railroad, at a total cost of $35,000,000. The first bill for a public school system was passed in the face of violent opposition in 1834. Though the iron and coal had been known to exist before the revolution, it was not until 1839 that anthracite was successfully applied to the manufacture of iron. The first oil well was sunk near Titusville in 1859. At the opening of the war with the southern states in 1861, in response to the president's call for 14,000 men as the state's quota, Pennsylvania sent 25,975, and during the war furnished a total of 387,284. No other northern state was invaded. At Gettysburg, near the state border, a three days' battle was fought, June 30 to July 3, 1863, resulting in a decisive victory of the federal forces. In 1864 Chambersburg was burned by the confederates.

A criminal combination in the anthracite mining region, known as the "Molly Maguires," was broken up in 1876 by due course of law, twenty men being hanged for murder. In 1877 the "railroad riots," an outbreak of dissatisfied railway employees, caused a vast destruction of property at Pittsburg and vicinity, but were quelled by the military. The constitution has been four times revised—in 1838, 1850, 1857, 1874.

In national elections the state was at the outset federalist, but in 1796 fourteen of its fifteen votes were cast for Jefferson. Eight votes were cast for him again in 1800, while seven went to the federalist candidate. From this time until 1840 the state was democratic. The state gave its vote to Polk in 1844, to Taylor in 1848, and in 1852 and 1856 to the democratic candidates. Since 1860 the state has been overwhelmingly republican in national affairs, though, on account of factional fights in the republican ranks, a democratic governor has been twice elected. Population 7,450,000.

PENNSYLVANIA DUTCH, a German dialect mixed with English spoken in Pennsylvania by German settlers and their descendants.

PENNSYLVANIA, Historical Society of, an association organized in Philadelphia in 1824. Its object is the elucidation of history with special reference to that of Philadelphia. It has a valuable historical library and a museum at Philadelphia. The society has a subscribed publication fund of $40,000, the revenue from which is expended in printing matter of historic interest.

PENNSYLVANIA, University of, an institution of higher learning in Philadelphia, Pa., established in 1740 as a charitable school and raised to the grade of an academy in 1751. In 1755 the institution was converted into the College and Academy of Philadelphia. In 1791 an act was passed amalgamating the old college with the new university under its present title. In 1872 the university was moved to its present site.

The departments of the university are the college, including the school of arts, the Towne Scientific school and the courses for teachers, the departments of philosophy (graduate school), law, medicine, dentistry, veterinary medicine, and archæology; the Wistar institute of anatomy and biology; the laboratory of hygiene, the veterinary hospital, the library and the Flower astronomical observatory, physical education. The school of art offers courses in arts and science, finance and commerce, biology and music. The Towne scientific school offers courses in architecture, science, and technology, mechanical, electrical, civil, and chemical engineering, and chemistry.

The university confers the degrees of bachelor of arts, laws, music, and science, master of arts and science, doctor of philosophy, medicine, dental surgery, and veterinary medicine, and the technical degrees of civil, mechanical electrical, and chemical engineer.

PENNY, a British coin (formerly of copper since 1860 of bronze), the twelfth part of a shilling. It was at first a silver coin weighing about 22½ grains troy, or the two-hundred-and-fortieth part of a Saxon pound. Till the time of Edward I. it was so deeply indented by a cross mark that it could be broken into halves (thence called half-penny) or quarters (fourthings or farthings). Its weight was steadily decreased till at last, in the reign of Elizabeth, it was fixed at $7\frac{3}{31}$ grains, or the sixty-second part of an ounce of silver. Copper pennies were first coined in 1797, but copper half pennies and farthings had been in use from 1672.

PENNYWEIGHT, a troy weight containing 24 grains, each grain being equal in weight to a grain of wheat from the middle of the ear, well dried. It was anciently the weight of a silver penny, hence the name.

PENOB'SCOT, the largest river of Maine, United States of America. It flows 300 miles south by west to Penobscot bay. It is navigable for ships to Bangor, 60 miles, where the tide rises 17 feet.

PENSACO'LA, a port of entry and capital of Escambia co., Florida, on the Pensacola bay, 64 miles east of Mobile. Pensacola suffered considerably in 1861 during the American civil war. Vessels drawing 21 feet can approach the town, and the bay is one of the safest and most capacious in the Gulf of Mexico.

It is a naval station and depot, and is well defended by several strong forts. Pop. 20,110.

PENSIONS, annual allowances of money settled upon persons, usually for services previously rendered. In Great Britain, besides large sums devoted to pensioning army and navy men, pensions are conferred upon the judges of the higher courts and upon many other civil officers who have performed their duties for a specified number of years and then resigned their active functions. They are also frequently granted to distinguished and meritorious authors, artists, scientific men, inventors, and the like, or to their widows or families, for the purpose of rewarding personal merit and of encouraging literature, art, and science. The policy of the United States government has confined the bestowment of pensions to the officers and privates who have served in the army or navy during the wars in which the republic has been engaged, or who have been wounded or otherwise disabled while in active service, and to their widows, children, and other dependent relatives.

THE NUMBER OF PENSION CLAIMS, PENSIONERS, AND DISBURSEMENTS, 1861–1905, ARE AS FOLLOWS:

Fiscal Year Ending June 30	Total Number of Applications Filed	Total Number of Claims Allowed	Number of Pensioners on the Roll			Disbursements
			Invalids	Widows, Etc.	Total	
1861	.....	.....	4,337	4,299	8,636	$1,072,461.55
1862	2,487	462	4,341	3,818	8,159	790,384.76
1863	49,332	7,884	7,821	6,970	14,791	1,025,139.91
1864	53,599	39,487	23,479	27,656	51,135	4,504,616.92
1865	72,684	40,171	35,880	50,106	85,986	8,525,153.11
1866	65,256	50,177	55,652	71,070	126,722	13,459,969.43
1867	36,753	36,482	69,565	83,618	153,183	18,619,956.46
1868	20,768	28,921	75,957	93,686	169,643	24,010,981.99
1869	26,066	23,196	82,859	105,104	187,963	28,422,884.08
1870	24,851	18,221	87,521	111,165	198,686	27,780,811.81
1871	43,969	16,562	93,394	114,101	207,495	33,077,383.63
1872	26,391	34,333	113,954	118,275	232,299	30,169,341.00
1873	18,303	16,052	119,500	118,911	238,411	29,185,289.62
1874	16,734	10,462	121,628	114,613	236,241	30,593,749.56
1875	18,704	11,152	122,989	111,832	234,821	29,683,116.63
1876	23,523	9,977	124,239	107,898	232,137	28,351,599.69
1877	22,715	11,326	128,723	103,381	232,104	28,580,157.04
1878	44,587	11,962	131,649	92,349	223,998	26,844,415.18
1879	57,118	31,346	138,615	104,140	242,755	33,780,526.19
1880	141,466	19,545	145,410	105,392	250,802	57,240,540.14
1881	31,116	27,394	164,110	104,720	268,830	50,626,538.51
1882	40,939	27,664	182,633	103,064	285,697	54,296,280.54
1883	48,776	38,162	206,043	97,616	303,658	60,431,972.85
1884	41,785	34,192	225,470	97,286	323,756	57,273,536.74
1885	40,918	35,767	247,146	97,979	345,125	65,693,706.72
1886	49,895	40,857	270,346	95,437	365,783	64,584,270.45
1887	72,465	55,194	306,298	99,709	406,007	74,815,486.85
1888	75,726	60,252	343,701	108,856	452,557	79,646,146.37
1889	81,220	51,921	373,699	116,026	489,725	89,131,968.44
1890	105,044	66,637	415,654	122,290	537,944	106,493,890.19
1891	696,941	156,486	536,821	139,339	676,160	118,548,959.71
1892	246,638	224,047	703,242	172,826	876,068	141,086,948.84
1893	119,361	121,630	759,706	206,306	966,012	158,155,342.51
1894	57,141	39,085	754,382	215,162	969,544	140,772,163.78
1895	45,361	39,185	750,951	219,567	970,524	140,959,361.00
1896	42,244	40,374	747,967	222,557	970,678	139,280,075.00
1897	50,585	50,101	746,829	229,185	976,014	140,845,772.00
1898	48,732	52,648	760,853	232,861	993,714	145,748,865.56
1899	53,881	37,077	753,451	238,068	991,519	139,482,696.00
1900	51,964	40,645	751,864	241,674	993,529	139,381,522.73
1901	58,373	44,868	747,999	249,736	997,735	139,582,231.98
1902	47,965	40,173	738,809	260,637	999,446	138,491,822.48
1903	52,325	40,136	728,732	267,813	996,545	138,890,088.64
1904	55,794	44,296	720,315	274,447	994,762	142,092,818.75
1905	52,841	50,027	717,158	281,283	998,441	142,099,286.05
Total	3,033,336	1,876,096	.....	.....	.....	$3,264,130,257 90

PEN'TACLE, a figure consisting of five straight lines crossing and joined so as to form a five-pointed star. It was a symbol among the Gnostics, and was employed with superstitious import by the astrologers and mystics of the middle ages.

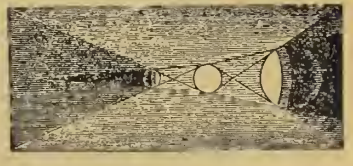
PEN'TAGON, a figure of five sides and five angles; if the sides and angles be equal it is a regular pentagon; otherwise, irregular.

PEN'TATEUCH, the Greek name applied to the first five books in the Bible, called also the Law of Moses, or simply the law. The division of the whole work into five parts has, by some authorities, been supposed to be original; others, with more probability, think it was so divided by the Greek translators, the titles of the several books being Greek, not Hebrew. It begins with an account of creation and the primeval condition of man; of the entrance of sin into the world, and God's dealing with it, broadening out into a history of the early world, but again narrowing into biographies of the founders of the Jewish family; it then proceeds to describe how the family grew into a nation in Egypt, tells us of its oppression and deliverance; of its forty years' wandering in the wilderness; of the giving of the law with all its civil and religious enactments; of the construction of the tabernacle; of the census of the people; of the rights and duties of the priesthood; and concludes with the last discourses of Moses and his death. The Pentateuch and the book of Joshua are sometimes spoken of together as the Hexateuch; when Judges and Ruth are added, as the Octateuch.

PEN'TECOST, a Jewish festival, held on the fiftieth day after the passover, in celebration of the ingathering and in thanksgiving for the harvest. It was also called the Feast of Weeks, because it was celebrated seven weeks after the passover. It is also a festival of the Christian church, occurring fifty days after Easter, in commemoration of the descent of the Holy Ghost on the disciples, called in England Whitsuntide.

PENTLAND FIRTH, a channel separating the mainland of Scotland from the Orkney islands, and connecting the North Sea with the Atlantic ocean. It is about 17 miles long east to west, and 6 to 8 miles broad. A current, setting from east to west, flows through it with a velocity of 3 to 9 miles an hour, causing many eddies, and rendering its navigation difficult and dangerous.

PENUM'BRA, the partial shadow between the full light and the total shadow caused by an opaque body intercepting the light from a luminous body, the penumbra being the result of rays emitted by part of the luminous body. An eye placed in the penumbra would see part of the luminous body, part being eclipsed by the opaque body; an eye placed in the "umbra," or place of total shadow, would receive no rays from the luminous body; an eye placed anywhere else than in the penumbra and umbra sees the luminous body without eclipse. The subject is of importance in the consideration of eclipses. In a partial eclipse of the sun, as long as any part of the same is visible the parties observing are in the penumbra; when the eclipse is total, in the umbra. The cut shows the phenomena of the umbra and penumbra in the case of a luminous body between two opaque bodies, the one larger, the other smaller than itself. See also Eclipse.



Umbra and penumbra.

PENZA, a government of Russia, bounded by Nijni-Novgorod, Tambov,

Saratov, and Simbirsk; area, 14,996 sq. miles; pop. 1,491,215. About 60 per cent of the soil is arable, the chief crops being rye, oats, buckwheat, hemp, potatoes, and beet-root, and about 14 per cent is under meadows or grazing land. The forests are extensive. Penza, the capital, is on an eminence at the junction of the Penza and Sura, 440 miles southeast of Moscow. Pop. 61,851.

PE'ONY, a genus of plants very generally cultivated for the sake of their large showy flowers. The species are mostly herbaceous, having perennial tuberous roots and large deeply-lobed leaves. The flowers are solitary, and of a variety of colors, crimson, purplish, pink, yellow, and white. The flowers, however, have no smell, or not an agreeable one, except in the case of a shrubby species, a native of China, of several varieties, with beautiful whitish flowers stained with pink. The roots and seeds of all the species are emetic and cathartic in moderate doses.

PEOPLE'S PALACE, a building in the East End of London, situated in Mile-end Road, opened by the queen, May 1887. It provides for the population of the East End a hall for concerts, entertainments, etc., a library and reading-rooms, gymnasia, swimming-baths, social-meeting rooms, rooms for games, refreshment rooms, a winter-garden, technical schools, etc. The nucleus of the palace was the Beaumont Institute founded by Mr. J. T. B. Beaumont (died 1840), who left $65,000 to establish an institution for the moral and intellectual improvement of the working-classes in the East End of London. A movement set on foot by a novel by Sir Walter Besant—All Sorts and Conditions of Men—resulted in raising the fund to $375,000.

PEO'RIA, the capital of Peoria co., Illinois, on the west bank of the Illinois river (here called from its width Lake Peoria). Peoria is a great railway center, and is connected with St. Louis by river steamers and with Chicago by the Michigan canal. It is a rapidly rising place, the seat of a large grain traffic, and has great iron-works and other manufacturing establishments. Pop. 1909 about 75,000.

PEPPER, a genus of plants. The pepper which furnishes the black pepper of commerce, is a native of the East Indies, where it is cultivated on an

Black pepper.

extensive scale. It is a climbing plant with broad, ovate, acuminate leaves, and little globular berries, which, when ripe, are of a bright-red color. The pepper of Malacca, Java, and especially of Sumatra, is the most esteemed. Its culture has been introduced into various other tropical countries. White pepper is the best and soundest of the berries, gathered when fully ripe, and deprived of their external skin. The Chavica Betle, or betel, belongs to the same natural order. Cayenne pepper, Guinea pepper, bird pepper, etc., are the produce of species of Capsicum. Jamaica pepper is pimento or allspice.

PEPPERMINT. See Mint.

PEP'SINE, an active principle of the gastric juice, a peculiar animal principle secreted by the stomach. The pepsine or pepsia of pharmacy is a preparation of the mucous lining of the stomach of the pig or calf. It is often prescribed in cases of indigestion connected with loss of power and tone of the stomach.

PEPYS (peps or pep'is), Samuel, secretary to the admiralty in the reigns of Charles II. and James II., was born at Brampton, Huntingdonshire, 1632. He died in 1703. He was president of the Royal Society for two years; but his title to fame rests upon his Diary (1659–69), which is a most entertaining work, revealing the writer's own character very plainly, giving an excellent picture of contemporary life, and of great value for the history of the court of Charles II. It is in shorthand, was discovered among a collection of books, prints, and manuscripts bequeathed by Pepys to Magdalene College, Cambridge and was first printed in 1825.

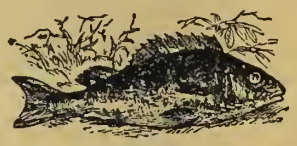
PERÆ'A, a district of Palestine eastward of the Jordan, the "Gilead" of the Old Testament.

PERAK (pā'rák), a native state of the Malay peninsula, extending about 80 miles along the west coast, and stretching inward to the mountain range which forms the backbone of the peninsula; area, 7949 sq. miles, pop. 328,801. Since 1875 Perak has been practically a dependency of the Straits settlements, the native rajah being controlled by a British resident appointed by the governor of that colony.

PERCEPTION, in philosophy, the faculty of perceiving; the faculty by which we have knowledge through the medium or instrumentality of the bodily organs, or by which we hold communication with the external world. Perception takes cognizance only of objects without the mind. We perceive a man, a horse, a tree; when we think or feel, we are conscious of our thoughts and emotions. Two great disputes are connected with perception, both brought into full prominence by Bishop Berkeley. The first is the origin of our judgments of the distances and real magnitudes of visible bodies. The second question has reference to the grounds we have for asserting the existence of an external material world, which, according to Berkeley, was connected with the other. See Idealism.

PER'CEVAL, Spencer, English statesman, son of John Perceval, Earl of Egmont, born 1762. In 1801 he became solicitor-general, and in 1802 attorney-general. In 1807 he was appointed chancellor of the exchequer, and on the death of the Duke of Portland, in 1809, he became premier. In this post he continued till May 11, 1812, when a person named Bellingham shot him dead with a pistol in the lobby of the House of Commons.

PERCH, a genus of fishes, forming the type of the perch family. The common perch is a common tenant of fresh-water lakes and rivers. The body is broad, and somewhat flattened laterally. There are two dorsal fins, the anterior



Perch.

supported by very strong spines. It is colored a greenish-brown on the upper parts, the belly being of a yellowish or golden white. The sides are marked with from five to seven blackish bands The average weight is from 2 to 3 lbs. The perch is a voracious feeder, devouring smaller fishes, worms, crustaceans, etc.

PERCUSSION, in medicine, that method of diagnosis which consists in striking gently on the surface of one of the cavities of the body, and then endeavoring to ascertain from the sound produced the condition of the organ lying beneath. Percussion is most frequently used on the chest, but it is also occasionally applied to the cavity of the abdomen, the head, etc.

PERCUSSION CAPS, are small copper cylinders, closed at one end for conveniently holding the detonating composition which is exploded by percussion so as to ignite the powder in certain kinds of fire-arms. The copper cap came into general use between 1820 and 1830.

PERENNIAL, in botany, a term applied to those plants whose roots subsist for a number of years, whether they retain their leaves in winter or not. Those which retain their leaves are called evergreens, such as cast their leaves are called deciduous. · Perennial herbaccous plants, like trees and shrubs, produce flowers and fruit year after year.

PERFUMES, substances emitting an agreeable odor, and used about the person, the dress, or the dwelling. Perfumes of various sorts have been held in high estimation from the most ancient times. The Egyptians, Hebrews, Phœnicians, Assyrians, and Persians are known to have made great use of them, as did also the Greeks and Romans. In the middle ages France and Italy were most conspicuous for the use and preparation of perfumes. Perfumes are partly of animal but chiefly of vegetable origin. They may be divided into two classes, crude and prepared. The former consist of such animal perfumes as muck, civet, ambergris, and such vegetable perfumes as are obtained in the form of essential oils. The prepared perfumes, many of them known by fancy names, consist of various mixtures or preparations of odorous substances made up according to recipe.

PERGUNNAHS (Parganás), The Twenty-four, a district of India, forming

the metropolitan district of the lieutenant-governorship of Bengal; area, 2128 sq. miles. Pop. (exclusive of Calcutta), 1,892,033.

PERICARDI'TIS, inflammation of the membranous sac containing the heart. In the acute stage of the disease there is exudation of lymph or serum; at a later stage false membranes are formed; and at a still later stage the two sides become glued together, forming adherent pericardium. This is generally followed by changes in the substance of the heart or in its internal surface, orifices, or valves, and a fatal termination is rarely long delayed. The symptoms of pericarditis are: 1st, pain more or less acute, in the situation of the heart; fever is present with loss of appetite and dry tongue. An anxious respiration and a feeling of overwhelming oppression are also present, with frequent sighing, which gives momentary relief. Most of the symptoms are aggravated by motion or a high temperature. For the diagnosis of pericarditis we must rely mainly on the physical signs, but it is only when the effusion is considerable that investigation by percussion is of much use. In ordinary cases, where adhesion takes place, there may be an apparently complete recovery at the end of three weeks or less; but adhesion frequently gives rise to other structural changes of the heart, and then fatal disease of that organ almost always follows. In slight cases a real cure without adhesion may be effected. This disease is frequently brought on by exposure to cold or draughts when the body is warm and perspiring. Its most frequent occurrence is in connection with acute rheumatism.

PERICAR'DIUM, the investing fibro-serous sac or bag of the heart in man and other animals. In man it contains the heart and origin of the great vessels. It consists of two layers an outer or fibrous and an inner or serous layer. The inner surface of the membrane secretes a serous fluid, which in health is present only in sufficient quantity to lubricate the heart, and so to facilitate its movements within the sac.

PER'ICLES (-klēz), one of the most celebrated statesmen of ancient Greece, born at Athens about 494 B. C. He was connected by family relations with the aristocracy, but as Cimon was already at its head he endeavored to gain the favor of the popular party. In this he fully succeeded by his eloquence, abilities, and political tactics, so that on the death of Cimon, in 449 B.C., Pericles became virtual ruler of Athens. By his great public works he flattered the vanity of the Athenians, while he beautified the city and employed many laborers and artists. His chief aim was to make Athens undoubtedly the first power in Greece, as well as the chief center of art and literature, and this position she attained and held for a number of years. At the commencement of the Peloponnesian war (B.C. 431), in which Athens had to contend against Sparta and other states, Pericles was made commander-in-chief. The Spartans advanced into Attica, but Pericles had made the rural population take refuge in Athens and refused battle. After they retired he led an army into Megaris, and next year he commanded a powerful fleet sent against the Peloponnesus. In 430 B.C. a plague broke out at Athens, and for a brief period Pericles lost his popularity and was deprived of the command. The people, however, soon recalled him to the head of the state, but amid his numerous civil cares he was afflicted by

Pericles---Antique bust.

domestic calamities. Many of his friends and his two sons, Xanthippus and Paralus, were carried off by the plague; and to console him for this loss the Athenians allowed him to legitimize his son by Aspasia. He now sunk into a lingering sickness, and died B.C. 429, in the third year of the Peloponnesian war. Pericles was distinguished by intellectual breadth, elevated moral tone, unruffled serenity, and superiority to the prejudices of his age. His name is intimately connected with the highest glory of art, science, and power in Athens.

PÉRIER (pā-ri-ā), Casimir, French statesman, was born at Grenoble in 1777; educated at Lyons; and served with honor in the campaigns of Italy (1799 and 1800). In 1802 he established a prosperous banking-house in company with his brother. In 1817 he was elected to represent the department of the Seine in the Chamber of Deputies. Here he became one of the leaders of the opposition under Charles X., and was no less distinguished as the firm and eloquent advocate of constitutional principles than as an enlightened and sagacious financier. After the revolution of 1830 he was prime-minister to Louis Philippe from March 13, 1831, to his death by cholera, May 16, 1832.

PERIGEE (-jē), that point in the orbit of the moon which is at the least distance from the earth. See Apogee.

PERIHE'LION, that part of the orbit of the earth or any other planet in which it is at the point nearest to the sun. The "perihelion distance" of a heavenly body is its distance from the sun at its nearest approach.

PERIM'ETER, in geometry, the bounds or limits of any figure or body. The perimeters of surfaces or figures are lines; those of bodies are surfaces.

PERIOD, in astronomy, the interval of time occupied by a planet or comet in traveling once round the sun, or by a satellite in traveling round its primary.

PERIODICALS, publications which appear at regular intervals, and whose principal object is not the conveyance of news (the main function of newspapers), but the circulation of information of a literary, scientific, artistic, or miscellaneous character, as also criticisms on books, essays, poems, tales, etc. Periodicals exclusively devoted to criticism are generally called reviews, and those whose contents are of a miscellaneous and entertaining kind magazines; but there is no great strictness in the use of the term. The first periodical was published in France, being a scientific magazine, the Journal des Savants, issued in 1665, and still existing in name at least. The most famous French literary periodical is the Revue de Deux Mondes, begun in 1829, from 1831 issued fortnightly, and marked by an ability which has placed it in the front rank of the world's periodicals. Into it tales, poems, etc., are admitted, and the names of the contributors have to be attached to their articles. The earliest English periodical seems to have been the Weekly Memorials for the Ingenious, the first number of which is dated January, 1681-82, and which lasted but a year. In 1802 was introduced the Edinburgh Review, which came out every three months, and soon had a formidable rival in the Quarterly Review (1809). To meet the demand for critical literature at shorter intervals than three months, there was published in 1865 the Fortnightly Review, which for about a year was true to its name, but has since appeared monthly. The first English magazine properly speaking may be said to be the Gentleman's Journal, or Monthly Miscellany, commenced in 1692. The most noted American reviews and magazines are the North American Review, The World's Work, Harper's Magazine, the Atlantic Monthly, Lippincott's Magazine, Scribner's Magazine, the Century Magazine, the Forum, etc., etc.

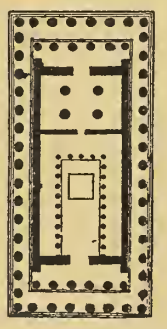
PERIODIC'ITY, the disposition of certain things or phenomena to recur at stated periods. As a physiological and pathological term it denotes the regular or nearly regular recurrence of certain phenomena of animal life, such as sleep and hunger. The first indication of a diseased state is generally a disturbance of the natural or acquired periodicity of the various functions of life.

PERIOS'TEUM, the fibrous membrane investing the bones, and which serves as a medium for the transmission of the nutritive blood-vessels of the bone. The periosteum firmly adheres to the surface of bones (including the inside of the long bones), save at their gristly or cartilaginous extremities, and it becomes continuous with the tendons or ligaments inserted into bones. When the periosteum, through disease or injury, becomes affected, the blood supply and nutrition of the bone suffer, and in consequence the bone-tissue dies or becomes necrosed, and is exfoliated or thrown off. When a bone is fractured the periosteum plays an important part in the repair of the injury, new osseous material being deposited by the membrane.

PERIOSTI'TIS, inflammation of the periosteum, a painful ailment frequently brought on by sudden exposure to cold after being heated.

PERIPATETIC PHILOSOPHY, the philosophy of Aristotle and his followers, so called, it is believed, because he was accustomed to walk up and down with his more intimate disciples, while he expounded to them his doctrines. The philosophy of Aristotle starts from his criticism of the Platonic doctrine of ideas, in combating which he is led to the fundamental antithesis of his philosophy, that between matter and form. The notion or idea of a thing is not, he says, a separate existence different from the thing itself, but is related to the thing only as form to matter. Every sensible thing is a compound of matter and form, the matter being the substance of which the thing consists, while the form is that which makes it a particular thing (a stone, for example, and not a tree), and therefore the same as its notion or idea. The form is the true nature of a thing. Origination is merely matter acquiring form, it is merely a transition from potential to actual existence. Everything that actually exists previously existed potentially in the matter of which it is composed. Matter is thus related to form as potentiality to actuality. And as there is, on the one hand, formless matter, which is mere potentiality without actuality, so, on the other hand, there is pure form, which is pure actuality without potentiality. This pure form is the eternal Being, styled by Aristotle the first or prime mover.

PERIP'TERAL, in Greek architecture, a term signifying surrounded by a row of columns: said of a temple or other building, especially of a temple the cella



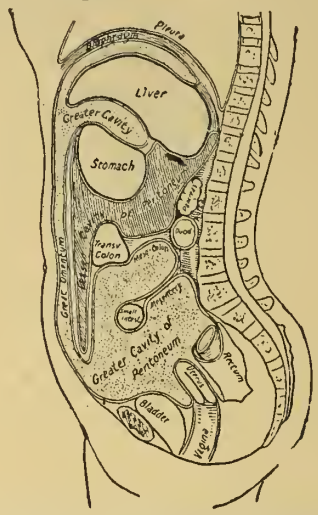
Plan of peripteral temple.

of which is surrounded by columns, those on the flanks (or sides) being distant one intercolumniation from the wall.

PERISTAL'TIC (or Vermicular) **MOTION,** the name given to certain movements connected with digestion observed in the stomach and intestines, which proceed with a wave-like or spiral motion, the object being gradually to propel forward the contents of these viscera.

PER'ISTYLE, in architecture, a range of columns surrounding the exterior or interior of anything, as the cella of a temple. It is frequently but incorrectly limited in signification to a range of columns round the interior of a place, as an open court.

PERITONE'UM, the serous membrane lining the abdominal cavity and covering the intestines. Like all other serous membranes, the peritoneum presents the structure of a closed sac; one layer (parieta) lining the abdominal walls, the other or visceral layer being reflected over the organs of the abdomen. A



Peritoneum of human female, in longitudinal section, somewhat diagrammatical.

cavity—the peritoneal cavity—is thus inclosed between the two layers of the membrane, and this contains in health a quanty of serous fluid just sufficient to moisten its surfaces.

PERITONI'TIS, a common and very frequently fatal disease caused by inflammation of the peritoneum. The latter is a great membrane, very thin, and in the form of a closed sac, of the same structure as the pleural membrane and the pericadium. This membrane encloses the viscera, or contents, of the abdominal cavity; but the viscera are not within the cavity of the sac, but are invested by the outside of the sac, much the same as if one were to wrap up several objects in a deflated foot-ball. It is clear that the cavity of the football would not enclose the objects, but that the interior walls of the football would be everywhere in contact. When foreign bodies, most frequently bacteria, or disease germs, find their way into the cavity of the peritoneum, the membrane becomes inflamed, the interior surfaces often adhere to each other, the intestines become deranged, fever follows, and unless prompt treatment is resorted to death ensues, especially in acute peritonitis. In acute peritonitis the first symptoms are chill and pain in the abdomen, more intense pain on pressure, and pain on breathing. The appearance of the patient's face is characteristic: "Sharp nose, hollow eyes, collapsed temples, ears cold and turned out, skin of the forehead rough, distended, and parched, the color of the face brown, black, livid, or lead-colored." Acute peritonitis is usually fatal in two to ten days, death being very sudden.

Chronic peritonitis is caused principally by germs, and is not painful except occasionally. The treatment for the acute form is local application of ice bags and calomel or salts. Chronic peritonitis frequently yields readily to treatment.

PERJURY, the act or crime of wilfully making a false oath in judicial proceedings in a matter material to the issue or cause in question. The penalties of perjury attach to wilful falsehood in an affirmation made by a Quaker or other witness where such affirmation is received in lieu of an oath. Perjury is a misdemeanor punishable at common law, by fine or imprisonment, but several acts provide for additional punishment. Popularly, the mere act of making a false oath, or of violating an oath, provided it be lawful, is considered perjury.

PERM, an eastern government of Russia, partly in Europe and partly in Asia; area, 128,211 sq. miles. The government is rich in minerals, comprising iron, silver, copper, platinum, nickel, lead, and gold. Pop. 3,003,208.—Perm, the capital of the government, is situated on the Kama, 930 miles north-east of Moscow. It has flourishing industries in iron, steel, leather, etc. In the neighborhood is a government manufactory of steel guns and munitions of war. Pop. 45,403.

PERMANENT WHITE, a white pigment consisting of sulphate of barium precipitated from the chloride by adding dilute sulphuric acid.

PERNAMBU'CO, a town in Brazil, the capital of the state of the same name, on the east coast. It consists of three distinct parts: Recife, occupying a small peninsula; San Antonio, on an island; and Boa Vista, on the mainland, the three parts being connected by iron bridges. The harbor is formed by the reef, which incloses a belt of water about a mile in width. The trade is extensive. Pop. 130,000.—The state has an area of about 46,000 square miles. The principal cultivated crops are the sugar-cane and cotton. Pop. 1,014,700.

PEROX'IDES, the general name applied to the binary compounds of oxygen containing the greatest amount of that element.

PERPENDIC'ULAR, in geometry, a line falling directly on another line, so as to make equal angles on each side. A straight line is said to be perpendicular to a curve, when it cuts the curve in a point where another straight line to which it is perpendicular makes a tangent with the curve. In this case the perpendicular is usually called a normal to the curve.

PERPENDICULAR STYLE, in architecture, a variety of the pointed Gothic, the latest variety to be introduced, sometimes called the florid or Tudor style of Gothic. It prevailed in England from about the end of the 14th to the middle of the 16th century. It is chiefly characterized by the predominance of straight lines in the design, and especially in its tracery. Another feature is the lofty square towers of its churches, divided into stages by bands, and each stage filled with windows. The mullions of the windows are vertical, generally rise to the main arches, and are often crossed by horizontal bars or transoms. Large windows are a distinctive feature of this style. The tracery of the doors is

similar to that of the windows. There are two kinds of roof peculiar to the

Perpendicular style.

style—the vaulted roof, with fan-tracery, and the open timber-roof.

PERPETUAL MOTION, motion that, once originated, continues forever or indefinitely. The problem of a perpetual motion consists in the invention of a machine which shall have the principles of its motion within itself, and numberless schemes have been proposed for its solution. It was not till the discovery of the principle of the conservation of energy (see Energy, Conservation of), experimentally proved by Joule, that the impossibility of the existence of a perpetual motion was considered to be a physical axiom. This principle asserts that the whole amount of energy in the universe, or in any limited system which does not receive energy from without, or part with it to external matter, is invariable. But every machine when in action does a certain amount of work, if only in overcoming friction and the resistance of air, and as the perpetual motion machine can start with only a certain amount of energy, this is gradually used up in the work it does. A machine, in short, would be required in which there was no friction, and which met with no resistance of any kind. The mechanical arrangements which have been put forward as perpetual motions by inventors are either, (1) Systems of weights, which are allowed to slide on a wheel into such positions relatively to the axis of the wheel as to produce a constant turning moment in one direction; (2) Masses of liquid moving in wheels on the same principle; (3) Masses of iron arranged on the same principle, but subjected to the attractions of magnets instead of their own weights. Numbers of patents for such machines are constantly being taken out, but in every case inventors show an ignorance of the most elementary principles of natural philosophy.

PERRY, Matthew Calbraith, American naval officer was born in Rhode Island, in 1794. He was a younger brother of Com. Oliver Hazard Perry. In 1809 he became midshipman, and in 1813 was made lieutenant. In 1853 Commodore Perry organized and commanded the famous expedition to Japan that opened that country to intercourse with the civilized world. On his return a report of the expedition was published by the United States government, in three volumes, entitled Report of Commodore Perry's Expedition to Japan. He died in 1858.

PERRY, Oliver Hazard, American naval officer, was born in South Kingston, R. I., in 1785. On April 7, 1799, he received his commission as midshipman, and on January 15, 1807, was promoted lieutenant. After building a fleet of gunboats, he commanded the schooner Revenge, that, in 1810, cruised off the southern coast of the United States. This vessel was wrecked on a reef near Watch Hill, R. I., January 8, 1811, but Perry was honorably acquitted of neglect or carelessness by a court of inquiry. Thereafter he repeatedly applied for a command at sea, which was refused, and eventually offered his services to Com. Isaac Chauncey on the lakes, who ordered him for duty to Lake Erie. Here at Erie, he superintended the building of a number of small vessels, the largest of which were of 500 tons burden; with them he expected to encounter the British flotilla, under Captain Barclay. Perry's squadron consisted of nine vessels of 1,671 tons, with 54 guns. On the British side Capt. Robert Heriot Barclay had a flotilla of six vessels of 1,460 tons, manned by 450 men and 63 pieces of cannon. On September 10, 1813, the American forces moved out of Put-in-Bay for action, and after a hard-fought

contest, on the afternoon of that day the British flotilla surrendered. Captain Barclay was wounded in the action. Congress bestowed on Perry the rank of captain, and the British, having lost control of Lake Erie, evacuated Detroit. Perry served in the Mediterranean under Decatur, and in 1819 was sent, in command of a squadron, to the Caribbean sea, where, on the Orinoco river, he died of yellow fever.

PERSECUTIONS, the name usually applied to periods during which the early Christians were subjected to cruel treatment on account of their religion. Ten of these are usually counted. The first persecution (64–68) was carried on under Nero. The cruelties practiced on this occasion are worthy of the ferocious instincts of that notorious tyrant. The apostles Peter and Paul suffered in this persecution. The second persecution (95–96) was raised by the Emperor Domitian. Many eminent Christians suffered; and it is generally held that St. John was exiled to Patmos at this time. The third persecution began in the third year of Trajan (100). This persecution continued for several years, with different degrees of severity in many parts of the empire, and the severity of it appears from the great number of martyrs mentioned in the old martyrologies. The fourth persecution, under Marcus Aurelius (161–180), at different places, with several intermissions and different degrees of violence, continued the greatest part of his reign. It raged with particular fury in Smyrna and Lyons, and Vienne in Gaul. Polycarp and Justin Martyr are famous victims of this period. The fifth began in 197 under Severus. During the sixth persecution, under Maximian (235–238), only Christian teachers and ministers were persecuted. Decius began his reign (249) with a persecution of the Christians (the seventh) throughout his dominions. This was the first really general persecution. Valerian in 257 put to death few but the clergy (eighth persecution); and the execution of the edict of Aurelian against the Christians (274)—the ninth persecution, as it was called—was prevented by his violent death. A severe persecution of the Christians (the tenth) took place under the Emperor Diocletian (303). Throughout the Roman empire their churches were destroyed, their sacred books burned, and all imaginable means of inhuman violence employed to induce them to renounce their faith. Persecutions, principally directed against the clergy, continued with more or less vigor until Constantine the Great (312 and 313) restored to the Christians full liberty and the use of their churches and goods; and his conversion to Christianity made it the established religion in the Roman empire.

PERSEPH'ONE, in Greek mythology, the daughter of Zeus and Dēmētēr (Ceres). While she was gathering flowers near Enna in Sicily Pluto carried her off to the infernal regions, with the consent of Zeus, and made her his wife, but in answer to the prayers of Dēmētēr she was permitted to spend the spring and summer of each year in the upper world. In Homer she bears the name of Persephoneia. The chief seats of the worship of Persephonē were Attica and Sicily. In the festivals held in her honor in autumn the celebrants were dressed in mourning in token of lamentation for her being carried off by Pluto, while at the spring festivals they were clad in gay attire in token of joy at her return. In works of art Persephonē is sometimes represented as sitting by the side of her husband, and sometimes alone.

PERSEUS (per'sūs), an ancient Greek hero, son of Danaë and Zeus. He was set adrift in the sea on his birth, in a chest along with his mother. But the chest reached the Island of Seriphos, and Perseus was brought up by the king of the island, who exacted a promise from him to fetch the head of the Gorgon

Medusa. This he accomplished under the guidance of Hermes and Athena, and with the assistance of the nymphs. He also delivered Andromeda from a sea-monster (see Andromeda), an exploit which is frequently figured in ancient art. He was king of Tiryns and founder of Mycenæ. After his death Perseus was worshipped as a hero, and placed among the stars.

PERSEUS, the last king of the Macedonians, and an illegitimate son of Philip V., succeeded his father B.C. 178, and entered keenly into the hostilities which had previously broken out against Rome. The Romans sent an army against him and gained a signal victory at Pydna 168 B.C. Perseus fled to Samothrace, but was given up to the Romans, and some years after died in captivity at Alba, near Rome.

PERSEUS, a northern constellation surrounded by Andromeda, Aries, Taurus, Auriga, Camelopardalus, and Cassiopeia.

PERSIA, a kingdom of Western Asia; bounded north by Transcaucasian Russia, the Caspian, and Russian Central Asia; east by Afghanistan and Baluchistan; south by the Persian Gulf; and west by Asiatic Turkey; extending for 700 miles from n. to s. and 900 miles from e. to w.; area, about 636,000 sq. miles; pop. from 7,000,000 to 9,000,000. The country is divided into 33 provinces, capital Teheran (pop. 150,000 to 200,000); chief trade centers, Teheran, Tabreez, Ispahan; chief ports, Bushire and Bender Abbas on the Persian Gulf. Other large towns are: Meshed, Balfroosh, Kerman, Yezd, Hamadān, Shirāz, Kazvin, Kom, Resht.

Persia may be considered as an elevated plateau, broken by clusters of hills or chains of rocky mountains, which alternate with extensive plains and barren deserts; the desert of Khorassan in the northeast alone absorbs about one-seventh of the entire area. Low tracts exist on the Persian gulf and the Caspian sea. The interior plains have an elevation of from 2000 to 6000 feet above the sea. This vast central plateau is supported in the n. and s. by two great mountain chains or systems, and from these all the minor ranges seem to spring. The north chain, an extension of the Hindu Kush, enters Persia from Northern Afghanistan, proceeds across the country, and reaches its greatest elevation on the south of the Caspian, where it takes the name of the Elburz mountains, and attains in Mount Demavend a height of nearly 20,000 feet. Still further west it becomes linked with the mountains of Ararat. The other great mountain system runs from northwest to southeast nearer the Persian gulf, is of considerable width, and forms several separate ranges. In one of these an elevation of 17,000 feet is reached. The rivers are few and insignificant. Not one of them is of any navigable importance, except the Euphrates, which only waters a small portion of the southwest frontier, and the Karun, recently opened to the navigation of the world. The latter is entirely within Persian territory, and flows into the Shat-el-Arab, or united Tigris and Euphrates. Of the streams which flow northward into the Caspian the only important one is the Kizil-Uzen or Sefid Rud (White river), which has a course of about 350 miles. There are a great number of small fresh-water lakes, and a few very extensive salt lakes, the largest being Urumiah in the extreme northwest.

The climate varies considerably in different provinces, and in the central plateau intense summer heat alternates with extreme cold in winter. The mineral wealth of Persia is but little developed. Iron, copper, lead, antimony are abundant; sulphur, naphtha, and rock-salt unlimited; coal also exists. The turquoise mines of Nishapur are about the only ones receiving anything like adequate attention. The interior of Persia, particularly its eastern and southern regions, is mostly devoid of vegetation over large areas; the southwest has its forests of stunted oaks and other trees, and jungle; but on the Caspian the mountain sides are covered with dense and magnificent woods of oak, beech, elm, and walnut, intermingled with box-trees, cypresses, and cedars. Lower down wheat and barley are extensively cultivated. In the level and rich plains below the sugar cane and orange come to perfection; the pomegranate grows wild; the cotton-plant and mulberry are extensively and successfully cultivated, and large tracts are occupied by the vine, and orchards producing every kind of European fruit. In the low plains the only grain under extensive and regular culture is rice; the principal subsidiary crops are cotton, indigo, opium, sugar, madder, and tobacco. Excellent dates are produced on the southern coast tracts. Irrigation is well understood and extensively practiced. The domestic animals are: sheep, chiefly of the large-tailed variety; goats, some of which produce a wool little inferior to that of Cashmere; asses and mules of a large and superior description; horses of Arab, Turkoman and Persian breeds, and camels. Wild animals include the lion, leopard, wolf, jackal, hyena, bear, porcupine, wild ass, gazelle, etc.

The manufactures of Persia were once celebrated, but excepting some carpets and shawls it may be said that the country has ceased to export manufactured articles. Its chief exports now are rice, dried fruits, opium, silk, wool, cotton, hides, pearls, and turquoises. Chief imports: textiles, china and glass, carriages, sugar, tea, coffee, petroleum, drugs, and fancy articles. The internal trade of the country is almost entirely carried on by caravans, the beasts of burden being horses, camels, and mules. Railways are as yet hardly known in Persia, and good roads are almost equally rare.

The government of Persia is an absolute monarchy. The only control to which its ruler, the Shah, is subject are the precepts of the Koran. He surrounds himself with a certain number of advisers, forming a ministry, eleven of whom are heads of special departments. These ministers he calls and dismisses at pleasure. The army on a war footing is supposed to number 60,000 men.

The population is chiefly made up of Iranians or pure Persians and Turanians (Turkish and Tartar tribes), and in religion belongs almost exclusively to the Shiah sect of Mohammedans, or more properly to a subdivision of that sect. The priesthood is very influential and very bigoted. Education is comparatively well attended to, Persia being considered, next to China, the best-educated country in Asia. The Persians are rather short and slender built, fair in complexion, hair long and straight, but beard bushy, and almost invariably jet black. The women are beautiful, intellectual, and polite. The Persian is celebrated for his affable manners, but also for his craft and deceit. Polygamy is both authorized and encouraged.

The Persian empire was founded by Cyrus (559–29 B.C.), and existed under his successors of the Achæmenean dynasty until Darius III. (338–30 B.C.) was overthrown by Alexander the Great. After the death of Alexander, Persia ultimately fell to his general Seleucus (312 B.C.), whose successors, the Seleucidæ, ruled over it till 236 B.C., when Arsaces I. founded the Parthian empire, of which Persia formed a part. The Parthian empire continued till 226 A.D., when Persia once more gained the ascendency under Ardashér Babigán, whose descendants, the Sassanidæ, continued to rule till the 7th century, when Persia was conquered by the Caliph Omar, and became a province of the Mohammedan empire. The Arab conquest made a deep and lasting impression on Persia. Under its influence the old Persian religion was given up in favor of Mohammedanism. About the beginning of the 9th century Persia began to be broken up into numerous petty states, and became the prey of successive conquerors—the Seljuk Turks (1037); Genghis Khan (1220); Tamerlane (1387); and the Turkomans, who were succeeded by the Sufi dynasty, (1501–1736). Ismail Sufi, the first sovereign of this dynasty, assumed the title of Shah, and introduced the Shiite or Shiah sect, or sect of Ali, Mohammed's son-in-law, from whom he pretended to be descended. Nadir Shah ascended the throne in 1736, and restored Persia to something of her former importance, but he was murdered in 1747, and his death was succeeded by a long period of anarchy, only broken by the reign of Kerin Khan, until Agha Muhammed, a Turkoman eunuch, founded the present dynasty of the Kajars (1794). Agha Muhammed was murdered in 1797, and succeeded by his nephew, Fath Ali, whose reign was largely taken up with unsuccessful wars with Russia and Turkey. He died in 1835, and was succeeded by his grandson, Mohammed, in whose reign Russian influence became predominant at Teheran. His son Nâsr-ed-dîn the reigning Shah, ascended the throne in 1848. His efforts to annex Herat led to a war between Great Britain and Persia, in which Bushire was taken by the British forces, and severe defeats were inflicted upon the Persian troops at Kooshab and Mohammerah. By the Peace of Paris (March 3, 1857), however, Persia renounced all claim to Herat. The bound-

ary between Persia and the Russian territory beyond the Caspian was settled in 1881.

PERSIAN GULF, a gulf separating Persia from Arabia, and communicating with the Indian ocean by the Strait of Ormuz, 35 miles wide; greatest length, 560 miles; medium breadth, 180 miles. It receives the waters of the united Euphrates and Tigris, and of a number of small streams; the principal port is Bushire. There are many islands in the gulf; the largest are: Kishim, Ormuz, and the Bahrein Isles; in the neighborhood of the latter there are lucrative pearl-fisheries.

PERSIAN POWDER, an efficacious insecticide introduced from the east, and prepared from the flowers of the roseum, a native of the Caucasus, Persia, etc.

PERSIAN WHEEL, or **NORIA,** the Puisaro of the south of France, a machine for raising water to irrigate gardens, meadows, etc., employed from time immemorial in Asia and Africa, and introduced by the Saracens into Spain and other European countries. It consists of a double water-wheel, with float-boards on one side and a series of buckets on the other, which are movable about an axis above their center of gravity. The wheel is placed in a stream, the water turns it, and the filled buckets ascend; when they reach the highest point, their lower ends strike against a fixed obstacle, and the water is discharged into a reservoir. In Portugal, Spain, South of France, and Italy, this contrivance is extensively used; and has been modified to enable it to draw water also from ponds and wells, animals supplying the motive power, and pots, leather or other bags taking the place of buckets.

PERSIGNY (per-sēn-yē), Jean Gilbert Victor Fialin, Duc de, French statesman, born 1808, died 1872. In 1840 he shared Napoleon's expedition to Boulogne. On the outbreak of the revolution of February, 1848, he hastened to Paris, contributed largely to determine the vote by which Napoleon was elected president (10th December, 1849), and was also one of the most prominent actors in the coup d'état (December 2, 1851), by which he became Napoleon III. He held the office of minister of the interior from 1852–54, and again from 1860–63; was appointed member of the senate 1852, ambassador to Great Britain 1855. He was elevated to the rank of duke in 1863.

PERSIM'MON, the fruit of a tree (a species of ebony) inhabiting the United States of America, more especially the southern states, where it attains the height of 60 feet or more. The fruit is succulent, reddish, and about the size of a small plum, containing a few oval stones. It is powerfully astringent when green, but when fully ripe the pulp becomes soft, palatable, and very sweet.

PERSIS'TENCE, in physics, the continuance of an effect after the cause which first gave rise to it is removed; as, the persistence of the impression of light on the retina after the luminous object is withdrawn; the persistence of the motion of an object after the moving force is withdrawn.

PERSONATION. See False Personation.

PERSONIFICATION, in the fine arts, poetry, and rhetoric, the representation of an inanimate subject as a person. This may be done in poetry and rhetoric

Personification.—The "Church of Christ," from the west front of the cathedral of Notre Dame, Paris (13th century sculpture).

either by giving epithets to inanimate subjects which properly belong only to persons, or by representing them as actually performing the part of animated beings.

PERSPEC'TIVE, the art or science which teaches how to produce the representation of objects on a flat surface so as to affect the eye in the same manner as the object or objects themselves when viewed from a given point. Perspective is intimately connected with the arts of design, and is particularly necessary in the art of painting, as without correctness of perspective no picture can be entirely satisfactory. Perspective alone enables us to represent foreshortenings (see Foreshortening) with accuracy, and it is requisite in delineating even the simplest positions of objects. That part of perspective which relates to the form of the objects differs essentially from that which teaches the gradation of colors according to the relative distance of objects. Hence perspective is divided into mathematical or linear perspective, and the perspective of color or aerial perspective. The contour of an object drawn upon paper or canvas represents nothing more than such an intersection of the rays of light sent from the extremities of it to the eye, as would arise on a glass put in the place of the paper or canvas. Suppose a spectator to be looking through a glass window at a prospect without, he will perceive the shape, size, and situation of every object visible upon the glass. If the objects are near the window the spaces they occupy on the glass will be larger than those occupied by similar objects at a greater distance; if they are parallel to the window, their shapes upon the glass will be parallel likewise; if they are oblique, their shapes will be oblique; and so on. As the person alters his position, the situation of the objects upon the window will be altered also. The horizontal line, or line corresponding with the horizon, will in every situation of the eye be upon a level with it, that is, will seem to be raised as far above the ground upon which the spectator stands as his eye is. Now suppose the person at the window keeping his head steady draws the figure of an object seen through it upon the glass with a pencil, as if the point of a pencil touched the object, he would then have a true representation of the object in perspective as it appears to his eye. Representations of objects have, however, generally to be drawn on opaque planes, and for this purpose rules must be deduced from optics and geometry, and the application of these rules constitutes what is properly called the art of perspective. Linear perspective includes the various kinds of projections. Scenographic projection represent objects as they actually appear to the eye at limited distances. Orthographic projections represent objects as they would appear to the eye at an infinite distance, the rays which proceed from them being parallel instead of converging. It is the method on which plans and sections are drawn. A bird's-eye view is a scenographic or orthographic projection taken from an elevated point in the air from which the eye is supposed to look down upon the objects. Aerial perspective teaches how to judge of the degree of light which objects reflect in proportion to their distance, and of the gradation of their tints in proportion to the intervening air. By its application each object in a picture receives that degree of color and light which belongs to its distance from the spectator. The charm and harmony of a picture, particularly of a landscape, depend greatly upon correct aerial perspective.

PERSPIRATION, or **SWEAT,** the fluid secretion of the sweat glands of the skin. The term perspiration is, however, sometimes used to include all the secretions of the skin, such as those of the sebaceous glands or follicles, etc. The sweat-glands, situated in the subcutaneous adipose or fat tissue of the skin, consist of a coiled-up tube, invested by a capillary net-work of blood-vessels, and continued to the surface of the skin, where it opens in an oblique valvular aperture. The openings of the sweat-ducts constitute the popular "pores" of the skin. The largest and most numerous ducts are situated in the palm of the hand (Krause estimates 2736 to the square inch, Erasmus Wilson 3528). Perspiration is divided into insensible and sensible, the former being separated in the form of an invisible vapor, the latter so as to become visible by condensation in the form of little drops adhering to the skin. Water, fatty acids, carbonic acid, salts, etc., are removed from the body by the sweat, by which also the skin is kept moist. By the passing off of the sweat as vapor, heat is lost from the body, and thus the greater or less activity of the sweat glands plays an important part in regulating the bodily temperature. For

these reasons the regular process of perspiration is necessary for the preservation of good health. The constituents of sweat are to some extent dependent on the various bodily conditions and circumstances, hence the various results of analysis by different authorities. The quantity of sweat evolved from the skin has been estimated at nearly 2 lbs. daily.

PERTH, a city and royal and parliamentary burgh of Scotland, capital of the county of the same name. Perth is celebrated for its extensive dye-works. It manufactures woolens, winceys, hosiery, jute, table-linen, gauge-glasses for boilers, castings, etc. Till the death of James I., in 1437, it was the capital of Scotland, and both then and subsequently it became the scene of some of the most remarkable events in Scottish history. Pop. 32,872.—The county, which occupies the center of Scotland, has an extreme length, east to west, of 63 miles; breadth, north to south, 60 miles; area, 1,664,690 acres, of which 32,000 are water and 349,000 acres are under cultivation. Pop. 123,255.

PERTH AMBOY, a city and port of entry in Middlesex co., N. J., at the mouth of Raritan river; on Raritan bay, Staten Island Sound, and the Cent. of N. J., the Lehigh Valley, the Penn., and the Staten Island Rapid Transit railways; 21 miles s.w. of New York. It is in a fire-clay and kaolin region; has a large and excellent harbor; and contains terra-cotta works, large dry-docks, and immense coal and freight shipping dépôt and wharves of the Lehigh Valley railroad. Pop. 20,145.

PERTURBATIONS, the orbital irregularities or deviations of the planets from their regular elliptic orbits. These deviations arise, in the case of the primary planets, from the mutual gravitations of these planets toward each other, which derange their elliptic motions round the sun; and in that of the secondaries, partly from the mutual gravitation of the secondaries of the same system, similarly deranging their elliptic motions round their primary, and partly from the unequal attraction of the sun on them and on their primary. Of the planetary perturbations, the most important in a practical point of view are those which arise from the mutual attractions of the three bodies, the sun, the earth, and the moon.

PERU′, a republic of South America, bounded on the north by Ecuador, on the west by the Pacific ocean, on the south by Chile, and on the east by Bolivia and Brazil; area, 683,145 sq. miles; estimated pop. in 1896, 2,900,000. The population consists of about 57 per cent aboriginal Indians, 23 per cent mixed Indian races, and 20 per cent of descendants of Spaniards, Europeans (chiefly Italians, French, and Spaniards), and Asiatics (chiefly Chinese).

This country exhibits great varieties of physical character. It is traversed throughout its length by the Andes, running parallel to and on an average 60 miles distant from the coast, the region between largely consisting of sandy desert, except where watered by transverse mountain streams. The Andes consist here of two main chains or Cordilleras, connected by cross ranges, inclosing extensive and lofty valleys and plateaus. The Andes region is roughly estimated at about two-fifths of the entire area of Peru. The loftiest summits are in the southern portion of the W. Cordillera; several peaks attain there an altitude of nearly 20,000 feet, and the Chuquibamba rises to 21,000 feet. The most important districts are those of Pasco, of Cuzco, the valleys of the Rio Jauja, and of the Marañon or Amazon. The first of these lies at one of those points where the branches of the Andes unite, the ridges sinking into an elevated plain, which has here a general height of 14,000 feet. The veins of the precious metals, with which this region abounds, have attracted to it a comparatively dense population. The table-land of Cuzco descends from an elevation of less than

Peruvians.

12,000 feet in the s. to about 8000 feet in the n. Of the lakes Lake Titicaca (12,542 feet above sea-level), the largest in South America, and which partly belongs to Bolivia, is the only one of commercial importance. The chief rivers are the Marañon or main stream of the Amazon, and the Huallaga and Ucayale, which join the Marañon; the Ucayale, formed by the united waters of a number of streams (Apurimac, Urubamba, Paucartambo), being about the same size as that river. In the maritime region of Peru earthquake shocks are of common occurrence, and some of them have been of exceptional severity, the most disastrous being those of 1746, 1868, and 1877. Gold and silver occur in all the provinces of Peru, and form the chief wealth of the country. Quicksilver is also abundant. Copper, lead and iron also exist in various places.

The climate of Peru is as varied as its physical aspect. On a portion of the coast no rain has fallen within the memory of man, but the garua, a thick heavy mist often approaching to drizzling rain, is a partial compensation, and the rivers from the Andes afford means of irrigation for sugar and cotton plantations. The central plateau region has a mild and comparatively humid climate, but the higher regions are inclement and subject to terrific tempests. East of the Andes the regular equatorial winds from the east come loaded with humidity, and, checked by the mountains, pour down copious, and in some places perpetual rains.

Peru is incomparably rich in botany, each region having its own flora. In the less elevated portions of the Eastern Andes a tropical vegetation is found; while on the higher parts representatives of alpine families (as the gentians) luxuriate. In the forests of Eastern Peru cinchona trees grow abundantly and supply the valuable bark from which the quinine is extracted. The same zone, especially the hot plains and swamps, also supply coca, the medicinal properties of which have for centuries been known to the natives of Peru and Bolivia who chew the leaves as a stimulant. Tobacco, cotton, sugar, rice, coffee, cocoa, and corn are grown in various parts and in increasing quantities. The eastern face of the Andes is as remarkable for its fauna as it is for its flora. The forests on the lower ranges and in the plains swarm with many species of parrots and monkeys; the tapir, sloth, ant-eater, armadillo, etc., are found here; the rivers are alive with alligators; and in the inundated plains the boa-constrictor attains a huge size. The puma and the South American bear inhabit the higher levels; the llama, the guanaco, the alpaca, and the vicuña, the still more elevated regions.

Peru exports precious metals, silver ores, copper, guano, wool of the sheep and the llama, alpaca, and vicuña, cotton, sugar, cinchona bark, rubber, coca leaves and cocaine, hides, chinchilla skins, etc. The chief imports are machinery, cotton, woolen, and linen goods, and provisions. The chief exports are minerals, sugar, wool, cotton, hides, cocaine, borax, coffee, and rice; imports, smallwares, cottons, provisions, woolens, etc. The foreign trade is chiefly carried on with Britain, Germany and the United States.

The government is based on a constitution adopted in 1867, and modeled on that of the United States. The legislative power is in the hands of a senate and a house of representatives. The president, elected for four years, is the head of the executive, and is assisted by two vice-presidents. By the laws of the republic the Indian is on a level in political rights with the white men; there exists absolute political but not religious freedom, the constitution prohibiting the exercise of any other religion than the Roman Catholic. There is, however a considerable amount of tolerance. Education is compulsory and free; there are universities at Lima, Arequipa, and Cuzco. The Peruvian language, of which there are many dialects, still maintains itself alongside of the language of the conquerors.

Of the early history of Peru we are almost entirely ignorant, but existing ruins, spoils secured by the Spaniards, and the descriptions left us by the historians of the Spanish conquest, sufficiently prove that the ancient Peruvians had no mean knowledge of architecture, sculpture, metal work, etc. They also had made considerable progress in astronomical science. The early religion of the Peruvians is bound up in the god Viracocha, the creator of the sun and the stars, and from him the Incas or emperors claimed descent as the sons of the sun. Under the Incas the empire was divided into four parts, corre-

sponding to the four cardinal points; each division had a separate government presided over by a viceroy of royal blood. All the land belonged to the Inca; and trade was carried on by barter, money being unknown. The thirteenth monarch of the Incas was reigning when the Spanish adventurer Pizarro disembarked in Peru in 1531. The Inca was taken prisoner (1532), numbers of his subjects were massacred, and the whole country fell in a short time into the hands of the invaders. It was then formed into a Spanish viceroyalty; subsequently part of it was incorporated in New Granada, and the viceroyalty of Buenos Ayres was constructed out of some of the provinces. In 1821 the country proclaimed it independence, but did not obtain actual freedom from Spanish rule until 1824, after a prolonged war. Since then Peru, like the rest of the South American republics, has suffered much from dissensions and revolutions. In the spring of 1879 it joined Bolivia in a war against Chile, resulting in the complete defeat of both the former. Peru had to cede by the peace of 1883 the province of Tarapacá absolutely to Chile, which also got possession provisionally of the department of Tacna. Since then Peru, though little troubled with external complications, has been disturbed by the ambitions of rival politicians, and even civil war.

PERUGINO (per-ụ-jē'nō), Pietro Vanucci, surnamed Il Perugino, the founder of the Roman school of painting, born at Città della Pieve (a dependency of Perugia) in 1446, died at Fontignano 1523. About 1480 Pope Sixtus IV. sent for him to Rome where he was employed along with Signorelli, Ghirlandaio, Botticelli, and Rosselli in decorating the Sistine Chapel with frescoes. Fine specimens of his frescoes are preserved in Perugia, Rome, Bologna, and Florence, and specimens of his other works are not infrequent in European galleries. Raphael is his most celebrated disciple.

PERUVIAN BARK. See Bark, Peruvian.

PERUZZI (pā-rụt'sē), Baldassari, architect and painter of the Roman school, born at Sienna 1481, died at Rome 1537. He went early to Rome and was employed in the decoration of various churches. He designed the Farnesina Villa on the banks of the Tiber, and he succeeded Raphael as architect of St. Peter's.

PES'ARO, a fortified town and seaport of Italy. The illustrious composer Rossini was born here in 1792. Pop. of town, 13,609.—The province of Pesaro e Urbino has an area of 1144 sq. miles. Pop. 233,155.

PESHA'WAR, a town of India, in the n. w. frontier province, capital of division of same name, 12 miles east of the eastern extremity of the Khyber Pass. The division or commissionership comprises the districts of Peshawar (area, 2444 sq. miles; pop. 786,406), Hazara, and Kohat, with the control of part of the hill tribes inhabiting the Khyber Pass. Area, 8206 sq. miles; pop. 1,715,248.

PESO, a silver coin and money of account used in Mexico and other parts of Spanish America, and often considered equivalent to a dollar.

PESSIMISM, a modern term to denote the opinion or doctrine that maintains the most unfavorable view of everything in nature, and that the present state of things only tends to evil; that in human existence there is an enormous surplus of pain over pleasure, and that humanity can find real good only by abnegation and self-sacrifice. It is antithetical to optimism, and as a speculative theory is the work of Schopenhauer and Von Hartmann, though it is preluded in the metaphysics of Brahmanism and the philosophy of Buddhism.

PESTALOZZI, Johann Heinrich, a Swiss philanthropist and educational reformer, born 1746, died 1827. His novel Lienhardt and Gertrud (1781–89, 4 vols.) exerted a powerful moral influence, while his educational treatises have laid the foundation for the more rational system of elementary instruction which now obtains in America. The grand principle that lay at the basis of Pestalozzi's method was that of communicating all instruction by direct appeal to the senses and the understanding, and forming the child by constantly calling all his powers into exercise, instead of making him a mere passive recipient, selecting the subjects of study in such a way that each step should best aid the further progress of the pupil.

PESTH, or PEST. See Budapest.

PESTILENCE. See Plague.

PETAL, an appellation given to the leaves of the corolla of plants, in opposition to those of the calyx, called sepals.

PET'ALITE, a rare mineral, a silicate of aluminium and lithium, containing from 5 to 6 per cent of the latter. It occurs in masses of foliated structure; color white, occasionally tinged with red, green, or blue.

PETARD', a bell-shaped machine of gun-metal, loaded with powder, attached to an object and exploded: formerly used to break down gates, bridges, barriers, etc.

PETER the apostle, commonly called Saint Peter, was a Galilean fisherman from Bethsaida, originally named Simon the son of Jona, and brother of St. Andrew, who conducted him to Christ. Jesus greeted Simon with the significant words, "Thou art Simon the son of Jona; thou shalt be called Cephas" (in Greek Petrus, a stone, whence the name Peter). After the miraculous draught of fishes Peter became a regular and intimate disciple of our Lord. The impetuosity of his character led Peter, especially in the early days of his apostleship, to commit many faults which drew upon him the rebuke of his divine Master. His zeal and eloquence made him often the speaker in behalf of his fellow-apostles on important occasions, and his opinions had great influence in the Christian churches. On one memorable occasion he incurred the rebuke of the apostle Paul in consequence of his behavior toward the Gentile Christians in regard to social intercourse. Nothing certain is known of his subsequent life, but it is almost beyond doubt that he was a joint-founder of the church at Rome, and that he suffered martyrdom there, most likely under Nero, about 64 A.D. The only written documents left by Peter are his two Epistles. The genuineness of the First Epistle is placed beyond all reasonable doubt, both the external and internal evidence being of the strongest description; that of the Second, however has been disputed by numerous critics on what appears to be plausible grounds. Doubts of its genuineness already existed in the time of Eusebius, and it was not admitted into the New Testament canon till 393 A.D.

PETER the cruel, King of Castile and Leon, born 1334, succeeded his father Alfonso XI. 1350, and died 1369. His reign was one long series of cruelties and despotic acts.

PETER the hermit, an enthusiastic monk of Amiens, whose preaching, after a pilgrimage to Jerusalem (end of the 11th century), gave rise to the first Crusade. (See Crusades.) Peter led the way through Hungary at the head of an undisciplined multitude of more than 30,000 men, a comparatively small number of whom survived to reach their destination, and distinguished himself by his personal courage at the storming of the holy city. On his return to his native country he founded the abbey of Noirmoutier, and died its first superior in 1115.

PETER I. (The Great), Alexeievitch, Emperor of Russia, born 1672, was the eldest son by his second wife of the Czar Alexis Mikhailovitch. His elder brothers Fedor and Ivan, were feeble in constitution. Fedor succeeded his father in 1676, and died in 1682. Ivan renounced the crown, and Peter was declared czar, with his mother, the Czarina Natalia Kirilovna, as regent. Sophia, third daughter of Alexis, ambitious to govern

Peter the Great.

succeeded in having Ivan proclaimed czar jointly with Peter, and herself regent. Peter was relegated to private life, his education purposely neglected, and his bad habits encouraged. In 1689 he wrested the power from his sister, and confined her in a convent. Peter was now virtually sole emperor, though, till the death of his brother in 1697, he associated his name with his own in the ukases of the empire. He now determined to do what he could to raise his country out of its barbarism, and to place its people in the ranks of civilized nations. His journey to Holland and England (1697–98), when he practically worked in shipyards, is familiar; and the knowledge he

there gained was amply profited by on his return. Peter, however, not only created a navy, but gave Russia, a seaboard and sea-ports by wresting the Baltic provinces from Charles XII. of Sweden. Young Russian nobles were obliged to travel; schools of navigation and mathematics were founded; agriculture was improved by the introduction of implements, seeds, and superior breeds of cattle. Peter imported foreign artisans of all kinds, established manufactories of arms, tools, and fabrics, and distributed metallurgists through the mining districts of Russia; roads and canals were made to foster internal commerce, and to extend trade with Asia. In 1703 he laid the foundation of St. Petersburg, and twenty years later of its Academy of Sciences. Laws and institutions which in any way interfered with his projects, he either abolished or altered. In his zeal to do good he was too frequently injudicious in choosing times and seasons, and the least show of opposition irritated him into ferocity. He repudiated his wife a few years after marriage for her reactionary leanings; for the same reason his son Alexis was ill treated, compelled to renounce the succession, and condemned to death, but died suddenly before sentence could be carried out. Peter died 28th January, 1725, the immediate cause being inflammation, contracted while assisting in the rescue of some soldiers in Lake Ladoga. In 1707 he had married his mistress Catharine; this marriage was publicly celebrated in 1712; Catharine was crowned in 1724, and succeeded Peter after his death. See Catharine I.

PETER'S, Saint, the Cathedral of Rome, the largest and one of the most magnificent churches in Christendom. It is a cruciform building in the Italian style, surmounted by a lofty dome, built on the legendary site of St. Peter's Martyrdom. In 306 Constantine the Great erected on this spot a basilica of great magnificence. In the time of Nicholas V. it threatened to fall into ruins, and he determined on its reconstruction, but the work of restoration proceeded slowly, and Julius II. (1503–13) decided on the erection of an entirely new building. He laid the foundation-stone of the new cathedral on the 18th of April, 1506, and selected the famous Bramante as his architect. After the latter's death various architects had charge of the work until Michael Angelo was appointed in 1546. He nearly completed the dome and a large portion of the building before his decease (1564). The nave was finished in 1612, the façade and portico in 1614, and the church was dedicated by Urban VIII. on 18th November, 1626. The extensive colonnade which surrounds the piazza and forms a magnificent approach to the church was begun by Bernini in 1667, and the sacristy erected by Carlo Marchionni in 1780. The interior diameter of the dome is 139 feet, the exterior diameter 195½ feet; its height from the pavement to the base of the lantern 405 feet, to the top of the cross outside 448 feet. The length of the cathedral within the walls is 613½ feet; the height of the nave near the door 152½ feet; the width 87½ feet. The width of the side aisles is 33¾ feet; the entire width of nave and side aisles, including the piers that separate them, 197¾ feet. The height of the baldacchino is 94½ feet. The circumference of the piers which support the dome is 253 feet. The floor of the cathedral covers nearly 5 acres, and its cost is estimated to have exceeded $50,000,000.

PETERSBURG, a city and river port, Dinwiddie co., Virginia, on the Appomattox river, 23 miles s. of Richmond. It is an important railway center, and a place of considerable trade and manufacturing industry. It was besieged by the Federal forces under General Grant in 1864–65, and the capture of this town, "the last citadel of the confederacy," was soon followed by the surrender of General Lee and the end of the war. Pop. 25,355.

PETERSBURG, St., the capital and most populous town of the Russian empire, is built at the mouth of the Neva, a considerable part being on the south or left bank of the river; a small portion on the north bank; and the remainder on the numerous islands formed by the different river mouths, these various sections being connected by numerous bridges. The site is low and marshy, and liable to periodic inundations; it is also unhealthy, the death-rate largely exceeding the birth rate. The streets are long, wide, and regular, and there are some immense squares; the public buildings are numerous, magnificent, and of colossal proportions; the quays massive and of granite. Among the many palaces are the Winter Palace, now used only for ceremonial purposes, one of the largest and most luxurious in Europe; the Marble Palace so called; the Michael Palace, now used as the School of Military Engineers; and the Hermitage Palace, containing a fine library and one of the richest collections of French, Flemish, Dutch, Italian, Spanish, Russian, and other paintings, the private property of the czars, besides engravings, coins, gems, antiquities, etc. The cottage in which Peter the Great lived while superintending the construction of St. Petersburg is still preserved. Other buildings of importance are: The Admiralty, a vast parallelogram of brick, with a naval and natural history museum and library; the arsenal, containing a museum of artillery; the palaces of the general staff and of the senate; the custom-house, the exchange, and imperial bank; the fortress of Petropavlovsk (the Russian bastile) the academy of sciences, with extensive museum and library; and the imperial library, with over a million volumes and large collections of manuscripts and engravings. There are numerous hospitals and charitable institutions, a university, founded in 1819, many special academies and four theaters maintained by the state. Of the monuments the colossal equestrian statue of Peter the Great, erected by Catharine II. (1782), and the monolithic Doric column of granite, 80 feet high, erected by Nicholas to the memory of Alexander I., take first rank; but these, in common with many of the finest buildings have severely suffered from climatic influences. St. Petersburg commands a large share of the commerce of the whole empire, but exact statistics are not obtainable. Formerly the port of the capital was at the strongly fortified island town of Cronstadt (which see), but large vessels now reach St. Petersburg by means of a deep canal, and commodious harbors have been constructed here. The manufactures are varied, but the principal are glass-works, tanneries, sugar-refineries, cotton mills, breweries, and tobacco works; also several government establishments besides those connected with military and naval equipment, as a carpet manufactory, modeled on that of the Gobelins at Paris, and a glass and porcelain manufactory. St. Petersburg was founded by Peter the Great in 1703, when he had just wrested its site from the Swedes. The forced construction of a city in a site apparently forbidden by nature cost the lives, according to various accounts, of from 100,000 to 200,000 peasants, collected from all

St. Petersburg—St. Isaac's cathedral and the senate-house.

parts of the Russian empire. It was at first built entirely of wood, and without a proper street system, but the extensive fires of 1736 and 1737 facilitated the reconstruction on an improved plan. The Empress Elizabeth did much to improve the city; it is, however, chiefly indebted to Catharine II. for its regularity and architectural splendor; and the improvements under Nicholas and Alexander II. have made it one of the finest of European capitals. Pop. 1,267,023.

PETER'S PENCE, a papal tribute collected in several of the western countries of Europe. The idea of an annual tribute seems to have originated in England before the Norman conquest, and was exacted from every householder about St. Peter's Day for the support of an English college or hospice in Rome. It was finally abolished by Elizabeth. This contribution was sometimes also called Romescot. It is still collected among Catholics, especially since the abolition of the pope's temporal power.

PETION DE VILLENEUVE (pā-ti-on dė vēl-neuv), Jerôme, French revolutionary, was born in 1753, was chosen deputy, by the tiersétat of that city, to the states-general in 1789. In October he was made a member of the Committee of Public Safety; elected president of the National Assembly in 1790; appointed president of the criminal tribunal of Paris, and became mayor of Paris in 1791. After the death of the king he was nominated a deputy to the convention; joined the Girondists; was impeached by Robespierre; escaped from prison, and died, it is supposed, from hunger, his body, in 1794, being found in a field in the department of the Gironde half devoured by wolves.

PETITION OF RIGHT, in English history, a parliamentary declaration of the rights and liberties of the people, assented to by Charles I. in the beginning of his reign (1628), and considered a constitutional document second in importance only to Magna Charta. The petition demanded: (1) that no freeman should be forced to pay any tax, loan, or benevolence, unless in accordance with an act of parliament; (2) that no freeman should be imprisoned contrary to the laws of the land; (3) that soldiers and sailors should not be billeted on private persons; (4) commissions to punish soldiers and sailors by martial law should be abolished.

PETIT JURY. See Jury.

PETOFI (pe-teu'fē), Sander, a Hungarian poet, born in 1823. His lyric of Most vagy sohā (Now or Never) became the war-song (1848) of the revolution; and in recognition of his lyrical fervency he has been named "the Hungarian Burns." In the revolutionary war he was appointed an adjutant under Bem, and was killed in the battle of Schässburg (1849).

PETRARCH (pet'rårk), Francesco Petrarca, an Italian poet and scholar, born at Arezzo 20th July, 1304. It was at Avignon in 1327 that he first saw, in the church of St. Claire, the Laura who exercised so great an influence on his life and lyrics. Our information regarding this lady is exceedingly meagre, but it is supposed that her name was Laura de Noves, that she had become the wife of Hughes de Sade two years before she was seen by Petrarch, and that she died in 1348 a virtuous wife and the mother of a large family. After this first meeting Petrarch remained at Avignon three years, singing his purely Platonic love, and haunting Laura at church and in her walks. He then left Avignon for Lombez (French department of Gers), where he held a canonry gifted by Pope Benedict XII., and afterward visited Paris, Brabant, Ghent, the Rhine, etc. In 1337 he returned to Avignon, bought a small estate at Vaucluse, in order to be near Laura, and here for three years wrote numerous sonnets in her praise.

Francesco Petrarca.

His Latin works were highly esteemed, and in 1341 he was called to Rome to receive the laureate crown awarded for his Latin poem of Africa, an epic on the Punic wars. At Parma he learned the death of Laura, which he recorded on his copy of Virgil, and celebrated in his Triumphs. A large part of his time was employed in various diplomatic missions, and in 1370 he took up his residence at Arqua, near Padua, where he passed his remaining years in religious exercises, dying 18th July, 1374. Among his Latin works are three books of Epistles (Epistolæ Familiares) and twelve Eclogues, his poem Africa, various philosophical, religious, political, and historical treatises; his Italian poems, on which his fame now entirely rests, chiefly consist of Sonetti and Canzoni in Vita e in Morte di Laura, and of Trionfi (Triumphs), a series of allegorical visions. His poems had an important influence on the development of Italian and modern European poetry.

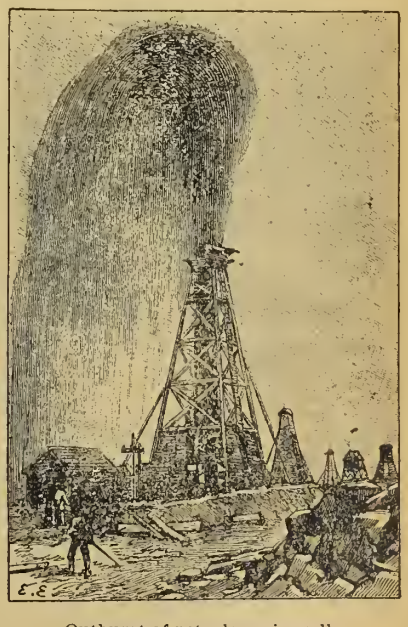
PETREL, the common name of the

Stormy petrel.

web-footed oceanic birds of the family Procellaridæ. The petrels are nocturnal in their habits, breed in holes in the rocks, lay but one egg, and are almost all of small size and more or less somber plumage. The smaller species are well known to sailors under the name of Mother Carey's chickens, and their appearance is supposed to presage a storm. The term stormy petrel is more exclusively applied to a bird which seems to run in a remarkable manner along the surface of the sea, where it picks up its food.

PETRIFICATIONS are the organic bodies (animal or vegetable) which have, by slow process, been converted into stone. The term is used in much the same sense as fossils.

PETRO'LEUM, a variety of naphtha, called also rock or mineral oil, a liquid inflammable substance in certain localities exuding from the earth, in some places collected on the surface of the water in wells, in other places obtained in great quantities by boring. It is essentially composed of a great number of hydrocarbons; is unctuous to the touch; exhales a strong odor; flows chiefly from beds associated with coal strata; and is found in enormous quantities in various parts of the United States, Russia (especially at Baku on the Caspian), Canada, Burmah, etc. At Baku a single well is said sometimes to spout as much as 11,000 tons of oil in a single day, the oil rising perhaps to the height of 300 feet. It yields kerosene, paraffin, and paraffin oil, so extensively employed for illuminating



Outburst of petroleum in well.

purposes; also lubricating oil and vaseline; and has been largely employed as liquid fuel in factories, locomotives, and steamships. Steamers, specially constructed with tanks, are now engaged in its transport, and in the larger towns in England vast reservoir-tanks for its reception have been recently constructed. Attention was first strongly drawn to petroleum by the successful manufacture and sale of paraffin oil in

Britain. This industry was also started in America, but it soon came to an end after 1859, when a company "struck oil" by boring at Oil Creek, Pennsylvania, and obtained a supply of 400 gallons a day. This led to numerous other borings, and the oil was obtained in such quantities that towns of considerable size soon sprang up in the oil district, railways were constructed, immense reservoirs were made, and long lines of oil pipes laid down, while large fortunes were realized. At first the borings were not very deep, and the oil generally flowed naturally; subsequently deeper borings were necessary, and the oil could only be raised to the surface by pumping. Boring for oil is carried on in the same way as for water. See Artesian Wells, Boring.

PEWTER, an alloy of tin and lead, or of tin with proportions of lead, zinc, bismuth, antimony, or copper, and used for domestic utensils. One of the finest sorts of pewter is composed of 83 parts of tin to 17 parts of antimony, while the common pewter of which beer-mugs and other vessels are made consists of 4 parts of tin and 1 of lead. The kind of pewter of which tea-pots are made (called Britannia-metal) is an alloy of tin, brass, antimony, and bismuth.

PFENNIG, a small copper or rather bronze coin current in Germany, of which 100 = 1 mark; so that ten pfennige are worth a little over two cents.

PHACOCHERE (fā'ko-kēr), Phacochœre, the wart-hog of Africa, apachydermatous mammal, akin to the swine, characterized by a large wart-like excrescence on each side of the face. The

Wart-hog.

tusks of the male project 8 or 9 inches beyond the lips, and form terrible weapons. One species is the Abyssinian phacochere or Ethiopian wild-boar.

PHA'COPS, a genus of fossil trilobites. P. latifrons is characteristic of the Devonian formation, and is all but world-wide in its distribution.

PHÆDO, a Greek philosopher, a scholar of Socrates, and founder of a school of philosophy in Elis. The dialogue of Plato on the immortality of the soul, which contains the conversation of Socrates in prison before his death, bears the name of Phædo. None of his own writings are extant.

PHÆDRA, in Greek mythology, daughter of Minos, king of Crete, was the sister of Ariadne and wife of Theseus. She falsely accused her stepson, Hippolytus, of a criminal attempt upon her honor, an injustice of which she afterward repented, and was either killed by her husband or committed suicide. Sophocles and Euripides made this the subject of tragedies (both of which are lost), and their example was followed by Racine.

PHA'ETHON, a mythological character, who one day obtained leave from his father Helios (the Sun) to drive the chariot of the sun, but being unable to restrain the horses Zeus struck him with a thunderbolt and hurled him headlong into the river Po. The name in its English form of Phæton is applied to an open four-wheeled carriage.

PHAL'ANGER, the name given to marsupial quadrupeds inhabiting Australasia. They are generally of the size of a cat, are nocturnal in their habits,

Vulpine phalanger.

and live in trees, feeding on insects, fruits, leaves, etc. The sooty phalanger or tapoa, so called from its color, is pretty common in Tasmania. The vulpine phalanger or vulpine opossum is another species, common in Australia.

PHALAN'GES (-jēz), the name applied to the separate bones of which the digits (or fingers and toes) of vertebrates are composed. Each digit or finger of the human hand consists of three phalanges, with the exception of the pollex or thumb, which is composed of two only.

PHAL'ANX, a name given generally by the Greeks to the whole of the heavy-armed infantry of an army, but more specifically to each of the grand divisions of that class of troops when formed in ranks and files close and deep, with their shields joined and their pikes crossing each other. The Spartan phalanx was commonly 8 feet deep, while the Theban phalanx was much deeper.

PHAL'ARIS, a small genus of grasses, of which the seed of one of the species, canary-grass, is extensively employed as food for birds, and commonly known as canary-seed.

PHALLUS, the emblem of the generative power in nature, carried in solemn procession in the Bacchic orgies of ancient Greece, and also an object of veneration or worship among various Oriental nations. In botany, Phallus is a genus of fungi.

PHANEROGA'MIA, a primary division of the vegetable kingdom, comprising those plants which have their organs of reproduction (stamens and pistils) developed and distinctly apparent.

PHANTASMAGO'RIA, a term applied to the effects produced by a magic-lantern.

PHARAOH (fā'rō), the name given in the Bible to the kings of Egypt, corresponding to the p-ra or ph-ra of the Egyptian hieroglyphics, which signifies the sun. The identification of the Pharaohs mentioned in Scripture with the respective Egyptian kings, particularly the earlier ones, is a matter of great difficulty.

PHARISEES, a religious sect among the Jews which had risen into great influence at the time of Christ, and played a prominent part in the events recorded in the New Testament. The most probable account of the origin of the Pharisees as a distinct sect is that which refers it to the reaction against the attempt of Antiochus Epiphanes to break down the distinctions between his Jewish and his Greek subjects. At the time of Christ the Pharisees stood as the national party in politics and religion—the opponents of the Sadducees. The fundamental principle of the Pharisees was that of the existence of an oral law to complete and explain the written law. "Moses," says the Mishna, "received the law (the unwritten law is meant) from Sinai, and delivered it to Joshua, and Joshua to the elders, and the elders to the prophets, and the prophets to the men of the Great Synagogue." This oral law declared the continuance of life after the death of the body, and the resurrection of the dead. This authoritative tradition received in process of time additions which were not pretended to be derived directly from Moses:—1st. Decisions of the Great Synagogue by a majority of votes on disputed points. 2d. Decrees made by prophets and wise men in different ages. 3rd. Legal decisions of proper ecclesiastical authorities on disputed questions. These authorities comprehended both the writers of the sacred books and their approved commentators. There is no doubt that though their strict observance of small points often led to hypocrisy and self-glorification, the sect contained a body of pious, learned, and patriotic men of progress.

PHARMACOPŒ'IA, a book containing the prescriptions for the preparation of medicines recognized by the general body of practitioners. Up till 1863 separate Pharmacopœias were issued by the Colleges of Physicians of London, Edinburgh, and Dublin. Since then a British Pharmacopœia, issued by the medical council of the kingdom, is recognized by the whole medical profession of Great Britain. There is also an American Pharmacopœia, based on that of Britain.

PHAR'MACY, pharmaceutics, the art of preparing, compounding, and combining substances for medical purposes: the art of the apothecary. As these substances may be mineral, vegetable, or animal, theoretical pharmacy requires a knowledge of botany, zoology, and mineralogy; and as it is necessary to determine their properties, and the laws of their composition and decomposition, of chemistry also. In a narrower sense pharmacy is merely the art of compounding and mixing drugs according to the prescription of the physician.

PHAROS, a lighthouse. The name is derived from the island of Pharos, close to and now part of Alexandria, which protected the port of that city. On the eastern promontory of the island stood the lighthouse of Alexandria, so famous in antiquity, and considered one of the wonders of the world, built 300 years B.C.

PHARYNX (fa'ringks), the term applied to the muscular sac which intervenes between the cavity of the mouth and the narrow œsophagus, with which it is continuous. It is of a funnel shape, and about 4 inches in length; the posterior nostrils open into it above the soft palate, while the larynx, with its lid, the epiglottis, is in front and below. The contraction of the pharynx transmits the food from the mouth to the œsophagus. From it proceed the eustachian tubes to the ears.

PHAS'MIDÆ, specter insects or walking-sticks, remarkable for their very close resemblance to the objects in the midst of which they live, this peculiarity known as mimicry, being their only protection against their enemies. Some of them are destitute of wings and have

Phasmidæ, or specter insects.
1, Brazilian walking-stick. 2, Australian.

the appearance of dead twigs, while the absence of motion in the insects add to the deception. In others, as the genus Pyhllium, the wings have the appearance of withered leaves, while the brighter hue of the wing-covers of a few of larger size give to the animal the appearance of a fresher leaf.

PHEASANT, the general name given to birds of the family Phasianidæ, which comprises several genera besides that of the pheasants proper, Phasianus.

Golden pheasant.

Impeyan pheasant.

There are usually naked spaces of skin on the head or cheeks and often combs or wattles. The plumage of the males is brilliant, that of the females more sober, and the males carry spurs on the tarsometatarsus. The wings are short, the tail long. The three front toes are united by a membrane up to the first joint, and the hinder toe is articulated to the tarsus. The food consists of grains, soft herbage, roots, and insects. They are chiefly terrestrial in habits, taking short, rapid flights when alarmed. The pheasants are polygamous, the males and females consorting together during the breeding-time, which occurs in spring.

PHELPS, Edward John, American political leader and diplomat, born at Middlebury, Vt., in 1822. In 1851 he was appointed Second Comptroller of the United States treasury. In 1870 he was a member of the Vermont constitutional convention. He was appointed by President Cleveland, Minister to the Court of Saint James's. In 1893 he was appointed senior counsel for the United States in the Bering sea arbitration. He died in 1900.

PHELPS, Elizabeth Stuart. An American author. See Ward, Elizabeth Stuart Phelps.

PHENIC ACID, phenol. See Carbolic Acid.

PHENOM'ENALISM, that system of philosophy which inquires only into the causes of existing phenomena. The sceptical phenomenalism of Hume is now represented by Positivism. A phenomenalist does not believe in an invariable connection between cause and effect, but holds this generally acknowledged relation to be nothing more than an habitually observed sequence.

PHI'DIAS of Athens, a celebrated Greek sculptor, who was born about 490 B.C., and flourished in the age of Pericles but of whose life hardly any particulars are known. Among his works were three statues of Athena which were all in the Acropolis of Athens in the time of Pausanias. One colossal statue of Athena was in bronze, and the goddess was represented as a warrior-goddess in the attitude of battle. The second and still more famous stood in the Parthenon, and was made of ivory and gold, representing Athena standing with a spear in one hand and an image of Victory in the other; it measured, with the pedestal, about 41½ feet in height. The third statue, in bronze, of a smaller size, was called emphatically the beautiful, on account of its exquisite proportions. Another colossal statue by Phidias, that of Zeus at Olympia, was ranked for its beauty among the wonders of the world. Zeus was here seen sitting upon a throne, with an olive wreath of gold about his temples; the upper part of his body was naked; a wide mantel, covering the rest of it, hung down in the richest folds to his feet, which rested on a footstool. The naked parts of the statue were of ivory, the dress was of beaten gold. The right hand held a Victory, and the left a scepter tipped with the eagle. The Zeus was removed to Constantinople by Theodosius I., and was destroyed by fire in 475 A.D. During the government of Pericles, which lasted twenty years, Athens was adorned with costly temples, colonnades, and other works of art. Phidias superintended these improvements; and the sculptures with which the Parthenon, for instance, among other buildings, was adorned, were partly his own work, and partly in the spirit and after the ideas of this great master. Of the merits of these we can ourselves judge. Phidias received great honors from the Athenians, but he is also said to have been falsely accused of peculation, and of impiety for putting his own likeness and that of Pericles on the shield of Athena. He died probably about B.C. 432.

PHILADELPHIA, a city and river port in Pennsylvania, after New York and Chicago the largest city in the Union, 125 miles northeast of Washington and 85 miles southwest of New York, situated between the rivers Delaware and Schuylkill, with suburbs on the opposite sides of both rivers, 96 miles from the Atlantic coast. The site is nearly flat, but slopes gently both toward the Delaware and the Schulykill. The houses are generally built of brick, the private houses having in many cases dressings of white marble. The streets were originally laid out so as to run nearly due westward from the Delaware, intersected by other streets running nearly north and south, and still almost everywhere the streets cross each other at right angles. Market street, the great central street running east and west, and continuously built upon for over 4 miles, has a width of 100 feet; Broad street, the principal central street running north and south, is built upon to about the same length, and is 113 feet in width. Most of the other chief streets vary from 50 to 66 feet broad, some of the avenues, however, being much wider. At the intersection of some are fine squares. There are more than 1500 miles of streets, 900 miles of which are paved, and there are 951 miles of sewers and over 1300 miles of water mains. The street railways, employing the overhead trolley system, have over 500 miles of track, and the steam railroads over 360 miles. A subway system of four tracks from the Delaware to the Schuylkill, with an elevated extension from the Schuylkill to the city limits is nearly completed. Several fine bridges, both for railway and general traffic, span the Schuylkill, and a regular service of steam-ferries across the Delaware affords communication with the shores of New Jersey. Among the notable public buildings are the state house, containing a large room called Independence Hall, from the circumstance that the declaration of independence was signed here (4th July, 1776); the custom-house, a white marble edifice; the United States mint, a marble-fronted building; the post-office, a large and handsome granite structure with a dome; the new city-hall, a splendid building of granite and marble, completed in 1889, with a tower 450 feet high, surmounted by a statue of William Penn; Girard college, a fine example of the Corinthian style; the buildings of Pennsylvania university; the splendid building accommodating the Academy of Fine Arts. Among the leading office buildings are the Land Title Annex, the Real Estate Trust building, the Arcade building, the Commonwealth Trust building, the Real Estate Title and

Trust Company building, the Drexel building, the Bullitt building, the Provident building. The Pennsylvania railroad station, with a train shed over 700 feet long, and the Reading terminal, a handsome railroad station, approached like that of the Pennsylvania railroad by a viaduct, are notable railway terminals and office headquarters. Of newspaper buildings the most prominent are those of The North American (22 stories), The Record, and The Public Ledger. Philadelphia has many important hotels, among the most elegant and commodious of which may be mentioned the Walton and the new Bellevue-Stratford, both on Broad street near city hall. The structures representing various interests are the Masonic and Odd Fellow's temples, Young Men's Christian Association building, Young Women's Christian Association, the Roman Catholic cathedral, the Kenneth Israel synagogue, the Baptist Temple, Holy Trinity (Protestant Episcopal), the Arch Street (Methodist Episcopal), the First Presbyterian and the Tabernacle Presbyterian and the Friends' Meeting House on Arch street—the Quaker Westminster of America. Of educational institutions the University of Pennsylvania, Drexel institute, the new Boys' High school, Girard college with its early Grecian structures, and the Roman Catholic high school are architecturally of importance. Charitable institutions are numerous and efficient. The educational establishments include the Pennsylvania university; the Jefferson Medical college; University Medical college; the Women's Medical college; the Academy of Fine Arts; the School of Design for Women; the Academy of Natural Sciences; the Franklin institute; numerous colleges, academies, and other educational institutions, supported by the various religious denominations; the Girard college, devoted to the secular education of orphan boys; and the public schools. Many of the above institutions possess extensive and valuable libraries in addition to which are the large collections belonging to the Library company, and to the Mercantile library; and Philadelphia is one of the recognized centers of literary, dramatic, and artistic culture. In addition to the public squares, the chief place of outdoor recreation is Fairmount park, with an area of 2740 acres, possessing much natural beauty, being well-wooded and having a great variety of surface. Many fine monuments have been placed in the park, among them being those of Washington, Lincoln, Garfield, Grant, Schiller Goethe, Columbus and Joan of Arc. The principal places of indoor amusements are the theaters, numerous concert-rooms, etc. The Walnut Street theater is the oldest in the county. The other theaters are: Keith's New theater, the Garrick, the South Broad, the Chestnut Street, the Grand, and the Academy of Music. Philadelphia ranks high as a center of foreign, inland, and coasting trade. The leading articles of export are grain, provisions, petroleum, anthracite, and gas-coal, iron and ironwares, lumber, tobacco, and cotton (raw and manufactured). The principal imports consist of cotton, woolen, and flax goods, tinplate, iron and iron-ore, chemicals, etc. Philadelphia is a great manufacturing city, ranking third in the value of products, the carpet industry being the largest in the country. The other leading manufactures are iron and steel, machinery and tools, refined sugar, clothing, boots and shoes, brewery products, chemicals, household furniture, etc.—Philadelphia was founded and named by William Penn in 1682 as the

capital of his colony of Pennsylvania. For a long time it was almost exclusively occupied and controlled by Quakers. Many of its most important improvements were due to Benjamin Franklin, and it played a most prominent part during the revolutionary war. In May-November, 1876 (a hundred years after the issue of the declaration of independence), a centennial exhibition was held on the grounds at the southwest extremity of Fairmount park. Pop. 1909 estimated at 1,500,000.

PHILE'MON, Epistle of Paul to, one of the books of the New Testament. This epistle, according to the prevalent opinion, was, together with the Epistles to the Ephesians, Colossians, and Philippians, written from Rome during St. Paul's first imprisonment in that city. The only doubt thrown on this opinion by those who accept the genuineness of the epistles is contained in the suggestion supported by Meyer and others, that these epistles were written during the apostle's imprisonment at Cæsarea. The genuineness and authenticity of Philemon is questioned by very few critics.

PHILIP, one of the twelve apostles, according to John's gospel "of Bethsaida, the city of Andrew and Peter," and who was called to follow Jesus at Bethany. After the resurrection he was present at the election of Matthias to the apostleship, but is not again mentioned. In the Western church he is commemorated on 1st May.—Philip the Evangelist, often confounded with the above, is first mentioned in Acts vi. 5. He preached at Smyrna, where Simon Magus was one of his converts; baptised the Ethiopian eunuch; entertained Paul and his companion on their way to Jerusalem, when "he had four daughters which did prophesy."

PHILIP II., King of Macedon, the most famous of the five Macedonian kings of this name, was born B.C. 382. and succeeded his elder brother Perdiccas in 360. His ambition was to make himself in the first place, supreme in Greece, and to accomplish this he began by seizing the Greek towns on his borders: Amphipolis, which gave him access to the gold-mines of Mount Pangæus, Potidæa, Olynthus, etc. The "sacred war" carried on by the Amphictyonic council against the Phocians gave Philip his first opportunity for interfering directly in the affairs of Greece. After the capture of Methone—the last possession of the Athenians on the Macedonian coast—between 354 and 352, Philip made himself master of Thessaly, and endeavored to force the pass of Thermopylæ, but was repulsed by the Athenians. The terror of his name provoked the "Philippics" of Demosthenes, who endeavored to rouse the people of Athens to form a general league of the Greeks against him; but by 346 he was master of the Phocian cities and of the pass of Thermopylæ, and as general to the Amphictyon council he was the crowned protector of the Grecian faith. Demosthenes exerted all his eloquence and statesmanship to raise the ancient spirit of Grecian independence, and a powerful army was soon in the field, but being without able or patriotic commanders it was defeated at the decisive battle of Chæroneia in August, 338 B.C. After this last struggle for freedom Philip was acknowledged chief of the whole Hellenic world, and at a congress held at Corinth he was appointed commander of the Greek forces, and was to organize an expedition against Persia. While preparing for this enterprise he was murdered in 336 B.C., some say at the instigation of his wife Olympias.

PHILIP I., King of France, was born 1052, and succeeded to the throne under the guardianship of Baldwin V., count of Flanders, in 1060. He died in 1108.

PHILIP II., Augustus, King of France, born 1165, was crowned as successor during the lifetime of his father Louis VII., whom he succeeded in 1180. In 1190 he embarked at Genoa on a crusade to the Holy Land, where he met Richard Cœur de Lion, who was engaged in the same cause in Sicily. The jealousies and disputes which divided the two kings induced Philip to return home the next year. He invaded Normandy during Richard's capivity (1193), confiscated the possessions of King John in France after the death of Prince Arthur (1203), prepared to invade England at the instance of the pope (1213), turned his arms against Flanders and gained the celebrated battle of Bouvines (1214). He died in 1223.

PHILIP III., called the Hardy, King of France, was the son of Louis IX. and Margaret of Provence. He was born 1245, and succeeded his father 1270. The invasion of Sicily by Peter of Ara-

gon, and the massacre of the French, known as "the Sicilian vespers," caused him to make war against that prince, in the course of which he died, 1285.

PHILIP IV. (Le Bel), King of France was born in 1268, and succeeded his father in 1285. He had already married Joanna, queen of Navarre, by which alliance he added Champagne as well as Navarre to the royal domain, which he made it his policy still further to increase at the expense of the great vassals. He even attempted to take Guienne from Edward I. of England, but afterward entered into an alliance with that monarch, and gave him his daughter in marriage (1299), from which originated the claim of Edward III. on the crown of France. Philip left numerous ordinances for the administration of the kingdom, which mark the decline of feudalism and the growth of the royal power. He also convoked and consulted the states-general for the first time. He died in 1314.

PHILIP VI. of Valois, King of France, was the nephew of Philip IV., to whose last son, Charles IV., he succeeded in virtue of the Salique law. He was born in 1293, and succeeded to the crown in 1328. In his reign occurred the wars with Edward III. of England, who claimed the French crown as grandson, by his mother, of Philip IV. (see above article). Philip died in 1350.

PHILIP II. of Spain, was the son of Charles V. and Isabella of Portugal, and was born at Valladolid in 1527. He was married in succession to the Princess Mary of Portugal 1543, and to Mary of England in 1554, the same year in which he became king of Naples and Sicily by the abdication of his father. In 1555 his father resolved to abdicate the sovereignty of the Netherlands in Philip's favor. This was done in public assembly at Brussels on 25th October, 1555; and on 16th January, 1556, in the same hall he received, in presence of the Spanish

Philip II. of Spain.

grandees then in the Netherlands, the crown of Spain, with its possessions in Asia, Africa, and America. The cause of religion in France was a constant subject of solicitude with Philip. In Naples, as in Spain, his zeal led him to persecute the Protestants; but it was in the Netherlands that his bigotry and obstinacy had their most disastrous, though ultimately fortunate results. In 1566 the revolt of the Netherlands commenced, which ended in the separation of the seven northern provinces from the crown of Spain, and their formation into the Dutch Republic. In 1571 the Archduchess Anne of Austria became his fourth wife, and the same year his natural brother, Don John of Austria, obtained the great naval victory of Lepanto over the Turks. In 1580 his troops under Alva subdued Portugal, of which, and all its dependencies, Philip now became sovereign. In 1586 Philip declared war with England. The year 1588 saw the destruction of the Armada and the descent of Spain from her position as a first-class power in Europe. The remainder of his reign was occupied with war and intrigues with France, but in 1598 the Peace of Vervins was concluded. He died in 1598.

PHILIP V. of Spain, the first Spanish king of the Bourbon dynasty, was born at Versailles 1683, died 1746. He was the grandson of Louis XIV. of France, and succeeded to the crown of Spain by the will of Charles II., who died without direct heirs, as the grandson of Charles' elder sister. On the death of Charles in November, 1700, he was immediately proclaimed king, and was generally recognized in Spain, Naples, and the Netherlands; but the succession was contested by the Archduke Charles of Austria, whose claim was enforced by the armies of England, Holland, and Austria in the wars of the Spanish succession which began in 1702. By the Treaty of Utrecht (1713) he was recognized as King of Spain, but Gibraltar was lost to Spain, Minorca was also ceded to England, Sicily to Savoy, the Netherlands, Naples, and the Milanese to Austria. In 1724 Philip resigned the crown of Spain in favor of his son Don Louis, but the death of Louis a few months later induced him to resume the royal power. He died in 1746, after a reign of forty-six years.

PHILIP the bold, Duke of Burgundy, born in 1342 ,was the fourth son of John, king of France. He fought at Poitiers (1356), where, according to Froissart, he acquired the surname of the Bold. He shared his father's captivity in England, and on his return his father, whose favorite he was, made him Duke of Touraine, gave him the Duchy of Burgundy, and made him premier peer of France. He was one of the most powerful French princes during the minority of Charles VI., during whose insanity he acted as regent, retaining the regency till his death in 1404.

PHILIP I. (The Magnanimous), Landgrave of Hesse, born in 1504. He began to reign at the age of fourteen, and introduced the Lutheran religion into Hesse in 1526. In 1527 he founded the University of Marburg, subscribed the protestation to the Diet of Spires in 1529, submitted the Confession of Faith at Augsburg in 1530, and in 1531 formed with the Protestant princes the Schmalkalden League. He was forced to submit to the Emperor Charles V. in 1547, who kept him a prisoner for five years. After his return to his dominions he sent a body of auxiliaries to assist the French Huguenots. He died in 1567.

PHILIP'PI, a city of Macedonia, now in ruins, founded by Philip of Macedon about B.C. 356. The two battles fought in B.C. 42, which resulted in the overthrow of Brutus and Cassius by Antony and Octavius, were fought here Philippi was visited on several occasions by the apostle Paul, who addressed to the church there one of his epistles.

PHILIP'PIANS, Epistle to the, one of St. Paul's epistles, is supposed to have been written from Rome toward the close of his first imprisonment there, about A.D. 63. Some authorities suppose it to have been written in Cæsarea. The genuineness of this epistle has been little questioned. It is referred to, though not quoted, in the epistle of Polycarp and by Tertullian and other early fathers. Epaphroditus, who conveyed it, was the messenger of the Philippians to Paul, and had been ill at Rome, which had been a cause of anxiety to the Philippians. Paul, therefore, hastened his return, and sent this epistle by him.

PHILIP'PICS, the name given to three celebrated orations of the Greek orator Demosthenes against Philip, king of Macedon (351–341 B.C.). This name was also applied to Cicero's fourteen speeches against Antony, and it has hence come to signify an invective in general.

PHILIP'PINES, or **PHILIPPINE ISLANDS,** an archipelago belonging to the United States, in the Pacific ocean, n.e. of Borneo, having on the west the China sea, on the east the North Pacific, and on the south the Sea of Celebes; area, 114,360 sq. miles; pop. about 7,000,000. It consists of about 1200 large and small islands Of the former the chief are Luzon, Mindoro, Samar, Panay, Leyte, Cebu, Negros, Bohol, Mindanao, and Palawan. Luzon is the only island of great commercial importance. It contains the capital Manila. The shore lines and internal surface of the larger islands are extremely rugged and irregular. Their magnificent mountain ranges are clothed with a gigantic and ever-teeming vegetation; and between these lie extensive slopes and plains of the richest tropical fertility, watered by numerous lakes and rivers, which afford abundant means of irrigation and transport. The climate on the whole is healthy, but hurricanes are common. Earthquakes are frequent, and often very destructive. The principal agricultural product is rice, and next in importance are sugar-cane, tobacco, and coffee. Fibrous plants are also abundant, and among the chief of these are the well-known Manila-hemp, the cotton-plant, the gomuti palm, ramie, etc. The pine-apple is grown both for its fiber and its fruit. The textile productions of the Philippines, the work of the native population, are considerable in number, ranging from the delicate and costly pina muslins, made from the pine-apple fibre, to coarse cottons, sacking, and the mats made of Manila-hemp and the fiber of the gomuti palm. The islands are rich in minerals, including gold, iron, quicksilver, sulphur, coal, marble, petroleum, etc., but they are little worked. The foreign trade is mostly in the hands of British and American mercantile houses, and consists principally in the export of sugar, tobacco, Manila-hemp, indigo, coffee, birds'-nests, trepang, sapan-wood, dye-woods, hides, rattans, mother-of-pearl, gold-

dust, etc., and in importing rice and other food-stuffs, and various manufactured articles. The natives are of diverse origin. Wild tribes, some of which are extremely ferocious, still haunt the mountains. The chief mountain tribes are the Negritos, diminutive negroes, who have given their name to the island Negros, though not confined to it; and the Ætas or Itus, a dusty or coppercolored race. But the great mass of the population consist of the Tagals, inhabiting Luzon, and the Bisayans, who inhabit the other islands. These speak respectively the Tagal and Bisayan tongues, each of which has a variety of dialects. Half-castes, Indo-European and Indo-Chinese, engross much of the business and wealth of the islands. Spaniards are comparatively few. The independent tribes are partly Mohammedan and partly heathen. Most of the former subjects of Spain profess Roman Catholicism, and priests are very numerous. The largest town and chief seaport as well as the seat of government is Manila. The Philippines were discovered by Magellan in 1520–21, and were finally annexed to the Spanish dominions, and named after Philip II. In 1762 Manila was taken and for a short time held by a British fleet, and the Americans seized it in 1898. The islands were ceded by Spain to the United States in 1898.

In February, 1900, the provisional government of the islands was intrusted to a new board of civil commissioners, five in number, at the head of which was Judge William H. Taft of Ohio. The commission in January, 1901, established a municipal code for the government of cities other than Manila and tribal settlements. A constitution for the government of the provinces enacted by the commission provided that their officials should be a governor elected by the municipalities subject to the approval of the commission, and a secretary, a treasurer, a commissioner of public works, and a public prosecutor, all appointed by the commission. From time to time the commission instituted civil governments in the localities as circumstances required, until in 1903 more than 700 localities had local governments suited to their conditions. By an act of the commission dated June 11, 1901, the judicial system was reorganized. A supreme court was created to consist of seven justices, four American and three native; and sixteen courts of First Instance, over which natives presided, were established. The city of Manila, the capital, is governed by a board of three commissioners. In addition to the above measures the present constitution of government for the Philippines consists of the Philippine commission, the governor and vice-governor, the departments of the interior, of commerce and police, of finance and justice, and of public instruction.

The first Filipino assembly elected by the people was opened on October 15, 1907, on which occasion Secretary of War Taft made an address in which he expressed the exact truth of the situation as seen by the authorities at Washington.

PHILIPPINE WAR, 1899–1900, CHRONOLOGY OF

Hostilities began	February 4, 1899
Battles around Manila	February 4-7, 1899
Battle at Pasig	March 13, 1899
Battle at Malinea	March 26, 1899
Battle at Santa Cruz	April 10, 1899
Santa Cruz captured	April 25, 1899
San Fernando captured	May 5, 1899
Battle at Bacoor	June 13, 1899
Battle at Imus	June 16, 1899
Battle at Colamba	July 26, 1899
Battle at Calulut	August 9, 1899
Battle at Angeles	August 16, 1899
Major John A. Logan killed	November 14, 1899
General Gregorio del Pilar killed	December 10, 1899
General Lawton killed	December 19, 1899
Taft commission appointed	February 25, 1900
Amnesty proclaimed	June 21, 1900
Aguinaldo captured	March 23, 1901
Civil government party established	July 4, 1901

PHILIS'TINES, the name of a Semitic people or race who inhabited the southern part of the lowlands of Palestine, from the coast near Joppa to the Egyptian desert south of Gaza. They occupied five chief cities (Ashdod, Gaza, Gath, Askelon, Ekron), and these formed a kind of confederacy under five lords or chiefs. Mention is made of this people in Genesis xxi., xxvi., but it was during the time of the Judges in Israel, and subsequently in the reigns of Saul and David, that the Philistines attained their highest power, and from the latter received their greatest defeats. In the wars between Assyria and Egypt the country of Philistia was subdued by Tiglath-Pileser (734 B.C.); but the Philistines still intrigued with Egypt, and made various revolts against Sargon and Sennacherib to assert their independence. During the Babylonian captivity they avenged themselves on

Philistine prisoners.—Sculptures at Medinet Haboo.

their old enemies the Israelites (Ezekiel xxv. 15), but subsequently the two nations seem (Nehemiah xiii. 23), to some extent, to have fraternized. The origin of this race has been a question of much debate by Biblical critics.

PHILIP, John Woodward, American naval officer, was born in New York City in 1840. He was appointed to the United States Naval academy, became midshipman in 1861, and served during the civil war in the gulf. In 1897 he was placed in command of the battleship Texas, which took a prominent part in the naval battle of Santiago during the Spanish-American war. In August, 1898, he was made commodore and was placed in command of the second squadron of the North Atlantic fleet, and in March, 1899, he was made rear-admiral and made commandant of the Brooklyn Navy yard. He died in 1900.

PHILLIPSBURG, a city in Warren co., N. J., on the Delaware river, and the Cent. of N. J., the Del., Lack. and West., the Lehigh Valley, and the Penn. railways; opposite Easton, Pa., 50 miles n.n.w. of Trenton. It is in an agricultural, iron-ore, and limestone region, and is noted for its extensive iron-works and their productions. Pop. 12,120.

PHILLIPS, Wendell, American abolitionist, born at Boston, 1811; died 1884. He was educated at Harvard university, studied law, and was called to the bar (1834); joined the movement for the abolition of slavery in 1837, and gave it the aid of his oratorical gifts and unremitting advocacy until in 1865 the negroes of the United States were made free citizens. His Speeches, Letters, and Lectures were published in 1863.

PHILOLOGY, or **COMPARATIVE PHILOLOGY,** a term commonly used as equivalent to the science of language, otherwise called Linguistic Science, or Linguistics. This science treats of language as a whole, of its nature and origin, etc., and of the different languages of the world in their general features, attempting to classify and arrange them according to such general features, and to settle in what relationship each stands to the others. The philologist as such does not study languages for practical purposes, or to be able to read and speak a number of them, though the more he is tolerably familiar with the better. He rather studies them in the way a naturalist studies a series of animals or plants, as if they were separate organisms each with a life and growth of its own. That every language has such a life and growth is true in a sense, for languages are continually in a state of change; yet a language is not to be regarded as an organism like a plant or an animal, but rather, to quote Professor Whitney, as an institution, an outcome of the needs of human beings for communication with their fellows. A language is a system of vocal sounds through which ideas are conveyed from person to person in virtue of the fact that certain ideas are attached or belong to certain sounds by a sort of convention or general understanding existing among those who use the language. That there is any natural law by which one idea belongs to one vocal sound rather than to another can hardly be affirmed in view of the fact that if we select any one idea we shall find that each of the thousand languages of the world expresses this idea by a different sound or group of sounds. Indeed, ideas can be conveyed otherwise than by vocal sounds, as witness the elaborate sign-language that has been developed in some communities, as also the finger-language of the deaf and dumb. We

can even conceive that a language of hieroglyphics or written symbols might exist with no spoken language alongside of it. We have, however, no knowledge of any such case, and, in fact, wherever man exists we find him making use of speech, which, indeed, is one of his most distinct and marked characteristics. As to the origin of language nothing is really known, although most probably it is an invention or acquisition of the human race, and not an original endowment.

To begin with our own language and the kindred tongues. Philology has succeeded in showing that the English language is one of a group of closely allied languages which are known by the general name of the Teutonic or Germanic tongues. The other languages of the group, some of which are more closely connected with English than the rest, are Dutch, German, Danish, Icelandic or Old Norse, Swedish, and Gothic; to which may be added, as of less importance and having more the character of dialects, Norwegian, Frisian, the Plattdeutsch or Low German of Northern Germany, and Flemish, which differs little from Dutch. The Teutonic tongues are often divided into three sections, based on closeness of relationship: the High German, of which the modern classical German is the representative; the Low German, including English, Dutch, Frisian, Plattdeutsch, and Gothic; and the Scandinavian, including Danish, Swedish, and Icelandic. Another division is into: East Germanic, including Gothic and Scandinavian; and West Germanic, including the others.

The evidence that all these languages are closely akin is to be found in the great number of words that they possess in common, in the similiarity of their structure, their inflections, their manner of compounding words—in short, in their family likeness. This likeness can only be accounted for by supposing that these languages are all descended from one common language, the primitive Teutonic, which must have been spoken at a remote period by the ancestors of the present Teutonic peoples, there being then only one Teutonic people as well as one Teutonic tongue. In their earliest form, therefore, and when they began to be differentiated, these languages must have had the character of mere dialects, and it is only in so far as each has had a history and literature of its own that they have attained the rank of independent languages.

The Teutonic tongues, with the primitive or parent Teutonic from which they are descended, have been proved by the investigations of philologists to belong to a wider group or family of tongues, which has received the name of the Aryan, Indo-European, or (especially in Germany) Indo-Germanic family. The chief members of this family are the Teutonic, Slavonic (Polish, Russian, Bohemian), Lithuanian, Celtic (Welsh, Irish, Gaelic, etc.), Latin (or Italic), Greek (or Hellenic), Armenian Persian, and Sanskrit. Just as the Teutonic tongues are believed to be the offspring of one parent Teutonic tongue, so this parent Teutonic and the other members of the Aryan family are all believed to be descended from one primitive language, the Aryan or Indo-European parent-speech. The people who spoke this primeval Aryan language, the ancestors (linguistically at least) of the Aryan races of Europe and Asia, are believed by many to have had their seat in Central Asia to the eastward of the southern extremity of the Caspian sea. This, however, is very problematical, and some philologists see reason to think that Europe may rather have been the original home of the Aryans. This latter view is now perhaps the one most generally held.

How remote the period may have been when the ancestors of the Teutons, the Celts, the Slavs, the Greeks, Romans, Persians, and Hindus were living together and speaking a common language is uncertain. Yet the general character of their language is approximately known, and philologists tell us with some confidence what consonant and what vowel sounds the Aryan parent-speech must have possessed, what were the forms of its inflections, and what, at the least, must have been the extent of its vocabulary, judging from the words that can still be traced as forming a common possession of the sister tongues of the family.

The Aryan tongues, ancient and modern, are entitled to claim the first rank among the languages of the globe, both for richness, harmony, and variety, and more especially as embodying a series of literatures to which no other family of tongues can show a parallel. Next in importance come the Semitic tongues—Hebrew, Chaldee, Syriac, Arabic, etc. These, like the Aryan tongues, form a well-marked family, one notable peculiarity of which is the possession of "triliteral" roots, or roots of which three consonants form the basis and give the general meaning, while inflection or modification of meaning is indicated by internal vowel-change. Thus the vowels play a subordinate part to the consonants, and do not, as in the Aryan tongues, associate with them on equal terms. Other important linguistic families are the Hamitic, which includes the ancient Egyptian, the Coptic, Berber, Galla, Somali, etc.; the Turanian or Ural-Altaic, which includes Turkish, Finnish, Hungarian, Mongolian, etc.; and the Southeastern Asiatic, which includes Chinese, Siamese, etc. The Turanian languages belong to the type known as agglutinate or agglutinating, being so called from the fact that the root always maintains a sort of independence or distinctive existence, the other elements of the word being more or less loosely "glued" or stuck on as it were. The Chinese is the chief of the monosyllabic languages, so called from their words consisting normally of monosyllables. Other families of languages are the Malayo-Polynesian of the Indian Archigelago and Pacific; the Bântu, a great family of South Africa; and the American Indian languages, which are characterized as polysynthetic, from the way in which they crowd as many ideas as possible into one unwieldy expression. All these families form groups, so far is as known, separate from and independent of each other; and attempts to connect any two of them, as Aryan and Semetic, for instance, have met with little success. Formerly etymologists had no hesitation in deriving English words from Hebrew roots, but this was in the days when there was no science of comparative philology. That all languages are descendants of one original tongue, as is believed by many, linguistic science can neither affirm nor deny. We may add that community of language is not a proof of community race, since it is well known that, as the result of war or otherwise, races have given up the language that once belonged to them and adopted some other.

PHILOME'LA, in Greek mythology, a daughter of Pandion, king of Athens, who being violated and deprived of her tongue by Tereus, the husband of her sister Progne made known her wrong to the latter by embroidering it in tapestry In revenge the sisters murdered Itys the son of Progne by Tereus, and served him up to his father. Tereus pursued them, but they were changed by the gods into birds, Philomela and Progne into a nightingale and a swallow, and Tereus into a lapwing.

PHILOSOPHER'S STONE. See Alchymy.

PHILOSOPHY, a term first brought into general use by Socrates. Philosophy is the science that deals with the general principles which form the basis of the other sciences, and of which they themselves take no cognizance. It follows up the data of experience to their ultimate grounds, regarding each particular fact in relation only to a final principle, and as a determinate link in the system of knowledge. In this view philosophy may be defined as the science of principles.

For all practical purposes the history of philosophy may be treated as commencing with the Greeks, the philosophic notions of the inhabitants of the East being considered merely as introductory to the Greek philosophy, in which many oriental notions were incorporated. The first problem of Greek philosophy was to explain the enigma of external nature, to solve the problem not of the soul but of the world. Thales (about 600 B.C.) stands at the head of the Ionian school which, with the Eleatic school, was the chief representative of speculative thought in pre-Socratic times; the former of these schools being characterized by Aristotle as seeking to find a material, the latter a formal principle of all things. In Socrates (470–399 B.C.), who united scientific method and a high ethical and religious spirit, the destructive teaching of the Sophists found its keenest opponent. What are called the minor Socratic school—the Cynics, Cyrenaics, and Megarians—severally professed to regard Socrates, as their founder, the Cynics, however, defining the end of action as self-sufficiency, the Cyrenaics as pleasure, and the Megarians as reason. With Plato (430–347) philosophy lost its one-sided character. Though professedly a disciple of Socrates his system of idealism is his own. The Platonic idea is the pure archetypal

essence, which is the source of all the finite realities that correspond to it. The visible world in an inferior reproduction of the world of pure ideas, where shine in all their splendor the good, the true, and the beautiful. In logic Plato brings back science to general ideas. In ethics the highest end of man is regarded as the unity of his nature. Plato's ideal theory is criticised by Aristotle, because he gives no real explanation of the connection between the phenomenal and the ideal. In Aristotle's own system, instead of beginning with the general and the absolute, as Plato had done, he begins with the particular and individual. His whole philosophy is a description of the given and empirical; and his method is induction. His system presents us with a number of coordinate sciences, each having its independent foundation, but no highest science which should comprehend them all. The three schools of Greek philosophy which followed the systems of Plato and Aristotle, and which mark the declining days of Greece, are those of the Stoics. Epicureans, and Sceptics.

Modern philosophy, which begins with the 15th century, is characterized by a freer, more independent spirit of inquiry. First the scholastic philosophy was attacked by those who called to mind the ancient Greek philosophy in its original purity. After this struggle new views were presented. Bacon and Locke on the one hand, and Descartes on the other, stand respectively at the head of the two systems—empiricism and idealism, which begin modern philosophy. Bacon created no definite system of philosophy, but gave a new direction to thought, the empiricism which he founded finally developing into scepticism. The system of Descartes was opposed by Gassendi, and received modifications at the hands of others, especially Malebranche. The most important successor, however, of Descartes was Spinoza, who reduced the three Cartesian substances to unity, to one infinite original substance, the ground of all things, that excludes from itself all negation or determination, and is named God or nature. Locke (1632–1704), who had a precursor in Hobbes (1588–1679), the influence of whom, however, chiefly concerned the history of political science, is regarded as the father of modern materialism and empiricism. As occupying the general position of Locke mention may be made of Isaac Newton, Samuel Clarke, William Wollaston, the Earl of Shaftesbury, and Francis Hutcheson. The philosophy of Locke received a further development in France, where Condillac sought to explain the development of humanity by the simple development of the sensations. Then followed the materialism of Helvetius, d'Holbach, La Mettrie, and others including several of the Encyclopedists. In opposition to this materialistic tendency arose the idealism of Leibnitz and Berkeley. The theories of Leibnitz were systematized by Wolff, and from his time to Kant German philosophy assumed no new stand-point. It was reserved for Hume to trace out the ultimate consequences of the Cartesian and Lockian philosophy, and to produce the great metaphysical revolution of which Reid and Kant were the first movers. Kant (1724-1804), who may be justly regarded as the father of the philosophy of the 19th century, sought to bring together into unity the one-sided endeavors of his predecessors in the realistic and idealistic schools. He took up a critical stand-point, and from it instituted an inquiry into the origin of our experience or cognition. In the hands of Fichte the critical idealism of Kant becomes absolutely subjective idealism. "All that is, is ego;" this is the principle of the Fichtian system; the world is merely phenomenal, consciousness is a phenomenon, perception is a dream. Fichte's subjective idealism found its continuation in the objective idealism of Schelling and the absolute idealism of Hegel. Hegel (1770–1831), developed the principle of identity, and created the system of absolute idealism. In his philosophy he aims at elevating consciousness to the standpoint of absolute knowledge, and systematically developing the entire contents of this knowledge by means of the dialectical method. Schleiermacher (1768–1834) promulgated an eclecticism to which Plato, Spinoza, Kant, and Schelling were the chief contributors. Schopenhauer (1788–1860) developed a doctrine which may be described as a transitional form from the idealism of Kant to the realism at present prevalent. In France two philosophical tendencies opposed the sensualism and materialism so universal at the beginning of last century. Of these the one was theosophical and the other found expression in the eclectic and spiritualistic school founded by Royer-Collard as the disciple of Reid, and further built up by Cousin, who incorporated into its body of doctrines a number of German philosophical notions. Jouffroy attempted to unite the philosophy of his predecessor Maine de Biran to that of the Scottish school, and became associated with the spiritualistic school, to which also belong the names of Garnier, Janet, Rémusat, Franck, Jules Simon, and others. This school has contended valiantly against the pantheistic tendencies of the age. Independent systems are those of Piere Leroux, Lamennais, Jean Reynaud, and Buchez. Materialism has its supporters in Cabanis, who sees in thought only a secretion of the brain, Broussais, Gall, and others. Positivism, founded by Auguste Comte, numbers not a few followers.

In Great Britain the associational psychology of Hartley, Priestley, and Dr. Darwin found representatives in the 19th century in James Mill (1773–1836) and his son John Stuart Mill (1806–73), who make the principal of association the sole explanation of psychical phenomena. Bain, Grote, and Lewes followed more or less in the same track. Herbert Spencer attempted to widen the psychological principles of the associational psychology into a universal doctrine of evolution. In America, as in England, philosophy has been prosecuted more as an applied science, and in its special relations to morals, politics, and theology. Among the best-known names are those of Jonathan Edwards, Henry P. Tappan, Thomas C. Upham, Francis Wayland, and others. A modified scholasticism, mostly Thomism, prevails in the catholic seminaries of France, Spain, and Italy. In most of the continental countries, German philosophy has exerted no small influence. In Italy a peculiar philosophical school, represented by Rosmini, Mamiani, and Gioberti, has flourished during the 19th century.

PHILTRE, a potion supposed to have the power of exciting love. The preparation was frequently associated with magic rites, and the ingredients were frequently of a harmless, fanciful, or disgusting kind. At times, however, poisonous drugs were employed, the death of Lucretius and the madness of Caligula being alike ascribed to philtres administered by their wives.

PHLEBOT'OMY, or VENESECTION, the act of letting blood by opening a vein; a method of treatment formerly applied to almost all diseases, but now chiefly confined to cases of general or local plethora. Another mode of letting blood is by cupping or by the application of leeches. It has been one of the processes of the medical profession from the earliest times.

PHLOX, a genus of perennial herbaceous plants, natives for the most part of North America, though some of the species are to be met with in Asia. The flowers are of a purple or violet color, more rarely white or red, with a salver-shaped corolla, and a narrow subcylindrical tube longer than the calyx. The trailing kinds are excellent for rockwork.

PHŒBUS. See Apollo.

PHŒNICIA, in ancient geography, a country on the coast of Syria, bounded on the east by Mount Lebanon, and containing the celebrated cities Tyre and Sidon. Phœnicia proper was a tract of country stretching along the eastern shore of the Mediterranean, not much more than 28 miles in length, and little more than 1 mile in average breadth; Sidon being situated near its northern, and Tyre not far from its southern boundary. In a wider sense Phœnicia was regarded as beginning on the north with the Island of Aradus, and extending south to the town of Dora, a little below the promontory of Carmel, being about 120 miles in length, and rarely more than 20 in breadth. It is watered by several streams flowing from Lebanon to the sea, such as the Eleutherus, the Adonis, the Lycus, the Tamyras, the Leontes. The country is fertile in timber, corn, fruits, etc.; and besides the great cities of Sidon and Tyre, it was anciently studded with numerous smaller towns, forming almost an unbroken line along the coast. Among these towns in earlier times were Arvad, Accho, Arka, Tripolis, Berytus, Sarepta, Dora, etc. Many of the roadsteads or harbors were excellent, but are now silted up.

The wealth and power of the Phœnicians arose from their command of the sea, and it was their policy not to provoke any of the nations to the east of them, and not to quarrel unnecessarily with Israel, which was their granary. The relation between Hiram and David was probably but a sample of such international treaties and intercourse. After

the division of the Hebrew kingdom Phœnicia would naturally cultivate alliance with the Ten Tribes nearest to it, and Ahab married a Phœnician princess. The country was afterward successively incorporated in the Assyrian, Babylonian, and Persian empires, but the cities retained more or less their independence. It was next conquered by Alexander the Great, and henceforth simply formed part of Syria.

From a very early period the Phœnicians occupied themselves in distant voyages, and they must speedily have reached to a style of substantial shipbuilding. Xenophon passes a high eulogy on a Phœnician ship; and they were skilled in navigation and the nautical applications of astronomy. Lebanon supplied them with abundance of timber and Cyprus gave them all necessary naval equipments, from the keel to the top-sails. In the reign of Pharaoh-Necho these daring navigators even circumnavigated Africa, and the Phœnicians furnished Xerxes with 300 ships, which took part in the battle of Salamis. The commerce of Tyre reached through the world. It traded in the produce of the whole known world, from the ivory and "bright iron" and ebony and cotton fabrics of India to the tin from Cornwall and Devonshire. Fishing was also an important industry, and the Tyrians sold fish in Jerusalem. The Phœnicians excelled in the manufacture of the purple dye from the shell-fish murex, abundant on its coasts. The glass of Sidon was no less famous than the Tyrian dye. Phœnicia produced also articles of silver and gold as well as of brass; its inhabitants were also skilled in architecture and in mining.

The maritime knowledge and experience of Phœnicia led to the plantation of numerous colonies in Cyprus, Rhodes, and the islands of the Ægean—the Cyclades and Sporades—in Sicily, in Sardinia, the Balearic islands, and in Spain. The most celebrated of the Phœnician colonies, however, was Carthage, in Northern Africa, which extended its sway over the Spanish peninsula and disputed with Rome the supremacy of the Mediterranean.

As was the case in Canaan at the invasion, each Phœnician city was governed by a king or petty chief. A powerful aristocracy existed in the chief towns, and there were also elective magistrates, called by the Romans suffētes, a disguised form of the Hebrew soffet. Sidon, and afterward Tyre, exercised a hegemony over the other states. The relation of Phœnicia to her colonies does not seem to have been very close. Their religion, however, bound the mother country and the colonies in a common worship. Carthage often sent presents to the chief Phœnician god; so did Gades and other settlements.

While the wealth and commerce of Phœnicia must have brought art and refinement, the people were noted for their dissoluteness. As a people the Phœnicians early obtained a reputation for cunning and faithlessness. They were often pirates; they were certainly slave-traders. They purchased slaves from the northern shores of the Black sea, and they also kidnaped and sold the children of Israel—a practice which brought upon them the denunciation of the prophets, and a just retaliation was predicted to fall upon them.

The language of ancient Phœnicia was closely akin to Hebrew. The famous passage in the Pœnulus of Plautus illustrates the assertion. Of ninety-four words on a tablet discovered at Marseilles in 1845 relating to the sacrificial ritual no less than seventy-four are found in the Old Testament. Coins and seals also disclose the same affinity, as do the numerous inscriptions. Proper names can all be explained in the same way. The invention of letters is often ascribed to the Phœnicians. The Greeks believed that letters had been brought to them from Phœnicia by Cadmus. The so-called Cadmean letters of the Greek alphabet are A B Γ Δ E F I K L M N O Π P Σ T, the sixth letter F being the digamma, which afterward disappeared from the Greek alphabet. The names of these letters have no meaning in Greek, but they have each a significance in Phœnician or Hebrew. The affinity of the old Greek letters in form to the Phœnician and early Hebrew can be easily traced. The literature of Phœnicia has perished. See also Tyre, Sidon, Carthage, etc.

PHŒNIX, a fabulous Egyptian bird, about the size of an eagle, with plumage partly red and partly golden. Of the various stories told of it by Herodotus and others the most popular is to the effect that the bird, at an age of 500 years, conscious of its approaching death, built a funeral pile of wood and aromatic gums, which it lighted with the fanning of its wings, and rose from the flames with a new life. The Egyptians regarded it as a symbol of immortality, and it is still used as an emblem of this.

PHŒNIX, the scientific name of the date palm genus.

PHŒNIXVILLE, a town of the United States, in Chester co., Pennsylvania, on the Schuylkill, with extensive ironworks. Pop. 10,722.

PHOLAS, a genus of marine bivalves, in which the shell gapes at both ends. The shell, which is of thin white texture, is studded over on its outer surface with numerous rasp-like promi-

Pholades in their holes.

nences, by means of which the animal excavates burrows in wood, rocks, indurated clay, etc., maintaining communication with the outer world by means of long breathing-tubes or siphons with fringed edges.

PHONET'ICS, the science which treats of the various sounds pertaining to human speech, their distinctive characteristics, the voice-mechanism by which they are uttered, and the methods by which they may be best represented to the eye. Any system of writing is strictly phonetic when by it each different sound is represented by a different character, and the same sound always by the same character.

PHO'NOGRAPH, an instrument by means of which sounds can be permanently registered, and afterward reproduced from the register. It consists essentially of a curved tube, one end of which is fitted with a mouthpiece, while the other end (about 2 inches in diameter) is closed in with a disc or diaphragm of exceedingly thin

Phonograph.

metal. Connected with the center of this diaphragm is a steel point, which, when the sounds are projected on the disc from the mouthpiece, vibrates backward and forward. This part of the apparatus is adjusted to a cylinder which rotates on a horizontal axis. On the surface of the cylinder is cut a spiral groove, and on the axis there is a spiral screw of the same pitch, which works in a nut. When the instrument is to be used a piece of tin-foil is gummed round the cylinder, and the steel point is adjusted so as to be just touching the tin-foil, and above the line of the spiral groove. If some words are now spoken through the mouthpiece, and the cylinder kept rotating either by the hand or clockwork, a series of small indentations are made on the foil by the vibratory movement of the steel point, and these markings have all an individual character of their own, due to the various sounds addressed to the mouthpiece. The sounds thus registered are reproduced by approaching the diaphragm and its steel point toward the tin-foil as at first commencing, at the point where it was when the cylinder originally started, and then once more setting the cylinder in motion. The indentations

previously made now cause the steel point to rise or fall or otherwise move as the markings pass under it, and the result is that the diaphragm is thrown into a state of vibration exactly corresponding to the movements induced by the markings, and thus affects the air around so as to produce sounds, and these vibrations, being exactly similar to those originally made by the voice, necessarily reproduce these sounds to the ear as the words at first spoken. Instead of these tin-foil strips hollow cylinders of wax are now commonly used. In this case the record consists of a series of markings cut into the wax by a fine steel point. The same cylinders can be used a large number of times, the previous record being always shaved off and a new surface thus obtained.

PHONOG'RAPHY, a system of writing by which the sounds of a language are accurately represented. The name is generally applied to Pitman's system of shorthand. See Shorthand.

PHONOM'ETER, an instrument for ascertaining the number of vibrations of a given sound in a given space of time.

PHOSPHATE, in chemistry, the generic term for the salts formed by the union of phosphoric anhydride with bases or water or both. They play a leading part in the chemistry of animal and plant life, the most important in this connection being the phosphate of soda, phosphate of lime, and the basic phosphate of magnesia. In agriculture the adequate supply of phosphates to plants in the form of manures becomes a matter of necessity in all deplenished soils. These phosphatic manures consist for the most part of bones, ground ones, mineral phosphates (apatite, phosphorite, coprolites), basic slag, superphosphates and reduced superphosphates (both prepared by treating broken-up bones with vitriol), bone-ash, and phosphatic guano. See also Manures.

PHOSPHIDES, compounds of phosphorus with one other element, more especially with the metals.

PHOSPHORES'CENCE, the property which certain bodies possess of becoming luminous without undergoing obvious combustion. It is sometimes a chemical, sometimes a physical action. Certain mineral substances exhibit the phenomenon when submitted to insolation, to heat, to friction, to electricity, or to cleavage. Rain, water-spouts, and meteoric dust sometimes present a self-luminous appearance. Several vegetable organisms, chiefly cryptogams, exhibit this kind of luminosity; but the most interesting cases of phosphorescense occur in the animal world, the species in which the luminous property has been observed belonging nearly to every main group of the zoological series. In some of the lowest life forms and in many of the jelly-fishes the whole surface of the body is phosphorescent; in other organisms the phosphorescent property is localized in certain organs, as in the sea-pens, certain annclids, the glow-worms, fire-flies, etc.; while many deep-sea fishes have shining bodies embedded in the skin. The phosphorescence of the sea is produced by the scintillating or phosphorescent light emitted from the bodies of certain microscopic marine animals, and is well seen on the surface of the ocean at night. Phosphorescence in animals appears to be a vital process, consisting essentially in the conversion of nervous force (vital energy) into light; just as the same force can be converted by certain fishes into electricity. See Fluorescence.

PHOSPHOR'IC ACID, an acid usually obtained by burning phosphoretted hydrogen in atmospheric air or oxygen. It is also produced by the oxidation of phosphorous acid, by oxidizing phosphorus with nitric acid, by the decomposition of apatite and other native phosphates, and in various other ways. It is used in medicine in the form of solution, constituting the dilute acid of the Pharmacopœia. It is peculiarly suited to disordered states of the mucous surfaces, and also to states of debility, characterized by softening of the bones.

PHOS'PHORITE, a species of calcareous earth; a sub-species of apatite. It is an amorphous phosphate of lime, and is valuable as a fertilizer.

PHOSPHOROSCOPE, an instrument designed to show the phosphorescence of certain bodies that emit light but for a very short period. By its means many substances hitherto unsuspected of phosphorescence have been proved capable of retaining light for very short periods. The name is also given to a philosophical toy for showing phosphorescent substances in the dark.

PHOSPHOROUS ACID, an acid produced by exposing sticks of phosphorus to moist air, and in several other ways. Phosphorous acid exists usually in the form of a thick uncrystallizable syrup, but it may also be obtained crystallized.

PHOS'PHORUS, a solid non-metallic combustible substance ranking as one of the elements; symbol P, atomic weight 31; specific gravity 1.826. It occurs chiefly in combination with oxygen, calcium, and magnesium, in volcanic and other rocks, whose disintegration constitutes very fertile soils. It exists also in the plants used by man as food, and is a never-failing and important constituent in animal structures. It is manufactured from bones, which consist in part of phosphate of lime, or from native mineral phosphate of lime. Common phosphorus when pure is almost transparent and colorless. At common temperatures it is a soft solid, easily cut with a knife, and the cut surface, has a waxy luster; at 108° it fuses, and at 550° is converted into vapor. It is exceedingly inflammable. Exposed to the air at common temperatures it undergoes slow combustion, emits a white vapor of a peculiar alliaceous odor, appears luminous in the dark, and is gradually consumed. On this account phosphorus should always be kept under water. A very slight degree of heat is sufficient to inflame phosphorus in the open air. Gentle pressure between the fingers, friction, or a temperature not much above its point of fusion, kindles it readily. It burns rapidly even in the air, emitting a splendid white light, and causing intense heat. Its combustion is far more rapid in oxygen gas, and the light far more vivid. The product of the perfect combustion of phosphorus is phosphorous pentoxide or phosphoric anhydride, a white solid which readily takes up water, passing into phosphoric acid. Compounds of phosphoric anhydride with basic bodies are known as phosphates. Phosphorus may be made to combine with most of the metals, forming compounds called phosphides. When dissolved in fat oils it forms a solution which is luminous in the dark. It is chiefly used in the preparation of lucifer-matches, and also in the preparation of phosphoric acid. It is of all stimulants the most powerful and diffusible, but on account of its activity highly dangerous. It can be safely administered as a medicine only in extremely minute doses and with the utmost possible caution. Phosphorus presents a good example of allotropy, in that it can be exhibited in at least one other form, known as red or amorphous phosphorus, presenting completely different properties from common phosphorus. This variety is produced by keeping common phosphorus a long time slightly below the boiling-point. It is a red, hard, brittle substance, not fusible, not poisonous, and not readily inflammable so that it may be handled with impunity. When heated to the boiling-point it changes back to common phosphorus.

PHOTO-ENGRAVING, a common name of many processes in which the action of light on a sensitized surface is made to change the nature or condition of the substance of the plate or its coating, so that it may by processes be made to afford a printing surface corresponding to the original from which the photographic image was derived. See Zinc Etching, Halftone Engraving.

PHOTOG'RAPHY is the art of taking representations of objects by the action of light through the lenses of the camera obscura on a previously prepared surface. It is of comparatively recent origin, though, as early as the commencement of the 19th century, Mr. Thomas Wedgewood had discovered a method of copying paintings on glass and of making profiles by the action of light upon nitrate of silver. About 1814 M. Nicéphore Niepce in France discovered a method of producing, by means of the camera obscura, pictures on plates of metal coated with asphaltum, and at the same time of rendering them permanent. In 1839 Daguerre announced the discovery of the Daguerreotype. In the meantime, however, Mr. Henry Fox Talbot had discovered the process of obtaining pictures in the camera by the agency of light on paper coated with chloride and nitrate of silver, and also of fixing them when so obtained. Mr. Talbot gave the name of calotype to his process. Numerous modifications of the calotype were introduced, besides various new photographic processes, the most important being those of M. Niepce de St. Victor and Mr. Scott Archer, the former of whom introduced the use of albumen and the latter that of collodion as a substitute for paper, these substances being in either case thinly spread over a plate of glass. Mr. Archer perfected the wet collodion process, and published full working details in

1851. Collodion dry plates were introduced by Dr. Hill Norris in 1856; collodion emulsion dry plates by Messrs. Sayce and Bolton in 1864. In 1871 Dr. R. L. Maddox discovered that glass plates could be coated with an emulsion consisting of bromide of silver contained in gelatine. This gelatine dry-plate process was improved by Bennett in 1878, and came into general use about 1880. It is now almost the only process employed in ordinary photography.

Photographs may be either negative or positive. Negative photographs are produced in the camera, and exhibit the lights and shades contrary to nature, that is, the lights dark and shades white. In order to obtain prints or positives several methods are used. In silver printing a paper sensitized by being floated on a solution of albumen mixed with common salt, and then on a solution of nitrate of silver, is placed in close contact with the negative in a printing-frame, and exposed to light until the silver compounds have become sufficiently darkened. It is afterward toned, fixed, and washed. In the platinotype process the paper is sensitized by ferric oxalate and a double salt of potassium and platinum. The latter process requires no toning, and produces a permanent print.

Various modes of multiplying photographic pictures by photolithography have been successfully tried. A common mode is to take a print on paper sensitized with gelatine and bichromate of potassium, and to ink it with a suitable oily ink. This ink adheres to the parts where the gelatine has been acted on by light and has become insoluble, but where the gelatine is still soluble the ink can be easily washed off. It is then transferred to a lithographic stone in the usual way. In photo-zincography the process consists in projecting an impression on a plate of prepared zinc by photography and then engraving it by etching with acids, so that copies can be printed from the plate. Since the introduction of the gelatine plate the art of photography has made immense advances, and its applications are endless. Hand (sometimes called detective) cameras in all shapes and sizes have been introduced, some of which take pictures of ½ and ¼ plate size. Many improvements have also been made in instantaneous shutters. These are now so carefully adjusted by mechanical appliances that they can be regulated to a small fraction of a second, or a prolonged exposure can be given to any part of the subject at will. These instantaneous processes have enabled scientists to analyse muscular movements and the various modes of locomotion. Remarkable results have also been attained in the application of photography to astronomy, and pictures of the most remote parts of the heavens are now common. Its application in the various processes of book-illustration has also been very successful. Photography by means of artificial light is regularly practiced. Recently it has been discovered that by means of a current of electricity and a glass globe or tube exhausted of air, rays may be produced which penetrate many solid substances though unable to penetrate others, and which give an image of such opaque bodies on a photographic plate. By these rays (X-rays, Röntgen rays) we may get a photograph (or radiograph) showing, for instance, the bones in the hand, the coins in a purse, etc.

PHOTOGRAVURE, a process of engraving in which by the aid of photography subjects are reproduced as plates suited for printing in a copper-plate press. The process known as Heliogravure (which see) is essentially the same.

PHOTO-HELIOGRAPH, an instrument for observing transits of Venus and other solar phenomena, consisting of a telescope mounted for photography on an equatorial stand and moved by suitable clockwork.

PHOTO-LITHOGRAPHY. See Photography.

PHOTOM'ETER, an instrument intended to indicate relative quantities of light, as in a cloudy or bright day, or to enable two light-giving bodies to be compared. Photometers depend on one or other of the two principles, that the eye can distinguish whether two adjacent surfaces are equally illuminated, and whether two contiguous shadows have the same depth. Benson's photometer is based on the former principle, Rumford's on the latter. The common unit for comparison is the light emitted by a sperm-candle burning 120 grains of spermaceti per hour, other lights being said to have the intensity of so many candles. Improved forms of photometers for more easily obtaining the illuminating power produced by coal-gas and the electric light have recently been introduced.

PHO'TOPHONE, an instrument invented in 1880 by Prof. Graham Bell, which resembles the telephone, except that it transmits sounds by means of a beam of light instead of the connecting wire of the telephone. The success of the instrument depends upon a peculiar property of the rare metal selenium, that, namely, of offering more or less opposition to the passage of electricity according as it is acted upon or not by light. In its simplest form the apparatus consists at the receiving end of a plane mirror of some flexible material (such as silvered mica) upon which a beam of light is concentrated, and the voice of a speaker directed against the back of this mirror throws the beam of light reflected from its surface into undulations which are received on a parabolic reflector at the other end, and are centered on a sensitive selenium cell in connection with a telephone, which reproduces in articulate speech the undulations set up in the beam of light by the voice of the speaker.

PHO'TOSPHERE, the luminous envelope, supposed to consist of incandescent matter, surrounding the sun. See Sun.

PHOTO-ZINCOGRAPHY. See Photography.

PHRENOLOGY, the term applied to the psychological theories of Gall and Spurzheim, founded upon (1) the discovery that the brain, as the organ of the mind, is not so much a single organ as a complex congeries of organs; and (2) observations as to the existence of a certain correspondence between the aptitudes of the individual and the configuration of his skull. Phrenology may therefore be regarded as a development, partly scientific and partly empirical, of the general idea that a correspondence exists between the physical structure and the psychical and mental traits of every individual man or animal. It was long ago observed by physiologists that in animals a certain character and intelligence seemed to accompany a certain formation and size of skull. Lavater, in his system of physiognomy, went further than this, and gave to particular shapes of the head certain powers and passions: the conical head he terms religious; the narrow retreating front, weak-minded; the broad neck, salacious, etc. But it was reserved to Drs. Gall and Spurzheim to expand this germ of doctrine into a minute system, and to map out the whole cranium into small sections, each section being the dwelling-place of a certain faculty, propensity, or sentiment.

So far as phrenology was scientific it undoubtedly was one cause which led to the minute anatomical investigations to which the brain has latterly been subjected; and Gall and Spurzheim have high claims to be regarded as anatomical discoverers and pioneers. Previous to their dissections the brain had generally been regarded as a single organ rather than a complex congeries of organs. Gall's view of the physiology of the brain was, that the convolutions are distinct nervous centers, each having its own special activity; that the frontal lobes are occupied by the perceptive group of centers; the superior lobes by the moral and æsthetic groups; the inferior lobes by the group mainly concerned in the nutrition and adaptation of the animal to external conditions; and the posterior lobes to the social instincts. To a considerable extent these views have been pronounced to be well founded by later specialists, and thus the leading positions of Gall and Spurzheim have taken a place in scientific psychology as represented by Bain, Carpenter, Ferrier, Wagner, Huschke, and others.

PHTHIO'TIS, a district of ancient Greece, in the south of Thessaly, now forming a monarchy of Greece. Pop. 128,440.

PHTHISIS (thī'sis). See Consumption.

PHYLAC'TERY, among the Jews a strip of parchment inscribed with certain texts from the Old Testament, and inclosed within a small leathern case, which was fastened with straps on the forehead just above and between the eyes, and on the left arm near the region of the heart. The four passages inscribed upon the phylactery were Ex. xiii. 1–10, 11–16; Deut. vi. 4–9; xi. 18–21. The custom was founded on a literal interpretation of Ex. xiii. 16; Deut. vi. 8; xi. 18. Phylacteries are the "prayer-thongs" of the modern Jews. In their origin they were regarded as amulets, which protected the wearer from the power of demons, and hence their name, which is from the Greek phulassein, to guard.

PHYLLOXE'RA, a genus of plant-lice. The type of the genus is a species which

lives upon oak-trees; but the Phylloxera vastatrix, or grape Phylloxera, a species which injuriously affects the vine, has attracted so much attention of late years that it has come to be known as the Phylloxera. Its proper home is North America, where it was known early in the history of grape-culture, and where it doubtless existed on wild vines from time immemorial. It was discovered in England in 1863, and about the same time it made its appearance in France. In 1885 its presence was discovered in Australia, at the Cape of Good Hope, and in Algeria; and, generally speaking, it has now obtained a foothold, at least in restricted localities, in every country where the grapevine is cultivated. Vines attacked by Phylloxera generally show external signs the second year of attack in a sickly yellowish appearance of the foliage and in stunted growth, and the third year they frequently perish, all the finer roots having decayed and wasted away. Many remedies have been proposed, but none are universally practicable or satisfactory.

PHYSA'LIA, a genus of marine animals. One species is known by the name of the Portuguese man-of-war. These hydrozoa are characterized by the presence of one or more large air-sacs, by which they float on the surface of the ocean. Numerous tentacles depend from

Portuguese man-of-war.

the under side, one class short and the other long. The shorter are the nutritive individuals of the colony, the longer, which in a Physalia 5 or 6 inches long are capable of being extended to 12 or 18 feet, possess a remarkable stinging power, and are probably used to stun their prey.

PHYSICAL GEOGRAPHY is that branch of geography which treats of the surface of the earth, or of any part of it as regards its natural features and conformation, the changes that are constantly taking place and that have formerly taken place so as to produce the features now existing; it points out the natural divisions of the earth into land and water, continents, islands, rivers, seas, oceans, etc.; treating of the external configuration of mountains, valleys, coasts, etc.; and of the relation and peculiarities of different portions of the water area, including currents, wave-action, depth of the sea, salt and fresh water lakes, the drainage of countries, etc. The atmosphere in its larger features is also considered, including the questions of climate, winds, storms, rainfall, and meteorology generally. Lastly it takes up various questions connected with the organic life of the globe, more especially the distribution of animals and plants, and their relation to their environment; tracing the influence of climate, soil, natural barriers or channels of communication, etc., upon the growth and spread of plants and animals, including in the latter the various races of man. The field of physical geography is thus by no means easy to confine within strict limits, as it is so closely connected at various points with geology, mineralogy, botany and zoology, chemistry, ethnology, etc.

PHYSICS, or **NATURAL PHILOSOPHY,** is the study of the phenomena of the material world, or of the laws and properties of matter; more restrictedly it treats of the properties of bodies as bodies, and of the phenomena produced by the action of the various forces on matter in the mass. It thus has as its chief branches the subjects dynamics, hydrostatics, heat, light, sound, electricity, and magnetism. See the different articles.

PHYSIOG'NOMY, the doctrine which teaches the means of judging of character from the countenance. Aristotle is the first who is known to have made any attempts in physiognomy. He observed that each animal has a special predominant instinct; as the fox cunning, the wolf ferocity, and so forth, and he thence concluded that men whose features resemble those of certain animals will have similar qualities to those animals. Baptista della Porta, in his work De Humana Physiognomia (1586), revived this theory and carried it out further. The theory was adopted and illustrated by the French painter Lebrun, in the next century, and by Tischbein, a German painter of the 18th century. The physiologist Camper sought new data in a comparison of the heads of different types of the human species, and in attempting to deduce the degree of intelligence belonging to each type from the size of the facial angle. Lavater was the first to develop an elaborate system of physiognomy, the scope of which he enlarged so as to include all the relations between the physical and moral nature of man.

PHYSIOG'RAPHY, a term often used as equivalent to physical geography; but otherwise used to embrace the aggregate of information necessary to be acquired as a preliminary to the thorough study of physical geography, or as an introduction to the study of nature and its forces.

PHYSIOL'OGY, in medical and biological science the department of inquiry which investigates the functions of living beings. In its wide sense the living functions of both animals and plants fall to be investigated by physiology, this division of the subject being comprehended under the terms comparative physiology and animal and vegetable physiology. When more specially applied to the investigation of the functions in man the appellation human physiology is applied to the science. The importance of physiological inquiry in connection with the observation of diseased conditions cannot be overrated. The knowledge of healthy functions is absolutely necessary for the perfect understanding of diseased conditions; and the science of pathology, dealing with the causes and progress of diseases, may in this way be said to arise from, and to depend upon, physiological inquiry. Physiology in itself thus forms a link connecting together the various branches of natural history or biology and those sciences which are more specially included within a medical curriculum. The history of scientific physiology may be said to begin with Aristotle (384–322 B.C.), who attained no mean knowledge of the subject. The Alexandrian school, flourishing about 280 B.C. under the Ptolemies, and represented by Erasistratus, Herophilus, and others, obtained greater opportunities for the acquirement of physiological knowledge, through the investigation of the bodies of criminals who had been executed. Erasistratus thus threw much light on the nervous system and its physiology; while Herophilus made important observations on the pulse, and in addition discovered the lacteal or absorbent vessels. After this there was a period of decline, but Galen, living in the 2d century after Christ, again raised the science to a respectable position, and effected a vast advance and improvement in physiological knowledge. The systems which succeeded Galen and his times consisted, until about 1543, of absurd speculations and theories, conducive in no respect to the advance of true knowledge. In 1543 Vesalius paved the way toward the more scientific epochs of modern times by his investigations into the anatomy and structure of the human frame. In 1619 Harvey, the "father of modern physiology," discovered the circulation of the blood. Since this time the history of physiology has gone hand in hand with the general history of anatomy (which see). One noteworthy peculiarity of modern physiological research consists in the introduction and extensive use of the experimental mode of investigation in physiology; and of elaborate and delicate instruments and apparatus, such as the sphygmograph, or pulse-recorder; the ophthalmoscope; the laryngoscope, and the microscope. The different departments of physiology may be enumerated as comprehending the investigation of the three great functions which every living being performs, namely, (1) nutrition, including all that pertains to digestion, the circulation, and respiration; (2) innervation, comprising the functions performed by the nervous system; (3) reproduction, which ensures the continuation of the species and includes also the phenomena of development. See the articles Digestion, Respiration, Skin, Eye, Ear, Larynx, Tongue, etc.

PIACENZA (pyà-chen'tsà), a town of North Italy, capital of province of same name. The manufactures consist of cotton goods, woolens, stockings, hats, leather, etc., and there are also several silk-spinning and paper-mills. Pop. 34,987. The province belongs to the basin of the Po, and is generally fertile; area, 965 sq. miles; pop., 245,126.

PIANO, soft, low; used in music in

contradistinction to forte. Pianissimo, the superlative of piano.

PIANOFORTE, or **PIANO,** a musical stringed instrument, the strings of which are extended over bridges rising on the sounding-board, and are made to vibrate by means of small felted hammers, which are put in motion by keys, and where a continued sound is not intended to be produced have their sound deadened immediately after the touch of the keys by means of leathern dampers. Its name is compounded of two Italian words signifying soft and strong, and it was so called in contradistinction to the harpsichord, the instrument which it superseded, and which did not permit of the strength of the notes being increased and diminished at will. The mechanism by which the movement of the keys is conveyed to the strings is called the action, and there is no part of the pianoforte in which the variations are more numerous. There are usually three strings in the pianoforte for each note in the higher and middle octaves, two in the lower, and one in the lowest notes. The strings are of steel wire. The lowest notes have their strings wound round with a double coil of brass wire, and those next above with a single coil. Pianofortes are either in the form of the grand piano, in which the strings lie in the direction of the keys, or they have the strings stretched vertically perpendicular to the keys, which is now the most common form, and constitutes the upright piano. Recently a variety called the upright grand has also been introduced. Grand pianos are used as concert intruments, and have the greatest compass and strength. The common compass of the piano at present is six and seven-eighths or seven octaves. The invention of the pianoforte can scarcely be ascribed to any one man in particular. The first satisfactory hammer-action appears to have been invented by an Italian of Padua, named Bartolommeo Cristofali, about 1711. The instrument was not introduced into England till the latter half of the 18th century. Among the principal improvers of the pianoforte are Sebastian Erard, the founder of the celebrated firm still in existence; Roller et Blanchet, the French firm which introduced the upright piano; Broadwood, Collard, Hopkinson, Kirkman, Bechstein, Steinway, Weber, besides others.

PIAS'SABA, or **PIAS'SAVA,** a strong vegetable fibre imported from Brazil, and largely used for making brooms. It is chiefly obtained from palms. The fibre proceeds from the decaying leaves, the petioles of which separate at the base into long, coarse, pendulous fringes.

PIASTRE (pi-às'tr), a name first applied to a Spanish coin, which, about the middle of the 16th century, obtained almost universal currency. The Spanish piastre had latterly the value of about $1.00.

PIAZ'ZA, in architecture, is a square or other open space surrounded by buildings. The term is frequently, but improperly, used to signify an arcaded or colonnaded walk.

PICA, a size of type. See Printing.

PICA, the generic name of the magpies.

PIC'ARDY, formerly a province of France, in the northern part of the kingdom, lying between the British Channel, Normandy, and Artois, now divided among the departments of Pas-de-Calais, Somme, Aisne, Oise, and Nord. The capital was Amiens.

PIC'COLO, a small flute having the same compass as the ordinary flute, but pitched an octave higher.

PICK'EREL, the young of the fish known as the pike. In America the name is given to some of the smaller kinds of pike.

PICKET, a military term having several meanings. Specifically it is used as describing a small body of men posted at some point beyond the general line of sentries for the purpose of observing the motions of an enemy, or giving timely notice in case of impending attack. In camp, horses are said to be picketed when secured to a picketing rope. Pegs of wood or iron used to secure tent ropes are also called pickets. In all English garrisons and camps a small body of men under a corporal or sergeant, and known as the garrison picket, patrols the lines or city as a disciplinary check on the troops, and a support to the military police.

PICKETT, George Edward, soldier, born in Richmond, Va., January 25, 1825; died in Norfolk, Va., July 30, 1875. At the beginning of the civil war he resigned from the United States army, and was commissioned colonel in the army of the Confederacy. At the battle of Gettysburg Pickett led the famous final assault on the Union lines, but, left without adequate support, his command was hurled back and almost annihilated. In May, 1864, General Pickett attacked Gen. Benjamin F. Butler's army between Richmond and Petersburg, and captured his works. At Five Forks on April 1, 1865, General Pickett's forces were surrounded and overwhelmed. After the war he returned to Richmond.

PICKLES, vegetables and certain fruits first steeped in strong brine, and then preserved in close vessels. Wood vinegar is often used, but malt or wine vinegar produces the best pickles. Owing to the corroding effects of brine and vinegar the use of metallic vessels should be avoided in making pickles. To give a green color to pickles verdigris or other poisonous compounds of copper is sometimes employed by manufacturers.

PIEDMONT, a department or territorial division of Italy, between Switzerland, Lombardy, Liguria, and France; area, 11,198 sq. miles; pop. 3,233,431.

PIER, in architecture, is the name applied to a mass of masonry between openings in a wall, such as doors, windows, etc. The solid support from which an arch springs or which sustains a tower is also called a pier. The term is also applied to a mole or jetty carried out into the sea, intended to serve as an embankment to protect vessels from the open sea, and to form a harbor.

PIERCE, Franklin, fourteenth president of the United States, was descended from an old yeoman family of New England, and was born at Hillsboro, N. H., November 23, 1804. In 1829 he was elected to the state legislature, of which he was speaker in 1832–33. In the latter year he was chosen a member of congress and in 1837 he was elected to the senate of the United States. In 1842 he resigned his seat in the senate, and returned to the practice of the law. In 1846 he was offered the position of attorney-general of the United States, but declined it. On the outbreak of the Mexican war he joined as a volunteer one of the companies raised in Concord. He was soon after appointed colonel of the ninth regiment, and in March, 1847, brigadier-general. In 1852, as candidate of the democratic party, he was elected president of the United States by 254 electoral votes against 42 given to Gen. Winfield Scott. The special feature of

Franklin Pierce.

his inaugural address was the support of slavery in the United States, and the announcement of his determination that the Fugitive Slave Act should be strictly enforced. This was the keynote of his administration, and pregnant with vital consequences to the country. President Pierce, surrounded by an able cabinet, among them Jefferson Davis as secretary of war, firmly adhered throughout his administration to the pro-slavery party. He failed, notwithstanding, to obtain renomination, but was succeeded by James Buchanan, March 4, 1857, and retired to his home in Concord, N. H., after spending some years in Europe. During the war of 1861–65 his sympathies were wholly with the south, but, with the exception of delivering a stong speech at Concord in 1863, he took no very active part in politics. He died October 8, 1869.

PIERRE, Bernardin de Saint. See Saint-Pierre.

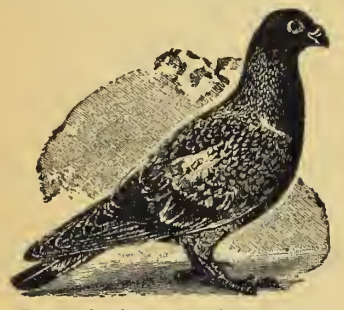
PIG. See Hog.

PIGEON, the common name of a group of birds. The pigeons or doves as a group have the upper mandible arched toward its apex, and of horny consistence; a second curve exists at its base where there is a cartilaginous plate or piece through which the nostrils pass. The crop is of large size. The pigeons are generally strong on the wing. They are mostly arboreal in habits, perching upon trees, and building their nests in elevated situations. Both sexes incubate; and these birds generally pair for life; the loss or death of a mate being in many cases apparently mourned and grieved over, and the survivor frequently refusing to be consoled by another mate.

The song consists of the well-known plaintive cooing. The pigeons are distributed in every quarter of the globe,

Passenger-pigeon.

but attain the greatest luxuriance of plumage in warm and tropical regions. The house-pigeons, tumblers, fan-tails, pouters, carriers, and jacobins are the chief varieties of the rock-pigeon, and have been employed by Darwin (see his



Domestic pigeon, homing variety.

Origin of Species and his Animals under Domestication) to illustrate many of the points involved in his theory of "descent by natural selection." See also Carrier Pigeon, Passenger Pigeon, Turtle-dove, etc.

PIGEON ENGLISH, conjectured to be a form of "business English;" a conglomeration of English and Portuguese words wrapped in a Chinese idiom, used by English and American residents in China in their intercourse with the native traders.

PIG-IRON. See Iron.

PIGMENT-CELL, in physiology, a small cell containing coloring matter, as in the choroid coat of the eye.

PIGMENTS, materials used for imparting color, especially in painting, but also in dyeing or otherwise. The coloring substances used as paints are partly artificial and partly natural productions. They are derived principally from the mineral kingdom; and even when animal or vegetable substances are used for coloring they are nearly always united with a mineral substance (an earth or an oxide). In painting the colors are ground, and applied by means of some liquid, which dries up without changing them. The difference of the vehicle used with the method of employing it has given rise to the modes of painting in water-colors, oil-colors, in fresco, in distemper, etc. For oil-painting mineral substances are more suitable than lakes prepared with minerals, because the latter become darker by being mixed with oil. The lake colors have tin or alum for their basis, and owe their tint to animal or vegetable coloring substances. Indigo is a purely vegetable color, as is also blue-black, which is obtained from burned vine-twigs. Ivory black is a purely animal color, being nothing else than burned ivory. In staining porcelain and glass the metallic colors which are not driven off by heat and are not easily changeable are used.

PIGMY. See Pygmy.

PIG-NUT. See Earth-nut.

PIKA, the calling-hare, an animal nearly allied to the hares. It is found in Russia, Siberia, and North America, and is remarkable for the manner in which it stores up its winter provision, and also for its voice, the tone of which so much resembles that of a quail as to be often mistaken for it.

PIKE, a genus of fishes. The pikes form the types of the family Esocidæ, in which group the body is lengthened, flattened on the back, and tapering abruptly toward the tail. One dorsal fin exists, this structure being placed far back on the body, and opposite the anal fin. The lower jaw projects. Teeth are present in plentiful array, and are borne by almost every bone entering into the composition of the mouth. The common pike occurs in the rivers of Europe and North America. It is fished chiefly for the sake of its flesh, which is accounted exceedingly wholesome. The pikes are very long-lived, and form the tyrants of their sphere, being the most voracious of fresh-water fishes. When fully grown the pike may attain a length of 5 or 6 feet, and there are numerous instances on record in which these fishes have greatly exceeded that length. The sea pikes also known as gar-pikes, are also included in the family Esocidæ. The saury pike resembles the gar-pike in general conformation, but possesses the dorsal and anal fins in the shape of a number of divided "finlets." The bony pike of North American lakes and rivers belongs to an entirely different order of fishes—that of the Ganoidei. See Bony Pike.

PIKE, a sort of lance, a weapon much used in the middle ages as an arm for infantry. It was from 16 to 18 feet long, and consisted of a pole with an iron point. For some time every company in the armies of Europe consisted of at least two-thirds pike-men and one-third harquebusiers. Gustavus Adolphus omitted the pike-men in some regiments entirely. The invention of the bayonet drove the pike out of use.

PIKE, Zebulon Montgomery, American soldier and explorer, was born at Lamberton, N. J., in 1779, and educated at Easton, Penn. In 1805 he engaged on an expedition to ascertain the source of the Mississippi river. The two following years were passed by him in exploring the territory of Louisiana, discovering, while thus occupied, what has since been known as "Pike's Peak," in the Rocky Mountains. Pike published the results of his expedition in An Account of an Expedition to the Sources of the Mississippi, and Through the Western Parts of Louisiana, . . . and a Tour Through the Interior Parts of New Spain. He died in 1813.

PIKE-PERCH, a genus of fishes closely allied to the perch, but showing a resemblance to the pike in its elongated body and head. Like the pike, it is a dangerous enemy to other fresh-water fishes, but the flavor of its flesh is excellent. In Europe it occurs in two species. It also occurs in the fresh waters of North America, such as the great lakes, the upper Mississippi, and the Ohio.

PIKE'S PEAK, one of the highest summits of the Rocky mountains (14,134 feet), in the center of the state of Colorado. It was discovered by General Pike in 1806. It abounds in rich gold-bearing quartz, and has a meteorological observatory. A rack-rail line of railway, 9 miles long, to the top of the mountain has recently been constructed.

PILAS'TER, a square pillar projecting from a pier or a wall to the extent of from one-fourth to one-third of its breadth. Pilasters originated in Grecian

Pilaster—Corinthian.

architecture. In Roman they were sometimes tapered like columns and finished with capitals modeled after the order with which they were used.

PILATE, Pontius, the sixth Roman procurator of Judæa. He succeeded Valerius Gratus in A.D. 26. Nothing is known of his early history. He was a narrow-minded and impolitic governor, and at the very beginning of his term of office led to commotions among the Jews at Jerusalem. When Christ had been condemned to death by the Jewish priests, who had no power of inflicting capital punishments, he was carried by them to Pilate to be executed. Yielding to the clamors of the Jews the Roman governor ordered Jesus to be executed, but permitted Joseph of Arimathea to take his body and bury it. Pilate was afterward removed from his office by Vitellius, prefect of Syria (A.D. 36), and, according to tradition, was banished by Caligula to Vienna (Vienne), in Gaul, where he is said to have died or committed suicide some years after.

PILES. See Hemorrhoids.

PILGRIMAGES, the practice of making pilgrimages to places of peculiar sanctity is as ancient as it is wide-spread.

The ancient Egyptians and Syrians had privileged temples, to which worshippers came from distant parts. The chief temples of Greece and Asia Minor swarmed with strangers. But it is in Christianity and Mohammedanism that the practice has attained its greatest development. The first Christian pilgrimages were made to the graves of the martyrs. By the end of the 4th and beginning of the 5th century the custom had become so general as to lead to abuses. Throughout the middle ages, and especially about the year 1000, the religious fervor of the people manifested itself in numerous pilgrimages, especially to Jerusalem. The outrages inflicted on the Christian pilgrims by the Saracens led to the Crusades, which were themselves nothing else than gigantic armed pilgrimages. The shrine of Our Lady of Loretto, near Rome, that of St. James of Compostella in Spain, of St. Martin of Tours in France, were all sacred spots to which, from the 10th to the 13th century, and even much later, pilgrims resorted in innumerable crowds; and from the end of the 12th century the shrine of St. Thomas Becket at Canterbury had the same honor in England. After the reformation the practice of making pilgrimages fell more and more into abeyance, and the spirit which led to it seems almost to have become extinct among Christians, although there are still occasional outbursts of it among the Roman Catholics, as in the modern pilgrimages to Paray-le-Monial, Lourdes, Iona, and Holy Island. In the Greek church Mount Athos is the chief shrine of pilgrimage. For Mohammedans the great place of pilgrimage is Mecca, which was the resort of Arabian pilgrims long before the time of Mohammed. Among the Hindus and the Buddhists also the practice of performing pilgrimages largely prevails.

PILGRIM FATHERS, the name given to the English, Scotch, and Dutch nonconformists who, sailing from Southampton in the Mayflower, landed at what is now Plymouth in Massachusetts, December, 1620, and colonized New England.

PILLAR. See Column.

PIL'LORY, a frame of wood erected

Pillory.

on posts, with movable boards, and holes through which were put the head and hands of a criminal for punishment. In this manner persons were formerly exposed to public view, and generally to public insult.

PILLS, medicines made up in globules of a convenient size for swallowing whole, the medicine being usually mixed up with some neutral substance such as bread-crumbs, hard soap, extract of liquorice, mucilage, syrup, treacle, and conserve of roses. The coverings are liquorice powder, wheat flour, fine sugar, and lycopodium. In many cases pills are now enamelled or silvered, which deprives them of most of their unpleasantness. Pills are a highly suitable form for administering medicines which operate in small doses, or which are intended to act slowly or not to act at all until they reach the lower intestines, and in some other cases.

PILOT, a person duly licensed by any piloting authority to conduct ships to which he does not belong as one of the crew. Pilots are in fact taken on board to superintend the steering of the vessel, where the navigation is difficult and dangerous, in consequence of their special knowledge of particular waters; and it is to this class alone that the term now applies, whereas in early times the pilot was the steersman, or the individual who conducted the navigation of a ship across the ocean and out of sight of land. The laws of pilotage in the United States are regulated by the individual States according to the Acts of congress.

PILOT-FISH, a genus of fishes included in the mackerel family. The pilot-fish was formerly supposed to act as a pilot to the mariner, and is still supposed to act as such to sharks. It

The pilot-fish.

often follows in the wake of ships for long distances, associating with sharks and devouring the refuse thrown overboard. The average length is about 12 inches. In general form it resembles the mackerel.

PILSEN, a town in Western Bohemia, at the confluence of the Mies and Radbusa, 53 miles southwest of Prague. The chief article of manufacture and commerce is beer. Coal, iron, alum, etc., are worked in the neighborhood. Pop. 68,292.

PIN, a piece of wire, generally brass, sharp at one end and with a head at the other, chiefly used by women in adjusting their dress. By the old methods of manufacture by hand, the distinct processes, from the straightening of the wire to the spinning and hammering of the head, were usually said to be fourteen. At present all those processes, from the cutting of the wire to the sticking of the pins into papers, are performed by machinery. Pins came into common use in England in the 15th century. In the 17th century Birmingham became the seat of the pin-manufacture, and has continued to be so ever since. Solid-headed pins, which are those now generally in use, were first made in 1824.

PINAR' DEL RIO, a town of Cuba, 90 miles southwest of Havana, in the famous Vuelta de Abajo, where the best tobacco grows. Pop. 10,180.

PINDAR, the greatest of the lyric poets of Greece, born in Bœotia, in or near Thebes, of a noble family, about 522 B.C. Little is known with certainty of his life; even the date of his death is doubtful. The most probable account appears to be that he died at the age of eighty, in which case his death would fall about 442 B.C. He practiced all kinds of lyric poetry, and excelled equally in all. His works embraced hymns to the gods, pæans, dithyrambs, dancing and drinking songs, dirges, panegyrics on princes, and odes in honor of the victors in the great Grecian games, but the only poems of his which have come down to us entire belong to the last class, the Epinicia. Forty-five of the epinician odes of Pindar are still extant. Fourteen of these are in celebration of Olympic victors, twelve of Pythian, eleven of Nemean, and eight of Isthmian.

PINE, the popular name of trees of the genus, Pinus, natural order Coniferæ, which is divided into two suborders, namely, 1. the fir tribe; and 2. the cypress tribe. The pines belong to the former section, and are distinguished from the spruce, larch, fir, cedar, etc., chiefly by having persistent leaves in clusters of two to five in the axils of membranous scales. All the European species, except one have only two leaves in a sheath; most of the Asiatic, Mexican, and Californian kinds have three, four, or five leaves, and those of the United States and Canada have generally three. There are extensive forests of it in Russia, Poland, Sweden, Norway, Germany, the Alps, the Pyrenees, and the Vosges. The Corsican pine grows to a height of from 80 to 100 feet, and in the island of Corsica it is said to reach an altitude of 140 to 150 feet. Sabine's pine was discovered in California in 1826. The leaves are in threes, rarely in fours, from 11 to 14 inches long; the trees are of a tapering form, straight, and from 40 to 120 feet high, with trunks from 3 to 12 feet in diameter. The Cembran pine is a native of Switzerland and Siberia. The red Canadian pine, or yellow pine, inhabits the whole of Canada from the Atlantic to the Pacific, and is also found in the northern and eastern parts of the United States. The trunk rises to the height of 70 or 80 feet by about 2 in diameter at the base, and is chiefly remarkable for its uniform size for two-thirds of its length. The wood is yellowish, compact, fine-grained, resinous, and durable. The true yellow pine rises to the height of 50 or 60 feet, by 15 or 18 inches in diameter at base. The cones are small, oval, and armed with fine spines. The timber is largely used in shipbuilding and for house timber. The other American pines are the Jersey pine, the trunk of which is too small to be of any utility in the arts; the pitch pine, which is most abundant along the Atlantic coast, and the wood of which, when the tree grows in a dry, gravelly soil, is compact, heavy, and

contains a large proportion of resin; the loblolly pine, the timber of which decays speedily on being exposed to the air; the long-leaved pine, which abounds in the lower part of the Carolinas, Georgia, and Florida, furnishing resin, tar, pitch, and turpentine, and timber which is hardly inferior to the white oak in naval architecture; the Weymouth pine, the timber of which, though not without essential defects, is consumed in much greater quantities, and for a far greater variety of purposes, than almost any other; and Lambert's pine, which grows between the fortieth and forty-third parallels of latitude, and about 100 miles from the Pacific. It is of gigantic size, the trunk rising from 150 to upward of 200 feet, and being from 7 to nearly 20 feet in diameter.

PINE'AL GLAND, in anatomy, is a body (not properly a gland) forming part of the brain. It is about the size of a pea, and is connected with the cerebrum at its base by four peduncles or stalks and by some few cross fibers. Its use is not known. It was considered by the ancients to be the seat of the soul.

PINE-APPLE, a plant belonging to the natural order Bromeliaceæ, much esteemed for its richly-flavored fruit, which somewhat resembles a pine-cone. A native of tropical America, it is now naturalized in many hot countries, and is also cultivated in hothouses. The common pine-apple plant yields the fiber of which, in Manila, the beautiful pina cloth is made. The fiber is also used for textile purposes in China, and to some extent in India, and it is believed that in the latter country the fiber might soon come to be an article of commercial importance.

PINE BLUFF, the capital of Jefferson co., Ark., on the Arkansas river at the head of low-water navigation, and on the St. L., Iron Mount. and South., and the St. L. S. West. railways; 42 miles s.s.e. of Little Rock. It is built on a bluff 228 feet above sea-level in the cotton-producing region of the state. Pop. 13,740.

PINES, ISLE OF, an island of the West Indies; 35 miles s. of the western end of Cuba. The island is a dependency of Cuba, contains 1214 sq. miles of undulating or flat and marshy land, and has about 5000 inhabitants. Capital and principal village, Nueva-Gerona. The island contains marble quarries, and is a favorite health resort for sufferers from lung diseases.

PIN'ERO, Arthur Wing, English dramatist, was born in London in 1855. He made his appearance as an actor at Edinburgh in 1874. He obtained under Henry Irving a practical experience in stagecraft which was of great value to him. In 1876 he made, with Two Can Play at That Game, his first attempt at play-writing, to which after 1881 he devoted himself. In the long list of his plays are: The Money Spinner, the Schoolmistress, the Hobby Horse, Sweet Lavender, The Weaker Sex, The Profligate, Lady Bountiful, The Second Mrs. Tanqueray, The Notorious Mrs. Ebbsmith, Trelawney of the "Wells", The Gay Lord Quex, Iris. Of his earlier pieces the most popular was the domestic drama called Sweet Lavender.

PINION, in machinery, a small wheel which plays in the teeth of a larger one, or sometimes only an arbor or spindle in the body of which are several notches forming teeth or leaves, which catch the teeth of a wheel that serves to turn it round.

PINK, a genus of plants. More than 100 species are known. Their roots are annual or perennial; the stems herbaceous and jointed; the leaves opposite and entire, and the flowers terminal, aggregate, or solitary, and always beautiful. The clove pink or carnation, and the garden pink, of which there are many varieties, are familiar species.

PINNACLE, in architecture, any lesser structure that rises above the roof of a building, or that caps and terminates the higher parts of angles or of buttresses. The application of the term is now generally limited to an ornamental pointed mass rising from angles, but-

Pinnacle, Trinity church, Cambridge.

tresses, or parapets, and usually adorned with rich and varied devices. They are usually square in plan, but are sometimes octagonal, and in a few instances hexagonal and pentagonal. The tops are generally crocketed, and have finails on the points.

PINNATE, in botany, formed like a feather. A pinnate leaf is a species of compound leaf wherein a single petiole has several leaflets or pinnules attached to each side of it.

PINT, a measure of capacity used for both liquids and dry goods; it is the eighth part of a gallon, or 34.65925 cubic inches.

PINZON', a family of Spanish navigators, natives of Palos, who were associated with Columbus in the discovery of America.—Martin Alfonso, the eldest, was of great assistance to Columbus in fitting out his fleet, and in the voyage commanded the Pinta.—Vicente Yañez, his brother, commanded the Niña in the first voyage of Columbus.—Francisco Martin, the third brother, was pilot of the Pinta in the first voyage of Columbus. From him descended the nobel Spanish family of Pinzon.

PIOTRKOV, a town of Russian Poland in the government of same name, one of the oldest towns of Poland. It was at one time the seat of the Polish diet, and the kings were elected here. Pop. 30,372.—The government has an area of 4729 sq. miles. It is moderately fertile, and has considerable manufactures of cottons and woolens. Pop. 1,409,044.

PIPA, a genus of toads, of which the best known species is of Surinam and Brazil, popularly designated the Surinam toad. The tongue and teeth are wanting in this family. The pipa is one of the most repulsive looking of the toads, and is noted as exemplifying, in the case of the female animals, an anomalous mode of developing the eggs and young. A number of pits or depressions termed "dorsal cells" appear to be

Surinam toad.

formed on the back of the female pipas at the breeding season. In each cell an egg is deposited, the eggs being first deposited by the female in water after the usual method, and being impregnated by the male, who then collects the eggs and places them in the female's back. Each cell appears to be closed by a lid-like fold, and within the cells the eggs are hatched and the young pass their tadpole state.

PIPE, a tube for the conveyance of water, steam, gas, or other fluid, used for a great variety of purposes in the arts and in domestic economy. The materials of which pipes are made are also very various, wood, stone, earthenware, iron, lead, copper, leather, guttapercha, etc., being all employed. Drainage and sewerage pipes of great strength and size (measuring from 1 to 2 up to 54 inches in diameter) are now usually made of fire-clay, glazed on their outer and inner surfaces. Large iron pipes are usually cast, and are used for the supply of water and gas.

PIPE, tobacco, a bowl and connecting tube, made of baked clay, wood, stone, or other material, and used in smoking tobacco. The cheap pipes in common use are made of a fine-grain white plastic clay. The chief processes in the manufacture of clay pipes are moulding and baking. Finer and more expensive pipes are made of meerschaum, a somewhat plastic magnesian stone of a soft greasy feel. Meerschaum pipe making is carried on to the greatest extent by the Germans, and Vienna may be said to be the center of the manufacture. Briar-root pipes, with the bowl and stem of one piece of wood, and provided with amber, ivory, or bone mouthpieces, are now very common. They are made of the roots of a large variety of heath. Many Germans and Dutchmen prefer pipes with porcelain bowls, which are sometimes beautifully painted in the style of fine chinaware painting. The eastern hookah is a pipe of great size, the bowl of which is set upon an air-tight vessel partially filled with water, and has a

small tube which passes down into the water; the long flexible smoking-tube is inserted in the side of the vessel, and the smoke is made to pass through the water, being thus cooled and deprived of some noxious properties. Upon the American continent pipes have been in use from a very remote period. Indian pipes, with elaborately-carved soapstone bowls and ornamented wooden stems, or entirely of baked clay, have been found in the ancient mounds of the west, together with other relics of an unknown race. See Calumet.

PIPE-CLAY, a fine white clay which is used for making tobacco pipes and articles of pottery, also for cleaning soldiers' belts, etc.

PIPE-FISHES, a genus of fishes nearly allied to the curious little fishes popularly known as "sea-horses." They are distinguished by a long and tapering body, and by jaws united to form a tube or pipe, bearing the mouth as the tip. It averages 20 inches in length. A very

Great pipe-fish.

remarkable circumstance in connection with the pipe-fishes consists in the males of some species possessing a pouch-like fold, situated at the base of the tail, in which the eggs are contained after being extruded from the body of the females, and in which the young, after hatching, continue to reside for a time.

PIPPIN, the name given to a certain class of apples, probably because the trees were raised from the pips or seeds, and bore the apples which gave them celebrity without grafting. The Ribston, Golden, and Newton Pippin are favorite varieties.

PIQUA, town in Miami co., Ohio, on Miami river, and Miami and Erie canal, 90 miles northeast of Cincinnati. Pop. 14,280.

PIQUET', a game at cards played between two persons with thirty-two cards, all the plain cards below seven being thrown aside. In playing, the cards rank in order as follows: the ace (which counts eleven), the king, queen, and knave (each of which counts ten), and the plain cards, each of which counts according to the number of its pips. The player who first reaches 100 has the game. The score is made up by reckoning in the following manner:—Carte blanche, the point, the sequence, the quatorze, the cards, and the capot.

PIQUE-WORK, a fine kind of inlaid work, resembling Buhl-work, but much more expensive and elaborate, the inlay being minute pieces of gold, silver, and other costly materials.

PI'RACY is the crime of robbery and depredation committed upon the high seas. It is an offense against the universal law of society. In England the offense was formerly cognizable only by the admiralty courts, which proceeded without a jury, in a method founded upon the civil law; but now any justices of assize, or oyer and terminer, or jail delivery, may try persons accused of piracy. Piracy, in the common sense of the word, is distinguished from privateering by the circumstance that the pirate sails without any commission, and under no national flag, and attacks the subjects of all nations alike; the privateer acts under a commission from a belligerent power, which authorizes him to attack, plunder, and destroy the vessels which he may encounter belonging to the hostile state.

PISA, a town of Northern Italy, capital of the province of the same name. In the northwest part of the city is a remarkable group of buildings consisting of the Duomo or Cathedral, the Baptistery, the famous "Leaning Tower," and the Campo Santo. The manufactures consist chiefly of silk, woolen, and cotton goods. The population, which reached 150,000 when the city was in its zenith, is now 61,279. The province of Pisa has an area of 1180 sq. miles, and a population of 320,829. See Leaning Tower.

PISCES, or **FISHES.** See Ichthyology.

PISCES (the Fishes), a sign of the zodiac, which is entered by the sun about the 19th of February. The constellation which occupies the zodiacal region corresponding to the sign has the same name; it contains some interesting double stars.

PISCICULTURE, the breeding, rearing, preservation, feeding, and fattening of fish by artificial means. Pisciculture has been practiced from very remote ages, having been in use in ancient Egypt, and followed in China in early times on a very large scale. The art, so far as the perfecting of natural conditions under which fish live and thrive, without interfering directly with the ordinary processes of nature, has thus always been more or less practiced. But the discovery that the ova of fish can be taken from the body of the female parent, impregnated with the male milt and hatched in tanks, has led to a great extension of the art. One great point in modern pisciculture is the propagation and rearing of young fish in artificial ponds with the view of introducing fish into some locality where they were not previously found. Salmon and trout ova have been sent from Britain, and successfully propagated in Australia and New Zealand. The art has now come into general favor and is widely followed, very many rivers having on their banks breeding and rearing establishments for the purpose of increasing the stock of fish in the streams. In Scotland a very successful effort has been carried out at Stormontfield, near Perth, on the Tay, and there is a still more famous piscicultural establishment belonging to Sir James Gibson Maitland at Howietoun, near Stirling. The Midlands Counties' Fish Culture Establishment at Malvern Wells is the largest in England. From Huningue, near Basel, on the Rhine, millions of ova are annually despatched to England, Germany, Spain, and other countries. The American Fish and Fisheries Commission have successfully introduced into various waters the American white fish, the Californian trout, the American brook char, etc., and pisciculture on a large scale is practiced both in the United States and Canada. The artificial culture of oysters, mussels, lobsters, and other crustacea, is also receiving attention; and altogether the art is every year attaining a greater development, and promises to become yet an important department of commercial industry.

PISIS'TRATUS, "tyrant" of Athens, was descended from Codrus, the last king of Athens, and was born not later than 612 B.C. He was rich, handsome, and eloquent, and being by nature ambitious he soon placed himself at the head of one of the three parties into which Attica was then divided. By putting himself forward as the patron and benefactor of the poor, and by advocating civil equality and a democratic constitution, he was able (notwithstanding the opposition of Solon) to seize upon the acropolis (citadel) in 560 B.C., and thus to make himself master, or, as the Greeks termed it, "tyrant" of the city. But though a tyrant in the Greek sense, his use of power was by no means tyrannical. He made no attempt to abolish the wise laws of Solon, but confirmed and extended their authority. He was, however, twice driven from Athens; but in the eleventh year of his second banishment succeeded in making himself master of the sovereignty for the third time. Pisistratus erected splendid public buildings at Athens, established a public library, and collected and arranged the poems of Homer, and conducted himself with so much prudence and clemency that his country scarcely ever enjoyed a longer term of peace and prosperity. He died 527 B.C., leaving two sons, Hippias and Hipparchus, to inherit his power, who were not, however, able to preserve it.

PISTACHIO (pis-tä'shi-o), a tree of several species, growing to the height of 15 to 20 feet. It yields the well-known pistachio-nut, which contains a kernel

Pistachio.

of a pleasant taste, resembling that of the almond, wholesome and nutritive, yielding a pleasant oil. It is a native of western Asia.

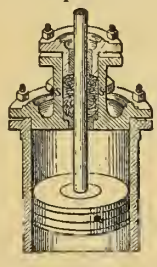
PISTIL, in botany, the female or central seed-bearing organ of a phanerogamous flower, consisting of one or more carpels or modified leaves. There may be only a single pistil or several in the same flower. It consists essentially of two parts, the ovary, containing the ovules or young seeds, and the stigma,

a cellular secreting body, which is either seated immediately on the ovary (as in the tulip and poppy), and is then called sessile, or is borne on a stalk called a style interposed between the ovary and stigma. It is on the stigma that the pollen falls by which the fecundation takes place, after which the ovule develops into the seed.

PISTOL, a small firearm with a curved stock, discharged with one hand, named from the town of Pistoja, where they were first made. Pistols were introduced into England in 1521. Mention is made of their use in 1544. The "dag" mentioned by the Elizabethan writers was a kind of clumsy pistol. Pistols are made of various sizes, ranging from 6 inches to 18 and even 24 inches (the holster pistol). See Firearms, Revolver.

PISTOLE (pis-tōl'), a gold coin met with in several parts of Europe, more especially in Spain, value about $4.00, but not now coined. It was originally a Spanish coin, and was equivalent to a quarter of a doubloon.

PISTON, in machinery, a movable piece, generally of a cylindrical form, so fitted as to occupy the sectional area of a tube, such as the barrel of a pump or the cylinder of a steam-engine, and capable of being driven alternately in two directions by pressure on either of its sides. One of its sides is fitted to a rod, called the piston-rod, which it



Piston and cylinder.

either moves backward and forward, as in the steam-engine, where the motion given to the piston-rod is communicated to the machinery, or by which the piston is itself made to move, as in the pump. The piston is usually made to fit tightly by some kind of material used as packing, the piston-rod being also made similarly tight by material closely packed in the stuffing-box (s s).

PITCAIRN ISLAND, an island in the South Pacific, belonging to the Low Archipelago, lat. 25° 5′ s.; lon. 130° 5′ w.; length, 2¼ miles; breadth, about 1 mile. It was discovered by Carteret in 1767. Its coast is almost perpendicular throughout its whole extent, fringed with formidable rocks and reefs, accessible only at two points, and not at all in stormy weather. It rises to the height of 1100 feet, and the soil, naturally fertile, yields good pasture, potatoes, yams, plantain and bread-fruit, pine-apples, and other tropical fruits. In 1881 the inhabitants numbered 96, and in 1901, 126. Whalers and trading vessels occasionally call and exchange the products of civilization for the produce of the island.

PITCH, the residuum obtained by boiling tar till the volatile matter is driven off. It is extensively used for caulking the seams of ships, for preserving wood and iron-work from the effects of water, for making artificial asphalt, etc.

PITCH, the acuteness or gravity of any particular musical sound, which is determined by the number of air-vibrations in a given time—the greater the number the higher the note. In stringed instruments the pitch is dependent on the length, thickness, and degree of tension of the string; in wind instruments, such as the flute or organ, chiefly on the length of the column of air set in motion. (See Music.) The tuning-fork is in common use to assist in giving some desired pitch.

PITCH-BLENDE, a mineral composed of 86.5 oxide of uranium, 2.5 black oxide of iron, galena and silex. In color it varies from brown to black, and occurs globular, reniform, massive, disseminated, and pulverulent. It generally accompanies uranite.

PITCHER-PLANT, a name given to several plants from their pitcher-shaped leaves, the best known of which is a

Pitcher-plant.

native of China and the East Indies. It is a herbaceous perennial, and grows in marshy situations. The leaves are sessile, oblong, and terminated at the extremities by a cylindrical hollow vessel resembling a common water-pitcher, which contains a fluid secreted by the plant itself. This pitcher is furnished with a lid which generally opens in the day and shuts at night, and which is regarded as the true blade of the leaf. Wonderful curative powers are ascribed to the fluid in the pitcher and to the leaf and the root of this plant by the natives of the East Indies and Madagascar.

PITCH-PINE. See Pine.

PITH, the cylindrical or angular column of cellular tissue at or near the center of the steam of a plant, also called the medulla. It is not usually continued into the root, but is always directly connected with the terminal bud of the stem; and in the first instance also by means of the medullary rays with the lateral leaf-buds. When examined microscopically it presents in section a union of cells resembling those of a honeycomb, of which a good example is afforded by Chinese rice-paper, the pith of the Aralia papyrifĕra. The pith is at first succulent and of a greenish color, afterward it becomes dry, and in many plants its cells are broken up, leaving large cavities. In its primary state it appears to be a reservoir of nourishment for the embryo plant

PITT, Earl of Chatham. See Chatham (William Pitt, Earl of).

PITT, William, second son of the Earl of Chatham, born May 28, 1759; died January 23, 1806. He possessed a remarkably precocious intellect, but his physical powers were weak. He was educated privately till his fourteenth year, when he entered Cambridge. He was called to the bar in 1780, and entered parliament the following year as member for Appleby. His success in the house was of unparalleled rapidity. He supported Burke's financial reform bill, and spoke in favor of parliamentary reform; became chancellor of the exchequer at twenty-three, under the Earl of Shelburne, and in the following year attained the position of prime minister. Although strongly supported by the sovereign, he stood opposed to a large majority of the House of Commons and a dissolution took place in March 1786. At the general election which followed the voice of the nation appeared decidedly in his favor, and some of the strongest aristocratical interests in the country were defeated, Pitt himself being returned by the University of Cambridge. His first measure was the passing of his India bill, establishing the board of control, which was followed by much of that fiscal and financial regulation that gave so much éclat to the early period of his administration. The establishment of the delusive scheme of a sinking fund followed in 1786, and his Regency bill in 1788. The French revolution now broke out, and in 1793 war arose between Great Britain and France, a conflict which brought a heavy responsibility on Pitt, and immense sacrifices and burdens on his country. In 1800 the Irish union was accomplished. In 1801 the opposition of the king to all further concession to the Irish Catholics caused Pitt to resign his post. The Peace of Amiens succeeded

William Pitt.—From the statue by Chantrey.

and the Addington administration, which concluded it, Pitt supported for a time, and then joined the opposition. The new minister, who had renewed the war, unable to maintain his ground, resigned; and in 1804 Pitt resumed his post at the treasury. Returning to power as a war minister, he exerted all the energy of his character to render the contest successful, and found means to engage the two great military powers of Russia and Austria, in a new coalition, which was dissolved by the battle of

Austerlitz. This event he did not survive long; his constitution, weakened by hereditary gout, rapidly yielded to the joint attack of disease and anxiety.

PITTSBURG, a city in Allegheny co., Pennsylvania, in the angle between the Monongahela and the Allegheny rivers where they unite to form the Ohio. It is admirably situated for trade, having ample river and railway connection with the great commercial emporiums of the east, west, and south, while in the neighborhood there are immense and cheaply-obtainable coal supplies. These exceptional advantages have made Pittsburg the chief center of the American iron and steel industry; smelting furnaces, foundries, rolling-mills, etc., being numerous and on a large scale. The glass manufactures of Pittsburg also rank first in importance in the United States; cotton goods, leather, earthenware, white lead, soda, tobacco, beer and spirits are largely produced; but the chief exports are iron and steel, hardware and machinery, glass, coal, and coke. Pittsburg consists of the town proper and of several large suburbs, and with those that are on the opposite side of the rivers the connection is kept up by twelve bridges, comprising some very excellent examples on the suspension principle. Of the adjacent places, which, though separately incorporated, are properly regarded as only suburbs of Pittsburg, the most important are Allegheny on the right bank of the Allegheny river, a favorite residence with the wealthier classes, and Braddocks on the right bank of the Monongahela to the east of the city. Both Pittsburg and Allegheny possess many fine public buildings and institutions. Natural gas is extensively employed for both lighting and heating purposes. Pittsburg occupies the site of a fort called Du Quesne, built by the French in 1754; captured by the British in 1758, and named after William Pitt. It was chartered in 1816, but since then its boundaries have been several times extended. On November 18, 1907, the Supreme Court of the United States declared the act consolidating the cities of Pittsburg and Allegheny valid. The consolidation gives the city an area of thirty-eight square miles, and an estimated population in 1909, 565.000. It will outrank Cleveland and Baltimore, giving Boston a close race for fifth place in size, and will have the largest tonnage of any city in the world.

The officials in Allegheny will at once become deputies to those in Pittsburg until the next election, which is in 1909.

PITTSBURG, a city in Crawford co., Kan., on the Atch., Top. and S. Fé, the Kan. City, Ft. Scott and Mem., the Kan. City, Pitts. and Gulf, the Mo. Pac., and the St. L. and San. Fran. railways; 10 miles s.e. of Girard, the county seat. It is in a coal mining region. Pop. 12,224.

PITTSFIELD, a city of Massachusetts, on the Housatonic, which is here formed by the waters from several lakes. It is well built, manufactures extensively cotton and woolen goods, silk, castings, machinery, tools, paper, boots and shoes, brewery products, etc., and owing to its salubrious climate and fine scenery is a favorite summer resort. Pop. 25,875.

PITTSTON, a town in Pennsylvania, 9 miles from Wilkesbarre, in an important coal district. Pop. 14,670.

PIUS II. (Æneas Sylvius Piccolomini), pope, born 1405, died 1464. He became secretary to Cardinal Capranica, and the Council of Basel in 1431; to the anti-pope Felix V. in 1439, and to Frederick III. of Germany in 1442. He succeeded Calixtus III. as pontiff 1458. Pius II. was one of the most learned men of his age, and left some valuable and interesting historical works, orations, and letters.

PIUS V. (Michele Giuslieri), pope, born in 1504, died 1572. He was raised to the cardinalate by Paul IV. in 1557, appointed inquisitor in Lombardy, then inquisitor-general, and chosen pope in 1565. He chiefly distinguished himself by his cruel persecutions of Protestants and Jews. In 1570 he excommunicated Elizabeth of England.

PIUS VI. (Giovanni Angelo Braschi), pope, born at Cesena 1717, died at Valence 1799. He held important offices under several pontiffs, was raised to the cardinalate by Clement XIV., and succeeded him in 1775.

PIUS VII. (Gregorio Barnaba Chiaramonti), pope, born at Cesena in 1742, died 1823. Pius VI. created him bishop of Tivoli, cardinal and bishop of Imola; and his friendly attitude toward the Cisalpine republic secured him the favor of France, and the election to the papal chair in 1800.

PIUS IX. (Giovanni Maria Mastaï-Ferretti), pope, born in 1792, was destined for a military career, and on the restoration of Pius VII. entered the Guardia Nobile of the Vatican, but soon after adopted the clerical profession. He held various ecclesiastical offices under Leo XII., who appointed him archbishop of Spoleto in 1827, and to the see of Imola in 1832. Although raised to the cardinalate in 1840, he resided in his diocese until his election to the pontificate in 1846. The immaculate conception of the Virgin was settled by a papal decree in 1854, and the dogma of papal infallibility was established by the ecumenical council of 1870. By this time the pope's dominions had been greatly reduced, and what remained of the temporal power was secured by the presence of French troops at Rome. But the downfall of Napoleon III. caused their withdrawal; the Italian troops took possession, and the political rule of the holy see was at an end. The Vatican was left to the pope, and his independence ensured. Free diplomatic intercourse, the honors due to a sovereign, and a civil list of $650,000 yearly, were secured to him. But these he declined, and year after year he confined himself to the Vatican and its garden, declaring that he was under restraint, and a prisoner in his own palace. His death took place in February, 1878.

PIZAR'RO, Francisco, Spanish adventurer, the discoverer and conqueror of Peru, was born in 1478, the illegitimate son of a hidalgo, and was first a swineherd and then a soldier. The spirit of adventure which at that time pervaded Spain, prompted him to seek fortune in the newly-found continent of America, where he participated in various military and trading expedition. While resident near Panamá he became associated with two other adventurers, Hernando Lugue, or de Lugues, and Diego de Almagro. In 1524 they jointly fitted out an expedition with a view to exploration and conquest, and on their second voyage discovered Peru; but finding their force inadequate for conquering the country, Pizarro returned to Spain for assistance. He arrived in Seville in 1528, was granted the necessary powers and a small force, and recrossed the Atlantic in 1531. The following year he arrived in Peru during a civil war, treacherously seized the person of the reigning inca at a friendly banquet, and after extorting an immense ransom put him to death. The whole empire was gradually conquered without much opposition, but its settlement was long in abeyance owing to a feud between Pizarro and Almagro. Hernando Pizarro, a brother of the general strangled Almagro in 1537. This act was avenged in 1541 when a son of Almagro murdered Francisco Pizarro in his palace at Lima. Lima was founded by Pizarro in 1535, and his remains are interred in the cathedral of that city, also founded by him.

PLACE, La. See Laplace.

PLACEN'TA, the structure which, in the higher mammalia, connects the fœtus, or unborn embryo, with the circulation of the mother, thus providing for its due nutrition. In its most typical form it is only met with in the higher mammalia, which are therefore called placental mammals, while the lower mammalia are termed implacental or aplacental, from their wanting a placenta; the latter include only the two orders Monotremata and Marsupialia. Certain analogous structures also exist in connection with the development of

Transverse and vertical sections to show placenta. 1, central placenta; 2, axile central placenta; 3, parietal placenta; *aa*, placentæ.

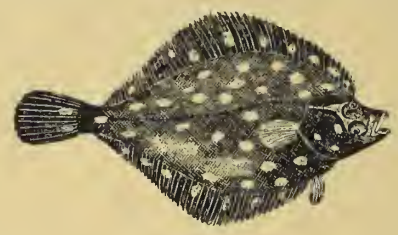
the young of some species of sharks and dog-fishes. The human placenta presents the most perfect type, and is a special growth on the part both of the womb and the ovum. By the end of pregnancy it forms a disc-like mass, measuring 7¼ inches across, ¾ inch thick, and about 20 oz. in weight. Connected with it near the middle is the umbilical cord, by means of which the growing embryo is attached to the placenta. Through the placenta and the umbilical cord the blood of the embryo comes into close communication with the blood of the mother, by means of which its purity and nourishing qualities are maintained, and the requisite supply of material furnished for the embryo's continued life and growth. At the end of

pregnancy the placenta is thrown off as the after-birth, after the child itself has been expelled.

PLACENTA, in botany, a development of cellular tissue at the inner or ventral suture of a carpel, to which the ovules or seeds are attached either immediately or by umbilical cords, as in the pod of the pea. The placenta is formed on each margin of the carpel, and is therefore essentially double. When the pistil is formed by one carpel the inner margins unite in the axis, and usually form a common placenta. When the pistil is composed of several carpels there are generally separate placentas at each of their margins. The term parietal placenta is applied to one not projecting far inward, or one essentially constituted of the wall of the seed-vessel. The form of placentation forms an important distinction between the various orders of plants.

PLAGUE, a contagious and very fatal febrile disease characterized by entire prostration of strength, stupor, delirium, often nausea and vomiting, and certain local symptoms, as buboes, carbuncles, and livid spots (petechiæ). Like all other malignant fevers the plague has its various stages, but most frequently runs its course in three days, although death may ensue a few hours after its appearance. If the patient survive the fifth day, he will, under judicious treatment, generally recover. It is now almost universally admitted that the plague is a specific disease, and that it is the result of a miasmatic poison. It is also well established that unfavorable climatic influences, such as heat and humidity combined, faulty sanitary conditions, inadequate air, light, water, and food, favor its spread when once introduced. There is no specific remedy against the disease, and a variety of treatment has been adopted on different occasions and by different medical men. The plague appeared in the most ancient times, although historians have used the term indiscriminately for other epidemics. The first recorded visitation of the plague to Europe is that at Athens (430 B.C.), described by Thucydides; Josephus relates that of Jerusalem A.D. 72. Among the most disastrous plagues of antiquity are those of Rome in 262, when 5000 persons are said to have died daily; and of Constantinople in 544. From the latter part of the 6th to the 12th century, it ravaged at intervals various parts of Europe, particularly France and Germany. In the 13th century it was brought to modern Europe by the Crusaders, and from 1347 to 1350 it traversed all Europe, and was then called the black death. The scourge again claimed its victims in the succeeding centuries, and in 1593 it was brought to England by an army returning from the continent. Before the true nature of the disease became known it had gained a firm footing in London, and there were 11,503 deaths. London lost by the plague 36,269 lives in 1603; 35,500 in 1625; 13,480 in 1636; and 68,600 in 1665. The plague in Marseilles in 1720 caused the death of over 60,000 in seven months, and in Messina (1743) of 43,000 in three months. In 1771 it nearly swept off the whole population of Moscow. Subsequently it appeared locally in Europe at a number of points. In 1878–79 it caused many deaths on the Lower Volga; but the most severe recent visitation was in India, in 1896–99, and subsequently, even in 1902.

PLAICE, a genus of so-called "Flat-fishes." The common plaice, a well-known food fish, attains an average length of 12 or 18 inches. The dark or upper side is colored brown, spotted with red or orange; the body is comparatively smooth; the ventral fins are situated on the throat, and are thus



The plaice.

jugular in position; the mouth is of small size, and provided with small teeth. These fishes are all "ground-fishes," that is, feed and swim near the bottom of the sea. They are caught chiefly by means of trawl-nets.

PLAIN, a tract of country of nearly uniform elevation. Plains receive a variety of names in different countries, as steppes in Russia and Asia; savannas, prairies, pampas, etc., in America. Elevated plains are called plateaus or table-lands.

PLAINFIELD, a city in Union co., N. J., on Green Brook, and the Central railroad of N. J.; 11 miles n. of New Brunswick, 24 miles w.s.w. of New York City. The principal industries are the manufacture of printing-presses, oil-cloth, carpets, and machine tools. Pop. 18,267.

PLAINTIFF, in English law, the person who commences a suit against another in law or equity.

PLAN, in architecture, a drawing showing the design of a building, a term chiefly used in reference to horizontal sections showing the disposition of the walls and various floors of the building, and of the doors and windows, etc.; but also applied to elevations and vertical sections. A geometrical plan is one wherein the several parts are represented in their true proportions. A perspective plan is one, the lines of which follow the rules of perspective, thus reducing the sizes of the more distant parts. The term is also applied to the draught or representation on paper of any projected work, as the plan of a city or of a harbor.

PLANE, a joiner's tool, consisting of a smooth-soled solid block, through which passes obliquely a piece of edged steel forming a kind of chisel, used in paring or smoothing boards or wood of any kind. Planes are of various kinds, as the jack-plane (about 17 inches long), used for taking off the roughest and most prominent parts of the wood; the trying-plane, which is used after the jack-plane; the smoothing-plane (7½ inches long) and block-plane (12 inches long), chiefly used for cleaning off finished work, and giving the utmost degree of smoothness to the surface of the wood; the compass-plane, which has its under surface convex, its use being to form a concave cylindrical surface. There is also a species of plane called a rebate-plane, being chiefly used for making rebates. The plough is a plane for sinking a channel or groove in a surface, not close to the edge of it. Moulding-planes are for forming mouldings, and must vary according to the design. Planes are also used for smoothing metal, and are wrought by machinery. See Planing Machine.

PLANE, in goemetry, a surface such that if any two points in it are joined by a straight line the line will lie wholly within the surface.

PLANE, Inclined. See Inclined Plane.

PLANE-TREE, a genus of trees, the American plane-tree or button-wood (the sycamore or cotton-tree of the West), abounds in American forests, and on the banks of the Ohio attains sometimes a diameter of from 10 to 14 feet, rising 60 or 70 feet without a branch. The bark is pale-green and smooth, and its epidermis detaches in portions; the fresh roots are a beautiful red; the leaves are alternate, palmated, or lobed; and the flowers are united in little globular, pendent balls. The wood in seasoning takes a dull red color, is fine-grained, and susceptible of a good

Oriental plane-tree.

polish, but speedily decays on exposure to the weather. The oriental plane resembles the preceding, and is plentiful in the forests of Western Asia.

PLANET, a celestial body which revolves about the sun as its center (primary planets), or a body revolving about another planet as its center (secondary planets, satellites, or moons). The known major planets are, in the order of their proximity to the sun, Mercury, Venus, the Earth, Mars, Jupiter, Saturn, Uranus, and Neptune. Mercury, Venus, Mars, Jupiter, and Saturn were known to the ancients. Uranus was accidentally discovered by Herschel in 1781, while the discovery of Neptune was the result of pure intellectual work, the calculating of Leverrier and Adams (1845). The planetoids or asteroids are small bodies discovered since the beginning of the nineteenth century between the orbits of Mars and Jupiter. The number of these asteroids is annually increased by fresh discoveries; over 400 are now known. Mercury, Venus, the Earth, and Mars closely resemble

each other in many respects. They are all of moderate size, with great densities; the earth weighing as much as five and a half times an equal bulk of water. They shine only by reflected sunlight. Jupiter, Saturn, Uranus, and Neptune, on the other hand, are of enormous size, of small densities, some of them weighing less than an equal bulk of water, and probably exist at a high temperature, and give out in addition to reflected sunlight a considerable amount of light and heat of their own. The most colossal of the planets is Jupiter; its volume exceeds that of the earth about 1200 times. Saturn is next in size. Mars, Jupiter, Saturn, Uranus, and Neptune, being outside the earth's orbit, are sometimes called the superior planets; Venus and Mercury being within the earth's orbit, are called inferior planets. The family of major planets has also been subdivided into intra-asteroidal planets—Mercury, Venus, the Earth, Mars; and extra-asteroidal planets—Jupiter, Saturn, Uranus, and Neptune, the character of the two being very different as above described. The planet which approaches nearest to the earth is Venus, the least distance in round numbers being 23 millions of miles; the most distant is Neptune, least distance 2629 million miles. We give here a comparative table of the planets; see also the separate articles.

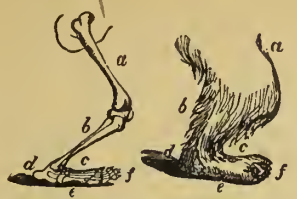
	Mean Distance From the Sun	Distance from the Earth		Time of Revolution Round the Sun	Time of Rotation on Axis		
		Greatest	Least				
	Miles	Miles	Miles	Mean Solar Days	h.	m.	s.
Mercury	35,393,000	135,631,000	47,229,000	87.9692		?	
Venus	66,131,000	159,551,000	23,309,000	224.7007		?	
The Earth	91,430,000	.....	.....	365.2563	23	56	4
Mars	139,312,000	245,249,000	62,389,000	686.9794	24	37	23
Jupiter	475,693,000	591,569,000	408,709,000	4332.5848	9	55	28
Saturn	872,135,000	1,014,071,000	831,210,000	10759.2197	10	29	17
Uranus	1,753,851,000	1,928,666,000	1,745,806,000	30686.8205		?	
Neptune	2,746,271,000	2,863,183,000	2,629,360,000	60126.722		?	

PLANT. See Botany.

PLANTAGENET, a surname first adopted by Geoffrey, Count of Anjou, and said to have originated from his wearing a branch of broom (plante de genêt) in his cap. This name was borne by the fourteen kings, from Henry II. to Richard III., who occupied the English throne from 1154–1485. In 1400 the family was divided into the branches of Lancaster (Red Rose), and York (White Rose), and from their reunion in 1485 sprang the House of Tudor. See England.

PLANTATION, a term formerly used to designate a colony. The term was latterly applied to an estate or tract of land in the southern states of America, the West Indies, etc., cultivated chiefly by negroes or other non-European laborers. In the southern states the term planter is specially applied to one who grows cotton, sugar, rice, or tobacco.

PLANTIGRA'DA, plantigrades, carnivorous animals in which the whole or nearly the whole sole of the foot is applied to the ground in walking. This section includes the bears, raccoons, coatis, and badgers. Carnivora which, like the weasels and civets, use only part of the sole in walking, are termed semi-plantigrada.



Plantigrada—foot of polar bear.
a, femur or thigh; *b*, tibia or leg; *c*, tarsus or foot; *d*, calx or heel; *e*, planta or sole of foot; *f*, digiti or toes.

PLASTERING is the art of covering the surface of masonry or wood work with a plastic material in order to give it a smooth and uniform surface, and generally in interiors to fit it for painting or decoration. In plastering the interior of houses a first coat is generally laid on of lime, thoroughly slacked, so as to be free from any tendency to contract moisture, and mixed with sand and cow's hair. For the purpose of receiving this coat the wall is generally first covered with laths or thin strips of wood, with narrow interstices between. The face of the first coat, which should be a considerable thickness, is trowelled, or indented with cross lines by the trowel, to form a key for the finishing coats. The second coat is applied to this when it is thoroughly dried. It is rubbed in with a flat board so as thoroughly to fill the indentations and cover the unequal surface of the first coat with a smooth and even one. In plastering walls great care must be taken to have the surface perfectly vertical. The setting coat, which is of pure lime, or for mouldings or finer work of plaster of paris or stucco, is applied to the second coat before it is quite dry. A thin coating of plaster of paris is frequently applied to ceilings after the setting coat.

PLASTER OF PARIS, the name given to gypsum when ground and used for taking casts, etc. If one part of powdered gypsum be mixed with two and a half parts of water a thin pulp is formed, which after a time sets to a hard, compact mass. By adding a small quantity of lime to the moistened gypsum a very hard marble-like substance is obtained on setting.

PLASTERS are applications of local remedies to any part of the surface of the body by means of a supporting texture of leather, silk or other cloth, or merely of paper. Plasters may be intended to give protection, support, or warmth, or they may be actively medicinal. (See Blister.) The materials most frequently used in plasters are belladonna, cantharides, galbanum, isinglass, lead, mercury, opium, pitch, resin, iron, and soap, and their adhesive property is generally due to the combination of oxide of lead with fatty acids.

PLASTIC CLAY, in geology, a name given to one of the beds of the Eocene period from its being used in the manufacture of pottery. It is a marine deposit.

PLATA, Rio de La (River of Silver), or River Plate, runs for more than 200 miles between the Argentine Republic and Uruguay, and is not, strictly speaking, a river, but rather an estuary, formed by the junction of the great rivers Paraná and Uruguay (which see). It flows into the Atlantic between Cape St. Antonio and Cape St. Mary, and has here a width of 170 miles. On its banks are the cities and ports of Montevideo and Buenos Ayres.

PLATEAU (pla-tō). See Table-land.

PLATE-GLASS. See Glass.

PLATE-POWDER, a fine powder for cleaning gold and silver plate, commonly made of a mixture of rouge and prepared chalk.

PLATING, the coating of a metallic article with a thin film of some other metal, especially gold or silver. As regards plating with precious metals, electro-deposition has entirely superseded the old Sheffield method, which consisted in welding plates of various metals at high temperatures. This welding process is now, however, largely employed in plating iron with nickel for cooking vessels, iron with brass for stair-rods and other furnishing and domestic requisites, and lead with tin for pipes, etc.

PLAT'INUM, one of the metals first made known to Europe in 1741. Native platinum occurs mostly in small, irregular grains, generally contains a little iron, and is accompanied besides by iridium, osmium, rhodium, palladium, ruthenium (hence called the "platinum metals"), and also sometimes by copper, chromium, and titanium. It was first obtained in Peru, and has since been found in various other localities, such as Canada, Oregon, the West Indies, Brazil, Colombia, Borneo, etc., but the chief supply of platinum ore comes from the Ural mountains in Siberia. It was there discovered in beds of auriferous sands in 1823, and has been worked by the Russian government since 1828. Pure platinum is almost as white as silver, takes a brilliant polish, and is highly ductile and malleable. It is the heaviest of the ordinary metals, and the least expansive when heated; specific gravity 21.53 rolled, 21.15 cast. It undergoes no change from the combined agency of air and moisture, and it may be exposed to the strongest heat of a smith's forge without suffering either oxidation or fusion. Platinum is not attacked by any of the pure acids. Its only solvents are chlorine and nitro-muriatic acid, which act upon it with greater difficulty than on gold. In a finely divided state it has the power of absorbing and condensing large quantities of gases. On account of its great infusibility, and its power generally of withstanding the action of

chemical reagents, platinum is much used as a material for making vessels to be used in the chemical laboratory. Crucibles, evaporating dishes, etc, are very often made of platinum; so also the large stills used for the evaporation of sulphuric acid. The useful alloys of platinum are not numerous. With silver it forms a tolerably fusible white alloy, malleable and brilliant when polished; but it scales and blackens by working. Gold, by a forge heat, combines with platinum, and the alloys, in all proportions, are more fusible than the latter metal. In the proportion of 38 grs. to 1 oz. it forms a yellowish-white, ductile, hard alloy, which is so elastic after hammering that it has been used for watch-springs; but the favorable results expected from them have not been realized. Alloyed with iridium (a rare metal of the same group) it possesses an excellent and unalterable surface for fine engraving, as in the scales of astronomical instruments, etc. This alloy has also been adopted for the construction of international standards of length and weight. Mercury, by trituration with spongy platinum, forms an amalgam at first soft, but which soon becomes firm, and has been much used in obtaining malleable platinum. A coating of platinum can be given to copper and other metals by applying to them an amalgam of spongy platinum and 5 parts of mercury; the later metal is then volatilized by heat. Lead combines with platinum readily; and iron and copper in like manner. The last-mentioned, when added in the proportion of 7 to 16 of platinum and 1 of zinc, and fused in a crucible under charcoal powder, forms the alloy called artificial gold. Steel unites with platinum in all proportions, and, especially in the proportion of from 1 to 3 per cent of platinum, forms a tough and tenacious alloy, well adapted for cutting instruments. Arsenic unites easily with platinum, and is sometimes employed for rendering the latter metal fusible. An alloy of platinum, iridium, and rhodium is used for making crucibles, etc. It is harder than pure platinum, is less easily attacked by chemical reagents, and bears a higher temperature without fusing.

PLATO, an ancient Greek philosopher, founder of one of the great schools of Greek philosophy, was born at Athens in B.C. 429, died in B.C. 347. About his twentieth year he came directly under the influence of Socrates, and from this time he gave himself entirely to philosophy. He is said to have visited Cyrene (in North Africa), lower Italy, and Sicily. About B.C. 389 or 388 Plato returned to Athens and began to teach his philosophical system in a gymnasium known as the Academy, his subsequent life being unbroken, except by two visits to Sicily. He appears to have had a patrimony sufficient for his wants, and taught without remuneration. One of his pupils was Aristotle.

The reputed works of Plato consist of dialogues and letters, the latter now regarded as spurious; but the genuineness of most of the dialogues is generally admitted.

The philosophy of Plato must be regarded as one of the grandest efforts ever made by the human mind to compass the problem of life. After the example of Socrates he held the great end of philosophic teaching to be to lead the mind of the inquirer to the discovery of truth rather than to impart it dogmatically, and for this end he held oral teaching to be superior to writing. The cardinal principle of Plato's dialectical system is the doctrine of ideas. True science, according to him, was conversant, not about those material forms and imperfect intelligences which we meet with in our daily intercourse with men; but it investigated the nature of those purer and more perfect patterns which were the models after which all created beings were formed. These perfect types he supposes to have existed from all eternity, and he calls them the ideas of the great original Intelligence. As these cannot be perceived by the human senses, whatever knowledge we derive from that source is unsatisfactory and uncertain. Plato, therefore, maintains that degree of scepticism which denies all permanent authority to the evidence of sense. Having discovered or created the realm of ideas he surveyed it throughout. He defined its most ex-

Plato.—Antique gem.

cellent forms of beauty, justice, and virtue, and having done so he determined what was the supreme and dominant principle of the whole. It is the idea of the Good. The harmony of intelligence throughout its entire extent with goodness, this is the highest attainment of Plato's philosophy. His ethical system was in direct dependence upon his dialectics. He believed that the ideas of all existing things were originally contained in God. These ideas were each the perfection of its kind, and as such were viewed by God with approval and love. God himself being infinitely good was the object of all imitation to intelligent beings, hence the ethics of Plato had a double foundation, the imitation of God and the realization of ideas, which were in each particular the models of perfection. To his cosmical theories he attributed only probability, holding that the dialectical method by which alone truth could be discovered was applicable only to ideas and the discovery of moral principles. The most valuable part of Plato's cosmogony is its first principle, that God, who is without envy, planned all things that they should be as nearly as possible like himself.

The followers of Plato have been divided into the Old, Middle, and New Academies; or into five schools; the first representing the Old, the second and third the Middle, and the fourth and fifth the New Academy. In the first are Speusippus, Xenocrates, and Heraclides, and others. Of these the first reverted to pantheistic principles, the second to mysticism, and the last was chiefly distinguished as an astronomer. In the Middle Academy, of which were Arcesilas and Carneades, the founders of the second and third school, sceptical tendencies began to prevail. The New academy began with Philo of Larissa, founder of the fourth school.

PLATT, Thomas Collier, American political leader, was born at Owego, N. Y., in 1833. In 1872 he was elected to congress, again in 1874, and, upon the expiration of Francis Kernan's term as United States senator, was chosen his successor, January 18, 1881. He became connected with the United States express company, of which he has been president since 1883. Platt eventually gained virtual control of the republican party in New York and was again elected to the senate both in 1897 and in 1903. He has been a delegate to all republican national conventions since 1876 as well as a member of the national republican committee.

PLATTDEUTSCH (plät'doich), or Low German, is the language of the North German Lowlands, from the borders of Holland to those of Russian Poland. The Dutch and Flemish languages also belong to the Low German dialects, but being associated with an independent political system, and having a literature of their own, are reckoned as distinct languages. The Low German dialects agree in their consonantal system not only with Dutch and Flemish, but also with English and the Scandinavian tongues. (See Philology.) Until the reformation Low German was the general written language of the part of the continent above mentioned; but from that time Low German works became gradually fewer, owing to the position now taken by the High (or modern classical) German. Even as a spoken language High German has ever since been slowly superseding the Low. In recent times, however, Low German literature has received a new impetus from Klaus Groth and Fritz Reuter. Linguistically the Low German dialects have received a good deal of attention, and many valuable lexicographical works have appeared.

PLATTSBURG, a manufacturing town and military station of the United States, in the state of New York, on the Saranac, where it enters Lake Champlain. Pop. 10,010.

PLAYING-CARDS. See Card.

PLEBEIANS (ple-bē'anz), or **PLEBS,** in ancient Rome, one of the great orders of the Roman people, at first excluded from nearly all the rights of citizenship. The whole government of the state, with the enjoyment of all its offices, belonged exclusively to the patricians, with whom the plebeians could not even intermarry. The civil history of Rome is to a great extent composed of the struggles of the plebeians to assert their claim to the place in the commonwealth to which their numbers and social importance entitled them, and which were

crowned with complete success when (B.C. 286) the Lex Hortensia gave the plebiscita, or enactments passed at the plebeian assemblies, the force of law. From this time the privileges of the two classes may be said to have been equal.

PLEB'ISCITE, a vote of a whole nation obtained by universal suffrage, a form of voting introduced into France under the Napoleonic régime, and named after the Roman plebiscita. The term is also used in a more general sense.

PLEIADES (plī'a-dēz), the so-called "seven stars" in the neck of the constellation Taurus, of which only six are visible to the naked eye of most persons. They are regarded by Mädler as the central group of the Milky Way. Ancient Greek legends derive their name from the seven daughters of Atlas and the nymph Pleione, fabled to have been placed as stars in the sky, and the loss of the seventh was variously accounted for. In reality the cluster consists of far more than seven stars.

PLEISTOCENE (plīs'to-sēn), in geology, the lower division of the Post-tertiary formation. The fossil remains belong almost wholly to existing species. The Pleistocene mollusca all belong to still living species, but its mammals include a few extinct forms. It is also known as the "glacial" or "drift" period, owing to the great prevalence of glaciers and icebergs at that period.

PLENIPOTEN'TIARY, an ambassador appointed with full power to negotiate a treaty or transact other business.

PLESIOSAU'RUS, a genus of extinct amphibious animals, nearly allied to the Ichthyosaurus. The remains of this curious genus were first brought to light in the Lias of Lyme Regis in 1822, but over twenty species are now known, and they have formed the subject of important memoirs by Owen and other palæontologists. Its neck was of enormous length, exceeding that of its body; it possessed a trunk and tail of the proportions of an ordinary quadruped; to

Plesiosaurus, partially restored.

these were added the paddles of a whale. The neck vertebræ numbered forty or fewer. From twenty to twenty-five dorsal segments existed; and two sacral vertebræ and from thirty to forty caudal segments completed the spine. No distinct breast-bone was developed. The head was not more than $\frac{1}{12}$ or $\frac{1}{13}$ of the length of the body; the snout of a tapering form; the orbits large and wide. The teeth were conical, slender, curved inward, finely straited on the enamelled surface, and hollow throughout the interior. These animals appear to have lived in shallow seas and estuaries, and, in the opinion of some, they swam upon or near the surface, having the neck arched like the swan, and darting it down at the fish within reach. Some of the Plesiosauri were upward of 20 feet long. Their remains occur from the Lias to the Chalk rocks inclusive, these forms being thus exclusively of the Mesozoic age.

PLETH'ORA, in medicine, an excess of blood in the human system. A florid face, rose-colored skin, swollen blood-vessels, frequent nose-bleeding, drowsiness and heavy feeling in the limbs, and a hard and full pulse, are symptoms, and this condition, habitual in many persons, and which, if not actually a disease, yet predisposes to inflammations, congestions, and hæmorrhages. Plethora may, however, develop in persons of all conditions and ages as the result of too much stimulating food (as an excessive meat-diet), over-eating, large consumption of malt and spirituous liquors, residence in northern and elevated regions with sharp, dry air, want of exercise, too much sleep, amputation of a limb—in short of any action tending to unduly increase the volume of blood. Plethora of a mild form may be reduced by copious draughts of diluents, a vegetable diet, and plenty of exercise; but in cases requiring prompt relief leeches or bleeding must be resorted to.

PLEURA, the serus membrane lining the cavity of the thorax or chest, and which also covers the lungs. Each lung is invested by a separate pleura or portion of this membrane. In the thorax each pleura is found to consist of a portion lining the walls of the chest, this fold being named the parietal layer of the pleura. The other fold, reflected upon the lung's surface, is named in contradistinction the visceral layer. These two folds inclose a space known as the pleural cavity, which in health contains serous fluid in just sufficient quantity to lubricate the surfaces of the pleuræ as they glide over one another in the movements of respiration. The disease to which the pleuræ are most subject is pleurisy.

PLEU'RISY, the inflammation of the pleura. It may be acute or chronic, simple or complicated with catarrh and pneumonia. Generally part only of the pleura is affected, but sometimes the inflammation extends to the whole, and even to both pleuræ (double pleurisy). Acute, it is a very common complaint due to a variety of causes, but most frequently to sudden chills. It invariably commences with shivering, its duration and intensity generally indicating the degree of severity of the attack; fever and its attendant symptoms succeed the shivering. A sharp, lancinating pain, commonly called stitch in the side, is felt in the region affected at each inspiration. A short, dry cough also often attends this disease. While the inflammation continues its progress a sero-albuminous effusion takes place, and when this develops the febrile symptoms subside, usually from the fifth to the ninth day. Acute pleurisy is seldom fatal unless complicated with other diseases of the lungs or surrounding parts, and many patients are restored simply by rest, moderate sweating in bed, spare and light diet, mild and warm drinks, and the application of hot mustard and linseed-meal poultices to the affected part. Opiates to relieve pain are often needful. When acute pleurisy is treated too late or insufficiently it may assume the chronic condition, which may last from six weeks to over a year, and result in death from gradual decay, as in the case of consumptives, or from asphyxia. Chronic pleurisy is characterized by effusion, which accumulates in the pleural cavity, and soon tends to produce lesions and complications in the surrounding organs. Besides local treatment purgatives and diuretics are used, but if the disease does not yield to these remedies, the liquid must be evacuated by operation. Pleurisy, acute and chronic, sometimes also appears without accompanying pain; it is then called latent pleurisy.

PLEURO-PNEUMONIA, a form of pneumonia peculiar to the bovine race. It is highly contagious, and proves rapidly fatal. It first manifests itself in a morbid condition of the general system; but its seat is in the lungs and pleura, where it causes an abundant inflammatory exudition of thick plastic matter. The lungs become rapidly filled with this matter, and increase greatly in weight. Whether pleuro-pneumonia is specifically a local or general disease is disputed, as also the manner of treatment. On the one hand bleeding and mercurial treatment, as in pleurisy and pneumonia, is recommended. On the other, evacuating remedies, maintaining the strength of the animal, and promoting the action of the skin, bowels, and kidneys.

PLINY (Caius Plinius Secundus), Roman writer, commonly called Pliny the Elder, was born A.D. 23, probably at Comum (Como). Every leisure moment was devoted to literature and science, and his industry was so great that he collected an enormous mass of notes, which he utilized in writing his works. He adopted his nephew, Pliny the Younger, A.D. 73, and perished in the eruption of Mount Vesuvius which overwhelmed Pompeii and Herculaneum in 79. The only work of Pliny which is now extant is his Natural History, a work containing a mass of information on physics, astronomy, etc., as well as natural history proper.

PLINY (Caius Plinius Cæcilius Secundus), the Younger, a nephew of the former, was born A.D. 61 at Comum (Como). Having lost his father at an early age, he was adopted by his uncle and inherited the latter's estates and MSS., and also his industry and love of literature. He was one of the most distinguished and best men of his age. The time of his death is unknown, but it is supposed that he died about the year 115. As an author he labored with ardor, and attempted both prose and poetry. Of his writings only a collection of letters in ten books, and a panegyric on Trajan, remain.

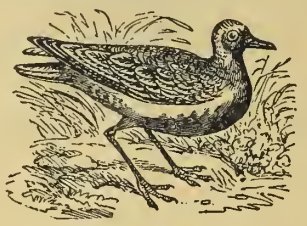
PLI'OCENE, a geological term applied to the most modern of the divisions of the Tertiary epoch. The Tertiary series Sir C. Lyell divided into four principal groups, namely, the Eocene and the Miocene (which see), the Older Pliocene, and the Newer Pliocene or Pleistocene each characterized by containing a very different proportion

of fossil recent (or existing) species. The Newer Pliocene, the latest of the four, contains from 90 to 95 per cent of recent fossils; the Older Pliocene contains from 35 to 50 per cent of recent fossils. The Newer Pliocene period is that which immediately preceded the recent era; and by the latest system of classification it has been removed from the Tertiary and placed in the Post-tertiary or Quaternary epoch. The Pliocene period proper, or the Crag period, is that which intervened between the Miocene and the Newer Pliocene. Both the Newer and the Older Pliocene exhibit marine as well as fresh-water deposits.

PLOCK (plotsk), or **PLOTZK,** capital of the government of the same name in Russian Poland, on the right bank of the Vistula, 78 miles n.w. of Warsaw. It has a handsome cathedral, dating from the 10th century, and a bishop's palace. Its manufactures are unimportant, but it has a large trade. Pop. 27,073.—The province has an area of 4209 sq. miles, mostly level, and marshes and lakes abound. Fully one-third of the area is forest. Corn and potatoes are the chief agricultural products, and sheep and cattle are extensively reared. Pop. 577,490.

PLOUGH, an implement drawn by animal or steam power, by which the surface of the soil is cut into longitudinal slices, and these successively raised up and turned over. The object of the operation is to expose a new surface to the action of the air, and to render the soil fit for receiving the seed or for other operations of agriculture.—Steam ploughs on various principles have latterly become familiar among farmers. Some are driven by one engine remaining stationary on the headland, which winds an endless rope (generally of wire) passing round pulleys attached to an apparatus called the "anchor," fixed at the opposite headland, and round a drum connected with the engine itself. Others are driven by two engines, one at either headland, thus superseding the "anchor." As steam-ploughing apparatus are usually beyond both the means and requirements of single farmers, companies have been formed for hiring them out. In steam-ploughing it is common to use ploughs in which two sets of plough bodies and coulters are attached to an iron frame moving on a fulcrum, one set at either extremity, and pointing different ways. By this arrangement the plough can be used without turning, the one part of the frame being raised out of the ground when moving in one direction, and the other when moving in the opposite. It is the front part of the frame, or that farthest from the driver, which is elevated, the ploughing apparatus connected with the after part being inserted and doing the work. Generally two, three, or four sets of plough bodies and coulters are attached to either extremity, so that two, three, or four furrows are made at once.

PLOVER, the common name of several species of birds. They inhabit all parts of the world. They are gregarious, and most of them are partial to the muddy borders of rivers and marshy situations, subsisting on worms and various aquatic insects; but some of them affect dry sandy shores. Their general features are: bill long, slender, straight, compressed; nostrils basal and longitudinal; legs long and slender, with three toes before, the outer connected to the middle one by a short web; wings middle-size. Most of them moult twice a year, and the males and females are seldom very dissimilar in appearance. The various species pass so imperceptible into one



Golden plover.

another that their classification is often attended with difficulty. All nestle on the ground. They run much on the soil, patting it with their feet to bring out the worms, etc. The golden plover, also called yellow and whistling plover, is the best known, and its flesh and its olive-green dark-spotted eggs are considered a delicacy by epicures.

PLUM, a genus of plants. About a dozen species are known, all inhabiting the north temperate regions of the globe. They are small trees or shrubs, with alternate leaves and white flowers, either solitary or disposed in fascicles in the axils of the leaves. The common garden plum is the most extensively cultivated, and its fruit is one of the most familiar of the stone-fruits. The varieties are very numerous, differing in size, form, color, and taste. Some are mostly eaten fresh, some are dried and sold as prunes, others again are preserved in sugar, alcohol, syrup, or vinegar. They make also excellent jams and jellies, and the syrup from stewed plums forms a refreshing drink for invalids, and a mild aperient for children. Perhaps the most esteemed of all varieties is the green gage. A very popular and easily grown sort is the damson. The wood of the plum-tree is hard, compact, traversed with reddish veins, susceptible of a fine polish, and is frequently employed by turners and cabinet-makers. The sloe or black-thorn is a species of wild plum bearing a small, round, blue-black, and extremely sour fruit. Its juice is made into prune-wine, which is chiefly employed by distillers, wine and spirit merchants, etc., for fining, coloring, purifying, and mellowing spirits.

PLUMBA'GO. See Graphite.

PLUMMET, plumb-line, a leaden or other weight let down at the end of a cord to regulate any work in a line perpendicular to the horizon, or to sound the depth of anything. Masons, carpenters, etc., use a plumb-line fastened on a narrow board or plate of brass or iron to judge whether walls or other objects be perfectly perpendicular, or plumb as the artificers call it. Near a range of high mountains the plumb-line, as can be shown by special arrangements, is not perfectly true, but inclines toward the mountains; and officers in charge of the United States coast and Geodetic Survey among the Hawaian Islands, have recently observed that the deviation of a plumb-line from the vertical is greater in the case of mountains in an island than in continental mountains, and greater in the neighborhood of extinct volcanoes than that of active volcanoes. In given localities the plumb-line also varies according to the ebb and flow of the tide.

PLU'MULE, in botany, that part of the seed which grows into the stem and axis of the future plant. In the seeds of the bean, horse-chestnut, etc., the plumule is distinctly visible, but in plants generally it is scarcely perceptible without the aid of a magnifying glass, and in many it does not appear

P, Plumule.

till the seed begins to germinate. The first indication of development is the appearance of the plumule, which is a collection of feathery fibers bursting from the enveloping capsule of the germ, and which proceeds immediately to extend itself vertically upward.

PLUS (L., more), in mathematics, signifies addition; the sign by which it is indicated is +; thus A + B, which is read A plus B, denotes that the quantity A is to be added to the quantity B. Plus, or its sign +, is also used to indicate a positive magnitude or relation, in opposition to minus —, which indicates a negative.

PLUSH, a fabric similar to velvet, from which it differs only in the length and density of the nap. The nap may be formed either in the warp or woof, the one in which it is being double, there being a warp and a woof for the nap. Plushes are now made almost exclusively of silk. The cheaper qualities have a cotton backing. Some of the finest dress plushes are produced in London, plushes for gentlemen's hats come chiefly from Lyons, while common or imitation plushes are largely manufactured in Germany. Plush is now also extensively used in upholstery and decorative work.

PLUTARCH (plō'tärk), a learned Greek writer, born at Cheronæa in Bœotia, where he also died. Neither the year of his birth nor that of his death is accurately known, but it is generally held that he lived from the reign of Nero to that of Hadrian (54–117 A.D.). He appears from his writings to have visited Italy, lectured there on philosophy, and stayed some time at Rome, where he established a school during the reign of Domitian. His Parallel Lives of Illustrious Greeks and Romans is the work to which he owes his fame. The lives are nearly all written in pairs, one Greek and one Roman, followed by a comparison of the two, and are models of biographical portraiture. We have numerous editions and translations of them. Plutarch's other works, about sixty in number, are generally classed as moralia, though some of them are narrative. His writings show that he was well acquainted with the literature of his time,

and with history, and that he must have had access to many books.

PLUTO, in classical mythology, the god of the infernal regions, the ruler of the dead. He was a son of Cronus and Rhea, a brother of Zeus (Jupiter) and Poseidon (Neptune), and to him, on the partition of the world, fell the kingdom of the shades. He married Persephŏnē (which see). By the Greeks he was generally called Hades and by the Romans Orcus, Tartarus, and Dis Pater. As is the case with all other pagan deities, the accounts of Pluto vary with different writers and periods, and in later ages he was confounded with Plutus. The worship of Pluto was extensively spread among the Greeks and Romans. The cypress, the box, the narcissus, and the plant adiantum (maiden-hair), were sacred to him: oxen and goats were sacrificed to him in the shades of night, and his priests were crowned with cypress. He is represented in gloomy majesty, his forehead shaped by his hair, and with a thick beard. In his hand he holds a two-forked scepter, a staff, or a key; by his side is Cerberus. He is often accompanied by his wife.

PLUTONIC ROCKS, unstratified crystalline rocks, such as granites, greenstones, and other, of igneous origin, formed at great depths from the surface of the earth. They are distinguished from those called volcanic rocks, although they are both igneous; plutonic rocks having been elaborated in the deep recesses of the earth, while the volcanic are solidified at or near the surface.

PLUTUS, in Greek mythology, the god of riches. Zeus struck him blind because he confined his gifts to the good; and he thenceforth conferred them equally on the good and the bad. His residence was under the earth. Plutus is the subject of Aristophanes' comedy of the same name.

PLUVIOSE, the fifth month of the French republican calendar, including January 20—Feb. 18 or 19. See Calendar.

PLYMOUTH (plim'uth), a seaport, municipal, parl., and county borough of England, in Devonshire, at the head of

Plymouth Sound. Plymouth is well defended both land- and seaward by a series of forts of exceptional strength provided with heavy ordnance. A stupendous breakwater has been constructed at a cost of about $10,000,000. The western harbor, is specially devoted to the royal navy, and here are the dockyard, and Keyham steam-yard. The mercantile marine is accommodated in the eastern harbor. Pop. 107,509.

PLYMOUTH, a seaport and capital of Plymouth co. Massachusetts, 37 miles s.s.e. of Boston, founded by the Pilgrim Fathers in 1620. It is situated in a capacious but shallow bay, and has extensive fisheries, rope and canvas factories, also iron-works. Pilgrim Hall, and a colossal monument to the pilgrims, on the top of the adjoining hill, are the chief sights of the place. Pop. 10,485.

PLYMOUTH, a growing town in Lucerne co., Penn. Coal mining is extensively carried on. Pop. 14.879.

PLYMOUTH BRETHREN, Plymouthites, a sect of Christians who first appeared at Plymouth in 1830, but have since considerably extended over Great Britain, the United States, and among the Protestants of France, Switzerland, Italy, etc. They object to national churches as being too lax, and to dissenting churches as too sectarian, recognizing all as brethren who believe in Christ and the Holy Spirit as his Vicar. They acknowledge no form of church government nor any office of the ministry, all males being regarded by them as equally entitled to "prophesy" or preach.

PLYMOUTH ROCK, a ledge of rock in Plymouth harbor, Mass., on which the Pilgrims are said to have stepped when disembarking. A beautiful granite canopy has been erected upon the rock.

PLYMOUTH ROCK, a breed of domestic fowls. It is of large size and has valuable qualities for market purposes. The favorite variety is the "barred," of a grayish white color, every feather marked with many curving black bands. The average weight of the cock is 9½ pounds, of hens 7½ pounds.

PNEUMATIC DISPATCH, propulsion by means of compressed air or by forming a vacuum. Pneumatic railways have thus far proved abortive, but propulsion by compressed air has been successfully applied to a variety of practical uses. Parcels are thus conveyed, and internal communication in mercantile houses, hotels, etc., is carried on by its means. The most developed application of compressed air as a motive force is in connection with the telegraph and post-office service of large cities. Pneumatic dispatch, which has proved a most useful auxiliary in securing prompt and cheap collection and distribution of telegraphic messages, was first introduced in London by Latimer Clark in 1853, improved by Varley 1858, and again by Siemens in 1863. The vehicles charged with the messages, technically called carriers, are forced through leaden tubes connecting the various stations, and from 1½ to 3 inches, diameter by means of air-pressure at one end, or sucked through by a partial vacuum at the other. The invention of Latimer Clark and Varley required a separate tube between each pair of stations, and admitted of only a single despatch at a time; but a system of laying tubes in circuit for the continuous transmission of dispatches, by means of an uninterrupted air-current in one direction, was adopted in Berlin by Messrs. Siemens and Halske in 1863, and introduced in London in 1870. Pneumatic tubes are also in growing use in Liverpool, Manchester, Glasgow, Dublin, etc. The circuit system, but not with a continuous current, is extensively used in Paris. The first attempt at pneumatic dispatch in America was made by A. E. Beach in 1867. The construction of an atmospheric railway tunnel was commenced but after a short distance was complete the work was abandoned. This was the first and only attempt at atmospheric railway construction in America. The use of pneumatic dispatch has, however, become very extensive. It is in use in all the large cities in stores for carrying cash to and from a centrally located cashier's desk and in a great many cities it is also used in carrying small parcels. The post-office department of New York, Philadelphia, Chicago and other large cities use it extensively, and it is proposed to keep extending the service as fast as possible.

PNEUMATICS, that branch of physics which treats of the mechanical properties of elastic fluids, and particularly of atmospheric air. The chemical properties of elastic fluids (air and gases) belong to chemistry. Pneumatics treat of the weight, pressure, equilibrium, elasticity, density, condensation, rarefaction, resistance, motion, etc., of air; it treats also of air considered as the medium of sound (acoustics), and as the vehicle of heat, moisture, etc. It also comprehends the description of those machines which depend chiefly for their action on the pressure and elasticity of air, as the various kinds of pumps, artificial fountains, etc. The weight of the air, and its pressure on all the bodies on the earth's surface, were quite unknown to the ancients, and only first perceived in the middle of the 17th century by Galileo, when a sucking-pump refused to draw water above a certain height; and to Torricelli, his pupil, belongs the honor of giving first a natural explanation of the phenomenon. See Air, Air-pump, Atmosphere, Barometer, Gas, Pump, etc.

PNEUMONIA, acute inflammation of the lung substance. The more general symptoms are feverishness, constant pressing pain on the chest, difficult breathing and painful cough. The base of the lung is generally attacked, and the right lung twice as often as the left, but both may be affected. Pneumonia is frequently complicated with pleurisy (which see). The patient must be kept quiet in bed, the affected parts poulticed and the bowels attended to. Mild nourishing diet, with medicines to stimulate the skin and to reduce fever, should be given.

PO, the largest river of Italy. It rises on the confines of France and Piedmont in Mount Viso, one of the Cottian Alps, and receives during its long course to the Adriatic (about 450 miles), a vast number of tributary streams. It divides the great plain of Lombardy into two nearly equal parts, and is the grand receptacle for the streams flowing south from the Alps, and for the lesser waters that flow north from a part of the

Apennine range. Its principal affluents are, on the left, the Baltea, Sesia, Ticino, Adda, and Mincio; on the right the Tanaro, Trebbia, and Panaro. The Po, in spite of embankments, etc., is the cause of frequent inundations, especially near its mouth. In some places, owing to the silt carried down, its channel is now raised above the country through which it flows. Fish are plentiful in it, including the shad, salmon, and even sturgeon.

PNEUMATIC TOOLS, portable, self-contained-motor tools, for metal and wood working, operated by compressed air. In the percussion type work is done by rapidly repeated percussive blows and in the rotary type by a rotary or boring action. The motive power used is air under pressure, and the motor is contained within the tool. There are nearly 100 different styles of tools in use and new appliances are being constantly discovered. Hammering, ramming, calking, chipping, riveting, shaving, drilling, boring, screwing, clipping, carving, and expanding tubes are some of the classes of work done.

POACHING, the trespassing on another's property for the purpose of killing or stealing game or fish. For the law relating to the poaching of game see Game Laws.

POCAHON'TAS, daughter of Powhatan, a celebrated American-Indian warrior of Virginia, born about the year 1595. Some romantic incidents are told of her life, but there seem to be considerable doubts as to their truth. She is said to have shown a great friendship for the English who colonized Virginia, and to have rendered them substantial services. In 1607 she prevailed on her father to spare the life of Captain John Smith, his prisoner, and two years later

Pocahontas.

frustrated a plot to destroy him and his party. After Captain Smith had left the colony she was kept as a hostage by an English expeditionary force (1612). During this detention she married Mr. Rolfe, an Englishman, who in 1616 took her on a visit to England, where she was baptized and assumed the name of Rebecca. She died the following year, and left one son, who was educated in London, and whose descendants are said to exist still in the state of Virginia.

PODIEBRAD (pod'ye-brâd), George, King of Bohemia, born 1420, died 1471. In 1444 he became one of the two governors of Bohemia during the minority of Ladislas, Albert's posthumous son, now king of the country, and, after overcoming the Catholic opposition, sole regent in 1451. Ladislas died in 1457, and Podiebrad was elected to the throne in the following year, and crowned by the Catholic bishops in 1459. He inaugurated his reign by the introduction of various beneficent laws, wise administration, and a policy of conciliation toward the Catholics; but he was not allowed to carry out his reforms in peace. The pope, Paul II., publicly denounced him as an heretic in 1463, excommunicated him, and his legate soon produced a rising among the Catholics. In order to secure the aid of the Poles he declared the successor to the throne of Poland to be his own successor, while his sons should only inherit the family estates (1469). The Poles were thus immediately drawn to his side; the Emperor Frederick also declared in his favor; and his Catholic subjects became reconciled to him. Shortly after he destroyed the infantry of the Hungarians. He thus saw himself at last completely secured in his kingdom; but no sooner was this accomplished than he died; being succeeded by Ladislas, eldest son of Casimir IV., king of Poland, who thus united the two crowns.

PODO'LIA, a government of Southwestern Russia; area, 16,224 sq. miles. The climate is temperate and salubrious, the soil generally very fertile; in fact, Podolia forms one of the most valuable agricultural possessions of the Russian Empire. Pop. 3,031,500. Capital, Kamenetz.

POE, Edgar Allan, American poet and romantic writer, born at Baltimore 1809, died in the same city 1849. His father and mother were actors, and being left an orphan when a mere child he was adopted by Mr. Allan, a wealthy Baltimore merchant. His early education he received at Stoke-Newington, London, 1816–21, and on his return to America attended a school at Richmond, Virginia, and finally entered the University of Charlottesville. Here he displayed extraordinary talents, but also contracted a taste for fast living which occasioned quarrels with his benefactor, and caused him to quit America for Europe. He took part in the struggles of the Greeks for independence, and for a few years led an erratic life on the continent. In 1829 he returned to America, a reconciliation with Mr. Allan took place, and he was sent as cadet to the military academy at West Point. Further irregularities brought about a complete rupture with Mr. Allan, and Poe enlisted as a private soldier, however, only to desert later on. His literary career may be said to have begun in 1835, when he gained the prize offered by the Baltimore Saturday Visitor for a tale and a poem. He then became successively editor of the newly-founded Southern Literary Messenger at Richmond, contributor to the New York Review at New York, and editor of Burton's Gentleman's Magazine and Graham's Magazine at Philadelphia. For these periodicals he wrote a number of tales, exhibiting a weird yet fascinating imagination. While at Richmond, in 1836, he married his cousin, Virginia Clemm, a beautiful and amiable girl. The great event in Poe's life was the publication at New York in 1845 of his poem the Raven, which spread his fame to the whole English-speaking world. For this remarkable production Poe is said to have received $10.00. He was subsequently connected with The Home Journal and The Broadway Journal. In 1848 his wife died. Passing through Baltimore in 1849, on his way to New York to make preparations for a second marriage, he was led to excessive drinking, and died from its effects at the hospital.

POET LAUREATE. See Laureate.

POETRY, that one of the fine arts which exhibits its special character and powers by means of language; or, according to Aytoun, the art which has for its object the creation of intellectual pleasures by means of imaginative and passionate language, and language generally, though not necessarily, formed into regular numbers. It has also been defined as the concrete and artistic expression of the human mind in emotional and rhythmical language. It is the earliest form of literature, and also the final and ideal form of all pure literature; its true place lying between music on the one hand and prose or loosened speech on the other. The poet deals with language as the painter does with color, sometimes invading the domain of music and sometimes that of prose, or rather he brings prose into the domain of poetry. The two great classes of poetic impulse are dramatic imagination and lyric imagination. Partaking of the character of both is epic or narrative poetry. (See Epic.) To the dramatic class belong tragedy and comedy; to the lyric belong the song, hymn, ode, anthem, elegy, sonnet, and ballad, though the last-named frequently has a kind of epic character. Other forms, such as "didactic" poetry, "satirical" poetry, are also in use, but it is a question if they enter into the circle of poetry at all. See separate articles on the various species. Poetics is the theory of poetry; that branch of criticism which treats of the nature and laws of poetry.

POINT, in geometry, is a quantity which has no parts, or which is indivisible, or which has position without magnitude. Points may be regarded as the ends or extremities of lines. If a point is supposed to be moved in any way, it will by its motion describe a line.

POINTER DOG, a breed of sporting dogs, nearly allied to the true hounds. The original breed is Spanish, but a cross with the fox-hound is now generally used. It is smooth, short-haired, generally marked black and white like the fox-hound, but occasionally a uniform black. It derives its name from its habit of stopping and pointing with the head in the direction of game, discovered by a very acute sense of smell. The dog once having pointed remains perfectly quiet. This faculty in the pointer is hereditary, but is better developed by training.

POISON, any agent capable of producing a morbid, noxious, dangerous, or deadly effect upon the animal economy, when introduced either by cutaneous absorption, respiration, or the diges-

tive canal. Poisons are divided, with respect to the kingdom to which they belong, into animal, vegetable, and mineral; but those which proceed from animals are often called venoms, while those that are produced by disease have the name virus. With respect to their effects they have been divided into four classes, namely, irritant, narcotic, narcotico-acrid, and septic or putrescent. Many poisons operate chemically, corroding the organized fiber, and causing inflammation and mortification. To this class belong many metallic oxides and salts, as arsenic, one of the most deadly poisons; many preparations of copper, mercury, and antimony, and other metals; the mineral and vegetable acids; the substance derived from some plants, as the spurges and mezereon; and cantharides, from the animal kingdom. Other poisons exercise a powerful action upon the nerves and a rapid destruction of their energy. These are the sedative or stupefying poisons, and belong for the most part to the vegetable kingdom. Opium, hemlock, henbane, belladonna, are the best-known forms of this poison. Prussic acid, a poison obtained from the kernels of several fruits, the cherry-laurel, etc., is one of the most rapid destroyers of life. Among plants there are many which unite the properties of both kinds, as the common foxglove, and the monkshood or aconite. An alkaloid is extracted from the latter, $\frac{1}{16}$th of a grain of which has proved fatal. Another class of poisons suddenly and entirely cause a cessation of some function necessary to life. To this class belong all the kinds of gas and air which are irrespirable, suffocating vapors, as carbonic acid gas, fumes of sulphur and charcoal, etc. Many preparations of lead, as acetate or sugar of lead, carbonate or whitelead, etc., are to be counted in this class. The effect of poisons materially depend on the extent of the dose, some of the most deadly poisons being useful remedies in certain quantities and circumstances. Antidotes naturally vary with the different kinds of poisons. They sometimes protect the body against the operation of the poison, sometimes change this last in such a manner that it loses its injurious properties, and sometimes remove or remedy its violent results. Thus in cases of poisoning by acrid and corrosive substances we use the fatty, mucilaginous substances, as oil, milk, etc., which sheathe and protect the coats of the stomach and bowels against the operation of the poison. Against the metallic posions substances are employed which form with the poison insoluble compounds, such as freshly prepared hydrated oxide of iron, or dialysed iron for arsenic, albumin (white of egg) for mercury; Epsom or Glauber's salts for lead. Lime, chalk, and magnesia are the best remedies for the powerful acids. For cantharides, mucilage, gruel, and barley-water are employed. We oppose to the alkaline poisons the weaker vegetable acids, as vinegar. Prussic acid is neutralized by alkalies and freshly precipitated oxide of iron. To arouse those poisoned by opium, we use coffee and ammonia, and belladonna as an antagonistic drug. Chloral-hydrate poisoning is similarly treated; and for strychnia or nux vomica, animal charcoal in water and chloral-hydrate are used. The sale of poison is regulated and restricted by law. Poisoning was common in ancient Rome, and in France and Italy during the 17th century.

POITIERS, DIANA OF. See Diana of Poitiers.

POKEWEED, a North American branching herbaceous plant. Its root acts as a powerful emetic and cathartic, but its use is attended with narcotic effects. Its berries are said to possess the same quality; they are employed as a remedy for chronic and syphilitic rheumatism, and for allaying syphiloid pains. The leaves are extremely acrid, but the young shoots, which lose this quality by boiling in water, are eaten in the United States as asparagus.

POLACCA, or **POLACRE,** a three-masted vessel used in the Mediterranean. The masts are usually of one piece, so that they have neither tops, caps, nor cross-trees. It carries a fore-and-aft sail on the mizzen-mast, and square sails on the main-mast and fore-mast.

POL'AND, an extensive territory of central Europe, which existed for many centuries as an independent and powerful state; but having fallen a prey to internal dissensions, was violently seized by Austria, Prussia, and Russia as a common spoil, partitioned among these three powers, and incorporated with their dominions. In its greatest prosperity it had at least 11,000,000 of inhabitants, and an area of 350,000 sq. miles, and immediately before its first partition an area of about 282,000 sq. miles, stretching from the frontiers of Hungary and Turkey to the Baltic, and from Germany far east into Russia, forming one compact kingdom. With the exception of the Carpathians, forming its southwestern boundary, and a ridge of moderate elevation penetrating into it from Silesia, the country presents the appearance of an almost unbroken plain, composed partly of gently-undulating expanses, partly of rich alluvial flats, partly of sandy tracts, and partly of extensive morasses. Its principal streams are the Vistula, the Niemen, and the Dwina, all belonging to the basin of the Baltic; and the Dniester, South Bug, and Dnieper, with its tributary, Pripet, belonging to the basin of the Black sea. The physical configuration of the country makes it admirably adapted for agriculture. Next to grain and cattle its most important product is timber.

The Poles, like the Russians, are a Slavonic race, and are first spoken of as the Polani, a tribe or people between the Vistula and Oder. The country was divided into small communities until the reign of Mieczyslaw I. (962–992) of the Piast dynasty, who renounced paganism in favor of Christianity, and was a vassal of the German emperor. He was succeeded by Boleslaw the Great (992–1025) who raised Poland into an independent kingdom and increased its territories. In succeeding reigns the country was involved in war with Germany, the heathen Prussians, the Teutonic knights, and with Russia. The last of the Piast dynasty was Casimir the Great (1364–70), during whose reign the material prosperity of Poland greatly increased. He was succeeded by his nephew, Louis of Anjou, king of Hungary, whose daughter, Hedwig, was recognized as "king" in 1384, and having married Jagello, prince of Lithuania, thus established the dynasty of the Jagellons, which lasted from 1386 to 1572. During this period Poland attained its most powerful and flourishing condition. In 1572 the Jagellon dynasty became extinct in the male line, and the monarchy, hitherto elective in theory, now became so in fact. The more important of the elective kings were Sigismund III. (1587–1637, Wladislaw or Ladislaus IV. (1632–48), John Casimir (1648–69), and the Polish general Sobieski, who became king under the title of John III. (1674–96). He was succeeded by Augustus II., Elector of Saxony, who got entangled in the war of Russia with Charles XII., and had as a rival in the kingdom Stanislaus Lesczynski. Augustus III. (1733—63) followed, and by the end of his reign internal dissensions and other causes had brought the country into a state of helplessness. In 1772, under the last feeble king Stanislaus Augustus (1764–95), the first actual partition of Poland took place, when about a third of her territories were seized by Prussia, Austria, and Russia, the respective shares of the spoil being Prussia 13,415 sq. miles, Austria 27,000 sq. miles, and Russia 42,000 sq. miles. What remained to Poland was completely under Russian influence. Another partition in 1793 gave Russia nearly 97,000 sq. miles and Prussia 22,500 sq. miles. A third partition took place in 1795 after the heroic attempt of Kosciusko to save his country, and the last king of Poland became a pensionary of the Russian court. The successive partitions gave Russia upward of 180,000 sq. miles, Austria about 45,000 sq. miles, and Prussia 57,000 sq. miles. From 1815 to 1830 Russian Poland was a constitutional monarchy with the emperor as king, but the Poles, taking occasion of the French revolution at the latter date rashly engaged in an insurrection, which only hastened their complete absorption in Russia. The name Kingdom of Poland indeed remains, but all the autonomic institutions of the country have been swept away, and the whole country is being rapidly Russified. The Polish language has been entirely superseded by Russian in all courts of law, educational establishments and public offices; and all official correspondence must be in Russian. The population in 1907 was 9,442,590, of whom over 70 per cent were Roman Catholics.

POLAR BEAR. See Bear.

POLAR CIRCLES, two imaginary circles of the earth parallel to the equator, the one north and the other south, distant 23° 28′ from either pole. See under Arctic.

POLAR DISTANCE, the angular distance of any point on a sphere from one of its poles; more especially, the angular distance of a heavenly body from the elevated pole of the heavens. It is measured by the intercepted arc of the circle passing through it and

In 1815 polar exploration found a promoter in Sir John Barrow, who offered a reward of £20,000 sterling to anyone making the northwest passage, and £5,000 for reaching 89 degrees north latitude, which would be sixty-nine miles south of the pole.

Two years later, in 1817, two expeditions set out, one by way of Spitzbergen, the other by Baffin's Bay. The Dorothea and the Trent, on the Spitzbergen route, were commanded by Captain David Buchen and Lieutenant John Franklin. The other expedition was in charge of Captain John Ross and Lieutenant Edward Parry. Neither expedition was a success. In 1827 Parry on his third voyage made his historic dash for the pole from Spitzbergen by sledge boats and reached latitude 82 degrees and 42 minutes.

In 1845 Sir John Franklin made his tragic voyage. His ships, the Erebus and the Terror, were seen by a whaler in July, 1845, and that was the last trace. For three years the British admiralty, spurred on by Lady Franklin, sent out relief expeditions, but the only reward of the searchers was the discovery of the grewsome relics of a frightful tragedy. One vessel had been crushed in the ice, the other had been stranded on the shore of King William's Island. Three winters in the north had reduced the explorers to skeletons, and they had fallen one by one by the way in an effort to drag their sledges over the ice to a land camp.

The field of arctic exploration was entered by Walter Wellman in 1894. He made his effort to reach the pole with sledge and boat, using a ship from Spitzbergen, scene of his later attempts by balloon flight. His vessel, the Ragnvald Jarl, was crushed by floes, May 28, 1894, at Walden Island. He continued north by sledge after the wreck occurred. He was obliged to abandon the attempt six miles from Platen Islands, near the eighty-first parallel. His second expedition was in 1898-9, when he penetrated Franz Josef Land. He had raised the funds for the expedition without assistance. His ship was the Frithjof, a Norwegian vessel.

In 1899 the ship of the Duke of Abruzzi touched at Franz Josef Land and Wellman, as the first settler, welcomed the duke. Then, in 1906, Wellman was prepared to start in his first attempt to reach the pole in a dirigible balloon. Atmospheric conditions were such as to make a start impracticable. He started, however, a year later, but was forced to halt. His last attempt was in 1909, but an accident to his balloon forced him again to relinquish the project. He announced then that he would try again.

In 1897 Andrée and two companions left Danes Islands from a point only a few hundred yards from Walter Wellman's camp in an attempt to reach the pole by balloon. It was not a dirigible balloon and the hope of the explorers was that the winds would blow it up to the pole. The last seen of the balloon it was drifting out over the Barents sea, and since then nothing has been heard of it nor has a trace been found.

The adventures of Frithjof Nansen, the Norwegian explorer, who in 1896 got as far north as 86 degrees 14 minutes, are recent enough to be comparatively fresh in the public memory. He sailed from Christiana in the Fram, with the intention of forcing his way into the arctic ice near the New Siberian Islands and then drifting to the pole.

A party was sent out to establish supply stations to which the explorer might retreat if necessary, and the cross country work was to be done on skis. Nansen was absent a long time and fears were entertained for his safety, but he returned, having penetrated farther north than any other explorer up to that time.

In 1900 the Duke of Abruzzi, nephew of the King of Italy, sailed from Christiania in the Stella Polari. He was considered an amateur, but he planted his standard in latitude 86 degrees 34 minutes, a new record that stood until Peary penetrated to latitude 87 degrees 6 minutes six years later.

Captain Roald Amundsen in 1903-6 made the Northwest Passage, which had been vainly sought since the discovery of America, and which had never been accomplished by ships alone, although MacClure is credited with making it by ships and sledges. In a tiny sealer, the Gjoa, he entered Lancaster Strait and proceeded to a harbor 100 miles from the magnetic pole, which is in or near King William Land. For nineteen months, day and night, the party made uninterrupted magnetic observations. Two members of the party in the spring of 1905 charted the east coast of Victoria Land as far as the seventy-second parallel and discovered an unknown tribe of Eskimos, the Kiilnermiums. The expedition spent a second winter in the ice and in the summer of 1906 reached civilization through Bering Strait.

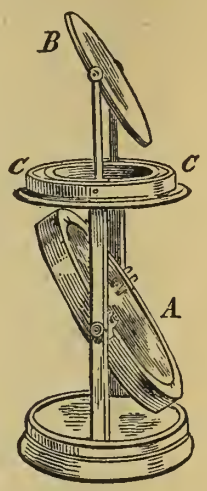
In 1904 Baron Toll, a Russian, led a polar exploration party by way of Siberia, but all the members perished from the cold.

In 1903 Erickson, a Dane, headed an expedition and got as far as Saunders Island, where they were rescued in a destitute condition. In the same year Anthony Fiala, a young Brooklyn explorer, sailed on the ship America and proceeded farther north than the Duke of Abruzzi. His party endured great hardships before they were rescued.

POLAR FORCES, in physics, forces that are developed and act in pairs with opposite tendencies, as in magnetism, electricity, etc.

POLA'RIS, the pole-star, which see.

POLARI'SCOPE, an optical instrument, various kinds of which have been contrived, for exhibiting the polarization of light, or for examining transparent media for the purpose of determining their polarizing power. The important portions of the instrument are the polarizing and analysing plates or prisms, and these are formed either of natural crystalline structures, such as Iceland-spar and tourmaline, or of a series of reflecting surfaces artificially joined together. The accompanying figure shows Malus' polariscope. A and B



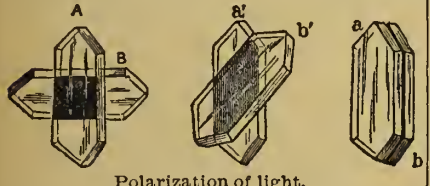
Polariscope.

are the reflectors, the one serving as polarizer, the other as analyzer, each consisting of a pile of glass plates. Each reflector can be turned about on a horizontal axis, and the upper one, or analyzer, can also be turned about on a vertical axis, the amount of rotation being measured on the horizontal circle C C. See Polarization of Light.

POLARITY, that quality of a body in virtue of which peculiar properties reside in certain points called poles; usually, as in electrified or magnetized bodies, properties of attraction or repulsion, or the power of taking a certain direction; as, the Polarity of the magnet or magnetic needle, whose pole is not that of the earth, but a point in the Polar Regions. A mineral is said to possess polarity when it attracts one pole of a magnetic needle and repels the other.

POLARIZATION OF LIGHT, an alteration produced upon light by the action of certain bodies by which it is made to change its character. A common ray of light exhibits the same properties on all sides, but any reflected or refracted ray, or a ray transmitted through certain media, exhibits different properties on different sides; and is said to be polarized. The polarization of light may be effected in various ways, but chiefly in the following:—(1) By reflection at a proper angle (the "polarizing angle") from the surfaces of transparent media, as glass, water, etc. (2) By transmission through crystals possessing the property of double refraction, as Iceland-spar. (3) By transmission through a sufficient number of transparent uncrystallized plates placed at proper angles. (4) By transmission through a number of other bodies imperfectly crystallized, as agate, mother-of-pearl, etc. The knowledge of this singular property of light has afforded an explanation of some interesting

phenomena in optics. A simple example of polarization may be illustrated by two slices of the semi-transparent mineral tourmaline cut parallel to the axis of the crystal. If one is laid upon the other in the positions A B (see fig. below) they form an opaque combination. If one is turned round upon the other at various angles it will be found that greatest transparency is produced in the position corresponding with *a b* (which represents the natural position they originally occupied in the crystal), an intermediate stage being that shown at *a' b'*. The light which has passed through the one plate is polarized, and its ability to pass through the other plate is thus altered. Reflection is another very common cause of polarization. The plane of polarization is that particular plane in which a ray of polarized light incident at the polarizing angle is most copiously reflected. When the polarization is produced by reflection the plane of reflection is the plane of polarization. According to Fresnel's theory, which is that generally received, the vibrations of light polarized in any plane are perpendicular to that plane. The vibrations of a ray reflected at the polarizing angle are accordingly to be regarded as perpendicular to the plane of incidence and reflection, and therefore as parallel to the reflecting surface. Polarized light



Polarization of light.

cannot be distinguished from common light by the naked eye; and for all experiments in polarization two pieces of apparatus must be employed—one to produce polarization, and the other to show it. The former is called a polarizer, the latter an analyzer; and every apparatus that serves for one of these purposes will also serve for the other. One such apparatus is shown in the article Polariscope. The usual process in examining light with a view to test whether it is polarized, consists in looking at it through the analyzer, and observing whether any change of brightness occurs as the analyzer is rotated. There are two positions, differing by 180°, which give a minimum of light, and the two positions intermediate between these give a maximum of light. The extent of the changes thus observed is a measure of the completeness of the polarization of light. Very beautiful colors may be produced by the peculiar action of polarized light; as for example, if a piece of selenite (crystallized gypsum) about the thickness of paper is introduced between the polarizer and analyzer of any polarizing arrangement, and turned about in different directions, it will in some positions appear brightly colored, the color being most decided when the analyzer is in either of the two critical positions which give respectively the greatest light and the greatest darkness. The color is changed to its complementary by rotating the analyzer through a right angle; but rotation of the selenite, when the analyzer is in either of the critical positions, merely alters the depth of the color without changing its tint, and in certain critical positions of the selenite there is a complete absence of color. A different class of appearances are presented when a plate, cut from a uniaxial crystal by sections perpendicular to the axis, is inserted between the polarizer and the analyzer. Instead of a broad sheet of uniform color, there is exhibited a system of colored rings, interrupted when the analyzer is in one of the two critical positions by a black or white cross. Observations of this phenomenon affords in many cases an easy way of determining the position of the axis of the crystal, and is therefore of great service in the study of crystalline structure. Crystals are distinguished as dextro-gyrate or lævo-gyrate, according as their colors ascend by a right-handed or left-handed rotation of the analyzer horizontally. Glass in a state of strain exhibits coloration when placed between a polarizer and analyzer, and thus we can investigate the distribution of the strain through its substance. Unannealed glass is in a state of permanent strain. A plate of ordinary glass may be strained by a force applied to its edges by means of a screw. The state of strain may be varied during the examination of the plate by polarized light. A plate of quartz (a uniaxial crystal) cut at right angles to the optic axis exhibits, when placed between an analyzer and polarizer, a system of colored rings like any other uniaxial crystal; but we find that the center of the rings, instead of having a black cross, is brightly colored—red, yellow, green, blue, etc., according to the thickness of the plate.

POLE, the name given to either extremity of the axis round which the earth revolves. The northern one is called the north pole, and the southern the south pole. Each of these poles is 90° distant from every part of the equator. In astronomy, the name is given to each of the two points in which the axis of the earth is supposed to meet the sphere of the heavens, forming the fixed point about which the stars appear to revolve. In a wider sense a pole is a point on the surface of any sphere equally distant from every part of the circumference of a great circle of the sphere; or a point 90° distant from the plane of a great circle, and in a line passing perpendicularly through the center, called the axis. Thus the zenith and nadir are the poles of the horizon. So the poles of the ecliptic are two points of the sphere whose distance from the poles of the world is equal to the obliquity of the ecliptic, or they are 90° distant from every part of the ecliptic. Pole, in physics, is one of the points of a body at which its attractive or repulsive energy is concentrated, as the poles of a magnet, the north pole of a needle, the poles of a battery.

POLE, Perch, or Rod, a measure of length containing 16½ feet or 5½ yards. Sometimes the term is used as a superficial measure, a square pole denoting 5½ × 5½ yards, or 30¼ square yards.

POLE-AXE, an axe attached to a pole or handle of which the length varies considerably. It was formerly used by mounted soldiers, and in the navy for boarding purposes.

POLECAT, a name common to several species of carnivora of the weazel family. The common polecat is about 17 inches long, and the tail 6 inches. The color is dark brown. It is a nocturnal animal, sleeping during the day and searching for its prey at night. It is especially de-

Polecat.

structive to poultry, rabbits, and game. Frogs, toads, newts, and fish are often stored as food by this voracious animal. It has glands secreting a fetid liquor, somewhat like that of the American skunk, which it ejects when irritated or alarmed.

POLEM'ICS, the art or practice of disputation generally, but in a special sense that branch of theological learning which pertains to the history or conduct of ecclesiastical controversy.

POLEM'OSCOPE, a sort of stand or frame high enough to rise above a parapet or other similar object, having a plane mirror at top so fitted as to reflect any scene upon another mirror below, and thus enable a person to see a scene in which he is interested without exposing himself.

POLE-STAR, the star *a* of the constellation Ursa Minor, situated about 1° 20′ from the north celestial pole, round which it thus describes a small circle. It is of the second magnitude, and is of great use to navigators in the northern hemisphere. Two stars called the pointers, in the constellation Ursa Major (the Great Bear, commonly called the Plough), always point in the direction of the pole-star, and enable it to be found readily.

POLICE (po-lēs′), the system instituted by a community to maintain public order, liberty, and the security of life and property. In its most popular acceptation the police signifies the administration of the municipal laws and regulations of a city or incorporated town or borough. The primary object of the police system is the prevention of crime and the pursuit of offenders; but it is also subservient to other purposes, such as the suppression of mendicancy, the preservation of order, the removal of obstructions and nuisances, and the enforcing of those local and general laws which relate to the public health, order, safety, and comfort. The term is also applied to the body of men by

whom the laws and regulations are enforced.

POLIGNAC (pol-in-yȧk), Jules Auguste Armand Marie, Prince de, a French statesman, belonging to an ancient French family, born at Paris 1780, died at St. Germain 1847. After the restoration he was appointed adjutant-general to the king, and entered the chamber of peers. In 1820 he obtained from the pope the title of a Roman prince. In 1823 he succeeded Châteaubriand as ambassador at London; but after the accession of Charles X. spent the greater part of his time in Paris. He was successively minister of foreign affairs and president of the council. At the revolution of 1830 he was apprehended and condemned to perpetual imprisonment. He remained in the fortress of Ham till the amnesty of 1836 allowed him to take up his residence in England. He was ultimately permitted to return to France. He was the author of Considérations Politiques (1832). Several other members of the family were men of some note.

POLISHING is the name given to the process by which the surface of a material is made to assume a perfectly smooth and glossy appearance, usually by friction. The article to be polished must first be made smooth and even, after which the polishing begins. In the case of wood the process is commonly effected by rubbing with French polish (which see). In metals, by polishing-steel or blood-stone, or by wood covered over with leather, and on which pulverized tripoli, chalk, tin-putty, etc., is sprinkled. In glass and precious stones, by tin-putty and lead siftings; in marble, by tin-putty and tripoli; in granite and other hard stones, by tripoli and quicklime.

POLISHING-POWDER, a preparation of plumbago for polishing iron articles, also a composition variously made up for cleaning gold and silver plate. See Plate-powder.

POLISHING-PLATE, a gray or yellowish slate, composed of microscopic infusoria, found in the coal-measures of Bohemia and in Auvergne, and used for polishing glass, marble, and metals.

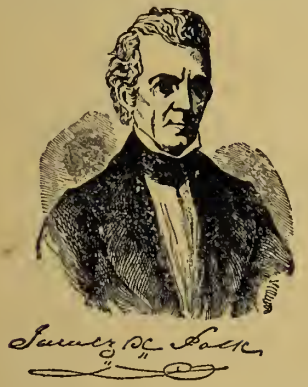
POLITICAL ECONOMY, the science of the social ordering of wealth, or the science which has as its aim the investigation of the social conditions regulating the production, distribution, exchange, and consumption of wealth, the term wealth being understood to mean all articles or products possessing value in exchange. While, however, political economy is susceptible of wide definition on these lines, the exact scope of the science within the terms of the definition has been the subject of much confused debate. From the nature of the actual conditions of the production and regulation of wealth, and the place of the systematic examination of these as departmental to a larger science investigating the natural laws of the formation and progress of civilized communities, it is impossible to sunder it entirely from physical, intellectual, and moral considerations tending to enlarge indefinitely its scope. The varying extent to which these elements have entered into the treatment of the subject by economists has given rise to controversy not only as to whether economics is to be considered as a physico-mental or a purely mental science, but even as to its claim to be considered an independent science at all. By most economists it is urged, that as the reasoned and systematic statement of a particular class of facts it may rightly claim to be considered a science, while, as dealing with inanimate things only incidentally as the measure of motives of desire, it is to be classed with the moral or social sciences. Of more importance, as affecting the whole history of the science, have been the questions arising from the method employed in economic inquiry. The modern English school of economists, including the names of Adam Smith, Ricardo, Mill, Cairns, Fawcett, and Marshall, have been mainly guided by the deductive method, its more extreme representatives, such as Senior, asserting this method to be the only one applicable to the science. In point of fact political economy has necessarily availed itself of both methods. It has been deductive in so far as it has assumed at the outset certain hypotheses, and derived from these by a dialectical process the guiding principles of the science; but even the older economists, working under the immediate influence of the mathematico-physical sciences chiefly, cannot be justly accused of having overlooked, though they tended to underestimate, the necessity of supplementing deduction by induction. The hypothesis on which the economic system was founded, was that in the economic sphere the principal motive of human action was individual self-interest, leading men to seek to obtain the greatest amount of wealth with the least expenditure of effort; this hypothesis being followed out to its logical conclusions, under assumed conditions of perfectly free competition, in connection with the facts of the limitations of the earth's extent and reproductiveness, and the theory of a tendency in the race to multiply to an incalculable extent in the absence of natural or artificial obstacles. On this basis theories of value, rent, and population were formed, having the character of laws, but of laws which were hypothetical merely—true only under the assumed conditions of an environment in which competition was free and frictionless, unhampered by inertness, ignorance, restrictive customs, and the like. In this respect the method adopted and the results arrived at found analogy in those physical sciences the laws of which are only applicable in actual fact under large and variable modification. There was, however, an indisputable tendency among the earlier economic writers to regard these hypothetical laws as in a greater degree representative of actual fact than they were, and even, when the actual facts fell short of the theoretic conditions, to regard these as prescriptive and regulative. The ethical protest against this tendency found a strong support in the development of the group of biological sciences, opening up new conceptions of organic life and growth; and as the result of these and other influences the old rigidity in the application of theory has largely disappeared. Where the older economist tended to look upon the subject-matter of economics as more or less constant and furnishing laws of universal application, the modern economist, having regard to the complexity and variability of human motives and the development of the race both in the matter of character and institutions, has come to recognize that the abstract conception of a frictionless competitive atmosphere, in which self-interested motives worked with mechanical regularity, can never bear other than a qualified application to actual economic conditions, and that laws relating to the economic aspects of life at one stage of human development seldom apply at another without large modification. He realizes clearly what the older economist only imperfectly perceived, and even more imperfectly expressed, that the system they were elaborating was to be considered rather as an instrument to assist in the discovery of economic truth, than a body of truths representing any actual or desirable social state. When regarded in this light—as a means to assist in the disentanglement of the complex motives operative in actual economic relations—the isolation of one set of economic forces, and the tracing of the logical issues of these, becomes of the highest value, despite the danger in careless use of neglecting necessary modification and of translating its hypothetic statements into prescriptions for conduct and social organization. It has been this neglect, the assumption of didactic authority, and the extent of the modifications often necessary in the practical application of theory which have tended to bring the older school into discredit at the hands of Comte, Cliff Leslie, Ruskin, and a large number of foreign economists—some complaining with Comte of the tendency to vicious abstractions, and the impossibility of isolating to any useful end the special phenomena of economics from other social phenomena some, like the German and American; historic schools, arguing that it is desirable and necessary to reason direct from historic facts to facts without the intervention of any formal economic theory. So far, however, the opponents of the older method of dealing with economic problems, though they have accomplished an admirable work in clearing the older economics of many confusions and misapprehensions, have failed to supply a superior method of analyzing the phenomena constituting the subject-matter of the science, while many of them have not scrupled to avail themselves largely of the results arrived at by the method they condemn.

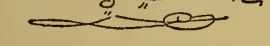
POLITICAL OFFENSES, are those offenses considered injurious to the safety of the state, or such crimes as form a violation of the allegiance due by a subject to the recognized supreme authority of his country. In modern times the crimes considered political offenses have varied at different periods and in different states. In Britain the most serious political offenses are termed treason (see Treason and Treason-Felony), and those of a lighter nature

which do not aim at direct and open violence against the laws or the sovereign, but which excite a turbulent and discontented spirit which would likely produce violence, are termed sedition. (See Sedition.) Political offenders of foreign countries are by English law not included in extradition treaties. In the United States also, and in most of the countries of Europe, the extradition treaties do not include the giving up of political offenders.

POL'ITICS, in its widest extent, is both the science and the art of government, or the science whose subject is the regulation of man in all his relations as the member of a state, and the application of this science. In other words it is the theory and the practice of obtaining the ends of civil society as perfectly as possible. In common parlance we understand by the politics of a country the course of its government, more particularly as respects its relations with foreign nations.

POLK (pōk), James Knox, president of the United States of North America from 1845–49, was born in 1795 in North Carolina; died at Nashville 1849. He studied law and entered congress as representative of Tennessee in 1825. He was speaker of the house of repre-

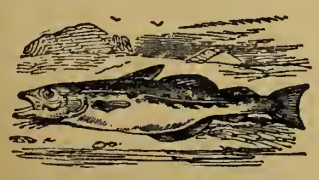




sentatives from 1835 to 1838. His advocacy of the annexation of Texas led to his election as president in 1844. The annexation of Texas, the Mexican war, the acquisition of upper California and New Mexico, and the settlement of the Oregon boundary were the chief events of his term of office.

POLKA, a species of dance of Bohemian origin, but now universally popular, the musie to which is in $\frac{2}{4}$ time, with the third quaver accented. There are three steps in each bar, the fourth beat being always a rest.

POLLACK, a fish of the cod family.



Pollack.

The pollack belongs to the same genus as the whiting, the members of this genus possessing three dorsal fins and two anals. The lower jaw is longer than the upper jaw, and the tail is forked, but not very deeply. It inhabits the Atlantic Ocean, and is common on all the British coasts, as well as on the shores of Norway. The northern coasts of Britain appear to be those on which these fishes are most abundant. The pollacks are gregarious in habits, and swim in shoals. It bites keenly at either bait or fly, and affords good eating.

POLLEN, the male element in flowering plants; the fine dust or powder which by contact with the stigma effects the fecundation of the seeds. To the naked eye it appears to be a very fine powder, and is usually inclosed in the cells of the anther; but when examined with the microscope it is found to consist of hollow eases, usually spheroidal, filled with a fluid in which

Pollen grains (magnified).

are suspended drops of oil from the 20,000th to the 30,000th of an inch in diameter, and grains of starch five or six times as large. Impregnation is brought about by means of tubes (pollen-tubes) which issue from the pollen-grains adhering to the stigma, and penetrate through the tissues until they reach the ovary. The cut shows the pollen-grains of (1) manna-ash, (2) clove, (3) strong-scented lettuce.

POLO, Marco, Venetian traveler, was born about the year 1256. His father Nicolo was the son of Andrea Polo, a patrician of Venice. Shortly before Marco's birth, Nicolo with his brother Matteo set out on a mercantile expedition, and ultimately arrived at Kemenfu on the frontiers of China, where they were favorably received by Kubilai, the grand-khan of the Mongols. In 1266 the khan sent the brothers on a mission to the pope, and they arrived in Venice in 1269. Two years later they again set out for the east, this time accompanied by the young Marco. After reaching the court of Kubilai, Marco rapidly learned the language and customs of the Mongols, and became a favorite with the khan, who employed him on various missions to the neighboring princes. Soon afterward he was made governor of Yang-tchou, in eastern China, an appointment he held for three years. In 1292 the three Polos accompanied an escort of a Mongolian princess to Persia. After arriving at Teheran they heard of Kubilai's death, and resolved to return home. They reached Venice in 1295. In the following year Marco Polo took part in the naval battle of Curzola, in which he was taken prisoner. During his captivity he dictated to a fellow-prisoner, Rustichello or Rusticiano of Pisa, an account of all his travels, which was finished in 1298. After his liberation he returned to Venice, where he died in 1323. His book—known as the Book of Marco Polo—created an immense sensation among the scholars of his time, and was regarded by many as pure fiction. It made known to Europeans the existence of many nations of which they were formerly totally ignorant, and created a passion for voyages of discovery.

POLONAISE, is a polish national dance, which has been imitated, but with much variation, by other nations. The Polonaise, in music, is a movement of three crochets in a bar, characterized by a seeming irregularity of rhythm, produced by the syncopation of the last note in a bar with the first note of the bar following, in the upper part or melody, while the normal time is preserved in the bass.

POLTA'VA, or **PULTAWA,** a government of Russia, bounded by Czernigov, Kharkov, Ekaterinoslav, Kherson, and Kiev; area, 19,265 sq. miles. It is one of the most fertile and best cultivated portions of the Russian empire, and grows large quantities of grain. Pop. 2,520,887.—Poltava, the capital, at the confluence of the Poltava with the Worskla, has straight and broad streets, a cathedral, important educational institutions, etc. As a place of trade Poltava derives importance from the great fair held on 20th July each year. Wool is the great staple of trade. Horses, cattle, and sheep are likewise bought and sold in great numbers. It contains a monument to Peter the Great, who here defeated Charles XII. in 1709. Pop. 53,060.

POLYAN'DRIA, or **POLYANDRY,** denotes the custom of one woman having several husbands (generally brothers) at one time. This system prevailed among the Celts of Britain in Cæsar's time, and occurs yet in southern India, in Tibet, among the Eskimo, the Aleutians, some tribes of American Indians, and in the South seas. The practice is believed to have had its origin in unfertile regions in an endeavor to check the undue pressure of population on the means of subsistence.

POLYANTHUS, a beautiful and favorite variety of the common primrose, a native of most parts of Europe, growing in woods and copses in a moist clayey soil. The leaves are obovate,

Garden polyanthus.

oblong, toothed, rugose, and villous beneath. The flowers are in umbels on a scape or flower stalk 3 to 6 inches or more in length. In addition to propagating from seeds polyanthuses may also be readily increased by division.

POL'YCARP, one of the Christian fathers, and, according to tradition, a disciple of the apostle John, was born probably in Smyrna about 69 or 70; martyred 155 or 156. According to a legendary fragment ascribed to a writer named Pionius, he was consecrated bishop of his native city by St. John

During the persecution under Marcus Aurelius, Polycarp was seized and brought before the Roman proconsul at Smyrna. Having refused to renounce his faith he was condemned to the flames. He wrote several letters, which were current in the early church, but have all perished except one addressed to the Philippians, which appears to have been written about 115, and is valuable for its quotations from the apostolic writings.

POLYC'RATES, Greek tyrant or absolute ruler of Samos during the time of the elder Cyrus. He made himself master of the island by violence, and having secured absolute sway seized upon several of the neighboring islands and some towns upon the mainland. In 522 B.C. the Persian satrap Oroetes treacherously invited Polycrates to his palace and there crucified him. Polycrates seems to have had much taste for learning and the arts, and greatly promoted the refinement of the Samians.

POLYG'AMY consists in a man's having more than one wife at the same time. In ancient times polygamy was practiced by all the eastern nations, and was sanctioned or at least tolerated by their religions. It was permitted to some extent among the Greeks, but entirely disappeared with the later development of Greek civilization. To the ancient Romans and Germanic races it was unknown. It prevailed among the Jewish patriarchs both before and under the Mosaic law. But in the New Testament we meet with no trace of it. Polygamy has never been tolerated among Christians, although the New Testament contains no injunction against it. It was, however, practiced by the Mohammedans and Mormons (up till recently). A statute of Edward I. treated polygamy as a capital crime.

POL'YGLOT, a work which contains the same matter in several languages. It is more particularly used to denote a copy of the Holy Scriptures in which two, three, or more translations are given, with or without the original. The first great work of the sort is the Complutensian polyglot, prepared under the direction of Cardinal Ximenes, and splendidly printed (1514–17), in 6 folio volumes at Alcala de Henares, called in Latin Complutum, whence the name of the work. It contains the Hebrew text of the Old Testament, with the Vulgate, the Septuagint, a literal Latin translation, and a Chaldee paraphrase (which is also accompanied by a Latin translation). Another celebrated polyglot is that of Antwerp, called the Royal Bible, because Philip II. of Spain bore part of the cost of publication. It was conducted by the learned Spanish theologian, Benedict Arias Montanus, assisted by other scholars. It appeared at Antwerp in 8 folio volumes (1569–72). The Paris polyglot appeared in 1654, in 10 folio volumes. The London or Walton's polyglot, in ten languages, appeared in 6 volumes folio, with two supplementary volumes (London, 1654–57). It was conducted under the care of Bryan Walton, afterward Bishop of Chester, and contains all that is in the Paris polyglot, but with many additions and improvements. It contains the original text according to several copies, with an Ethiopic and a Persian translation, and the Latin versions of each. Bagster's Polyglot folio, London (1831), gives eight versions of the Old Testament and nine of the new.

POL'YGON, in geometry, a plane figure of many angles and sides, or at least of more than four sides. A polygon of five sides is termed a pentagon; one of six sides, a hexagon; one of seven sides, a heptagon, and so on. Similar polygons are those which have their several angles equal each to each, and the sides about their equal angles proportionals. All similar polygons are to one another as the squares of their homologous sides. If the sides, and consequently the angles, are all equal the polygon is said to be regular; otherwise, it is irregular. Every regular polygon can be circumscribed by a circle or have a circle inscribed in it.—Polygon of forces, in mechanics, the name given to a theorem which is as follows:—If any number of forces act on a point, and a polygon be taken, one of the sides of which is formed by the line representing one of the forces, and the following sides in succession by lines representing the other forces in magnitude, and parallel to their directions, then the line which completes the polygon will represent the resultant of all the forces.

POLYHE'DRON, in geometry, a body or solid bounded by many faces or planes. When all the faces are regular polygons similar and equal to each other the solid becomes a regular body. Only five regular solids can exist, namely, the tetrahedron, the hexahedron, the octahedron, the dodecahedron, and the icosahedron.

POLYNE'SIA, a general name for a number of distinct archipelagoes of small islands scattered over the Pacific ocean, extending from about lat. 35° n. to 35° s., and from lon. 135° e. to 100° w., the Philippines, New Guinea, Australia, and New Zealand being excluded. (See Oceania.) The islands are distributed into numerous groups, having a general direction from n.w. to s.e. The groups north of the equator are the Pelew, Ladrone, or Marianne, Caroline, Marshall, Gilbert or Kingsmills, Fanning, and Hawaii or the Sandwich islands. South of the equator are New Ireland, New Britain, Solomon islands, New Hebrides, Fiji, New Caledonia, Navigator, Friendly, Cook's or Harvey, and the Society islands, the Low Archipelago, the Marquesas islands, and the isolated Easter island. The term Polynesia is sometimes restricted to the groups most centrally situated in the Pacific; the New Hebrides, Solomon islands, New Britain, New Ireland (Bismark Archipelago), etc., being classed together as Melanesia, whereas the Carolines, Ladrones, Marshall islands etc., form Micronesia. The predominating race, occupying the central and eastern portion of Polynesia, is of Malay origin, with oval faces, wide nostrils, and large ears. The hair and complexion vary greatly, but the latter is often a light brown. Their language is split up into numerous dialects. The other leading race is of negroid or Papuan origin, with negro-like features and crisp mop-like hair. They are confined to Western Polynesia, and speak a different language, with numerous distinct dialects.

POLYPHE'MUS, in Greek mythology, the most famous of the Cyclops, who is described as a cannibal giant with one eye in his forehead, living alone in a cave of Mount Ætna and feeding his flocks on that mountain. Ulysses and his companions having been driven upon the shore by a storm, unwarily took refuge in his cave. Polyphemus, when he returned home at night, shut up the mouth of the cavern with a large stone, and by the next morning had eaten four of the strangers, after which he drove out his flocks to pasture, and shut in the unhappy captives. Ulysses then contrived a plan for their escape. He intoxicated the monster with wine, and as soon as he fell asleep bored out his one eye with the blazing end of a stake. He then tied himself and his companions under the bellies of the sheep, in which manner they passed safely out in the morning. Polyphemus was the despised lover of the nymph Galatea.

POLYPODIA'CEÆ, a natural order of ferns, which may be taken as the type of the whole. They constitute the highest order of acrogenous or cryptogamic vegetation, and are regarded as approaching more nearly to cycadaceous gymnosperms than to any other group of the vegetable kingdom. They are usually herbaceous plants with a permanent stem, which either remains buried or rooted beneath the soil, or creeps over the stems of trees, or forms a scarcely movable point of growth, round which new leaves are annually produced in a circle, or it rises into the air in the form of a simple stem, bearing a tuft of leaves at its apex and sometimes attaining the height of 40 feet, as in the tree-ferns.

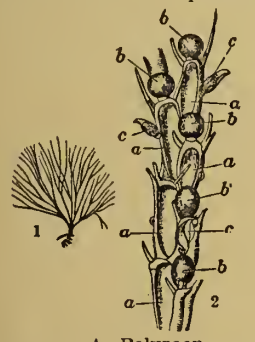
POLYPUS, in medicine, a name given to tumors chiefly found in the mucous membranes of the nostrils, throat, ear, and uterus; rarely in the stomach, bladder, and intestines. Polypi differ much in size, number, mode of adhesion, and nature. One species is the mucous, soft, or vesicular, because its substance consists of mucous membrane with its embedded glands; another is called the hard polypus, and consists of fibrous tissue. Polypi may be malignant in character, that is, of the cancerous type.

POLYTECHNIC SCHOOL. See Ecole Polytechnique.

POLYTHE'ISM, the belief in, and worship of, a plurality of gods; opposed to monotheism, the belief in, and worship of one god. It is still a matter of debate whether polytheism is a primary form of human belief, or a degeneration of an original monotheistic idea. It is argued, on the one hand, that the sense of personal dependence, the feeling that there was an undefined power, a mysterious something around and above him, did not primarily present itself to the mind of man except under a form of unity. His earliest religion would therefore be of a monotheistic character, but of a highly unstable nature, and eminently liable, among races of rude faculties and little power of abstraction, to assume a polytheistic form, the idea

of one Supreme Being being readily obscured by the multiplicity of the visible operations of that being on earth. Those who affirm that polytheism was a primary form of religious belief argue that man, ignorant of the nature of his own life, and of the nature, origin, and properties of other objects, could at first only attribute vaguely to all visible things the same kind of conscious existence as that which belonged to himself. Thus the sun, moon, and stars would all be living beings; and their influence, from the absence of any idea of a natural order, would be seen in the working of the material world, and in all the accidents of human life. As being beyond human control, and as affecting the condition of men, they would be loved or feared; and with the growth of the idea that they might be propitiated or appeased the system of polytheism would be complete. See Monotheism and Mythology.

POLYZO'A, a class of Molluscoida or Lower Mollusca, generally known by the popular names of "sea-mosses" and "sea-mats." They are invariably compound, forming associated growths or colonies of animals produced by gemmation from a single primordial individual, and inhabit a polyzoarium, or aggregate of cells, corresponding to the polypidom of the composite hydroids.



A—Polyzoon.
1, Natural size. 2, Portion of same magnified. *a*, Cells. *b*, Ovicells. *c*, Avicularia.

The polypide, or individual polyzoon, resides in a separate cell or chamber, has a distinct alimentary canal suspended freely in a body cavity, and the reproductive organs contained within the body. The body is inclosed in a double-walled sac, the outer layer of which is chitinous or calcareous, and the inner a delicate membranous layer. On the ectocyst are seen certain peculiar processes called "bird's-head processes," or avicularia, from their shape, the use of which is unknown. The mouth-opening at the upper part of each cell is surrounded by a circlet of hollow ciliated tentacles, which perform the function of respiration, and the cell may be closed by a sort of valve called the epistome. All the Polyzoa are hermaphrodite. In many cases there are ovicells or sacs into which the fertilized ova pass. From these proceed free-swimming ciliated embryos which develop into polypides. Continuous gemmation exists in all. They are all aquatic in their habits; the marine Polyzoa being common to all seas, but the fresh-water genera are mostly confined to the north temperate zone.

POMEGRANATE (pom'gra-nāt), a dense spiny shrub, from 8 to 20 feet high, supposed to have belonged originally to the north of Africa, and subsequently introduced into Italy. It was called by the Romans Carthaginian apple. The leaves are opposite, lanceo-

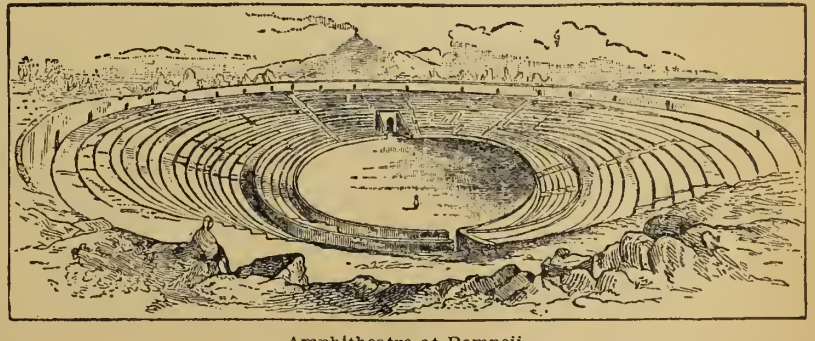
Pomegranate.

late, entire, and smooth; the flowers are large and of a brilliant red; the fruit is as large as an orange, having a hard rind filled with a soft pulp and numerous red seeds. The pulp is more or less acid and slightly astringent. The pomegranate is extensively cultivated throughout Southern Europe, and sometimes attains a great size.

POMERA'NIA, a province of Prussia, bounded by the Baltic, Mecklenburg, Brandenburg, and West Prussia; area, 11,622 sq. miles. The principal rivers are the Oder, Persante, and Stolpe. The soil is generally sandy and indifferent, but there are some rich alluvial tracts, producing a quantity of grain. Flax, hemp, and tobacco are also cultivated. Pop. 1,634,832.

POMPADOUR (pon-pâ-dör), Jeanne Antoinette Poisson, Marquise de, the mistress of Louis XV., was born in 1721, and was said to be the daughter of the farmer-general Lenormand de Tournehem, who at his death left her an immense fortune. In 1741 she married her cousin, Lenormand d'Etiolles. A few years later she succeeded in attracting the attention of the king, and soon entirely engrossed his favor. In 1745 she appeared at court as the Marquise de Pompadour. Here she at first posed as the patroness of learning and the arts, but with the decay of her charms she devoted her attention to state affairs. Her favorites filled the most important offices, and she is said to have brought about the war with Frederick II. She died in 1764, at the age of forty-four, hated and reviled by the nation.

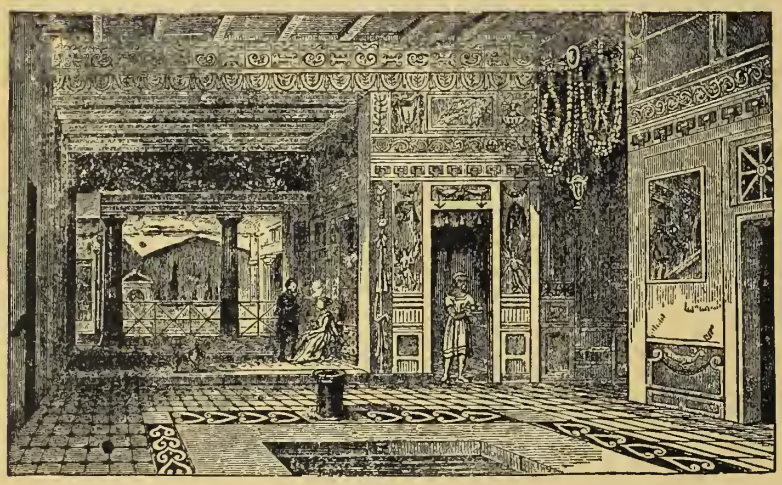
POMPEII (pom-pā'yē), an ancient city of Italy, in Campania, near the Bay of Naples, about 12 miles southeast from the city of that name, and at the base of Mount Vesuvius on its southern side. Before the close of the republic, and under the early emperors, Pompeii became a favorite retreat of wealthy Romans. In A.D. 63 a fearful earthquake occurred, which destroyed a great part of the town. The work of rebuilding was soon commenced, and the new town had a population of some 30,000 when it was overtaken by another catastrophe on 24th August, A.D. 79. This consisted in an eruption of Mount Vesuvius, which suddenly belched forth tremendous showers of ashes, red-hot pumice-stone, etc., so as to overwhelm the city for a considerable depth. In 1906 an eruption took place accompanied by earthquakes, which, compared with other great eruptions, was one of the most important in its history. Many towns were destroyed by lava. Pompeii was threatened for a time, but only a few houses were destroyed. In Naples, 12 miles from the volcano, the fall of ashes was so great that it caused the death and injury of many people. The number of lives lost was over 300, and the loss of property was incalculable. Pompeii was consigned to oblivion during the middle ages, and it was not until 1748, when a peasant in sinking a well discovered a painted chamber with statues and other objects of antiquity, that anything like a real interest in the locality was excited. Excavations were now prosecuted and in 1755 the amphitheater, theater, and other parts were cleared out. Under the Bourbons the excavations were carried out on a very unsatisfactory plan. Statues and articles of value alone were extricated, while the buildings were suffered to fall into decay or covered up again. To the short reign of Murat (1808–15) we are indebted for the excavation of the Forum, the town walls, the Street of Tombs, and many private houses. Latterly the government of Victor Emmanuel assigned $12,500 annually for the prosecution of the excavations,



Amphitheatre at Pompeii.

and a regular plan has been adopted, according to which the ruins are systematically explored and carefully preserved. The town is built in the form of an irregular oval extending from east to

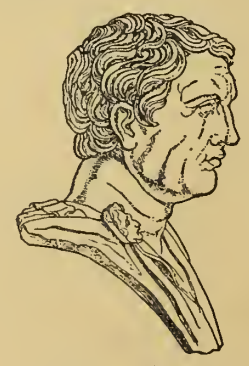
west. The circumference of the walls amounts to 2925 yards. The area within the walls is estimated at 160 acres; greatest length, ¾ mile; greatest breadth ½ mile. There are eight gates. The streets are straight and narrow and paved with large polygonal blocks of lava. The houses are slightly constructed of concrete, or occasionally of bricks. Numerous staircases prove that the houses were of two or three stories. The ground floor of the larger houses was generally occupied by shops. Most of the larger houses are entered from the street by a narrow passage (vestibulum) leading to an internal hall (atrium), which provided the surrounding chambers with light and was the medium of communication; beyond the latter is another large public apartment termed the tabulinum. The other portion of the



Pompeii—House of the Tragic Poet, so called.

house comprised the private rooms of the family. All the apartments are small. The shops were small and all of one character, having the business part in front and one or two small chambers behind, with a single large opening serving for both door and window. The chief public buildings are the so-called Temple of Jupiter, the Temple of Venus, the Basilica, the Temple of Mercury, the Curia, and the Pantheon or Temple of Augustus. There are several interesting private buildings scattered through the town, including the villa of Diomedes, the house of Sallust, and the house of Marcus Lucretius. The Museum of Naples owes many of its most interesting features to the ornaments, etc., found in the public and private edifices above mentioned.

POMPEY, in full Cneius Pompeius Magnus, a distinguished Roman, born B.C. 106, was the son of Cneius Pompeius Strabo, an able general. In B.C. 89 he served with distinction under his father in the war against the Italian allies. In the struggle between Marius and Sulla, Pompey raised three legions to aid the latter, and regained all the territories of Africa which had forsaken the interest of Sulla. This success excited the jealousy of Sulla, who recalled him to Rome. On his return Sulla greeted him with the surname of Magnus (Great). Pompey demanded a triumph, to which Sulla reluctantly consented. He entered Rome in triumph in September 81, and was the first Roman permitted to do so without possessing a higher dignity than that of equestrian rank. After the death of Sulla, Pompey put an end to the war which the revolt of Sertorius in Spain had occasioned, and in 71 obtained a second triumph. In this year, although not of legal age and without official experience, he was elected consul with Crassus. In 67 he cleared the Mediterranean of pirates, and destroyed their strongholds on the coast of Cilicia. In the four years, 65–62, he conquered Mithridates, Tigranes, and Antiochus, king of Syria. At the same time he subdued the Jews and took Jerusalem by storm. He returned to Italy in 62 and disbanded his army, but did not enter Rome until the following year, when he was honored with a third triumph. Pompey, in order to strengthen his position, united his interest with that of Cæsar and Crassus, and thus formed the first triumvirate. This agreement was concluded by the marriage of Pompey with Cæsar's daughter Julia; but the powerful confederacy was soon broken. During Cæsar's absence in Gaul Pompey ingratiated himself with the senate, was appointed sole consul, and the most important state offices were filled with Cæsar's enemies. Through his influence Cæsar was proclaimed an enemy to the state, and his rival was appointed general of the army of the republic. Cæsar crossed the Rubicon in 49 (see Cæsar), and in sixty days was master of Italy without striking a blow. Pompey crossed over to Greece, and in this country, on the plains of Pharsalia, occurred the decisive battle which made Cæsar master of the Roman world. Pompey fled to Egypt, where he hoped to find a safe asylum. The ministers of Ptolemy betrayed him, and he was stabbed on landing by one of his former centurions in B.C. 48.



Pompey.—Antique gem.

POMPEY'S PILLAR, a celebrated column, standing on an eminence about 1800 feet to the south of the present walls of Alexandria in Egypt. It consists of a Corinthian capital, shaft, base, and pedestal. The total height of the column is 104 feet; the shaft, a monolith of red granite, is 67 feet long, and 9 feet in diameter below and not quite 8 at top. It is named from the Roman prefect Pompeius, who erected it in honor of Diocletian about or soon after 302 A.D.

PONCE DE LEON (pon'the de le-on'), Juan, one of the early Spanish discoverers in America, born about 1460, died at Cuba 1521. He accompanied Columbus on his second expedition in 1493, and was sent by Ovando to conquer the island of Porto Rico. Having there amassed great wealth, and received information of an island situated to the north, he discovered the country, to which he gave the name of Florida. Ponce returned to Spain in 1513, and was appointed by Ferdinand governor of the island of Florida, as he called it, on condition that he should colonize it. In 1521 he embarked nearly all his wealth in two ships, and proceeded to take possession of his province. He was, however, met with determined hostility by the natives, who made a sudden attack upon the Spaniards, and drove them to their ships. In the combat Ponce de Leon was mortally wounded.

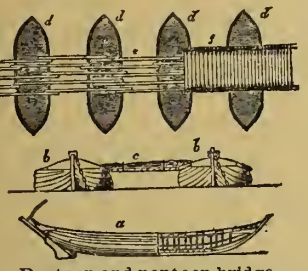
PONDICHERRY, a town, capital of the French East Indian settlement of the same name, on the east or Coromandal coast, 85 miles south by west from Madras. Its territory is surrounded on the land side by the British district of South Arcot, and has an area of 115 sq. miles; pop. 182,000.

PONDOLAND, a maritime territory of Cape Colony abutting on Natal, 90 miles from n.e. to s.w., and about 50 from n.w. to s.e. Pop. about 200,000. It was the last remnant of independent Kaffraria, became a British protectorate in 1884, and was annexed to the Cape in 1894.

PONTEVEDRA (pon-te-vā'drȧ), a town in Northwest Spain, capital of a province of the same name. It is surrounded by an old wall; consists of broad, well-paved streets, and well-built houses of granite, and has manufactures of cotton, velvet, woolen and cotton cloth, hats, leather, etc. Pop. 20,012.—The province produces in abundance corn, rye, wheat and millet, flax, fruit, and wine, and rears great numbers of cattle. Area, 1730 sq. miles; pop. 463,564.

PONTIAC, the capital of Oakland co., Mich., on the Clinton river, and the Detroit, Gr. Haven and Mil. and the Pontiac, Oxford and N. railways; 26 miles n.w. of Detroit. Within the county and a few miles from the city are over 400 lakes, with a total area of about 30,000 sq. miles, teeming with choice fish. Pop. 11,542.

PONTOON', in military engineering, a flat-bottomed boat, or any light framework or floating body used in the construction of a temporary bridge over a river. One form of pontoon, used in the British service, is a hollow tin-plate cylinder, with hemispherical ends, and divided by several longitudinal and transverse partitions to act as braces and to prevent sinking if pierced by a shot or by accident. Another is in the



Pontoon and pontoon bridge.

a, Pontoon, external and internal structure. *bb*, End of same, supporting the roadway. *c*, Plan of bridge. *dd*, Pontoons. *e*, Rafters for supporting the roadway. *f*, Roadway complete

form of a decked canoe, and consists of a timber frame covered with sheet copper. It is formed in two distinct parts, which are locked together for use and dislocated for transportation, and is also divided into air-tight chambers. The name is also given to a water-tight structure or frame placed beneath a submerged vessel and then filled with air to assist in refloating the vessel; and to a water-tight structure which is sunk by filling with water and raised by pumping it out, used to close a sluiceway or entrance to a dock.

POOLE, William Frederick, American librarian, was born in Salem, Mass., in 1821. He was librarian of the Boston Mercantile library, 1852–56; then of the Athenæum, where he remained thirteen years, becoming known as one of the leading librarians of the country. He was in charge of the Cincinnati Public library in 1869–73; of the Chicago Public library in 1873–87; and of the Newberry library, Chicago, from 1887 till his death. Dr. Poole was most widely known for his admirable Index to Periodical Literature, of which he published enlarged editions in 1853 and in 1882. He died in 1894.

POONAH, or **PUNA,** a city and district of Hindustan, in the presidency of Bombay. It is about 119 miles east of Bombay by the Great Indian Peninsular railway. Pop. 153,320, of whom 40,000 are in the cantonments.—The district has an area of 5348 sq. miles, and a pop. of 995,074.

POOP, the aftermost and highest part of the hull in large vessels; or, a partial deck in the aftermost part of a ship above the deck proper.

POOREE, or **PURI,** a town and district of India, in the province of Orissa. The town is 250 miles s.w. from Calcutta. It contains the shrine of Juggernaut, to whose worship crowds flock from every part of India. Pop. 49,334.—The district has an area of 2473 sq. miles, and a pop. of 1,017,286.

POOR RICHARD'S ALMANAC, a popular almanac published by Benjamin Franklin in 1732 and continued for twenty-five years. As "Richard Saunders" Franklin supplied in his almanacs, of which 10,000 were sold yearly, a fund of proverbs, homely wisdom and common sense of the greatest practical value to the people of this country.

POPE, the title given to the head of the Roman Catholic hierarchy. It seems to have been used at first in the early church as a title of reverence given to ecclesiasties generally, and at the present time it is applied in the Greek church to all priests. In the early Western church the title of pope was ultimately bestowed upon the metropolitan bishops, but in the struggle for pre-eminence the claim to be recognized as the only pope was enforced by the Bishop of Rome. This claim of pre-eminence was founded on the belief, supported by the early traditions of the church, that the Apostle Peter planted a church in Rome, and that he died there as a martyr. This tradition, taken in connection with the alleged pre-eminence of Peter among Christ's disciples, came to be regarded as sufficient reason for the primacy of the Bishop of Rome in the church. Consequently from the end of the 4th century the Bishop of Rome was the first among the five patriarchs or superior bishops of Christendom. A decree of the emperor Valentian III. (445) acknowledged the Bishop of Rome as primate, but until the 8th century many measures of the popes met with violent opposition. Leo the Great (440–461) was the first to base his claims to the primacy on divine authority by appealing to Matt. xvi. 18; and he did much to establish the theory that bishops in disputes with their metropolitans had a right of appeal to Rome. The Eastern church always resisted the see of Rome, and this mainly occasioned the schism that in 1054 divided Christendom into the Greek and Roman churches. After the 8th century several circumstances contributed to open to the popes the way to supreme control over all churches. Among these were the establishment of missionary churches in Germany directly under Rome, the pseudo-Isidorian decretals, which contained many forged documents supporting the general supremacy of the Roman pontiff the gradations of ecclesiastical rank, and the personal superiority of some popes over their contemporaries. Leo the Great (440–461), Gregory I., the Great (590–604), and Leo III. (795–816), who crowned Charlemagne, all increased the authority of the papal title. Much violence and corruption prevailed in the Roman see during the middle ages. In 1059 the dignity and independence of the papal chair were heightened by the constitution of Nicolas II., placing the right of election of the pope in the hands of the cardinals. In 1073 Gregory VII., at a Roman council, formally prohibited the use of the title of pope by any other ecclesiastic than the Bishop of Rome; he also enforced a celibate life upon the clergy, and prohibited lay investiture. The reign of Innocent III. (1198–1216) raised the papal see to the highest degree of power and dignity; and having gained almost unlimited spiritual dominion, the popes now began to extend their temporal power also. The dominions under the pope's temporal rule had at first consisted of a territory granted to the papal see by Pepin in 754, which was subsequently largely increased. The popes, however, continued to have to some extent the position of vassals of the German empire, and until the 12th century the German emperors suffered no election of pope to take place without their sanction. Innocent III., however, largely increased his territories at the expense of the empire, and the power of the emperors over Rome and the pope may now be said to have come to an end. Favorable circumstances had already made several kingdoms tributary to the papal see, which had now acquired such power that Innocent III. took upon him to depose and proclaim kings, and put both France and England under an interdict. France alone first successfully resisted the popes. In Philip the Fair Bonifface VIII. found a master, and his successors between 1307 and 1377 remained under French influence, and held their courts at Avignon. Their dignity sunk still lower in 1378 when two rival popes appeared, Urban VI. and Clement VII., causing a schism and scandal in the church for thirty-eight years. This schism did much to lessen the influence of the popes in Christendom, and it subsequently received a greater blow from the Reformation. During the reign of Leo X. (1513–25) Luther, Zuinglius, and Calvin were the heralds of an opposition which separated almost half the west from the popes, while the policy of Charles V. was at the same time diminishing their power, and from this time neither the new support of the Society of Jesuits nor the policy of the popes could restore the old authority of the papal throne. The national churches obtained their freedom in spite of all opposition, and the Peace of Westphalia (1648), bringing to an end the Thirty Years' war and the religious struggle in Germany, gave public legality to a system of toleration which was in direct contradiction to the papal doctrines. The bulls of the popes were now no longer of avail beyond the states of the church without the consent of the sovereigns, and the revenues from foreign kingdoms decreased. Pius VI. (1775–98) witnessed the revolution which not only tore from him the French church, but even deprived him of his dominions. In 1801, and again in 1809, Pius VII. lost his liberty and possessions, and owed his restoration in 1814 to a coalition of temporal princes, among whom were two heretics (English and Prussian) and a schismatic (the Russian). Nevertheless he not only restored the Inquisition, the order of the Jesuits, and other religious orders,

but advanced claims and principles entirely opposed to the ideas and resolutions of his liberators. The same spirit that actuated Pius VII. actuated in like manner his successors, Leo XII. (1823–29), Pius VIII. (1829–30), and above all Gregory XVI. (1831–46). The opposision of the latter to all reforms in the

Pope.

civil relations of the papal dominions contributed greatly to the revolution of 1848, which obliged his successor, Pius IX., to flee from Rome. The power of the papacy was further weakened by the events of 1859, 1860, and 1866. And after the withdrawal of the French troops from Italy in 1870, King Victor Emmanuel took possession of Rome, and since that time the pope has lived in seclusion in the Vatican.

By the decrees of the Vatican Council of 1870 the pope has supreme power in matters of discipline and faith over all and each of the pastors and of the faithful. It is further taught by the Vatican council that when the pontiff speaks ex cathedra, that is when he, in virtue of his apostolic office, defines a doctrine of faith and morals to be held by the whole church, he possesses infallibility by divine assistance. The pope cannot annul the constitution of the church as ordained by Christ. He may condemn or prohibit books, alter the rites of the church, and reserve to himself the canonization of saints. A pope has no power to nominate his successor, election being entirely in the hands of the cardinals, who are not bound to choose one of their own body. The papal insignia are the tiara or triple crown, the straight crosier, and the pallium. He is addressed as "Your holiness."

POPE, Alexander, a celebrated English poet, was born May 21, 1688. His father was a London merchant and a devout Catholic. Soon after his son's birth the father retired to Binfield, near Windsor. Pope was small, delicate, and much deformed. His education was a desultory one. In 1711 he published his poem the Essay on Criticism, which was followed by The Rape of the Lock, a polished and witty narrative poem founded on an incident of fashionable life. His next publications were The Temple of Fame, a modernization and adaptation of Chaucer's House of Fame; Windsor Forest, a pastoral poem (1713); and The Epistle of Eloisa to Abelard (1717). From 1713 to 1726 he was engaged on a poetical translation of Homer's works, the Iliad (completed in 1720) being wholly from his pen, the Odyssey only half. In 1728 he published his Dunciad, a mock heroic poem intended to overwhelm his antagonists with ridicule. It is distinguished by the excessive vehemence of its satire, and is full of coarse abuse. This was followed by Imitations of Horace (among the most original of his works), and by Moral Epistles or Essays. His Essay on Man was published anonymously in 1733, and completed and avowed by the author in the next year. This work is distinguished by its poetry rather than by its reasonings, which are confused and contradictory. In 1742 he added a fourth book to his Dunciad, in which he attacked Colley Cibber, then poet-laureate. He died on May 30, 1744, and was interred at Twickenham.

POPE, John, American soldier was born in Kaskaskia, Ill., in 1822. He saw service in the Florida Indian war and served under General Taylor in the Merican war. He was one of President Lincoln's escort to Washington on the occasion of his first inauguration. In 1861 he was made brigadier-general. In 1862 he was called to Washington and assigned to the army of Virginia. He was utterly defeated by Stonewall

John Pope.

Jackson at the second battle of Bull Run. He returned to Washington and resigned his command. After the war he was placed in command of one of the southern military districts. In 1882 he was made major-general. He was placed on the retired list in 1886. He died in 1902.

POPLAR, a well-known genus of hardy deciduous trees, with both barren and fertile flowers in catkins, stamens four to thirty, leaves alternate, broad, with long and slender foot-stalks flattened vertically, the leaves having generally more or less of a tremulous motion. About eighteen species have been observed, natives of Europe, central and northern Asia, and North America. Some of the poplars are the most rapid growers of all hardy forest trees. They thrive under a variety of conditions as regards soil, etc., but do best in damp situations. The timber of the poplar is white, light, and soft, and not very valuable.

POPOCATEPETL, an active volcano in Mexico, in the province of Puebla; long. 98° 33′ w.; lat. 18° 36′ n. Its height has been estimated at 17,884 feet. The crater is 3 miles in circumference and 1000 feet deep. Forests cover the base of the mountain, but its summit is mostly covered with snow.

POPPY, the common name for a species of herbaceous plant, all bearing large, brilliant, but fugacious flowers. The white poppy yields the well-known opium of commerce. Most of the species are natives of Europe, and four are truly natives of Britain. They often occur as weeds in fields and waste places, and are frequently also cultivated in gardens for ornament. The seeds of the white poppy

Poppy.

a, The upper part of the stem with the flower. *b*, The lower part of the plant. *c*, The fruit.

yield a fixed harmless oil employed for culinary purposes; and the oil-cake is used for feeding cattle. The roots of the poppy are annual or perennial; the calyx is composed of two leaves, and the corolla of four petals; the stamens are numerous, and the capsule is one-celled, with several longitudinal partitions, and contains a multitude of seeds.

POPULATION, the power of propagation inherent in all organic life may be regarded as infinite. There is no one species of vegetable or animal which under favorable conditions as to space, climate, and food (that is to say, if not crowded and interfered with by others), would not in a small number of years overspread every region of the globe. To this property of organized beings the human species forms no exception. And it is a very low estimate of its power of increase if we only assume that, under favorable conditions, each generation might be double the number of the generation which preceded it. Taking mankind in the mass, the individual desire to contribute to the increase of the species may be held to be universal, but the actual growth of population is nowhere left to the unaided force of this motive, and nowhere does any community increase to the extent of its theoretical capacity, even though the growth of population has come to be commonly considered as an indispensable sign of the prosperity of a community. For one thing population cannot continue to increase beyond the means of subsistence, and every increase beyond actual or immediately attainable means, must lead to a destruction of life. But if population is thus actually limited by the means of subsistence, it cannot be prevented by these means from going further than these means will warrant; that is to say, it will only be checked or arrested after it has exceeded the means of subsistence. It becomes then an inquiry of great importance by what kind of checks population is actually brought up at the

point at which it is in fact arrested. This inquiry was first systematically treated in an Essay on the Principle of Population published in 1798 by the Rev. T. R. Malthus. Malthus points out that population increases in a geometrical, while the means of subsistence only increase in an arithmetical ratio. And in examining the bearing on each other of the different ratios of increase of human life, and of the means of supporting it, he has deduced a law to the proof of which a considerable portion of his work is devoted. This law is that the energy of reproduction raises above all the ordinary accidents of human life, and the inevitable restraints imposed by the various organizations of human society, so that in all the various countries and climates in which men have lived, and under all the constitutions by which they have been governed, the normal tendency of population has always been to press continously upon the means of subsistence. Malthus divides the checks on the increase of population into two classes, preventive and positive; the one consisting of those causes which prevent possible births from taking place, the other of those which, by abbreviating life, cut off actual excesses of population. In a further analysis of these checks he reduces them to three—vice, misery, and moral restraint. The proof of his main position is historical and statistical. In regard to the subsidiary inquiry, the most striking point brought out is the rarity of moral restraint and the uniform action, in innumerable forms, of vice and misery. In order that the latter should be weakened in their action, and the former strengthened, it is desirable to have the general standard of living in a community raised as high as possible, and that all may look to the attainment of a position of comfort by the exercise of prudence and energy. The following figures may be given as approximately representing the density of population in the great divisions of the world (but some of the figures are mere estimates):

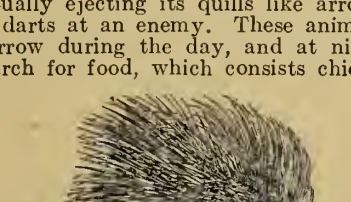
	Area in thousands of sq. miles	Pop. in millions	Density per sq. mile
Europe.....	3.861	390	100
Africa	12.124	197	16
Asia	16.217	789	47
Oceania.....	4.247	38	9
N. America.	9.035	104	11·5
S. America..	7.066	32	4·6

POPULIST PARTY, or **PEOPLE'S PARTY,** a political party organized at Cincinnati in May, 1891. On July 2, 1892, a national convention of the populist party met at Omaha, Neb., and nominated James B. Weaver of Iowa for president and James G. Field of Virginia for vice-president. The ticket received 22 electoral votes and a popular vote of 1,055,424. In the presidential campaign of 1896, the populist party nominated for president W. J. Bryan, who had already received the nomination of the democratic party, and for vice-president Thomas E. Watson of Georgia. In the campaign of 1900 the populist party again nominated for president W. J. Bryan, who was also the democratic nominee, and Charles A. Towne of Minnesota, but he subsequently withdrew, and the national executive committee of the populist party substituted Stevenson, who had already received the nomination by the democratic party for vice-president. It received 155 electoral votes.

PORBANDAR, a town of India, chief town of a native state of the same name, in the political agency of Kattyawar, Bombay. It is built on a creek on the s.w. coast of Gujerat, and has a brisk trade with Bombay and Malabar. Pop. 14,569. The state has an area of 535 sq. miles and a pop. of 72,077.

PORCH, an exterior appendage to a building, forming a covered approach to one of its principal doorways. The porches in some of the older churches are of two stories, having an upper apartment to which the name parvis is sometimes applied.—The porch was a public portico in Athens where the philosopher Zeno taught his disciples. Hence The Porch is equivalent to the School of the Stoics.

POR'CUPINE, a name of certain rodent quadrupeds. The body is covered, especially on the back, with the so-called quills, or dense solid spine-like structures, intermixed with bristles and stiff hairs. There are two incisors and eight molar teeth in each jaw, which continue to grow throughout life from permanent pulps. The muzzle is generally short and pointed; the ears short and rounded. The anterior feet possess four, and the hinder feet five toes, all provided with strong thick nails. The common or crested porcupine, found in Southern Europe and in Northern Africa, is the best-known species. When fully grown it measures nearly 2 feet in length, and some of its spines exceed 1 foot. Its general color is a grizzled dusky black. The spines in their usual position lie nearly flat, with their points directed backward; but when the animal is excited they are capable of being raised. The quills are loosely inserted in the skin, and may, on being violently shaken, become detached—a circumstance which may probably have given rise to the purely fabulous statement that the animal possessed the power of actually ejecting its quills like arrows or darts at an enemy. These animals burrow during the day, and at night search for food, which consists chiefly



Porcupine.

of vegetable matter. Of the American species, the Canadian or North American porcupine is the best known. It is about 2 feet long, and of slow and sluggish habits. The quills in this species are short, and are concealed among the fur. The ears are short, and hidden by the fur. The tail is comparatively short. The genus of South America possesses a distinctive feature in the elongated prehensile tail, adapting it for arboreal existence. These latter forms may thus be termed "tree porcupines." In length the typical species of this genus averages 1¼ foot, the tail measuring about 10 inches.

PORGIE, a fish of the family Sparidæ, with an oblong body, scaly cheeks, and one dorsal fin, found off the coasts of the United States. It is one of the most important food fishes, and attains a length of 18 inches and a weight of 4 lbs.

PORK, the flesh of swine, is one of the most important and widely-used species of animal food. Pork is coarser and ranker than beef or mutton, but when of good quality and well cured it develops a richness and delicacy of flavor in marked contrast with the dryness and insipidity of other salted meat. The abundance and digestive quality of its fat renders it a suitable diet for cold climates. The swine was forbidden to be eaten by the Mosaic law, and is regarded by the Jews as especially typical of the unclean animals. Other Eastern nations had similar opinions as to the use of pork. Pork contains less fibrine, albuminous and gelatinous matter than beef or mutton.

POROSITY, the name given to a property possessed by all bodies, in consequence of which their molecules are not immediately contiguous to one another, but are separated by intervening spaces or pores.

PORPHYR'IO, a genus of birds of the rail family found in Europe, Asia, and

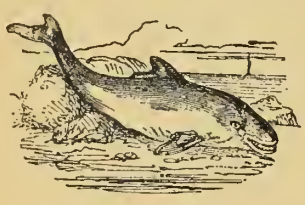
Porphyrio.

Africa, and remarkable for the structure of its beak and the length of its legs. It feeds on seeds and other hard substances, and lives in the neighborhood of water, its long toes enabling it to run over the aquatic plants with great facility. It is about 18 inches long, of a beautiful blue color, the bill and feet red.

PORPHYRY, originally the name given to a very hard stone, partaking of the nature of granite, susceptible of a fine polish, and consequently much used for sculpture. It consists of a homogeneous felspathic base or matrix, having crystals of rose-colored felspar, called oligoclase, with some plates of blackish hornblende, and grains of oxidized iron ore imbedded, giving to the mass a speckled complexion. It is of a red, or rather of a purple and white color, more or less variegated, the

shades being of all gradation from violet to a claret color. Egypt and the East furnish this material in abundance. It also abounds in Minorca, where it is of a red lead color, variegated with black, white, and green. Pale and red porphyry, variegated with black, white, and green, is found in separate nodules in Germany, England, and Ireland. The art of cutting porphyry as practiced by the ancients appears to be now quite lost. In geology the term porphyry is applied to any unstratified or igneous rock in which detached crystals of felspar or some other mineral are diffused through a base of other mineral composition. The varieties of porphyry are known as felspar porphyry, claystone porphyry, porphyritic granite, and porphyritic greenstone.

PORPOISE, a genus of cetacean mammalia. The common porpoise is the smallest and most familiar of all Cetacea, and occurs plentifully off the British coasts and in the North sea. It attains average length of 5 feet. The front of the head is convex in form, and has the spiracle or blow-hole in the middle line. The eyes and ears are small. The caudal fin is horizontal and flattened. The neck is very short. The fore limbs project from the body. No hind limbs are developed. The teeth are small with blunted crowns. The stomach is in three portions. No olfactory nerves exist. The porpoise feeds almost entirely on herrings and other fish, and herds or "schools" of porpoises follow the herring shoals, among which they prove very destructive. An allied species is the



Porpoise.

round-headed porpoise, or "caaing whale" of the Shetlanders. These latter measure from 20 to 24 feet in length, and are hunted for the sake of the oil. See Caaing Whale.

PORT, a kind of wine. See Port Wine.

PORT, a harbor or haven, or place where ships receive and discharge cargo. A free port is one at which the goods imported are exempted from the payment of any customs or duties, as long as they are not conveyed into the interior of the country.

PORT, the name given to the left side of a ship (looking toward the prow), as distinguished from the starboard or right side. Formerly larboard was used instead of port.

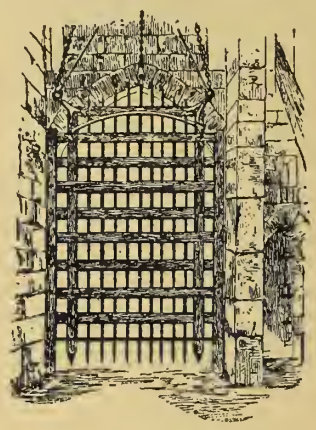
PORTAGE, a term applied in Canada to a break in a chain of water communication, over which goods, boats, etc., have to be carried, as from one lake, river, or canal to another; or, along the banks of rivers, round waterfalls, rapids, etc.

PORTAL CIRCULATION, a subordinate part of the venous circulation, belonging to the liver, in which the blood makes an additional circuit before it joins the rest of the venous blood. The term is also applied to an analogous system of vessels in the kidney.

PORT ARTHUR, naval station and fine harbor on the Liaotung peninsula of n. e. China, taken by the Japanese in 1894, and acquired by Russia in 1898, and in 1905 taken for the second time by the Japanese, who retain control.

PORT-AU-PRINCE (por-tō-prans), capital of the Republic of Hayti. The chief exports are mahogany and redwood, coffee, and cocoa-nuts. Pop. 40,000.

PORTCULLIS, a strong grating of timber or iron, resembling a harrow,



Portcullis.

made to slide in vertical grooves in the jambs of the entrance-gate of a fortified place, to protect the gate in case of assault.

PORTE, Ottoman, **SUBLIME PORTE,** common term for the Turkish government. The chief office of the Ottoman empire is styled Babi Ali, lit. the High Gate, from the gate (bab) of the palace at which justice was administered; and the French translation of this term being Sublime Porte, hence the use of this word.

PORTER. See Brewing.

PORTER, David, American naval officer, was born in Boston, Mass., in 1780. In 1798 he entered the navy as midshipman on board the United States ship Constellation and participated in the war with the French. Next year he was made lieutenant and was assigned to the West Indies station, where he saw service against the pirates in those waters. In 1806 he was made master, and in 1812 captain. In the latter year he fought in the Essex the famous action with the Alert, which he sank in eight minutes. He made numerous captures during the war of 1812, both of British ships and Peruvian privateers, nearly destroying the British whale fisheries in the Pacific. From 1815 till 1824 Captain Porter was a member of the board of navy commissioners. In 1829 he was appointed consul of Algiers, and in the next year minister to Turkey, where he remained till his death. He was the author of a Journal of the Cruise of the Essex, and from his letters several other interesting books have been compiled. It can be said of him that the two most distinguished officers of the United States navy during the late war received their earliest training on his ship. These two were his son and adopted son, David D. Porter, and David G. Farragut. He died in 1843.

PORTER, David Dixon, American admiral, was born at Philadelphia, in 1814. He saw his first battle in the Mexican navy at the time his father was chief in command of that service, and in 1829, he became a midshipman in the United States navy. He served in the Mediterranean station till 1835, at which time he was assigned to the United States coast survey corps. On the outbreak of the civil war he had attained the rank of commander. In January, 1863, he captured Arkansas Post, and in April destroyed the Grand Gulf batteries. At this time he was made rear-admiral, and had command of all the naval forces on the Mississippi river. After the fall of Vicksburg he assisted Banks in his Red river expedition in 1864. The same year saw him transferred to the James river in Virginia, and he was employed in the two attacks on Fort Fisher (in the second one of which the fort was captured), besides other important expeditions. At the close of the war he was made vice-admiral, and in 1866 he became superintendent of the naval academy of Annapolis, Md. In 1870, on the death of Admiral Farragut, he became admiral (commander-in-chief) of the navy. Admiral Porter wrote several books, among them being Life of Commodore David Porter, Incidents and Anecdotes of the Civil War, History of the Navy in the War of the Rebellion, and two works of fiction. He died in 1891.

PORTER, Fitz-John, American soldier, was born at Portsmouth, N. H., in 1822. He served in the Mexican war with General Scott, being wounded in the battles around the City of Mexico. He was twice brevetted for gallantry during the war, and in 1849 he was appointed instructor of cavalry and artillery at West Point. In 1861 he had reached the rank of colonel in the regular army, and on the beginning of hostilities was made brigadier-general of volunteers. At the second battle of Bull Run, Porter was ordered to attack Jackson's flank, but failed to move (as he alleged) on account of Longstreet being immediately in his front. Pope laid the blame of his defeat on Porter's inactivity, and even charged him with treachery. Soon after this event McClellan was restored to the chief command, and General Porter participated in the battle of Antietam. On November 27, 1862, he was tried by court-martial on a charge of disobedience of orders, and after a tedious investigation was cashiered from the army. Appeal was taken, and a board of inquiry was called to proceed with a rehearing of the case, and Porter was in 1878 declared blameless. In Cleveland's administration, a bill was passed and signed by the president authorizing the restoration of Porter to the regular army, with the rank of colonel, the bill taking effect in 1886.

PORTER, Horace, American soldier and diplomat. He was born in 1837 at Huntingdon, Pa. At the reduction of Fort Pulaski, Ga. (1862), he was the chief of ordnance and artillery, and

earned the brevet rank of captain. He participated in the Tennessee campaign during which he fought at the battle of Chickamauga and took part in the defense of Chattanooga. On April 4, 1864, he was promoted to be lieutenant-colonel and was assigned to the staff of General Grant. On March 13, 1865, he received the brevet rank of brigadier-general in the regular army. When Grant was elected to the Presidency Porter became his private secretary. In 1873 he resigned from the army to become vice-president of the Pullman Car company, and during the following years he filled executive positions on several railroads. In 1897 President McKinley appointed him ambassador to France. His writings include West Point Life; Campaigning with Grant; and the articles on Five Forks and the Pursuit of Lee and The Surrender at Appomattox Court House, in Battles and Leaders of the Civil War.

PORTER, Jane, was born at Durham, England in 1776, and made her first essay in literature in 1803 by the publication of Thaddeus of Warsaw, an historical romance, which became extremely popular and secured her European fame. A still greater success attended her Scottish Chiefs (1809). She died at Bristol 1850.

PORTER, Noah, D.D., LL.D., an American philosopher and writer, born at Farmington, Conn., in 1811. Graduating at Yale college in 1831, he was ordained pastor of the Congregational church, New Milford, Conn., in 1836, and in 1843 settled at Springfield, Mass. Returning to Yale in 1846 as professor of metaphysics and moral philosophy, he was elected president in 1871, and continued to hold that position till 1886. Among his chief works are Historical Discourses, the Human Intellect, Books and Reading, the Science of Nature versus the Science of Man, The Elements of Intellectual Philosophy, The Elements of Moral Science, Bishop George Berkeley, and Kant's Ethics. Dr. Porter also edited an edition of Webster's Dictionary. He died in 1892.

PORT HURON, a city on the St. Clair river, Michigan, where it leaves Lake Huron. It has an extensive lumber trade, ship-yards, saw, flour, and planing mills, etc., and is connected with Sarnia in Canada by ferries and a railroad passing under the river. Pop. 21,972.

PORTICO, in architecture, a kind of porch before the entrance of a building fronted with columns, and either projecting in front of the building or receding within it. Porticoes are styled tetrastyle, hexastyle, octostyle, decastyle, according as the columns number four, six, eight, or ten.

PORTLAND, a seaport and largest city in Maine, on a peninsula at the western extremity of Casco bay, a picturesque and well-built city, with handsome public buildings, and abundance of trees in many of its streets. Locomotive cars, etc., are made; there are also ship building yards, glass-works, potteries, and rope-walks; and the refining of petroleum and sugar is extensively carried on. The trade both maritime and inland is extensive, Portland being the terminus of important railways. The principal exports are timber, fish, beef, butter, etc. Pop. 60,242.

PORTLAND, the chief city of Oregon, situated on the left bank of Willamette river, about 12 miles from its confluence with the Columbia. It is the terminus of the Northern Pacific, Union Pacific, Great Northern, and the Southern Pacific railways, and is at the head of ship navigation, having regular steam communication with British Columbia and San Francisco. Pop. 1909 about 250,000.

PORTLAND BEDS, in geology, a division of the upper Oolites occurring between the Purbeck beds and the Kimmeridge clay, consisting of beds of hard oolitic limestone and freestone interstratified with clays and resting on light-colored sands which contain fossils, chiefly mollusca and fish with a few reptiles. They are named from the rocks of the group forming the Isle of Portland in Dorsetshire, from whence they may be traced through Wiltshire as far as Oxfordshire.

PORTLAND CEMENT, a well-known cement, so called from its resemblance in color to Portland stone. It is made from chalk and gault clay in definite porportions. These materials are intimately mixed with water, and formed into a sludge. This is dried, and when caked is roasted in a kiln till it becomes hard. It is afterward ground to a fine powder, in which state it is ready for market. This cement is much employed along with gravel or shivers for making artificial stone. A month after it is set it forms a substance so hard as to emit a sound when struck.

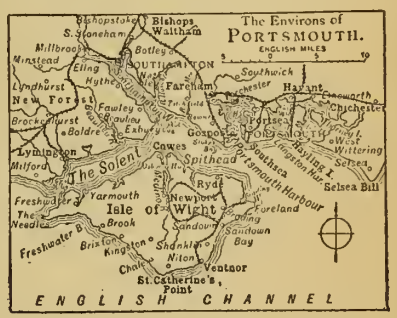
PORTLAND STONE is an oolitic limestone occurring in great abundance in the Isle of Portland, England. It is one of the members of the Portland Beds, and is much used in building, being soft when quarried, but hardening on exposure to the atmosphere.

PORTO-RICO, one of the larger West India islands, the fourth in size of the Antilles, east of Hayti; area, with subordinate isles, 3596 sq. miles. The island is beautiful and very fertile. A range of mountains, covered with wood, traverses it from east to west, averaging about 1500 feet in height, but with one peak 3678 feet high. In the interior are extensive savannahs; and along the coast tracts of fertile land, from 5 to 10 miles wide. The streams are numerous, and some of the rivers can be ascended by ships to the foot of the mountains. There are numerous bays and creeks. The chief harbor is that of the capital, San Juan de Porto Rico; others are Mayaguez, Ponce, and Arecibo. The climate is rather healthy except during the rainy season (Sept.—March). Gold is found in the mountain streams. Copper, iron, lead, and coal have also been found; and there are salines or salt ponds. The chief products are sugar, rum, molasses, coffee, cotton, tobacco, hides, live-stock, dye-woods, timber, rice, etc. Discovered by Columbus in 1493, it was settled by the Spaniards in 1510, who ceded it to the United States in 1898. Pop. 953,243.

PORTO-RICO, San Juan de, the capital and principal seaport of the above island, on its north coast, stands upon a small island connected with the mainland by a bridge, is surrounded by strong fortifications, and is the seat of the government and superior courts of the island. The harbor is capable of accommodating ships of the largest size. Pop. 32,048.

PORT SAID, a town of Egypt, on the Mediterranean, at the northern entrance of the Seuz Canal. It was begun simultaneously with the canal in 1859, being designed for its terminal port. There is an outer harbor formed by two piers jutting out into the sea, each terminated by a small lighthouse. This admits large ocean steamers, which thus sail into the inner harbor and from it into the canal. Near the entrance to the inner harbor is a lofty lighthouse with a powerful light. Pop. 42,095.

PORTSMOUTH, the principal station of the British navy, a seaport, municipal county, and parl. borough of England, in Hampshire, on the southwest extremity of the island of Portsea. The royal dockyard covers an area of about 500 acres, and is considered the largest and most magnificent establishment of the kind in the world. A series of hills, 4 miles to the north of Portsmouth, and commanding its front to the sea, are well fortified with strong forts. On the



Gosport side a line of forts extends for 4 miles. The municipal and parliamentary borough includes nearly the whole of the island of Portsea. It sends two members to the House of Commons. Pop. 189,160.

PORTSMOUTH, a seaport in Rockingham co., New Hampshire, on the right bank of the Piscataqua, 3 miles above its mouth in the Atlantic, 50 miles north by east of Boston. It has long been noted for its skill in naval architecture, and for maritime enterprise. It is the seat of a government navy-yard, and the harbor is one of the safest and most commodious in the United States, Pop. 12,237.

PORTSMOUTH, a seaport town in Norfolk co., Virginia, at the mouth of the Elizabeth, 88 miles e.s.e. Richmond; has a military academy and a harbor allowing ships of the heaviest burden to come to the wharfs. At Gosport, a suburb, are a navy-yard, dry dock, and naval hospital. Pop. 19,115.

PORTSMOUTH, a town in Scioto co., Ohio, on the Ohio; has extensive iron manufactures. Pop. 20,146.

PORTSMOUTH, TREATY OF, in accordance with the proposal of President Roosevelt in May, 1905, after nearly 16 months of war, Russia and Japan named their plenipotentiaries to end the war and conclude peace. The meeting

took place at Portsmouth, N. H., on September 5th. The treaty was signed by the plenipotentaries and was approved by the Emporor of Japan and the Czar of Russia on the 16th of September.

POR'TUGAL, a kingdom in the southwest of Europe, forming the west part of the Iberian peninsula; bounded east and north by Spain, and west and south by the Atlantic; greatest length, north to south, 345 miles, greatest breadth, 140 miles. Seven old provinces: Minho, Trazos-Montes, Beira (Upper and Lower), Estremadura, Alemtejo, and Algarve now form seventeen districts, total area 34,462 sq. miles, population, 5,021,657 in 1906. Add to these the Azores (921 sq. miles; population, 256,474), and Madeira (315 sq. miles; population, 150,528), which gives a grand total of 35,698 sq. miles, and a population of 5,428,659. The colonial possessions of Portugal consist of—in Asia—Goa, Salsette, Damaun, and Diu, all in Hindustan, Macao in China, and possessions in the Indian Archipelago, having together an area estimated at 9000 sq. miles and a population estimated at 941,000; in Africa—Cape Verd, St. Thomas, and Prince's Islands, the Guinea settlements, Angola, Mozambique and dependencies, with an aggregate area of 792,000 sq. miles, and an estimated population of 8,197,790. The total area of the Portuguese possessions, therefore, amounts to 801,000 sq. miles, the population to nearly 9,250,000.

Portugal is only partially separated from Spain by natural boundaries. Its shape is nearly that of a parallelogram. The coast-line, of great length in proportion to the extent of the whole surface, runs from the north in a general s.s.w. direction till it reaches Cape St. Vincent, where it suddenly turns east. The only harbors of importance, either from their excellence or the trade carried on at them, are those of Lisbon, Oporto, Setubal, Faro, Figueira, Aveiro, and Vianna. The interior is generally mountainous, a number of ranges stretching across the country, forming a succession of independent river basins, while their ramifications form the watersheds of numerous subsidiary streams, and inclose many beautiful valleys. The minerals include lead, iron, copper, manganese, cobalt, bismuth, antimony, marble, slate, salt, saltpeter, lithographic stones, mill-stones, and porcelain earth. No rivers of importance take their rise in Portugal. The Minho in the north, the Douro, and the Tagus all flow from east to west. The Guadiana is the only large river which flows mainly south. Portugal can only claim as peculiarly her own the Vouga, Mondego, and Sado.

The climate is greatly modified by the proximity of the sea and the height of the mountains. In general the winter is short and mild, and in some places never completely interrupts the course of vegetation. In the mountainous districts the loftier summits obtain a covering of snow, which they retain for months; but south of the Douro, and at a moderate elevation, snow does not lie long. The mean annual temperature of Lisbon is about 56°. Few countries have a more varied flora than Portugal. Many of the mountains are clothed with forest trees, among which the common oak and the cork oak are conspicuous. In the central provinces chestnuts are prevalent; in the south both the date and the American aloe are found; while in the warmer districts the orange, lemon, and olive are cultivated with success. The mulberry affords food for the silkworm, and a good deal of excellent silk is produced. The vine, too, is cultivated, and large quantities of wine are exported. Agriculture generally, however, is at a low ebb, and in ordinary years Portugal fails to raise cereals sufficient to meet its own consumption. Among domestic animals raised are mules of a superior breed, sheep, goats, and hogs. More horned cattle have been raised and of a better quality, and live-stock now figures with timber and wine among the chief exports. The fisheries, so long neglected, have also been revived in recent years.

Manufactures are of limited amount, although they have been increasing of late years. They embrace woolens, cottons, silks, earthenware and porcelain, soap, paper, iron goods, hats, etc. The principal exports are wine, cork, cattle, timber, olive-oil, fruits, iron and copper pyrites, and wool; the principal imports are cereals, salt provisions, colonial produce, woolen, cotton, linen, and silk tissues, iron, steel, and other metals, and coal. The bulk of the trade is with Great Britain, France, and Brazil.

The crown is hereditary both in the male and female line. The constitution recognizes four powers in the state—the legislative, executive, judicial, and moderating. The last is vested in the sovereign. There are two chambers, the Chamber of Peers and the Chamber of Deputies. In 1885 a law was passed abolishing hereditary peerages by a gradual process. While the established religion is the Roman Catholic, other religions are tolerated. Conventual establishments were suppressed in 1834. Education, under a distinct ministry, is compulsory; but the law is not enforced, and the general state of education is low. The army, consisting of 30,000 men on the peace footing, is raised both by conscription and enlistment. The navy is as yet of insignificant strength.

The Phœnicians, Carthaginians, and and Greeks early traded to this part of the peninsula, the original inhabitants of which are spoken of as Lusitanians, the country being called Lusitania. When the Spaniards finally wrested the country between the Minho and the Douro from Moorish hands, they placed counts or governors over this region. Alphonso I., defeated Alphonso, king of Castile, in 1137, and made himself independent. In 1139 he gained the brilliant victory of Ourique over the Moors, and was saluted on the field King of Portugal. The cortes convened by Alphonso in 1143 at Lamego confirmed him in the royal title, and in 1181 gave to the kingdom a code of laws and a constitution. The succeeding reigns from Alphonso I. to Dionysius (1279) are noteworthy chiefly for the conquest of Algarve (1251) and a conflict with the pope, who several times put the kingdom under interdict. Dionysius' wise encouragement of commerce, agriculture, manufactures, and navigation laid the foundation of the future greatness of Portugal. He liberally patronized learning, and founded a university at Lisbon, transferred in 1308 to Coimbra. He was succeeded by Alphonso IV., who in conjunction with Alphonso II. of Castile defeated the Moors at Salado in 1340. He murdered Inez de Castro, the wife of his son Pedro (1355) who succeeded him. Dying in 1367, Pedro I. was succeeded by Ferdinand, on whose death in 1383 the male line of the Burgundian princes became extinct. His daughter Beatrice, wife of the King of Castile, should have succeeded him; but the Portuguese were so averse to a connection with Castile that John I., natural son of Pedro, grand-master of the order of Avis (founded in 1162), was saluted king by the estates. In 1415 he took Ceuta, on the African coast, the first of a series of enterprises which resulted in those great expeditions of discovery on which the renown of Portugal rests. In this reign were founded the first Portuguese colonies, Porto Santo (1418), Madeira (1420), the Azores (1433), and those on the Gold coast. The expeditions of discovery were continued with ardor and scientific method. Bartolommeo Diaz doubled the Cape of Good Hope in 1487, and Vasco da Gama reached India in 1498. In 1500 Cabral took possession of Brazil. While these great events were still in progress John II. was succeeded by his cousin Emanuel (1495–1521). The conquests of Albuquerque and Almeida made him master of numerous possessions in the islands and mainland of India, and in 1518 Lope de Soares opened a commerce with China. Emanuel ruled from Babelmandeb to the Straits of Malacca, and the power of Portugal had now reached its height. In the reign of John III., son of Emanuel (1521–57), Indian discoveries and commerce were still further extended. The Inquisition was introduced (1536), and the Jesuits were admitted (1540). Sebastian, the grandson of John III., who had introduced the Jesuits, having had his mind inflamed by them against the Moors of Africa, lost his life in the battle against these infidels (1578), and left his throne to the disputes of rival candidates, of whom the most powerful, Philip II. of Spain, obtained possession of the kingdom by the victory of Alcantara. Portugal continued under the dominion of Spain till 1640, and her vast colonial possessions were united to the already splendid acquisitions of her rival. But these now began to fall into the hands of the Dutch, who, being provoked by hostile measures of Philip, attacked the Portuguese as well as the Spanish possessions both in India and America. They deprived the Portuguese of the Moluccas, of their settlements in Guinea, of Malacca, and of Ceylon. They also acquired about half of Brazil, which, after the re-establishment of Portuguese independence, they restored for a pecuniary compensation. In 1640, by a successful revolt of the nobles, Portugal recovered her independence, and John IV., duke of Braganza, reigned till 1656, when he

was succeeded by Alphonso VI. On the accession of Maria Francisca Isabella, eldest daughter of Joseph, in 1777, the power was in the hands of an ignorant nobility and a not less ignorant clergy. In 1792, on account of the sickness of the queen, Juan Maria José, prince of Brazil (the title of the prince-royal until 1816), was declared regent. His connections with England involved him in war with Napoleon; Portugal was occupied by a French force under Junot, and the royal family fled to Brazil. In 1808 a British force was landed under Wellington, and after some hard fighting the decisive battle of Vimeira took place (August 21), which was followed by the Convention of Cintra and the evacuation of the country by the French. The French soon returned, however; but the operations of Wellington, and in particular the strength of his position within the lines of Torres Vedras, forced them to retire. The Portuguese now took an active part in the war for Spanish independence. On the death of Maria in 1816, John VI. ascended the throne of Portugal and Brazil, in which latter country he still continued to reside. A revolution in favor of constitutional government was effected without bloodshed in 1820, and the king invited to return home, which he now did. In 1822 Brazil threw off the yoke of Portugal, and proclaimed Dom Pedro, son of John VI., emperor. John VI. died in 1826, having named the Infanta Isabella Maria regent. She governed in the name of the Emperor of Brazil, Dom Pedro IV. of Portugal, who granted a new constitution, modeled on the French, in 1826. In 1831 Dom Pedro resigned the Brazilian crown, and returning to Europe succeeded in overthrowing Dom Miguel, and restoring the crown to Maria in 1833, dying himself in 1834. In 1836 a successful revolution took place in favor of the restoration of the constitution of 1820, and in 1842 another in favor of that of 1826. Maria died in 1853. Her husband, Ferdinand of Saxe-Coburg (Dom Ferdinand II.), became regent for his and her son, Pedro V., who himself took the reins of government in 1855. Pedro died in 1861, and was succeeded by his brother, Louis I. Louis died in 1889, and was succeeded by his son, Carlos I. During these latter reigns the state of Portugal has generally been fairly prosperous. On Feb. 1st, 1908, King Carlos and the Crown Prince Luig Philippe were killed and the Infant Manuel slightly injured by assassins as the king and queen and their two sons were returning in their carriage to the palace. On Feb. 3rd, Manuel II. was crowned king.

PORT WINE is a very strong, full-flavored wine produced in the upper valley of the Douro, Portugal, and has its name from the place of shipment, Oporto. It is slightly astringent, and has a color varying from pink to red. It requires three or four years to mature, and with age becomes tawny; it receives a certain proportion of spirit to hasten the process of preparation. The vintage begins early in September and extends into October. Large quantities of artificial port are made.

POSEN, a fortified town in Prussia, capital of the province of the same name. The most noteworthy public buildings are the cathedral, in the Gothic style (1775), the town parish church, a fine building in the Italian style, both Roman Catholic; the town-house (1508), with a lofty tower; the Raczynski library; the municipal archive building, etc. The manufactures consist chiefly of agricultural machines, manures, woolen and linen tissues, carriages, leather, lacquerware, etc.; besides breweries and distilleries. Pop. 117,014.—The province is bounded by west Prussia, Russian Poland, Silesia, and Brandenburg; area, 11,178 sq. miles.

POSIDONIUS, a Stoic philosopher, born in Syria, about 135 B.C. He settled as a teacher at Rhodes, whence he is called the Rhodian. The most distinguished Romans were his scholars, and Cicero was initiated by him into the Stoic philosophy. Removing to Rome in 51 B.C., he died not long after. In his physical investigations he was more a follower of Aristotle than of the Stoic school.

POSITIVE, in photography, a picture obtained by printing from a negative, in which the lights and shades are rendered as they are in nature. See Photography.

POSITIVE PHILOSOPHY, or **POSITIVISM,** is the name given by Auguste Comte to the philosophical and religious system promulgated by him (chiefly in his Cours de Philosophie Positive, 1830–42, and his posthumous Essays on Religion). The distinguishing idea which lies at the root of this two-fold system is the conception that the anomalies of our social system cannot be reformed until the theories upon which it is shaped have been brought into complete harmony with science. The leading ideas of Comte's philosophy are (1) the classification of the sciences in the order of their development, proceeding from the simpler to the more complex—mathematics, astronomy, physics, chemistry, biology, and sociology; and (2) the doctrine of the "three stages," or the three aspects in which the human mind successively views the world of phenomena, namely, the the ological, the metaphysical, and the scientific.

POST-RESTANTE, a department in a post-office where letters so addressed are kept till the owners call for them. It is for the convenience of persons passing through a country or town where they have no fixed residence.

POST-GLACIAL. See Post-tertiary.

POST MORTEM ("after death"), a Latin term used as in the phrase post mortem examination, an inspection made of a dead body by some competent person in order to ascertain the cause of death.

POST-OFFICE, a department of the government of a country charged with the conveyance of letters, newspapers, parcels, etc. From the time of Cyrus the Elder down to the middle ages various rulers had concocted more or less effective systems of postal communication throughout their dominions; but the "post" as we know it today is an institution of very modern growth. The first traces of a postal system in England are observed in the statutes of Edward III., and the postoffice as a department of government took its rise in the employment of royal messengers for carrying letters. The first English postmaster we hear of was Sir Brian Tuke, his date being 1533. In 1543 a post existed by which letters were carried from London to Edinburgh within four days, but this rate of transportation, rapid for that period, lasted but a short time. James I. improved the postal communication with Scotland, and set on foot a system for forwarding letters intended for foreign lands. In 1607 he appointed Lord Stanhope postmaster for England, and in 1619 a separate postmaster for foreign parts. Up to within a short time of the reign of Charles I., merchants, tradesmen, and professional men availed themselves of any means of conveyance that offered, or employed express messengers to carry their correspondence. The universities and principal cities had their own posts. The foreign merchants settled in London continued to send their foreign letters by private means long after the establishment of the foreign post. In 1632 Charles I. forbade letters to be sent out of the kingdom except through the post-office. In 1635 he established a new system of posts for England and Scotland. All private and local posts were abolished, and the income of the post-offices was claimed by the king. Interrupted by the civil wars, peace had no sooner been restored than a more perfect postal system was established. In 1683 a penny post was set up in the metropolis. During the government of William III. acts of parliament were passed which regulated the internal postal system of Scotland; and under Queen Anne, in 1711, the postal system of England was arranged on the method on which, with some modifications, it continued till near the middle of the 19th century. Sir Rowland Hill, the author of the system at present existing, gave the first intimation of his plan in a pamphlet in the year 1837. He soon had the satisfaction of seeing the legislature adopt his plan, in its principal features at least, and on the 10th January, 1840, the uniform rate of 1 d. per ½ oz. for prepaid letters came into operation. The success of Rowland Hill's scheme was vastly favored by the invention of the adhesive postage-stamp, the idea of which would seem to be due to Mr. James Chalmers of Dundee. Subsequently many important improvements have been made in the management of the post-office business. One of these was the adoption of postal carriages on railways, by which the delivery of letters was greatly accelerated. These carriages are fitted with an apparatus into which letter-bags are thrown without stopping or even materially slackening the speed of the train; while the sorting of letters, etc., proceeds during the transit. The reduction of the cost of carriage, the great increase in the rapidity of transmission, the immense development of commerce, together with the increase of population, have had the effect of enormously increasing the work done by the post-office.

Other departments under the manage-

ment of the post-office in Great Britain are the money-order departments, the savings-bank department, annuities and life assurance department, and telegraph department. For the annuities and life assurance department see Post-office Insurance. The money-order department was annexed to the post-office in 1838. By means of an inland money-order an amount, not exceeding $50, can be transmitted to any person in any part of the United Kingdom and presented for payment at the post-office named in it within twelve months after the date of issue, otherwise it is legally void. At first the rates were much higher than they are now. Postal orders are now provided with counterfoils for retention by the sender. There are now money-order conventions with most foreign countries and with all the colonies, so that money in this form can be transmitted to most parts of the world.

Since 1861 post-office savings banks have been in operation in Britain; the deposits are paid over to the commissioners for the reduction of the national debt who allow interest at 2½ per cent per annum. Not more than $150 may be deposited by a person in any one year nor may the total amount so deposited exceed $1000. France, Austria, Germany, Canada, and other countries also have the like savings banks.

The telegraph lines of the United Kingdom have been worked by the post-office since 1870. An act passed in 1868 authorized the postmaster general to buy up all existing lines, to make extensions and improvements as occasion requires, and to work them as part of the post-office business. A second, passed in 1869, practically gave the government a monopoly in telegraphing. The rate is 6d. for twelve words or less, and ½d. for every word afterward, the addresses of sender and receiver being both charged for.

In the English colonies of America before 1639 such postal facilities as existed were supplied by private enterprise. Letters from abroad were delivered at the wharf to those who called for them or sent to a near-by coffee-house for distribution. Benjamin Franklin was more identified with the Colonial post-office than any other man. In 1737 he was appointed postmaster of Philadelphia. He immediately systematized the department. In 1753 the delivery of letters by the penny post was begun. In 1792 rates of postage were fixed which remained unaltered for nearly half a century. They were: for 30 miles and under, 6 cents; over 30 miles and not exceeding 60 miles, 8 cents; over 60 and not exceeding 100 miles, 10 cents; and so on up to 450 miles and over, for which the charge was 25 cents. In 1851 the rate on letters not exceeding ½ ounce in weight was reduced to 3 cents for distances under 3000 miles and 6 cents for distances above 3000 miles. In 1863 the element of distance as a factor in fixing the scale of rates was abolished and a uniform rate of 3 cents was established for letters not exceeding ½ ounce in weight. In 1883 this rate was reduced to 2 cents.

In 1847 adhesive postage stamps were first introduced into the United States, but, on account of the high rate of postage and the provision allowing optional prepayment, they did not come into general use until 1855, when the rates were reduced and prepayment required. In 1852 stamped envelopes were introduced and in 1872 postal cards were authorized. In 1879 double or reply postal cards were authorized, and in 1898 private mailing cards were allowed to be sent through the mails at the rate of one cent postage, subject to certain restrictions prescribed by the postmaster-general.

By an act of 1855 provision was made for a system of registration by which extra precaution is taken in the transmission of valuable letters and parcels upon payment of a fee of eight cents in addition to the regular postage. By an act of 1897, provision was made for indemnifying persons who lose registered letters and parcels of value, when the actual value of the article is less than $25.

In 1864 the postal money order system was adopted. No single money order for more than $100 may be issued.

The system of delivering mail by carriers at the houses and offices of persons to whom it is addressed was first introduced in 1863. In 1865 free delivery was extended to all places having a population of 50,000. In 1873 the system was extended to all places of 20,000 inhabitants and over, and in 1887 to cities of 10,000 inhabitants. Provision was also made in 1885 for special or immediate delivery of letters within certain limits upon the payment of a fee of 10 cents in the form of a special stamp. In 1896 the delivery of mail in rural districts was inaugurated.

In the United States there is no distinct parcels post as in England, parcels being conveyed through the regular mails as fourth-class matter. Arrangements, however, exist with Mexico, certain of the West Indies, and certain Central and South American countries providing for a parcels post between the countries concerned.

In the United States all mail matter is divided into four classes. The first class includes letters, post-cards, and anything closed against inspection: postage, 2 cents each oz. or additional fraction of an oz.; post-cards, 1 cent; registered letters, 8 cents in addition to postage. Second class matter includes all newspapers, periodicals, etc., issued as frequently as four times a year: postage, one cent per lb. or fraction thereof. When the newspapers, etc., are sent by persons other than the publishers the charge is one cent for each four ounces. Mail matter of the third class includes books, circulars, proof-sheets, etc.: postage, 1 cent for each 2 ozs.; limit of weight, 4 lbs. each package. The fourth class embraces merchandise and all matters not included in the other three classes: postage, 1 cent per oz.; limit of weight, 4 lbs. Prepayment of postage by stamps for all classes of matter is required. In most of the Central and South American states the postal system is as yet far from being well organized, though a somewhat better state of affairs prevails in Chile, Mexico, the Argentine Republic, and Brazil, in each of which there is also a system of state telegraphs.

In recent years an immense stride has been taken in the improvement of postal communication between different countries by the formation of the International Postal Union, the provisions adopted by which came into force in 1875. The Union has been greatly enlarged since that time; and only a few countries or regions now remain outside of it, such as China, Abyssinia, Arabia, etc. All the countries in the Union have a uniform charge for letters, etc., passing between them. Practically an ounce letter (new rule put in force Oct. 1, 1907) is carried to any part of the world for five cents and a post card for two cents. In 1908 a two-cent postage rate between the United States and Great Britain went into effect.

POST-PLEIOCENE, or **POST-PLIOCENE,** in geology, same as Pleistocene.

POST-TERTIARY, in geology, the Lyellian term for all deposits and phenomena of more recent date than the Norwich or mammaliferous crag. It may be restricted so as only to include accumulations and deposits formed since the close of the glacial or bolder drift systems, and has been divided into three sections—historic, pre-historic, and post glacial. The first comprises the peat of Great Britain and Ireland, fens, marshes river-deposits, lake-silts, accumulations of sand-drift, etc., containing human remains, canoes, metal instruments, remains of domestic animals, etc. The pre-historic comprises similar, or nearly similar deposits, but the remains found in them are older, comprising stone implements, pile-dwellings, and extinct animals, as the Irish deer, mammoth, etc. To the post-glacial belong raised beaches, with shells of a more boreal character than those of existing seas, the shell-marl under peat, many dales and river valleys, as well as the common brick-clay, etc., covering submarine forests or containing the remains of seals, whales, the mammoth, rhinoceros, urus, hyæna, hippopotamus, etc.

POTASH, or **POTASSA,** an alkaline substance obtained from the ley of vegetable ashes which is mixed with quicklime and boiled down in iron pots, and the residuum ignited, the substance remaining after ignition being common potash. It derives its name from the ashes and the pots (called potash kettles) in which the lixivium is (or used to be) boiled down. An old name was vegetable alkali. Potash in this crude state is an impure carbonate of potassium which when purified is known in commerce as pearl-ash. It is used in the making of glass and soap, and large quantities of it are now produced from certain "potash minerals" (especially carnallite), instead of from wood ashes. What is known as caustic potash (hydrate of potassium, is prepared from ordinary potash. It is solid, white, and extremely caustic, eating into animal and vegetable tissues with great readiness. It changes the purple of violets to green, restores reddened litimus to blue and yellow tumeric to reddish-brown. It rapidly attracts humidity from the air

and becomes semi-fluid. It is fusible at a heat of 300°, and is volatilized at low ignition. It is used in surgery under the name of lapis infernālis or lapis causticus for destroying warts, fungoid growths, etc., and may be applied beneficially to the bites of dogs, venomous serpents, etc. In chemistry it is very extensively employed, both in manfactures and as an agent in analysis. It is the basis of the common soft soaps, for which purpose, however, it is not used in its pure state.

POTASH WATER, an aerated water produced by mixing bicarbonate of potash with carbonic acid water in the proportion of 20 grains to each bottle of the water, or about half an ounce to the gallon. Bisulphate of potash, as being cheaper than tartaric acid, is sometimes used (but should not be) with carbonate of soda to produce the common effervescing drink. A valuable medicinal water is compounded of a certain proportion of bromide of potassium.

POTAS'SIUM (a latinized term from potash), a name given to the metallic basis of potash, discovered by Davy in 1807, and one of the first-fruits of his electro-chemical researches; symbol, K; atomic weight, 39.1. Next to lithium it is the lightest metallic substance known, its specific gravity, being 0.865 at the temperature of 60°. At ordinary temperatures it may be cut with a knife and worked with the fingers. At 32° it is hard and brittle, with a crystalline texture; at 50° it becomes malleable, and in luster resembles polished silver; at 150° it is perfectly liquid. Potassium has a very powerful affinity for oxygen, which it takes from many other compounds. A freshly-exposed surface of potassium instantly becomes covered with a film of oxide. The metal must therefore be preserved under a liquid free from oxygen, rock-oil or naphtha being generally employed. It conducts electricity like the common metals. When thrown upon water it decomposes that liquid with evolution of hydrogen, which burns with a pale violet flame, owing to the presence in it of potash vapor. Chloride of potassium is known in commerce as "muriate of potash," and closely resembles common salt (chloride of sodium). It is obtained from potassic minerals, the ashes of marine plants (kelp), and from sea-water or brine springs. It enters into the manufacture of saltpeter, alum, artificial manure, etc. Bromide and iodide of potassium are useful drugs. Bicarbonate of potassium is obtained by exposing a solution of the carbonate to the air, carbonic acid being imbibed from the atmosphere, and crystals being deposited; or it is formed more directly by passing a current of carbonic acid gas through a solution of the carbonate of such a strength that crystals form spontaneously. It is much used in medicine for making effervescing drinks. Nitrate of potassium is nitre, or saltpeter. Sulphate of potassium is used medicinally as a mild laxative, in making some kinds of glass and alum, and in manures. The bisulphate is used as a chemical reagent and in colico-printing and dyeing. Chlorate of potassium is employed in the manufacture of lucifer matches, in certain operations in colico-printing, and for filling friction-tubes for firing cannon. It is a well-known source of oxygen. The bichromate is also used in calico-printing and dyeing. Cyanide of potassium is much used in photography.

POTATO, a plant belonging to the natural order Solanaceæ, which also includes such poisonous plants as nightshade, henbane, thorn-apple, and tobacco. We owe this esculent to western South America, where it still grows wild chiefly in the region of the Andes, producing small, tasteless, watery tubers. The potato is a perennial plant, with angular herbaceous stems, growing to the height of 2 or 3 feet; leaves pinnate; flowers pretty large, numerous, disposed in corymbs, and colored violet, bluish, reddish, or whitish. The fruit is globular, about the size of a gooseberry, reddish-brown or purplish when ripe, and contains numerous small seeds. The tubers, which furnish so large an amount of the food of mankind, are really underground shoots abnormally dilated, their increase in size having been greatly fostered by cultivation. Their true nature is proved by the existence of the "eyes" upon them. These are leaf-buds, from which, if a tuber or a portion of it containing an eye is put into earth, a young plant will sprout, the starchy matter of the tuber itself supplying nutriment until it throws out roots and leaves, and so attains an independent existence. The potato succeeds best in a light sandy loam containing a certain proportion of vegetable matter. The varieties are very numerous, differing in the time of ripening, in their form, size, color, and quality. New ones are readily procured by sowing the seeds, which will produce tubers the third year, and a full crop the fourth. But the plant is usually propagated by sowing or planting the tubers, and it is only in this way that any one variety can be kept in cultivation. Like all plants that are extensively cultivated and under very different circumstances of soil, climate, and artificial treatment, the potato is extremely subject to disease. Among the diseases to which it is liable are the "curl," the "scab," the "dry-rot," and the "wet-rot," besides the more destructive potato disease proper. The principal feature of the curl is the curling of the shoots soon after their first appearance. After that they make little progress, and sometimes disappear altogether. The plants produce no tubers, or only a few minute ones, which are unfit for food. The scab is a disease that attacks the tubers, which become covered with brown spots on the outside, while underdeath the skin is a fungus called Tubercinia scabies. The dry-rot is characterized by a hardening of the tissues, which are completely gorged with mycelium (the vegetative part of fungi). In the disease called wet-rot the potato is affected much in the same way as by the dry-rot; but the tubers, instead of becoming hard and dry, are soft. The fungus present in wet-rot is supposed to be the same that accompanies dry-rot. The potato is also attacked by various insects, the most destructive being the Colorado beetle. The tubers consist almost entirely of starch, and being thus deficient in nitrogen, should not be too much relied on as a staple article of diet. Potatoes are extensively used as a cattle-food, and starch is also manufactured from them. A coarse spirit is also obtained from them by distillation, the starch being converted into sugar by means of malt or sulphuric acid, and then fermentation set up.

POTATO-BUG, a name given in America to many insects injurious to

Colorado potato bug and its feeding larva.

the potato, such as the Colorado beetle, which see.

POTEMKIN (pot-yom'kin), Gregory Alexandrovitch, Russian general, a favorite of the Empress Catharine II., born in 1736, died in 1791. From 1776 till his death, a period of more than fifteen years, he exercised a boundless sway over the destinies of the empire. In 1783 he suppressed the khanate of the Crimea, and annexed it to Russia. In 1787, being desirous of expelling the Turks from Europe, he stirred up a new war, in the course of which he took Oczakoff by storm (1788). In the following year (1789) he took Bender, but as the finances of Russia were now exhausted Catharine was desirous of peace. Potemkin, however, resolved on conquering Constantinople, resisted the proposal to treat with the enemy, and went to St. Petersburg to win over the empress to his side (March, 1791); but during his absence Catharine sent plenary powers to Prince Repnin, who signed a treaty of peace. When Potemkin learned what had been done he set out for the army, resolved to undo the work of his substitute; but he died on the way, at Nicolaieff.

POTENTIAL ENERGY, that part of the energy of a system of bodies which is due to their relative position, and which is equal to the work which would be done by the various forces acting on the system if the bodies were to yield to them. If a stone is at a certain height above the earth's surface the potential energy of the system consisting of the earth and stone, in virtue of the force of gravity, is the work which might be done by the falling of the stone to the surface of the earth.

POTEN'ZA, a town of Southern Italy and a bishop's see, capital of the province of the same name, on a hill of the Apennines near the Basento, 85 miles e.s.e. of Naples. The province is partly bounded by the Gulf of Taranto and the Mediterranean. Its chief productions are corn, hemp, wine, silk, cotton. Area, 4122 sq. miles; pop. 490,705.

POTO'MAC, a river of the United States, which forms the boundary between Maryland and Virginia, passes Washington, and after a course of nearly 400 miles flows into Chesapeake bay, being about 8 miles wide at its mouth. The termination of the tide-water is at Washington, about 125 miles from the sea, and the river is navigable for large

ships all that distance. Above Washington are several falls which obstruct navigation.

POTOSI (pot-o-sē′; common pronunciation, po-tō′sē), a city of Southern Bolivia, in the department of same name on the slope of the mountain mass of Cerro de Potosi, more than 13,000 feet above the sea-level, in bare and barren surroundings. It has long been celebrated for its silver-mines, which were at one time exceedingly productive, and have again begun to show an improved return. Pop. 15,000.—The department has an area of 54,000 sq. miles, and is celebrated for its mineral wealth, especially silver. Pop. 325,615

POTIPOURRI (pō-pō-rē), signifies the same as olla podrida; also, and more generally, a musical medley, or a literary composition made up of parts put together without unity or bond of connection.

POTSDAM, a town in Prussia, a bishop's see, capital of the province of Brandenburg, and the second royal residence of the kingdom, is charmingly situated in the midst of wooded hills, 17 miles southwest of Berlin, on the Havel, which here has several lakes connected with it. Potsdam was an unimportant place till the Great Elector selected it as a place of residence and built the royal palace in the town (1660–71). Pop. 58,452.

POTTER, Paul, a celebrated Dutch painter of animals, born at Enkhuisen in 1625. He died at Amsterdam in 1654, at the early age of twenty-nine. His engravings are much esteemed, and his paintings command a high price.

POTTER, Henry Codman, Episcopal bishop of the diocese of New York. He was born at Schenectady, N. Y., May 25, 1835, educated at the Episcopal academy in Philadelphia and at the

Bishop H. C. Potter.

Theological seminary of Virginia. His earlier charges were Christ church, Greensburg, Pa., in 1857; St. John's church at Troy, N. Y., in 1859; Trinity church, Boston, in 1866; and Grace church, New York, in 1868. He became bishop of New York in 1887, having been assistant bishop four years previously. He is well known as a lecturer. He died in 1908.

POTTERY, the art of forming vessels or utensils of any sort in clay. This art is of high antiquity, being practiced among various races in prehistoric times. We find mention of earthenware in the Mosaic writings. The Greeks had important potteries at Samos, Athens, and Corinth, and attained great perfection as regards form and ornamentation. The Italians are said first to have become acquainted with this kind of ware as it was manufactured in the Island of Majorca, and hence they gave it the name of majolica. About the middle of the 16th century the manufactory of Bernard Palissy at Saintes in France became famous on account of the beautiful glaze and rich ornaments by which its products were distinguished. A little later the Dutch began to manufacture at Delft the more solid but less beautiful ware which thence takes its name. The principal improver of the potter's art in Britain was Josiah Wedgwood in the 18th century. Porcelain or chinaware first became known in Europe about the end of the 16th century through the Dutch, who brought it from the East.

Though the various kinds of pottery and porcelain differ from each other in the details of their manufacture, yet there are certain general principles and processes which are common to them all. The first operations are connected with the preparation of the potter's paste, which consists of two different ingredients—an earthy substance, which is the clay proper; and a siliceous substance, which is necessary to increase the firmness of the ware, and render it less liable to shrink and crack on exposure to heat. The clay is first finely comminuted, and reduced to the consistency of cream, when it is run off through a set of wire, gauze, or silk sieves into cisterns, where it is diluted with water to a standard density. The other ingredient of the potter's material is usually ground flints, or flint-powder, as it is called. The flint nodules are reduced to powder by being heated and then thrown into water to make them brittle. They are then passed through a stamping-mill and ground to fine powder; which, treated in much the same way as the clay, is finally passed as a creamy liquor into a separate cistern. These liquors are now mixed in such measure that the dry flint-powder bears to the clay the proportion of one-sixth or one-fifth, or even more, according to the quality of the clay and the practice of the manufacturer. The mixture is then forced into presses, lined with cloth, by means of a force-pump, the cloth retaining the clay and allowing the water to escape. The clay now forms a uniform inelastic mass, which is cut into cubical lumps and transferred to a damp cellar, where it remains until a process of fermentation or disintegration renders it finer in grain and not so apt to crack in the baking. But even after this process the ingredients composing the paste are not intimately enough incorporated together nor sufficiently fine in texture until another operation has been undergone, called slapping or wedging, which consists in repeatedly breaking the lumps across and striking them together again in another direction, dashing them on a board, etc. This final process of incorporation is now most frequently performed by machinery.

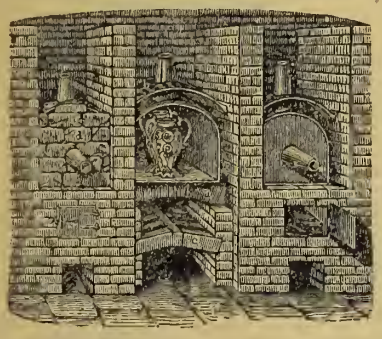
In making earthenware vessels, if they are of a circular form, the first operation after the paste has been made is turning, or what is technically called throwing them on the wheel. This is an apparatus resembling an ordinary turning-lathe, except that the surface of the chuck, or support for the clay, is horizontal instead of vertical. The chuck is in fact a

Successive stages of earthenware vessel on the potter's wheel.

revolving circular table, in the center of which a piece of clay is placed, which the potter begins to shape with his hands. The rotary motion of the table gives the clay a cylindrical form in the hands of the potter, who gradually works it up to the intended shape. It is then detached from the revolving table and dried, after which, if intended for finely-finished ware, it is taken to a lathe and polished. It is at this stage that the handles and other prominent parts are fitted on, which is done by means of a thin paste of clay called slip. The articles are now removed to a room in which they are dried more thoroughly at a high temperature. When they have reached what is called the green state they are again taken to a lathe and more truly shaped, as well as smoothed and burnished. When the articles are not of a circular form, and accordingly cannot be produced by means of the wheel, they are either pressed or cast in molds of plaster of Paris. In the former case the paste used is of the same consistency as that employed on the wheel; in the latter, molds of the same sort are used, but the clay mixture is poured into them in the condition of slip. By the absorption of the water in the parts next the dry mold a crust is formed of greater or less thickness, according to the time that the liquid is allowed to remain. The molds are in two or more pieces, so as to be easily detached from the molded article.

When shaped and dried the articles are ready for the kiln, in which they are exposed to a high temperature until they acquire a sufficient degree of hardness for use. The paste of which the earthenware is composed is thus converted into what is called bisque or biscuit. While undergoing this process of baking, the articles are inclosed in larger vessels of baked fire-clay, called saggers, to protect them from the fire and smoke,

and to distribute the heat more uniformly. The whole firing lasts from forty to forty-two hours. After the kilns have been allowed to cool very slowly, the articles are taken out, and if they are not to be decorated in color, and sometimes also when they are to be so decorated, they are immersed in a vitrifiable composition called glaze, which, after the vessels have been a second time subjected to heat in glazed



The muffle for fixing the colors on decorated porcelain.

saggers, is converted into a coating of glass, rendering the vessels impermeable to water.

Porcelain or chinaware is formed only from argillaceous minerals of extreme delicacy, united with siliceous earths capable of communicating to them a certain degree of translucency by means of their vitrification. Porcelain is of two kinds—hard and tender. Both consist, like other earthenwares, of two parts—a paste which forms the biscuit, and a glaze. The biscuit of hard porcelain is composed of kaolin or china clay, and of decomposed felspar. The glaze consists of a felspar rock reduced to a fine powder, and mixed with water, so as to form a milky liquid into which the articles are dipped after a preliminary baking. Tender porcelain biscuit is made of a vitreous frit, composed of siliceous sand or ground flints, with other ingredients added, all baked together in a furnace till half-fused, and then reduced to a condition of powder.

The manufacture of pottery, stoneware, and china has been established in the United States for many years, and is now conducted on the most extensive scale both at the east and in some portions of the west—notably at a pottery in Cincinnati, Ohio, where a very superior quality of ornamental china is included in the output. The principal depots for the manufacture of this commodity are at Trenton, N. J., and at East Liverpool, Ohio, where, it is said, fully nine-tenths of the capital employed in the production of pottery in the United States are invested. There are potteries also at East Boston, Mass.; Geddes, N. Y.; Green Point, L. I.; Peoria, Ill., and at various points in West Virginia, their lines of production grading from the ordinary descriptions of pottery to the best qualities of vitrified china. The trade catered to is domestic, and for some portions of Canada, South America, and Mexico.

POTTSTOWN, a town in Pennsylvania, on the Schuylkill, between Philadelphia, and Reading. Pop. 15,120.

POTTSVILLE, a town in Pennsylvania, in the center of the great anthracite coal-fields, with blast-furnaces, forges, foundries, rolling-mills, machine factories, etc. Pop. 18,210.

POUGHKEEPSIE (po-kēp'si), a city in the state of New York, the capital of Dutchess county, situated on the east bank of the Hudson river, 74 miles north of New York City and 70 miles south of Albany. It is built partly on a slope, partly on a plateau, about 200 feet above the river, and is prettily situated. It is distinguished for its educational institutions, and is known as the "City of Schools." These include Vassar college for women, one of the chief institutions of the kind in America. Poughkeepsie was the seat of the convention of 1788, at which the federal constitution was adopted. Pop. 1909, 26,000.

POULTICE, in medicine, a soft moist application applied externally to some part of the body either hot or cold, but generally the former. The simple poultice is made with linseed meal and boiling water, spread out with uniform thickness on a cloth or rag, and is used where it is desired to hasten the progress of inflammation. Its moisture causes relaxation of the skin, and thereby lessens the discomfort or pain. It acts also as a counter-irritant, producing a redness and congestion of the skin. Disinfecting poultices are made with charcoal, mixed with linseed-meal and bread. The sedative poultice, made with beer, yeast, flour, and hot water, is generally used to relieve pain in cases of cancer. The best-known poultice, however, is the counter-irritant, commonly called a mustard-plaster. This may be made, by mixing linseed-meal with water, and adding mustard. It produces a rapid but mild counter-irritation, indicated by a redness of the skin and is very useful in cases of bronchitis, lumbago and similar affections.

POULTRY, a general name for all birds bred for the table, or kept for their eggs. The birds most commonly included under this designation are the common fowl, the pea-fowl, the guinea-fowl, the turkey, goose, and duck.

POUND, an English weight of two different denominations, avoirdupois and troy. The pound troy contains 5760 grains, and is divided into 12 ounces; the pound avoirdupois, contains 7000 grains, and is divided into 16 ounces. The pound, or pound sterling, the highest monetary denomination used in British money accounts, and equal to 20 shillings, was so called from originally being equal to a quantity of silver weighing one pound. The pound is strictly a money of account, the coin representing it being the sovereign. See Money.

POUSSIN, Nicolas, a distinguished French painter, born at Andelys in 1594. From 1640 to 1642 he resided in Paris; but the rivalry of French painters and the want of appreciation of his works induced him to return to Rome, where he lived until his death in 1665. Among his works are the Seven Sacraments, the Death of Germanicus, the Capture of Jerusalem, the Plague of the Philistines, Abraham's Servant and Rebecca, the Adulteress, the Infant Moses, Moses Bringing Water from the Rock, the Worship of the Golden Calf, John Baptizing in the Wilderness, etc., and many fine landscapes.

POUTER, a variety of fancy pigeon, named for the habit of pouting or puffing

English pouter.

up the breast. They occur in many different color varieties. See Pigeon.

POWDERLY, Terrence Vincent, American labor leader, was born at Carbondale, Lackawana co., Pa., in 1849. In 1879 he was elected general master workman of the Knights of Labor, which he reorganized and greatly extended its interests. In 1893 owing to internal differences arising from opposition to his policy he resigned. In 1878, 1880, and 1882 he was elected mayor of Scranton as candidate of the labor greenback party, and in 1891 republican delegate-at-large to the projected state constitutional convention. He studied law in 1893–94, was admitted to the bar of Lackawanna co., Pa., in 1894, and to that of the United States supreme court in 1901. From 1897 until his resignation in 1902 he was United States commissioner-general of immigration. During the presidential campaigns of 1896 and 1900 he appeared as a republican stump speaker in the west and south.

POWELL, John Wesley, American geologist and anthropologist, was born at Mount Morris, N. Y., in 1834. In 1867 Major Powell visited the Rocky mountains of Colorado for exploration and research. In 1869 he induced Congress to establish a geological and topographical survey of the Colorado river and its tributaries, an undertaking which consumed the following ten years. He published in 1876 Contributions to North American Ethnology. In 1881 he was appointed director of the United States geological and geographical survey. In 1894 he resigned this office to devote himself to the directorship of the Bureau of Anthropology, and to ethnological and philosophical studies. He died in 1902.

POWELL, Robert Stephenson Smyth Baden-, English general, born in 1857 During the South African war of 1899–1902 he highly distinguished himself by

his defense of Mafeking from October, 1899, till his relief in May, 1900, for which he was promoted to the rank of major-general. Author of Pig-sticking, Reconnaissance, Cavalry Instruction, Downfall of Prempeh, Matabele Campaign, etc.

POWER OF ATTORNEY, in law, a written instrument whereby one person is authorized to act for another as his agent or attorney, either generally or in a special transaction.

POWERS, Hiram, American sculptor, born in 1805. He early displayed great ingenuity in mechanical matters, but having formed the acquaintance of a German sculptor, and having been taught modeling by him, he determined to become himself a sculptor. He produced busts of many American statesmen. His most famous ideal works are the statue of Eve, the Greek Slave, and the Fisher Boy. He died in 1873.

POWERS, The Great, a term of modern diplomacy, by which are now meant Britain, France, Austria, Germany, Italy, and Russia.

POYNTER, Sir Edward John, R. A., British painter, was born in Paris in 1836; was elected an associate in 1869 and a Royal Academician in 1876, became president and was knighted in 1896. He was the first Slade professor of art at University college, London. He is the author of Ten Lectures on Art (1879).

PRÆFECT, the title of various functionaries of ancient Rome. Of these the most important was the præfectus urbi or urbis (præfect of the city). During the kingly period and the early republic the præfectus urbis had the right to exercise all the powers of the king or consuls in their absence. After the foundation of the prætorship this office lost its dignity and privileges; but under the empire it was revived as that of chief permanent magistrate of the city, with important military functions.

PRÆTOR, an important official in the ancient Roman state. Up to 367 B.C. the title was merely an adjunct to that of consul; but when at that date the consulship was thrown open to the plebeians, the judicial functions of the consul were separated from his other duties and given to a new patrician magistrate, who was entitled the prætor.

PRÆTORIANS, the body-guard of the Roman emperors, first established as a standing body by Augustus. They were reorganized and their powers curtailed by Septimius Severus and by Diocletian, and were finally disbanded by Constantine the Great in 312 A.D.

PRAGMATIC SANCTION, a public and solemn decree pronounced by the head of a legislature. In European history several important treaties are called pragmatic sanctions, but the one best known by this name is the instrument by which the German emperor Charles VI., being without male issue, endeavored to secure the succession to his female descendants. It was in accordance with this instrument that he settled his dominions on his daughter Maria Theresa.

PRAGUE, the capital of Bohemia, a prosperous and well-built city near the center of the kingdom, on both sides of the Moldau, here crossed by seven bridges; 153 miles northwest of Vienna and 75 miles southeast of Dresden, with both of which it is connected by railway. Its site is a regular basin, cut in two by the river, from the banks of which the houses rise on both sides till they are terminated and inclosed by hills of considerable height. Among the public buildings of Prague are the old castle, or palace of the Bohemian kings; the Roman Catholic cathedral, the Teynkirche or old church of the Hussites, interesting as containing statues and other works of art and the burial-place of the astronomer Tycho Brahe; the palace of Wallenstein, originally a magnificent

View in Prague.

structure, but now much dilapidated, etc. Prague is one of the oldest towns in the kingdom, dating from the 8th century. Its university was founded in 1348, and had at one time about 10,000 students. Recently it was divided into two universities, a German and a Czech or Bohemian, having together more than 3500 students. During the Austro-Prussian war in 1866 Prague was occupied by the Prussians, and here the treaty of peace was signed on the 23d August. Pop. 201,589, or with suburbs 385,238, of whom about six-sevenths are Bohemians.

PRAIRIE, the name given in North America to the vast natural meadows or plains of the Mississippi valley, especially lying between it and the Rocky mountains, and extending northward into Central Canada. Throughout this immense territory the differences of level are sufficient to produce a steady flow of the rivers, but not so great as to obstruct their navigation, thus securing a unique system of easy inter-communication between all sections of the country. There is a great sameness in the features of the topography, the vegetable productions, the soil, and geological features. Some of the prairies that have a peculiarly undulating surface are known as rolling prairies. Immense tracts are cultivated, and produce large crops of wheat and corn with little outlay of labor on the part of the farmer.

PRAIRIE-DOG, or **MARMOT,** a small rodent animal, the wistonwish, allied to the marmot as well as to the squirrel, and found on the North American prairies west of the Mississippi and east of the Rocky mountains. These animals live gregariously in burrows, and are characterized by a sharp bark, like that of a small dog, whence their popular name. They are about 1 foot

Prairie-dogs.

in length exclusive of the tail, which is rather short. Their burrows are quite close together, and have a mound of excavated earth near the entrance, on which the little animals are wont to sit and look around them. These communities are termed "villages." The prairie-dog is not to be confounded with the prairie-squirrel, to which it is allied.

PRAIRIE-HEN, the popular name of the pinnated grouse of the United States. The neck of the male is furnished with neck-tufts of eighteen feathers, and is remarkable also for two loose, pendulous, wrinkled skins, which somewhat resemble an orange on inflation. The prairie-hen is much prized for the table.

PRAIRIE-SQUIRREL, or **GOPHER,** a name for several animals of North America, found in the prairies in great numbers. They live in burrows, and not on trees, and much resemble the prairie-dog or marmot. They have cheek-pouches, in which their food is carried. This consists of prairie plants with their roots and seeds.

PRAIRIE-WOLF, or **COYOTE,** the small wolf which is found on the prairies in North America, believed by many to be a mere variety of the European wolf. It is a cowardly animal, and only dangerous to man when in packs and pressed by hunger.

PRE-ADAMITES, those supposed inhabitants of the earth prior to the creation of Adam. Ancient legends or traditions of the East speak of nations and empires existing before Adam's creation, and of a line of kings who ruled over them. In modern times the subject was taken up by Isaac de la Peyrère, who, in a work published in 1655, maintained that the Jews were the descendants of Adam, and the Gentiles those of a long anterior creation, founding his opinions on Romans v. 12–14.

PREC'EDENT, in law, a judicial decision which serves as a rule for future determinations in similar cases. Precedents, strictly speaking, are binding on tribunals only when they are actual decisions of the point in question; what is termed an extrajudicial opinion or obiter dictum—the opinion of a judge pronounced where it was not called for to decide the issue—can have authority only from the character of the judge, and not as a precedent. Precedents are now of as much authority in courts of equity as in those of common law.

PRECESSION OF THE EQUINOXES, a slow motion of the line of intersection of the celestial equator or equinoctial and the ecliptic, which causes the positions occupied by the sun at the equinox (the equinoctial points, which see) to move backward or westward at the mean rate of 50.25″ per year. This motion of the equinox along the ecliptic carries it, with reference to the diurnal motion, continually in advance upon the stars; the place of the equinox among the stars, with reference to the diurnal motion, thus precedes at every subsequent moment that which it previously held, hence the name. This sweeping round in the heavens of the equinoctial line indicates a motion of the axis of rotation of the earth, such that it describes circles round the poles of the ecliptic in 25,791 years. Nutation is a similar, but much smaller gyratory motion of the earth's axis, whose period is about nineteen years. From these two causes in combination the axis follows a sinuous path, instead of a circle, about the pole of the ecliptic. Nutation causes the equinoctial points to be alternately in advance of and behind their mean place due to precession by 6.87″. At present the vernal equinoctial point is in the zodiacal sign Pisces, and it is moving toward the sign Aquarius.

PRECIOUS METALS, a name commonly applied to gold and silver in contradistinction to such ordinary and abundant metals as iron, copper, lead.

PRECIPITATE, in chemistry, a solid body produced by the mutual action of two or more liquids mixed together, one or other of them holding some substance in solution. The term is generally applied when the solid appears in a flocculent or pulverulent form. Substances that settle or sink to the bottom like earthy matters in water are called sediments, the operating cause being mechanical, not chemical. Red oxide or peroxide of mercury is often called red precipitate.

PREDESTINATION, in theology, the term used to denote the degree of God, whereby the elect are foreordained to salvation. The theory of predestination represents God's absolute will as determining the eternal destiny of man, not according to the fore-known character of those whose fate is so determined, but according to God's own choice. This doctrine has been the occasion of many disputes and controversies in the church in all ages. On the one side, it has been observed that the doctrine of predestination destroys moral distinction, introduces fatalism, and renders all our efforts useless. On the other side, it is contended that if God's knowledge is infinite he must have known everything from eternity; and that the permission of evil under such circumstances is indistinguishable from a plan or decree under which it is foreordained. The first great champions of these opposite views were Pelagius and Augustine. The former held that there was a possibility of good in man's nature, and that the choice of salvation lay in man's will. Augustine maintained that apart from divine grace there is no possibility of good in human nature, and that since the fall man's will has no power of choice. Predestination forms one of the peculiar characteristics of the Calvinistic theology; the question is left an open one by the Anglican church, and also by the Roman Catholic church since the reformation.

PRE-EXISTENCE, Doctrine of, the doctrine sometimes maintained that the soul of every man has an existence previous to that of his body. This opinion was very prevalent in the East, and was held by several Greek philosophers, more especially by the Pythagoreans, Empedocles, and also apparently by Plato. A similar doctrine has found some countenance in Christian times as an explanation of the union of soul and body. In favor of this theory appeal is made to these peculiar sensations which are sometimes raised by sights or sounds, which we feel conscious of having had a former familiarity with, though reason would persuade us we had seen them for the first time. The doctrine is supported by some modern German philosophers, particularly the younger Fichte.

PREFET (prā-fā), the title of an important political functionary in France, whose office was created in 1800 at the instance of Napoleon. There is a préfet at the head of each department, who is intrusted with the whole organization and management of the police establishments; but not with the punishment of police offenses.

PREGNANCY, the state of a female who is with child. It lasts in the human subject from 274 to 280 days; that is to say, that time should elapse from the moment of conception to the time of birth. Among the earliest signs of pregnancy are the stoppage of the monthly discharge, and sickness, usually felt in the early part of the day, and thus called "morning sickness." The latter usually begins about the fourth or fifth week, and may last all the time, but often diminishes in course of the fourth month. Changes in the breast are evident during the second month, the nipple becoming more prominent, and the dark circle round it being deeper in tint by the ninth week, little elevated points in it being more marked. Toward the fourth month enlargement of the belly becomes noticeable, and continues to increase regularly till delivery takes place. About the sixteenth or seventeenth week quickening occurs; that is, the mother becomes aware of movements of the child. Nonc of these signs are, however, absolutely conclusive, as various conditions may give rise to similar signs or signs resembling them. The only conclusive evidence is the detection of the sounds of the child's heart, heard by applying the ear to the belly of the mother, midway between the naval and the line of the groins, a little to the right or left of the middle line. They may be detected about the eighteenth week. During pregnancy women should take regular meals of plain, nourishing food, avoiding rich and highly-seasoned dishes, and should restrain unwholesome cravings, which sometimes exist. Gentle but regular and moderate exercise should be engaged in, all undue exertion, effort, and fatigue being avoided. Clothing should be warm, woolen next the skin, and nowhere tight. Prudence in baths must be exercised, too hot or too cold water being avoided, and the bowels must be kept well regulated, only the mildest medicine being used. Above all a calm and equable frame of mind should be cultivated, and there should be no hesitation in asking advice of the doctor.

PRE'LUDE, in music, originally the first part of a sonata; though, as the name implies, it may be an introduction to any piece of music. Bach and his contemporaries elaborated preludes considerably; and Chopin wrote several piano works which, though complete in themselves, he designated preludes. Latterly the term has been applied to operatic introductions when they are shorter than the usual overture. Wagner in particular has prefaced most of his operas with a prelude.

PREPOSITION, a part of speech which is used to show the relation of one object to another, and derives its name from its being usually placed before the word which expresses the object of the relation. In some languages this relation is often expressed merely by changes of the termination.

PRESBYTERIANS, a name applied to those Christians who hold that there is no order in the church as established by Christ and his apostles superior to that of presbyters, and who vest church government in presbyteries, or associations of ministers and elders, possessed all of equal powers, without any superiority among them. The Presbyterians believe that the authority of their ministers is derived from the Holy Ghost by the imposition of the hands of the presbytery; and they oppose the independent scheme of the common rights of Christians by the same arguments which are used for that purpose by the Episcopalians. They affirm that all ministers, being ambassadors of Christ, are equal by their commission; and that Episcopacy was gradually established upon the primitive practice of making the moderator, or speaker of the presbytery, a permanent officer. These positions they maintain against the Episcopalians by the general argument that the terms bishop and presbyter are used as synonymous terms in the New Testament, and that they were used simply to designate the minister appointed by the apostles to take charge of a new church on its foundation. They therefore claim validity for the ordination after the Presbyterian form, as there was originally no higher ecclesiastic than a presbyter in the church.

The first Presbyterian church in modern times was founded in Geneva by John Calvin about 1541; and the constitution and doctrines were thence introduced, with some modifications, into Scotland by John Knox about 1560, though the Presbyterian was not legally recognized as the national form of church government until 1592. For nearly a century after this date there was a continual struggle in Scotland between Episcopacy and Presbyterianism; until ultimately by the Treaty of Union in 1707 it was agreed on the part of England and Scotland that that form of church government should be the national form of ecclesiastical government

in Scotland, and that the Scotch church should be supported as the only one established by law.—The constitution of the Scotch church, and of the Presbyterian church generally, is as follows: The kirk-session is the lowest court, and is composed of the parochial minister, or ministers, if more than one, and of lay elders (usually from six to twenty) the minister, or senior minister where there are more than one, being president or moderator. This court exercises the religious discipline of the parish; but an appeal may be made from its decisions to the presbytery, and again from the presbytery to the synod. A presbytery consists of the pastors of the churches within a certain district, and of an elder connected with each, while the synod comprises the presbyteries within a certain area, their ministers and representative elders. The general assembly is the highest ecclesiastical court, its decisions being supreme. Besides the Established Church of Scotland there are other important religious bodies whose constitution is strictly Presbyterian, but who, from different principles, decline to have any connection with the state. The chief of these is the United Free church of Scotland, formed by the union of the Free and United Presbyterian churches.

Shortly after the reformation Presbyterianism was in considerable strength in England, a large number of the Puritans preferring this system to episcopacy, but it subsequently declined in strength. The rule of the Stuarts, however, did much to renew its vigor, and in 1642 the Long Parliament abolished episcopacy, a measure followed by the meeting of the famous assembly of divines at Westminster the following year. In 1646 presbytery was sanctioned by parliament, but it was never generally adopted, or regularly organized, except in London and Lancashire. Soon after the restoration episcopacy was restored, and about 2000 Presbyterian clergy were ejected from their cures in consequence of the Act of Uniformity in 1662. Presbyterianism has ever since been simply one of the forms of dissent in England, and has held no prominent position, though many Presbyterian churches are scattered throughout England. Of these by far the greater number are united to form a single body, the Presbyterian church of England.—The Presbyterian church in Ireland originated through the settlement of Scottish colonists in Ulster in the reign of James I. When Charles II. attempted to force Prelacy upon the Scotch many of them took refuge in the north of Ireland, which gave the cause of Presbyterianism in that country a fresh impulse. The favor shown them by William III. was of great assistance to them; which they repaid by the part they played in the rebellion under James II., particularly in the memorable siege of Londonderry. As a test of his gratitude the king doubled the sum given for the support of their ministers, hence known as Regium Donum; the act of 1869, however, which disestablished the Irish church, provided also for the discontinuance of this sum.—The Presbyterian church of the United States is undoubtedly to be reckoned as a daughter of the Church of Scotland. There are at present a number of different organizations of Presbyterians in the states; and the body is also an important one in Canada and the other British colonies, and on the European continent.

PRES'BYTERY, a judicatory, consisting of the pastors of all the churches of any particular Presbyterian denomination within a given district, along with their ruling (i.e, presiding) elders, there being one ruling elder from each church-session commissioned to represent the congregation in conjunction with the minister. The functions of the presbytery are, to grant licenses to preach the gospel, and to judge of the qualifications of such as apply for them; to ordain ministers to vacant charges; to judge in cases of reference for advice, and in complaints and appeals which come from the church-sessions within the bounds of the presbytery; and generally to superintend whatever relates to the spiritual interests of the several congregations under its charge, both in respect of doctrine and discipline. Appeals may be taken from the presbytery to the provincial synod, and then to the general assembly.

PRESCOTT, George Bartlett, American electrician, was born at Kingston, N. H., in 1830. In 1852 he discovered that the aurora borealis is an electric phenomenon. He invented an improvement in telegraph insulators in 1872; with Thomas A. Edison invented and introduced the duplex telegraph and the quadruplex telegraph; and also introduced from Europe the system of sending messages in pneumatic tubes. He died in 1894.

PRESCOTT, William Hickling, American historian, born in Salem, Massachusetts, 1796; died 1859. Acquaintance with Spanish literature, which he began to cultivate in 1824, led him to attempt his first great work on Spanish history, the Reign of Ferdinand and Isabella, published 1837. It was received with enthusiasm both in America and Europe; was rapidly translated into French, Spanish, and German; and its author was elected a member of the Royal academy at Madrid. Prescott's next work was the History of the Conquest of Mexico, with a Preliminary View of the Ancient Mexican Civilization, and the Life of the Conqueror Hernando Cortez, which appeared in 1843, and was received with an equal degree of favor. In 1847 he published the History of the Conquest of Peru, with a Preliminary View of the Civilization of the Incas. In 1855 the first two volumes of the long-expected History of the Reign of Philip II., King of Spain, appeared, and proved to the public equally acceptable with Prescott's former works. In 1858 was published a third volume; but the sudden death of the author from apoplexy put a stop to his labors. Prescott affords a remarkble instance of the success of indomitable industry and perseverance, carried out in spite of the affliction of partial and latterly almost total blindness.

PRESCRIPTION, in medicine, is the form with directions, in which a medicine or medicines are ordered or prescribed by a medical man. The several medical substances which may be contained in a prescription are distinguished by names indicative of the office performed by each. These are: 1. The basis, which is the principal or most active ingredient. 2. The adjuvant, or that which is intended to promote the action of the basis. 3. The corrective, intended to modify its action. 4. The excipient, or that which gives the whole a commodious or agreeable form. To these certain writers add a fifth, the intermedium, which is the substance employed to unite remedies which do not mix with each other or with the excipient, such as yolk of eggs and mucilage, employed in the preparation of emulsions. In choosing the form of a prescription it should be borne in mind that solutions and emulsions generally act with more certainty and rapidity than powders diffused through water; and these again than the semi-solid and solid forms of medicine.

PRESERVED PROVISIONS, MEATS, ETC., the preservation of dead organized matter from the natural process of decay is a most useful means of increasing and diffusing the food supply of the world. Animals, vegetables, and fruits may all be easily preserved for this purpose. The preserving of fruits is an old and familiar process. This is generally effected by boiling or stewing, though drying is also frequently resorted to, where the fruit is meant to be kept intact. Fruits intended for confectionery are preserved in four different ways: 1. In the form of jam, in which the fruit is boiled with from one-half to about equal its weight of sugar. 2. In the form of jelly, in which the juice only is preserved by being carefully strained from the solid portions of the fruit, and boiled with a third to a half of its weight of sugar. 3. By candying, which consists in taking the fruits whole or in pieces, and boiling them in a clear syrup of sugar previously prepared. They absorb the syrup, which is then crystallized by the action of a gentle heat. 4. By stewing them in a weak syrup of sugar and water till they become soft but not broken, and transferring them with the syrup to jars, adding pale brandy equal in quantity to the syrup. Several kinds of vegetables, as cabbages, cucumbers, cauliflowers, onions, are preserved by pickling. Antiseptics are used to preserve meats also, salting being the most common process. But to preserve large quantities of vegetable and animal products for food purposes, and at the same time to keep them nearly in their fresh state, they must be subjected to one of three processes. These are—drying, refrigeration, and exclusion of air. With vegetables, which contain so large an amount of water in proportion to their solid and nutritious material, the process of drying is peculiarly applicable, and it is largely employed as the means of furnishing fresh vegetable food for ships in a compact and portable form, when, in addition to desiccation, compression is also employed. The preservation of articles of food by the application of cold is the simplest of all known methods, and in such climates as North America, Russia, etc., it is largely taken

advantage of. In 1875 ice began to be used to preserve fresh meat in considerable quantities, which was sent from America to Europe. The modern methods of refrigeration for carrying purposes consist of an air-tight room on board ship, where the meat is kept, and through which dry cold air is made to circulate by means of special machinery driven by steam, the air being first compressed and cooled, and a further cooling taking place when it is again allowed to expand.

The process of preservation by exclusion from the action of atmospheric air is yearly assuming more importance and being more largely practiced. The most perfect method, and that which is now most generally resorted to, is the inclosure of the food in air-tight cases from which the air is then expelled; upon the perfection of the air-excluding process depends entirely the preservation of the article. The plan now generally adopted is commonly known as canning, and is applicable alike for flesh-meats, vegetables, and fruits. The process is usually as follows: The provisions of whatever kind are packed into a tin cylinder, and the interstices filled in with water or other appropriate fluid, as gravy in the case of flesh-food. The lid, which is perforated with a small aperture or pin-hole, is soldered carefully down. The cases are then set in a bath of solution of chloride of calcium; heat is applied until the whole boils, and the air is thus expelled through the pin-holes. These holes are then hermetically closed, and the canister and its contents are once more subjected to the operation of heat until the provisions are perfectly cooked. When it has become cool the canister is coated over with paint and removed to the proving room, an apartment the temperature of which has been raised to the degree of temperature most favorable to decomposition. If the operation has been successfully performed, the ends or sides of the canisters will have fallen in to some extent from the outward pressure of the air. If, after the interval of some days, the ends bulge out, it is a certain sign that the process has not been successful, the liberated gases causing the outward pressure. Such cases should be rejected or submitted again to the process. Not only may boiled provisions be preserved in this way, but roast meats also. An improvement on this process has been effected by introducing into the canisters a small quantity of sulphite of soda which causes the absorption of any traces of free oxygen which may lurk in the cases.

PRESS, Correction of the. See Correction of the Press.

PRESS, Liberty of the, the liberty of every citizen to print whatever he chooses, which at the same time does not prevent his being amenable to justice for the abuse of this liberty. The right of printing rests on the same abstract grounds as the right of speech, and it might seem strange to a man unacquainted with history that printing should be subjected to a previous censorship, as it is in some states, and has been in all, any more than speaking, and that the liberty of the press should be expressly provided for in the constitutions of most free states. But when we look to history we find the origin of this, as of many other legislative anomalies, in periods when politics, religion, and individual rights were confusedly intermingled. It is only since men's views of the just limits of government have become clearer that the liberty of the press has been recognized as a right; and to England we are particularly indebted for the establishment of this principle. The existence of a censorship of the press was for centuries, however, deemed an essential to the safety of all European governments. Liberty of printing, as we understand it, is a comparatively modern notion; Milton's plea for a free press met with no response from his own party, nor for very many years later was it the cue of any party in the English commonwealth to refrain from suppressing the writings of their political opponents. In England the liberty of the press, soon after printing was introduced, was regulated by the king's proclamations, prohibitions, charters of license, etc., and finally by the court of Star-chamber. The long parliament, after their rupture with Charles I., assumed the same power. The government of Charles II. imitated their ordinances, and the press did not really become free till the expiration of the statutes restricting it in 1693, after which it was found impossible to pass new laws in restraint of it, and it has remained free ever since, the last restriction being done away with on the abolition of the newspaper stamp duty, in 1856. Such legal checks as remain are merely intended to prevent outrages on religion or decency, to protect subjects from defamation, and to conserve the copyright of authors. The constitutions of many of the United States declare, as we should expect, for liberty of the press. The same may be said of all the South American republics. Among European countries, it may be generally said the liberty of the press is found most predominant among the weaker powers, such as Spain, Turkey, Sweden, and Norway, Switzerland, and Roumania; in France the press may be said to be comparatively free; while in Germany, Austria, and particularly in Russia, there are still many restrictions. In the British colonies the law is as in England, but in India the governor-general exercises a censorship. See Books (Censorship of).

PRESSBURG, or **PRESBURG,** a town in Hungary, 35 miles east of Vienna, beautifully situated on the left bank of the Danube, and on spurs of the Little

PRESIDENTS OF THE UNITED STATES.

	Name	Birthplace	Year	Paternal Ancestry	Residence	Inaugurated		Politics	Place of Death	Year	Age
						Year	Age				
1	George Washington	Westmoreland Co., Va	1732	English	Va.	1789	57	Fed.	Mt. Vernon, Va.	1799	67
2	John Adams	Quincy, Mass.	1735	English	Mass	1797	62	Fed.	Quincy, Mass.	1826	90
3	Thomas Jefferson	Shadwell, Va.	1743	Welsh	Va.	1801	58	Rep.†	Monticello, Va.	1826	83
4	James Madison	Port Conway, Va.	1751	English	Va.	1809	58	Rep.	Montpelier, Va.	1836	85
5	James Monroe	Westmoreland Co., Va	1758	Scotch	Va.	1817	59	Rep.	New York City	1831	73
6	John Quincy Adams	Quincy, Mass.	1767	English	Mass	1825	58	Rep.‡	Washington, D. C.	1848	80
7	Andrew Jackson	Union Co., N. C.*	1767	Scotch-Irish	Tenn	1829	62	Dem.	Hermitage, Tenn.	1845	78
8	Martin Van Buren	Kinderhook, N. Y.	1782	Dutch	N. Y.	1837	55	Dem.	Lindenwold, N. Y.	1862	79
9	William H. Harrison	Berkeley, Va	1773	English	Ohio	1841	68	Whig.	Washington, D. C.	1841	68
10	John Tyler	Greenway, Va.	1790	English	Va.	1841	51	Dem.	Richmond, Va.	1862	72
11	James K. Polk	Mecklenburg Co., N.C.	1795	Scotch-Irish	Tenn	1845	50	Dem.	Nashville, Tenn.	1849	53
12	Zachary Taylor	Orange Co., Va	1784	English	La.	1849	65	Whig.	Washington, D. C.	1850	65
13	Millard Fillmore	Summerhill, N. Y.	1800	English	N. Y.	1850	50	Whig.	Buffalo, N. Y.	1874	74
14	Franklin Pierce	Hillsboro, N. H.	1804	English	N. H.	1853	49	Dem.	Concord, N. H.	1869	64
15	James Buchanan	Cove Gap, Pa.	1791	Scotch-Irish	Pa.	1857	66	Dem.	Wheatland, Pa.	1868	77
16	Abraham Lincoln	Larue Co., Ky.	1809	English	Ill.	1861	52	Rep.	Washington, D. C.	1865	56
17	Andrew Johnson	Raleigh, N. C.	1808	English	Tenn	1865	57	Rep.	Carter's Depot, Tenn.	1875	66
18	Ulysses S. Grant	Point Pleasant, Ohio	1822	Scotch	D. C.	1869	47	Rep.	Mt. McGregor, N. Y.	1885	63
19	Rutherford B. Hayes	Delaware, Ohio	1822	Scotch	Ohio	1877	54	Rep.	Fremont, Ohio	1893	70
20	James A. Garfield	Cuyahoga Co., Ohio	1831	English	Ohio	1881	49	Rep.	Long Branch, N. J.	1881	49
21	Chester A. Arthur	Fairfield, Vt.	1830	Scotch-Irish	N. Y.	1881	51	Rep.	New York City	1886	56
22	Grover Cleveland	Caldwell, N. J.	1837	English	N. Y.	1885	48	Dem.	.....	....	..
23	Benjamin Harrison	North Bend, Ohio	1833	English	Ind.	1889	55	Rep.	Indianapolis, Ind.	1901	67
24	Grover Cleveland	Caldwell, N. J.	1837	English	N. Y.	1893	56	Dem.	.....	....	..
25	William McKinley	Niles, Ohio.	1843	Scotch-Irish	Ohio	1897	54	Rep.	Buffalo, N. Y.	1901	58
26	Theodore Roosevelt	New York City	1858	Dutch	N. Y.	1901	43	Rep.	.....	....	..

*Jackson called himself a South Carolinian and his biograghcr, Kendall, recorded his birthplace in Lancaster County, S. C., but Parton has published documentary evidence to show tbat Jackson was born in Union County, N. C., less than a quarter mile from the South Carolina line. †The Democratic party of to-day claims lineal descent from the first Republican Party and President Jefferson as its founder. ‡Political parties were disorganized at the time of the election of John Quincy Adams. He claimed to be a Republican, but his doctrines were decidedly Federalistic. The opposition to his Adminstration took the name of Democrats and elected Jackson President.

Carpathians. Pop. 65,867, fully more than half of whom are Germans, and 5400 Jews.

PRESTON, a municipal, parl., and county borough of England, in Lancashire, 27 miles northeast of Liverpool, agreeably situated on a height above the right or north bank of the Ribble. Population 112,982.

PRESIDENT, the supreme executive officer of the United States. The qualifications of a person raised to this dignity are to be a natural-born citizen of the age of 35 years, and to have resided 14 years within the United States. The election is by electoral colleges in every state. In his legislative capacity the president has the power of approving bills sent to him after passing congress, or of returning them to the house in which they originated. In his executive capacity he is commander-in-chief of the army and navy; his powers are prescribed in the constitution. He holds his office for four years, and is eligible for re-election. The table on preceding page gives the presidents in the order of their succession.

PRESIDENTIAL SUCCESSION, THE. The presidential succession is fixed by chapter iv of the acts of the forty-ninth congress, first session. In case of the removal, death, resignation, or inability of both the president and vice-president, then the secreatry of state shall act as president until the disability of the president or vice-president is removed or a president is elected. If there be no secretary of state, then the secretary of the treasury will act; and the remainder of the order of succession is as follows: The secretary of war, attorney-general, postmaster-general, secretary of the navy, and secretary of the interior. The secretary of agriculture and secretary of commerce and labor were added by subsequent enactment. The acting president must, upon taking office, convene congress, if not at the time in session, in extraordinary session, giving twenty days' notice. This act applies only to such cabinet officers as shall have been confirmed by the senate, and are eligible under the constitution to the presidency.

PRETORIA, the capital of the Transvaal, in South Africa, situated in a valley, 4500 feet above sea-level, 1040 miles by railway from Cape Town, 349 from Delagoa bay. There are government buildings, English cathedral, and other churches, market buildings, museums, etc. Pop. 15,000.

PREVENTION OF CRUELTY TO ANIMALS. See Animals, Cruelty to.

PRI'AM, in Greek legend, the last king of Troy, the son of Laomedon. By his second wife, Hecuba, he had, according to Homer, nineteen children, the most famous being Hector, Paris, Cassandra, and Troilus. His name has been rendered famous by the tragical fate of himself and his family, as a result of the Trojan war. When he was extremely old the Greeks demanded of him the restoration of Helen, who had been carried away by Paris, and on his refusal to give her up they made war against Troy, and took and destroyed the city, after a siege of ten years. Homer gives no account of the death of Priam; but other poets represent him to have been slain at the altar of Zeus by Pyrrhus the Greek.

PRIB'YLOV, or PRIBYLOFF, ISLANDS, a group of islands on the coast of Alaska, United States, in Behring sea. The largest are St. Paul, St. George, Walrus, and Beaver islands. They are frequented by numbers of fur-seals. The natives are Aleutians.

PRICKLY ASH, a name given to several prickly shrubs of the United States. They have an aromatic and pungent bark, which from being used as a remedy for toothache gains them the name of toothache-tree.

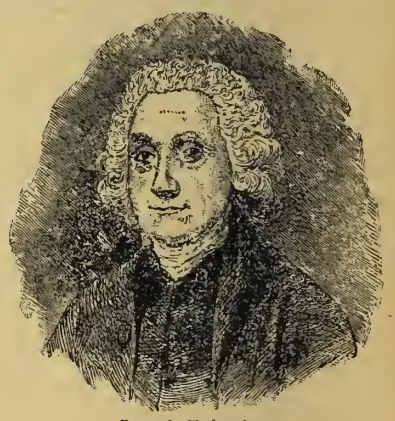
PRICKLY PEAR, otherwise called Indian fig, is a fleshy and succulent

Prickly pear.

plant, destitute of leaves, covered with clusters of spines, and consisting of flattened joints inserted upon each other. The fruit is purplish in color, covered with fine prickles, and edible. The flower is large and yellow. It is a native of the tropical parts of America, whence it has been introduced into Europe, Mauritius, Arabia, Syria, and China. It is easily propagated, and in some countries is used as a hedge-plant. It attains a height of 7 or 8 feet.

PRIEST, in its most general signification, a man whose function is to inculcate and expound religious dogmas, to perform religious rites, and to act as a mediator between worshippers and whatever being they worship. In some countries the priesthood has formed a special order or caste, the office being hereditary; in other countries it has been elective. In sacred history the patriarchal order furnishes an example of the family priesthood. Abraham, Isaac, and Jacob perform priestly acts, and "draw near to the Lord," as also does Job, and the Arab sheikh to this hour unites in his person the civil and religious headship. The Mosaic priesthood was the inheritance of the sons of Aaron, of the tribe of Levi. The order of the priests stood between the high-priest on the one hand and the Levites on the other. The ceremony of their consecration is described in Exodus xxiv. and Leviticus viii. They wore a special dress, and their actions were in many cases prescribed strictly by the Mosaic law. In the New Testament believers generally are regarded as having the character of priests, and it is held by many Protestants that the idea of a consecrated priesthood invested with sacrificial functions is repugnant to Christianity. In some churches, therefore, the name priest is not used, minister, pastor, etc., being the term employed instead. Those Christians, however, who, like the Roman Catholics, Greeks, etc., look upon the eucharist as a sacrifice, regard the priest as performing sacrificial duties, and as standing in a special relation between God and his fellow-men. The priests of the Church of Rome are bound to a life of celibacy; but in the Greek church a married man may be consecrated a priest. In the Angelican and other Episcopal churches the priests form the second order of clergy, bishops ranking first. Diverse views of the priestly office are held in the Angelican and allied churches.

PRIESTLEY, Joseph, an English philosopher and divine, was born in 1733 near Leeds. In 1761 he became a teacher in the Dissenting academy at Warrington, and while here wrote a History of Electricity, which gained him admission to the Royal Society, and the degree of LL.D. from the University of Edinburgh. In 1767 he became minister of the Mill Hill chapel at Leeds, where his religious opinions became decidedly Socinian. While here he published his History and Present State of Discoveries relating to Vision, Light, and Colors (1772), his next important work being Institutes of Natural and Revealed Religion (1772–74). In 1774 he discovered oxygen, or "dephlogisticated air," as he called it, a result which was quickly followed by other important discoveries in chemistry. He died in 1804.



Joseph Priestley.

PRI'MARY, in geology, a term applied by the early geologists to rocks of a more or less crystalline structure, supposed to owe their present state to igneous agency. They were divided into two groups: stratified, consisting of gneiss, mica schist, argillaceous schist, hornblende schist, and all slaty and crystalline strata generally; and unstratified, these being chiefly granite. By geologists of the present day the term primary is used as equivalent to palœozoic, the name given to the oldest known group of stratified rocks, extending from the Pre-cambrian to the Permian formation. See Geology.

PRI'MATE, in the early Christian church the title assumed by the bishop of the capital of a province, and hence equivalent to metropolitan. In Africa the title belonged to the bishop who had been longest ordained. In France the

Archbishop of Lyons was appointed primate of the Gauls by Gregory VII. in 1079. In the German empire the Archbishop of Salzburg was primate. In the Church of England both the archbishops still retain the title of primate, the Archbishop of Canterbury being distinguished as the primate of all England, and the Archbishop of York as the primate of England. In the Protestant Episcopal church of Ireland the Archbishop of Armagh is primate, as formerly when the church was established.

PRIMA'TES (-tēz), the highest order or group of the mammalia, including the orders bimana and quadrumana, and thus placing man, monkeys, apes, and lemurs in one great division.

PRIMOGENITURE, the right of the eldest son and those who derive through him to succeed to the property of the ancestor. In the United States no distinction of age or sex is made in the descent of estates to lineal descendants.

PRIMROSE, a genus of beautiful low Alpine plants, natural order Primulaceæ. Some are among the earliest flowers in spring, as the common primrose, the oxlip, and cowslip; and several Japanese and other varieties are cultivated in

Primrose.

gardens as ornamental plants. Their roots are perennial; the leaves almost always radical; and the flowers supported on a naked stem, and usually disposed in a sort of umbel. The varieties of the common primrose which have arisen from cultivation are very numerous.

PRIMULA'CEÆ, the primrose order of plants, a natural order of monopetalous exogens, distinguished by the stamens being opposite to the lobes of the corolla, and having a superior capsule with a free central placenta. It consists of herbaceous plants, natives of temperate and cold regions. Many have flowers of much beauty, and some are very fragrant. See Primrose.

PRINCE, literally one who holds the first place. In modern times the title of prince (or princess) is given to all sovereigns generally, as well as to their sons and daughters and their nearest relations. In Germany there is a class of sovereigns, ranking next below the dukes, who bear the title of prince (Fürst) as a specific designation; members of royal families are, however, denominated Prinzen. On the continent there are many ancient families not immediately connected with any reigning house who bear the title of prince.

PRINCE EDWARD ISLAND, an island forming a province of the Dominion of Canada, in the Gulf of St. Lawrence, and separated by Northumberland strait from New Brunswick on the east and Nova Scotia on the south; greatest length, from east to west, about 130 miles; breadth, varying from 4 to 34 miles; area, about 2134 sq. miles, or 1,365,760 acres, of which over 1,000,000 are under cultivation. The island is supposed to have been discovered by Cabot. It was first colonized by France, captured by Britain in 1745, restored and recaptured, and finally in 1873 was admitted to the Dominion of Canada. Pop. 103,258.

PRINCE OF WALES, the title of the heir-apparent of the British throne, first conferred by Edward I. on his son (afterwards Edward II.) at the time of his conquest of the Principality of Wales. Edward III. was never Prince of Wales, but the title has been conferred on all the male heirs-apparent to the English (and afterward the British) throne from Edward the Black Prince, son of Edward III.

PRINCETON UNIVERSITY, an institution of higher education at Princeton, N. J., founded in 1746. It was called the College of New Jersey and was situated at Elizabethtown, and removed to Newark, where the first commencement was celebrated in 1748. In 1752 it was voted that the college be fixed at Princeton. In 1754 the cornerstone was laid for the first building, which was named Nassau Hall. The college was completed and the students removed from Newark to Princeton in the fall of 1756.

The government of the university is in the hands of a board of trustees under the presidency of the Governor of New Jersey. The university is organized in three departments, the Academic, the school of science, and the graduate school. The college course embraces instruction in the three departments of philosophy, language and literature, mathematics, and natural science. The graduate department offers over 200 courses of study leading to the matser's and doctor's degree in arts and science.

The university provides pecuniary aid to deserving students through a large number of endowed scholarships and charitable funds. In 1902 Woodward Wilson became its president.

PRINCIPIA (Lat., principles). A famous mathematical treatise in Latin, by Sir Isaac Newton (1687). It consists of three parts, two on the motions of bodies and one on the solar system, and contains the full develoment of Newton's great discovery, the principal of universal gravitation.

PRINTING, in a general sense, is the art of stamping impressions of figures, letters, or signs, with ink, upon paper, vellum, cloth, or any similar substance; but the term is also applied to the production of photographs from negatives, where neither ink nor pressure is used. Printing may be done (1) from engraved metal plates, in which the ink is stored for transference in the sunk or incised lines of the pattern (see Engraving); (2) from a level surface, as, polished stone, where the ink is confined to the lines by a repellent medium (see Lithography); or (3) from surfaces in relief, where the ink is transferred from the raised characters, which may be either on one block or on separate or movable types. The latter method is so much the more important that it gives its restricted meaning to the term printing, unless where otherwise qualified.

It is a matter of much dispute to whom is due the merit of adopting movable types. The invention has long been popularly credited to Johan Gutenberg, but critical examination of early Dutch and German specimens and historical evidence would seem to point to Laurens Janszoon Coster of Haarlem as the first inventor. The date of the Haarlem invention is variously placed between 1420 and 1430. Coster's types were first of wood, then of lead, and lastly of tin; the first book printed from movable types being probably one entitled Speculum Nostræ Salutis. Gutenberg in 1449 connected himself with a rich citizen in Mainz, named Johann Fust or Faust, who advanced the capital necessary to prosecute the business of printing. Soon after (probably in 1453) Peter Schöffer, who afterward became Fust's son-in-law, was taken into copartnership, and to him belongs the merit of inventing matrices for casting types, each individual type having hitherto been cut in wood or metal. The oldest work of any considerable size printed in Mainz with cast letters, by Gutenberg, Fust, and Schöffer, finished about 1455, is the Latin Bible, which is called the Forty-two-lined Bible, because in every full column it has forty-two lines; or the Mazarin Bible, from a copy having been discovered in the library of Cardinal Mazarin in Paris.

The art of printing was first introduced into England by William Caxton, who established a press in Westminster Abbey in 1476.

The various letters and marks used in printing are cast on types or rectangular pieces of metal, having the sign in relief on the upper end. These types, with the low pieces required to fill up spaces, are placed in cells or boxes in a shallow tray or case in such way that any letter can be readily found. The cases are mounted on a stand or frame, so that they may lie before the person who is to select and arrange the types, technically styled a compositor. The Roman types used are of three kinds: an alphabet of large capitals (A B C etc.), one of small capitals (A B C etc.), and one of small letters (a b c etc.), called lower-case by the compositor. Of italic characters only large capitals and lower-case are used. Besides these there are many varieties of letter, such as Old English, and imitations of manuscript letters, the mention of which could only be serviceable to the prac-

tical printer. Types are of various sizes, the following being those in use among British printers for book work:—English, Pica, Small Pica, Long Primer, Bourgeois, Brevier, Minion, Nonpareil, Pearl, Diamond. English has 5½ lines and Diamond 17 lines in an inch. See Type.

The main part of the work of a compositor consists in picking up types from their respective boxes, as required to give the words in the author's manuscript that has been supplied to him. The types are lifted by the right hand and placed in a composing stick held in the left. The composing stick is a sort of box wanting one side, and having one end movable to enable it to be adjusted to any required length of line. When the words in the stick have increased till they nearly fill the space between the ends they are "spaced out," that is, the blanks between the words are so increased or diminished as to make them exactly do so. Line is in this way added to line till the stick is full, when it is emptied on to a flat board with edges, called a galley. Subsequently the column of types so produced is divided into portions of definite length; these are furnished with head-lines and folios, and become pages. See Type Setting Machines.

The first printing press in America was set up in 1536, by Antonio de Mendoza, Viceroy of Mexico, and in 1638 the first press in our country was established at Harvard college, the second at Philadelphia in 1685, and the third in New York in 1693.

The process of printing is as follows: The pages of type to be printed are locked up with iron or wedge-shaped boxwood blocks called quoins in a steel frame called a "chase." Books are usually printed in sheets of sixteen pages or multiples of sixteen, and when locked in the chase ready for printing it is called a form. The surface of the type is covered with ink by composition rollers, which are made from a mixture of molasses, glue, glycerine, etc., boiled together and cast in brass molds.

The first printing press was made by Conrad Saspach, a turner, in 1436, under the direction of Gutenberg. The contemplation of a wine press gave Gutenberg the first conception of a printing press. The essential feature of the first press was a movable flat board, platen, as now called. The form was laid upon a movable bed, inked with balls, the paper placed upon it and pushed under the platen which was brought down upon it by a powerful screw, squeezing the paper upon the form. In 1683, Moxon, the first technical writer on printing, speaks of a newly invented press, meaning the old wooden press improved by Blaen of Amsterdam. From this time until Earl Stanhope enlarged and improved the hand press about 1800, improvements were slow. In 1772 a rotary press was patented in England by Adkin & Walker, for the purpose of "stamping and printing on paper, cotton, and other cloths, whereby the printing on such material would be greatly facilitated and rendered much less expensive and more perfect and exact." In 1790, William Nicholson, of London, editor of a scientific journal, took out a patent for a press, which foreshadowed nearly every fundamental principle in the improved presses of to-day, even to the use of curved plates fastened upon a cylinder, and, the use of small form rollers feeding from a large one. Nicholson never constructed a press, however, and his patent was merely a forecast of modern methods.

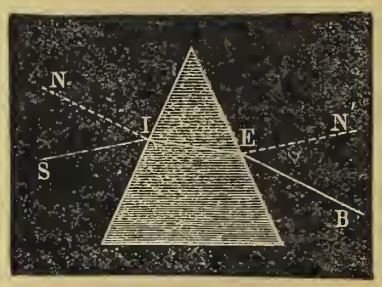
In 1818 Edward Cowper invented several improvements, including a flat ink-distributing table, ink fountain, distributing and form rollers. In the same year König patented a perfecting press (by which both sides of the sheet was printed at the rate of 750 papers per hour). Cowper also improved on this. The principle of these presses was used for years with improved methods for carrying the sheets. Robert M. Hoe, the American inventor, made marked and practical improvements increasing the capacity of presses. Mr. Hoe, in 1847, made a rotary press which would print about 20,000 papers an hour on one side. Then the invention of William A. Bullock of Philadelphia, which printed complete from a role or web, followed. This was improved on by Walters of London, but the Hoe presses soon distanced all, and to-day a press constructed by R. Hoe & Co., when running at full capacity, uses eight rolls of paper, each four newspaper pages wide. This machine requires 125 horse-power to drive it, and when running at its full capacity consumes in an hour about 70 miles of paper the width of the roll, or 280 miles of paper the width of the newspaper page. In addition to the eight rolls of paper already mentioned eight other rolls are in position, so that when any of the rolls run out the roll-carrier may be turned on a turntable, and the new roll of paper quickly pasted to the end of the depleted roll. The running speed of this press is 96,000 papers an hour—four, six, eight, ten, twelve, fourteen or sixteen pages—or 48,000 eighteen, twenty, twenty-two, twenty-four, twenty-six, twenty-eight, thirty, or thirty-two page papers, all delivered, folded to half-page size, pasted, and counted. Other rotary presses of merit are made in this country, and in France and Germany, but they contain no distinctive principle that calls for minute description.

PRIOR, a title somewhat less dignified than that of abbot, formerly given to the head of a small monastery, designated a priory. Similarly the term prioress was applied to the head of a convent of females. See Abbey.

PRIOR, Matthew, an English poet, the son of a joiner, born in 1644, and educated at Westminster school. He died in 1721 and was buried in Westminster Abbey. Prior was endowed with much wit and power of satire; and many of his lighter pieces are charming, but his serious performances fail in moving either the feelings or the fancy.

PRISCIA'NUS, usually known as Priscian, a celebrated Roman grammarian, who lived in the latter half of the 5th century of our era, and of whom little more is known than that he was born at Cæsarea, taught grammar at Constantinople in the time of Justinian, and wrote the Institutiones Grammaticæ, an exposition of Latin grammar. His work, successively abridged by several writers, formed the basis of instruction in Latin up to the 15th century, and there exist at present about one thousand MSS. of it, none dating before the 9th century. It contains numerous quotations from Latin authors now lost.

PRISM, in geometry, a solid figure which might be generated by the motion of a line kept parallel to itself, one extremity of it being carried round a rectilinear figure. A "right prism" is one in which the faces are at right angles to the ends. In optics a prism is a transparent body having two plane faces not parallel to each other, and most commonly it is made of glass, and triangular in section, the section forming either a right-angled, equilateral, or isosceles triangle. The two latter varieties are most familiar. If a ray of light, s i, enter such a prism by one of the two principal faces, it is bent in passing through so as to take the direction by s i e b. The angle which the ray in the prism makes with the normal, n i, is always smaller than the angle of incidence, n i s, and the angle which it makes with the normal, e n′, is smaller than the angle of emergence, n′ e b, the ray being always bent toward the base of the prism. Not only is the ray thus bent, but it is also decomposed, and by suitable arrangements could be exhibited as made up of what are usually known as the seven primary colors: violet, indigo, blue, green, yellow, orange, and red.



Light passing through prism.

PRISON, a house in which a person is confined and thereby deprived of his personal liberty; especially a building for the confinement or safe custody of criminals, debtors, or others. Imprisonment is now one of the recognized methods of judicially punishing certain crimes; but formerly it was employed in nearly every country in Europe for purposes of injustice and oppression. Men were hidden in dark dungeons, where in a short time they perished, through the inefficiency of the law to protect those who were offensive to the powerful; and even in Great Britain, where the laws have always condemned the incarceration of the innocent, the prison was, by the connivance of the authorities, made subservient to gross injustice and cruelty. To the 18th century belongs the honor of initiating the proper regulation of imprisonment. In Britain parliamentary inquiries

brought out strange revelations as to the horrors of the debtors' prisons; but public interest in the subject was only effectually aroused by the extraordinary exertions of the celebrated John Howard, who in 1773 began, without any official standing, to make inspections of the chief English prisons. He found these places not only insanitary and ill-ventilated, but filthy, poisonous, and in nearly every case overcrowded. Disease was rampant, and no measures were taken to prevent its spread; many of the prisons were utterly unfit for human creatures to live in: and, to crown all, such intercourse was allowed between the prisoners as ensured the reduction of all to the level of the most corrupt and criminal. Howard's revelations caused such a feeling throughout the country that prison reformation could no longer be delayed. The result was that parliament entrusted a committee of three (of whom Howard was one) with the duty of framing a suitable scheme for the future management of the prisons. The chief features recommended were—solitary confinement, cleanliness, medical help, regular work and the enforcement of order—the same principles, indeed, which are now adopted by every civilized state in the world.

PRIVATEER, a vessel of war owned and equipped by private individuals to seize or plunder the ships of an enemy. Such a vessel must be licensed by government and under a letter of marque, otherwise she is a pirate. The letters of marque were first granted in England during the reign of Henry V., in view of the war with France; and they were issued to aggrieved subjects in order that they might compensate themselves for injury done by foreigners. It was probably in deprecation of irresponsible warfare of any kind that the powers agreed to abandon privateering in 1856.

PRIVY-COUNCIL, the council of state of the British sovereign, convened to concert matters for the public service, and for the honor and safety of the realm. The English privy-council may be said to have existed from times of great antiquity; but the concilium ordinarium, established by Edward I., was the parent of the modern institution.

PRIZE, anything captured in virtue of the rights of war. Property captured on land is usually called booty, the term prize being more particularly used with reference to naval captures. The right of belligerents to capture the property of their enemies on the sea is universally admitted, as well as the right to prevent violation of the law of nations by neutrals, so long as the independence of other nations is not interfered with. It is accordingly settled as a principle of the law of nations that every belligerent has a right to establish tribunals of prize, and to examine and decide upon all maritime captures; and likewise that the courts of prize of the captors have exclusive jurisdiction over all matters relating to captures made under the authority of their sovereign. The sentence of a court of competent jurisdiction once pronounced is conclusive and binding on all nations.

PROA, a peculiar kind of sailing-boat used in the Malay or eastern Archipelago and the Pacific. It is variously constructed, but regularly has one side quite flat, on a line with the stem and stern, while the other side is curved in the usual way; and being equally sharp at stem and stern, it sails equally well in either direction without turning. Their shape and small breadth of beam would render them peculiarly liable to overset were it not for the outrigger they carry, adjusted sometimes to one side and sometimes to both sides. The outrigger in the example here shown is a large

Proa, with outrigger.

structure supported by and formed of stout timbers. The outrigger may have weights placed on it and adjusted according to circumstances. Proas carry a lugsail generally of matting.

PROBATE, in law, the official proof of a will, that is the proceeding by which it is established as the last will and testament of the party whose will it professes to be.

PROBATE COURT, an English tribunal established by act of parliament in 1857, to which all the powers previously exercised by the ecclesiastical courts in the granting of probates of wills and letters of administration were transferred. This court was merged in the supreme court by the Judicature Act of 1874, by which its jurisdiction was assigned to a probate, divorce, and admiralty division. The functions of this branch are confined entirely to deciding on the authenticity of wills and upon the proper persons to whom administration is to be committed when no will exists. The practice of the court is thrown open to the whole legal profession, and its proceedings are otherwise assimilated to the courts of common law.

In many of the United States probate tribunals are distinct courts, with original and extensive jurisdiction not only over the probate of wills and the administration of decedents' estates, but over the appointment of guardians to minor and other legally incompetent persons, over petitions for the adoption of children, and the change of names. They are always inferior courts, from whose decisions appeals may be taken to higher tribunals. For their jurisdiction and powers, the statutes in each state must be consulted.

PROBOS'CIS, the term applied to the longer or shorter flexible muscular organ formed by the elongated nose of several mammals. Although seen in a modified degree in the tapirs, etc., the term is more generally restricted, and applied to indicate the flexible "trunk" of the elephant.

PROBOSCIS MONKEY, or **KAHAU,** a native of Borneo, distinguished particularly by its elongated nose, its shortened

Kahau.

thumbs, and its elongated tail. The general color is a lightish red. These monkeys are arboreal in habits, and appear to frequent the neighborhood of streams and rivers, congregating in troops.

PROBUS, Marcus Aurelius, one of the ablest of the Roman emperors, was born at Sirmium in the year 232. His skilful administration and public virtues did not, protect him from enmity; and after a short reign he was murdered in a military insurrection in 282.

PROCONSUL and **PROPRÆTOR,** originally, in the ancient Roman system of administration, a consul or prætor whose command (or imperium) was prolonged for a particular purpose after his demission of office. In course of time the terms came to be applied to any one who was intrusted with some special service, and with magisterial authority for the purpose of performing it. Proconsuls and proprætors were generally men who had been consuls or prætors, but were not always so. There were four varieties of proconsul: 1. A distinguished statesman, formerly consul, appointed for a special duty. 2. An individual, who had never been consul, was sometimes created proconsul to be sent on some important mission. 3. A consul occasionally had his imperium prolonged, in order to complete some undertaking he had commenced. 4. A consul appointed after his term of office to the government of a province. The proconsuls under the republic had no authority within the walls of Rome, and they lost their imperium on entering the city. Under the empire the emperor was always invested with proconsular authority.

PROCTER, Bryan Waller, an English poet and prose writer, born about 1789; died in London, October 4, 1874. His daughter, Adelaide Ann, born in London in 1825, died in 1864, was a poetess of some note. Her songs and hymns show much taste and feeling, but she never attempted anything on a large scale. Her best-known volume is Legends and Lyrics, published in 1858.

PROCTOR, Redfield, American political leader and cabinet officer, was born

at Proctorsville, Vt., in 1831. He served throughout the civil war, rising to be colonel of the Fifteenth Vermont. He served several terms in the state legislature, from 1876–8, as lieutenant governor, and from 1878–80 as governor. In 1889 he entered the cabinet of President Harrison as secretary of war. He resigned in 1891 to accept an appointment as United States senator, which office he held until 1905. He died in 1908.

PROCTOR, Richard Anthony, astronomer, born at Chelsea in 1837, and educated at King's college, London, and Cambridge university. Having devoted himself specially to the study of astronomy, he published a number of valuable works on the subject, including Saturn and its System, Handbook of the Stars, Half Hours with the Telescope, Half Hours with the Stars, Other Worlds than Ours (a very popular work), Light Science for Leisure Hours, The Transits of Venus, The Cycloid and Cylcoid Curves, several Star Atlases, The Universe of Stars, The Moon, Old and New Astronomy, etc., besides two treatises on whist. He died in 1888.

PROC'URATOR, among the ancient Romans, a provincial officer who managed the revenue of his province. In some of the small provinces, or in a part of a large province, the procurator discharged the office of a governor, and had the power of punishing capitally, as was the case with Pontius Pilate in Judæa, which was attached to the province of Syria.

PROFESSOR, the title given to salaried teachers in universities and similar institutions who are appointed to deliver lectures for the instruction of students in some particular branch of learning.

PROGNO'SIS, in medicine the prejudgment of the physician regarding the probable course and result of a disease. Such a judgment is based upon the known character of the disease modified by the age, sex, environment, previous health, etc., of the patient.

PROHIBITION PARTY. The prohibition party is a political organization that during recent years has occupied a position of no inconsiderable importance among the political parties of the United States. The principles of the party first found expression in Maine during 1851, when the state adopted a law prohibitory in its character that yet remains on the statute book. On various occasions since 1867 conventions have been held, and since 1869 those convening have nominated candidates for the presidency of the United States, as also for state and county offices. In 1890 the Supreme Court of the United States in a case on appeal from Iowa, decided that the transportation of liquor through, and the sale of liquor in original packages could not be prohibited in any of the states or territories of the United States, and that the statute of Iowa prohibiting the sale of liquors in the state was in violation of the constitution of the United States. In the elections held in November, 1907, local option was nearly everywhere successful in the southern, central and western states, including some of the larger cities. The conclusions, after a thorough investigation, are: That prohibition has abolished or prevented the manufacture of liquor on a large scale, that the suppression of retail trade is dependent upon local sentiment, and is more successful in the country than in the city.

PROJEC'TILES, Theory of, is that branch of mechanics which treats of the motion of bodies thrown or driven some distance by an impelling force, and whose progress is affected by gravity and the resistance of the air. The most common cases are the balls projected from cannon or other firearms. If thrown horizontally, the body will move in a curved path, because it retains unchanged (leaving out of account the resistance of the air) its horizontal velocity, while it falls faster and faster toward the ground. A body projected obliquely has initially a certain horizontal velocity and a certain vertical velocity. It retains its horizontal velocity unchanged, but its vertical velocity is altered by the force of gravity, and in both of these cases we find that the path of the projectile is a parabola. With a given velocity the greatest range of a projectile is obtained by projecting at an angle of 45° with the vertical. The actual path of a bullet is always within the parabola of the theoretical projectile, and hence the range of a gun is much less than what the parabola would give. The range depends also upon the shape and weight of the projectile as well as upon it initial velocity. See Gunnery.

PROJECTION, the representation of something by means of lines, etc., drawn on a surface, especially the representation of any object on a perspective plane, or such a delineation as would result were the chief points of the object thrown forward upon the plane, each in the direction of a line drawn through it from a given point of sight or central point. This subject is of great importance in the making of maps, in which we have to consider the projection of the sphere or portions of it. Projections of the sphere are of several kinds, according to the situations in which the eye is supposed to be placed in respect of the sphere and the plane on which it is to be projected.

PROLETA'RII, the name which was given to those Roman citizens who, in the classification of their means by Servius Tullius, stood in the sixth or lowest class. The term has been revived in modern times as a designation of the lowest class of the community; but more frequently the collective appellation proletariat is used.

PROM'EROPS, a genus of insessorial birds, many of which are remarkable for the beauty of their plumage. They have a longish bill, an extensible tongue, and feed upon insects, soft fruits, and the saccharine juices of plants. One species is a native of New Guinea; another is a native of Africa.

PROME'THEUS, in Greek mythology, one of the Titans, brother of Atlas and of Epimetheus, and the father of Deucalion. His name means "forethought," as that of his brother Epimetheus signifies "afterthought." He gained the enmity of Zeus by bringing fire from heaven to men, and by conferring other benefits on them. To punish this offense Zeus sent down Pandora, who brought all kinds of diseases into the world. He caused Prometheus himself to be chained by Hephæstus (Vulcan) on a rock of the Caucasus (the eastern extremity of the world, according to the notions of the earlier Greeks), where his liver, which was renewed every night, was torn by a vulture or an eagle. He was ultimately delivered by Heracles, who destroyed the vulture, unlocked the chains, and permitted Prometheus to return to Olympus.

Promerops.

PRONG-BUCK, or **PRONG-HORN ANTELOPE,** a species of antelope, which inhabits the western parts of North America. It frequents the plains in summer and the mountains in winter. It is one of the few hollow-horned antelopes, and the only living one in which the horny sheath is branched, branching being otherwise peculiar to deer which have bony antlers.

PROOF IMPRESSION, in printing, a rough impression from types, taken for correction. A first proof is the impression taken with all the errors of workmanship After this is corrected another impression is printed with more care to send to the author: this is termed a clean proof. When this is corrected by the author, and the types altered accordingly, another proof is taken and carefully read over: this is called the press proof. In engraving, a proof impression is one taken from an engraving to show the state of it during the progress of the work; also, an early impression, or one of a limited number, taken before the letters to be inserted are engraved on the plate.

PROPAGATION, the multiplication or continuation of the species of animals or plants. As a technical term it is used chiefly in regard to plants. The most common method of propagating plants is of course by their seed. There are other ways, however, by which plants are propagated naturally. Some, for example, throw off runners from their stems which creep along the ground, and these runners take root at the buds, and send up new plants. The commonest artificial methods of propagating plants are budding, layering, the various forms of grafting, including inarching or grafting by approach, propagation by offsets and by slips. Some plants (as the potato) are propagated by dividing the tubers or underground stems, each "eye" or leaf-bud of which sends up a new plant, while a few are propagated by cuttings of the leaves.

PROPHETS, among the Hebrews, inspired teachers sent by God to declare his purposes to his people. From the time of Samuel frequent mention is made of a body of men bearing the general name of prophets. They were members of a school in which young men of all the tribes were instructed in the law, and apparently also in sacred poetry and music. The first school of this nature appears to have been set up by Samuel at Ramah, and there is mention of others at Bethel, Jericho, Gilgal, and elsewhere. It is probable that these schools of the prophets were formed to strengthen the attachment of the Jews to their religion, and to maintain that religion pure. The chief function of the prophetic order was to maintain the Mosaic theocracy in its purity, and the patriotism which strongly characterizes all the Hebrew prophets was closely connected with their religious zeal. The Jewish people being the chosen of God and the immediate subjects of the divine ruler, it is the constant cry of the prophets that the people should turn to righteousness in order to be delivered from the hands of their enemies. The predictive powers of prophets have been the occasion of much controversy. The ability of the prophets to foretell the future was generally believed in by the Jews, and in one passage of the Old Testament, Deut. xviii. 22, is made a negative test of the justness of a person's claim to be a prophet. The main controversies with regard to this predictive power turn upon two points—first, the reality of the power, which is by some altogether denied; and secondly, the reference of the prophecies. With regard to the reference of the prophecies the chief controversy is connected with the prophetical writings of the Old Testament supposed to relate to the Messiah. Regarding these prophecies three different positions are taken up by different schools of Biblical critics. Those who deny to the prophets the power of foretelling future events altogether necessarily deny also the reference of the prophecies in question to Christ as the Messiah. Another school, while admitting the reference of at least some of the passages to historical events, contend that in their secondary meaning they have also a reference to the Messiah. The third school hold that none but the Messianic interpretation is permissible.

PROPRÆTOR. See Prætor, Proconsul.

PROPYLÆ'A, in Greek architecture, the entrance to a temple. The term was employed particularly in speaking of the superb vestibules or porticoes conducting to the Acropolis of Athens. This magnificent work, of the Doric order was constructed under the direction of Pericles (B.C. 437–433) after the designs of Mnesicles, one of the most celebrated architects of his age.

PROPYLON. See Pylon.

PROSCE'NIUM, the part in a theater from the curtain or drop-scene to the orchestra; also applied to the curtain and the ornamental framework from which it hangs. In the ancient theater it comprised the whole of the stage.

PROSCRIPTION, in Roman history, a mode of getting rid of enemies, first resorted to by Sulla in 82 B.C., and imitated more than once afterwards in the stormy years that closed the republic.

PROSE, ordinary spoken or written language, untrammeled by poetic measure, and thus used in contradistinction to verse or poetry. The true character of prose can be clearly conceived only by considering it in relation to poetry. The two chief states of the inward man may be called the thinking and the poetical states, and depend upon the predominance of the understanding, or the imagination and feelings. If we think (in the narrower sense of the word) we combine ideas according to the laws of reason; and prose, which is the language of sober thought, is characterized by the abstractness and precision belonging to ideas that occupy the understanding. Artistic and finished prose is among the latest attainments both of nations and individuals, and it would appear that with most nations classical prose writers are fewer than classical poets.

PROS'ELYTE, a person who leaves one religion for the profession of another. The Jews, in New Testament times at least, had two classes of proselytes, namely, the "prosclytes of the gate," as they were termed; and the "proselytes of righteousness," or of the covenant. According to the rabbis the proselytes of the gate were those who renounced idolatry and worshipped the only true God according to the (so-called) seven laws of the children of Noah, without subjecting themselves to circumcision and the other commands of the Mosaic law. The proselytes of righteousness were persons who had been fully converted from paganism to Judaism, had been circumcised, and bound themselves to observe the Mosaic law.

PROSIM'IÆ, a name applied to the lemurs and their allies.

PROS'ODY, that part of grammar which treats of the quantity of syllables, of accent, and of the laws of versification. Though chiefly restricted to versification, it may also be extended to prose composition. In the Greek and Latin languages every syllable had its determinate length or quantity, and verses were constructed by systems of recurring feet, each foot containing a definite number of syllables, possessing a certain quantity and arrangement. The versification of modern European languages, in general, is regulated mainly by accent and number of syllables, though the weight or quantity of syllables has also to be taken into account if harmonious verse is to be produced.

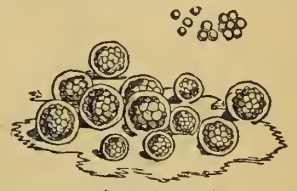
PROTECTION, applied in economics to an artificial advantage conferred by a government or legislature on articles of home production, either by means of bounties or (more commonly) by duties imposed on the same or similar articles introduced from abroad. Such duties may be simply protective, that is, such as that the foreign and home articles can compete in the market on nearly equal terms; or prohibitory, that is, such as to exclude foreign competition altogether. See Free-trade.

PROTESTANTS, a name given to the party who adhered to Luther during the reformation in 1529, and protested, or made a solemn declaration of dissent from a decree of the emperor Charles V. and the diet of Spires, and appealed to a general council. The protesting members were the electors John of Saxony and George of Brandenburg, Princes Ernest and Francis of Brunswick-Lüneburg, Philip, landgrave of Hesse, and Wolfgang, prince of Anhalt, together with fourteen imperial cities, the chief of which were Strasburg, Nürnberg, Ulm and Constance. The name is now applied generally to those Christian denominations that differ from the Church of Rome, and that sprang from the reformation. See Reformation.

PRO'TEUS, in classical mythology, a marine deity who fed the flocks (seals) of Poseidōn (Neptune) in the Ægean Sea. He is represented as a soothsayer who prophesied only when compelled by force and art, and who tried every means to elude those who consulted him, and changed himself, after the manner of the sea gods, into beasts, trees, and even into fire and water.

PROTHONOTARY, a term for certain functionaries connected with the papal court who receive the last wills of cardinals, make informations and proceedings necessary for the canonization of saints, etc.

PROTOCOC'CUS, a genus of algæ (red-snow) appears on the surface of snow, tinging extensive tracts in the Arctic regions or among the Alps, in an incredibly short space of time, with a deep crimson. This plant, which may be



Protococcus nivālis (red-snow), magnified and natural size.

regarded as one of the simplest forms of vegetation, consists of a little bag or membrane forming a cell. A large number of these are commonly found together, but each one is separate from the rest, and is to be regarded as a distinct individual.

PRO'TOCOL, in diplomacy, a document serving as a preliminary to, or for the opening of, any diplomatic transaction; also, a diplomatic document or minute of proceedings, signed by friendly powers in order to secure certain political ends peacefully.

PRO'TOPLASM, a substance consisting of carbon, oxygen, nitrogen, and hydrogen, nearly identical with the white of an egg, and constituting the most elementary living matter in animal and plant structures. It is colorless, transparent, and apparently destitute of structure, and is seen in its simplest form in some of the lowest types of animal life, as in the Protozoa. When unrestricted by an imprisoning envelope it is endued with the power of extending itself in all directions in the form of mutable processes which can be withdrawn spontaneously, and it has also the power of passing or flowing in minute masses through closed membranes without these masses thereby losing their identity of

form. In the form of cells, the skin of which is merely dead and hardened protoplasm, and inclosing a nucleus, or with a nucleus embedded in its substance, it is the structural unit of all organized bodies, constituting not only the basis of the ovum of both plants and animals, but of the tissues themselves in their perfect state, which are mere multiples of such cell-units variously modified. (The nucleus is believed by some to be doubtful, and due to imperfection in the glass.) As the protoplasm in our bodies is continually undergoing waste, a continuous renewal of the material is essential to the continuance of life. Animals, however, cannot elaborate protoplasm from mineral substances for themselves, they being able only to convert by the process of digestion dead protoplasm into living. Plants can, on the other hand, manufacture protoplasm from mineral compounds and the atmosphere, and so they are the storehouse of protoplasmic matter for the animal kingdom. Some biologists prefer the term Bioplasm to that of Protoplasm, as being more expressive of its function. Sarcode is also used similarly.

PROTOZO'A, a sub-kingdom including the most lowly organized members of the animal kingdom.

PROUDHON (prö-dōn), Pierre Joseph, a French publicist, born at Besançon 1809, died there 1865. Political economy became his chief study, and in 1840 appeared his famous work, bearing on the title-page the question: Qu'est-ce que la Propriété? (What is property?), to which the first page of the treatise contains the answer, "C'est le Vol" (it is theft). Besides those already noticed his more important treatises are: Discours sur la Célébration du Dimanche, De la Création de l'Ordre dans l'Humanité, Système des Contradictions Economiques.

PROVERBS, one of the canonical books of the Old Testament, usually in the main ascribed to Solomon, in accordance with the superscriptions in chap. i. 1; x.1; xxv. 1, which, if not written by Solomon himself (as the first two of them may have been), at least represent the traditional views of the ancient Jewish church. According to modern Biblical critics the book of Proverbs is composed of several sections written by different authors and at different times, and finally collected into a single book at some period subsequent to the return from the captivity. All seem to be agreed that some part of the book is to be ascribed to Solomon, but there is great diversity of opinion as to how large his share is. With regard to the other two contributors to Proverbs named in the book itself, Agur and Lemuel, nothing whatever is known; and in the case of Lemuel it is even suspected that the name is not that of a real personage. The canonicity of the book of Proverbs is represented as a subject of dispute in the Talmud, some having objected to receive the book as canonical on account of the contradictions it contains. It ultimately found its place, however, in all the Jewish lists of the sacred writings.

PROVIDENCE, one of the capitals of the state of Rhode Island (the other being Newport), situated on both sides of the Providence or Seekonk, at the head of Narragansett bay, 40 miles s.s.w. of Boston. There are many fine public and private buildings. Of the former the most important are the city-hall, library building, court-house, the buildings of Brown university, etc. The industrial establishments include flour and saw mills, cotton and woolen factories, foundries, steam-engine and boiler factories, machine-shops; printing, bleaching, calendering, and dye works, etc. Providence has a safe and commodious harbor, though somewhat difficult of access, and the coasting trade is important. Pop. 1909, 211,000.

PROVOST-MARSHAL, in the army, is an officer of the rank of a captain, who deals with offenses against discipline, brings the offenders to punishment, and sees the sentence executed. In the navy there is a similar office.

PRUDHON (prü-dōn), Pierre, a French painter, born in 1758, died in 1823. His importance consists in the fact that, in opposition to David, he accentuated the purely pictorial element and the effect of light in his works.

PRUNING, is the severing of portions of the stem, branches, shoots, leaves, or roots of a plant for the purpose of removing excrescent or unprofitable growths, and rendering the sap more conductive to the nutrition of the valuable parts of the plant. The immediate effect of pruning is to reduce the growth of a plant in as far as it depends on the amount of foliage duly exposed to the light; but as by judicious pruning the parts left have not only a greater share of sap, but are better exposed to the light, its ultimate effect is to produce a larger and stronger plant. From the tendency of sap to flow in increased quantity into the parts immediately adjoining those where its flow has been interrupted, an almost unlimited power is given to the gardener of controlling the direction of the growth of a plant. The season for pruning varies with the nature of the tree and the purpose for which it is pruned. In general it may be said that autumn or winter is the best season for extensive pruning; in summer an excess of vigor in the plant may require a little pruning, but in spring it not only weakens the plant but is liable to induce disease. Root-pruning is employed to check rapidity of growth and to induce development of flower-buds. The best season for this operation is after the leaves have fallen in autumn or before the sap begins to flow in spring.

PRUSSIA (German, Preussen), Kingdom of, the leading state of the German empire, comprising the greater part of Northern and Eastern Germany, and part of Western Germany, divided as in the following table:

Provinces	Area—sq. miles	Pop.
East Prussia	14,280	1,994,417
West Prussia	9,852	1,563,459
Brandenburg	15,405	4,992,102
Pomerania	11,627	1,634,659
Posen	11,182	1,888,056
Silesia	15,562	4,668,378
Saxony	9,747	2,833,224
Schleswig-Holstein	7,295	1,387,587
Hanover	14,855	2,590,336
Westphalia	7,802	3,188,072
Hesse-Nassau	6,059	1,897,310
Rhineland	10,422	5,758,995
Hohenzollern	441	66,783
Total	184,500	34,463,377

The capital and largest town is Berlin. Other large towns are Breslau, Cologne, Frankfort, Hanover, Magdeburg, Düsseldorf, Stettin, Charlottenburg, and Königsberg. The whole of Northern and Eastern Prussia, from Holland on the west to Russia on the east, belongs to the great plain of Northern Europe, and may be described generally as a vast plain, elevated in the south and south-west, and thence descending toward the Baltic and the German ocean. On the shores of the Baltic and North sea, large tracts are only saved from inundation by low sand-hills. Behind these hills extensive lagoons, on the Baltic coast called Haffs, have been formed, communicating with the sea by narrow outlets. The chief bays or gulfs are Danzig bay, Pomeranian bay, and Kiel bay, all on the Baltic coast; and on the Baltic coast are the islands of Rügen, Usedom, Wollin, etc.; in the North sea the North Frisian islands and East Frisian islands. The principal river of Prussia is the Elbe, which enters it from the Kingdom of Saxony, flows northwestward, and enters the North sea between Hanover and Holstein. The Weser and the Ems, are the principal rivers west of the Elbe. Lakes abound in almost every province. The climatic conditions of this extensive territory must necessarily be diversified. The average of a number of places situated between the highest and lowest altitudes gives a mean annual temperature of 52° Fahr.

The south-western division of Prussia, consisting of the greater part of Westphalia, the Rhenish province, and Hesse-Nassau, differs so much from the eastern divisions as, in many repsects, to present a striking contrast to it. In particular, its surface as a whole is much more finely diversified. By far the greater part of this portion of the Prussian monarchy belongs to the basin of the Rhine, which, entering it on the south-east, traverses it in a n.n.w. direction till it enters Holland. There are numerous streams tributary to the Rhine, the largest being the Moselle with its tributary the Saar. There are no lakes worth mention in this portion of Prussia. As compared with the division already described, the climate of this part of Prussia is milder in winter and cooler in summer, the mean annual temperature being about 1° higher.

The Rhine valley and the province of Saxony may be considered the most productive portions of the kingdom. Rye is the chief agricultural product, oats are largely grown in the north-east, wheat chiefly in the south and west, while the other grain crops are spelt (an inferior sort of wheat), corn, millet, and barely. Potatoes are extensively cultivated; beet-root for the production of sugar is a very important crop; flax, hemp, and rape-seed cover large areas; tobacco is raised in several provinces; and in the Rhine and Moselle districts the vine is freely cultivated and some of the finest wines produced. In East Prussia horses are reared chiefly for

military purposes; cattle are largely exported from the maritime provinces, and in West Prussia and Pomerania sheep are raised in large numbers. The forests cover about 23 per cent of the total area, and are a great source of wealth, forestry being nowhere better understood than in Prussia. In some of the forests the wild boar is common, other wild animals being the wolf, lynx, wild-cat, etc.

Mining is one of the chief branches of Prussian industry; the most important mineral products being coal and lignite, iron, copper, lead, silver, and zinc, while other minerals produced to a greater or less extent are cobalt, nickel, arsenic, antimony, manganesc, rock-salt, kainit and other potash salts, alum, and copperas. The chief textile manufacturcs are those of linens, cottons, and woolens. Silesia, Brandenburg, and Westphalia, are the provinces in which the linen industry is chiefly developed; the cotton manufacture is most extensive on the Rhine; the woolen manufacture has its chief seats in Brandenburg and the Rhenish province; while silk and velvet are made in the Rhine valley, as also at Berlin. In iron and steel ware the chief manufacturing centers are Essen, Solingen, Aix-la-Chapelle, and Burtscheid. The manufacture of porcelain and the finer kinds of ware is extensive, and leather and paper making are large industries. Other manufactures of national importance are beet-root sugar, chocolate, chicory, chemical products, and tobacco.

Prussia carries on a large trade both by sea and with its inland neighbors. The principal exports are textile fabrics, yarn, metals and metal wares, agricultural produce and live stock, wool, chemicals, spirits, coal, timber, leather, stoneware and glass, etc.; and the imports are chiefly in the raw materials connected with the textile and other manufactures, and tea, coffee, sugar, and other colonial products. Besides the ordinary road and canal communication, Prussia has an extensive system of railways. The principal ports are Memel, Pillau, Königsberg, Danzig, Stettin, Stralsund, Kiel, and Flensburg on the Baltic; and Altona on the North sea. In some of these ports, and particularly Stettin, shipbuilding is carried on with considerable activity. The system of money, weights, and measures is the same as that of the rest of Germany.

Prussia is a monarchy hereditary in the male line, the present constitution of which was framed by the government with the aid of the constituent assembly, in 1850, and subsequently modified by royal decrees. The king is assisted in the executive by an irresponsible privy-council and by a cabinet which is nominally responsible to a legislative assembly composed of two chambers. The primary qualification of electors is based on taxation, and the primary electors are divided into three classes. Although the reigning family and nearly two-thirds of the total population are Protestant, absolute religious liberty is guaranteed by the constitution. A complete system of primary, secondary, and university education exists, all grades of schools being linked together according to a definite scheme or schemes of study. Elementary education is enforced by law, maintained by local taxes, and administered by local authority. Prussia has ten universities—Berlin, Donn, Breslau, Göttingen, Greifswald, Halle, Kiel, Königsberg, Marburg, and Münster. The historical development of the Prussian kingdom is closely associated with three important elements. The first of these is found in the growing power of the Electorate of Brandenburg, which formed the nucleus of the future kingdom; the second relates to the acquirement of the province of Prussia, which gave its name to the new heterogeneous territory; and the third is associated with the rule of the Hohenzollern family, under whose skilful diplomatic and military guidance the small Brandenburg electorate has grown into what is now considerably the larger portion of the German empire. Brandenburg, which had been conquered by Charlemagne in 789, was erected into a margraviate by Henry I. (the Fowler), emperor of Germany in 926. Albert the Bear, who received Brandenburg as a fief from the Emperor Lothaire (1134), conquered the Slavonian Wends, and took in 1157 the title of Margrave of Brandenburg. Brandenburg later fell as a lapsed fief to the empire, and Louis of Bavaria gave it to his son. Remaining under Bavarian rule for three electorates it was subsequently ceded to the house of Luxemburg, and Charles IV., the first imperial representative of this house, gave it successively to his sons Wenceslaus (1373) and Sigismund (1378). The latter being in debt received from Frederick, the burgrave of Nürnberg, a loan of 400,000 gold florins, for which Frederick held Brandenburg in pawn, and subsequently acquired it in full. This burgrave was the descendant of Conrad of Hohenzollern, a cadet of a Suabian family to whom belonged a small territory surrounding the ancestral castle of Hohenzollern, of which they traced their lordship back to the time of Charlemagne. Frederick II., who succeeded his father in 1440, extended the possessions of his family by policy as well as by valor. In 1470 he abdicated in favor of his brother Albert III., Joachim II., who succeeded in 1535, embraced the Reformation, and established Lutheranism in 1539. In 1537 he acquired the reversion of the principalities of Liegnitz, Brieg, and Wohlau. John George succeeded in 1571. Joachim Frederick, who succeeded in 1598, married his son John Sigismund to the daughter of Frederick Albert, duke of Prussia; and in 1618 John Sigismund united the duchy of Prussia to the electorate, thus bringing it about that the whole country became known as Prussia.

John Sigismund was succeeded in 1619 by his son George William, who was unequal to encounter the terrible crisis that now occurred in the affairs of Germany, the Thirty Years' war. A very different man was his son Frederick William, called the Great Elector, who may be regarded as the virtual founder of the Prussian monarchy. Dying in 1688 he was succeeded by his son Frederick, who in 1701 had himself crowned as king, being the first king of Prussia. Frederick I. was succeeded by his son (1713) Frederick William I., who governed Prussia till 1740. He went to war with Charles XII., and acquired part of Pomerania, with Stettin, from Sweden. At his death he left a prosperous country, a well-supplied treasury, and an army of 80,000 men to his successor.

Frederick II., surnamed the Great, succeeded to the crown on the death of his father in 1740. In less than a year after his accession he proclaimed war against Maria Theresa in order to enforce his claim to the Silesian principalities, and invaded Silesia. By a treaty concluded at Berlin (1742) Frederick obtained the cession, with the exception of some specified districts, of both upper and lower Silesia, and of Glatz. Conceiving that the Austrians might seek to regain this territory, Frederick in 1744 invaded Bohemia, and commenced what is called the Second Silesian war. He gained such successes, that when peace was concluded in 1745, Austria confirmed the cession of Silesia, which was guaranteed by Great Britain. In the Seven Years' war the immense forces which his enemies were able to bring into the field reduced Frederick to the greatest straits, and gave opportunity for the development of his strategic genius. According to Frederick's calculation 886,000 men had perished in a war which failed in effecting any territorial change; but it transformed Prussia into one of the chief European powers. Frederick determining again to extend his boundaries entered into an alliance with Austria, and invaded the territories of Poland. Negotiations followed with Russia, and in 1772 the partition of Poland was arranged in a treaty between the three powers. In this way Prussia obtained most of Pomerania and a large portion of Poland. Frederick died in 1786, and was succeeded by his nephew Frederick William II.

In 1792, war having already been declared by the French authorities against the empire, the Prussians, under the Duke of Brunswick, invaded France. They were defeated by Kellerman at Valmy, and soon afterwards Frederick William withdrew from this war with France. Then followed a second and a third partition of Poland (1793, 1795), by which Prussia acquired a considerable accession of territory. Frederick William died in 1797, and was succeeded by Frederick William III. In 1804 Prussia recognized Napoleon as Emperor of France, and in the campaign which ended in the overthrow of Austria at Austerlitz (1805) remained neutral. This attitude was at first successful, but ultimately it led to distrust among the German states, and by the formation of the confederation of the Rhine Prussia was isolated and left to the mercy of Napoleon. On the 14th October, 1806, the armies met at Jena and Auerstadt, where the Prussians were completely defeated, and the whole country was soon in the hands of Napoleon, who entered Berlin in triumph. At the Peace of Tilsit (June 1807), concluded between Prussia and Napoleon, all lands between the Rhine and the Elbe were ceded to Napoleon for his free disposal, and a war

indemnity of 140,000,000 francs was imposed on the mutilated kingdom. In the great struggle for the overthrow of Napoleon, an important part was taken by the Kingdom of Prussia, and the Prussian troops along with the British bore a noble part in the Waterloo struggle. At the Congress of Vienna (1815), when the map of Europe was rearranged, Prussia, was placed in a more advantageous position than before. She now also formed one of the states in the new German confederacy.

After the restoration Frederick William III, leaned to the despotic counsels of Austria and Russia, supported heartily the Holy Alliance, and entered upon a reactionary policy which continued until his death in 1840. He was succeeded by Frederick William IV. The Poles in 1848 revolted against Prussian rule, but the movement was summarily suppressed. In 1857, the king being uable to conduct affairs by reason of mental illness, his brother William became regent, and ulitimately succeeded to the throne on the death of Frederick William in 1861.

The new king, William I., showed a disposition to absolutism, which in 1862—63 occasioned a lengthened dispute between the chambers and the ministry under Count Bismarck. Through a disagreement with Austria over Schleswig and Holstein the brief campaign known as the Seven Wecks' war took place (1866), the Prussian forces were armed with the new needle-gun, and the whole movements were directed by the chief of the staff, Count von Moltke. The Austrians, under General Benedek, were completely defeated near Königgrätz in Bohemia, where on 3d July was fought the decisive battle of Sadowa; and peace soon followed. In 1870 Prince Leopold of Hohenzollern consented to become a candidate for the then vacant Spanish throne. This was opposed by the French emperor, who demanded not only that the candidates should withdraw, but that the King of Prussia should pledge himself not to permit any such future candidature. This being refused, war was declared by France on 15th July, 1870, with a most disastrous result to herself. (See Franco-German War.) After the German arms had proved entirely successful, on the invitation of the North German parliament supported by the South German states, the King of Prussia assumed on 18th January, 1871, the title of German emperor.

From this point the history of Prussia is, to a great extent, merged in that of the German empire. In the hands of Prince Bismarck, acting as premier of Prussia as well as chancellor of the empire, a strong, central, autocratic government was maintained. In his policy, both home and foreign, Prince Bismarck was supported by the Emperor William I. until the death of the latter in March, 1888. He was succeeded by his son, Frederick III., who, when he ascended the throne, was struggling with a deadly throat disease. When he died in June 1888 he was succeeded by his son, William II., who has shown himself a ruler with a mind and will of his own.

PRUSSIAN BLUE, a cyanide of iron possessed of a deep-blue color, and much used as a pigment. It is also used in medicine.

PRUSSIAN BROWN, a color obtained by adding a solution of the yellow prussiate of potash to a solution of sulphate of copper, which throws down a precipitate of deep brown. This, when washed and dried, is equal to madder, and possesses greater permanency.

PRUSSIC ACID, called also hydrocyanic or cyanhydric acid, was discovered by Scheele in 1782, but first prepared in the pure state by Gay-Lussac in 1811. It is a colorless liquid which solidifies at 5° F. to feathery crystals, and boils at 80°. Its specific gravity is about 0.7. It dissolves in all proportions in water, forming a liquid which reddens litmus-paper but slightly. It is found in the kernels of bitter almonds, peaches, apricots, plums, cherries, and quinces; the blossom of peaches, sloes, etc.; the leaves of the beech, cherry, laurel; and various parts of other plants. Pure prussie acid is prepared by passing a stream of dry sulphuretted hydrogen over dry cyanide of mercury. This acid, which is one of the strongest poisons known, is used medicinally to remove various forms of irritation; but in all cases it must be used with extreme caution. When an overdose is administered death is instantaneous, and with a lesser dose the symptoms are convulsions or paralysis. The nature of its action is not clearly understood, but the best antidotes are found to be ammonia, chlorine-water, or a subcutaneous injection of atropine.

PSALMS, Book of, one of the books of the Old Testament, containing the liturgical collection of hymns used by the Jews in the temple service. Each psalm in the collection, with a few exceptions, has a particular superscription, such as maschil, instruction, michtam, memorial, etc. The chronology of the psalms is much disputed. The earliest (Psalm xc.) is said to have been written by Moses, many are attributed to David, a few are supposed to have been written on the return from the captivity, and some are assigned to the time of the Maccabees. In structure the psalms have the strophe and anti-strophe which is so characteristic of Hebrew poetry. It would also seem that many of them were meant to be sung in parts, the chief part by the officiating priest, and a responsive part by the people. The book of Psalms as we have it is essentially the hymn-book of the second temple, and according to the latest criticism, was ascribed to David, merely because the order of the worship in the second temple was the same as that prescribed by him for the first temple.

PSALTER, specifically, the version of the Psalms in the Book of Common Prayer; also applied in the Roman Catholic church to a series of devout sentences, 150 in number, and to a large chaplet or rosary with 150 beads, agreeing with the number of the psalms.

PSALTERY, or **PSALTERION,** an instrument of music used by the Hebrews, the form of which is not now known.

PSKOV, or **PLESKOV,** a government of Russia, bounded by those of St. Petersburg, Novgorod, Tver, Smolensk, Vitebsk, Livonia; area, 17,069 sq. miles. Pop. 948,080.—Pskov, or Pleskov, the capital, is situated on the Velikaia, on which there is regular communication by steamer with Dorpat. Pop. 30,424.

PSORI'ASIS, a kind of skin disease, in which elevated red patches appear covered with large scales, there being often cracks or fissures between, from which blood may ooze. In some cases it is a syphilitic affection. The name is also given to the itch.

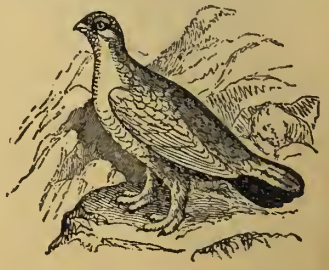
PSYCHE (si'kē), a sort of mythical or allegorical personification of the human soul, a beautiful maiden whose charming story is given by the Latin writer Appuleius. She was so beautiful as to be

Cupid (Eros) and Psyche.—Capitoline Museum, Rome.

taken for Venus herself. This goddess, becoming jealous of her rival's charms, ordered Cupid or Love to inspire her with love for some contemptible wretch. But Cupid fell in love with her himself. Many were the trials Psyche underwent, arising partly from her own indiscretion, and partly from the hatred of Venus, with whom, however, a reconciliation was ultimately affected. Psyche by Jupiter's command became immortal, and was forever united with her beloved.

PSYCHICAL RESEARCH (si'ki-kal), Society for, an English society, founded in 1882, "for the purpose of making an organized attempt to investigate that large group of debatable phenomena designated by such terms as mesmeric, psychical, and spiritualistic."

PSYCHOLOGY (si-kol'-) is the science or department of philosophy which



Ptarmigan, winter plumage.

deals with the phenomena of mind. See Mind, Physics, Philosophy.

PTARMIGAN (tär'-), a bird of the grouse family, distinguished from the true grouse by having the toes as well as

the tarsi feathered. The male is about 15 inches long, the female about an inch less. In summer the predominant colors of its plumage are speckled black, brown, or gray, but in winter the male becomes nearly pure white, and the female entirely so. In Britain it is to be met with only on the summits of some of the highest Scottish hills, chiefly amid the Grampians, in the Hebrides and Orkneys, and sometimes but rarely in the lofty hills of Cumberland and Wales. The willow-ptarmigan or willow-grouse occurs in great abundance in the arctic regions of America and in Norway, whence great numbers are brought to the London market.

PTERICHTHYS (te-rik'this), a fossil genus of fishes belonging to the Old Red Sandstone.

PTERODAC'TYL ("winged-finger"), a genus of extinct flying reptiles of the order Pterosauria, found in the Jura limestone formation, in the Lias at Lyme-

Pterodactyl.

Regis, in the Oolite slate of Stonefield, etc. The pterodactyls had a moderately long neck, and a large head; the jaws armed with equal and pointed teeth; most of the bones, like those of birds, were "pneumatic," that is, hollow and filled with air; but the chief character consisted in the excessive elongation of the outer digit (or little finger) of the forefoot, which served to support a flying membrane. A number of species have been discovered, most of them small or of moderate size, but one must have had an expanse of wing of at least 20 feet.

PTHAH, or **PHTHA,** an ancient Egyptian divinity, the creator of all things and source of life, and as such father and sovereign of the gods. He was worshipped chiefly at Memphis under the figure of a mummy-shaped male, and also as a pygmy god.

PTOLEMAIC SYSTEM, in astronomy, that maintained by Claudius Ptolemy, the astronomer, who supposed the earth to be fixed in the center of the universe, and that the sun and stars revolved around it. This long-received theory was rejected for the Copernican system.

PTOL'EMY (Ptolemaios), the name of a line of Græco-Egyptian kings, who succeeded, on the division of the empire of Alexander the Great, to the portion of his dominions of which Egypt was the head. Ptolemy I., called Soter, the Savior, was by birth a Macedonian. Ptolemy was one of the intimate friends of Alexander, attended the king on his expedition to Asia, was admitted into the bodyguard, and in 329 B.C. commanded one of the chief divisions of the army. On the death of Alexander he attached himself to the party of Perdiccas, and secured for himself the government of Egypt. He married Eurydice, daughter of Antipater, and in B.C. 320 he seized the satrapy of Phœnicia and Cœle-Syria. In 308 he invaded Greece, and proclaimed himself as a liberator. Ptolemy died in B.C. 283. —Ptolemy II. (Philadelphus), born B.C. 309, succeeded his father, and reigned in almost complete peace. His chief care as ruler was directed to the internal administration of his kingdom. He spared no pains to fill the library of Alexandria with all the treasures of ancient literature, and among the architectural works erected during his reign were the lighthouse on the island of Pharos, the Alexandrian museum, and the royal burying-place. —Ptolemy III., surnamed Euergĕtes ("benefactor"). He was early engaged in an important war against Syria, which having invaded he advanced without opposition to Antioch, then turned eastward, subduing Mesopotamia, Babylonia, etc. He died in B.C. 222, being succeeded by Ptolemy IV., surnamed Philopator. His Syrian possessions having been gradually wrested from him by Antiochus the Great, Ptolemy put himself at the head of a large army and completely defeated Antiochus at Raphia, in B.C. 217.— Ptolemy V. (surnamed Epihpănes), his son and successor, was under five years old at his father's death, and this led Philip of Macedon and Antiochus III. (the Great) of Syria to combine to dispossess Ptolemy, and divide his dominions. To avert this danger the guardians of the young king placed him under the protection of Rome, which thus had first an occasion for interfering in the affairs of Egypt. Ptolemy was poisoned

Ptolèmy I.—Antique gem.

B.C. 181.— Ptolemy VI. (surnamed Philomĕtor) was a child at the death of his father. His reign was much disturbed by the rivalry of a brother, and being expelled from Alexandria he repaired to Rome B.C. 164, by whose intervention he was replaced. He died in B.C. 146.— Ptolemy XI. ("flute-player") was driven from his kingdom by his subjects, who were ground down by taxation; but he was restored by the Romans (to whom he gave great sums of money), and died B.C. 51.—Ptolemy XII., son of the preceding, reigned jointly with his sister Cleopatra till B.C. 48, when Cleopatra was expelled, and raising an army in Syria invaded Egypt. On the arrival of Cæsar, Cleopatra by her charms acquired an ascendency over him. Ptolemy put himself at the head of the insurgents, was defeated by Cæsar, and drowned in attempting to make his escape, in B.C. 48 or 47.—Ptolemy XIII. (Aulētēs), the youngest son of Ptolemy XI., was declared king by Cæsar in conjunction with his sister Cleopatra in B.C. 47. He was married to his sister, but being only a boy possessed no more than the name of husband or king. Cleopatra caused him to be put to death, and the line of the Ptolemies ended when Cleopatra perished by her own hands after Octavius defeated Antony at Actium, and Egypt become a Roman province, B.C. 30.

PTOMAINE (tō'ma-in), one of a class of alkaloids or organic bases, which are generated as a result of putrefaction, during morbid conditions prior to death, and even, it is said, during normal healthy conditions of life. Some of them are highly poisonous, and in their action may even resemble strychnine.

PU'BERTY, the period in both male and female marked by the functional development of the generative system. In males it usually takes place between the ages of thirteen and sixteen; in females somewhat earlier; and, as a rule, in very warm climates puberty is reached somewhat sooner than elsewhere. In males puberty is marked externally by the deepening of the voice, the first appearance of the beard, greater firmness, fullness of body, etc.; in females, by the enlargement of the breasts, and by the general rounding out of the frame, and most unequivocally of all by the commencement of menstruation.

PUBLIC SCHOOLS, the schools, especially the elementary schools, established under any national system of education; but in England the term is often specifically applied to certain important secondary schools or colleges, including Eton, Harrow, Winchester, Rugby, Westminster, St. Paul's, Shrewsbury, etc., known as "the great public schools of England."

In the United States the term is applied to the institutions maintained at public expense for the formal education of children. The idea of organizing schools where rich and poor might obtain efficient free instruction did not take firm root in the minds of the people of the several states until the early part of the 19th century. The federal government has by means of land grants and other aid encouraged the several states in the establishment of school systems.

The three main types of public schools in the United States are: (1) the city elementary and high schools; (2) the town union school, which includes a high school department; (3) the district school, so called from its usually being established in certain rural districts, and offering elementary instruction.

PUCK, a celebrated elf, the "merry wanderer of the night," whose character and attributes are depicted in Shakespeare's Midsummer Night's Dream, and who was also known by the names of Robin Goodfellow and Friar Rush. He was the chief of the domestic fairies,

and many stories are told of his nocturnal exploits.

PUDDING-STONE, or **PLUM-PUDDING STONE,** a term now considered synonymous with conglomerate, but originally applied to a mass of flint pebbles cemented by a siliceous paste. When select specimens are cut and polished they resemble a section of a plum-pudding, and are used for ornamental purposes.

PUEB'LA, in full La Puebla de los Angeles, the capital of a Mexican state of the same name, situated on a plateau 76 miles s.e. of Mexico. It has spacious streets and solidly-built houses, the cathedral being a magnificent structure. It contains a large number of religious edifices, many of them highly decorated. There are also several colleges, a museum and a theater. It is one of the chief seats of Mexican manufacturing industry, and its chief products are cotton and woolen goods, leather, glass, earthenware, and soap. Puebla was built by the Spaniards in 1533–34. Pop. 93,521. The state consists of an elevated plateau, and contains much fertile soil. On the western frontier is the volcano of Popocatepetl, the highest mountain in Mexico. Area, 12,042 sq. miles; pop. 1,021,133.

PUEBLO, the second largest city and county-seat of Pueblo co., Colorado. Its transportation facilities comprise the Denver and Rio Grande, the Atchison, Topeka and Santa Fé, the Missouri Pacific, the Chicago, Rock Island and Pacific, and the Colorado and Southern. Pueblo is the great distributing and receiving point for this section of vast natural wealth. It has become known as the "Pittsburg of the West," being famous for its iron and steel, and smelting industries. Pop. 33,267.

PUEBLO INDIANS are semi-civilized Indians of New Mexico and Arizona, some 9,000 in number, living in villages in communal houses (a number of families together), and possessed of considerable skill in agriculture and the simpler kinds of manufacture. The village communities are self-governed, and they are only nominally citizens of the United States.

PUER'PERAL FEVER, a dangerous contagious disease peculiar to women in childbed, and due to the absorption of poisonous material by the raw surface of the womb. The poison may originate from decomposing material in the womb itself, but is generally introduced from without.

PUFF-ADDER, a serpent found in South and Central Africa. Its popular name is derived from its power of puffing out the upper part of the neck when irritated or alarmed. It is very thick, attains a length of 4 or 5 feet, and is extremely venomous. The Bosjesmen poison their arrows with its venom.

PUFF-BALLS, a species of birds so called from their globular shape, and because if they are struck when ripe the dry spores fly out in powder like a puff of smoke, from a genus of fungi. When young, and whether raw or cooked, some of them are very good eating.

PUFFIN, the name for the marine diving birds. The common puffin is a native of the arctic and northern temperate regions, and is often met with on the rocky cliffs of Great Britain and Ireland. It is about a foot in length, and from the singular shape and enormous size of its bill, which is striped with

Puff-bird.

orange upon bluish-gray, is often called the sea-parrot or the coulter-neb. Their plumage is glossy black, with the exception of the cheeks and under-surfaces which are white. It breeds upon rocks and in the rabbit-warrens near the sea,

Common Puffin.

and lays one egg, which is white. It lives on fish, crustacea, and insects, and is a gregarious and migratory bird.

PUGET SOUND (pū'jet), an inlet on the northwest coast of the state of Washington, forming the southwest continuation of Juan de Fuca strait, with which it is connected by Admiralty inlet. On its shores are Seattle, Olympia, and other important cities.

PUGILISM. See Boxing.

PULASKI (pōōläs'kē), Casimir, Polish soldier in the American revolution, was born in Podolia, Poland, in 1748. He joined enthusiastically in the movement to liberate his country, and fought heroically in the unequal struggle against

Pulaski.

the Russians. He was accused, unjustly it appears, of complicity in the plot to abduct King Stanislas Poniatowski from Warsaw (1771), and in consequence was outlawed and deprived of his estates. He was induced by Franklin and the French ministry to assist the Americans against England. He arrived in Philadelphia in 1777. In 1778, with the sanction of congress, he organized an independent corps of cavalry and light infantry, called Pulaski's Legion. In 1779 he commanded the French and American cavalry at the siege of Savannah, and during the attack of October 9th was mortally wounded, dying two days later on board the United States brig Wasp.

PU'LITZER, Joseph, American journalist, was born at Budapest, Hungary, in 1847. He came to the United States in 1864. After serving in a federal cavalry regiment in 1864–5 he became a reporter on Carl Schurz's Westliche Post, St. Louis, later becoming managing editor with a proprietary interest. In 1869 he was elected to the state legislature. In 1878 he purchased the St. Louis Dispatch and combined it with the Evening Post, which as the Post-Dispatch became an important journal of the west. In 1883 he purchased the New York World which, under his management obtained an immense circulation. In 1884 he was elected to the United States congress from New York. He has made donations to educational and charitable causes, and in 1903 provided an endowment fund for a school of journalism at Columbia university.

PULLEY, a small wheel movable about an axle, and having a groove cut in its circumference over which a cord passes. The axle is supported by a kind of case or box called the block, which may either be movable or fixed to a firm support. The pulley is one of the six simple machines or mechanical powers and is used for raising weights. A single

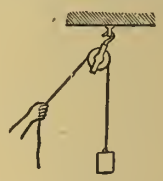


Fig. 1.

Fig. 2.

pulley serves merely to change the direction of motion, but several of them may be combined in various ways, by which a mechanical advantage or purchase is gained, greater or less, according to their number and the mode of combination. The advantage gained by any combination or system of pulleys is readily computed by comparing the velocity of the weight raised with that of the moving power, according to the principle of virtual velocities. The friction, however, in the pulley is great, particularly when many of them are combined together. A pulley is said to be fixed when the block in which it turns is fixed, and it is said to be movable when the block is movable. In the single fixed pulley (fig. 1) there is no mechanical advantage, the power and weight being equal. It may be considered as a lever of the first kind with equal arms. In the single movable pulley (fig. 2) where the cords are parallel there is a mechanical advantage, there being an equilibrium when the power is to the weight as 1 to 2.

It may be considered as a lever of the second kind, in which the distance of the power from the fulcrum is double that of the weight from the fulcrum. In a system of pulleys (fig. 3, 4) in which the same string passes round any number of pulleys, and the parts of it between the pulleys are parallel, there is an

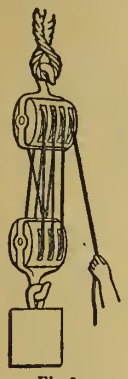


Fig. 3.

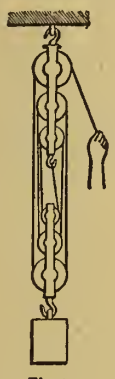


Fig. 4.

equilibrium when the power is to the weight as 1 to the number of strings at the lower block. In a system in which each pulley hangs by a separate cord and the strings are parallel (fig. 5), there is an equilibrium when the power is to the weight as 1 to that power of 2 whose index is the number of movable pulleys (in the case here illustrated $1 : 2^3$ or $1 : 8$). Whatever be the mechanical arrangement of the pulleys and of the ropes the

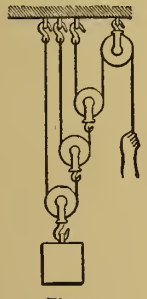


Fig. 5.

principle of all pulleys is the same, namely, the transmission of the tension of a rope without sensible diminution so as to obviate the loss of force consequent on rigidity. The term pulley is used indifferently to denote either a single sheave or the complete block and its sheaves. In machinery, a pulley is a wheel, generally with a nearly flat face, which being placed upon a shaft transmits power to or from the different parts of the machinery, or changes the direction of motion by means of a belt or band which runs over it.

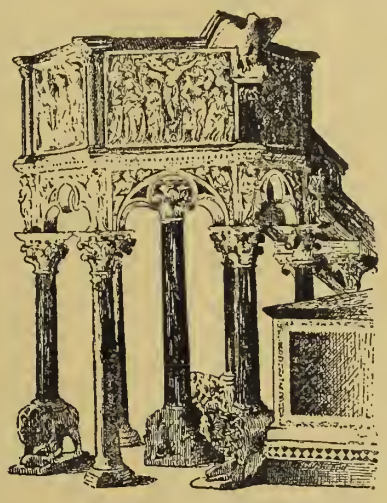
PULLMAN, an industrial town now forming a part of Chicago. It was founded in 1880 by George M. Pullman, who established here the extensive shops of the Pullman Palace Car Company. The idea of the promotor was to secure for his employees all the advantages which might accrue from congenial surroundings. The high rates charged for rent, water, and gas, however, caused dissatisfaction among the residents, and in 1889 they voted in favor of annexation to Chicago. Population, at that time, about 12,000.

PULLMAN, George Mortimer, an American inventor, born in 1831 in Chautauqua co., N. Y. In 1859 he removed to Chicago, and in the same year he remodeled two old coaches into sleeping cars. Four years later he built the first new sleeping car, "Pioneer," upon lines of the now famous "Pullman" cars. In 1867 he organized the Pullman Palace Car company, and was its president until his death, in 1897.

PULLMAN-CAR, a luxuriously fitted up railway carriage, named after its inventor, for the use of which an extra charge is made, and which is specially adapted for sleeping in, or as a drawing room or dining car.

PULMONARY CONSUMPTION. See Consumption.

PULPIT, the elevated inclosure or desk in a church from which the preacher delivers his discourse. The pulpitum



Pulpit of Niccolà Pisano, in the Baptistery at Pisa, Italy.

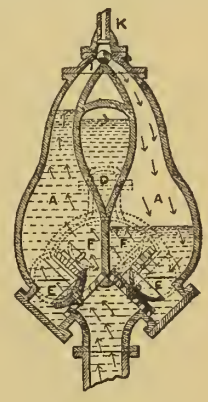
of the ancient Roman theatres was that part of the stage where the actors performed.

PULQUE (pŭl'kā), or Octli, a favorite drink in Mexico and Central America, made from the juice of various species of agave, pleasant and harmless until after protracted fermentation, when it becomes an intoxicant. A kind of brandy is also distilled from it.

PULSE, leguminous plants or their seeds, including all kinds of beans, peas, lentils, etc. The considerable proportion of nitrogen which they contain makes them very nutritious, and on that account they are much eaten, with or without rice, in India, where the chick-pea (Cicer arietinum) is one of these very largely used. The Hebrew word translated pulse in the authorized version of the Bible, Daniel i. 12, 16, probably means edible seeds in general.

PULSE, the throbbing movement of the walls of blood-vessels, from the passing waves of blood due to the beats of the heart. It is limited in healthy conditions to the arteries. In the newly-born child the healthy pulse registers 130 to 140 beats a minute; at two years of age, 105, at ten years about 90, at fifteen to twenty about 70; while in old age it may sink to about 60. In females it is somewhat higher than in males, and during certain fevers it sometimes reaches 140 beats per minute. In arteries which lie immediately under the skin it can be felt with the finger, as is the case with the radial artery, the pulsation of which is very perceptible at the wrist. The state of the pulse is therefore an indication of the force and frequency of the action of the heart, and of the fulness of the vessels.

PULSOM'ETER, an instrument of the pump kind for raising water, especially when that liquid is mixed with solid matter. It acts by the condensation of waste steam sent into a reservoir, the water rushing up into the vacuum formed by the condensation. From the accompanying figure it will be seen that it con-



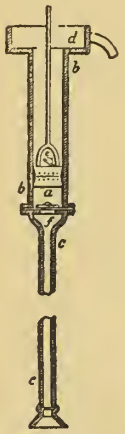
Pulsometer.

sists essentially of a double chamber, or two connected chambers, aa, having a ball-valve i at top (which shuts either chamber alternately) and clack-valves ee at bottom. Steam is admitted at k to one of the chambers and presses out the water contained there through f to the pipe d to be carried away. Condensation then taking place a vacuum is formed, and the ball falls over and closes the opening through which the steam entered, and water flows up through the clack-valves and again fills the chamber. The steam in the meantime is now acting upon the water in the adjoining chamber, condensation then taking place there, the ball falls back to that side, and the operations go on alternately, the result being a steady stream of water sucked into one chamber after another, and then forced out and upward by the steam.

PU'MICE, a substance frequently ejected from volcanoes, of various colors, gray, white, reddish-brown or black; hard, rough, and porous; specifically lighter than water, and resembling the slag produced in an iron furnace. Pumice is really a loose, spongy, froth-like lava. It contains 75 parts silica and 17 alumina with some iron, lime, soda, etc., and the pores being generally in parallel rows, it seems to have a fibrous structure. Pumice is of three kinds, glassy, common, and porphyritic. It is used for polishing ivory, wood, marble, metals, glass, etc.; also for smoothing the surfaces of skins and parchment.

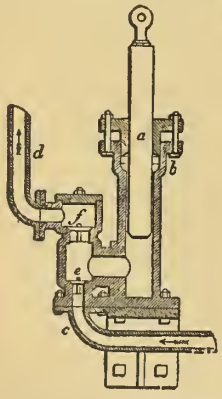
PUMP. a contrivance for raising

liquids or for removing gases from vessels. The air-pump is dealt with in a separate article. Though the forms under which the hydraulic pump is constructed, and the mode in which the power is applied, may be modified in a great variety of ways, there are only four which can be considered as differing from each other in principle. These are the sucking or suction pump, the lift-pump, the force-pump, and the rotary or centrifugal pump. Of these the suction or common household pump is most in use, and for ordinary purposes the



Suction-pump.

most convenient. The usual form and construction of this pump are shown in the annexed engraving. A piston a is fitted to work air-tight within a hollow cylinder or barrel bb; it is moved up and down by a handle connected with the piston-rod, and is provided with a valve e opening upwards. At the bottom of the barrel is another valve f, also opening upward, and which covers the



Force-pump of steam-engine

orifice of a tube cc, called the suction-tube, fixed to the bottom of the barrel, and reaching to the bottom of the well from which the water is to be raised. When the piston is drawn up from the bottom of the barrel the air below is rarefied, and the pressure of the external air acting on the surface of the water in the well, causes the water to rise in the suction-tube until the equilibrium is restored. After a few strokes the water will get into the barrel, the air below the piston having escaped through the piston-valve e. By continuing, the water will get above the piston and be raised along with it to the cistern d, at the top of the barrel, where it is discharged by a spout. The lift-pump has also two valves and a piston, both opening upward; but the valve in the cylinder instead of being placed at the bottom of the cylinder is placed in the body of it, and at the height where the water is intended to be delivered. The bottom of the pump is thrust into the well a considerable way, and the piston being supposed to be at the bottom, as its valve opens upward there will be no obstruction to the water rising in the cylinder to its height in the well. When the piston is drawn up its valve will shut, and the water in the cylinder will be lifted up; the valve in the barrel will be opened, and the water will pass through it and cannot return as the valve opens upward;—another stroke of the piston repeats the same process, and in this way the water is raised from the well; but the height to which it may be raised is not in this as in the suction-pump limited to 32 or 33 feet. The force-pump differs from both of these in having its piston solid, or without a valve and also in having a side pipe with a valve opening outward, through which the water is forced to any height required, or against any pressure that may oppose it. In such pumps the plunger or solid piston is frequently employed instead of the ordinary piston; this arrangement is represented in the accompanying figure, which shows a section of the feed-pump of a steam-engine. The plunger a works air-tight through a stuffing-box b at the top of the barrel, and on being raised produces a vacuum in the pump-barrel into, which the water rushes by the pipe c and is discharged, on the descent of the plunger through the pipe d, the valves e and f serving to intercept the return of the water at each stroke. The side pipe d, however, requires the addition of an air-vessel. "Double-acting" pumps are often employed for household purposes. (See Fire-engine.) Centrifugal pumps are universally employed wherever the lift is not too great, and the quantity of water is considerable. A wheel, shaped like an ordinary fan, has passages leading from its center to its circumference; it is made to rotate very rapidly in a casing. Its circumference communicates with a delivery pipe, and its center with a pipe leading to the water which is to be pumped. The rapid revolution of the wheel causes by centrifugal action a constant flow of water from center to circumference of the wheel; and in this way the water is sucked up to the center of the wheel, and leaves the circumference by the eduction pipe.

PUMPERNICKEL, a coarse brown bread made in Westphalia from unbolted rye.

PUMPKIN, a climbing plant and its fruit. The pumpkin is originally from India, but is at present cultivated in most parts of Europe, and in America. The fruit is red, and sometimes acquires a diameter of 2 feet. There are two varieties of the plant, one with roundish, the other with oblong fruit. The fruit is eaten in a cooked state.

PUNCH (contracted from punchinello) the chief character in a popular comic exhibition performed by puppets, who strangles his child, beats to death Judy his wife, belabors a police-officer, etc. The puppet-show of Punch seems to have been first popular in England dur-

Pumpkin.

ing the reign of Queen Anne. The hero was sometimes called Punchinello, a semi-anglicized form of the Neapolitan Pulcinello.

PUNCH, a beverage; received its name from the Hindu word panch, five, this being the number of its ingredients, arrack, tea, sugar, water, and lime-juice. In a common brew of the beverage its ingredients are rum, brandy, sugar, boiling-water, and lemon-juice.

PUNCH, a tool worked by pressure or percussion, employed for making apertures, in cutting out shapes from sheets or plates of various materials in impressing dies, etc. Punches are usually made of steel, and are variously shaped at one end for different uses. They are solid for stamping dies, etc., or for perforating holes in metallic plates, and hollow and sharp-edged for cutting out blanks, as for buttons, steel-pens, jewelry, and the like.

PUNCHEON, a liquid measure of capacity containing from 84 to 120 gallons.

PUNCTUATION, the art of employing signs by which the parts of a writing or discourse are connected or separated as the sense requires, and the elevation, depression, or suspension of the voice indicated. Punctuation serves both to render the meaning intelligible, and to aid the oral delivery. Our present system of punctuation came very gradually into use after the invention of printing, the Venetian printers, the Manutii contributing materially to its development. The principal points used in English composition are the comma (,), semi-colon (;), colon (:), period or full stop (.), note of interrogation (?), note of exclamation or admiration (!), dash (—), and parenthesis ( ). The comma marks the smallest grammatical division in a sentence, separating the several members of a series, and the subordinate clauses from the main clause. The semi-colon indicates a longer pause than the comma, but requires another member or members to complete the sense. The colon denotes a still longer pause, and may be inserted when a member of a sentence is complete in itself, but is followed by some additional illustration of the subject. The period indicates the end of a sentence, and is also used after contracted words, headings, titles of books, etc., and generally after Roman numerals. The note of interrogation is placed at the end of a direct interroga-

tory sentence. The note of exclamation or admiration is placed at the end of such words or clauses as indicate surprise or other emotion. The dash is employed where a sentence breaks off abruptly, and the subject is changed; where the sense is suspended, and is continued after a short interruption; after a series of clauses leading to an important conclusion; and in certain cases to indicate an ellipsis. The parenthesis incloses a word or phrase introduced into the body of a sentence, with which it has no grammatical connection.

PUNISHMENT, a penalty inflicted on a person for a crime or offense, by the authority to which the offender is subject; a penalty imposed in the enforcement or application of law. The punishments for criminal offenses now known to the English law, are death by hanging, penal servitude, imprisonment with and without hard labor, solitary confinement, detention in a reformatory school, subjection to police-supervision, and putting under recognizance.

In the United States, while there are but few agencies for the assistance of discharged prisoners, considerable care is devoted to the treatment and checking of juvenile crime. Reformatories have existed since 1825, when the first was established on Randall's Island within the limits of the city of New York. There are also a number of semi-public schools. The percentage of youths reformed and trained into good citizens has been placed as high as 60, 75, even 80 per cent. Parents may in some states contribute to the support of their children in reformatories, but as a rule the inmates are orphans or abandoned children or those whose parents are very poor. The best system for training and caring for juvenile offenders probably is that which obtains in Massachusetts.

PUNJAB, or **PANJAB** (the name means "Five Rivers"), a province of British India, under the administration of a lieutenant-governor, so called because it was the region intersected by the five tributaries of the Indus, the Sutlej, the Beas, the Ravi, the Chenab, and the Jhelum. The present lieutenant-governorship of the Punjab, however, is larger than the Punjab proper, and is bounded on the west by Afghanistan and Beluchistan; on the north by Kashmir; on the east by the United (N.W.) provinces; and on the south by Sind and Rajputana. The area, exclusive of the connected native states, is 97,209 sq. miles; the pop., according to the census of 1901, 20,330,339; inclusive of native states, the area is 133,741 sq. miles, and the pop. 24,754,737. The Punjab has had a rather eventful history from the time of Alexander the Great downward. After being long held by rulers of Afghan or Tartar origin, the Sikhs under Runjit Singh established themselves here early in the 19th century. Latterly the country fell into a very d stracted state; its Sikh rulers came into warlike contact with the British, and after the second Sikh war in 1849, the country was brought under British adminstiration.

PUNNAH, native state of India, in Bundelcund, by the British agency of which it is politically superintended, formerly very prosperous from the yield of its diamond mines. Estimated area, 2568 sq. miles; pop. 239,333.—Punnah is the chief town. Pop. 14,676.

PUNT, an oblong flat-bottomed boat used for fishing and shooting in shallow waters. The most common mode of propulsion is by pushing with a pole against the bottom of the river, etc., a process which is hence called punting.

PURDUE' UNIVERSITY, a coeducational state institution of higher learning, established in 1869 at Lafayette, Ind., and named for John Purdue, an early benefactor. The university is the Indiana Institute of Technology and embraces six schools: Mechanical engineering, civil engineering, electrical engineering, agriculture, science, and pharmacy. Students in each of the schools are required to spend an average of three hours a day in laboratory, shop, or field. It confers the degrees of bachelor of science and graduate in pharmacy in course, and the following degrees for advanced work: Master of science, mechanical, electrical, and civil engineer, and analytical chemist.

PUR'GATIVES, are medicines used for the purpose of producing the evacuation of the bowels. The following is a common classification of them: (1) Laxatives or mild cathartics, employed when the least possible irritation is desired, such as manna, sulphur, cassia, castor-oil, tamarinds, prunes, honey, ripe fruit. (2) Saline or cooling laxatives, giving rise to more watery evacuations than the first group, such as Epsom salts, Glauber's salt, phosphate of soda, Seidlitz powders, etc. (3) Active cathartics, occasionally acrid, frequently tonic and stomachic, such as rheubarb, senna (often in the form of black draught), and aloes. (4) Drastic or violent cathartics, such as jalap, scammony, gamboge, croton-oil, colocynth, and elaterium, which in large doses act as irritant poisons, and are employed in smaller doses chiefly when the bowels have failed to be moved by milder purgatives. (5) Mercurial purgatives, such as calomel blue pill, and gray powder. Of late years podophyllin, a preparation of the resin of the May-apple, has come much into vogue as a substitute for mercury in its various forms. All the members of this group are usually combined with or followed by other purgatives, blue pill, for instance, being followed by black draught, and podophyllin combined with taraxacum.

PUR'GATORY, as believed in by the Roman Catholic church, is an intermediate state after death in which the souls of the righteous expiate, through temporary suffering, sins committed in this life, and not fully atoned for before death. According to the council of Trent, they are "assisted by the suffrages of the faithful, but especially by the most acceptable sacrifice of the mass," to be enabled to enjoy the happiness of heaven. Catholics claim that this belief in purgatory is upheld by the general teaching of Scripture without being specifically declared in any particular passage; they also claim that it is in harmony with the faith and practice of the early Christian ages.

PURIM, a Jewish festival observed on the 14th and 15th of Adar (March), instituted to commemorate the preservation of the Jews in Persia from the destruction threatened them by the schemes of Haman (Esther ix).

PU'RITANS, a name first applied to those English Protestants who regarded the reformation in England as incomplete, and the Anglican church, even of Edward VI., as retaining too much of the discipline, ritual, and ceremonial of the Church of Rome. Many of them, who were driven into exile under Queen Mary, and who returned to England after the accession of Elizabeth, brought back a zealous desire to remodel the Church of England in the spirit of continental Protestantism, especially that of Geneva. In 1572 a presbytery was set up at Wandsworth in Surrey, and before many years Presbyterianism found adherents both among the clergy and the laity. Meanwhile the Brownists, the Independents of later days, whose Congregationalism was as much opposed to Presbyterianism as to Episcopacy, began to be organized and to make some progress. In doctrine these two Puritan parties differed little from each other, or from many Anglicans who remained contented with the Church of England as it was. The hopes with which the accession of James I. inspired the Puritan party in the church were grievously disappointed when their moderate demands for a reform of ritual and a slight modification of episcopal authority were rejected at the Hampton Court conference. During his reign the prelates and many of the clergy became less Protestant, while the Puritan element in the church, and out of it, increased in intensity. Nonconformity was pursued by new penal statutes, and numbers of Puritans emigrated to New England. This emigration continued during the reign of Charles I. and the ascendency of Laud. With the downfall of the Anglican system Independency again reared its head in England. The Independents now combined with their congregationalism the desire for a theological latitude, which widened the gulf between them and the Presbyterians. The army became leavened with Independency, and Oliver Cromwell its champion. With his ascendency the influence of Presbyterianism as a power in the state dwindled, and Independency became the dominant element in English Puritanism. After the restoration of Charles II. and of the old Anglicanism, the Presbyterians, Independents, and Baptists were the three chief denominations into which Puritanism had split up. Since then Nonconformists or Dissenters has been the term generally used where Puritanism would formerly have been employed.

PUR'NIAH, the northeastern district of the Bhágalpur division of the lieutenant-governorship of Bengal. Rice and indigo are its chief products. Area, 4956 sq. miles; pop. 1,944,658. Purniah, the chief town, stands on the east bank of the Saurá river. It is an unhealthy place, but does a considerable trade in jute. Pop. 14,600.

PURPLE, a secondary color compounded by the union of the primaries

blue and red. Of all the various kinds in use, the Tyrian dye was anciently the most celebrated. This color was produced from an animal juice found in a shell-fish called murex by the ancients; and as it was thus obtained only in small quantities, its use was restricted to the great and wealthy. It became the distinctive color of imperialism, and the later emperors of the East forbade its use by subjects. Hence their offspring were called purphyrogeniti, born in the purple. In modern times, and from the red or scarlet hat, cassock, and stockings worn by them, cardinals are sometimes said to have obtained the purple. With the general disuse of the purple obtained from shell-fish, archil and cudbear, yielded by various species of lichens, were employed in the dyeing of silk and wool; but they have been superseded by the purples obtained from aniline. For cotton the chief purple dye was furnished by madder, but the alizarin to which madder owed its dyeing properties is now prepared from coal-tar. The common shades of purple with which wool is dyed are obtained from logwood with a mordant of alum and tartar.

PURSE-CRAB, a name for decapod crustaceans allied to the hermit-crabs. A species, the robber-crab, found in the Mauritius and the more eastern islands of the Indian ocean, is one of the largest crustaceans, being sometimes 2 to 3 feet in length.

PUS, the white or yellowish matter found in abscesses, and formed upon the surfaces of what are termed healthy sores.

PU'SEY, Edward Bouverie, D. D., after whom the Tractarian movement in the Church of England became designated Puseyism, was born in 1800. In 1833 the Tracts for the Times began to appear, but he was not prominently connected with the Tractarian movement until 1835–36, when he contributed

Rev. Dr. Pusey.

to the Tracts one on baptism, which excited much attention. He died in 1882. Among the more substantial of his works, in addition to his Library of English Fathers and Anglo-Catholic Library, are his Councils of the Church, from the Council of Jerusalem, A.D. 51, to the Council of Constantinople, A.D. 381 (1857); Daniel the Prophet, nine lectures (1864); and the Minor Prophets, with a commentary and introduction to the several books (1860–67).

PUSHKAR, town of India, in Ajmere-Merwára, Rajputána, the only one in India containing a temple dedicated to Brahma. A great fair in October and November is attended by about 100,000 pilgrims. Pop. 5000.

PUSHKIN, Alexander Sergéyevitch, a famous Russian poet, born at St. Petersburg, 1799, died 1837. His works have been translated into German, French, and English.

PUTNAM, Israel, American soldier, was born in Old Salem village (now Danvers), Mass., in 1718. In August, 1755, during the French and Indian war, he was commissioned lieutenant by the Connecticut legislature, later in the year became one of Roger's Rangers, in March, 1756, became captain, saved Fort Edward from being destroyed by fire in the winter of 1757, and in March,

Israel Putnam.

1758, became major. In 1775, hearing of the battle of Lexington, he left his plow in the field, and rode to Cambridge in one day, a distance of sixty-eight miles. Returning, he was made brigadier-general by the legislature, organized and drilled a regiment. In 1775 he received his commission from congress as major-general. On the evacuation of Boston in the spring of 1776, Putnam was placed in command of New York. In 1779, one of his outposts, guarded by 150 men and two cannon, was attacked by the British officer Tryon, with 1500 men. Putnam, being closely pursued while on his way with his men to a swamp, is said to have dashed down a steep hill and escaped. Riding to Stamford and collecting the militia, he formed a junction with his troops, pursued Tryon in his retreat, and took 50 prisoners. In the summer of 1779 he had command of the troops in the Highlands, and completed the fortifications at West Point, The army going into winter quarters, he returned home, and on starting out again for camp was stricken with paralysis, from which he never completely recovered. He died May 19, 1790 .

PUTNAM, Rufus, American soldier, was born in Sutton, Mass., in 1738. He enlisted as a private soldier for service in the French and Indian war in 1757. He entered the continental army as lieutenant-colonel in May, 1775, and in August, 1776, was appointed chief engineer of the army with the rank of colonel. He was given command of a Massachusetts regiment in November, and in 1777 served in the campaign against Burgoyne. He was a member for several terms of the Massachusetts legislature, and during Shay's rebellion was General Lincoln's aide. He was one of the judges of the United States court in the northwest territory from 1790 to 1796, concluded an important treaty with the Indians at Vincennes, Ind., in 1792. In 1812 he organized the first Bible society west of the Alleghanies. He died in 1824.

PUTNEY, a suburb of London, in the county of Surrey, on the right bank of the Thames opposite Fulham, and within the parliamentary bounds of Wandsworth. The town is about 8 miles above London Bridge by river, and 4½ miles from Hyde Park Corner by road. The headquarters of the English rowing world are at Putney. Pop. 24,139.

PUTREFACTION, such a decomposition of dead organic matter as is generally accompanied by the evolution of fetid gases, now regarded as due to the agency of bacteria or other organisms floating in the atmosphere, which find a nidus in the putrescible matter and grow and multiply in it. The substances in which these animalcules are thus developed are reduced either to much more simple compounds, or to their original separate elements. The putrefaction, or putrefactive fermentation, of animal substances is usually attended by more fetid and noxious exhalations than those arising from vegetable products, chiefly through the more abundant presence of nitrogen in the former. The formation of ammonia, or of ammonical compounds, is a characteristic of most cases of animal putrefaction, while other combinations of hydrogen are also formed, especially carburetted hydrogen, together with complicated and often highly infectious vapors or gases, in which sulphur and phosphorus are frequently discerned. These putrefactive effluvia are for the most part easily decomposed or rendered innocuous by the agency of chlorine. The rapidity of putrefaction and the nature of its products are to a great extent influenced by temperature, moisture, and access of air. A temperature between 60° and 80°, a due degree of humidity and free access of air, are the circumstances under which it proceeds most rapidly. Hence the action of the minute organisms which produce putrefaction can be checked or altogether prevented by a very high, or a very low, temperature, by the exclusion of air, and by the absence of moisture. Antiseptics prevent and to some extent arrest the progress of putrefaction.

PUTTY, a kind of paste or cement compounded of whiting or soft carbonate of lime and linseed-oil, beaten or kneaded to the consistence of dough. In this state it is used by glaziers for fixing in the squares of glass in window frames, etc., and also by house-painters to stop up holes and cavities in woodwork before painting.

PUY-DE-DOME (pu-ē-dė-dōm), a department of Central France; area, 3070 sq. miles; takes its name from a volcanic cone (4805 feet) which overlooks it. The highest point in the department, Puy-de-Sancy, 6188 feet, is the most elevated peak of Central France. The industries of the department include paper-making, sugar production, and the manufacture of various textile fabrics. Pop. 544,194.

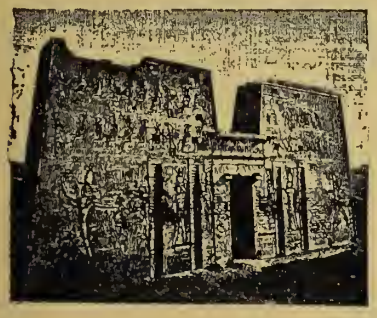
PYÆMIA (pī-ē'mi-a), blood-poisoning, a dangerous disease resulting from

the introduction of decaying animal matter, pus, or other morbid product into the system. Such matter may be introduced through an ulcer, wound, an imperfectly closed vein, or a mucous membrane, as that of the nose. This disease was common after severe operations in crowded hospitals, whose atmosphere was loaded with purulent or contaminated matter. It has been much checked of late years by the improved ventilation of hospitals, and by the application of antiseptics in the performance of surgical operations and the dressing of wounds.

PYGMA'LION, in Greek mythology, a king of Cyprus, who, having made an ivory image of a maiden, fell in love with his own work, and entreated Venus to endow it with life. His prayer was granted, and the maiden became his wife.

PYGMY, one of a race of dwarfs, first mentioned by Homer as dwelling on the shores of Ocean, and having to sustain a war against the cranes every spring. Later writers place them mainly in Africa, Aristotle at the sources of the Nile, and in fact there are dwarfish races in the interior of Africa.

PYLONS, in Egyptian architecture, the name given to powers or masses of



Pylon—Temple of Edfou, Egypt.

Propylon at Karnak, Egypt.

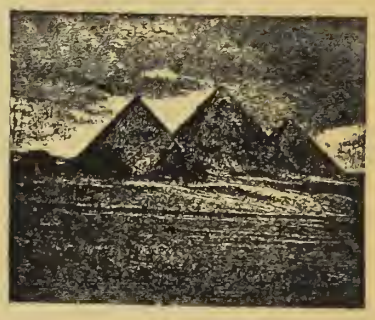
masonry, somewhat resembling truncated pyramids, placed one on each side at the entrance of temples, and having a very imposing appearance. Behind them in the larger temples there was often a large open court, and in front there might be an avenue with sphinxes on either side. An entrance of which these pylons form part is sometimes called a propylon. See Egypt (Architecture).

PYM, John, English statesman and leader of the popular party during the reigns of James I. and Charles I., was born in Somersetshire 1584; studied at Oxford and became famous as a lawyer. He entered parliament in 1614, and during the reign of James he attained

John Pym.

great influence by his opposition to the arbitrary measures of the king. In November, 1643, he was made lieutenant-general of ordnance, and in the following month he died, and was buried in Westminster Abbey.

PYRAMID, in architecture, a colossal structure of masonry having a rectangular base and four triangular sides terminating in a point, used by the ancients in various parts of the world for sepulchres or for religious purposes, especially in Egypt. The largest and most remarkable of the Egyptian pyramids occur in several groups on the west side of the Nile, on the border of the Libyan desert, extending for a distance of about 25 miles from north to south, the farthest north being opposite Cairo. They are built chiefly of the hard limestone of the adjacent hills, but large blocks of granite brought from a distance are also used, especially on the outside. The four sides are so placed as to face the four cardinal points. These structures are supposed to date from about 3000 B.C. to 2300 B.C. The stones used varied in size, but are mostly large, requiring wonderful mechanical skill to quarry them, transport them, and raise and adjust them in their proper places. An almost fabulous number of laborers were engaged in erecting the chief Egyptian pyramids, of which the group of Gizeh, 4 miles s.w of Cairo, in the neighborhood of the ancient Memphis, is the most remarkable. This group consists of nine pyramids, among them the three most celebrated of all, the pyramid of Cheops (Khufu), called the Great Pyramid; of Cephren (Khafra); and of Mycerinus (Menkauru). According to Herodotus the Great Pyramid took 100,000 men working for ten years to make a causeway 3000 feet long in order to facilitate the transport of the stone from the quarries; and the same number of men for twenty years more to complete the pyramid itself. Its base forms a square each side of which was originally 768 feet, though now, by the removal of the coating, only 750 feet long, occupying 13 acres. The outer surface forms a series of steps, each of the average height of 3 feet or more.



The pyramids of Ghizeh, Egypt.

When the structure was perfect this step formation was hidden by the coating, which rendered the sides quite smooth, and the apex, where there is now a space of 12 sq. yards, was no doubt originally quite sharp. The height was originally about 480 feet, but is now only 451. The interior, entered 49 feet above the base of the north face, contains several chambers, one of which, called the King's Chamber, is 34¼ feet long, 17 wide, and 19 high, and contains a sarcophagus of red granite. The second pyramid is 690 feet square and 447 feet high. The third pyramid is only 354 feet square and 203 feet high, and is the best constructed of the three. The six smaller pyramids which complete the Gizeh group are of much inferior interest. The pyramids are supposed to have been built by the respective kings as tombs and memorials of themselves; and it is conjectured that they were begun at the beginning of each reign, and that their size corresponded with the length of it. About 350 yards southwest of the Great Pyramid is the celebrated Sphinx. Ruins of pyramids are to be found at Benares in India and in other parts of the East. Certain monuments of the ancient inhabitants, found in Mexico, are also called pyramids. These seem to have been intended to serve as temples, the tops of them being flat and surmounted by a house or chamber in which sacred rites were probably performed. The largest and perhaps the oldest of them is that of Cholula, which is said to have a base of 1770 feet and a height of 177 feet.

PYR'AMUS AND THIS'BE, a pair of devoted lovers, who, as their story is told by Ovid (Met. iv. 55–165), resided in Babylon, and being prevented by their parents from meeting openly, were in the habit of secretly conversing through an opening of the wall, as their houses adjoined. They agreed one day to meet at the tomb of Ninus, when Thisbe, who was the first at the rendezvous, was surprised by a lioness and took to flight. In her haste she dropped her garment, which the lioness seizing

covered with blood, having immediately before killed an ox. Pyramus appearing on the scene, and concluding from the blood-besmeared robe that Thisbe was dead, killed himself. Thisbe returning soon afterward, and finding the body of her lover, also killed herself. The story was very popular in the time of Shakespeare, who made it the subject of the burlesque interlude in A Midsummer Night's Dream.

PYRENEES', a lofty mountain range, the crest of the main chain of which forms the boundary between France and Spain. It abuts with one extremity on the Mediterranean, and with the other on the Atlantic. Its length, from Cape Creux on the Gulf of Lyons, to Fontarabia, on the bay of Biscay, is about 280 miles, and its greatest breadth little more than 50 miles. It consists of two lines, which form parallel ridges about 20 miles apart from each other, except near the center, towards which the range rises both from the east and west. The descent on the south side is much more abrupt than on the north. Its loftiest summits are near its center, where its culminating point, Maladetta, or Pic de Néthou, reaches a height of 11,424 feet. The principal passes in the Pyrenees, formed by the meeting of valleys from opposite sides of the axis, take in the east part of the chain the name of Cols, and toward the center that of Ports. Only four of these are conveniently practicable for carriages. In 1885 the French and Spanish governments agreed to the construction of two railways, of which the tunnels perforating the Pyrenees were to be made at the cost of both countries. In the Pyrenees is to be found some of the finest scenery in France. The climate, genial and warm, banishes perpetual snow to 1300 feet higher than the snow-line of the Alps. The French Pyrenees abound in mineral springs, in connection with which are some of the gayest watering-places in Europe, chief among them Bagnères de Luchon. Barège is in a dreary gorge, but its waters are celebrated for their efficacy.

PYRENEES (pē-rā-nā), the French name of the Pyrenees, giving name to three French departments.—Basses-Pyrénées (bäs-pē-rā-nā), is a department of Southwestern France, at the angle of the Bay of Biscay. Its industry is mainly agricultural. The surface is diversified, there is much fine scenery, and the forests are extensive and valuable. Biarritz, its chief watering-place, is well known as a health resort, especially in winter. Pau is the capital of the department. Area, 2943 sq. miles; pop. 432,999.—Hautes-Pyrénées (ōt-pē-rā-nā) is a department of Southern France, bounded partly by Spain, partly by Basses-Pyrénées, and other departments. To it in the south belong some of the loftiest summits of the Pyrenees. The finest scenery and the mineral springs of the department attract many visitors. Area, 1749 sq. miles; pop. 234,825. Tarbes is the capital.—Pyrénées-Orientales (pē-rā-nā-zo-rē-an-tàl), a department of Southern France, bordering on the Mediterranean and the Spanish frontier. Its chief wealth lies in its wines, of which the well-known Roussillon is one. The department is also very rich in iron. Pergipnan is the capital. Area, 1592 sq. miles; pop. 211,187.

PYRHE'LIOMETER, an instrument devised by M. Pouillet for measuring the intensity of the heat of the sun.

PYRITES (pi-rī'tēz), a name given in mineralogy to various metallic sulphides, chiefly to the sulphides of copper and iron. Pyrites is largely used as a source of sulphur in the manufacture of sulphuric acid.

PYROGALLIC ACID, an acid obtained by the dry distillation of gallic acid (which see). It forms crystals that have neither smell nor color, is readily soluble in water, alcohol, and ether, has a neutral reaction, readily absorbs oxygen in an alkaline solution, and becomes of a dark brown color. It is used in photography, and sometimes as a hair-dye.

PYROM'ETER, any instrument, the object of which is to measure all graduations of temperature above those indicated by the mercurial thermometer.

PYR'OSCOPE, an instrument for measuring the intensity of heat radiating from a hot body, or the frigorific influence of a cold body.

PY'ROTECHNY, the science of making and using artificial fire-works, the chief ingredients of which are nitre, sulphur, and charcoal. Iron filings yield bright red and white sparks. Steel filings and cast-iron borings contain carbon, and give a more brilliant fire with wavy radiations. Copper filings give flame a greenish tint, those of zinc a fine blue color; the sulphurate of antimony gives a less greenish blue than zinc, but with much smoke; amber, resin, and common salt give a yellow fire. Lampblack produces a very red color with gunpowder, and a pink with niter in excess. Verdigris imparts a pale green, sulphate of copper and sal-ammoniac a palm-tree green. Lycopodium, used also in the manufacture of stage-lighting, burns with a rose color and a magnificent flame. See Fire-works.

PYROX'YLINE, a term embracing gun-cotton and all other explosive substances obtained by immersing vegetable fiber in nitric or nitro-sulphuric acid, and then suffering it to dry. These substances are nitro-derivatives of cellulose.

PYRRHIC DANCE, an ancient Grecian warlike dance, which consisted chiefly in such an adroit and nimble turning of the body as represented an attempt to avoid the strokes of an enemy in battle, and the motions necessary to perform it were looked upon as a kind of training for war.

PYRRHO, a Grecian philosopher of Elis, founder of the Pyrrhonian or sceptical school, flourished about 340 B.C. A disposition to doubt is often called, from this philosopher, Pyrrhonism.

PYRRHUS, King of Epirus, one of the most illustrious generals of antiquity, was born about 318 B.C. He defeated the Romans in two battles, but with severe loss to himself; then passed over into Sicily, returned to Italy again, and was defeated at Beneventum 275 B.C. He now retired to Epirus, took part in the Greek troubles, and was killed at Argos, B.C. 272.

PYTHAG'ORAS, a Grecian philosopher, supposed to have been born about 586 B.C. at Samos. He went to Scyros, and was a scholar of Pherecydes till the death of the latter; others make him also a scholar of Thales and Anaximander. He is said to have gathered knowledge from the philosophers or learned men of Phœnicia, Syria, Egypt, Babylon, India, etc., but eventually settled at the Greek city of Crotona in Lower Italy, probably about 529 B.C. His abilities and character led great numbers, chiefly of the noble and wealthy classes, to adopt his views. Three hundred of these were formed into a select fraternity or order, and were bound by vow to Pythagoras and each other, for the purpose of cultivating the rites and observances enjoined by their master, and studying his philosophy. They thus formed at once a philosophical school and a religious order. The political influence of this body became very considerable, and was exerted in the interest of the aristocratic party. The democratic party strenuously opposed the growing power of the order, and their enmity caused Pythagoras to retire to Metapontum, where he died about 506 B.C. His public instruction consisted of practical discourses in which he recommended virtue and dissuaded from vice, with a particular reference to the various relations of mankind, as those of husbands and wives, parents and children, citizens and magistrates, etc. His disciples were required to practice the greatest purity and simplicity of manners. He imposed upon them, it is said, a silence of from two to five years, according to circumstances. He alone who had passed through the appointed series of trials was allowed to hear the word of the master in his immediate presence. To the initiated the doctrines were not delivered, as to others, under the mask of images and symbols, but unveiled. Pythagoras left no writings; the Golden Sentences extant under his name having been composed or compiled by later hands.

PYTHIAN GAMES, one of the four great Grecian games, instituted in honor of Apollo, and celebrated at Delphi. Until about 586 B.C. they were under the management of the Delphians, and took place every eighth year; but after that date they were conducted by the Amphictyons, and celebrated every fourth year, prizes being given for flute-playing, athletic sports, and horse and chariot racing. Eventually contests in tragedy, painting, sculpture, etc., were added. At first prizes of silver or gold were awarded, but afterward the simple laurel wreath and palm-branch were substituted. They continued to be celebrated until the end of the 4th century of our era.

PYTHIAS, Knights of, a fraternal and beneficial order founded in Washington, D. C., in 1864. Its objects are the practice of friendship, benevolence and charity toward the members. Its most binding obligation is complete and absolute secrecy. The first lodge instituted was Washington lodge. In 1868 a new constitution was adopted at Washington under which was organized, as the central governing body, the Supreme Lodge

Knights of Pythias of the World. Its roll of membership exceeds 600,000. The uniform rank is another division of the order. It is under the control of the supreme lodge also, but is directed by an officer whose title is major-general. The members of this grade are on the same plane with the other members, but only those members who have received the rank of knight are eligible for membership. Pythian knighthood confers three ranks or degrees, viz.: The initiatory rank of "page;" the armorial rank of "esquire;" and the chivalric rank of "knight." The motto of the order is: "Be generous, brave, and true."

PYTHON, a genus and family of serpents allied to the family Boidæ or Boas. They are not venomous, but kill their prey by compression. The pythons belong exclusively to the Old World, and are of enormous size, sometimes attaining a length of 30 feet. They are found in India and in the islands of the Eastern Archipelago, in Africa and in Australia. A rudimentary pelvis and traces of hinder limbs exist in the pythons, these structures terminating externally in a kind of hooked claw. The head exceeds the neck in thickness, and the mouth is extremely large. Aided by their pre-

Python.

hensile tails and rudimentary hinder limbs, the pythons suspend themselves from the branches of trees and lie in wait near water for animals which come to drink. The genus python contains various species, the best known of which is the West African python, common in menageries. The female python hatches her eggs by the heat of her body.

PY'THONESS, the priestess of Apollo at his temple at Delphi who gave oracular answers. See Delphi.

PYX (Greek, pyxis, a box), a covered vessel used in the Roman Catholic church to contain the consecrated host. In ancient times, although generally rectangular in shape, it sometimes had the form of a dove, and was suspended above the altar. It is now cylindrical, cup or bell shaped, with a cross-surmounted cover, and is frequently delicately chased and inlaid.

PYX, Trial of the, the final trial by weight and assay of the gold and silver coins of the United Kingdom, prior to their issue from the mint, a certain number being taken and tested by way of sample of the whole. The trial takes place periodically by a jury of goldsmiths summoned by the lord-chancellor, and constitutes a public attestation of the standard purity of the coin.

Q

Q, the seventeenth letter in the English alphabet, a consonant having the same sound as k or hard c. It is a superfluous letter in English, as the combination qu, in which it always occurs, could be equally well expressed by kw or k alone when the u is silent. It did not occur in the Anglo-Saxon alphabet, the sound qu in Anglo-Saxon words being regularly written cw or cu, but was borrowed from the French-Latin alphabet.

QUADRAN'GLE, in geometry, a quadrilateral figure; a plane figure having four sides, and consequently four angles. In ordinary language it is a square or quadrangular court surrounded by buildings, as often seen in the buildings of a college, school, or the like.

QUAD'RANT, an instrument for measuring angular altitudes, variously constructed and mounted for different specific uses in astronomy, navigation, surveying, etc., consisting originally of a graduated arc of 90°, with an index or vernier, and either plain or telescopic sights, along with a plumb-line or spirit-level for fixing the vertical or horizontal direction. Its principle and application is the same as that of the sextant, by which it is superseded. See Sextant.

QUADRILLE', a dance of French origin, which consists generally of five consecutive figures or movements, danced by four sets of couples, each forming the side of a square.

QUADRU'MANA ("four-handed"), the name applied by Cuvier and others to denote the order of mammalia represented by the lemurs, monkeys, and apes, from the fact that these forms agree in possessing a great toe so constructed as to be capable of opposing the other digits of the feet, instead of being placed parallel with the other toes, thus forming a kind of "hand" adapted for supporting the foot on the ground.

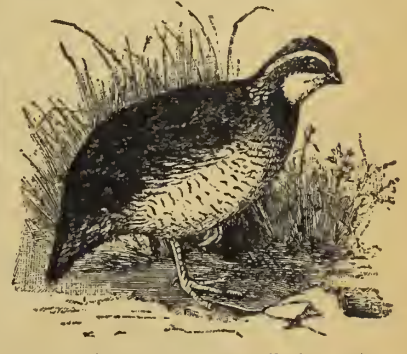
QUADRUPED, the name popularly applied to those higher vertebrate animals which possess four developed limbs. The name is usually restricted to four-footed mammals.

QUADRUPLE ALLIANCE, an alliance, so called from the number of the contracting parties, concluded in 1718 between Great Britain, France, and Austria, and acceded to by Holland in 1719, for the maintenance of the Peace of Utrecht. The occasion of the alliance was the seizure by Spain of Sardinia in 1717, and Sicily in 1718, both of which she was forced to give up.

QUÆSTOR, the name of certain magistrates of ancient Rome whose chief office was the management of the public treasure, being receivers of taxes, tributes, etc.

QUAGGA, a species of the horse genus, nearly allied to the zebra, and formerly found on the plains of Southern Africa. Striped liked the zebra, it yet possessed no bands on the limbs; of a dark or blackish-brown on the head, neck, and shoulders, the back and hind quarters were of a lighter brown, while the croup was of a russet gray. The under parts of the body were white, the upper parts of the legs and tail being marked by whitish bars. The quagga was of smaller size than the zebra, and in general conformation bore a closer resemblance to the horse. Gregarious in habits, the quagga is said to have mingled indiscriminately with the zebra herds. Its food consisted of grasses and mimosa leaves. It is now said to be absolutely extinct. The animal to which the name quagga is now applied is Burchell's zebra.

QUAIL, a genus of rasorial birds, included in the family of the partridges, to which they are nearly allied, but from which they differ in being smaller, in having a relatively shorter tail, no red space above the eye, longer wings, and no spur on the legs. The common quail is a migratory bird, and is found in every country of Europe, and in many parts of Asia and Africa. It is about 8 inches in length. The color of the upper parts is brownish with lighter and darker markings, of the under parts yellowish. The quail is very pugnacious, and in some places quail fights are a form of amusement, as was the case also in ancient times. Its flesh is deemed excellent food, and large numbers are brought alive and dead from the conti-



Bob-white, or common quail of America.

nent to the British markets. In Britain these birds arrive early in May, and depart southward in October. There are several other species, in appearance and habits not greatly differing from the common quail, as the Coromandel quail, the Australian quail, the white throated quail, the Chinese quail, an elegant little species measuring only 4 inches in length, etc. The name of quail is also given to some birds of other genera, as the Virginia or Maryland quail, and the Californian or crested quail. The Virginian quail is common throughout

North America, and extends as far south as Honduras. It is rather larger than the European quail. The flesh is very white and tender, and is unequalled in delicacy by any other member of its order in America.

QUAKERS, a society of Christians which took its rise in England about the middle of the 17th century. George Fox, a native of Drayton, in Leicestershire, was the first to teach the religious views which distinguish the society. He commenced his ministerial labors in 1647, and immediately fell under persecution. But persecution, as usual, enlisted the sympathies of many in his cause. After making multitudes of converts he organized them into a church, which became, although not until after severe persecution, one of the recognized sects of Christianity. Among the other eminent members of the society in its early days we may mention William Penn, Robert Barclay, George Whitehead, Stephen Crisp, Isaac Pennington, John Crook, Thomas Story, etc. The early Quakers were marked as a peculiar people by their testimonies against oaths, a paid ministry, and tithes; their use of the singular pronouns when addressing only one person; their refusal to take off the hat as a compliment to men; the plainness of their apparel; and their disuse of the ordinary names of the months and days. The name Quakers was given to them in derision, and though they accepted the name they call themselves by that of Friends. One of the brighest chapters in the annals of Quakerism is that relating to the founding of the colony of Pennsylvania. (See Penn, William, Pennsylvania.)

The society, or the orthodox section of it, believes that, under the gospel dispensation, all wars and fightings are strictly forbidden; the positive injunction of Christ, "Love your enemies," etc., entirely precluding the indulgence of those passions from which only such contests can arise. They also believe that the express command, "Swear not at all," prohibits the Christian from the use of judicial as well as other oaths. In like manner, following the spirit of the Scriptures, they believe that a special call is necessary to constitute a true minister of the gospel, that the faithful minister should not preach for a pecuniary reward, that the essential baptism is of the Holy Ghost, not by water, and that the Lord's supper is also entirely of a spiritual nature. They therefore renounce both these sacraments so far as the ordinary outward forms are concerned. As to the cardinal doctrines of Christianity, the incarnation, crucifixion, resurrection, redemption through Christ's death, justification, etc., their beliefs are similar to those of orthodox Christians generally. The Quakers were one of the first sects to allow women to teach publicly. As early as 1727 they censured the traffic in slaves, and the efforts of the society had a great influence in bringing about their emancipation. They object to balls, gaming-places, horse-races, theaters, and music; also to the reading of plays, romances, and novels; and enjoin plainness of dress and the avoidance of ornaments.

The society is governed by its own code of discipline, which is enacted and supported by meetings of four degrees for discipline—namely, preparative, monthly, quarterly, and yearly meetings. The preparative digest and prepare the business for the monthly meetings, in which the executive power is principally lodged, subject, however, to the revision and control of the quarterly meetings, which are again subject to the supervision and direction of the yearly meetings. There are about 60,000 members and adherents in Britain, about 95,000 in the United States and Canada, besides small numbers in other countries.

QUANTITY, that property of anything, in virtue of which it is capable of being measured, increased, or diminished, relating to bulk, weight, or number. In mathematics a quantity is anything to which mathematical processes are applicable. In grammar it signifies the measure of a syllable, or the time in which it is pronounced—the metrical value of syllables as regards length or weight in pronunciation. In Latin and Greek poetry quantity and not accent regulates the measure.

QUAR'ANTINE, the period (originally forty days) during which a ship coming from a port suspected of contagion, or having a contagious sickness on board, is forbidden intercourse with the place at which she arrives. This form of quarantine is now confined to foreign countries where cholera, yellow fever, etc., have to be guarded against. In Britain quarantine is altogether abolished. If there be evidence or suspicion of infectious disease on board a vessel arriving in a British port, the customs-officers report the same to the port sanitary authorities, who have power to deal with cases under the public health acts. Quarantine was originally introduced at Venice as a measure of proection against plague or leprosy about the middle of the 14th century, Venice, then the chief trading center of the Mediterranean, being especially liable to contagion through vessels coming from Eastern ports. A lazaretto was early erected here in connection with the quarantine restrictions. In the United States it is a misdemeanor punishable by a fine or imprisonment, or both, for the master, pilot, or owner of any vessel entering a port of the United States in violation of the quarantine law passed in 1888, or regulations framed under it.

QUARREL, a bolt or dart to be shot from a cross-bow, or thrown from a catapult, especially one with a square head and pyramidal point.

QUARRY, an open excavation made for obtaining stone, such as granite, marble, sandstone, limestone, and slates. Stones suitable for important building purposes are usually found at a good distance below the surface. In the case of unstratified rocks, such as granite, whinstone, etc., the stone is most frequently detached from the mass by blasting, a process by which much valuable stone is wasted, and a different method is employed whenever it is found possible. This is frequently the case with some stratified rocks, such as sandstone, from which blocks are separated by hand-tools alone. Small holes a few inches asunder are cut along a certain length of rock, into which steel wedges are inserted. These are driven in by heavy hammers until the stratum is cut through. The large blocks necessary for monumental purposes are generally obtained in this way, and before they leave the quarry they are usually reduced as nearly as possible to a rectangular form.

QUART, an English measure of capacity, being the fourth part of a gallon, or 8 gills.

QUARTER-DECK, the upper deck, or aftermost part of the upper deck, of a vessel, extending from the main-mast to the stern, or to the poop (when there is one). In ships of war it is especially set apart for the officers.

QUARTERING, in heraldry, is dividing a coat into four or more quarters or quarterings, by perpendicular and horizontal lines, etc. See Heraldry.

QUARTER-MASTER, in the army, an officer who attends to the quarters for the soldiers, their provisions, fuel, forage, etc. There is a quarter-master attached to every regiment, battalion, etc., who generally holds the relative rank of lieutenant. A quarter-master in the navy is a petty officer appointed by the captain, who, besides having charge of the stowage of ballast, and provisions coiling of ropes, etc., attends to the steering of the ship.

QUARTERMASTER-GENERAL, a staff officer of high rank in the army, whose department is charged with all orders relating to the marching, embarking, disembarking, billeting, quartering, and cantoning of troops, encampments and camp equipage. The quarter-master-general is attached to a whole army under a commander-in-chief, and generally holds the rank of major-general while to every brigade is attached a deputy-assistant quarter-master-general.

QUARTERN, a term sometimes used to designate the fourth of a peck, or of a stone; as the quartern-loaf. In liquid measure it is the fourth part of a pint.

QUARTET', or **QUARTETTE',** a musical composition for four instruments, generally stringed instruments (that is, two violins, one viola or tenor violin, and one violoncello); also a composition for four voices, with or without accompaniment.

QUARTO (4to), a book of the size of the fourth of a sheet; a size made by twice folding a sheet, which then makes four leaves.

QUARTZ, the name given to numerous varieties of the native oxide of silicon, called also silicic acid. Quartz embraces a large number of varieties. It occurs both crystalized and massive, and in both states is most abundantly diffused throughout nature, and is especially one of the constituents of granite and the older rocks. When crystalized it generally occurs in hexagonal prisms, terminated by hexagonal pyramids. It scratches glass readily, gives fire with steel, becomes positively electrical by friction, and two pieces when rubbed together become luminous in the dark. The colors are various, as white or milky, gray, reddish, yellowish or brownish, purple, blue, green. Quartz veins are often found in metamorphic rocks, and

frequently contain rich deposits of gold. The principal varieties of quartz known by distinct names are the following: 1, rock-crystal; 2, smoky quartz; 3, yellow quartz; 4, amethyst; 5, siderite or blue quartz; 6, rose quartz; 7, milky quartz; 8, irised quartz; 9, common quartz; 10, fat (greasy) quartz; 11, flint; 12, hornstone; 13, Lydian stone; 14, float stone (swimming stone); 15, fibrous quartz; 16, radiating quartz; 17, chalcedony; 18, carnelian; 19, chrysoprase; 20, agate. The name rock-crystal is applied to transparent and colorless crystals. Smoky quartz consists of crystals and crystalline masses which are translucent and of a brown color. Yellow quartz, sometimes called Bohemian or Scottish topaz, is transparent, and of various shades of yellow. Amethyst is of every shade of violet, and nearly transparent. Siderite is of an azure-blue color, and never in regular crystals. Rose quartz is of a rose-red color. Milky quartz is massive, translucent, and of a milk-white color. Irised quartz exhibits the colors of the rainbow. Fat or greasy quartz has the appearance of having been immersed in oil. Flint has a more compact texture than common quartz, is dull, only translucent on the edges, of a brownish color, and breaks with a conchoidal fracture. Hornstone resembles flint, but its conchoidal fracture is less distinct. Lydian stone differs from flint chiefly in having a darker color, less translucency, and a fracture somewhat slaty; when black it is often called basanite. Floatstone consists of a delicate tissue of minute crystals, visible only under a powerful magnifier. Owing to the cavities it contains it will sometimes float on water. Fibrous quartz consists of those varieties which are in distinct parallel concretions. Radiating quartz is like fibrous quartz, except that the fibers diverge from a common center, and resemble the radii of a circle, instead of being parallel. Chalcedony includes those varieties of radiating quartz where the thickness of the individuals becomes so much diminished as to render them nearly or altogether impalpable. Carnelian differs from chalcedony merely in having a blood-red color. Chrysoprase also resembles chalcedony in composition, except that it is granular instead of fibrous; its color is apple-green. Agate implies the occurrence of two or more of the above varieties existing together in intimate union. Cat's eye, avanturine, prase, plasma, heliotrope, Compostella hyacinth, jasper (red, brown, striped, and porcelain), jasper agate, Mocha stone, Venushair agate, etc., formerly included under quartz, are only mixtures of this mineral with other substances. Several varieties of quartz are of important use in the arts and manufactures. The ancients regarded rock-crystal as petrified water, and made use of it for the fabrication of vases. At present it is employed not only for cups, urns, chandeliers, etc., but for seals, spectacle-glasses, and optical instruments. Quartz enters into the composition of glass, both white and colored. In the manufacture of porcelain it is added in the state of an impalpable powder, and forms part of the paste; it is also used in other kinds of pottery. Quartz is used as a fluid in the melting of several kinds of ores, particularly those of copper, and in other metallurgical processes. Touchstone is a hard velvety-black variety of Lydian stone.

QUATREFOIL (kwa'tẽr-foil), in architecture, an opening or a panel divided by cusps or foliations into four leaves, or more correctly the leaf-shaped figure formed by the cusps. It is an ornament which has been supposed to represent the four leaves of a cruciform flower,

Quatrefoils.

and is common in the tracery of Gothic windows. Bands of small quatrefoils are much used as ornaments in the perpendicular Gothic style, and sometimes in the decorated. The same name is also given to flowers and leaves of similar forms carved as ornaments on mouldings, etc.

QUAVER, a note and measure of time in music, equal to half a crotchet or the eighth of a semibreve. See Music.

QUAY (kē), a landing-place substantially built along a line of coast or a river bank, or round a harbor, and having posts and rings to which vessels may be moored, frequently also cranes and storehouses for the convenience of merchant ships.

QUAY (kwā), Matthew Stanley, American politician, born in Dillsburg, York co., Pa., in 1833. During the civil war he was assistant commissary-general of the state, and military secretary to the governor. He was a member of the legislature from 1865 to 1867; secretary of state for Pennsylvania from 1872 to 1878, recorder of Philadelphia from 1878 to 1879, again secretary of state from 1879 to 1882, elected state treasurer in 1885, and was chosen United States senator in 1887. In 1888 he was chairman of the executive committee of the republican national committee. He was re-elected to the senate in 1893, but failed to succeed himself in 1899, because of a deadlock which lasted throughout the session of the legislature. He was appointed senator by the governor, but the senate refused to recognize the appointment. He was, however, nominated to succeed himself by the republican state convention, and in 1901 was re-elected for the term to expire in 1905. He died in 1904.

QUEBEC', a city and shipping port of the Dominion of Canada, capital of the province of the same name, situated on a promontory near the confluence of the St. Charles with the St. Lawrence, terminating abruptly in Cape Diamond, which has a height of 333 feet, and on the banks of both streams. It is about 400 miles from the mouth of the St. Lawrence and 140 miles northeast of Montreal, to which the river is navigable for large vessels. On the Plains of Abraham, west of the upper town, a column 40 feet high has been erected to the memory of General Wolfe; while in the upper town there is a handsome obelisk, 65 feet high, to the joint memory of the two commanders, Wolfe and Montcalm, who both fell at the taking of Quebec. Ship-building is the chief industry. There are also manufactures of iron-castings, machinery, cutlery, nails, leather, paper, india-rubber goods, rope, tobacco, beetroot-sugar, etc. Quebec is the chief seat of the Canadian trade in timber, immense quantities of which are here accumulated, so that at certain seasons rafts moored within booms may be seen extending along the water's edge for 6 miles. Pop. 75,000.

QUEBEC, a province of the Dominion of Canada. It is bounded on the n. by Labrador and the northeast territory of Canada; on the e. by Labrador and the Gulf of St. Lawrence; on the s. by the Chaleurs bay, New Brunswick, and the states of Maine, New Hampshire, Vermont, and New York; and on the s.w. by the River Ottawa, which separates it from the province of Ontario. It is nearly 1000 miles in length from e. to w. by 300 in breadth, and has an area of 188,694 sq. miles. The climate is variable, though salubrious, the temperature ranging from 20° below zero in winter to 90° in summer. The soil is generally fertile, and well suited for the growth of cereals, hay, etc.; corn, flax, and tobacco are also grown, especially to the west of the longitude of Quebec, while grapes, melons, peaches, and tomatoes in this region come to maturity in the open air. A large portion of the province is still covered with forest, the white and red pines and the oak being the most valuable trees for timber. The fisheries are extensive and valuable. The minerals worked include apatite, asbestos, gold, copper, iron, plumbago, etc. The manufactures are steadily increasing, and include furniture, leather, paper, chemicals, boots and shoes, woolen goods, steam and agricultural machinery. The chief exports are timber and fish. The educational system embraces institutions of all grades, from primary schools upward, at the top being three universities—Laval university, Quebec (Roman Catholic); Macgill university, Montreal (Protestant); and Bishop's college, Lennoxville (Anglican). The affairs of the province are administered by a lieutenant-governor (appointed by the governor-general) and an executive council composed of 8 members, assisted by a legislative assembly of 74 members and a legislative council of 24 members. The latter hold their appointments for life; the former are elected by the people for five years. The capital is Quebec, but Montreal is the largest town. Pop. 1,620,974.

QUEEN, a woman holding a position similar to that of king. In Britain the queen is either queen-consort or merely wife of the reigning king, who is in general (unless where expressly exempted by law) upon the same footing with other subjects, being to all intents the king's subject, and not his equal; or queen-regent, regnant, or sovereign, who holds the crown in her own right, and has the same powers, prerogatives, and duties as if she had been a king, and whose husband is a subject; or queen-dowager, widow of the king, who enjoys most of the privileges which belong to her as queen-consort. In Prussia,

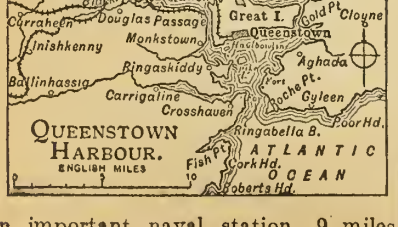
Sweden, Belgium, and France there can be no queen-regent. See Salic Law.

QUEEN CHARLOTTE ISLANDS, a group of islands in the North Pacific ocean, off the mainland of British Columbia, north of Vancouver island, discovered by Cook about 1770, and annexed to the British crown about 1787.

QUEEN'S COUNTY, a county of Ireland, in the province of Leinster, with an area of 664 sq. miles. Pop. 57,226.

QUEENSLAND, an Australian colony, comprising the whole northeast portion of Australia north of New South Wales and east of S. Australia and its northern territory, being elsewhere bounded by the Gulf of Carpentaria, Torres strait, and the Pacific. A considerable portion is thus within the tropics, the most northern part forming a sort of peninsula, known as York peninsula. It has an area of about 668,224 sq. miles, and is divided into twelve large districts, namely, Moreton (east and west), Darling Downs, Burnett, Port Curtis, Maranoa, Leichhardt, Kennedy, Mitchell, Warrego, Gregory, Burke, and Cook. Most of these districts are now subdivided into counties. Toward the west a large portion of the surface is dry and barren, but toward the east, and for a long stretch along the coast, boundless plains or downs, admirably adapted for sheep-walks, and ranges of hills, generally well wooded and intersected by fertile valleys, form the prevailing features of the country. The coast is skirted by numberless islands, and at some distance is the Great Barrier Reef. The highest mountains are near the coast, the greatest elevation being about 5400 feet. The principal rivers are the Brisbane, the Burnett, the Pioneer the Fitzroy, and the Burdekin flowing into the Pacific, and the Flinders and Mitchell into the Gulf of Carpentaria. Some of these streams are navigable for a considerable distance inland. The coast is indented with many noble bays, affording some capacious natural harbors, which have already been brought into practical use as the outlets for the produce of the adjacent districts. The climate is healthy, and the temperature comparatively equable. The mean temperature at Brisbane is 69°, the extreme range being from 35° to 106°. In the more northern parts the climate is tropical. The rainfall in the interior is scanty and variable; the mean at Brisbane is about 35 inches. The indigenous animals and plants are similar to those of the rest of Australia. Pop. 525,262.

QUEENSTOWN, formerly Cove of Cork, a maritime town of Ireland, and

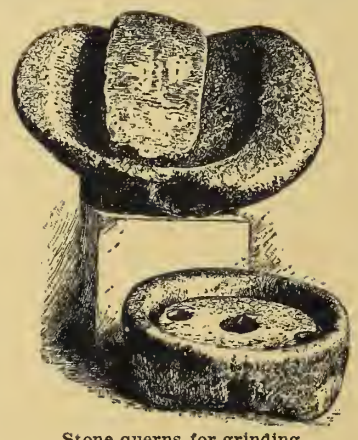


an important naval station, 9 miles southeast of Cork, on the south side of Great island, which rises abruptly out of Cork harbor to a considerable elevation. It is the port for the transmission of American mails, and a chief emigration station. It has little trade and no manufactures, being almost solely dependent on the military and naval establishments in its vicinity. Pop. 7909.

QUENTIN', St. (saṇ kăṇ-taṇ), an ancient town of France, department of Aisne, on a height above the Somme, 87 miles n.e. of Paris, which from its position on the frontiers between France and the Low Countries figures much in history. Pop. 50,150.

QUERETARO (ke-rā'tȧ-rō), a city in Mexico, capital of the state of the same name, on a plateau 6365 feet above sea-level, 110 miles northwest of Mexico. Pop. 33,152.—The state of Querétaro has an area of 3207 sq. miles, and forms part of the central plateau of the Cordillera, presenting a very rugged surface, traversed by mountain spurs and lofty heights. Grain and cattle form the chief wealth of the state. The minerals are comparatively unimportant. Pop. 232,389.

QUERN, a hand-mill for grinding corn, such as is or has been in general use among various primitive peoples. In using the quern the grain is dropped with one hand into the central opening, while with the other the upper stone is re-



Stone querns for grinding.

volved by means of a stick inserted in a small opening near the edge. Hand-mills of this description are used in parts of Scotland and Ireland to the present day.

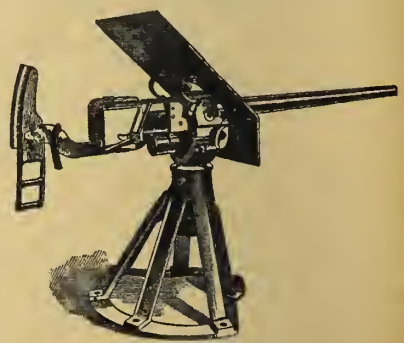
QUESNAY (kā-nā), François, a French physician of some eminence, but chiefly noted as a writer on political economy, born in 1694, died in 1774. He was the author of various surgical and medical works; of several articles in the Encyclopédie, in which he expounds his economical views; and tracts on politics, including a treatise on the Physiocratic System (1768).

QUETELET (kāt-lā), Lambert Adolphe Jacques, Belgian statistician and astronomer, born at Ghent in 1796, studied at the lyceum of his native town, where, in 1814, he became professor of mathematics. A member of the Belgian Royal academy, he became its perpetual secretary in 1834. Quetelet's writings on statistics and kindred subjects are very numerous. He also published many papers on meteorology, astronomy, terrestrial magnetism, etc. Died 1874.

QUEZAL, a most beautiful Central American bird. It is about the size of a magpie, and the male is adorned with tail-feathers from 3 to 3½ feet in length, and of a gorgeous emerald color. These feathers are not strictly speaking the true tail-feathers (the color of which is black and white), but are the upper tail coverts of the bird. The back, head (including the curious rounded and compressed crest), throat, and chest are of the same rich hue, the lower parts being of a brilliant scarlet. The female wants these long feathers, and is otherwise much plainer. The food of the quezal consists chiefly of fruits. It lives in forests of tall trees. There are several allied species of birds, but none with the distinctive feature of the quezal.

Quezal.

QUICK-FIRING GUNS, a type of ordnance of recent introduction, consisting of breech-loading guns of comparatively small size, the projectile and powder for which are combined together in a metallic cartridge-case, so that loading and firing are thus facilitated. They are mounted on special carriages provided with steel shields to protect the gunners, are fitted with special gear for handling and aiming, and are fired by electricity.



Hotchkiss six-pounder with deck mount.

QUICKSAND, a large mass of loose or moving sand mixed with water formed on many sea-coasts, dangerous to persons who trust themselves to it and find it unable to support their weight.

QUI'ETISM, a religious movement in the Roman Catholic church at the close

of the 17th and beginning of the 18th centuries, largely of a mystic character.

QUINCE, the fruit of the quince-tree, which is supposed to be a native of Western Asia, but is now cultivated throughout Europe, and in many parts of the United States for its handsome

Quince.

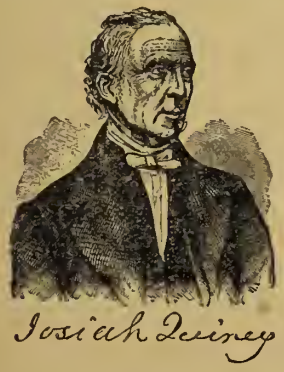
golden yellow fruit, which, though hard and austere when plucked from the tree, becomes excellent when boiled and eaten with sugar, or preserved in syrup, or made into marmalade.

QUINCEY, Thomas de. See De Quincey.

QUINCY, a town in Adams co., Illinois, on the left bank of the Mississippi, 105 miles northwest of St. Louis. It is an important railway center; has an extensive river traffic, and various manufacturing establishments including tobacco manufactories, foundries, machine-shops, saw and flour mills, and an extensive and rapidly increasing trade. Pop. 1909, estimated at 40,000.

QUINCY, a town in Norfolk co., Massachusetts, on a branch of Boston harbor, about 7 miles from Boston. Its most important and lucrative industry is the working of the quarries which furnish the well-known Quincy granite. The fisheries also are important, and a considerable number of vessels are fitted out in the building-yards. Pop. 26,314.

QUINCY, Josiah, an American writer, born at Boston 1772, died 1864. Educated for the law, he made politics his profession, and was a member of con-



Josiah Quincy

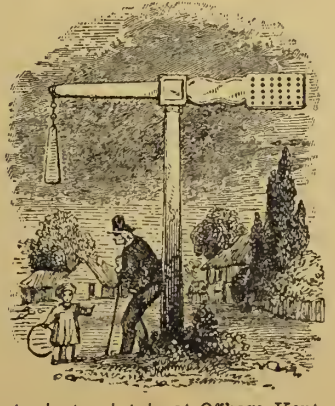
gress from 1804 to 1812. Then he was elected a member of the senate of the legislature of Massachusetts, a position which he held till 1821, in which year he held the office of speaker of the house. From 1823 to 1828 he was mayor of Boston and effected various important reforms. From 1829 to 1845 he was president of Harvard college. His principal works are History of Harvard University; Municipal History of the Town and City of Boston during Two Centuries; Life of John Quincy Adams.

QUIN'INE, a white, crystalline alkaloid substance, inodorous, very bitter, and possessed of marked antifebrile properties. It is obtained from the bark of several trees of the order Cinchonaceæ (see Cinchona), but perhaps the best is that from calisaya bark. It was discovered about 1820, and has entirely superceded the use of the bark itself in medicine, being most commonly used in the form of sulphate of quinine. The extraordinary value of quinine in medicine as a febrifuge and tonic has given rise to a large trade in Peruvian bark, and has caused the cinchona tree to be extensively planted in India and elsewhere. Quinine in small doses is stomachic, in large doses it causes extreme disturbance of the nerves, headache, deafness, blindness, paralysis, but seldom death.

QUINQUAGESIMA, name of the Sunday before Lent, because fifty days before Easter.

QUINSY, the common name for inflammation of the tonsils. The inflammation is generally ushered in by a feeling of uneasiness in the part. The voice is thick, and there is often swelling of the glands of the neck, with loss of appetite, thirst, headache, and a considerable degree of general fever. The tonsils, uvula, and even the soft palate are swollen and vascular, and the tongue is foul and furred. In severe cases respiration is considerably impeded, and swallowing is always difficult and painful. The inflammation of the throat may terminate either in resolution or suppuration. The most frequent cause of quinsy is cold, produced by sudden changes of temperature. But in a great many cases it will be found that the patient has been predisposed to the disease, owing to a bad state of the digestive organs. The best treatment to ward off an attack is to administer a dose of some strong purgative saline medicine. Bland soothing drinks should be given during the course of the disease, and sucking small pieces of ice give much relief.

QUINTAIN, a figure or other object set up to be tilted at with a lance. It was



Ancient quintain at Offham, Kent.

constructed in various ways; a common form in England consisted of an upright post, on the top of which was a horizontal bar turning on a pivot; to one end of this a sand-bag was attached, on the other a broad board; and it was a trial of skill to tilt at the board end with a lance, and pass on before the bag of sand could whirl round and strike the tilter on the back.

QUINTET', a vocal or instrumental composition in five parts, in which each part is obligato, and performed by a single voice or instrument.

QUINTIL'IAN, Marcus Fabius Quintilianus, a Roman rhetorician, born at Calagurris (Calahorra) in Spain, probably between 35 and 40 A.D.; died about 118. He began to practice as an advocate at Rome about A.D. 69, and subsequently became a teacher of rhetoric. His work, De Institutione Oratoria, contains a system of rhetoric in twelve books, and includes some important opinions of Greek and Roman authors.

QUIRE, twenty-four sheets of paper. Twenty quires make a ream.

QUIRINAL, one of the seven hills of ancient Rome. There is a palace here, begun in 1574, and formerly a summer residence of the popes, but since 1871 the residence of the King of Italy. See Rome.

QUIT-CLAIM, in law, signifies a release of any action that one person has against another. It signifies also a quitting of a claim of title to lands, etc.

QUITO (kē'tō), the capital of Ecuador, in a ravine on the east side of the volcano of Pichincha, 9348 feet above the sea, a little to the south of the equator. It has repeatedly suffered from earthquakes. Pop. about 80,000, largely consisting of half-breeds and Indians.

QUIT-RENT, in law, a small rent payable by the tenants of most manors, whereby the tenant goes quit and free from all other services.

QUOITS, a game played with a flattish ring of iron, generally from 8¼ to 9½ inches in external diameter, and between 1 and 2 inches in breadth. It is convex on the upper side and slightly concave on the under side, so that the outer edge curves downward, and is sharp enough to cut into soft ground. The game is played in the following manner: Two pins, called hobs, are driven into the ground from 18 to 24 yards apart; and the players, who are divided into two sides, stand beside one hob, and in regular succession throw their quoits (of which each player has two) as near the other hob as they can, giving the quoit an upward and forward pitch with the hand and arm, and at same time communicating to it a whirling motion so as to make it cut into the ground. The side which has the quoit nearest the hob counts a point toward game, or if the quoit is thrown over the hob, it counts two.

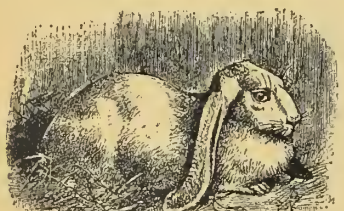
QUORUM, a term used in commissions, of which the origin is the Latin expression, quorum unum A. B. esse volumus ("of whom we will that A. B. be one"), signifying originally certain individuals, without whom the others could not proceed in the business. In legislative and similar assemblies a quorum is such a number of members as is competent to transact business.

R

R is the eighteenth letter of the English alphabet, classed as a liquid and semi-vowel. In the pronunciation of Englishmen generally it represents two somewhat different sounds. The one is heard at the beginning of words and syllables, and when it is preceded by a consonant; the other, less decidedly consonantal, is heard at the end of words and syllables, and when it is followed by a consonant. In the pronunciation of many English speakers, r, followed by a consonant at the end of a syllable, is scarcely heard as a separate sound, having merely the effect of lengthening the preceding vowel; when it is itself final, as in bear, door, their, etc., it becomes a vowel rather than a consonant.—The three Rs, a humorous and familiar designation for Reading, Writing, and Arithmetic. It originated with Sir William Curtis, who, on being asked to give a toast, said, "I will give you the three Rs, Writing, Reading, and Arithmetic."

RABBI, a title of honor among the Hebrews, corresponding nearly to the English master. There are two other forms of the title, rabboni and rabbani, the former of which is found in the New Testament. It is supposed that this title first came into use at the period immediately preceding the birth of Christ. In the time of our Lord it was applied generally to all religious teachers, and hence sometimes to Christ himself. Now the term rabbi or rabbin is applied to regularly appointed teachers of Talmudic Judaism.

RABBIT, a genus of rodent mammals, included in the family Leporidæ, to which also belong the hares. It is of smaller size than the hare, and has shorter ears and hind legs. The rabbit's fur in its native state is of a nearly uniform brown color, whilst under domesti-



Rabbit (white lop-eared variety).

cation the color may become pure white, pure black, piebald, gray, and other hues. The texture of the fur also changes under domestication. The rabbit is a native of all temperate climates, and in its wild state congregates in "warrens" in sandy pastures and on hill-slopes. Rabbits breed six or seven times a year, beginning at the age of six months, and producing from five to seven or eight at a birth. They are so prolific that they may easily become a pest as in Australia, if not kept in check by beasts and birds of prey. They feed on tender grass and herbage, and sometimes do great damage to young trees by stripping them of their bark. They grow exceedingly tame under domestication, and sometimes exhibit considerable intelligence. Rabbits are subject to certain diseases, such as rot—induced probably by damp and wet —parasitic worms, and a kind of madness. The skin of the rabbit is of considerable value; cleared of hair, it is used with other skins to make glue and size. The fur is employed in the manufacture of hats, and to imitate other and more valuable furs, as ermine, etc.

RABELAIS (rȧb-lā), François, a humorous and satirical French writer, born in or before 1495, the son of an apothecary, of Chinon in Touraine. He entered the Franciscan order at Fontenay-le-Comte, in Poitou, and received the priesthood. In the course of a few years we find him at Montpellier, where he studied medicine, having by this time become a secular priest; he was admitted bachelor in 1530, and for some time successfully practiced and taught. In 1532 he went to Lyons, where he published a work of Hippocrates and one of Galen, and the first germ of his Gargantua (1532 or 1533). The first part of his Pantagruel appeared under the anagram of Alcofribas Nasier, within a year or so after the former work, and its success was such that it passed three editions in one year. Soon after its publication Rabelais accompanied Jean du Bellay on an embassy to Rome. On his return to France he went first to Paris; but not long after he is found once more at Lyons, where the Gargantua, as we now have it, first saw the light (1535). The Gargantua and Pantagruel together form a single work professing to narrate the sayings and doings of the giant Gargantua and his son Pantagruel. The next few years were as unsettled as regards his abode as any previous period of Rabelais' life, and it is difficult to follow him. Probably he was in Paris in 1546, when the third book of his Gargantua and Pantagruel appeared, but during most of 1546 and part of 1547 he was physician to the town of Metz. In the third book all the great moral and social questions of the day were discussed with the gaiety and irony peculiar to Rabelais, and with a freedom that roused the suspicion of the clergy, who endeavored to have it suppressed. The favor of the king secured its publication, but it was with more difficulty that a license was obtained for the fourth book from Henry II., who had succeeded François in 1547. This book did not appear complete till 1552. About 1550 Rabelais was appointed to the cure of Meudon, but he resigned his position in 1552, and died a year later according to most authorities. He left the whole of the fifth book of his remarkable romance in manuscript. By many Rabelais has been set down as a gross buffoon, and their is much in his writings to justify the harsh judgment, though we must remember what was the taste of his times. As regards the purpose of his work, many have looked upon Rabelais as a serious reformer of abuses, religious, moral, and social, assuming an extravagant masquerade for the purpose of protecting himself from the possible consequences of his assaults on established institutions.

RABIES (rā'bi-ēz), the name given to a disease, probably a kind of blood-poisoning, with which dogs, horses, cats, wolves, and other animals are attacked, and to which, indeed, all animals are said to be liable. A bite from some rabid animals induces hydrophobia in man. See Hydrophobia.

RACE-HORSE, a horse bred or kept for racing or running in contest, called also a blood-horse and a thorough-bred horse. The American race-horse is perhaps the finest horse in the world as regards speed for a moderate distance. It is of Arabian, Berber, or Turkish extraction, improved and perfected by the influence of the climate, and by careful crossing.

RACHEL (rȧ-shell), Mademoiselle (Elizabeth Rachel Felix), a French tragédienne, of Jewish extraction, born in 1821; died in 1858. Her reputation was speedily established as the first tragic actress of her day. In 1841 she visited England, and was received with the greatest enthusiasm. Her renown continued to increase, and for many years she reigned supreme at the Théâtre Français, making also tours to the provincial towns of France, to Belgium, etc. Later she visited America, but when there caught a severe cold, which terminated in consumption. She was of a fierce and unlovable temper, destitute of moral principle, and very avaricious.

RACINE (ra-sēn'), a town in Racine co., Wisconsin, on the west shore of Lake Michigan. It has a fine harbor, and enjoys considerable trade. It has iron-foundries, manufactures of machinery and agricultural implements; tanneries and flour-mills, and extensive railway-carriage works. Pop. 33,302.

RACINE (rȧ-sēn), Jean Baptiste, a distinguished French dramatist, born at La Ferté-Milon (Aisne) 1639, died at Paris 1699. He was educated at Port-Royal, the famous Jansenist institution, and latterly at the Collége d'Harcourt. After writing an ode, called Nymphes de la Seine, in honor of the king's marriage, and two comedies, now lost, he made the acquaintance of Boileau and Molière, and began to write for the stage. His first tragedy, the Thébaïde, or Les Frères Ennemis, was performed by Molière's troupe at the Palais-Royal in 1664, as was also his next, Alexandre, in 1665. His first master-piece was Andromaque, which on its performance at the Hôtel de Bourgogne, in 1667, produced a profound impression. The immediate successor of Andromaque was Les Plaideurs (1668), a witty and delightful imitation of the Wasps of Aristophanes. His next pieces were Britannicus (1669); Bérénice (1670); Bajazet (1672); Mithridate (1673); Iphigénie (1674); Phèdre (1677), the last piece that Racine produced expressly for the theater. In 1673 he obtained a seat in the French academy. His death is said to have been hastened by grief at losing the favor of the king. As a dramatist Racine is usually considered the model of the French classical tragic drama, and in estimating his powers in this field it is necessary to take into account

the stiff conventional restraints to which that drama is subjected. What he achieved within these limits is extraordinary. Besides his dramas Racine is the author of epigrams, odes, and hymns, etc.

RACK, an instrument for the judicial torture of criminals and suspected persons. It was a large open wooden frame within which the prisoner was laid on his back upon the floor, with his wrists and ankles attached by cords to two rollers at the end of the frame. These rollers were moved in opposite directions by levers till the body rose to a level with the frame; questions were then put, and if the answers were not deemed satisfactory, the sufferer was gradually stretched till the bones started from their sockets. It was formerly much used by civil authorities in the cases of traitors and conspirators; and by the members of the Inquisition, for extorting a recantation from imputed heretical opinions. The rack was introduced into England in the reign of Henry VI., and although declared by competent judges to be contrary to English law, there are many instances of its use as late as the time of Charles I.

RACK, in machinery, a straight or slightly curved metallic bar, with teeth on one of its edges, adapted to work into the teeth of a wheel or pinion, for the purpose of converting a circular into a rectilinear motion, or vice versa.

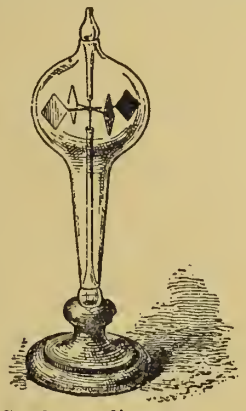
RACOON', or **RACCOON',** an American plantigrade carnivorous mammal, the common racoon being the Procyon lotor. It is about the size of a small fox, and its grayish-brown fur is deemed valuable, being principally used in the manufacture of hats. This animal lodges in hollow trees, feeds occasionally on vegetables, and its flesh is palatable food. It inhabits North America from

Common racoon.

Canada to the tropics. The black-footed racoon of Texas and California is P. Hermandezii. The agouara or crab-eating racoon is found further south on the American continent than the above species, and is generally larger. Although dominated "crab-eating" it does not appear to be any more addicted to this dietary than the common species.

RADETZ'KY, Joseph Wenceslaus, Count, a famous Austrian soldier, born at Trebnitz, in Bohemia, in 1766; died 1858. Commencing his career in a Hungarian regiment of horse in 1784, he fought in most of the campaigns in which Austria was engaged from that date up to the time of his death, including Hohenlinden, Wagram, and Leipzig. But his most signal services were in Italy, whither he was called by the commotions following the French revolution of 1830, and where a great part of his subsequent life was spent. Radetzky was made field-marshal in 1836, and honors and rewards were showered upon him.

RADIOM'ETER, an instrument designed for measuring the mechanical effect of radiant energy. It consists of four crossed arms of very fine glass, supported in the centre by a needle-



Crookes' radiometer.

point, having at the extreme ends thin discs of pith, blackened on one side. The instrument is placed in a glass vessel exhausted of air, and when exposed to light the arms revolve.

RADISH, a well-known cruciferous plant. The tender leaves are used as a salad, the green pods as a pickle, and the succulent roots are much esteemed.

RADIUM, a metal in elemental form, possessing the extraordinary property of constantly emitting rays of heat and light without combustion, without chemical change of any kind, and without any apparent change in its molecular structure, was discovered and named by the French physicist, Pierre Curie and his Polish wife, in Paris, in 1898.

Imagine, if you can, an atom of radium—an infinitesimal speck, too small to be seen even with the aid of a most powerful microscope. Now imagine that this infinitesimal atom is a hollow globe and that inside this globe are 150,000 ions—each ion having room enough to fly through space at the incredible rate of speed of 20,000 miles a second, and only rarely coming in contact with another atom. An ion is the smallest division of an atom recognized by science.

Place this atom of radium, composed of 150,000 ions, in a small instrument known to scientists as a spinthariscope, which is really a powerful microscope fitted with a florescent screen. Then liberate the 150,000 ions and watch them hurl themselves with incredible force against the florescent screen. Each ion becomes a wave of light and as each ion strikes the florescent screen it explodes, giving out myriads of sparks and engendering heat.

Such an atom is radium. A piece of radium weighing a tenth part of a grain is composed of millions of atoms, and each atom in turn is made up of 150,000 ions. This tenth of a grain of radium is an active force, the myriads of ions constantly disintegrating—each ion the source of heat and light. For months, years, decades, and centuries the ions would continue to hurl themselves from that tenth part of a grain of radium, and in all those centuries the tenth of a grain would not become appreciably smaller, nor would the disintegrating process lose its power to eminate rays of heat and light.

Then, instead of a tenth of a grain of radium, imagine a pound of it—ten pounds—one hundred pounds. Even science, which pierces millions of miles of space, which estimates the myriad numbers of the stars and weighs the planets of countless solar systems, has not yet dared to place a limit on the heat and light giving power of radium in the mass.

It has been estimated that a piece of radium weighing fourteen pounds, if so great a quantity could be produced, and if all its energy could be applied mechanically, would drive a one-horse-power engine for at least 50,000 years. Thus radium, if it could only be produced in sufficient quantities, would transform night into day and do away with coal, electricity, gas, and oil. It would light streets and buildings and supply power for factories and workshops. It would revolutionize the industry of the world.

Unfortunately, radium cannot be produced except in infinitesimally small quantities. Up to the present time it has been found only in a dark, velvety mineral called pitchblende, found mostly in the Erzgebirge mountains in Austria. In 7,000 tons of pitchblende there are possibly two pounds of radium. Professor and Madame Curie laboriously

Madame Curie.

pulverized, fractionized, and washed eight tons of uranium—a metal found in pitchblende—and secured only fifteen grains of radium—say the 466th part of a pound. At that rate, the cost of producing a pound of radium would approximate $3,000,000.

The scientific history of radium covers a scant eleven years. The investigations which led to its discovery began in 1895 with the discovery of the X-rays by Professor Roentgen. This discovery impelled scientists in all parts of the

world to begin an investigation of the mystery hidden behind the X-rays of light which has the power of passing through solid substances. The first result was produced by Prof. Henri Becquerel, a noted French physicist, who discovered that uranium emitted rays like the X-rays and which rendered a gas through which they passed a conductor of electricity.

Now, uranium was found in pitchblende, and Professor Curie and his wife, who had been extracting uranium from pitchblende and experimenting along the same lines with Professor Becquerel carried their researches still further, and in 1898 discovered radium. The discovery was made by Madame Curie herself. In experimenting with pitchblende, the chief component of which is uranium oxide, she noticed that the crude pitchblende would affect a photographic plate or discharge an electrified body much more quickly than the same weight of pure uranium salt. She therefore concluded that there was still hidden in pitchblende some element having a greater radio activity than uranium oxide. Following this conclusion, aided by her husband, she proceeded to separate the various substances of pitchblende by chemical analysis. After each separation she determined by careful experiment which of the parts contained the greater amount of radio activity. She followed this process to the end, and the discovery of radium was the result.

Naturally, the discovery created the greatest interest throughout the world. Medical science, which had been quick to adopt the X-rays in medicine and surgery, began experimenting with radium as a cure for disease. The fact that radium, when exposed to the flesh, would burn away the tissue, led to the belief that the newly discovered element might be used successfully for the eradication of cancer. The experiments so far, however, have not enabled medical science to determine with any degree of certainty the value of radium as a remedial agency.

Professor Curie, who shared with his wife the honor of discovering radium was accidentally killed in Paris on April 19, 1906. His death ended one of the most remarkable marital partnerships in the history of science. Professor Curie was 43 years old at the time of his death. His wife formerly was Miss Skiodowska, of Polish birth. When she went to Paris to complete her studies, her independent means were so small she could not matriculate at one of the big schools, and so she went to a municipal working class institute, where Professor Curie directed the laboratory. Her remarkable ability led him to make her his assistant. Their marriage followed, and they pursued their scientific researches together. Their discovery of radium made them famous in a day. In 1903 they received the Nobel prize for chemistry, and a short time later Madame Curie was awarded $12,000 from the Osiris prize of France. Mme. Curie was appointed to succeed her husband as lecturer on physical science at the Sorbonne, this being the first instance of a woman ever being appointed to such a place in France.

RADOM, a town in Russian Poland, on the Radomka, capital of the government of the same name. It has manufactures of oil, vinegar and leather. Pop. 28,749.—The government has an area of 4768 square miles; forms the most elevated portion of the Polish plain; is much wooded; agriculture and cattle-raising the chief occupations of the inhabitants. Pop. 820,363.

RAFFLE, a game of chance, in which several persons each deposit part of the value of a thing for the chance of gaining it.

RAFFLE'SIA, a genus of parasitical plants. This gigantic flower, one of the marvels of the vegetable world, was discovered in the interior of Sumatra by Sir T. Raffles and Dr. Arnold. The whole plant seems to consist of little else beyond the flower and root. The perianth or flower forms a huge cup reaching a

Rafflesia Arnoldi.

width of 3 feet or more; it weighs from 12 to 15 lbs., and some of its parts are ¾ inch in thickness. It is fleshy in character and appearance, remains expanded for a few days, and then begins to putrefy, having quite the smell of carrion, and thus attracting numerous insects.

RAGNAROK (rag'na-rek), in Scandinavian mythology, literally twilight of the gods or doom of the gods, the day of doom when the present world will be annihilated to be reconstructed on an imperishable basis.

RAGOUT, meat or fish stewed with vegetables, and highly seasoned to excite a jaded appetite.

RAGS, though valueless for most purposes, are yet of great importance in the arts, particularly in paper-making. Woolen rags, not being available for paper, are much used for manure; but those of a loose texture, and not too much worn, are unraveled by means of machinery, and mixed up with good wool, to form what is known as *shoddy*, with which cheap woolen goods are made; while the refuse is pulverized and dyed various colors, to form the flock used by paper-stainers for their flock-papers.

RAHWAY, a town of the United States, in Union county, New Jersey, 20 miles s.w. of New York, on river of same name, navigable for small craft. Industries include carriage and other factories. Pop. 10,110.

RAI BARELI (rī ba-rā'lē), a town of Oudh, India, administrative head-quarters of district of the same name, on the banks of the Sai, 48 miles s.e. of Lucknow. There is a bridge over the Sai, several interesting ancient structures, and the usual government buildings. Pop. 18,798.—The district forms part of the Lucknow division, has an area of 1751 sq. miles, and a population of 1,036,521.

RAIBOLINI (rī-bo-lē'nē), Francesco di Marco di Giacomo, usually called Francesco Francia, a famous Italian painter, engraver, medallist, and goldsmith, was born at Bologna about the middle of the 15th century, died 1533. He excelled particularly in Madonnas, and executed a number of admirable frescoes in the church of St. Cecilia at Bologna, but his most famous work is an altar-piece exhibiting the Madonna, St. Sebastian, etc., in the church of St. Giacomo Maggiore in the same city.

RAILWAYS, roads made by placing on the ground, on a specially prepared track, continuous parallel lines of iron or steel rails, on which carriages with flanged wheels are run with little friction and at consequent high velocities. The necessity for railways originated in the requirements of the coal-traffic of Northumberlandshire, where the first railways, formed on the plan of making a distinct surface and track for the wheels, were constructed. In 1676, near Newcastle-on-Tyne, the coals were conveyed from the mines to the banks of the river, "by laying rails of timber exactly straight and parallel; and bulky carts were made, with four rollers fitting those rails, whereby the carriage was made so easy that one horse would draw 4 or 5 chaldrons of coal." Steam-power was first used on these tram-roads early in the 18th century, but the inauguration of the present great railway system dates from 1821, when an act was passed for the construction of the Stockton and Darlington railway, which was opened in 1825. The United States of America quickly followed Britain in railway construction, and between 1830 and 1833 railways were rapidly opened in the states. Horse railroads extending to a considerable length were in existence before 1830. There was no development of the railway system in France till about 1842, when several great lines were established; Belgium and the Netherlands followed, but Germany, Austria, and Russia were somewhat behind the western European nations in their railway development.

The modern railway consists of one or more pairs of parallel lines of iron or steel bars, called rails, these bars joining each other endwise, and the parallel lines being several feet apart. The width between the rails is called the gauge. What is known as the national or standard gauge, used in Britain and the greater part of Europe, and formerly called the narrow gauge, measures 4 feet 8½ inches between the rails; the broad gauge (now gone out of use) being 7 feet. It is believed to have originally represented the width suitable for the coal wagons of the North of England, and has been found on the whole very satisfactory. In Ireland the gauge is 5 feet 3 inches, in India 5 feet 6. Narrower gauges are used in certain special lines; and in the United States the standard gauge is 4 feet 8½ inches. A pair of parallel lines of rails constitutes a single track of railway, two pairs a double line, and so on. The

RAILWAYS

RAILROAD SPEED NOTABLE FAST RUNS OF PASSENGER TRAINS FOR LONG DISTANCES.

Date	Railroad	Terminals	Distance Miles	Inclusive Time H.M.	Inclusive Miles per Hour
May, 1848.	Great Western (England)	London—Didcot	53.25	0.47	68
July, 1885.	Westshore	East Buffalo—Frankfort	201.7	4.00	50.4
Aug., 1888.	London, N. W. & Caledonian	London—Edinburgh	400	7.38	52.4
Aug., 1894.	Plant System, Atlantic Coast Line	Jacksonville—Richmond	661.5	12.51	51.48
April, 1895.	Pennsylvania	Camden—Atlantic City	58.3	0.45¾	76.50
Aug., 1895.	London & Northwestern	London—Aber een	540	8.32	63.28*
Sept., 1895.	New York Central & H. R.	New York—Buffalo	436.50	6.47	64.33*
Sept., 1895.	New York Central "World Flyer"	Albany—Syracuse	148	2.10	68.3
Feb., 1897.	Chicago, Burlington & Quincy	Chicago—Denver	1,025	18.52	58.74
April, 1897.	Lehigh Val., Black Diamond Exp.	Alpine, N. Y.—Geneva Jc., N. Y.	43.96	0.33	80
Aug., 1897.	Union Pacific	North Pla te—Omaha	291	4.39	63.49
May, 1900.	Burlington Route	Burlington—Chicago	205.8	3.08½	65.5‡
Mar., 1902.	Burlington Route	Eckley—Wray	14.8	0.9	98.7
Aug., 1902.	"20th Century Ltd." on L. Shore	Kendallville—Toledo	91	1.15	72.8
Mar., 1903.	Atlantic Coast Line	Jacksonville—Savannah	172	2.32	70.7
May, 1903.	"20th Century Ltd." on L. Shore	Toledo—Elkhart	133.4	1.54	70.2
July, 1903.	Great Western (England)	London—Plymouth	246	3.54	63.13
April, 1904.	Michigan Central	Niagara Falls—Windsor	225.66	3.11½	70.74
July, 1904.	Great Western (England)	Paddington—Bristol	118.5	1.24	84.6
Nov., 1904.	Pennsylvania	Crestline—Fort Wayne	131	1.53	69.56
June, 1905.	Pennsylvania	Chicago—Pittsburgh	468	7.20	63.53*
June, 1905.	Lake Shore & Mich. Southern	Buffalo—Chicago	525	7.50	69.69‡
June, 1905.	Pennsylvania	New York—Chicago	897	16.3	56.07
June, 1905.	New York Central	Chicago—New York	960.52	15.56	60.28‡
July, 1905.	Pennsylvania	Washington, O.—Fort Wayne	81	1.4	75.84
Oct., 1905.	Pittsburgh, Ft. Wayne & C.	Crestline, O.—Clark Junc., Ind.	257.4	3.27	74.55

*Including stops. ‡Excluding stops.

rails are supported at a little height above the general surface by iron pedestals called chairs, which again are firmly fixed to wooden or iron (sometimes stone) supports called ties, placed at intervals and embedded in the material of the roadway. A railway, in general, approaches as nearly to a straight line between its two extremes as the nature of the country and the necessities of the intermediate traffic will permit. It is carried over valleys, either by embankments or viaducts, and through hills or elevated ground by deep trenches called cuttings, or by tunnels. In favorable cases the surface line of the railway is so adjusted that the materials excavated from the cuttings will just serve to form the embankments. Should the excavated material be in too small quantity to form the embankment, recourse is had to an excavation along the sides of the site of the latter to supply the deficiency. The line of railway can seldom run for any distance on a level, and its various slopes are termed gradients, the arrangements of the rises and falls being termed the grading of the line. A more or less steep ascent is termed an incline. When the line is formed its surface is covered with broken stones or clean gravel called ballasting, and in this the sleepers for sustaining the chairs and rails are embedded. The wooden ties are laid across the roadway about 3 feet apart from center to center, and to them the chairs which sustain the rails are spiked. Sometimes longitudinal wooden ties are used along with the transverse ties. These consist of beams laid under the rails and secured to the transverse ties. When such are used chairs are frequently dispensed with, the rails being formed with a flange at bottom which is fastened directly to the wooden beam. When the railway track is thus completed the work is called the permanent way, and it furnishes the route over which carriages or cars, wagons, vans, etc., are dragged by a locomotive engine, a number of these vehicles forming a train.

In the railway of a single line of rail it is necessary to make provision for permitting meeting engines or carriages to pass each other by means of sidings, which are short additional lines of rail laid at the side of the main line, and so connected with it at each extremity that a carriage can pass into the siding in place of proceeding along the main line. In double lines, in addition to sidings, which are in them also required at many places, it is necessary to provide for carriages crossing from one line of rails to another. This change in the direction of the carriage is effected by switches. Switches or points are short movable rails close to the main rails connected by rods to suitable handles, the extremities of these short rails being formed so as to guide the flanges of the wheels of a carriage from one line of rail to another. Switches are usually coupled or interlocked with the signals or signalling apparatus, so necessary for properly carrying on the traffic—coupled when they are moved simultaneously with the signals, interlocked when the necessary movement of the switches is completed before the signal is moved. Signalling is effected by means of semaphores in daylight and lights of three colors, white, green, or blue, and red, at night. The telegraph is also used in regulating the traffic. (See Block System.) The various places along the line of railway, where railway trains stop for taking up or depositing goods or passengers are termed depots, with the prefix of freight or passenger, as they are allotted to the one or the other; the stations at the extremities of a railway are called terminals.

The mode in which the locomotive acts in moving the cars is that by its weight and the friction of its wheels on the rails a tractive force is provided sufficient to enable it to move at a high rate of velocity, and to drag great loads after it. In some particular cases a fixed engine is employed to give motion to a rope by which the cars are dragged along, the rope being either an endless rope stretched over pulleys, or one which winds and unwinds on a cylinder. Such engines are termed stationary engines, and are used chiefly on inclined planes, where the ascent is too steep for the locomotive engine. In some cases the cars are impelled by atmospheric pressure, and in some few cases by electricity. (See Atmospheric Railway, Electric Railway.) The locomotives, passenger cars, freight cars or trucks, vans, etc., constitute the rolling stock of a railway. For the sake of uniformity, externally and in many of the details, the cars are usually made of the same external length width, and height, and suitably in the interior. The underworks of the cars may thus be identical in construction, and a uniformity of working and wearing parts is thus secured, which is conducive to economy of maintenance. They are usually from 40 to 60 feet long with a center passage, the doors being at the ends—with the seats arranged transversely on each side. At platform at the end enables a person to go from end to end of the train. There is generally but one class of passengers, but on long journeys Pullman and other sleeping-cars are used at extra fares. The average speed of express passenger trains in the United States is about 60 miles an hour for the express trains and from 30 to 40 miles an hour for the regular local trains; express freight trains from 20 to 25 miles. Railways for the local service of large cities are usually partly or wholly underground, as in the London Metropolitan railway, the New York Central and Hudson River R. R., or elevated above the street traffic, as in New York and Chicago.

Some of the tunnels, bridges, and viaducts constructed in connection with railways are among the engineering triumphs of the age. Of the former the most notable are those of Mt. Senis, the St. Gothard, and the Arlberg tunnel in the Alps; the Severn tunnel, and the Mersey tunnel in England, and the Hoosac tunnel in Massachusetts. The greatest of the railway bridges are those over the Forth and the Tay in Scotland; the Britannia tubular bridge over the Menai straits, North Wales; the Victoria bridge, Montreal; the New York and Brooklyn Suspension bridge. There are many stone viaducts of great length. The Congleton viaduct, on the Manchester and Birmingham railway, is perhaps the longest in England; it is 1026 yards long and 106 feet high. An iron viaduct 2½ miles long connects the city of Venice with the mainland.

The use of sleeping cars and parlor cars introduced an element of comfort in railway travel which was of great importance in this country, on account of the distance traversed. The buffet car was afterward provided to avoid delays at meal stations. Dining cars, introduced shortly afterward, led to the development of vestibuled trains. Vestibuled express trains are now in general use, on which sleepers, parlor cars, a dining car, a smoking saloon, library, bath-room, barber-shop, and writing-

room are provided. In the United States between four and five thousand passengers are killed and injured each year by railway accidents. These figures seem large until the enormous number of passengers carried safely to one injured is calculated. According to the report of the interstate commerce commission, 2,316,648 passengers were carried safely in 1900 to one passenger killed, and 139,740 passengers were carried safely to one injured. In England in 1900 the proportion was one passenger killed in 8,461,309 and one injured in 470,848. On the continent of Europe in many cases an even better record is maintained. The total mileage in the United States at the close of 1905 was 212,624, the capital stock $6,741,956,825, the bonded debt $7,821,243,105, gross earnings $2,112,197,770, the net earnings $685,464,488.

RAIN, the water that falls from the heavens. Rain depends upon the formation and dissolution of clouds. The invisible aqueous vapor suspended in the atmosphere, which forms clouds, and is deposited in rain, is derived from the evaporation of water, partly from land, but chiefly from the vast expanse of the ocean. At a given temperature the atmosphere is capable of containing no more than a certain quantity of aqueous vapor, and when this quantity is present the air is said to be saturated. Air may at any time be brought to a state of saturation by a reduction of its temperature, and if cooled below a certain point the whole of the vapor can no longer be held in suspension, but a part of it condensed from the gaseous to the liquid state will be deposited in dew or float about in the form of clouds. If the temperature continues to decrease the vesicles of vapor composing the cloud will increase in number and begin to descend by their own weight. The largest of these falling fastest will unite with the smaller ones they encounter during their descent, and thus drops of rain will be formed of a size that depends on the thickness, density, and elevation of the cloud. The point to which the temperature of the air must be reduced in order to cause a portion of its vapor to form clouds or dew is called the dew-point. The use of the spectroscope has become to some extent a means of anticipating a fall of rain, since when light that has passed through aqueous vapor is decomposed by the spectroscope a dark band is seen (the rain-band), which is the more intense the greater the amount of vapor present. The average rainfall in a year at any given place depends on a great variety of circumstances, as latitude, proximity to the sea, elevation of the region, configuration of the country and mountain ranges, exposure to the prevailing winds, etc. When the vapor-laden atmosphere is drifted toward mountain ranges it is forced upward by the latter, and is consequently condensed, partly by coming into contact with the cold mountain tops, and partly by the consequent expansion of the air due to the greater elevation. The presence or absence of vegetation has also considerable influence on the rainfall of a district. Land devoid of vegetation has its soil intensely heated by the fierce rays of the sun, the air in contact with it also becomes heated, and is able to hold more and more moisture, so that the fall of rain is next to impossible. On the other hand, land covered with an abundant vegetation has its soil kept cool, and thus assist in condensation. Although more rain falls within the tropics in a year, yet the number of rainy days is less than in temperate climes. Thus in an average year there are 80 rainy days in the tropics, while in the temperate zones the number of days on which rain falls is about 160. At the equator the average yearly rainfall is estimated at 95 inches. At a few isolated stations the fall is often very great. At Cherrapungee, in the Khasia Hills of Assam, 615 inches fall in the year, and there are several places in India with a fall of from 190 to 280 inches. In Britain, Skye, and a large portion of the mainland to the s.e. as far as Loch Lomond, the greater part of the lake district of Northern England, and the mountainous parts of Wales have an average of 80 inches and upward (the highest, 128.50 inches at Glencoe in Argyleshire). The s.e. of England has the smallest, 22.50 to 25 inches. The rainfall at Paris is 22 in.; New York, 43 in.; Washington, 41 in.; San Francisco, 22 in.; Sitka, Alaska, 90 in.; Honduras, 153 in.; Maranhao, 280 in.; Singapore, 97 in.; Canton, 78 in.; New South Wales, 46 in.; South Australia, 19 in.; Victoria, 30 in.; Tasmania 20 in.; Cape Colony, 24 in. The greatest annual rainfall hitherto observed seems to be on the Khasia Hills.

RAINBOW, a bow, or an arc of a circle consisting of all the prismatic colors, formed by the refraction and reflection of rays of light from drops of rain or vapor, appearing in the part of the heavens opposite to the sun. When the sun is at the horizon the rainbow is a semicircle. When perfect the rainbow presents the appearance of two concentric arches; the inner being called the primary, and the outer the secondary rainbow. Each is formed of the colors of the solar spectrum, but the colors are arranged in the reversed order, the red forming the exterior ring of the primary bow, and the interior of the secondary. The primary bow is formed by the sun's rays entering the upper part of the falling drops of rain, and undergoing two refractions and one reflection; and the secondary, by the sun's rays entering the under part of the drops, and undergoing two refractions and two reflections. Hence, the colors of the secondary bow are fainter than those of the primary. Rainbows are sometimes produced by the sun's rays shining on the spray of cascades, fountains, etc., and then a whole circle can frequently be seen. A broken rainbow mostly occurs from the field not being filled with falling rain, but it will also happen when the sun is invisible from part of the field. The moon sometimes forms a bow or arc of light, more faint than that formed by the sun, and called a lunar rainbow. A spurious or supernumerary rainbow is a bow seen in connection with a fine rainbow, lying close inside the violet of the primary bow, or outside that of the secondary one. Its colors are fainter and more impure, as they proceed from the principal bow, and finally merge into the diffused white light of the primary bow, and outside the secondary.

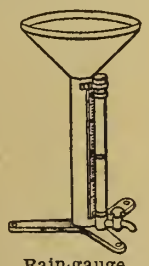
Non-concentric rainbow observed in Sweden in 1875.

Non-concentric bows have been seen at various times during the last two hundred years. One of the most perfect was observed by Halley, the astronomer, on August 6, 1698. It appears to have been a very perfect specimen of a non-concentric bow, extending in an unbroken arch from the feet of the inner bow to the summit of the outer or secondary bow. The order of colors in this non-concentric bow was the same as in the primary; so that where it appeared to overlap the secondary bow there was a portion of a white arch. Perhaps one of the most remarkable

cases is that represented in our illustration, in which it will be noted that between the ordinary inner and outer bows there are the legs of a bow non-concentric with both. This splendid sight was seen at Nya, Kopparberg, in Sweden, by M. Gumœlius, on June 19, 1875, and it is remarkable that similar bows have been recorded in Sweden on several occasions. In this case, besides the non-concentric bow, several supplementary concentric bows were seen, as shown in the engraving.

Other wonderful rainbows, or, perhaps more correctly, mist-bows, have been seen on rare occasions. Aëronauts and mountaineers have observed them of a completely circular form, when they have happened to be in elevated positions. A somewhat similar phenomenon is sometimes observed by the boatmen of Lake Superior when there is a low-lying fog on the water, and a brilliant sun overhead. On such occasions an iridescent halo surrounds the shadow of the observer's head, but is generally of a simply circular form.

RAIN-GAUGE, or **PLUVIOMETER,** an instrument used to measure the quantity of rain which falls at a given place. They are variously constructed. A convenient form (shown in figure) consists of a cylindrical tube of copper, with a funnel at the top where the rain enters. Connected with the cylinder at the lower part is a glass tube with an attached scale. The water which enters the funnel stands at the same height in



Rain-gauge.

the cylinder and glass tube, and being visible in the latter the height is read immediately on the scale, and the cylinder and tube being constructed so that the sum of the areas of their sections is a given part, for instance a tenth of the area of the funnel at its orifice, each inch of water in the tube is equivalent to the tenth of an inch of water entering the mouth of the funnel. A stop-cock is added for drawing off the water. A simpler form of gauge consists of a funnel having at the mouth a diameter of 4.697 inches, or an area of 17.33 sq. inches. Now, as a fluid ounce contains 1.733 cubic inches, it follows that for every ounce fluid collected by this gauge the tenth of an inch of rain has fallen. Recently-constructed automatic gauges give a continuous record of rainfall; indicate the duration of each shower, the amount of rain that has fallen, and the rate at which it fell

RAIN-TREE, a leguminous tree of tropical America, now largely planted in India for the shade it furnishes, and because it flourishes in barren salt-impregnated soils, as well as for its sweet pulpy pods, which are greedily eaten by cattle.

RAIPUR (ri-pör'), a town of India, headquarters of district of same name in the Chhatisgarh division, Central provinces. Pop. 32,114.—The district includes within its limits four small feudatory states; area, 11,724 sq. miles; pop. 1,422,778.

RAISINS, the dried fruit of various species of vines, comparatively rich in sugar. They are dried by natural or artificial heat. The natural and best method of drying is by cutting the stalks bearing the finest grapes half through when ripe, and allowing them to shrink and dry on the vine by the heat of the sun. Another method consists of plucking the grapes from the stalks, drying them, and dipping them in a boiling lye of wood-ashes and quick-lime, after which they are exposed to the sun upon hurdles of basket-work. Those dried by the first method are called raisins of the sun or sun-raisins, muscatels, or blooms; those by the second, lexias. The inferior sorts of grapes are dried in ovens. Raisins are produced in large quantities in the south of Europe, Egypt, Asia Minor, California, etc. Those known as Malagas, Alicantes, Valencias, and Denias are well-known Spanish qualities. A kind without seeds, from Turkey, are called sultanas. The Corinthian raisin, or currant, is obtained from a small variety of grape peculiar to the Greek Islands.

RAJAH, or **RAJA,** in India, originally a title which belonged to those princes of Hindu race, who, either as independent rulers or as feudatories, governed a territory; subsequently, a title given by the native government to Hindus of rank. It is now not unfrequently assumed by the zemindars or landholders, the title Mahârâjah (great rajah) being generally reserved to the more or less powerful native princes.

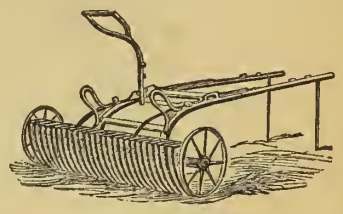
RAJPIPLA, native state of India, in Bombay presidency, watered by the Nerbudda. Area, 1514 sq. miles; pop. 114,756; capital Nandod.

RAJPUTA'NA, a large province of India, under the suzerainty of Britain since 1817, in the west part of Hindustan proper, extending from the Jumna and Chumbul rivers, west to Sind and Bhawalpur, and comprising the greater part of the Indian desert. It includes the British district of Ajmere-Merwara and twenty autonomous states, each under a separate chief; has a total area of 127,541 sq. miles, and a pop. of 9,723,301, exclusive of a considerable Bheel population, estimated at 230,000.

RAJSHAHI, a division or commissionership of Bengal, extending from the Ganges to Sikkim and Bhutan. Area, 17,428 sq. miles; pop. 8,019,187.—The district of Rájsháhi, forming part of the division, has an area of 2361 sq. miles; a pop. of 1,460,644. Capital of division and district Rámpur Beauleah.

RAKE, an implement which in its simplest form consists merely of a wooden or iron bar furnished with wooden or iron teeth, and firmly fixed at right angles to a long handle. In farming it is used for collecting hay, straw, or the like, after mowing or reaping; and in gardening it is used for smoothing the soil, covering the seed, etc. Large rakes for farm work are adapted for being drawn by horses; and there are many modifications both of the hand-rake and the horse-rake.

RALEIGH (ral'i), the capital of North Carolina, near the center of the state. Among the principal public buildings are the state-house with a handsome



Horse-rake.

columned front, the court-house, and post-office, all in granite. It is an important cotton center, and the industries are various. Pop. 15,940.

RALEIGH (ral'i), or **RALEGH,** Sir Walter, navigator, warrior, statesman, and writer in the reigns of Elizabeth and James I. In 1584 he obtained a charter of colonization and unsuccessfully attempted the settlement of Virginia in one or two following years. In 1584, also, he obtained a large share of the forfeited Irish estates, and introduced here the cultivation of the potato. In 1588 he rendered excellent service against the Spanish Armada, and subsequently vessels were fitted out by him to attack the Spaniards. To discover the fabled El Dorado or region of gold he planned an expedition to Guiana, in which he embarked in 1595, and reached the Orinoco; but was obliged to return after

Sir Walter Raleigh.

having done little more than take a formal possession of the country in the name of Elizabeth. In 1596 he held a naval command against Spain under Lord Howard and the Earl of Essex, and assisted in the defeat of the Spanish fleet and the capture of Cadiz. Next year he captured Fayal in the Azores; in 1600 he became governor of Jersey. James I., on his accession in 1603, had his mind soon poisoned against Raleigh, whom he deprived of all his offices. Accused of complicity in Lord Cobham's treason in favor of Arabella Stuart, Raleigh was brought to trial at Winchester in November 1603, found guilty of treason, and sentenced to death. He was, however, reprieved and confined

in the tower. Here he remained for twelve years, devoting himself to scientific and literary work. In 1616 he obtained his release by bribing the favorite Villiers, and by offering to open a mine of gold which he believed to exist near the Orinoco. The enterprise proved disastrous. Raleigh's force had attacked the Spaniards, and on his return James, to favor the Spanish court, with his usual meanness and pusillanimity determined to execute him on his former sentence. After a trial before a commission of the privy-council the doom of death was pronounced against him, and was carried into execution October 29, 1618.

RAM, a steam iron-clad ship-of-war, armed at the prow below the water-line with a heavy iron or steel beak intended to destroy an enemy's ships by the force with which it is driven against them. The beak is an independent adjunct of the ship, so that, in the event of a serious collision, it may be either buried in the opposing vessel or carried away, leaving uninjured the vessel to which it is attached. By naval experts the ram is considered as a main element in the solution of the problem of coast defense.

RAMEE, Louise de la (Ouida), English novelist of French extraction, born at Bury St. Edmunds, 1840, has latterly lived much in Italy. She published her first novel, "Held in Bondage," in 1863, and since then has been a very prolific writer. Among her best works are Strathmore, Chandor, Puck, Moths, Princess Napraxine, A House Party, Gilderoy, etc. She died in 1908.

RAM'ESES, or **RAMSES** (in Egyptian, "the Child of the Sun"), the name given to a number of Egyptian kings.—Rameses I. was the first king of the nineteenth dynasty, and was not among the most remarkable of the series.—Rameses II., grandson of the preceding, was the third king of the nineteenth dynasty, and was born in the quarter of a century preceding the year 1400 B.C. He is identified by many with the Sesostris of Greek writers. (See Sesostris.) His first achievement was the reduction of Ethiopia to subjection. He defeated a confederation among whom the Khita or Hittites were the chief in a great battle near the Orontes in Syria, and in a subsequent stage of the war took Jerusalem and other places. He was a zealous builder and a patron of art and science. He is supposed to have been the king who oppressed the Hebrews, and the father of the king under whom the exodus took place.—Rameses III., the Rhampsinitus of Herodotus, belonged to the twentieth dynasty, and was uniformly successful in war. He endeavored to surpass his ancestors in the magnificence of his buildings.

RAM'ESES, one of the treasure-cities of Egypt built by the Hebrews during the oppression, and probably named after Rameses II. It has been identified by Lepsius with Tell-el-Maskhûta on the Fresh-water canal (about 12 miles west of the Suez canal), and by Brugsch with Tanis the modern San.

RAMPANT, in heraldry, standing upright upon its hind-legs (properly on one foot) as if attacking; said of a beast of prey, as the lion. It differs from salient, which means in the posture of springing forward. Rampant gardant is the same as rampant, but with the animal looking full-faced. Rampant regardant is

Rampant.

Rampant gardant.

when the animal in a rampant position looks behind.

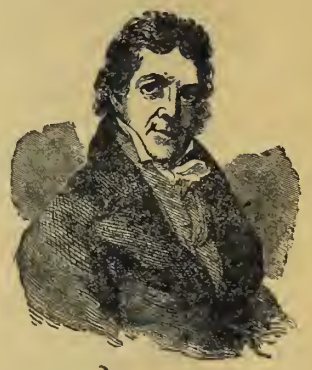
RAMPART, in fortification, an elevation or mound of earth round a place, capable of resisting cannon-shot, and on which the parapet is raised. The rampart is built of the earth taken out of the ditch, though the lower part of the outer slope is usually constructed of masonry. The term in general usage includes the parapet itself.

RAMPUR', capital of a native state of the same name, in the United Provinces of India, on the left bank of the Kosila river, 18 miles e. of Moradabad. Pop. 78,758.—The state, which is under the political superintendence of the government of the United Provinces, has an area of 899 sq. miles and a pop. of 532,067.

RANDALL, Samuel Jackson, American political leader, was born in Philadelphia, Pa., in 1828. In 1858 he was elected a member of the state senate. In November, 1862, he was elected to represent the First Pennsylvania district in congress, to which he was thirteen times successively reëlected. In the Forty-third congress (1873–75) by directing the democratic opposition to the "Force Bill" he was recognized as the leader of his party in the house. In December, 1876, he was elected to succeed Speaker Kerr, who had died during the recess of congress. He was reëlected speaker of the Forty-fifth and Forty-sixth congresses (1877–81). At the democratic national convention of 1880 he received 128½ votes on the second ballot for the nomination to the presidency. In his last two elections to congress he was unopposed by the republicans. He died in 1890.

RANDOLPH, Edmund Jennings, an American statesman, was born in Williamsburg, Va., in 1753. In August, 1775, he became one of Washington's aides, and in 1776 sat in the Virginia constitutional convention. He was the first attorney-general under the new state constitution (1776), sat in the continental congress from 1780 to 1782, and was governor of Virginia from 1786 to 1788. In 1789, he was appointed by Washington attorney-general of the United States. On January 2, 1794, he succeeded Jefferson as secretary of state, but resigned in August, 1795. Returning to his home, he became the leader of the Virginia bar, and in 1807 helped defend Aaron Burr against the charge of treason. He died in 1813.

RANDOLPH, John, of Roanoke, American statesman, was born at Cawsons in Chesterfield co., Va., in 1773. In 1799 he was elected to congress and became the democratic-republican leader of the house of representatives. He opposed the war of 1812, and the Missouri compromise, and stigmatized the northern members who voted for the latter as "doughfaces." In 1822 and 1824 he visited England. In 1825 he began his two years' service as senator from Virginia, and fought his famous



John Randolph

duel with Henry Clay. In 1830 he was appointed minister to Russia. He died in 1833.

RANGE, in gunnery, the horizontal distance to which a shot or other projectile is carried. When a cannon lies horizontally it is called the point-blank range; when the muzzle is elevated to 45 degrees it is called the utmost range. To this may be added the ricochet, the skipping or bounding shot, with the piece elevated from 3 to 6 degrees. Several instruments have been invented for the purpose of finding the range or distance or objects against which guns are to direct their fire, being known as range-finders or telemeters. They generally depend on trigonometrical principals and on the use of telescopes.

RANGE-FINDER, an instrument used to determine the horizontal distance of the object to be hit from the gun which is firing. They are of three types, those furnishing their own bases for measurement, those depending upon a known dimension of the object aimed at, and those utilizing a time observation. The first-named type have the most general application, but satisfactory instruments are either very cumbersome or delicate, or are liable to give ranges considerably in error.

RANGOON', the capital of Lower Burmah, and the chief seaport of Burmah, is situated at the junction of the Pegu, Hlaing or Rangoon, and Pu-zundoung rivers, about 21 miles from the sea. Since its occupancy by the British in 1852 Rangoon has undergone such changes that it is practically a new town, and its population has increased five-fold. Pop. 234,881. Of the population about 100,000 are Buddhists) Burmese) and 60,000 Hindus.

RANGPUR', a district in the Rajshahi division of Bengal; area, 3486 sq. miles. This territory is flat and well-watered, the chief product being rice. Pop. 2,097,964.—Rangpur, the capital, is situated on the Ghaghát river, 270 miles n.e. of Calcutta. Pop. 14,300.

RANK, a line of soldiers standing abreast or side by side; often used along with file, which is a line running from the front to the rear of a company, battalion, or regiment, the term rank and file, thus comprising the whole body of the common soldiers.

RANKE (rän'ke), Leopold von, German historian, born in 1795, died 1886. His first published work (1824) was a History of the Romance and Teutonic Nations from 1494 to 1535. This was followed by Princes and Peoples of Southern Europe in the 16th and 17th centuries (1827). The Servian Revolu-

tion (1829), History of the Popes (1834–37), History of Germany in the time of the Ruformation (1839–47), History of Prussia during the 17th and 18th centuries (1847–48), History of France, chiefly in the 16th and 17th centuries (1852–55), History of England in the 17th century (1859–68), besides a number of smaller works supplementary of his History of Germany.

RANSOM, the money or price paid for the redemption of a prisoner, captive, or slave, or for goods captured by an enemy, and formerly a sum paid for prisoners of war.

RANUNCULA'CEÆ, a natural order of exogenous polypetalous plants, in almost all cases herbaceous, inhabiting the colder parts of the world, and unknown in hot countries except at considerable elevations. They have radical or alternate leaves (opposite in Clematis) regular or irregular, often large and handsome flowers, and fruits consisting of one-seeded achenes or many seeded follicles. There are about 30 genera and 500 species. They have usually poisonous qualities, as evinced by aconite and hellebore in particular. Some of them are objects of beauty, as the larkspurs, ranunculus, anemone, and pæony. See next article.

RANUN'CULUS, a genus of herbaceous plants, the type of the natural order Ranunculaceæ. They have entire, lobed, or compound leaves, and usually panicled, white or yellow flowers. The species are numerous, and almost exclusively inhabit the northern hemisphere. Almost all the species are acrid and caustic, and poisonous when taken internally, and, when externally applied, will raise blisters. The various species found wild are known chiefly by the common names of crowfoot, buttercup, and spearwort.

RAPE, the carnal knowledge of a woman forcibly and against her will. By the English law this crime is felony, and is punishable with penal servitude for life. By 24 and 25 Vict. (1861) cap. c. unlawfully and carnally knowing any girl under the age of ten years, with or without her consent, was regarded as rape, and punishable as such; if the girl were between the ages of ten and twelve the punishment was penal servitude for five years, or imprisonment not exceeding two years with or without hard labor. But by the Criminal Law Amendment Act of 1885 the maximum penalty of penal servitude for life has been extended to the defilement of girls under thirteen; and the maximum penalty of two years' imprisonment with hard labor has been extended to the defilement of girls under sixteen years. In the case of older females consent must be withheld or there is no rape. In Scotland this crime may still be punished with death, though it never is so. In the United States the crime is treated as a felony, and the punishment is imprisonment for life or a term of years.

RAPE, a plant of the cabbage family, cultivated for its seeds, from which oil is extracted by grinding and pressure. It is also cultivated for the succulent food which its thick and fleshy stem and leaves supply to sheep when other fodder is scarce. The oil obtained from the seed, which is much the same as colza oil, is used for various economical purposes, for burning in lamps, for lubricating machinery, in medicine, etc. The oil-cake is used as food for sheep and cattle, and as a fertilizer.

RAPH'AEL or **RAFFAELLO,** Sanzio or Santi, one of the greatest painters that ever lived, was born at Urbino 1483,

Raphael Sanzio.

died 1520. His father, Giovanni Sanzio, a painter of some merit, from whom young Raphael received his first instruction, died in 1494, and he was then intrusted to the care of an uncle. His studies, however, were not interrupted, and at the early age of twelve he was received into the studio of Perugino at Perugia as one of his pupils, and continued with that celebrated painter for six or eight years. His most important works are the Madonna del Gran Duca (Florence); Madonna del Giardino (Vienna); Holy Family (Madrid); Christ Bearing the Cross (Madrid); Marriage of Joseph and the Virgin (Brera, Milan); the Ansidei Madonna (National gallery); Madonna (belonging to Lord Cowper); Tempi Madonna (Munich); and the Bridgewater Madonna (Bridgewater house). Besides these he painted as Vatican frescoes (1508–11) the allegorical figures of Theology, Philosophy, Justice, and Poetry, in the corners of the ceiling; the Fall of Adam, Astronomy, Apollo and Marsyas, and Solomon's Judgment, all having reference to the four principal figures of the apartment; and, lastly, on the fourth wall, over the windows, Prudence, Temperance, and Fortitude, besides many others. During this time Raphael prepared designs for several palaces in Rome and other cities of Italy (notable among which were the series of designs in the Villa Farnesina to illustrate the story of Cupid and Psyche). finished the Madonna for the church of St. Sixtus in Piacenza (now in Dresden), and painted the portraits of Beatrice of Ferrara, of the Fornarina of Carondelet (now in England), and of Count Castiglione. It was probably at a later period that Raphael prepared for Augustino Ghigi designs for the building and decoration of a chapel in Sta. Maria del Popolo and for Leo X. the celebrated cartoons for the tapestry of one of the chambers of the Vatican. Seven of these cartoons are now in the South Kensington museum. To this period also belong his easel-pieces of John in the Desert (of which there exist several copies); his Madonna and Child, on whom an angel is strewing flowers; a St. Margaret (Louvre); the Madonna della Seggiola (Florence), St. Cecilia (Bologna). Raphael's last and unfinished painting—the Transfiguration of Christ—is in the Vatican. Attacked by a violent fever, which was increased by improper treatment, this great artist died at the age of thirty-seven years, and was buried with great pomp in the Pantheon. His tomb is indicated by his bust, executed by Naldini, and placed there by Carlo Maratti.

RA'PHIA, a genus of palms, rather low trees with immense leaves, inhabiting swampy coasts. One specie, a native of West Africa, Madagascar, Polynesia,

Raphia vinifera.

etc., besides yielding palm-wine, supplies materials for the roofs and other parts of houses, for baskets and other work, etc. The fibre of these palms is known as raphia or raffia, and is used for matting, for tying up plants, etc.

RAPID FIRE GUN. See Machine Gun. Quick Firing Guns.

RA'PIER, a light, highly-tempered, edgeless and finely-pointed weapon of the sword kind, used for thrusting. It is about 3 feet in length and was long a favorite weapon for duels. Its use now, however, is restricted to occasions of state ceremonial.

RAPPAHAN'NOCK, a river in Virginia, which rises in the Blue Ridge, runs e.s.e. about 130 miles, and flows into Chesapeake bay. It passes the towns of Falmouth, Fredericksburg, Port-Royal, and Leeds, and is navigable to Fredericksburg, 110 miles.

RAPTO'RES, the birds of prey, an order of birds, also called Accipitres, including those which live on other birds and animals, and are characterized by a strong, curved, sharp-edged, and sharp-pointed beak, and robust short legs, with three toes before and one behind, armed with long, strong, and crooked talons. The eagles, vultures, falcons, and owls are examples.

RAR'ITAN, a river of New Jersey, United States, formed by two branches which unitedly flow s.e., and fall into Raritan bay near Perth Amboy. It is navigable as far as New Brunswick.

RASHI, properly Rabbi Solomon-ben-Isaak, a great Jewish rabbi, born at Troyes, France, in 1040; died 1105. His most famous work is a Commentary on the Pentateuch; he also wrote commentaries on the Prophets, the Talmud, and various treatises on miscellaneous subjects.

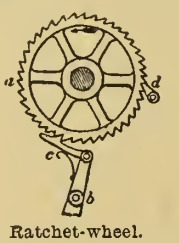
RASO'RES, gallinaceous birds or scratchers, an order of birds comprising the sub-orders Gallinacei, or fowls, turkeys, partridges, grouse, etc., and the Columbacei, or pigeons, which are often made a distinct order. The common domestic fowl may be regarded as the type of the order. They are characterized by the toes terminating in strong claws, for scratching up seeds, etc., and by the upper mandible being vaulted, with the nostrils pierced in a membraneous space at its base, and covered by a cartilaginous scale. The rosarial birds are, as a rule, polygamous in habits; the pigeons, however, present an exception to this rule, and their young are also produced featherless and helpless.

RASPBERRY, the fruit of the well-known shrubby plant and the plant itself, which is of the same genus as the bramble or blackberry, dewberry, and cloudberry. Several varieties are cultivated, either red, flesh-colored, or yellow. Raspberries are much used in cookery and confectionery, and the juice mixed with a certain portion of sugar and brandy, constitutes the liquor called raspberry brandy. Raspberry vinegar, a refreshing summer beverage and cooling drink for invalids, is composed of raspberry juice, vinegar, and sugar.

RAT, one of the rodent mammalia, forming a typical example of the family Muridæ or mice. The best known species are the (so-called) Norway or brown rat and the true English or black rat. The brown rat grows to about 9 inches in length, has a shorter tail than the other, small ears, is of a brownish color above and white below, and is altogether a much larger and stronger animal. Supposed to have belonged originally to India and China, it only became known in Europe about the middle of the 18th century; but it is now found in almost every part of the habitable globe, and where it has found a footing the black rat has disappeared. It is a voracious omnivorous animal, swims readily in water, breeds four or five times in the year, each brood numbering about a dozen, and these again breed in about six months. The black rat is usually about 7 inches in length, has a sharper head than the other, larger ears and a much longer tail. It is much less numerous than the brown rat and more timid. To this variety belongs the white rat, which is sometimes kept as a household pet. Various other animals are called rats.

RATCHET, an arm or piece of mechanism one extremity of which abuts against the teeth of a ratchet-wheel; called also a click, pawl, or detent. If employed to move the wheel it is called a pallet. See next article.

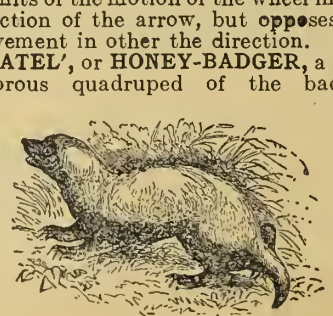
RATCHET-WHEEL, a wheel with pointed and angular teeth, against which a ratchet abuts, used either for converting a reciprocating into a rotary motion on the shaft to which it is fixed or for admitting of circular motion in



Ratchet-wheel.

one direction only as in a winch, a capstan, etc. For both purposes an arrangement is employed similar to that shown in the figure, in which a is the ratchet-wheel, b a reciprocating lever, to the end of which is jointed the small racthet or pallet c. This ratchet, when the lever is moved in one direction, slides over the teeth, but in returning draws the wheel with it. The other ratchet d permits of the motion of the wheel in the direction of the arrow, but opposes its movement in other the direction.

RATEL', or **HONEY-BADGER,** a carnivorous quadruped of the badger


Honey-ratel.

family, found chiefly in South and East Africa, and in India. The Cape or South African ratel averages about 3 feet in length, including the tail, which measures 8 or 9 inches in length. The fur is thick and coarse, the color is black on the under parts, on the muzzle, and limbs, whilst the tail, upper surface, sides, and neck are of grayish hue. It is celebrated for the destruction it makes among the nests of the wild bee, to the honey of which it is very partial.

RATIO, the numerical measure which one quantity bears to another of the same kind, expressed by the number found by dividing the one by the other. The ratio of one quantity to another is by some mathematicans regarded as the quotient obtained by dividing the second quantity by the first; by others, as the quotient obtained by dividing the first by the second.

RATIONALISM, is the doctrine which affirms the prerogative and right of reason to decide on all matters of faith and morals whatever so-called "authority" may have to say on the matter. In 1835 Strauss published his Life of Jesus, a work in which, from the Hegelian stand-point, and in a destructive spirit, he discusses the origin of the New Testament. The movement which this originated is chiefly associated with scientific materialism, agnosticism, etc., and rationalism as a distinctive phase of religious controversy may be said to have then ceased.

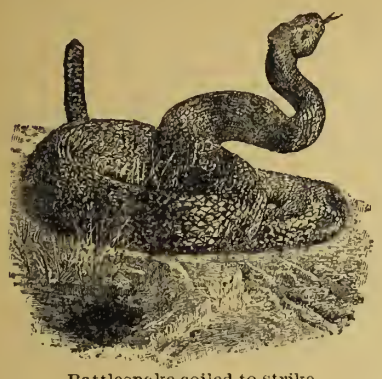
RA'TISBON, a town of Bavaria, capital of the province of Oberpfalz or Upper Palatinate, stands on the right bank of the Danube opposite the junction of the Regen, 65 miles n.n.e. of Munich and 53 miles s.e. of Nuremberg; 1010 feet above the sea. Pop. 50,000.

RAT'LINES, small lines which traverse the shrouds of a ship horizontally, at regular distances of about 15 to 16 inches, forming a variety of ladders reaching upwards to the different mast-heads.

RATTANS', the commercial name for the long trailing stems of various species of palm forming a considerable article of export from India and the Eastern Archipelago. They have all perennial, long, round, solid, jointed, unbranching stems, extremely tough and pliable. All the species are very useful, and are employed for wicker-work, seats of chairs, walking-sticks, thongs, ropes, cables, etc.

RATTLESNAKE, a name of various venomous American snakes, distinguished from the other members of the family by the tail terminating in a series of articulated horny pieces, which the animal vibrates in such a manner as to make a rattling sound. The function of the "rattle" is dubious. The rattlesnake is one of the most deadly of poisonous serpents, but hogs and peccaries kill and eat it, finding protection in the thickness of their hides and the depth of their layers of fat. A number of species belong to the United States and Mexico. East of the Mississippi the banded rattlesnake, is the best known and most dreaded species. It is naturally a sluggish animal, ready to defend itself, but seldom commencing the attack. It feeds on rats, squirrels, small rabbits, etc., and reaches a length of 5 or 6 feet. Other species are the

striped rattlesnake, found from Mexico to Brazil; the diamond rattlesnake, the western black rattlesnake, the prairie



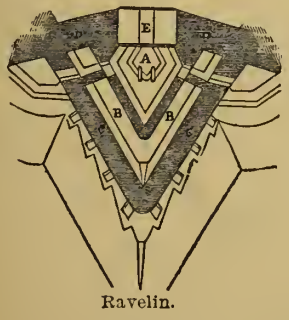
Rattlesnake coiled to strike.

rattlesnake, and the horned rattlesnake of the American deserts.

RAUCH (rouh), Christian, one of the most distinguished of German sculptors, born at Arolsen 1777, died 1857. He was especially great in ideal figures and in portraiture. Among his chefs d'œuvre may be mentioned the monument of King Frederick William III. and Queen Louisa in the Charlottenburg mausoleum, the colossal equestrian statue of Frederick the Great at Berlin, having the base surrounded by groups of his most distinguished contemporaries, and forming altogether one of the most notable monuments in Europe; the six colossal figures of Victory in the Walhalla, and a group representing Moses with his hands supported by Aaron and Hur.

RAVAILLAC (rà-vâ-yàk), François, the murderer of Henry IV. of France, born 1578. His various disappointments and his religious fanaticism led him to plan the assassination of Henry IV., which he successfully accomplished 14th May, 1610. Upon this he was seized, horribly tortured, and put to death.

RAV'ELIN, a detached triangular work in fortification, with two embankments which form a projecting angle. In the figure b b is the ravelin with a



Ravelin.

its redout, and c c its ditch, d d being the main ditch of the fortress, and e the passage giving access from the fortress to the ravelin.

RAVEN, a large bird of the crow family. Its plumage is entirely black; it is above 2 feet in length from the tip of the bill to the extremity of the tail, and about 52 inches from tip to tip of the extended wings. It can be taught to imitate human speech, and in a domestic state is remarkable for its destructiveness, thievishness, and love of glittering things. It flies high, and scents carrion, which is its favorite food, at the distance

Raven.

of several miles; it feeds also on fruit, small animals, etc. It is found in every part of the globe.

RAVEN'NA, a town of Italy, capital of the province of the same name, on the Montone, about 4 miles west of the Adriatic, and 43 miles east by south of Bologna. The principal edifices are the cathedral, founded in the 4th but rebuilt during the 17th century, adorned with some of Guido's finest paintings; the ancient baptistry, an octagonal structure, the church of San Vitale, one of the earliest of Christian churches, having been consecrated in 547; the Basilica of San Giovanni Evangelista, founded in 414, the church of San Apollinare Nuovo (or San Martino), the mausoleum of the empress Galla Placidia, daughter of Theodosius the Great, dating from the 5th century; the palace of Theodoric, king of the Ostro-Goths; the tomb of Dante; the town-house, library, museum, etc. Pop. 64,031. The province has an area of 820 sq. miles; pop. 235,485.

RAWAL PINDI, a town of British India, in the Punjab, situated in the district between the Indus and the Jhilam. It has an arsenal, extensive cantonments, and important military works, churches, schools, public park, etc. It is on the railway from Lahore to Peshawar, and carries on a thriving transit trade between Hindustan and Afghanistan. Pop. 87,688.

RAWLINS, John Aaron, American soldier, was born in East Galena, Ill., in 1831. On April 16, 1861, shortly after the fall of Fort Sumter, he made a powerful war speech at a meeting which was presided over by Ulysses S. Grant. Shortly afterward he became a major in an Illinois regiment, but resigned that post in order to become Grant's assistant adjutant-general, friend and adviser. He became chief of staff in November, 1862, and was honored with numerous promotions, ending with that of brevet major-general, March 13, 1865. When Grant became president he made Rawlins his secretary of war. He died in 1869.

RAWLINSON, Rev. George, born in 1815. Besides various short works on antiquity he published a translation of Herodotus with a commentary (1858–60); The Five Great Monarchies of the Ancient Eastern World (4 vols. 1862–67), followed by the Sixth (1873), and the Seventh Oriental Monarchy (1876); History of Ancient Egypt (2 vols. 1881); Egypt and Babylon (1885); Phœnicia (1889), etc. He died in 1902.

RAWLINSON, Sir Henry Creswicke, G.C.B., brother of the above, born in 1810. He has published A Commentary on the Cuneiform Inscriptions of Babylon and Assyria (1850); Outline of the History of Assyria (1852); Notes on the Early History of Babylon (1854); and the Cuneiform Inscriptions of Western Asia, edited along with E. Norris and G. Smith (5 vols. 1861–70). He was D.C.L. of Oxford, LL.D. of Cambridge F.R.S., and a corresponding member of the French Institute. He died in 1895.

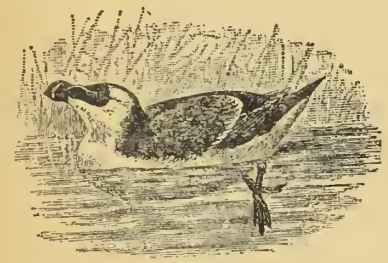
RAY, a family of fishes, including the skate and allied forms, recognized by the flattened body and by the extremely broad and fleshy pectoral fins, which seem to be mere continuations of the body. These fishes produce large eggs which are inclosed in cartilaginous capsules quadrilateral in form, with pro-

Ray.

cesses at the corners, and known familiarly as "mermaids' purses," etc. The most common members of this group are the thornback ray or skate, so named from the curved spines which arm the back and tail; and the common gray or blue skate, which possesses an acutely-pointed muzzle, the body being somewhat lozenge-shaped, and the color ashy-gray above. The starry ray is so called from having a number of spines on its upper surface rising from rayed or starlike bases; it reaches a length of 30 inches. The sting ray occurs in the Mediterranean sea, but is also found on the British coasts, having the tail armed with a long spine, serving as a means of defense. The horned ray, common in the Mediterranean sea, attains occasionally a large size.

RAYNOUARD (rā-nö-är), François Juste Marie, French poet and philologist, born at Brignoles, Provence, 1761; died 1836. We wrote several tragedies, such as Scipion, Don Carlos, Charles I., Les Templiers, but he is chiefly remembered as a philologist who revived the study of Provençal by his Choix des Poesies originales des Troubadours (1816–21), six vols. 8vo); Lexique Roman, ou Dictionnaire de la Langue des Troubadours (1836–44, six vols. 8vo); Grammaire Comparé des Langues de l'Europe Latine dans leurs Rapports avec la Langue des Troubadours (1821, 8vo).

RAZORBILL (rā'zor-bil), the razor-billed auk, or tinker, so called from the deep, compressed, and trenchant bill. The bill is feathered for about one-half its length, in the rest of its extent being vertically furrowed, and hooked at the tip; one of the furrows is white, the bill being otherwise black, like the feet; the mouth is yellow. The plumage is black on the upper parts, the lower parts from the neck in summer, and from the bill in winter, being white; there is a narrow white line from the bill to the eye, and the tips of the secondaries are white. The bird is about 18 inches long, and 27



Razorbill, in winter plumage.

in extent of wings. It inhabits arctic and northerly regions of both hemispheres, subsists chiefly on fish, and nests on rocky sea-coasts, laying a single egg about 3 by 2 inches, white or whitish, spotted and blotched with different shades of brown. The flesh is eatable.

REACTION, in physics, counteraction, the resistance made by a body to the action or impulse of another body, which endeavors to change its state, either of motion or rest. It is an axiom in mechanics that "action and reaction are always equal and contrary," or that the mutual actions of two bodies are always equal and exerted in opposite directions. In chemistry, the term is applied to the mutual or reciprocal action of chemical agents upon each other. In pathology, reaction is the action of an organ which reflects upon another the irritation previously transmitted to itself.

READE (rēd), Charles, novelist, son of Mr. John Reade of Ipsden house in Oxfordshire, born in 1814, died 1884. The most scholarly and artistic of his writings, The Cloister and the Hearth, dealing with the lives of the parents of Erasmus, appeared in 1861, and among the more important of his other works are: The Course of True Love Never Did Run Smooth, Love Me Little Love Me Long, White Lies, Hard Cash, Griffith Gaunt, Put Yourself in His Place, A Terrible Temptation, Single-heart and Double-face, A Perilous Secret, etc.

READ, Nathan, American inventor, was born in Warren, Mass., in 1759. In 1788 he conceived the idea of utilizing the steam engine for propelling boats and carriages, and, with that end in view, began a series of experiments which resulted in the invention (1789) of the vertical multitubular fire-box boiler now in general use. In 1798 he patented a machine for cutting and heading nails at one operation. He was a member of congress from 1800 to 1803. Among his inventions were: a pumping engine, a threshing machine, a method for equalizing the action of windmills, and a plan for utilizing the force of the tide, by means of reservoirs. He died in 1849.

READ, Opie Percival, an American author, was born in Nashville, Tenn., in 1852. He edited the Kansas Gazette from 1878 until 1881. In 1883 he established the Arkansaw Traveler, of which he was the editor until 1893. His works include: A Kentucky Colonel, Emmet Bonlore, A Tennessee Judge, My Young Master, Bolanyo, In the Alamo, The Jucklins, An American in New York, and several plays.

READ, Thomas Buchanan, American poet and artist, born in Chester co., Pa., in 1822. He is best known as a poet, especially for his stirring Sheridan's Ride, and his charming stanzas entitled Drifting. His first volume, Poems, appeared in 1847. Lays and Ballads followed the next year; The New Pastoral, an elaborate description of Pennsylvania life; The House by the Sea. In 1848 he compiled a volume entitled Female Poets of America, which was illustrated by engravings of portraits painted by himself. He died in New York City in 1872.

READING (red'ing), a parl. county, and municipal borough of England, capital of the county of Berks, on the Kennet, near its confluence with the Thames, 36 miles west of London. There are interesting remains of a magnificent abbey founded by Henry I., who was buried within its precincts in 1135. Reading sends one member to parliament. Pop. 72,214.

READING, a city in Pennsylvania, on the left bank of the Schuylkill, 52 miles northwest of Philadelphia. The chief industries are muslin and woolen goods, felt hats, iron-founding, tanning, etc. Pop. 92,300.

READJUSTERS, the name applied to a political party in Virginia which favored the readjustment or scaling down of the state debt which at the close of the civil war amounted to about $41,000,000, and which was increased by the extravagance and corruption of the reconstruction governments.

REAGAN (rē'gan), John H., senator, was born in Sevier co., Tenn., October 8, 1818. In 1839 he went to Texas, where he served against the Indians. He was elected to congress in 1856, serving till the war broke out, when he became a member of the state secession convention; voted for secession, and was sent to the provisional congress. He was made postmaster-general of the confederacy, and was for a short time acting secretary of the treasury. After the fall of the confederacy he was captured with Jefferson Davis, and confined for many months in Fort Warren. He was elected to congress in 1874, and successively till 1887, in which year he was elected senator for Texas. He resigned from the senate to become chairman of the Texas State Railroad Commission. He was one of the authors of the interstate commerce law, passed in 1887. He died in 1905.

REA'GENT, in chemical analysis, a substance employed as a test to determine the presence of some other substance. Thus, the infusion of galls is a reagent which detects iron by a dark purple precipitate; the prussiate of potash is a reagent which exhibits a blue with the same metal, etc.

REAL, in law, pertaining to things fixed, permanent, or immovable. Thus real estate is landed property, including all estates and interest in lands which are held for life or for some greater estate, and whether such lands be of freehold or copyhold tenure. So a real action is an action brought for the specific recovery of lands, tenements, and hereditaments.

REALISM, in metaphysics, as opposed to idealism, the doctrine that there is an immediate or intuitive cognition of external objects, while according to idealism all we are conscious of is our ideas. According to realism external objects exist independently of our sensations or conceptions; according to idealism they have no such independent existence. As opposed to nominalism, it is the doctrine that asserts that general terms like man, tree, etc. are not mere abstractions, but have real existences corresponding to them. In the middle ages there was a great controversy between the realists and the nominalists, the chief controversy which divided the schoolmen into rival parties. The realists maintained that things and not words are the objects of dialectics. Under the denomination of realist were comprehended the Scotists and Thomists, and all other sects of schoolmen, except the followers of Occan and Abelard, who were nominalists.

REAM, a quantity of paper, consisting of 20 quires of 24 sheets each. The printer's ream consists of 21½ quires, or 516 sheets.

REAPING-MACHINE, or **REAPER,** a machine for cutting down standing wheat, etc., usually worked by a pair of horses, the cutting machinery being driven by being connected with the wheels on which the machine is drawn over the field. The cutting is effected rather in the manner of a pair of scissors than in that of a scythe, and a series of small toothed wheels have to be connected with the main wheel or wheels so as to produce the fast motion necessary for driving the cutting knives. These knives generally consist of triangular pieces of steel riveted to an iron bar, and are sometimes smooth-edged and sometimes tooth-edged. The knife-bar projects horizontally from the side of the machine at a short distance above the ground, and moves backward and forward on guides fixed at the back of a number of pointed fingers, which enter the standing grain and guide the straw to the edges of the knives. The motion of the bar being very rapid, the grain is cut down with corresponding speed, and as it is cut it is received on a platform fixed behind the knife-bar. In most cases a revolving rake with four inclined arms is attached to such machines, and set in motion by the driving-wheel. Two of the arms bring the wheat well on to the knife-bar, and the others deliver the wheat cut at the back of the machine. Many of the recent machines are also fitted with a binding apparatus. An endless apron receives the grain as it is cut, and

deposits it in a trough on the outer side of the machine. By an ingenious mechanical arrangement the loose straw is caught and compressed by two iron arms; wire from a reel is passed round the sheaf, fastened by twisting, cut away, and the bound sheaf is tossed out of the trough by one of the arms by which it was compressed. Other apparatus are constructed so as to bind with cord, straw rope, etc. See Agriculture.

REASON, a faculty of the mind by which it distinguishes truth from falsehood, and which enables the possessor to deduce inferences from facts or from propositions, and to combine means for the attainment of particular ends. Reason is the highest faculty of the human mind, by which man is distinguished from brutes, and which enables him to contemplate things spiritual as well as material, to weigh all that can be said or thought for and against them, and hence to draw conclusions and to act accordingly. In the language of English philosophy the terms reason and understanding are sometimes nearly identical, and are so used by Sewart; but in the critical philosophy of Kant a broad distinction is drawn between them.

REAUMUR (rā-ō-mür), René Antoine Ferchault de, French physicist and naturalist, born in 1683 at La Rochelle, died 1757. As a natural philosopher he is celebrated for the invention of an improved thermometer, which he made known in 1731 (see Thermometer); but his greatest work is the Mémoires pour servir à l'Histoire Naturelle des Insectes, 6 vols.

REBEC', an old stringed instrument somewhat similar to the violin, having properly three strings tuned in fifths,

Rebec of the sixteenth century.

and played with a bow. It was of Arabian or Turkish origin and was introduced by the Moors into Spain.

REBUS, a group of words or a phrase written by figures or pictures of objects whose names resemble in sound the

Rebus of Abbot Islip, Westminster abbey.

Rebus of Bishop Oldham, Exeter cathedral.

words or the syllables of which they are composed; thus, "I can see you" might be expressed by figures or pictures of an eye, a can, the sea, and a ewe. In heraldry a rebus is a device on a coat of arms conveying an illusion to the name of the person, as castles for Castleton, three cups for Butler. The accompanying cuts show rebuses on personal names (not very happy attemps, however), the one standing for the name Oldham (Owledom), the other for Islip. I slip may be obtained several ways, as from the eye and the slips on the tree; or the figure may be supposed to say "I slip," or the hand to belong to a person slipping.

RECAMIER (rā-kȧ-mi-ā), Jeanne Françoise Julie Adélaïde, whose maiden name was Bernard, born at Lyons 1777, died 1849. At the age of sixteen she went to Paris, and was there married to Jacques Récamier, a rich banker, more than double her own age. From this time her aim was to surround herself with personal admirers, and to attract to her salon the chief personages in French literature and politics.

RECIPROC'ITY, a term in economics commonly applied in international relationships to the arrangement whereby two nations mutually agree to import to each other certain goods, either duty free or with duties which are equivalent. See Free-trade.

RECON'NAISSANCE, in military affairs, an examination of a territory or of an enemy's position, for the purpose of directing military operations. The term is also used in geodetics, etc., a reconnaissance being an examination of a region as to its general natural features, preparatory to a more particular survey, as for determining the location of a road, a railway, a canal, or the like.

RECONSTRUCTION, in American history, the method by which the seceded states, after the war, were restored to their former relations with the union.

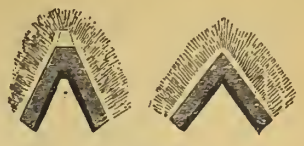
RECTANGLE, a right-angled parallelogram, or a quadrilateral figure having all its angles right angles and its opposite sides equal. Every rectangle is said to be contained by any two of the sides about one of its right angles.

RECTIFY, in chemistry, to refine by repeated distillation or sublimation, by which the fine parts of a substance (as some kind of spirits) are separated from the grosser. To rectify liquors, in the spirit trade, is to convert the alcohol produced by the distiller into gin, brandy, etc., by adding flavoring materials to it. Thus in order to convert the spirit into London gin, juniper berries and coriander seeds are added previous to the last rectification. Œnanthic ether and other things give the flavor of brandy.

RECTUM, in anatomy, the third and last part of the large intestine opening at the anus; so named from an erroneous notion of the old anatomists that it was straight.

RED, one of the primary colors, the color of that part of the spectrum which is farthest from the violet. The red rays are the least refrangible of all the rays of light. (See Color.) Red pigments or coloring matters include vermillion, realgar, cochineal, lakes and madders, coal-tar colors, etc. The different forms of oxide of iron are Indian red, which is pure, finely ground hæmatite; Venetian red and colcothar, which are coarser forms of the same substance. Minium or lead oxide, and another form of the same substance containing a little carbonate, are known as Paris red.

REDAN', in field fortification, the simplest kind of work employed, consisting of two parapets of earth raised so as to form a salient angle, with the apex toward the enemy and unprotected on the rear. Several redans connected



Redans.

by curtains form lines of intenchment.

RED-BIRD, the popular name of several birds in the United States, as the summer red-bird, the Baltimore oriole or hang-nest.

REDBREAST, or **ROBIN REDBREAST,** a species of bird belonging to the family of warblers. The red breast of the male is the distinguishing feature of these well-known birds, the female possessing the breast of a duller yellowish-brown color. The young are of a dull yellowish-green color, and want the characteristic breast-coloring of the

American robin.

adult. The nest is made of moss and leaves, and is lined internally with feathers. The eggs number five or six, and are white, spotted with pale brown. The robin redbreast of America is a thrush, congeneric with the British blackbird; and one of the bluebirds, is usually called the blue robin.

RED CEDAR, a species of juniper found in North America and the West Indies; the heartwood is of a bright red, smooth, and moderately soft, and is in much request for the outsides of black-lead pencils.

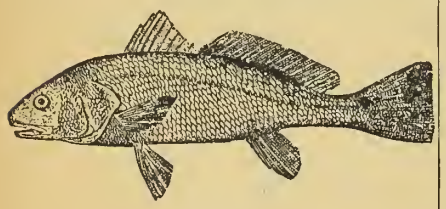
RED CORAL, an important genus of sclerobasic corals belonging to the order of Alcyonaria. Red coral is highly valued for the manufacture of jewelry, and is obtained from the coasts of Sicily, Italy, and other parts of the Mediterranean.

RED CROSS SOCIETIES, international associations formed to mitigate the horrors of war by alleviating the sufferings of the sick and wounded. M. Jean Henri Dunant, a citizen of Geneva, Switzerland, was an eye witness at the Battle of Solferino to the unnecessary suffering that resulted from inability of the regular surgical corps to take care of the thousands of wounded who lay upon the field. In his book Un Souvenir de Solférino, published three years afterward, he described the horrors witnessed and proposed that societies be formed in every country for the purpose of training nurses to supplement the regular military surgical

corps in time of war. An international conference was held in Geneva in 1863, sixteen nations being present, and a provisional program agreed upon. The Geneva convention was signed in 1864 by fourteen nations, a number that has now been increased to forty three. In 1884 the American National Red Cross society was formed, and its usefulness widened by including not only relief during war, but also during great calamities, such as famine, pestilence, flood, or fire. The American association has expended over $2,000,000, and has afforded relief to the sufferers from the Michigan fires of 1881, the Florida yellow fever of 1888, the Johnstown flood of 1889, the Russian famine of 1891–92, the South Carolina tidal wave of 1893, the Armenian massacres of 1896, the Spanish reconcentrado system in Cuba in 1897–98, the Galveston tidal wave of 1900, the Mont Pelée eruption of 1902, and the San Francisco earthquake and fire in 1906. The association rendered valuable assistance during the Spanish-American war.

RED CURRANT, a deciduous shrub much cultivated for its fruit, indigenous in the northern portions of Europe and America. The juice of the fruit is used for making jelly, and a well-known fermented liquor called current wine.

RED-FISH, a species of fish found on the Atlantic coast of North America, a large red fish caught in considerable



Redfish.

numbers for food. A smaller species receives the same name, and is called also red-perch, rose-fish, etc.

RED GUM, the popular name of a florid eruption usually occurring in infants before and during first dentition, and appearing on the most exposed parts, as the face, neck, arms, and hands. It is almost always an innocent disease, and seldom lasts over a month.

RED HAND, in heraldry, originally the arms of the province of Ulster, but granted to baronets as their distinguishing badge on the institution of the order in 1611. It consists of a sinister (or left) hand, open, erect, showing the palm.

RED-LEAD, an oxide of lead produced by heating the protoxide in contact with air. It is much used as a pigment, and is commonly known as Minium.

RED OCHRE, a name common to a variety of pigments, rather than designating an individual color, and comprehending Indian red, light red, Venetian red, scarlet ochre, Indian ochre, reddle, bole, and other oxides of iron. As a mineral it designates a soft earthy variety of hæmatite.

REDOUT', in fortification, a general name for nearly every class of works wholly inclosed and undefended by re-entering or flanking angles. The word is, however, most generally used for a small inclosed work of various form—polygonal, square, triangular, or even circular, and used mainly as a temporary field work.

RED PINE, a species of pine also called Norway Pine. Its wood is very resinous and durable, and is much used in house and ship-building. It produces turpentine, tar, pitch, resin, and lamp-black.

RED-POLE (red-poll), a name given to several species of linnets. The same name is given to the American red-headed warbler and yellow red-pole.

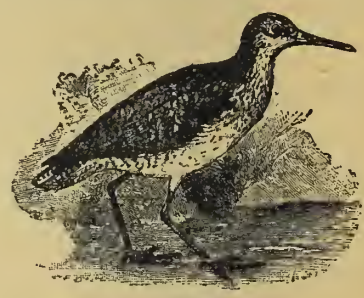
RED RIVER, a large river of the United States, the southernmost of the great tributaries of the Mississippi. It rises in Northern Texas, and has several sources, the chief, besides the main stream, being called the North and South Forks, which unite with it on the boundary of Texas and Oklahoma territory. The stream then flows e.s.e., forming the boundary between Texas and the Indian territory, and between Texas and Arkansas; cuts off a corner of the latter state, and then flowing through Louisiana falls into the Mississippi, 125 miles northwest of New Orleans; total course estimated at 1550 miles; chief affluents—the Washita, which joins it in Louisiana; and the False Washit which it receives in the Indian territory. Much of its course is through rich prairies. About 1200 miles of the river are useful for navigation, but its mouth at low water can be entered only by boats drawing 2 feet.

RED RIVER OF THE NORTH, a river of North America, which rises in Elbow lake, in Minnesota, flows south and southwest, and then nearly north, crossing from the United States into Manitoba, where it falls into Lake Winnipeg. Its entire length is 665 miles, 525 of which are in the United States. In Manitoba it receives the Assiniboine, another large stream, at its junction with which stands the town of Winnipeg.

RED RIVER SETTLEMENT, a settlement formed in 1812 by the Earl of Selkirk on the banks of the above river; repurchased by the Hudson's Bay company in 1836; finally transferred to the Canadian government in 1870 and now made part of the province of Manitoba.

RED SEA, or **ARABIAN GULF,** a branch of the Indian ocean, communicating with it by the Strait of Bab-el-Mandeb, stretching in a n.n.w. direction between Arabia on the east, Abyssinia, Nubia, and Egypt on the west, and connected with the Mediterranean on the north by the Suez canal. It forms a long and narrow expanse, stretching for 1450 miles, with a breadth which averages about 180 miles, but diminishes gradually at its extremities. At the northern end it divides into two branches, one of which, forming the Gulf of Akaba, penetrates into Arabia for about 100 miles, with an average breadth of about 15 miles; while the other, forming the Gulf of Suez, penetrates between Arabia and Egypt for about 200 miles, with an average breadth of about 20 miles. The shores consist generally of a low, sandy tract, varying in width from 10 to 30 miles, and suddenly terminated by the abutments of a lofty table-land of 3000 feet to 6000 feet high. Occupying a long deep valley this water expanse has gradually been divided into three channels formed by coral reefs and islands. In the main channel the depth reaches in one place 1054 fathoms, but diminishes toward the extremities to 40 fathoms, while in the harbor of Suez it amounts to only 3 fathoms. The cross trade consists largely of pilgrims to and from Mecca; the traffic up and down has been immensely increased by the Suez canal. The Israelites are supposed to have crossed the Red sea at its northern extremity in the Gulf of Suez, and near the town of that name, but opinions vary as to the precise spot.

REDSHANK, a bird, so called from its red legs. It is about 11 inches long, resides in Britain all the year, but is known also as a summer bird of passage in the



Redshank.

most northern parts of Europe and Asia, occurring in winter as far south as India. The spotted redshank visits Britain in spring and autumn on its migrations north and south.

REDSTART, a bird belonging to the family Sylviadæ, nearly allied to the redbreast, but having a more slender form and a more slender bill. It is found in almost all parts of Britain as a summer bird of passage, and has a soft, sweet song. The tail is red, whence the name, start being A.-Saxon steort, a tail. The forehead is white, the throat black, the upper parts lead-gray or brown. The

American redstart.

black redstart is distinguished from the common redstart by being sooty black on the breast and belly where the other is reddish brown, and is only an occasional visitor to Great Britain. The American redstart is a small bird of the family Musicapidæ or fly-catchers, common in most parts of North America.

RED-TOP, a well-known species of bent-grass, highly valued in United States for pasturage and hay for cattle.

RED-WOOD, the name of various sorts of wood of a red color, as an Indian dyewood; a coniferous tree of California, the red-wood of the timber trade. The tree reaches a very great size, and forms forests in the coast mountains of California

REEBOK (rā'bok; that is roebuck), a species of South African antelope. The horns are smooth, long, straight, and slender. The reebok is 2½ feet high at the

Roebuck.

shoulder, of a slighter and more graceful form than the generality of other antelopes and extremely swift.

REED, Thomas Brackett, an American political leader, was born at Portland, Maine, in 1839. In 1868–69 he was a member of the lower house of the Maine legislature, and in 1870 sat in the state senate. From 1870 to 1872 he was attorney-general of Maine; from 1874 to 1877 solicitor of the City of Portland. In 1876 he was elected to congress and was continuously reëlected until 1898. In 1889, 1895, 1897 he was chosen speaker of the house. Before the expiration of his last term he resigned his seat in congress and entered upon the practice of law in New York City. In 1896 Reed was a candidate for the republican nomination for the presidency. He died in 1902.

REED, Walter, American army surgeon, sanitarian, and bacteriologist, was born in Virginia in 1851. He was appointed assistant surgeon in the army in 1875. In 1893 he was appointed curator of the Army Medical museum in Washington. In 1898 he was placed at the head of a board to investigate the epidemic occurrence of typhoid fever among the troops assembled for the Spanish-American war. It developed that infected water was not an important factor but that the infection was distributed by the agency of flies and on the hands, feet and clothing of the men. In 1899 Reed, with his assistant, Carroll, demonstrated the fallacy of the claim of Sanarelli that the bacillus icteroides was the causative agent of yellow fever. In 1900 Reed went to Havana and demonstrated that yellow fever is transmitted by the bite of mosquitoes of a certain variety, which have become infected by previously biting persons sick of yellow fever, with the result that yellow fever was exterminated in Cuba. He died in 1902.

REED, a name usually applied indiscriminately to all tall, broad-leaved grasses which grow along the banks of streams, pools, and lakes, and even to other plants with similar leaves, growing in such situations, as the bamboo. The largest of all the grasses of northern climates, is used for roofing cottages, etc. The sea-reed or mat-grass is often an important agent in binding together the masses of loose sand on sea-shores. The bur-reed of Britain is of the reed-mace order.

REED, in music, a vibrating slip or tongue in the mouth-piece through which a hautboy, bassoon, or clarinet is blown, originally made of reed; or one of the thin plates of metal whose vibrations produce the notes of an accordion, concertina, or harmonium, or a similar contrivance in an organ-pipe.

REED-BIRD. See Rice-bunting.

REED-MACE, a plant known by the name of cat-tail, and grows in ditches and marshy places, and in the borders of ponds, lakes, and rivers. They are tall, stout, erect plants, sometimes 6 or 8 feet high, with creeping root-stocks, long flag-like leaves, and long, dense, cylindrical brown spikes of minute flowers. They are sometimes erroneously called bulrush.

REEF, a certain portion of a sail between the top or bottom and a row of eyelet-holes running across the sail, one or more reefs being folded or rolled up to contract the sail in proportion to the increase of the wind. There are sets of cords called reef-points attached to the sail for tying up the reefs, and the sail is also strengthened by reef-bands across it. There are several reefs parallel to each other in the superior sails, and

Wherry with fore-sail reefed, the main-sail showing reef-bands and reef-points.

there are always three or four reefs parallel to the foot or bottom of the chief sails which are extended upon booms. Many ships are now fitted with sails which can, by a mechanical appliance, be reefed from the deck.

REEF, a chain, mass, or range of rocks in various parts of the ocean, lying at or near the surface of the water.

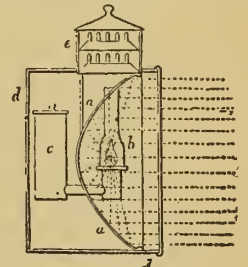
REEL, a machine on which yarn is wound to form it into hanks, skeins, etc. Also a skeleton barrel attached to the butt of a fishing-rod, around which the inner end of the line is wound, and from which it is paid out as the fish runs away when first hooked.

REEL, a lively dance peculiar to Scotland, in one part of which the couples usually swing or whirl round, and in the other pass and repass each other, forming the figure 8. The music for this dance, called by the same name is generally written in common time of four crotchets in a bar, but sometimes in jig time of six quavers.

REEVES, John Sims, tenor singer, born at Shooters' Hill, Kent, in 1822, appeared as a baritone on the stage at Newcastle in 1839; joined a company at Drury Lane under Macready as second tenor in 1841; visited the continent and studied under Bordogni at Paris, and Mazzucato at Milan; and in 1847 returned to England, where he met with great success. He devoted himself more especially to oratorio and ballad singing and long held the reputation of being the first of modern tenors. He published an autobiography in 1889. Died in 1900.

REFEREN'DUM is a term used in the United States to denote the reference to the citizen voters of resolutions or laws passed by their representatives. If these, when so referred, are accepted by the majority of the voters of the canton, then they become part of the law of the land; but if they are rejected, then the rejection is final. The referendum is obligatory when the law or resolution affects the constitution; in other cases it is optional, and may be demanded on the requisition of a certain number of voters.

REFLECTOR, a polished surface of metal, or any other suitable material, applied for the purpose of reflecting



Parabolic reflector.

rays of light, heat, or sound in any required direction. Reflectors may be either plane or curvilinear; of the former the common mirror is a familiar example. Curvilinear reflectors admit of a great variety of forms, according to the purposes for which they are employed; they may be either convex or concave, spherical, elliptical, parabolic, or hyperbolic, etc. The parabolic form is perhaps the most generally serviceable, being used for many purposes of illumination, as well as for various highly important philosophical instruments. The annexed cut is a section of a ship lantern fitted with an argand lamp and parabolic reflector. a a is the reflector, b the lamp, situated in the focus of the polished concave paraboloid, c the oil cistern, d the outer frame of the lantern, and e the chimney for the escape of the products of combustion.

REFLEX NERVOUS ACTION, in physiology, those actions of the nervous system whereby an impression is transmitted along sensory nerves to a nerve

center, from which again it is reflected to a motor nerve, and so calls into play some muscle whereby movements are produced. These actions are performed involuntarily, and often unconsciously, as the contraction of the pupil of the eye when exposed to strong light.

REFORMATION, the term generally applied to the religious revolution in the 16th century which divided the Western church into the two sections known as the Roman Catholic and the Protestant. Before this era the pope exercised absolute authority over the whole Christian church with the exception of those countries in which the Greek or Eastern church had been established. He also claimed supremacy in temporal affairs wherever his spiritual authority was recognized. The great movement known as the Reformation was started by Martin Luther, an Augustine monk of Erfurt, professor of theology in the University of Wittenberg; and what immediately occasioned it was the sale of indulgences in Germany by a duly accredited agent, Johann Tetzel, a Dominican monk of Leipzig. Luther condemned this abuse, first in a sermon and afterward in ninety-five theses or questions which he affixed to the door of the great church, October 31st, 1517. This at once roused public interest and gained him a number of adherents, among them men of influence in church and state. Luther urged his spiritual superiors and the pope to put a stop to the traffic of Tetzel and to reform the corruptions of the church in general. A heated controversy now arose, Luther was fiercely assailed, and in 1520 excommunication was pronounced against him by Pope Leo X. Upon this the reformer appealed to a general council; and when his works were burned at Mainz, Cologne, and Louvain, he publicly committed the bull of excommunication with the papal canons and decrees to the flames (December, 1520). From this time Luther formally separated from the Roman church, and many of the principal German nobles —Hutten, Sickingen, Schaumburg, etc., the most eminent scholars, and the University of Wittenberg, publicly declared in favor of the reformed doctrines and discipline. Luther's bold refusal to recant at the Diet of Worms (April 17, 1521), gave him increased power, while the edict of Worms and the ban of the emperor made his cause a political matter.

The Reformation in England was only indirectly connected with the reform movement in Germany. Wickliffe, and the Lollards, the revival of learning, the writings of More, Colet, and Erasmus, the martyrdom of Thomas Bilney, had all combined to render the doctrine and discipline of the church unpopular. This feeling was greatly increased when the writings of Luther and Tyndale's translation of the Bible found eager readers. Then the political element came in to favor the popular reform movement. Henry VIII., in his efforts to obtain a divorce from Catherine, found it necessary to repudiate the papal supremacy and declare himself by act of parliament (1534) the supreme head of the Church of England. To this the pope replied by threats of excommunication, which were not, however, immediately executed. Yet the breach with Rome was complete, so far, at least, as the king was concerned. Under the new laws of supremacy and treason several of the clergy suffered at Tyburn; Sir Thomas More and Fisher, bishop of Rochester, were beheaded at Tower Hill; and the lesser and greater monasteries were suppressed.

In Scotland the movement was more directly connected with the continent, and in particular with Geneva. The first indication of the struggle against the Roman doctrine is found in the martyrdom (1528) of Patrick Hamilton; and this policy of suppression was continued (1539–46) with great severity by Cardinal Beaton, until he himself became the victim of popular vengeance. Perhaps the most important result of this persecution, and the martyrdom of George Wishart, which Beaton had brought about, was that it determined John Knox to embrace the new reformed faith. In 1546–47 the Scottish reformer established himself as preacher to the Protestant congregation which held the castle of St. Andrews. When the castle was captured by the French fleet Knox was made prisoner and treated as a galley-slave, but regained his liberty after about eighteen months' hardship, and settled in England. During the Marian persecutions he withdrew to the continent and visited the churches of France and Switzerland, but returned to Scotland in 1559. Here he at once joined the Protestant party; preached in Dundee, Perth, and St. Andrews, amid public tumult and the destruction of images, altars, and churches; and finally, under the protection of the lords of the congregation, he established himself as a preacher of Protestantism in St. Giles, Edinburgh. From this center Knox traveled all over Scotland teaching the reformed faith; and such was the roused spirit of the people that when the Scottish parliament assembled (1560) a popular petition was presented demanding the abolition of popery. This was promptly accomplished, and at the assembling of the new Church of Scotland shortly afterward Knox presented his reformed system of government under the name of the First Book of Discipline which was adopted by the assembly. (See Knox.) The position thus secured by the reformer was maintained and the Reformation successfully established in Scotland. In Ireland for various causes the Reformation never made much progress.

REFOR'MATORY SCHOOLS, schools instituted for the training of juvenile offenders (under sixteen) who have been convicted of an offense punishable by penal servitude or imprisonment. The offender, after undergoing a short imprisonment, is committed to a certified reformatory under an order from the court, and there detained for a period not less than two and not more than five years.

REFRACTION, the deflection or change of direction impressed upon rays of light obliquely incident upon and passing through a smooth surface bounding two media not homogeneous, as air and water—or upon rays traversing a medium, the density of which is not uniform, as the atmosphere. A familiar instance of refraction is the broken appearance which a stick presents when thrust partly into clear water, the portion in the water apparently taking a different direction from the other portion. Glass, water, and other solids and fluids each have a different power of refraction, and this power in each case may be expressed numerically by a number known as the index of refraction. Atmospheric refraction is the apparent angular elevation of the heavenly bodies above their true places, caused by the refraction of the rays of light in their passage through the earth's atmosphere, so that in consequence of this refraction the heavenly bodies appear higher than they really are. It is greatest when the body is on the horizon, and diminishes all the way to the zenith, where it is nothing. Double refraction is the separation of a ray of light into two separate parts, by passing through certain transparent mediums, as Iceland spar, one part being called the ordinary ray, the other the extraordinary ray. All crystals except those whose three axes are equal exhibit double refraction.

REFRACTOR, or REFRACTING TELESCOPE. See Telescope.

REFRIGERANT (rē-frij'-), a cooling medicine, which directly diminishes the force of the circulation, and reduces bodily heat without any diminution of nervous energy. The agents usually regarded as refrigerants are weak vegetable-acids, or very greatly diluted mineral acids; effervescing drinks, saline purgatives, etc. Refrigerants in medicine and surgery are also applied externally in the form of freezing-mixtures prepared with salt and pounded ice for the purpose of lowering the temperature of any particular part of the body.

REFRIGERATION, the art of producing cold by artificial means. Mechanical refrigeration is employed in the manufacture of artificial ice, for the freezing and chilling of freshly killed meat in slaughter houses, the cooling of meat, fish, fowl, fruits, vegetables, and other perishable provisions, the cooling of the atmosphere of dwellings and hospitals, and for a variety of manufacturing processes. The refrigerating devices all belong to one or the other of the following five classes: (1) the liquefaction process by which the more or less rapid liquefaction of a solid is utilized to abstract heat; (2) the vacuum process, by which the abstraction of heat is effected by the evaporation of a portion of the liquid to be cooled; (3) the compression process, in which the abstraction of heat is effected by the evaporation of a separate refrigerating agent of a more or less volatile nature, which agent is subsequently returned to its original condition by mechanical compression and cooling; (4) the absorption process, by which the abstraction of heat is effected by the evaporation of a separate refrigerating agent of more or less volatile nature under the direct action of heat, which agent again enters into solution with a liquid; (5) the cold air process in which air or other gas is first compressed, then cooled, and after-

ward permitted to expand while doing work.

REFRIGERATOR, a name applied to cooling apparatus of various kinds. One kind is an apparatus for cooling wort, beer, etc., consisting of a large shallow vat traversed by a continuous pipe through which a stream of cold water is passed. The wort, etc., runs in one direction and the water in another, so that the delivery end of the wort is exposed to the coolest part of the stream of water. Another kind of refrigerator is a chest or chamber holding a supply of ice to cool provisions and prevent them spoiling in warm weather; or a vessel surrounded by a freezing-mixture used in the manufacture of ice-cream, ices, etc.

REFUGEE', a person who seeks safety in a foreign country to escape persecution for religious or political opinions. A large historical movement of this kind occurred when the Edict of Nantes was repealed in France (1685). Such were the oppressions then put upon the Protestants by the dominant Roman Catholic party that 800,000 of the former, it is estimated, sought refuge in England, Denmark, Holland, Switzerland, and Germany.

REGAL, a small portable organ played with the fingers of the right hand, the

Regal, from an old painting.

left being used in working the bellows. It was much used during the 16th and 17th centuries.

REGA'LIA, the emblems or insignia of royalty. The regalia of England consist of the crown, scepter with the cross, the verge or rod with the dove, the so-called staff of Edward the Confessor, several swords, the ampulla for the scared oil, the spurs of chivalry, and several other articles. These are preserved in the jewel-room in the Tower of London.

REGENERATION, in theology, is the equivalent used by the English translators of the Bible for the Greek word palingenesia, which occurs only twice in the New Testament, in Matt. xix. 28 and in Titus iii. 5. In the former passage the term is applied generally to the gospel dispensation as a process of renovation, in the latter it is used as descriptive of the process of individual salvation. An equivalent term is used in 1 Peter i. 3, where it is translated "begotten us again;" and in one or two other passages regeneration, as a theological term, refers to the doctrine of a change effected upon men by divine grace, in order to fit them for being partakers of the divine favor, and for being admitted into the kingdom of heaven.

REGENT-BIRD, or **KING HONEY-EATER,** a very beautiful bird of Australia, belonging to the family Meliphagidæ or honey-eaters. The color of the plumage is golden yellow and deep velvety black. It was discovered during

Regent-bird.

the regency of George IV., and was named in compliment to him.

REGGIO (red'jō) **DI CALABRIA,** a seaport of South Italy, capital of a province of the same name, on the east coast of the Strait of Messina, a handsome and beautifully-situated town. Pop. 23,853.—The province occupies the southwestern extremity or toe of Italy, and is a rugged and mountainous region. The area is 1515 sq. miles; the pop. 398,086.

REGGIO NELL' EMILIA, a town of North Italy, capital of the province of same name, 15 miles w.n.w. Modena. —The province of Reggio lies between those of Parma on the west and Modena on the east; area, 877 sq. miles; pop. 259,793.

REGIL'LUS, anciently a small lake of Italy, in Latium, to the southeast of Rome (site uncertain), celebrated for a great battle between the Romans and Latins in B.C. 496.

REGIMENT, a body of regular soldiers forming an administrative division of an army, and consisting of one or more battalions of infantry or of several squadrons of cavalry, commanded by a colonel and other officers. A regiment is the largest permanent association of soldiers, and the third subdivision of an army corps, several regiments going to a brigade, and several brigades to a division. These combinations are temporary, while in the regiment the same officers serve continually, and in command of the same body of men. The strength of a regiment may vary greatly, as each may comprise any number of battalions.

REHAN (rē'ăn), Ada, American actress, was born in Limerick, Ireland, in 1860, and was brought to the United States when about six years old. Her greatest rôles are those of Rosalind in As You Like It, Katharine in The Taming of the Shrew, Viola and Lady Teazle. Among her parts were those of Peggy in The Country Girl, Kate Verity in The Squire. She was Maid Marian in Tennyson's Foresters, and Roxane in Cyrano de Bergerac. Miss Rehan had great success in Germany, France and England.

REICHSTAG (rīhs'tăh), the imperial parliament of Germany, which assembles at Berlin.

REID (rēd), Capt. Mayne, born in the north of Ireland in 1819, died 1883. His love of adventure took him to America, where he traveled extensively as hunter or trader; joined the United States army in 1845 and fought in the Mexican war. He afterward returned to London, where he became well known as a writer of thrilling juvenile stories, many of them based on his American experiences, such as the Rifle Rangers, Scalp Hunters, the War Trail, the Headless Horseman, etc.

REID, Whitelaw, American journalist and statesman, was born in Xenia, Ohio, in 1837. He served as correspondent of the Cincinnati Gazette during the civil war, was present at Shiloh, Gettysburg, and elsewhere, and was afterward chosen librarian of the house of representatives (1863–66). He joined the staff of the New York Tribune, and in 1872, became its editor and principal owner. He declined the appointment as minister to Germany but accepted the nomination for vice-president (1892) and the appointment of minister to France (1889–92) and special ambassador to Queen Victoria's jubilee (1897). He was a member of the peace commission that terminated the Spanish war (1898), and special ambassador to Great Britain for the coronation of Edward VII. (1902).

REINDEER (rān'dēr), a species of deer found in the northern parts of Europe and Asia. It has branched, recurved, round antlers, the summits of which are palmated; the antlers of the male are much larger than those of the female. These antlers, which are annually shed and renewed by both sexes, are remarkable for the size of the branch which comes off near the base, called the brow antler. The body is of a thick

Reindeer.

and square form, and the legs shorter in proportion than those of the red-deer. Their size varies much according to the climate, those in the higher arctic regions being the largest; about 4 feet 6 inches may be given as the average height of a full-grown specimen. The reindeer is keen of sight, swift of foot, being capable of maintaining a speed of 9 or 10 miles an hour for a long time, and can easily draw a weight of 200 lbs., besides the sledge to which they are usually attached when used as beasts of draught. Among the Laplanders the reindeer is a substitute for the horse, the cow, and the sheep, as he

furnishes food, clothing, and the means of conveyance. The caribou of North America, if not absolutely identical with the reindeer, would seem to be at most a well-marked variety of it.

REINDEER MOSS, a lichen, which constitutes almost the sole winter food for reindeer, etc., in high northern latitudes, where it sometimes attains the height of 1 foot. It is also found in the moors and mountains of Britain. Its taste is slightly pungent and acrid, and when boiled it forms a jelly possessing nutritive and tonic properties.

RELATIVE RANK in the Army and Navy. See Navy and Army Relative Rank in.

RELICS, remains of saints and martyrs or objects connected with them, and especially memorials of the life and passion of our Lord, to which worship or a special veneration is sanctioned and practised both in the Roman Catholic and Greek churches. The doctrine of the Roman Catholic church in regard to relics was fixed by the council of Trent, which decreed in 1563 that veneration should be paid to relics as instruments through which God bestows benefits on men; a doctrine which has been rejected by all Protestant churches. The veneration of relics is not peculiar to Christianity, but has found a place in nearly every form of religion. Buddhism is remarkable for the extent to which relic-worship has been carried in it.

RELIEF, in sculpture and architecture, is the protection of a figure above or beyond the surface upon which it is formed. According to the degree of projection a figure is described as in high, middle, or low relief. High relief (alto-rilievo) is that in which the figures project at least one-half of their apparent circumference from the surface upon which they are formed; low relief (basso-rilievo) consists of figures raised but not detached from a flat surface; while middle relief (mezzo-rilievo) lies between these two forms.

High relief—The Rondanini mask of Medusa in the Glyptothek, Munich—illustrating the late beautified type of the Gorgon.

RELIGION, the feeling of reverence which men entertain toward a Supreme Being or to any order of beings conceived by them as demanding reverence from the possession of superhuman control over the destiny of man or the powers of nature; more especially the recognition of God as an object of worship, love, and obedience. The common use of the term, applies it to a body of doctrines handed down by tradition, or in canonical books, and accompanied by a certain outward system of observances or acts of worship. In this sense we speak of the Jewish, the Christian, the Hindu, etc., religions. Religions in this sense are divided into two great classes, polytheistic and monotheistic; that is, those recognizing a plurality of deities and those that recognize but one. A dualistic class may also be established, in which two chief deities are recognized, and a henotheistic, in which there are one chief and a number of minor deities. In some religions magic, fetishism, animal worship, belief in ghosts and demons, etc., play an important part. The most remarkable religious conquests in history are that of Judaism, which effected the establishment of a national religion, originally that of a single family, in a hostile territory by force of arms and expulsion or extinction of the previous inhabitants; that of Christianity, which, by the power of persuasion and in the midst of persecution, overthrew the polytheism of the most enlightened nations of antiquity; that of Mohammedanism, which, partly by persuasion, but more by force, established itself on the site of the eastern empire of Christianity, and extended its sway over a population partly idolatrous and partly Christian; that of Buddhism, which, being expelled by persecution from India, where it had widely disseminated itself by conversion, spread itself also by moral suasion over the larger portion of Eastern Asia. All these religions, with the exception of Buddhism, which may perhaps be considered atheistic, are monotheistic systems.

Various estimates have been made of the diffusion of the various religious creeds over the world. These are necessarily very loose and often differ widely from each other. A recent estimate is the following:

Roman Catholics	229,000,000
Protestants	153,000,000
Eastern Churches	112,000,000
Mohammedans	194,000,000
Buddhists	400,000,000
Brahmanists	208,000,000
Followers of Confucius	80,000,000
Sinto Religion	14,000,000
Jews	7,000,000

RELIGIOUS LIBERTY, or **LIBERTY OF CONSCIENCE,** is the recognition and assertion by the state of the right of every man, in the profession of opinion and in the outward forms and requirements of religion, to do or abstain from doing whatever his individual conscience or sense of right suggests. Religious liberty is opposed to the imposition by the state of any arbitrary restrictions upon forms of worship or the propagation of religious opinions, or to the enacting of any binding forms of worship or belief. The limit of religious liberty is necessarily the right of the state to maintain order, prevent excesses, and guard against encroachments upon private right. In the organization of civil and ecclesiastical government which prevailed from Constantine to the Reformation persecution was in general only limited by dissent, and universal submission to the dominant church became the condition of religious peace throughout Christendom, while religious liberty was unknown. The contest of opinion begun at the Reformation had the effect of establishing religious liberty, as far as it at present exists, but the principle itself was so far from being understood and accepted in its purity by either party that it hardly suggested itself even to the most enlightened reasoners of that age. In Great Britain even, civil liberty, jealously maintained, was not understood, by the dominant party at least, to import religious liberty. Active measures of intolerance were adopted against Dissenters in the reign of Queen Anne. Even in the reign of George III. conditions were attached to the toleration of Dissenting preachers; and civil enactments against Roman Catholics have been repealed only within Victoria's reign. Religious liberty was introduced in Prussia by Frederick the Great, but controvened by his immediate successor. The state at present in Prussia, without, perhaps, actually dictating to private individuals, maintains a vigilant control over ecclesiastical organization, the education of the clergy, and all public matters connected with religion. Religious liberty has only been established in Austria under the present monarch. Italy first enjoyed the same advantage under Victor Emanuel II. The government of France, even since the revolution, has always been of a paternal character, but practically religious liberty exists in France. In Spain, in the days of its power the most bigoted state in Europe, restricted liberty of worship was allowed only in 1876. Religious persecution was actively conducted against the Roman Catholics in Russia during the reign of the emperor Nicholas I., and full religious liberty does not yet exist. Since the Crimean war religious liberty has been recognized in Turkey. Toleration has thus been slowly advancing in Europe since the Reformation, and its recent progress has been extensive; yet even in the most advanced countries the state of public opinion on this subject is still far from being satisfactory.

REM'BRANDT, in full, Rembrandt Hermansz Van Ryn, the most celebrated painter and etcher of the Dutch school,

Rembrandt Van Ryn.

was born in 1606 at Leyden, where his father was a well-to-do miller. His eminence in portraiture may especially be noted in portrait-groups in particular.

His artistic development may be broadly divided into three periods. To the first of these (1627–39), which shows less mastery than the succeeding two, belong his St. Paul, Samson in Prison, Simeon in the Temple, Lesson in Anatomy (Tulp the anatomist), and various character portraits of his wife as Queen Artemisia, Bathsheba, the Wife of Samson, etc. To his middle period (1640–54), belong The Night Watch, The Woman taken in Adultery, Tobit and his Wife, The Burgomaster and his Wife, Descent from the Cross, Portrait of Coppenol, Bathsheba, and Woman Bathing. Among the works of his last period (1655–68) may be mentioned John the Baptist Preaching, Portrait of Jan Six, The Adoration of the Magi, the Syndics of Amsterdam, and various portraits of himself. His etchings in technique and deep suggestion have not yet been equalled. He was the first and as yet the greatest master of this department of art. Of his works there are about 280 paintings and 320 etchings extant and accessible, dating from 1625 to 1668. He died in 1669.

REMENYI (rĕ'mān-yē), Eduard, Hungarian violin virtuoso, was born at Heves, in 1830. He was appointed solo violinist to Queen Victoria in 1853. He afterward visited the United States, Canada, Mexico, China, Japan, France, and Germany. He ranked among the foremost musical artists of his day. He died while on an American concert tour in 1898.

REM'INGTON, Frederick, American sculptor, artist, and author, born in 1861 at Canton, N. Y. His pictures of western subjects are very popular. His statuettes include "The Broncho Buster" and "The Wounded Bunkie." They are spirited bronzes, executed with skill, and his horses are very fine. His stories, illustrated by himself, include Pony Tracks, Crooked Trails, Sundown Leflare, Men with the Bark on, and John Ermine of the Yellowstone.

REMINGTON, Philo, American manufacturer and inventor, born at Litchfield, N. Y., in 1816. During the civil war the Remingtons supplied small arms to the federal government. Soon afterward they began to manufacture the breech-loading rifle which bears their name. In 1873 the firm secured the right to one of the first typewriters. Both rifles and typewriters have since passed into other hands. He died in 1889.

REMITTENT FEVER, a fever which suffers a decided remission of its violence during the course of the twenty-four hours, but without entirely leaving the patient. It differs from an intermittent fever in this, that there is never a total absence of fever. Remittent fever is severe or otherwise according to the nature of the climate in which the poison is generated. The autumnal remittents of temperate climates are comparatively mild, while the same fever in the tropics is often of a very severe type, and not unfrequently proves fatal. The period of remission varies from six to twelve hours, at the end of which time the feverish excitement increases, the exacerbation being often preceded by a feeling of chilliness. The abatement of the fever usually occurs in the morning; the principal exacerbation generally takes place towards evening. The duration of the disease is generally about fourteen days, and it ends in a free perspiration, or may lapse into a low fever. This fever is often cured by the administration of quinine, which should be given at the commencement of the remission. A simple yet nourishing diet must also be attended to. No stimulants must be allowed.

Rem'ora, a genus of fishes included in the Goby family, and of which the common remora, or sucking-fish is the typical example. These fishes have on the top of the head a peculiar sucking-disc, composed of a series of cartilaginous plates arranged transversely, by means of which they attach themselves to other fishes or to the bottoms of

Remora.

vessels. The common remora attains an average length of 1 foot and possesses a general resemblance in form to the herring. It is common in the Mediterranean sea and in the Atlantic ocean. Other species are of larger size. The ancients attributed to the remora the power of arresting and detaining ships in full sail.

REMUSAT (rā-mu-zä), Charles François Marie, Comte de, politician and man of letters, was born at Paris 1797, died 1875. His works include several on English subjects, such as L'Angleterre au XVIII. Siècle, Bacon, Lord Herbert of Cherbury, Histoire de la Philosophie en Angleterre depuis Bacon jusqu'à Locke. His mother, Claire Elizabeth de Vergennes, Comtesse de Rémusat (born 1780, died 1824), was a very remarkable woman. Her essay on Female Education, published after her death, received an academic couronne, and her Mémoires, published in 1879–80, are particularly valuable for the light which they throw on the court of the first empire.

RENAIS'SANCE, a term applied, in its more specific sense, to a particular movement in architecture and its kindred arts, but in a general sense to that last stage of the middle ages when the European races began to emerge from the bonds of ecclesiastical and feudal institutions, to form distinct nationalities and languages; and when mediæval ideas became largely influenced by the ancient classic arts and literature. It was a gradual transition from the middle ages to the modern, characterized by a revolution in the world of art and literature brought about by a revival and application of antique classic learning. The period was also marked by a spirit of exploration of lands beyond the sea, by the extinction of the scholastic philosophy, by the new ideas on astronomy promulgated by Copernicus, and by the invention of printing and gunpowder, etc.

RENAISSANCE ARCHITECTURE, a style which originated in Italy in the first half of the 15th century, and afterward spread over Europe. Its main characteristic is a return to the classical forms and modes of ornamentation which had been displaced by the Byzan-

Renaissance sculpture—The "David" of Michelangelo, in the Accademia, Florence, Italy.

tine, the Romanesque, and the Gothic.

RENAN (rē-nän), Joseph Ernest, orientalist, historian, and essayist, was born at Tréguier, in Brittany, February 27, 1823. In 1862 he was appointed professor of Hebrew, Chaldee, and Syriac in the Collége de France, but the sceptical views manifested in his Life of Jesus (1863) raised an outcry against him, and he was removed from his chair, to be restored again, however, in 1871. This work, the publication of which caused intense excitement throughout Europe, was the first part of a comprehensive work on the History of the Origins of Christianity (Historie des Origines du Christianisme), which includes Les Apôtres, St. Paul, L'Antéchrist, Les Evangiles, L'Eglise Chrétienne, and Marc Aurèle, all written from the sceptical stand-point. He became a member of the Academy in 1878, and rector of the Collége de France in 1883. Renan's latest important work was the History of the People of Israel (1887–94) five vols.). He died in 1892.

RENFREW, or **RENFREWSHIRE,** a county of Scotland, bounded by Ayrshire, Lanarkshire, Dumbartonshire, and the river and Firth of Clyde; area, 156,785 acres, of which about 95,000 acres are cultivated. Pop. 268,418. The town of Renfrew is an ancient royal and parliamentary burgh, 6 miles w.n.w. of Glasgow, close to the Clyde. Pop. 9296.

RENNES (renn), a city of France, formerly capital of Brittany, at present capital of the department of Ille-et-Vilaine, situated at the confluence of the rivers Ille and Vilaine. Pop. 74,006.

RENNET, the prepared inner surface

of the stomach of a young calf. It contains much pepsin, and has the property of coagulating the casein of milk and forming curd. It is prepared by scraping off the outer skin and superfluous fat of the stomach when fresh, keeping it in salt for some hours, and then drying it. When used a small piece of the membrane is cut off and soaked in water, which is poured into the milk intended to be curdled.

RENT, in the strict economic sense, the payment which, under conditions of free competition, an owner of land can obtain by lending out the use of it to others. This will be found to consist of that portion of the annual produce which remains over and above the amount required to replace the farmer's outlay, together with the usual profits.

Rent, as a legal term, is the consideration given to the landlord by a tenant for the use of the lands or subjects which he possesses under lease. There is no necessity that this should be, as it usually is money; for capons, horses, corn, and other things, may be, and occasionally are, rendered by way of rent; it may also consist in services or manual operations. It is incidental to rent that the landlord can distrain—that is, seize and sell the tenant's chattels in order to liquidate the rent. Sometimes the owner transfers to another by deed or otherwise the right to a certain rent out of the lands, that is termed a rent-charge, and the holder of it has power to distrain for the rent, though he has no right over the lands themselves.

REPEAT, in music, a sign that a movement or part of a movement is to be played or sung twice.

REPLEV'IN, in law, is an action brought to recover possession of goods illegally seized, the validity of which seizure it is the regular mode of contesting.

REP'LICA, in the fine arts, is the copy of a picture, etc., made by the artist who executed the original.

REPOUSSE (rē-pō'sā), a kind of ornamental metal-work in relief. It resembles embossed work, but is produced by beating the metal up from the back, which is done with a punch and hammer the metal being placed upon a wax block. By this means a rude resemblance to the figure to be produced is formed, and it is afterward worked up by pressing and chasing the front surface. The finest specimens of this style are those of Benvenuto Cellini of the 16th century.

REPRESENTATIVE GOVERNMENT, is that form of government in which either the whole of a nation, or that portion of it whose superior intelligence affords a sufficient guarantee for the proper exercise of the privilege, is called upon to elect representatives or deputies charged with the power of controlling the public expenditure, imposing taxes, and assisting the sovereign in the framing of laws. See Constitution.

REPRIEVE (re-prēv'), the suspension of the execution of the sentence passed upon a ciminial for a capital offense. A reprieve may be granted in various ways: First, by the mere pleasure of the sovereign; second, when the judge is not satisfied with the verdict, or any favorable circumstance appears in the criminal's character; third, when a woman capitally convicted pleads pregnancy; and lastly, when the criminal becomes insane.

REPROBATION, in theology, is the doctrine that all who have not been elected to eternal life have been reprobated to eternal damnation. This doctrine was held by Augustine and revived by Calvin; but most modern Calvinists repudiate it in the sense usually given to it.

REPRODUCTION, the process by which animals perpetuate their own species or race. Reproduction may take place in either or both of two chief modes. The first of these may be termed sexual, since in this form of the process the elements of sex are concerned—male and female elements uniting to form the essential reproductive conditions. The second may be named asexual, since in this latter act no elements of sex are concerned. The distinctive character of sexual reproduction consists in the essential element of the male (sperm-cell or spermatozoön) being brought in contact with the essential element of the female (germ-cell, ovum, or egg), whereby the latter is fertilized or impregnated, and those changes thereby induced which result in the formation of a new being. Whether these elements, male and female, be furnished by one individual or by two—or in other words whether the sexes be situated in separate individuals or not—is a fact of immaterial consequence in the recognition and definition of the sexual form of the process. The reproductive process, therefore, may be (I.) Sexual, including (A) Hermaphrodite or Monœcious parents possessing male or female organs in the same individual, and these may be (a) self-impregnating (for example, the tape-worm), or (b) mutually impregnating (for example, the snail); and (B) Dicœcious parents, which may be (1) Oviparous (for example, most fishes, birds, etc.), (2) Ovo-viviparous (for example, some amphibians and reptiles), or (3) Viviparous (for example mammals). Or the reproductive process may be (II.) Asexual, including the processes of (A) Gemmation or budding (internal, external, continuous, or discontinuous), and (B) Fission (transverse, longitudinal, irregular).

The most perfert form of the reproductive process is best seen in the highest or vertebrate animals, where the male elements are furnished by one form, and the female elements by another. The male element, with its characteristic sperm-cells or spermatozoa, is brought into contact with the female ova in various ways. The ova when inmated may undergo development external to the body of the parent, and be left to be developed by surrounding conditions (as in the eggs of fishes); or the parent may (as in birds) incubate or hatch them. Those forms which thus produce eggs from which the young are afterward hatched are named oviparous animals. In other cases (as in the land salamanders, vipers, etc.) the eggs are retained within the parent's body until such time as the young are hatched, and these forms are hence named ovo-viviparous: whilst (as in mammalia alone) the young are generally completely developed within the parent's body, and are born alive. Such animals are hence said to be viviparous. In the higher mammals, which exhibit the viviparous mode of reproduction in fullest perfection, the mother and embryo are connected by a structure consisting partly of fœtal and partly of maternal tissues, and which is known as the placenta. (See Placenta.) In tape-worms we find similar examples of normal hermaphrodite forms. Each segment or proglottis of the tape-worm—which segment constitutes of itself a separate zoöid or part of the compound animal—contains a large branching ovary, developing ova or eggs, and representing the female organs, and also the male organ or testis. These organs between them produce perfect or fertilized eggs, each of which under certain favorable conditions is capable of developing into a new tape-worm. The snails also form good examples of hermaphrodite animals and illustrate organisms which require to be mutually impregnated in order to produce fertilized eggs—that is to say, the male element of one hermaphrodite organism must be brought in contact with the female element of another hermaphrodite form before the eggs of the latter can be fecundated.

REPTILES, or **REPTILIA,** a class of vertebrates, constituting with the birds, to which they are most closely allied, Huxley's second division of vertebrates, Sauropsida. Reptiles, however, are generally regarded as occupying a separate place in the animal kingdom, between birds and amphibians. Reptiles differ from amphibians chiefly in breathing through lungs during the whole period of their existence; and from birds in being cold-blooded, in being covered with plates or scales instead of feathers, and in the forelegs (as far, at least, as living reptiles are concerned) never being constructed in the form of wings.

The class may be divided into ten orders, four of which are represented by living forms, while six are extinct. The living orders are the Chelonia (tortoises and turtles), the Ophidia (serpents and snakes), the Lacertilia (lizards), and Crocodilia (crocodiles and alligators). The extinct orders are: Ichthyopterygia (Ichthyosaurus), Sauropterygia (Plesiosaurus), Anomodontia (Rhynchosaurus, etc.), Pterosauria (Pterodactylus), Deinosauria (Megalosaurus, etc.), and Theriodontia. The class is also divided into two sections, Squamata and Loricata, according as the exoskeleton consists simply of scales, or of bony plates in addition to the scales.

The exo-skeleton varies greatly in its development throughout the class. As in the tortoises and turtles and crocodiles it may attain, either separately or in combination with the endo-skeleton, a high development. In serpents and many lizards it is moderately developed, while in some lizards the skin is comparatively unprotected. The skeleton is always completely developed and ossified. The vertebral column in the quadrupedal forms is divided into four or five regions, less distinctly differentiated, however, than in the mammals. The

ribs differ considerably in their mode of attachment to the vertebræ, but are always present, and in a state of greater development than in the amphibians. The body, except in the case of the tortoises, is of an elongated form. The limbs are very differently developed in the different species. In the serpents and some lizards they are completely wanting, or atrophied; in other lizards they are rudimentary; while in the remainder of the class sometimes the anterior and sometimes the posterior limbs are developed, and not the others. In no case are the limbs developed to the extent to which they are developed in birds and quadrupeds, these members seldom being of sufficient length to keep the body from the ground. In some of the forms, living or extinct, the limbs are modified for swimming or for flight. The lower jaw is connected with the skull through the intervention of a quadrate bone, and, as this often projects backward, the opening of the mouth is very great, and may even extend beyond the base of the skull. Teeth, except in the turtle and tortoises, are present, but are adapted rather for seizing and holding prey than masticating food, and, except in the crocodiles, are not sunk in sockets. The skull possesses a single occipital condyle, by means of which it articulates with the spine. The brain is small compared with the size of the skull. The muscular system is developed more like that of the birds and mammals than that of the amphibians or fishes. The intestinal tract is generally differentiated into an œsophagus, stomach, small intestine, and large intestine. It terminates in a cloaca, which is also common to the efferent ducts of the urinary and generative systems. In some forms (as snakes) the stomach, like the gullet, is capable of great distention. The heart has only three cavities, viz.: two separate auricles and a single ventricular cavity, usually divided into two by an incomplete partition. Respiration is always performed by the lungs, which are highly organized, and often attain a great size. The ova are in general retained within the body of the parent until the development of the young has proceeded to a greater or less extent, and then expelled and left to the heat of the sun; but in some forms (as snakes and lizards) they are hatched in the interior of the body. Reptiles are found in greatest number, and in most typical form and variety, in the warm or tropical regions of the earth. During winter, or in the colder seasons of the year, most reptiles hybernate, and snakes are notable as periodically moulting their skin or epidermis. See the different orders in separate articles.

REPUB'LIC, a constitution in which the supreme power in the state is vested, not in a hereditary ruler, but in the citizens themselves. According to the constitution of the governing body a republic may therefore vary from the proudest aristocracy to the most absolute democracy. In the small states of ancient Greece the supreme power was vested in the whole body of the citizens, who met in common assembly to enact their laws. In the oligarchic republics of Genoa and Venice the supreme power was consigned to the nobles or a few privileged individuals. In all modern republics the representative system prevails. Besides the diminutive republic of San Marino, in Italy, and Andorra, on the south side of the Pyrenees the only republics in Europe at the present day are those of Switzerland and France. Switzerland has been a republic ever since it liberated itself from German rule; and France has been thrice a republic—from 1793 to 1804, from 1848 to 1852, and from 1870 to the present time. Holland was a republic from the separation of the seven provinces from Spain until 1815; Great Britain was nominally a republic from 1649 to 1660; Spain possessed a republican government in 1868–69, and in 1873–74. In the New World the republican form of government prevails universally among the independent states, the most important of all the republics there being the United States. The United States, like Switzerland, is a federative republic, consisting of a number of separate states bound together by a treaty, and having a central government, with power to enact laws binding on all the citizens. Mexico has been a republic since 1824, except during the short-lived empire from 1863 to 1867. Brazil has only been a republic since November, 1889.

REPUBLICAN PARTY, in United States politics, a name first applied to the party which favored a strong central government, not acting through the states, but directly upon the people; opposed to the democratic party, which maintained the rights of individual states. The party was latterly identified with the anti-slavery movement, and was the party of the north in the civil war. It is strongly protectionist. Since 1860 when Abraham Lincoln was elected by the Republicans, with the exception of the years 1884-88, 1892-96, when Grover Cleveland was elected by the Democrats, the Republicans have been successful in electing their candidate for the presidency.

REPUDIATION, a refusal on the part of a government to pay the debts contracted by the governments which have preceded it. Repudiation has sometimes been resorted to by the smaller American republics, and by some of the United States, and in Europe there are also instances of a similar kind.

REPULSION, in physics, is a term often applied to the action which two bodies exert upon one another when they tend to increase their mutual distance. It was formerly thought that there were two forces, attraction and repulsion, which balanced and counteracted each other; but it is now known that all apparent repulsion is merely a difference of attractions.

RESERVE, in military matters, has several significations. In battle the reserve consists of those troops not in action, and destined to supply fresh forces as they are needed, to support those points which are shaken, and to be ready to act at decisive moments. The reserve of ammunition is the magazine of warlike stores placed close to the scene of action to allow of the supply actually in the field being speedily replenished. The term reserves is also applied to those forces which are liable to be called into the field on great emergencies, for the purposes of national defence; which has received a military training but follow the ordinary occupations of civil life, and do not form part of the standing army. Such reserves now form a part of all national troops organized on a great scale.

RESERVE, in banking and insurance, that portion of capital which is set aside to meet liabilities, and which, in banking, is therefore not employed in discounts or temporary loans.

RESERVOIR (rez'ẽr-vwȧr), an artificial basin in which a large quantity of water is stored. The construction of a reservoir often requires great engineering skill. In the selection of a site the great object should be to choose a position which will give the means for collecting a large supply of rainfall with as little recourse as possible to artificial structures or excavations. The embankments or dams may be constructed either of masonry or earth-work, but the latter is the more usual, as it is generally the more economical method. Reservoirs in which the dams are built of earth-work must be provided with a waste-weir, to admit of the surplus water flowing over; in the reservoirs of which the dams are built of masonry there is no necessity for a waste-weir, as then the water may be allowed to overflow the wall, there being no fear of its endangering the works. The outlet at the bottom, by which the water to be used is drawn off from the reservoir, may consist either of a tunnel, culvert, or iron pipes provided with suitable sluices. Distributing reservoirs for cities are generally built of masonry. They are placed high enough to command the highest part of the town, and are capacious enough to contain half a day's supply, their chief use being to store the surplus water during the night.

RESINS, a class of vegetable substances insoluble in water, soluble in alcohol, and easily softened or melted by heat. Resins are either neutral or acid; they are transparent or translucent; they have generally a yellow-brown color; are sometimes elastic, but more generally friable and hard. They become electric when rubbed. Resins may be divided into three classes: (1) Those which exude spontaneously from plants, or from incisions in the stems and branches. They are generally mixtures of gum-resins and volatile oils. The principal resins belonging to this class are benzoin, dragon's-blood, Peru balsam, storax, copaiba, copal, elemi, guaiacum, jalap, lac, myrrh, sandarach, and turpentine. (2) Resins extracted from plants by alcohols; they generally contain definite carbon compounds. The principal resins belonging to this class are gum ammoniacum, angelica-root, Indian hemp, cubebs, manna, and squill. (3) Fossil resins, occurring in coal or lignite beds, amber, asphalt, copaline, fossil caoutchouc, etc.

RESISTANCE, Electrical, the opposition which a conductor offers to the flow of electricity, the conductor being removed so far from neighboring conductors that their action will be very

small, and maintained at the temperature of 0° C. The unit of resistance is called an ohm.

RES'ONANCE, in acoustics, a strengthening of sound. When a person speaks in an empty room the walls reflect the words. Suppose we have only to deal with one reflecting surface, at a distance of 112.5 feet from the speaker; there will be an interval of one-fifth of a second between the word and its echo, and the sound will be distinguished from its reflection; for any shorter distance the echo will merely strengthen the sound. Resonance includes such strengthening of sound as occurs in sounding-boards and the bodies of musical instruments.

RESPIRATION, the act of respiring or breathing. Respiration is that great physiological function which is devoted to the purification of the blood by the removal, through the media of the breathing organs, of carbonic acid and other waste products, and at the same time to the revivifying of the blood by the introduction of the oxygen of atmospheric air. It is thus partly excretory and partly nutritive in its character. The other waste products, besides carbonic acid, which are given off in the process of animal respiration are water, ammonia, and organic matters; the carbonic acid is by far the most important.

In man and the higher animals respiration is carried on by the breathing organs or lungs. The blood is conveyed to the breathing organs by special vessels, the right side of the heart in birds and mammals being exclusively employed in driving blood to the lungs for purification. The blood is sent through the pulmonary or lung capillaries in a steady stream, and passes through these minute vessels at a rate sufficient to expose it to the action of the oxygen contained in the air-cells of the lungs. The essential part of the function of respiration, namely, the exchange of carbonic acid gas for oxygen, thus takes place in the lung, where the dingy-hued venous blood becomes converted into the florid red arterial blood. Respiration includes the physical acts of inspiration and expiration, both involuntary acts, although they may be voluntarily modified. From fourteen to eighteen respiratory acts take place per minute, the average quantity of air inhaled by a healthy adult man being about 30 cubic inches, a slightly smaller quantity being exhaled. This definite volume of air which ebbs and flows is termed tidal air. The quantity (about 100 cubic inches) which may be taken in a deep inspiration, in addition to the tidal air, is termed complemental air. The quantity of air (75 to 100 cubic inches) remaining in the chest after an ordinary expiration has expelled the tidal air, is named supplemental or reserve air, and this may be in greater part expelled by a deeper expiration; while a quantity of air, also averaging from 75 to 100 cubic inches, always remains in the lungs after the deepest possible expiratory effort, and cannot be got rid of. This latter quantity is therefore approximately named residual air. The difference in the mode of breathing between the two sexes is clearly perceptible. In man it is chiefly abdominal in its character; that is to say, the lower part of the chest and sternum, together with the abdominal muscles, participate before the upper portions of the chest in the respiratory movments; while in women the breathing movements are chiefly referable to the upper portions of the chest. In women, therefore, breathing is said to be pectoral.

Every volume of inspired air loses from 4½ to 5 per cent of oxygen and gains rather less carbonic acid. The quantity of carbonic acid given off varies under different circumstances. More carbonic acid is excreted by males than by females of the same age, and by males between eight and forty than in old age or in infancy. An average healthy adult man will excrete more than 8 oz. of carbon in 24 hours. Hence the necessity for repeated currents of fresh air in meeting places and places of public entertainment, in halls and in churches, and for the proper ventilation of sleeping apartments. The breathing of an atmosphere vitiated by organic matter and carbonic acid results in imperfect oxygenation of the blood, is accompanied or followed by headaches, drowsiness, and lassitude, and is the source of many serious and even fatal disorders.

While in man and the more highly organized animals respiration is carried on by the lungs, in fishes it is effected by the gills. The essential feature of any breathing organ is a thin membrane, having the blood on one side and air, or water containing air, on the other; and the essential feature of respiration is an interchange of products between the blood and the atmosphere, oxygen passing from atmosphere into the blood, and carbonic acid and organic matters from the blood into the atmosphere. In the protozoa no respiratory organs are specialized, but the protoplasm of which the bodies of these animals are composed has doubtless the power of excreting waste matters, as well as of absorbing nutritive material. Even in comparatively high organisms, where no specialized breathing organs are developed the function of respiration may be carried on by the skin or general body surface—the integument being, as in the highest forms, intimately correlated in its functions to the breathing process. Thus in earthworms, lower crustacea, etc., the breathing appears to be solely subserved by the body-surfaces.

Respiration goes on in plants as well as in animals, the plant in the presence of light exhaling oxygen and inhaling carbonic acid, and thus reversing the action of the animal.

RESPIRATION, Artificial. See Drowning.

RESPIRA'TOR, a mouth-covering, which gives warmth to the air inhaled, and is used by persons having delicate lungs. It is constructed of a series of layers of very fine silver or gilt wires placed closely together, which are heated by the exhalation of the warm breath, and in turn heat the cold air before it is inhaled. Other respirators, designed to exclude smoke, dust, and other noxious substances, are used by firemen, miners, cutlers, grinders, and the like.

RESPIR'ATORY SOUNDS, in medicine, the sounds made by the air when being inhaled or exhaled, as heard by the ear applied directly to the chest, or indirectly through the medium of the stethoscope. The respiratory sounds are of the highest importance in the diagnosis of diseases of the chest and bronchial tubes.

REST, in music, an interval of silence between two sounds, and the mark which denotes such interval. Each note has its corresponding rest. See Music.

RESTIA'CEÆ, a natural order of plants allied to the Cyperaceæ or sedges, and confined to the southern hemisphere, being found chiefly in South Africa and Australia. They are herbs or undershrubs, with matted roots which bind shifting soil, hard wiry stems, simple narrow leaves, the sheaths of which are usually split, and inconspicuous brown rush-like panicles of flowers.

RESTORATION, in English history, the re-establishment of Charles II. on the throne, May 29, 1660. The restoration was held as a festival in the Church of England till 1859.

RESURRECTION, the rising again of the body from the dead to be reunited to the soul in a new life. It has formed a part of the belief of the Christian church since its first formation, and has been embodied as an article to each of the creeds. There are traces to be found of such a belief among heathen nations from a very early period. There can be little doubt that the Jews, particularly those of later times, held the doctrine, though it would be difficult to point to any express indication of it in the Old Testament. It appears, however, to be alluded to in Isaiah xxvi. 19, and is distinctly affirmed in Daniel, chap. xii. 1–3. That the belief in the resurrection was generally held among the Jews at the time of Christ is evident, particularly from the position occupied by the Sadducees, a sect having as its most characteristic feature the denial of the resurrection. Beyond doubt, however, it was the gospel that "brought life and immortality to light." At best the notions of a resurrection and future state current prior to the advent of Christ were dim and undefined, and it remained for him to set them in a full clear light, and give evidence and pledge of their reality by his own resurrection. With regard to the information conveyed to us in the New Testament on the doctrine of the resurrection, we are taught that it will be universal, extending to the wicked as well as to the righteous, John v. 28, 29; Rev. xx. 13; that there shall be identity, in some sense, between the body which died and the body which shall be raised, 2 Cor. v. 10; that, as regards the resurrection of the righteous, the body, though identical, shall be wonderfully altered, Phil. iii. 21; 1 Cor. xv.; Luke xx. 35, 36; and that, as regards the time of the resurrection, it shall be at the end of this present earthly state, and that it shall be connected with the coming of our Lord to judge the world, 1 Thess. iv. 16.

Connected with this subject is the resurrection of Christ himself from the dead, the corner-stone of the Christian

system. The evidence in support of it is marked by the following characteristics: (1) The variety of circumstances under which the risen Savior appeared. (2) The circumstantiality of the testimony given by the different witnesses. (3) The simplicity and apparent truthfulness with which the witnesses described their impressions when the Savior appeared to them. (4) That the event borne witness to was completely unexpected by the witnesses; and (5) That the testimony was published to the world on the very spot where, and at the very moment when, the event was said to have happened.

RESZKE (rĕsh'ke), Edouard de, Polish opera singer, brother of Jean de Reszke, was born at Warsaw in 1856. He made his first public appearance in 1876 at the Italiens in Paris, as the King in Verdi's Aïda, which was so successful that Massenet intrusted to him the creation of Le roi de Lahore at La Scala in Milan. From 1880 to 1884 he sang with the Royal Italian Opera company in London, where he became famous as one of the greatest dramatic bassos of his time.

RESZKE, Jean de, Polish dramatic tenor, was born at Warsaw in 1853. In 1874 he made his début at Venice, as Alfonso in La Favorita, under the name of De Reschi. He made his second début before the public in 1879, this time in the tenor rôle of Robert le Diable, at Madrid. His success was instantaneous. His repertoire includes Faust, Lohengrin, L'Africaine, Aïda, Le Cid (written for him by Massenet), Les Huguenots, Elaine, Romeo and Juliet, and Tristan. He is conceded to be one of the most artistic singers and actors known to the operatic stage. For many years subsequent to 1891, both the De Reszkes were favorite members of the Metropolitan Opera House Company, New York.

RETAINER, in law, the contract between a solicitor and a client, or a solicitor and counsel for professional services, and the document given by the solicitor to a counsel engaging his services. When the counsel is engaged for a particular suit the document is called a special retainer; and when he is engaged for all matters of litigation in which such party may be at any time involved, it is called a general retainer. The retainer is in all cases accompanied by a preliminary fee called a retaining fee.

RETENTION OF URINE, in medicine, a condition in which the urine cannot be expelled from the bladder at all, or only with great difficulty; to be distinguished from suppression of urine, a condition in which the bladder is empty, the urine not having been secreted by the kidneys. It may be due to some mechanical obstruction, as a calculus, a clot of blood, or a tumor, or to paralysis, etc. If not relieved by means of the catheter or otherwise it may cause rupture of the bladder and death.

RETICULATED WORK, a species of masonry very common among the ancients, in which the stones are square and laid lozenge-wise, resembling the meshes of a net, and producing quite an ornamental appearance. It is the opus reticulatum of the Romans.

RET'INA, in anatomy, a membrane of the eye, formed by an expansion of the optic nerve, and so constituted as to receive the impressions which result in vision. See Eye.

RETORT', a vessel, generally of glass, used in chemistry, for distilling liquids. Retorts consist of a flask-shaped vessel, to which a long neck or beak is attached. The liquid to be distilled is placed in the flask and heat applied. The products

Ancient Roman reticulated work.

of distillation condense in the cold neck of the retort, and are collected in a suitable receiver. In gas-making, retorts of iron or fire-clay are used for distilling the coal.

RETRIEVER, a dog specially trained to fetch game which has been shot, and greatly valued by sportsmen for its sagacity in the field and in the water. The larger and more familiar breed of retrievers is formed by crossing the Newfoundland and setter; the smaller breed is formed by crossing the water-spaniel and terrier. The typical retriever is 20 or more inches high, with a stoutly-built body, strong limbs, webbed toes, and black and curly fur.

RETROGRADE, a term given to the apparent motion of a planet among the stars when it is in opposition to the motion of the sun in the ecliptic. The motion of a planet in the direction from right to left is said to be direct.

RETROGRESSION OF THE MOON'S NODES, the motion of the moon nodes—the two points in which the moon's orbit meets the plane of the ecliptic—in the direction opposite to that of the sun's motion in the ecliptic. The moon's nodes slowly change at each revolution of the moon, in the direction from left to right, and make a complete revolution round the earth in 18.6 years.

REUMONT, (roi'mont), Alfred Von, German historian, born at Aix-la-Chapelle, August 15, 1808. He died in 1887. He was the author of several valuable works on the history of Italy, including Contributions to Italian History, The Carafas of Maddaloni, History of the City of Rome, etc. He also wrote on the history of art.

REUNION (rā-u-ni-ōn), formerly Bourbon, an island in the Indian ocean, between Mauritius and Madagascar, 115 miles from each; area, 1127 sq. miles. It was annexed by France in 1643, and is an important French colony, now sending a representative to the chamber of deputies, and forming practically almost a department of France. The population, which consists of creoles, negroes, Indian coolies, Chinese, Malays, etc., is 179,639.

REUSS (rois), two principalities of Central Germany, consisting of several separate territories situated between Prussia, Saxony, and Bavaria, and belonging to an older and a younger line of the family of Reuss. Reuss-Greiz, the territory of the elder line, comprises an area of 122 sq. miles, with a population of 68,396; the territory of the younger line, Reuss-Schleiz-Gera, has an area of 318 sq. miles, with a pop. of 139,210.

REUTER (roi'tĕr), Fritz, German humorist, was born in 1810, and educated at Rostock and Jena. His first literary venture was a volume of humorous poems in Low German (Laüschen and Riemels, 1853), which met with extraordinary success. His greatest work is Olle Kamellen, a series of prose tales, which stamped him as the greatest writer of Plattdeutsch and one of the greatest humorists of the century. He died at Eisenach in 1874.

REUTER (roi'tĕr), Paul Julius, Baron, born at Cassel in 1816, was connected with the electric telegraph system from the beginning, and in 1849 established Reuter's News Agency at Aix-la-Chapelle. In 1865 he converted his agency into a limited liability company. In 1871 he received the title of baron from the Duke of Coburg-Gotha. He laid some important telegraphic cables. He died in 1899.

REVAL, or **REVEL,** a fortified seaport of Russia, capital of Esthonia, on a small bay in the Gulf of Finland. It is much frequented for sea-bathing. Pop. 64,578.

REVEILLE (re-vel'ye), the signal given in garrisons at break of day, by beat of drum or sound of bugle, for the soldiers to rise and the sentinels to forbear challenging until the retreat is sounded in the evening.

REVELATION, the knowledge of God and his relation to the world, given to men by God himself, and for the Christian contained in the Bible. The earliest revelations, made in the patriarchal age, were preserved till later times, and gradually enlarged during the Mosaic period by successive revelations to chosen individuals, with whom the Bible makes us acquainted under the name of prophets, from Moses to Malachi, God having finally completed his revelations through Christ.

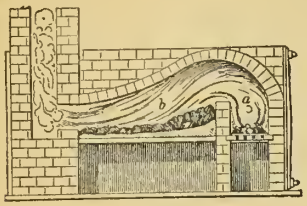
REVELATION, Book of. See apocalypse.

REVENUE, the income of a nation derived from taxes, duties, and other sources, for public uses. See articles on the different countries, also Taxation, etc.

REVENUE CUTTER, a sharp-built single-masted vessel, armed, for the purpose of preventing smuggling and enforcing the custom-house regulations.

REVER'BERATORY FURNACE, a furnace in which the material is heated without coming into contact with the fuel. Between the fireplace a and the bed on which the material to be heated b lies, a low partition wall, called a fire-bridge, is placed. The flame passes over

this bridge, and plays along the flat arch which surmounts the whole, reflecting or reverberating the heat downward. The reverberatory furnace gives free access of air to the material, and is em-



Section of reverberatory furnace.

ployed for oxidizing impurities in metals, and for other similar purposes.

REVERE (re-vēr'), Paul, born at Boston, Massachusetts, January 1, 1735, has earned fame by riding through Charlestown to Concord on the night of April 18, 1775, to give warning of the British expedition, which was resisted next day at Lexington and Concord; a service immortalized in Longfellow's poem, The Midnight Ride of Paul Revere. He had been a goldsmith and copper-plate engraver, and subsequently he set up a foundry and erected works for rolling copper at Canton, Massachusetts, still carried on by his successors as the Revere Copper company. He died May 10, 1818.

REVISED STATUTES, the acts of the legislatures of the various states and of congress. After a large number of these volumes have been issued, it is found that acts in the earlier volumes are repealed or amended by acts reported in later ones, that some have become obsolete by reason of changed conditions. Where this state of facts exists, most of the states have at some time authorized thorough revisions of their statute law. The general laws are thus collected, arranged and amended, are reënacted by the legislature and then constitute the official revised statutes of the state, superseding all original acts on the same subject. There have been several revisions of the statutes of the United States.

REVIVAL, a term applied to religious awakenings in the Christian church, and to the occurrence of extensive spiritual quickening and conversion in the general community. The first great revival in Europe was the Reformation in the 16th century, which awoke the church from the sleep of centuries. When religion had degenerated into formalism in England in the 17th century a second revival of spiritual interest was accomplished through the instrumentality of the Puritans. When the church had once more sank into a state of sloth and apathy in the 18th century, it was aroused by the preaching of Whitfield, the Wesleys, Rowland Hill, Venn, Newton, Cecil, Fletcher, and a multitude of other earnest men. Coincident with this movement was the origin of missions to the heathen. Scotland also presents several remarkable revivals. But it was reserved for recent times to witness in America and Great Britain perhaps the most remarkable religious revival which has been witnessed since the era of the Reformation. Movements of this nature, but of limited extent, have not been infrequent in the American churches, as in 1736 and 1830; but the great revival which originated in the United States in 1858 subsequently extended to the British islands, and was experienced with more or less power throughout almost every part of the world. New York and Philadelphia were the principal centers of the movement, which became universal in the United States, embracing all denominations and all classes of society. In the summer of 1859 the revival extended to the north of Ireland, chiefly through the agency of the Presbyterian church, and from Ireland it spread to Scotland, where its power was extensively felt by the long-neglected population of the fishing villages in the east and north, and in Glasgow, Edinburgh, Aberdeen, Perth, Dundee, Paisley, Dumfries, and other large towns. Wales largely participated in this revival; the increase to the membership of its churches in one year, from June, 1859, amounting to 100,000. Various parts of England also shared in the movement. The most extraordinary revival movement of modern times, was that initiated by the two American "evangelists," D. L. Moody and Ira D. Sankey, whose respective functions it has been, to use their own words, "to preach and to sing the gospel." The movement commenced in 1873 in England, but it attained no great prominence until the arrival of the two evangelists in Edinburgh. Their ministrations in that city, and afterwards in Glasgow, Dundee, and other towns in Scotland, and also in England and Ireland, up to August, 1875, were attended daily by multitudes of people, a remarkable feature of these assemblies being the presence in great numbers of the upper ranks of society, even to members of the peerage and royal family. On their return to the United States they headed a similar movement there; and they paid a second and equally successful visit to Britain in 1883–84. Reuben Archer Torrey, clergyman and evangelist, became associated with the work of Moody, and has met with great success. In 1902-3 he visited and preached in England, Scotland, Ireland, Australia, New Zealand, Tasmania, China, Japan and India; returning to Britain in 1903-5, holding meetings in principal English and Scotch cities, including 5 months in Albert Hall, London. He preaches continually and in 1907 he held the most extraordinary and successful revival in Chicago in a vast steam tent, erected especially for the purpose. His works have been translated into French, German, Spanish, Portuguese, Chinese (2 languages), Japanese, Hindustani. The Salvation Army, which was originated in 1865 and organized under its present name in 1878, and the Volunteers of America, organized in 1896, may be regarded as permanent revival organizations. See Salvation Army. Volunteers of America.

REVOLUTION, the more or less sudden, and it may be violent, overturning of a government or political system, with the substitution of something else The term "revolution" is applied distinctively in English history to the convulsion by which James II. was driven from the throne in 1688; and in French history to the upheaval of 1789. Subsequent French revolutions are those of 1830, 1848, 1851, and 1870–71. The American war of independence (1775–83) is often called a revolution.

REVOLVER, a description of firearm in which a number of charges contained in a revolving cylinder are, by pulling the trigger, brought successively into position and fired through a single barrel. For the introduction of the revolver in its present form we are indebted to Colonel Samuel Colt, of the United States, though repeating pistols had long been known in other countries. These were made from one mass of metal bored into the requisite number of barrels, but were so clumsy as to be almost quite useless. In Colt's weapon there is a revolving cylinder containing six chambers placed at the base of the barrel, each chamber having at its rear end a nipple for a cap. These contain the cartridges, which are put in from the front of the breech-piece and driven home by a lever ramrod placed in a socket beneath the barrel. The revolver is fired through the single barrel, the cylinder being turned by mechanism connected with the lock, until each chamber in succession is brought round so as to form virtually a continuation of the barrel. Various modifications of Colt's revolver have been introduced, with the view in some cases of increasing the rapidity and facility of firing, in

Hammerless.

others of diminishing by safeguards the risks to which inexperienced hands must ever be exposed in the use of these weapons. In the Smith and Wesson revolver one of the most recent (adopted by Austria and Russia), facility in loading is a feature, the cylinder and barrel together being pivoted to the front of the stock, so that by setting the hammer at half-cock, raising a spring-catch, and lowering the muzzle the bottom of the cylinder is turned up to receive fresh metallic cartridges. When this is done the muzzle is pressed back until the snap-catch fastens it to the back plate, and the revolver is again ready to be fired. In the latest form of this revolver the spent cartridges are thrown out of the cylinder by means of an automatic discharger. As a military weapon the revolver will, it is thought, be superseded by a repeating pistol with mechanism similar to that of magazine rifles. The revolver principle has also been applied to rifles, and to guns for

throwing small projectiles, as in the Gatling and other machine guns.

REWA KANTHA, a political agency of India, subordinate to the government of Bombay. It was established in 1821–26, and has under its control 61 separate states, great and small, on the Nerbudda, most of which are tributary to the Gaekwar of Baroda. Area, 4980 sq. miles; pop. 478,889.

REYNOLDS, Sir Joshua, English portrait-painter, was born at Plympton, Devonshire, 16th July, 1723. Among the more notable of his portraits are the Duchess of Hamilton (1758), the Duke of Cumberland (1759), Miss Palmer (1770), Mrs. Nesbitt as Circe (1781), Mrs. Siddons as the Tragic Muse (1784), the Duchess of Devonshire and Child (1786),

Sir Joshua Reynolds.

and Miss Gwatkin as Simplicity (1788). In 1768, on the foundation of the Royal academy, he was chosen president, and received the honor of knighthood; and in 1784 he was appointed principal portrait-painter to the king. As president of the Royal academy he delivered his celebrated annual Discourses on Painting, the last of which was delivered in 1790. He died unmarried February 23, 1792, and was interred in St. Paul's cathedral.

RHAMNA'CEÆ, a natural order of exogenous plants, consisting of trees or

Branch of common buckthorn with fruit. *a*, female flower; *b*, male flower; *c*, leaf, showing the nervation.

shrubs, with simple, alternate, rarely opposite leaves, small greenish-yellow flowers, a valvate calyx, hooded petals, opposite to which their stamens are inserted, and a fruit which is either dry or fleshy. This order contains about 250 known species, distributed very generally over the globe. There is a remarkable agreement throughout the order between the properties of the inner bark and the fruit, especially in several species, in which they are both purgative and emetic, and in some degree astringent. Many species, however, bear wholesome fruit; and the berries of most of them are used for dyes. The buck-thorn and jujube belong to this order.

RHEIMS, or **REIMS** (rēmz), a town of France, in the department of Marne, in an extensive basin surrounded by vine-clad hills, 82 miles e.n.e. of Paris. The principal edifices are the cathedral, erected in the 13th and 14th centuries, one of the finest Gothic structures now existing in Europe; the archi-episcopal palace (1498–1509), occupied by the French kings on the occasion of their coronation; the church of St. Remy (11th and 12th centuries), the oldest church in Rheims, the Porte de Mars, a Roman triumphal arch erected in honor of Julius Cæsar and Augustus; the town-house, of the 17th century; and several ancient mansions, particularly the hôtel of the counts of Champagne. The staple industries are the manufacture of the wine known as champagne, and of woolen fabrics, such as flannels, merinoes, blankets, etc. Since the Franco-German war it has been surrounded with detached forts, which render it a place of great strength. Pop. 107,017.

RHENISH PRUSSIA, the most westerly province of Prussia, touching w.and n. Luxemburg, Belgium, and Holland; area, 10,420 sq. miles; greatest length from n. to s. about 200 miles, greatest breadth about 90. Pop. 5,758,995, the majority of whom are Roman Catholics.

RHENISH WINES, the general designation for the wines produced in the region watered by the Rhine, and specifically for those of the Rheingau, the white wines of which are the finest in the world. The red wines are not so much esteemed, being considered inferior to those of Bordeaux. Good wines are also produced in the valleys of the Neckar, Moselle, and other tributaries of the Rhine. The vineyards are mainly between Mannheim and Bonn, and the most valuable brands of wines are those of Johannisberg, Steinberg, Hochheim, Rüdesheim, Rauenthal, Markobrunn, and Assmannshausen, the last being a red wine.

RHE'OSTAT, an instrument for measuring electrical resistances, invented by Sir Charles Wheatstone. The rheostat is very convenient for measuring small resistances; but for practical purposes, such as measuring the resistance of telegraph cables, Wheatstone's bridge (an apparatus of which there are several forms) is always used.

RHESUS MONKEY, a name for two species of monkeys, the bruh or pig-tailed monkey which inhabits the Malay peninsula, and the islands of the Indian archipelago, and is often domesticated; and a species of monkey held sacred in India, where they swarm in large numbers about the temples.

RHET'ORIC, in its widest sense, may be regarded as the theory of eloquence, whether spoken or written, and treats of the general rules of prose style, in view of the end to be served by the composition. In a narrower sense rhetoric is the art of persuasive speaking, or the art of the orator, which teaches the composition and delivery of discourses intended to move the feelings or sway the will of others. In the wider sense rhetoric treats of prose composition in general, purity of style, structure of sentences, figures of speech, etc.; in short, of whatever relates to clearness, preciseness, elegance, and strength of expression. In the narrower sense it treats of the invention and disposition of the matter, the character of the style, the delivery or pronunciation, etc. Aristotle, Cicero, and Quintilian are the principal writers on rhetoric among the ancients; and among the English, Campbell, Blair, Whately, Spalding, and Bain.

RHEUMATISM, an ailment or set of ailments attended with sharp pains, partly neuralgic in character, and partly owing perhaps to infection with certain disease germs. Some varieties of it have so much resemblance to the gout that some physicians have considered it as not an entirely distinct disease. Rheumatism is distinguished into acute and chronic. The former is characterized by fever more or less severe, pains in the joints, which are swollen, red, and tender, and sweating. The inflammation flits from one joint to another, one joint getting well when another is attacked; and the pain may be very severe. The entire duration of an attack, if not treated, may be from two to six or ten weeks, and disease of the heart may be a consequence of this disease. Chronic rheumatism is distinguished by pain and stiffness, either stationary or shifting, in the joints, without fever. It is aggravated by damp weather, and usually is never absolutely got rid of. Acute rheumatism mostly terminates in one of these species. Rheumatism may arise at all times of the year, when there are frequent vicissitudes of the weather from heat to cold, but the spring and autumn are the seasons in which it is most prevalent; and it attacks persons of all ages, but very young people are less subject to it than adults. Obstructed perspiration, occasioned either by wearing wet clothes, lying in damp sheets or damp rooms, or by being exposed to cool air when the body has been much heated by exercise, is the cause which usually produces rheumatism.

RHINE, the finest river of Germany, and one of the most important rivers of Europe, its direct course being 460 miles and its indirect course 800 miles (about 250 miles of its course being in Switzerland, 450 in Germany, and 100 in Holland); while the area of its basin is 75,000 sq. miles. The chief towns on its banks are Constance and Bâle in Switzerland; Spires, Mannheim, Mainz, Coblentz, Bonn, Cologne, and Düsseldorf, with Worms and Strasburg not far distant, in Germany; Arnheim, Utrecht, and Leyden, in Holland. Its breadth at Bâle is 750 feet; between Strasburg and

Spires from 1000 to 1200 feet; at Mainz 1500 to 1700 feet; and at Emmerich, where it enters the Netherlands, 2150 feet. Its depth varies from 5 to 28 feet, and at Düsseldorf amounts even to 50 feet. It is navigable without interruption from Bâle to its mouth, a distance of 550 miles, and much timber in rafts, coal, iron, and agricultural produce are conveyed by it.

RHINOCEROS, a genus of hoofed mammals, belonging to the perissodactylate or odd-toed division, allied to the elephant, hippopotamus, tapir, etc. They are large ungainly animals, having short legs, and a very thick skin, which is usually thrown into deep folds. There are seven molars on each side of each jaw; there are no canines, but there are usually incisor teeth in both jaws. The feet are furnished with three toes each, encased in hoofs. The nasal bones usually support one or two horns, which are of the nature of epidermic growths, somewhat analogous to hairs. When two horns are present the one is placed behind the other and is generally shorter than it. These animals live in marshy places, and subsist chiefly on grasses and foliage. They are exclusively confined to the warmer parts of the eastern hemisphere. The most familiar species is the one-horned or Indian rhinoceros, which, like all the Asiatic species, has the skin thrown into very definite folds, corresponding to the regions of the body. The horn is black, and usually very thick. The upper lip is very large, and is employed by the animal somewhat as the elephant uses his trunk. Though

Indian rhinoceros.

possessed of great strength it is quiet and inoffensive unless provoked. The Javanese rhinoceros is distinguished from the Indian chiefly by its smaller size. It has been trained to bear a saddle and to be driven. It occurs in Java, Sumatra, and Borneo. The Sumatran species is found in Sumatra and the Malay peninsula. It has two horns, the first being the longer and sharper. The typical African rhinoceros is found in Southern Africa generally. Like other African species it possesses no skin-folds. The horns are of very characteristic conformation, the front horn being broad and raised as on a base, sharp-pointed, and curved slightly backward, while the hinder horn is short and conical. This animal appears to be of ferocious disposition, is quick and active, and greatly feared by the natives. Other allied African species are the Keitloa or Sloan's rhinoceros, the common white rhinoceros, and the long-horned white rhinoceros. Fossil species are numerous and range from the Miocene tertiary through the Pliocene and Post-pliocene deposits. The "woolly rhinoceros," formerly inhabited England and ranged over the greater part of Europe.

RHINOCEROS-BIRD, or **RHINOCEROS-HORNBILL.** See Hornbill.

RHIO, or **RIOUW,** a seaport belonging to the Dutch, in the Indian archipelago, on an islet 50 miles southeast of Singapore. It is the capital of a Dutch residency, comprising the islands of the Rhio archipelago and other groups as well as districts on the east coast of Sumatra. The population of the residency is estimated at 90,000. The Rhio archipelago is a group of small islands lying chiefly south and east of Singapore. Chief island Bintang.

RHODE ISLAND, one of the original thirteen States of North America, between Massachusetts, Connecticut, and the Atlantic; area, 1250 sq. miles. Rhode Island is the smallest in area of the states of the Union. The surface, which in the north is hilly and rugged, but elsewhere generally level, is divided into two parts by Narragansett bay, a fine body of water about 30 miles long by 15 miles broad, and containing several islands, and among others the one which gives the state its name. The chief rivers are the Pawtucket, the Pawtuxet, and the Pawcatuck. The climate is mild and equable, and well adapted, from its pleasant summers and temperate winters, for invalids from the south. Corn, oats, hay and forage are the most important crops. Potatoes, sweet corn, and other vegetables are grown for the local market. The minerals include coal, iron ore, and limestone; sandstone, marble, and serpentine are sufficiently common. The soil is only of indifferent fertility. Manufactures form the staple industry; they consist of cotton, woolen, worsted, and mixed textiles, jewelry, and foundry and machine-shop products. The higher education is provided for by Brown university at Providence. A compulsory education law is now in force for children from 7 to 14 for twelve weeks in the year only. The chief cities are Providence, Pawtucket, and Newport. Providence and Newport both rank as state capitals. Rhode Island is one of

Rhode Island seal.

the six New England states, and one of the original thirteen which formed the Union. The Northmen are supposed to have visited Rhode Island in the tenth century, and the "Old Stone Mill" at Newport has been claimed as their work. Rhode Island was first settled when Roger Williams was banished from Massachusetts bay, and settled with a few companions at "Providence Plantations," on land purchased from the Narragansett Indians probably in June, 1636. Through the influence of the Earl of Warwick, parliament granted (1644) a charter uniting the settlements as the "Incorporation of Providence Plantations in the Narragansett bay in New England."

The union effected by this instrument was of the very loosest description, but under the pressure of causes which threatened the very existence of the colony a new and much more comprehensive charter was obtained in 1663. This extraordinarily liberal instrument constituted the fundamental law of Rhode Island for the next 180 years, through a succession of vicissitudes. Massachusetts and other American colonies were withdrawn in 1686, but the efforts of the royal agent were frustrated in Connecticut and Rhode Island; and in this colony the government was simply committed temporarily to the separate towns which had constituted the colony, the charter government being peacefully resumed three years later, in 1689. Rhode Island was hardly free, during the next seventy years, from some form of conflict with the mother country over the question of charter rights; and in the steps which served to precipitate the War of Independence (1775-83) as well as in the war itself, it was among the foremost. During the revolution Newport was held (1776–79) by British troops, and in 1780 the French fleet was stationed there. The famous soldier of Rhode Island was General Nathanael Greene, who ranks easily second to Washington in generalship.

The state refused to send delegates to the convention which drew up the federal constitution, and it was not until threats of coercion had been made that the instrument was ratified, May 29, 1790. A new state constitution was adopted as a result in 1842, which has been frequently amended since. The property qualification for suffrage was not abolished until 1888, and election by a plurality has been allowed since 1893. Until 1900 the legislature met in Newport in April to canvass the vote and adjourned to Providence in January to transact business. Now all sessions are held in Providence. Since 1856 the state has been republican in national elections. Pop. 514,000.

RHODES (rōdz), a Turkish island in the Ægean sea, off the southwest coast of Asia Minor, separated from it by a channel 10 miles broad; area, 560 sq. miles. It is traversed by a mountain range, the highest point of which is 4786 feet. Pop. 30,000, of whom 20,000 are Greeks, 7000 Turks, and 1500 Jews —Rhodes, the capital, stands at the northeastern extremity of the island, rising from the sea in the form of an amphitheater, with fortifications mainly the work of the Knights of St. John. The celebrated Colossus of Rhodes stood for fifty-six years, and was prostrated

by an earthquake 224 B.C. Pop. about 11,000.

RHODES, Cecil, born in England in 1853, went out to South Africa early in life, and becoming connected with the Kimberley diamond mines accumulated a large fortune. Having entered the Cape parliament, he became colonial prime-minister in 1890, and held this position till 1896, when his alleged connection with the Jameson raid caused him to resign. He was the leading spirit in the British South Africa company, and it was mainly by his influence that Rhodesia became British. He was made a privy councillor in 1895. He died in 1902.

RHODES SCHOLARSHIPS, The, under the will of Cecil John Rhodes, who died in 1902, a large part of his estate was bequeathed in trust for the purpose of maintaining a number of British, American, and German students at Oxford university, in the belief that "a good understanding between England, Germany, and the United States will secure the peace of the world, and that educational relations form the strongest tie." The founder suggested the following basis for awarding these scholarships: (1) Proficiency in literary and scholastic attainments, which was to count three-tenths; (2) success in outdoor sports, two-tenths; (3) qualities of manhood, etc., three-tenths; (4) qualities of leadership, two-tenths. Qualifications second and third were to be decided upon by a vote of the fellow students, first and fourth by the masters of the respective schools where candidates prepare. The number of scholarships to be thus distributed are as follows: Rhodesia, 9; Cape Colony, 12; Natal, 3; Australia, 18; New Zealand, 3; Canada, 6; Newfoundland, 3; Bermuda, 3; Jamaica, 3; two to each state and territory of the United States and 15 to Germany. The annual value of the colonial and American scholarships is $1,500, tenable for three years. Only one-third of the colonial and one-half of the American scholarships are to be filled each year. The disposal of the German scholarships is at the pleasure of the emperor. Candidates must be from 20 to 25 years of age and must have attended two years at a recognized institution of higher learning. Scholars must be unmarried and citizens of the United States.

RHODE'SIA, a vast British territory in South Africa, stretching northward from the Transvaal across the Zambesi to the Congo Free State, and comprising Mashonaland, Matabeleland, etc. Southern Rhodesia is being rapidly developed. Chief towns, Bulawayo and Salisbury.

RHO'DIUM, a metal belonging to the platinum group, discovered by Wollaston in 1804. It is of grayish-white color very ductile and malleable, hard and very infusible, unaltered in the air at ordinary temperatures, but oxidizes at a red heat. It has been used for the points of metallic pens.

RHODODEN'DRON, a genus of evergreen shrubs with alternate, entire leaves, and ornamental flowers disposed in corymbs, belonging to a sub-order of the heaths and chiefly inhabiting the mountainous regions in Europe, North and South America, and Asia. The varieties are very numerous, and are much cultivated in gardens. The colors

Rhododendron.

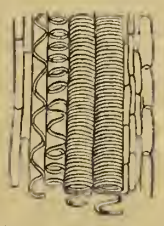
of the flowers range through rose, pink, lilac, scarlet, purple, red, and white.

RHONDDA, an urban district in Glamorganshire, South Wales, in the valley of a river of same name, which also gives name to a parl. div. Pop. of urban dist., 113,735; of div. 88,968.

RHONE (rōn), a river which rises in Switzerland, in the east of canton Valais, taking its origin in the Rhone Glacier, 5581 feet above the sea-level. It passes through the Lake of Geneva, and enters France, flowing first southward and then westward to the city of Lyons, where it turns almost due south, and so continues till it falls into the Gulf of Lyons. Its principal affluent is the Saône, which enters it at the city of Lyons; other large tributaries are the Isère and Durance. Its whole course is about 500 miles; its drainage area is 38,000 miles; and it is navigable for 360 miles.

RHONE, a department in France, in the basin of the Rhône, to which it sends its waters by the Saône (with the Azergues) and the Gier; area, 1077 sq. miles. The city of Lyons is the capital. Pop. 806,737.

RHUBARB, a genus of plants belonging to the natural order Polygonaceæ. The species of this genus are large-leaved herbaceous plants, natives of a



Spiral vessels of rhubarb, with cell tissue on each side—highly magnified.

considerable portion of Central Asia, with strong branching, almost fleshy roots and erect branching stems 6 to 8 feet high. They usually possess more or less purgative and astringent properties; this is essentially the case with their roots, and hence these are largely used in medicine. The principal kinds of medicinal rhubarb have received such names as Russian or Turkey, East Indian, Himalayan, Chinese, and English, according to their source or the route by which they have reached Europe. At present most of the Asiatic rhubarb comes from China. American rhubarb has long been cultivated for medical purposes. The leaf-stalks of this species and others are now largely used for tarts, puddings, jam, etc., and the juice is made into a kind of wine.

RHYME, more correctly Rime (A. Saxon, rîm, number), in poetry, a correspondence in sound of the terminating word or syllable of one line of poetry with the terminating word or syllable of another.

RHYTHM, in general, means a measured succession of divisions or intervals in written composition, music, or dancing. The rhythm of poetry is the regular succession of accent, emphasis, or voice-stress; or a certain succession of long and short (heavy and light) syllables in a verse. Prose also has its rhythm, and the only difference (so far as sound is concerned) between verse and prose is, that the former consists of a regular succession of similar cadences, or of a

Medicinal rhubarb.

limited variety of cadences, divided by grammatical pauses and emphases into proportional clauses, so as to present sensible responses to the ear at regular proportioned distances. In music, rhythm is the disposition of the notes of a composition in respect of time and measure; the measured beat which marks the character and expression of the music.

RIAZAN, or **RYAZAN** (ryâ-zân'), a government of Central Russia. The government has an area of 16,254 sq. miles, and is wholly drained by the Oka and its tributaries. The surface on the right of the Oka is largely swampy and has extensive forests; on the left it is generally fertile. Cereals of all kinds are produced for export. The principal manufactures are cotton, linen, leather, and spirits. Pop. 1,783,958.

RIB, the name given to the curved bones which in man and the other vertebrates spring from either side of the spine or vertebral column, and which

may or may not be joined to a sternum or breast-bone in front. The ribs ordinarily agree in number with the vertebrate of the back or dorsal region. Thus in man twelve dorsal vertebræ and twelve pairs of ribs exist. The true or sternal ribs are the first seven, which are articulated at one extremity to the spine, and at the other to the sternum by means of cartilages. The false or short ribs are the remaining five; the uppermost three being united by their cartilages to the cartilage of the last true rib. The others are free at their sternal extremity, and hence have been called "floating ribs." Ribs are wanting in such lower fishes as lampreys, lancelets, etc., and in amphibians such as frogs and toads. The number of these bones may be very great in certain species, and they are occasionally developed in the cervical and pelvic regions in reptiles and birds respectively.

RIBBON-FISHES, the name of certain deep-sea fishes met with in all parts of the ocean, generally found floating dead on the surface, or thrown ashore by the waves. The body is like a band from 15 to 20 feet long, 10 to 12 inches broad, and an inch or two thick. These fishes are generally silvery in color. They live at such a depth that when they reach the surface the expansion of gases in the body so loosens all parts of the muscular and bony system that some portions are nearly always broken on lifting them out of the water. The fin rays in young ribbon-fishes are extraordinarily developed, some of them being several times longer than the body.

RICAR'DO, David, a celebrated writer on finance and political economy, was born in London, in 1772, died 1823. In 1793 he embraced Christianity and married a Christian wife. He then began business as a stockbroker on his own account, and in a short time realized an immense fortune. His first publication was on the subject of the depreciation of the national currency (1810). He then published an Essay on Rent, and his name is usually associated with a certain distinctive view on this subject. But his most important work is his Treatise on Political Economy and Taxation, which appeared in 1817. In 1819 he entered parliament as member for Portarlington. In 1822 he published a pamphlet on Protection to Agriculture. Though his mode of treatment is totally different, he belongs essentially to the school of Adam Smith.

RICCIO. See Rizzio.

RICE, a cereal plant, natural order Graminaceæ or Grasses. This important food-plant was long known in the East before it was introduced into Egypt and Greece. It is now cultivated extensively in the low grounds of the tropical and sub-tropical parts of south-eastern Asia, Egypt, Japan, part of the United States, and in several districts of southern Europe. The culm of the rice is from 1 to 6 feet high, annual, erect, simple, round, and jointed; the leaves are large, firm, and pointed, arising from very long, cylindrical, and finely striated sheaths; the flowers are disposed in a panicle somewhat resembling that of the oat; the seeds are white and oblong, but vary in size and form in the numerous varieties. In the cultivation of this plant a high summer temperature is required, combined with abundance of water. Thus the sea-board areas and river deltas which are subject to inundation give the best conditions, otherwise irrigation is necessary. The amount of water required by the plant depends upon its strength and stage of growth. In Egypt it is sown while the waters of the Nile cover the land, and the rice plant grows luxuriant in the rich alluvial deposit left by the receding flood. The Chinese obtain two crops a year from the same ground, and cultivate it annually on the same soil, and without any other manure than the mud deposited by the water of the river used in overflowing it. The young plants are transplanted into ploughed furrows, and water is brought over them and kept on until the plants begin to ripen. The first crop is cut in May, and a second is immediately prepared for by burning the stubble, and this second crop ripens in October or November. In India two harvests are obtained in the year, especially in Bengal, and frequently two

Rice.

crops are taken from the same field. In Japan, Ceylon, and Java rice is cultivated much in the same manner. Mountain rice is a hardy variety which thrives on dry soil; and in India it is cultivated at an altitude of 8000 feet. Rice can be profitably cultivated only in warm countries, but has for some time past been grown in South Germany and Italy. In the United States it is grown chiefly in the swampy districts of South Carolina, Georgia, and Louisiana. In the husk rice is known by the name of "paddy." Rice is more largely consumed by the inhabitants of the world than any other grain; but it contains less flesh-forming matter (nitrogenous), this essential element being, in 100 parts of rice, only 6.5. At one period Europe was supplied from America, but this source has almost been entirely superseded by Lower Burmah, India, Siam, Japan, and Cochin-China. The inhabitants of the East obtain from rice a vinous liquor more intoxicating than wine; and arack is also made from it. See Arack.

RICE-BUNTING, a name given to two distinct birds. The first, also known by the name "bob-o'-link," a bird of the bunting family, which migrates over North America from Labrador to Mexico, appearing in Massachusetts about the beginning of May. Their food is insects, worms, and seeds, including rice in South Carolina. The song of the male is singular and pleasant. When fat their flesh becomes little inferior in flavor to that of the European ortolan. The other species, known as the rice-bunting, also known as the Java sparrow and

Rice-bunting.

paddy bird. It belongs to the true finches, a group nearly allied to the buntings. It possesses a largely-developed bill; the head and tail are black, the belly rosy, the cheeks of the male white, and the legs flesh-colored. It is dreaded in Southern Asia on account of the ravages it commits in the rice-fields.

RICE-PAPER, a substance prepared from thin, uniform slices of the snow-white pith of a plant which grows in Formosa. Rice-paper is prepared in China, and is used in the manufacture of artificial flowers and by native artists for water-color drawings.

RICHARD I., King of England, surnamed Cœur de Lion, second son of Henry II. by Eleanor of Aquitaine, was born at Oxford in 1157. He several times rebelled against his father, and in 1189, supported by the King of France, he defeated the forces of Henry, who was compelled to acknowledge Richard as his heir. On Henry's death at Chinon, Richard sailed to England and was crowned at Westminster (September, 1189). The principal events of his reign are connected with the third crusade, in which he took part uniting his forces with those of Philip of France. In the course of this crusade he married the Princess Berengaria of Navarre in Cyprus. Richard left Palestine in 1192 and sailed for the Adriatic, but was wrecked near Aquileia. On his way home through Germany he was seized by the Duke of Austria, whom he had offended in Palestine, and was given up a prisoner to the Emperor Henry VI. During his captivity his brother John headed an insurrection in England in concert with the King of France, but Richard, who was ransomed, returned to England in 1194, and the movement came to nothing. Richard then passed over to Normandy, and spent the rest of his life there in warfare of no decisive character. He died in April, 1199, of a wound received while besieging the castle of Chalus. Richard was thoroughly neglectful of his duties as a king, and owes his fame chiefly to his personal bravery.

RICHARD II., King of England, son of Edward the Black Prince, and grandson of Edward III., was born at Bordeaux in 1366. He succeeded the latter in 1377. He is supposed to have been murdered in 1400.

RICHARD III., King of England, the last of the Plantagenet kings, born at Fotheringhay castle in 1450, was the youngest son of Richard, duke of York,

who was killed at Wakefield. On the accession of his brother Edward IV. he was created Duke of Gloucester, and during the early part of Edward's reign served him with great courage and fidelity. He married in 1473 Anne Neville, joint-heiress of the Earl of Warwick, whose other daughter was united to the Duke of Clarence, and quarrels rose between the two brothers over their wives' inheritance. On the death of Edward in 1483, the Duke of Gloucester was appointed protector of the kingdom; and he immediately caused his nephew, the young Edward V., to be declared king, and took an oath of fealty to him. But Richard soon began to pursue his own ambitious schemes. Earl Rivers, the queen's brother, and Sir R. Grey, a son by her first husband, were arrested and beheaded at Pomfret, and Lord Hastings, who adhered to his young sovereign, was executed without trial in the Tower. It was now asserted that the king and his brother were illegitimate, and that Richard had a legal title to the crown. The Duke of Buckingham supported Richard, and a body of peers and citizens having offered him the crown in the name of the nation he accepted it, and on July 8, 1483, was crowned at Westminster. The deposed king and his brother were, according to general belief, smothered in the Tower of London by order of their uncle. Richard governed with vigor and ability, but was not generally popular, and in 1485 Henry, earl of Richmond, head of the house of Lancaster, landed with a small army at Milford Haven. Richard met him on August 23d with an army of 15,000 men at Bosworth, in Leicestershire. Richmond had only 6000 men, but relied on the secret assurances of aid from Stanley, who commanded a separate royal force of 7000. In the midst of the battle, Stanley, by falling on the flank of the royal army, secured the victory to Richmond. Richard during the battle was slain; he possessed courage as well as capacity; but his conduct showed cruelty, dissimulation, treachery, and ambition. He has been represented as of small stature, deformed, and of a forbidding aspect; but his personal defects have probably been magnified.

RICHARD, Earl of Cornwall and Emperor of Germany between 1256 and 1272, during the so-called interregnum, a son of King John of England, was born in 1209. In 1268 he again visited Germany and held a diet at Worms in the following year. He died in England 2d April, 1272.

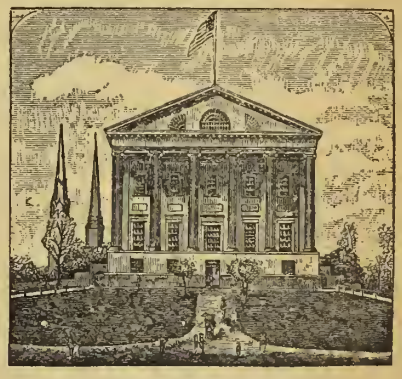
RICHARDSON, Charles, LL.D., born in 1775, died 1865. In 1818 he undertook the lexicographical articles in the Encyclopædia Metropolitana, and afterward published his great work, a New Dictionary of the English Language (2 vols. 1835–37). He also wrote a work on the Study of Languages (1854), and contributed frequently to the Gentleman's and other magazines.

RICHARDSON, Sir John, naturalist and arctic traveler, born at Dumfries 1787, died near Grasmere 1865. After studying medicine at the University of Edinburgh he entered the royal navy, in 1807, as assistant-surgeon. He served on various stations till 1819, and was surgeon and naturalist to the arctic expeditions of 1819–22 and 1825–27, under Sir John Franklin, exploring on the latter occasion the shores of the Arctic ocean between the Mackenzie and Coppermine rivers. In March, 1848, he took charge of an expedition to search for Franklin, and on his return published The Arctic Searching Expedition (1851) and The Polar Regions (1861).

RICHARDSON, Samuel, English novelist, was born in 1689 in Derbyshire, and received only a common school education. In 1741 his Pamela, or Virtue Rewarded, was published and its popularity was so great that it ran through five editions in one year. In 1749 the appearance of Clarissa Harlowe, fully established his literary reputation. The History of Sir Charles Grandison appeared in 1753, and was also received with great applause. He died in 1761, and was buried in the church of St. Bride, in Fleet street.

RICHELIEU (rēsh-lyeu), Armand Jean du Plessis, Cardinal, Duc de, French statesman, born at Paris 9th September, 1585; died there 4th of December, 1642. In 1614 as deputy of the clergy of Poitou to the states-general he managed to insinuate himself into the favor of the queen-mother, Marie de Medici, who obtained for him the post of grand-almoner, and in 1616 that of secretary of state for war and foreign affairs. He obtained, through the influence of the queen-mother, the cardinal's hat, and in 1624 was admitted into the council of state. From this date he was at the head of affairs, and he at once began systematically to extend the power of the crown by crushing the Huguenots, and overthrowing the privileges of the great vassals; and to increase the influence of the French monarchy by undermining that of the Hapsburgs, both beyond the Pyrenees and in Germany. The rallying point of the Huguenots was Rochelle; and Richelieu laid siege to that city, commanding the army in person. Rochelle, supported by supplies from England, held out for some time, but was compelled to surrender by famine (October 29, 1628). After the suppression of the Huguenots his next step was the removal of the queen-mother from court, she having endeavored to effect his fall. This he accomplished in November, 1630. In 1631 Richelieu was raised to the rank of duke. In 1632 a rising in favor of the Duke of Orleans, the king's brother, was suppressed by the royal forces directed by Richelieu, and the Duke of Montmorency was executed. The whole period of his government was marked by a series of conspiracies of the feudal nobility, the queen-mother, the queen herself, and even Louis, against the royal power exercised by Richelieu. But he was prepared at every point and his vengeance sure. During the Thirty Years' war the cardinal employed all the arts of negotiation and even force of arms to protect the Protestants of Germany, for the purpose of humbling the power of Austria. For the same object he declared war against Spain in 1635, and the separation of Portugal from Spain was effected by his assistance (1640). He also endeavored to weaken Austrian influence in Italy, and procured the transfer of the duchy of Mantua to the Duke of Nevers. Among the last to be crushed by him were Cinq-Mars and De Thou, who, with the king's approval, attempted to ruin the great minister. Before his death he recommended Cardinal Magarin as his successor. Richelieu was a great statesman, but he was proud, arrogant, and vindictive. He was a patron of letters and art, and founder of the French academy and the Jardin des Plantes. He was the author of Mémoires relating to the years 1624–38; Histoire de la Mère et du Fils, etc.

RICHMOND, the capital of Virginia, is finely situated on the north side of James river, at the head of tide-water, 100 miles s.w. of Washington. The streets are generally wide and well-built, and mostly intersect each other at right angles. There are many fine buildings, including the capital, governor's house, city hall, federal buildings, buildings of Richmond college, churches, schools, asylums, etc. The state house or capitol contains Houdon's celebrated marble statue of Washington, and in the capitol grounds are Foley's bronze statue of General T. J. ("Stonewall") Jackson and Crawford's bronze statue of Washington, 25 feet high, on a pedestal 42



State capitol, Richmond.

feet high, surrounded by other bronze statues. Water-power is almost unlimited, and the various mills and factories give employment to numerous workmen. The trade staples are tobacco, iron, grain, and flour. The first occupation of any part of its site was by English settlers in 1609; the city was formally founded in 1742, and became the seat of government in 1780. During the civil war it was the seat of the confederate government. It was invested by the federal armies, and surrendered on April 3, 1865. Pop. 114,000.

RICHMOND, a city in Indiana, on the east fork of the Whitewater, and at the junction of several important lines of railway (which connect it with Chicago, St. Louis, Cincinnati, etc.), 69 miles east of Indianapolis. Pop. 21,201.

RICHTER, Gustav, German painter, born at Berlin 1823, died there 1884. He was a member of the Academies of Berlin, Munich, and Vienna; executed frescoes in the Berlin Museum, and attracted attention by his Raising of

Jairus' Daughter and his Building of the Pyramids. a colossal picture (at Munich). It is on his portraits, however, that his fame chiefly rests, his sitters having included many European celebrities.

RICHTER, Jean Paul Friedrich, commonly called Jean Paul, German writer, was born March 21, 1763, at Wunsiedel, in the Fichtelgebirge, and died November 14, 1825, at Baireuth. In 1787–94 he had published his Greenland Lawsuits, (1783–84), Selection from the Devil's Papers (1789), The Invisible Lodge (1793). This brought him fame and money, and was followed by another romance, Hesperus (1795), and The Life of Quintus Fixlein (1796), a humoristic idyl, works which made his name one of the best known in Germany. In 1798 he went to Weimar, and subsequently moved to other towns, finally settling at Baireuth in 1804.

RICHETS, a disease peculiar to infancy, chiefly characterized by changes in the texture, chemical composition, and outward form of the bony skeleton, and by altered functions of the other organs, transient for the most part, but occasionally permanent. The chief external features are the legs bent outward, chest unduly projecting, head large and forehead projecting, spine often curved, joints large and prominent, general form stunted, etc. Rickets is chiefly a disease of large cities, and its development is favored by want of nourishing food, overcrowding, and neglect of sanitary and hygienic precautions generally. In the treatment of rickets all means are employed by which the system is invigorated, including good food, fresh air, and exercise. The use of splints for the legs is often beneficial, and as the child grows up nature often remedies the worst features.

RICOCHET FIRING, the firing of guns, mortars, or howitzers with small charges and low elevation, so as to cause the balls or shells to bound along. It is very destructive, and is frequently used in sieges to clear the face of a ravelin, bastion, or other work, dismounting guns and scattering men; and may also be used against troops in the field.

RID'PATH, John Clark, American historian and educator, was born in Putnam co., Ind., in 1840. His writings, chiefly popularizations of historical matter, are his Academic History of the United States, Popular History of the United States, Cyclopædia of Universal History, The Great Races of Mankind. He compiled a Library of Universal History, and helped to edit the People's Cyclopædia. His most widely circulated work is Ridpath's History of the United States. He died in 1900.

RIEN'ZI, Cola di, a native of Rome, born about 1312. He was the son of a tavernkeeper, acquired a good education, and early distinguished himself by his talents, and especially by his attacks on the tyranny of the nobles. In 1342 he endeavored to induce Pope Clement VI., then at Avignon, to initiate reforms, but nothing was done. In 1347, during the absence of the governor of Rome, Stefano Colonna, Rienzi summoned a secret assembly of his friends upon Mount Aventine, and induced them all to subscribe an oath for the establishment of a plan of government which he called the good estate. The people conferred upon him the title of tribune, with all the attributes of sovereignty. He banished several noble families, and compelled Colonna to quit Rome. His strict regard to justice and the public good in the first exercise of his power induced even the pope to countenance him. But he subsequently became ambitious and haughty, and finding he had lost the confidence of the people he withdrew from Rome in 1348. He returned secretly to Rome in 1350, but was discovered, and fell into the hands of Pope Clement at Avignon, who imprisoned him for three years. Innocent VI. released Rienzi, and sent him to Rome to oppose another popular demagogue named Boroncelli. But after a turbulent administration of a few months he was killed in 1354.

RIEL (re-ĕl'), Louis, leader of the so-called "Riel's Rebellion" in Canada, was born at Saint Boniface, Manitoba, in 1844. He came into prominence as the leader of the rebellion of 1869. Colonel Wolseley (afterward Sir Garnet Wolseley, commander-in-chief of the British army) was dispatched with a force of about 1400 men. Finding resistance hopeless, Riel and some of his associates fled to the United States. Later he went to Montana. In 1884 he was invited by French half-breeds living near the forks of the Saskatchewan to come and assist them in forcing the government to settle their claims to certain land grants and to give them certain other rights. Riel accepted and was made president of the provisional government. Troops, however, were dispatched against the rebels, and the main stronghold of Batoche was taken by General Middleton. Riel himself was soon afterward captured, and in July was brought to trial at Regina for high treason, condemned, and on November 16, 1885, was hanged.

RIFLE, a portable firearm, the interior surface of the barrel of which is grooved, the channels being cut in the form of a screw. The number of these spiral channels or threads, as well as their depth, varies in different rifles, a highly approved form being with the channels and ridges of equal breadth, and the spiral turning more quickly as it nears the muzzle. The bullet fired is now always of an elongated form. The great advantage gained by a weapon of this construction is that the bullet discharged from the piece, by having a rotatory action imparted to its axis coincident with its line of flight, is preserved in its direct path without being subject to the aberrations that injure precision of aim in firing with unrifled arms. As a necessary consequence of the projectile being carried more directly in its line of aim, its length of range, as well as its certainty in hitting the object, is materially increased. Rifles were invented in Germany in 1498, and have been used as military weapons since 1631, but were not used in the British army until the latter half of the 18th century. Till 1851 the British infantry, with the exception of those regiments known as rifle corps, was universally armed with the smooth-bore musket. In 1851 the first rifle firing an elongated bullet came in under the name of the Minié. Some of the regiments in the Crimean war were armed with this rifle, but it was cumbersome and heavy. It was succeeded in 1853 by the Enfield rifle. The chief feature of this rifle was the reduction of the bore to .577 in. in diameter, which made it considerably lighter. Britain was longer in adopting the breech-loading system than some other countries. Up to 1866 all British rifles had been muzzle-loaders, but in that year the Snider system of converting muzzle-loading arms into breach-loaders was adopted, and the army temporarily supplied with Enfield rifles converted into Sniders. Trials on a very extensive scale followed, resulting in the acceptance in 1871 of the Martini-Henry rifle, which became the rifle of the British army from 1874 onward. In this excellent weapon the breech is closed by a block which contains a piston or striker, the latter exploding the cartridge by the force of a strong spiral spring passing round it. An improved form of this arm was subsequently produced, viz. the Enfield-Martini, in which the barrel had a smaller bore, the diameter being reduced from .45 inch to .40. It was then determined by the authorities to adopt a repeating or magazine rifle, and in 1887 the Lee-Metford rifle was approved of. The rifling (Metford system) is in seven grooves without corners or angles, one turn or twist in 10 inches, calibre .303. The German needle-gun and the French Chassepot were the first of the breech-loading rifles to acquire a reputation for their use in actual warfare. Both these rifles have long been superseded, first by single-firing and then by repeating or magazine rifles. Germany having adopted the Mauser rifle and France the Lebel.

The repeating rifle is a development of a very old type of weapon. In the Spencer, the first used with signal success, the cartridges were in the stock of the arm; in the Winchester, one of the best known of repeating rifles, they are in a tube underneath the barrel. Some modern military magazine rifles draw their supply of cartridges from a reserve contained in a detachable magazine, the advantage being the greater efficiency of the weapon as a single-loader. The magazine of the Lebel rifle is in the fore end of the stock. The breech mechanism usually preferred is that upon the "door-bolt" principle, of which the Chassepot and Prussian needle-gun were well-known types; the Winchester is one of the few actuated by an under lever. In the Mannlicher, the weapon adopted by Austria, the bolt is drawn back simply; in others it has to be turned to the left before it can be withdrawn. With the Lebel the breech-bolt has two projections, which, when the bolt is turned, securely lock the bolt close to the base of the cartridge; in the Lee-Metford, a similar double-locking arrangement is placed where the projecting knob to actuate the mechanism joins the breech-bolt. The magazine of the Lee-Metford, containing eight cartridges, is placed under the stock behind

the barrel, to the level of which a spiral spring in the magazine raises the cartridges. The breech-bolt, which contains the firing mechanism and extractor, when pushed forward forces the raised cartridge into the barrel. The magazine is detached by pressing a "catch," or blocked by a "cut-off," when the rifle may be used as a single-loader.

When Whitworth produced his hexagonal bore rifle of .450 caliber, it was thought that the bullet was of insufficient diameter, and the .577 was adopted in its stead; later, after twenty years' experience with the .450 Martini-Henry, the bore has been still further reduced, chiefly owing to the discoveries of Hebler, whose Swiss rifle of 7½ millimetres was found to give increased velocity, greater range, equal accuracy, and at the same time permitted of lighter ammunition being used. The bullet is coated with thin steel, ferro-nickel, or other hard metal, so that it shall not strip in the rifling, which has a sharp twist, one complete turn in less than 12 inches, and leaves the muzzle at a velocity of 2000 or more feet per second, thus giving an extreme range of 3500 yards. Improved explosives, almost smokeless and which do not foul the barrel, have added to the success of the small-bore rifle.

Sporting rifles have a shorter range and inferior velocity to the best military weapons, their object being not extreme range or penetration, but great force at impact to produce such a shock as will paralyze the game shot.

RIGA, a seaport of Russia, capital of the government of Livonia, on both sides of the Duna or Dwina, about 5 miles above its mouth in the Gulf of Riga. Pop. 282,943, of whom nearly half are Germans, and Protestants by religion.

RIGHTS, BILL OF, on February 13, 1688–89, the declaration of right was delivered by the lords and commons to the prince and princess of Orange. In October, 1689, the rights claimed by the declaration were enacted with some alterations by the bill of rights, next to Magna Charta the greatest landmark in the constitutional history of England and the nearest approach to the written constitutions of other countries.

The declaration of right and the bill of rights introduced no new principle into the English constitution. In the United States, the main provisions of the bill of rights, so far as they are applicable, have been adopted both in the constitution of the United States and in the state constitutions. See Bill, Rights of.

RIGHTS OF MAN, a theoretical declaration passed by the French National assembly in August, 1789. It was attacked by Edmund Burke in his Reflections on the French Revolution. Thomas Paine replied to Burke in his Rights of Man. See Paine, Thomas.

RIGOR MORTIS, the rigidity of limbs that follows death. It is one of the signs of cessation of life.

RIG-VEDA, the first and principal of the Vedas or sacred hymns of the Hindus. See Vedas.

RILEY, Charles Valentine, entomologist, was born at London, England, in 1843, came to America in 1860, and located in Chicago. He served during the civil war as a member of the 134th Illinois infantry. In 1877 he was appointed chief of the entomological commission of the United States, and entomologist of the agricultural department in 1878. He organized the entomological branch of that department in 1881, also having the custody of the insect department of the National museum, which now contains over 100,000 specimens given it by Professor Riley. He was a member of the leading scientific organizations in this country and in Europe. He has been a voluminous writer on entomology, and is the author of works dealing with the various phases of that science. He died in 1895

RILEY, James Whitcomb, American poet, was born in 1853. His first book of verse appeared in 1883, entitled, The Old Swimmin'-hole and 'Leven More Poems. Among his other works are: Character Sketches and Poems, Afterwhiles, Pipes o' Pan: at Zekesbury, Rhymes of Childhood, An Old Sweetheart of Mine, Green Fields and Running Brooks, Poems Here at Home, Armazindy, Home Folks, Book of Joyous Children.

RINDERPEST (German name), or Cattle-plague, a contagious disease which attacks animals of the ox family, and is attended with the most deadly results. The disease appears to be identical with what was formerly known as murrain, and is sometimes called the steppe-murrain, from the Russian steppes, which are its habitat. This disease has caused great havoc among cattle for at least a thousand years, spreading occasionally like a pestilence over Europe. The probable cause of the disease is a micro-organism which is found in the blood and all the discharges of the infected animals, and is capable of being transmitted indirectly by any of these to great distances. Sheep and other animals can be affected by the disease, but in a less intense form. The period of incubation varies from two to ten days. The symptoms are elevation of the temperature of the body, followed by a heightened color of the mucous membrane of the mouth, and granular yellowish eruptions on the gums, lips, tongue, palate, and cheeks. The skin becomes congested, and develops scales with papular eruptions, and finally a slimy discharge comes from the eyes and nose. The name is also given to an eminently fatal cattle disease of America differing, however, from the true rinderpest in attacking cows only, and in running its course in three days in place of seven, the general duration of the European form of the disease.

RINE'HART, William Henry, an American sculptor, born near Union Bridge, Carroll co., Md., in 1825. He executed the two statuettes, an "Indian" and a "Backwoodsman," which act as supports for the clock in the house of representatives. He returned to Italy in 1858, settling at Rome, where he died. In 1872 his marble statue of Chief Justice Taney was erected at Annapolis; His works are in the Corcoran Art gallery, Washington, and in the Peabody institute, Baltimore. The former possesses his "Atalanta," "Latona and Her Children," "Diana," "Apollo," "Endymion," and "Rebecca;" in the latter are the works left in the sculptor's studio at his death, and his "Clytie Forsaken by Apollo," which is considered his masterpiece. He died in 1874.

RING, an ornament for the fingers which has been worn from the most ancient period of civilization. Among the ancient nations who are known to have attached special importance to the wearing of rings were the Assyrians, Egyptians, Hebrews, Greeks, and Romans. The nose, ears, arms, and even the legs and toes have also, among various people, been decorated with them. Rings have also from a very early period been reckoned as symbols of authority, which could be delegated by merely delivering the ring to an agent; they were also used as symbols of subjection. The earliest mention of rings is in the book of Genesis, and relates to the Hebrews. Among the Egyptians rings of gold were worn in great profusion. The common people wore porcelain rings. The Greeks and Romans used them for sealing contracts, closing coffers, etc. The modern use of wedding rings was probably derived from the Jews. A ring appears from an early period to have been one of the insignia of a bishop. Motto rings date from the time of the Romans, and were long popular in Britain.

RINGBONE, an exostosis or bony tumor mostly met with on the coronet of overworked horses, but sometimes seen on colts, or even newly-dropped foals. Ringbone injures a horse's market value, and is practically incurable.

RING-DOVE, or **CUSHAT,** the largest of the pigeons inhabiting Britain, a bird which occurs very generally throughout the wooded parts of Europe. It is migratory in countries in which the severe winters preclude the possibility of its obtaining a due supply of food, and even in Britain, in which it permanently resides, it appears on the approach of winter to assemble in flocks, and to perform a limited migration, probably in search of food. A bluish-gray color prevails generally over the head, cheeks, neck, back, and rump, while the breast and under parts of the neck are of a purplish red, the belly and thighs dull white. A patch of white on either side of the neck forms a sort of ring or collar. The average length is about 16 or 17 inches. The food of the ring-dove consists of grain, acorns, berries, the leaves and tops of turnips, etc. The nests are composed of sticks and twigs loosely placed together. The birds are wary and shy, and rarely breed in confine ment.

RINGWORM, a chronic contagious disease of the hair, hair-bulbs, and epithelial covering of the skin. It is due to a microscopic fungus, which lays hold upon and preys upon these tissues, and is very contagious. It is known by the decolorization and brittleness of the affected hairs, by the scaly eruption, and roundness of the affected patches. Ringworm is most commonly found on the scalp. The treatment of the disease consists in destroying the vitality of the

fungus, which is effected by a solution of sulphurous acid or of corrosive sublimate.

RIO-DE-JANEIRO (rē-o-de-zhâ-nā'i-ro), the capital of the republic of Brazil, second largest city of South America, is most beautifully and advantageously situated on the southeastern coast, on a fine natural harbor formed by a bay of the same name. The finest buildings are the opera-house, senate-house, military barracks, and the national museum,

while the churches are chiefly notable for their gaudy interior decorations. A striking feature in the city is the aqueduct, which brings the water a distance of 12 miles and here crosses a wide valley on a beautiful double-tier of granite arches. Among benevolent institutions are the Casa da Misericordia, several other hospitals, and a large lunatic asylum. There are two colleges, medical schools, a naval and military academy, numerous scientific establishments, public schools, national library, a botanical garden and observatory. At Rio is the chief military arsenal of the republic, while on one of the islands in the bay there is a naval arsenal with docks and building yards. The bay has its entrance, 1700 yards wide, between Fort St. Juan and Fort Santa Cruz, and extends inward 15 miles, with a width varying from 2 to 8 miles. It is diversified with numerous islands, surrounded by hills covered by luxuriant tropical vegetation, and affords safe anchorage for the largest vessels. Manufactures are unimportant, but there is an extensive trade in coffee, sugar, hides, tobacco, timber, etc. The principal imports are linen, woolen, and cotton tissues; iron and steel goods, and provisions and preserved meats. The city is the central terminus of the railways of the country; pop. 522,621.

The state of Rio-de-Janeiro has an area of about 28,000 miles, and is decidedly mountainous in the center. It is the best-cultivated state in Brazil, the chief crop being coffee. Immense herds of cattle are reared, and the forests are rich in timber. Capital, Nictheroy. Pop. 876,884.

RIO-GRANDE-DEL-NORTE. See Bravo.

RIO-GRANDE-DO-SUL, the most southern state in Brazil, bounded partly by the Atlantic, and bordering with Uruguay and the Argentine Republic, has an area of 91,336 sq. miles, and a pop. of 897,455. It is well-watered, contains much fertile land, and has a healthy climate. On the coast is the large lake or lagoon of Patos, besides others. The chief occupations of the inhabitants are cattle-rearing and agriculture. Among the population are 100,000 Germans, there being a number of flourishing German settlements. There are some 600 miles of railway. Hides, tallow, horse-hair, bones, etc., are exported. The capital is Porto Alegre. The town of Rio-Grande is situated on a peninsula near where the Lake of Patos communicates with the Atlantic. Its houses are mostly of earth, and its streets unpaved. It has an active trade in hides, horse-hair, wool, tallow, etc. Pop. 18,000 or 19,000.

View of Rio-de-Janeiro.

RIOJA (rē-ō'hâ), La, one of the western provinces of the Argentine Republic. It is well watered on the west, but in the east and south there are salt and sand deserts. The climate is dry and healthy. The inhabitants are chiefly engaged in agriculture and cattle-rearing. Excellent wheat, wine, and fruits are produced. Pop. 100,000. Chief town, La Rioja, at the foot of the Sierra Velasco, in the midst of vineyards and orange groves. Pop. 8000.

RIO NEGRO (Spanish "black river"), the name of numerous streams, of which two are important: (1) A river of South America, and principal tributary of the Amazon. It rises in Colombia and joins the Amazon after a course of about 1000 miles at Manaos, Brazil. Through its affluent, the Cassiquiari, there is direct communication between the Amazon and Orinoco. (2) A river of South America forming the boundary between the Argentine Republic and Patagonia. It rises in the Andes in Chile, and is about 700 miles long. Its current is very rapid, and its bed obstructed with shoals and sandbanks.

RIOT, a disturbance of the public peace, attended with circumstances of tumult and commotion, as where an assembly destroys, or in any manner damages, seizes, or invades private or public property, or does any injury whatever by actual or threatened violence to the persons of individuals. By the English common law a riot is an unlawful assembly of three or more persons which has actually begun to execute the common purpose for which it assembled by a breach of the peace, and to the terror of the public. A lawful assembly may become a riot if the persons assembled form and proceed to execute an unlawful purpose to the terror of the people, although they had not that purpose when they assembled. Every person convicted of riot is liable to be sentenced to hard labor. By act 1 George I. cap. v. s. 2, called the Riot Act, whenever twelve or more persons are unlawfully assembled to the disturbance of the peace, it is the duty of the justices of the peace, and the sheriff and under-sheriff of the county, or of the mayor or other head officers of a city or town corporate, to command them by proclamation to disperse. And all persons who continue unlawfully together for one hour after the proclamation was made, commit a felony, and are liable to penal servitude or imprisonment (substituted for death by 7 Will. 4 and 1 Vict.). The act also contains a clause indemnifying the officers and their assistants in case any of the mob should be killed or injured in the attempt to arrest or disperse them. Compensation out of the rates is paid to persons sustaining damage by riot. In the United States the definition of Riot and its punishment are regulated by statue but the English law practically covers the subject.

RIPLEY, George, an American author, born at Greenfield, Massachusetts, 1802; died 1880. He became literary editor of the New York Tribune in 1849, and was joint editor with C. A. Dana of the American Cyclopædia (1858–63, 16 vols., also of the second edition).

RIPPLE-MARKS, the wavy or ridgy marks left on the beach of a sea, lake, or river by the ripples or wavelets. Such marks have often been preserved when the sand has hardened into rock, and are held by geologists as indications that deposition of the beds in which they occur took place on the sea-shore or at a

depth not greater than 60 feet. We have also wind ripple-marks and current ripple-marks, and it requires much discrimination to determine the producing cause.

RISTO'RI, Adelaide, Italian actress, born 1822. She married the Marquis Capranica del Grillo in 1847, and afterward played in all the chief European capitals. She took her farewell of the English stage in Manchester, Nov. 8, 1873. Among her chief characters are Medea, Francesca da Rimini, Marie Antoinette, Mary Stuart, and Lady Macbeth. She visited the United States in 1866, 1875, and 1884-85. She died in 1906.

RITUALISM, a strict adherence to rites and ceremonies in public worship. The term is more especially applied to a tendency recently manifested in the Church of England, resulting in a series of changes introduced by various clergymen of the high church party into the services of the church. These changes may be described externally as generally in the direction of a more ornate worship, and as to their spirit or animating principle, as the infusion into outward forms of a larger measure of the symbolic element. They are defended on the grounds of law, ancient custom, inherent propriety, and divine sanction or authority. The points of ritual about which there has been the most violent contention are those which involve the adoration of Christ as present on the altar under the forms of bread and wine. Other points are: the eastward position of the priest at consecration; lights on the holy table; the use of various vestments; the use of incense; mixing water with wine for communion; fasting before communion from previous midnight; regular confession to a priest, with absolution and penance; etc.

RIVER-HORSE, a name sometimes given to the hippopotamus.

RIVERS rank high in importance among the natural features of the globe, and are intimately connected with the history and condition of mankind. They have always formed important highways of communication, and the great cities built upon their banks have constituted in all ages the seats of empire. Every circumstance concerning rivers is therefore of importance, as their source, length of channel, outlet, rapidity of current, depth, and consequent capability of navigation. The source of a river is either a spring or springs, or a lake, or the river takes its origin from the melting of the snow and ice on mountains. The termination of a river is usually in the sea, a lake, or another river, or it may lose itself in the sand. All the streams which ultimately gather into one river form a river system, and the region which is drained by such a system of streams is called a river basin. River basins are usually separated from each other by more or less elevated ground, and the line of greatest elevation between them is called a watershed. In speaking of the right and left bank of a river we are always supposed to have the position of a person looking in the direction toward its mouth. The volume of water which rivers contain varies with many conditions, dependent upon the nature of the sources by which they are fed and the amount of rainfall throughout their course. The periodical melting of the snows adds greatly, in some cases, to the volume of rivers which have their origin in mountain regions, the rainy season in tropical regions has a similar effect (as in the case of the Nile), often causing extensive inundations. In arid countries the so-called rivers are often mere surface torrents, dependent on the rains, and exhibiting merely the dry beds of watercourses during the season of drought. The "creeks" of Australia and the "wadies" of the Arabian desert are of this character. The average fall of a river's bed is indicated by the difference between the altitudes of its source and its outlet compared with its length of channel. The fall of many great rivers is much less than might be supposed. The Amazon has a fall of only 12 inches in the last 700 miles of its course. The Volga, which rises at an elevation of 633 feet above the Caspian sea, has an average inclination of less than 4 inches to the mile throughout its course of more than 2000 miles. The Aberdeenshire river Dee, which rises at a height of 4060 feet, has a course of only 87 miles to its outlet, showing an average declivity of 46 feet per mile. Many rivers carry down immense quantities of earthy matter which accumulates at their mouths forming what is called a delta (which see). Among the great rivers of the world are the Mississippi and Missouri (4200 miles), and the Amazon (3900 miles), in America; the Yang-tse-Kiang, the Amoor, the Yenisei, the Indus, and Ganges in Asia, all over 1500 miles in length; the Congo (3000 miles), the Niger (2600 miles), and the Nile (4200 miles), in Africa; and the Danube (1670 miles), Volga (2200 miles), and the Rhine (800 miles), in Europe.

RIVER-TORTOISE, a name of a family of tortoises that are aquatic in their habits, coming to shore only to deposit their eggs. They are exclusively carnivorous, subsisting on fishes, reptiles, birds, etc. The edges of the mandible are so sharp and firm that they easily snap off a man's finger. They inhabit almost every river and lake in the warmer regions in the Old and New Worlds, and are particularly plentiful in the Ganges, where they prey on human bodies.

RIVET, a short metallic pin or bolt passing through a hole and keeping two pieces of metal together; especially, a short bolt or pin of wrought iron, copper, or of any other malleable material, formed with a head and inserted into a hole at the junction of two pieces of metal, the point after insertion being hammered broad so as to keep the pieces closely bound together. Rivets are especially employed in making boilers, tanks, iron bridges, etc. They are closed up by hammering when they are in a heated state, the hammering being either done by hand or by machinery.

RIVIERA (riv-i-ā'ra), the name given to a portion of the coast of North Italy, on each side of the town of Genoa. It extends to Spezzia on the east and Nice on the west, and is much resorted to by invalids.

RIZZIO, David, a native of Turin, came to Scotland in 1564 in the train of the ambassador from Savoy, and soon became so great a favorite with the queen that he was appointed her secretary for foreign languages. The distinction with which he was treated by his mistress soon excited the envy of the nobles and the jealousy of Darnley. A conspiracy, with the king at its head, was formed for his destruction, and before he had enjoyed two years of court favor, the Lord Ruthven and others of his party were introduced by Darnley into the queen's apartment, where they dispatched the object of their revenge, 9th March, 1566. Popular tradition assigns to Rizzio the improvement of the Scottish style of music, but many of the airs which have been ascribed to Rizzio are traced to more distant periods.

ROACH, a species of fresh-water fish of the carp family found in Britain and

The European roach.

other parts of Europe. Their average length is about 9 or 10 inches. Allied fishes receive the same name in America.

ROADS are artificial pathways formed through a country for the accommodation of travelers and the carriage of commodities. Though the Romans set an example as roadbuilders, some of their public highways being yet serviceable, the roads throughout most of Europe were in a wretched condition till toward the end of the 18th century. France was in advance of other countries in road-making; in England a decided improvement of the highways only began in the 19th century. When diversities of level are necessary, road-engineers fix the degree of inclination at the lowest possible point. Telford estimated the maximum inclination of a road to be 1 in 24, but except in extreme cases it is considered better that it should not exceed 1 in 50. The angle of repose, or maximum slope on which a carriage will stand, has been estimated at 1 in 40. The width of the road is also a very important consideration as bearing both on the original cost and on the permanent maintenance. A properly-constructed road, besides a foundation, consists of two layers, an upper and an under. After a good foundation is obtained the laying of a base, the best material being concrete of gravel and lime, gives durability to the road. Upon this base the actual roadway is laid with a slight inclination from the center to the sides for the purpose of drainage. Before the time of Macadam it was customary to use broken stones of different sizes to form the roadway, the consequence being that in couse of time the smaller stones sank, making the road rough and dangerous. Macadam carly in the 19th century introduced the principle of using stones of uniform size from top to bottom. What is known as the rule of

the rule is that in passing, whether going in the same or opposite direction, the rider or driver must pass on the right hand of the other rider or driver.

ROANOKE (ro-a-nōk′), a navigable river formed by the union of the Dan and the Staunton, which after a course of about 250 miles falls into Albemarle sound. It is tidal for 75 miles. —The town of Roanoke, Virginia, situated on this river, has become a flourishing industrial center. Pop. 25,160.

ROARING, in horses, is a disease of the nerves and muscles of the larynx which causes an obstruction to the passage of air, giving rise, when the horse is briskly exercised, to the peculiar sound from which the disease derives its name. The cause of the disease is in most cases attributed to fatty degeneration and atrophy of the laryngeal nerve, which brings about an atrophy of the muscles of the larynx on the side affected, and thus causes the arytenoid cartilage to obstruct the passage. The disease generally affects the left side, and is not, as a rule, amenable to treatment. Several cases have been cured lately by excision of a portion of the affected arytenoid cartilage, and this operation promises to be very successful in this disease.

ROASTING is the cooking of meat by the direct action of fire—that is, by dry heat, either before the fire or in an oven. Roasting before an open fire is considered preferable to roasting in an oven (which is analogous to baking), on account of the free ventilation to which it exposes the meat during the process. The apparatus in most kitchens for open roasting are a fire, a spit, a contrivance for turning the meat to present all sides of it alternately to the fire, a screen to economize the heat, and a saucepan to catch the dripping. The fire must be kept even and bright throughout. During the process of roasting, the meat should be basted with the dripping to keep it soft and allow the heat to penetrate. The speciality of roasting as compared with boiling is that it retains the saline ingredients of the meat. The time allowed for roasting is roughly estimated at a quarter of an hour to 1 lb. of meat. Longer time is required in winter than in summer, and for new than old killed meat.

ROBBERY, a felonious and forcible taking away another man's goods or money from his person, presence, or estate by violence or putting him in fear. Violence or intimidation is the criterion which distinguishes robbery from other larcenics; and it is sufficient that so much force or threatening, by word or gesture, is used as might create an apprehension of danger, so as to lead a man to part with his property against his will. Highway robbery, or the forcible taking of property from travelers, in many countries is a capital offense, and in all civilized countries is severely punished.

ROBERT, Duke of Normandy, surnamed the Devil, was the younger son of Duke Richard II. by his marriage with Judith, a daughter of Count Godfrey of Brittany. In 1027 he succeeded his elder brother, Richard III., whom he is charged with having poisoned. The first years of his government were employed in bringing his rebellious vassals into subjection, and he then restored Count Baldwin of Flanders to his states, assisted Henry I., king of France, against his mother Constantia, and humbled Count Otho of Champagne. In 1034 his fleet was wrecked off Jersey while on its way to England to support his nephews Alfred and Edward against Canute, who had excluded them from the succession to the English throne. Hereupon he concluded a truce with Canute, by which the two princes were promised half of England. In 1033 he set out to visit the holy places, and subsequently made the pilgrimage to Jerusalem on foot. While returning he died suddenly at Nicæa in Asia Minor (1035), and is supposed to have been poisoned by his servants. His heroic deeds and penance have given rise to numerous stories. William the Conqueror was his son.

ROBERT II., King of Scotland, was the son of Marjory, daughter of Robert Bruce, and of Walter, steward of Scotland, and was thus the first of the Stewart or Stuart kings. He was born 1316, and was recognized by parliament in 1318 as heir to the crown. On the death of David II. he was crowned at Scone, 26th March, 1371. He had long acted as regent, and had done good service in the English wars. An act of parliament in 1375 settled the crown on his sons by his first wife Elizabeth Mure of Rowallan, illegitimate by ecclesiastical law. His reign was comparatively a peaceful one, one of the chief events being the battle of Otterburn. He died in 1390.

ROBERT III., King of Scotland, eldest son of the preceding, was born in 1340 and was originally called John, but changed his name on his coronation, in 1390. Robert died in 1406.

ROBERT OF GLOUCESTER, an English historian, is supposed to have been a monk in the abbey of Gloucester during the reign of Edward I., but of his private history nothing is known.

ROBERTS, Frederick Sleigh, Earl, V.C., son of Sir Abraham Roberts, was born in 1832. He entered the army and became a lieutenant in the Bengal artillery in 1851 and a captain in 1860. He gained the Victoria Cross in the Indian mutiny, and was made brevet-major. He took part in the Abyssinian war 1867–68, and in 1872 was made a C. B. for his services in India on the Lushai expedition. He commanded a column in the Afghan war of 1878, and after a brilliant march from Cabul to Candahar utterly defeated Ayoub Khan. In 1881 he was created a baronet and G.C.B. He became commander-in-chief in India in 1885, was made a baron in 1892, field-marshal and commander-in-chief in Ireland, 1895; commander-in-chief in the Boer war, 1900; commander-in-chief of the army, 1900; created earl and K.G., 1901. He is author of Forty-one Years in India (1897).

ROBESPIERRE (rob-es-pi-ār), François Maximilien Joseph Isidore, was born at Arras in 1758, and was the son of an advocate. He was educated at the college of Louis-le-Grand at Paris. He afterward practiced as an advocate at Arras, and held for a short period the position of judge in the bishop's diocese. In 1789 he was elected deputy to the states-general, and was a zealous supporter of democratic measures. At this time he became a prominent member of the Jacobins and other revolutionary clubs. In March, 1791, he was appointed public accuser to the New Courts of Judicature. He remained in the background during the September massacres of 1792, which he assisted in planning, leaving the work with Marat and Danton. In the same month he was elected a member of the convention, and in the proceedings against Louis XVI. distinguished himself by the relentless rancour with which he opposed every proposal to avert or delay the fatal result. On 19th March, 1794, the Hébertists fell victims to his jealousy. Eleven days later he caused Danton to be arrested, who, after a trial of three days, was guillotined, together with Camille Desmoulins, on April 5th. Robespierre's power now seemed to be completely established, and the Reign of Terror was

Maximilien Robespierre.

at its height. On June 8, 1794, he, as president of the convention, made the convention decree the existence of the Supreme Being; and on the same day he celebrated the Feast of the Supreme Being. In the meantime a party in the convention was formed against Robespierre and on July 27 he was openly accused of despotism. A decree of arrest was carried against him, and he was thrown into the Luxembourg prison. He was released by his keeper on the night of the same day, and conducted to the Hall of Commune, where his supporters were collected. On the following day Barras was sent with an armed force to effect his arrest. Robespierre's followers deserted him, and he was guillotined on July 27, 1794, together with some twenty-three of his supporters. The tendency with modern writers is to modify the character for infamy which at one time obtained regarding Robespierre.

ROBIN, a name given to several birds, more especially to the robin redbreast of Europe (see Redbreast) and to an American species of blackbird, as also to the bluebird of America.

ROBINSON, Rev. Edward, D.D., LL.D., biblical scholar and explorer of the Holy Land, born at Southington, Connecticut, 1794; died at New York 1863. In 1837 he made a voyage to the Holy Land. The result of this journey

was his great work entitled Biblical Researches in Palestine, Mount Sinai, and Arabia Petræa (1841, 3 vols.), subsequently enlarged after a second visit to Palestine in 1852. He had been appointed to the chair of biblical literature in Union Theological seminary, New York, but only entered on the duties in 1840, occupying the post till his death.

ROBINSON CRUSOE, a celebrated romance, written by the well-known Defoe, and published in 1719.

ROB ROY (that is, "Robert the Red") a celebrated Highland freebooter, whose true name was Robert Macgregor, but who assumed his mother's family name, Campbell, on account of the outlawry of the clan Macgregor by the Scotch parliament in 1662. He was born about 1660. He was the younger son of Donald Macgregor of Glengyle, by his wife, a daughter of Campbell of Glenfalloch. His own designation was of Inversnaid, but he seems to have acquired a right to the property of Craig Royston, on the east side of Loch Lomond. Like other Highland gentlemen, Rob Roy was a trader in cattle previous to the rebellion of 1715, in which he joined the adherents of the pretender. On the suppression of the rebellion the Duke of Montrose, with whom Rob Roy had previously had a quarrel, took the opportunity to deprive him of his estates; and the latter began to indemnify himself by a war of reprisals upon the property of the duke. An English garrison was stationed at Inversnaid, not far from Aberfoyle, the residence of Rob Roy; but his activity and courage saved him from the hands of his enemies, from whom he continued for some time to levy blackmail. In his latter years he became reconciled to Montrose, and died at Balquhidder in 1734. See Sir Walter Scott's Introduction to the novel of Rob Roy.

ROB'SON, Stuart, American comedian, was born at Annapolis, Md., in 1836, his real name being Robson Stuart. His Captain Crosstree in the burlesque of Black-Eyed Susan is one of his best characters. In 1877 he made a hit in Our Boarding House with W. H Crane and the two established a partnership which lasted till 1889. They successfully revived several of Shakespeare's comedies. Among their greatest successes were The Two Dromios and The Henrietta. He died in 1903.

ROC, a fabulous bird of immense size and strength, which is mentioned in the Arabian Nights entertainments. A belief in it was spread in Europe during the middle ages, having been brought from the east probably as a consequence of the Cruades.

ROCHAMBEAU (ro-shȧn-bō), Jean Baptiste Donatien de Vimeur, Count de, Marshal of France, born 1725, entered the French army in 1742, distinguished himself in the Seven Years' war, and became field-marshal in 1761. He died in 1807.

ROCHEFORT (rosh-fōr), Henri (Victor Henri, Marquis de Rochefort-Luçay), a French journalist, dramatist, and politician, born in Paris, 1832. After Sedan he became a member of the government of National defense. He fled from Paris in May, 1871, when he foresaw the end of the Commune, of which he had been a vigorous supporter, but was arrested by the Versailles government and sentenced to transportation to New Caledonia. He escaped in 1874, and after the general amnesty of 1880 returned to Paris (July 12th), where he founded his new journal the Intransigeant. He was returned as deputy by the department of the Seine, but resigned his seat in February, 1886. His influence suffered from his joining in the Boulangist movement.

ROCHELLE SALTS, the double tartrate of sodium and potassium, crystallizing in large rhombic prisms. It has a mild, hardly saline taste, and acts as a laxative.

ROCHESTER, capital of Monroe co., New York state, on both sides of the Genesee (over which are several bridges), 7 miles above its entrance into Lake Ontario, on the Erie canal, which here crosses the river by a splendid aqueduct. The town is well built, among buildings and institutions being a Roman Catholic cathedral, a court-house, and city-hall, a university, a Baptist theological seminary, a free library, an athenæum, etc. The prosperity of Rochester is partly due to the immense water-power furnished by the falls of the Genesee, which within the city limits makes a descent of 268 feet, one of the falls having a height of 96 feet. This power is employed in driving flour-mills, which are here on a great scale, and also in various other industrial establishments. The suburbs are highly cultivated, there being a great extent of nursery grounds. In 1812 two log-huts were the only buildings on the site now occupied by Rochester. Pop. 1909, estimated at 200,000.

ROCK, in geology, is a term applied to any considerable aggregation of mineral matter, whether hard and massive like granite, marble, etc., or friable and unconsolidated like clay, sand, and gravel. In popular language, however, it is confined to any large mass of stony matter as distinguished from soil, mud, sand, gravel, etc.

ROCKET, a projectile consisting of an iron cylinder filled with an inflammable composition, the reaction of the gases produced by the combustion of which, pressing on the head of the rocket, serve to propel it through the air. Rockets were first used in eastern countries. They were kept point first by the use of a stick which acted on the principle of an arrow's feathers. But the rocket now used has no stick, being kept point first by rapid rotation, imparted to it by means of three curved shields fixed on the base so as to be on the same side of each vent. They may be discharged from tubes or troughs, or even laid on the ground. In war rockets are chiefly used for incendiary purposes, for moral effect —especially frightening horses and for various irregular operations. Signal and sky rockets are small rockets formed of pasteboard cylinders, filled with combustible materials, which, when the rocket has attained its greatest height and bursts, cast a brilliant light which may be seen at a great distance.

ROCKEFELLER, John D., American capitalist, was born in Richford, Tioga Co., N. Y., in 1839. In 1851 when twelve years of age he was taken by his parents to Cleveland, Ohio. In 1860 he engaged in the oil business, and in partnership with his brother William and others built in 1865 a large refinery known as the Standard Oil Refinery. In 1870 a number of firms were combined under the name of the Standard Oil Co., of which John D. was the president and controlling spirit. By degrees the Standard Oil Company absorbed or drove out of business most of its rivals. In 1882 the Standard Oil Trust was organized, but this was dissolved ten years later. Since that time the various companies have been operated separately, but all are under the management of Rockefeller and his associates, whose control of the oil business is complete. In 1892 he founded and endowed the University of Chicago. To this institution he has given nearly $25,000,000. In 1907 the Standard Oil Co. was fined for violating the Interstate Commerce Law in receiving rebates from the Chicago & Alton Railway, $39,000,000.

ROCKFORD, a city in Illinois, finely situated on the Rock river, 93 miles w.n.w. of Chicago. It has abundant water-power, woolen and cotton factories, iron-foundries, agricultural machine and implement factories, wagon and carriage factories, etc. Pop. 37,090.

ROCK ISLAND, a town in Illinois, on the Mississippi, at the foot of the Upper Rapids, deriving its name from an island in the river, on which there is now an extensive government arsenal. It is a great center of railway and river traffic, and is connected with Davenport on the opposite side of the river by a railway and general traffic bridge. Pop. 23,683.

ROCK RIVER, a river of the United States, which rises in Wisconsin, 50 miles west of Lake Michigan, and falls into the Mississippi 2 miles below Rock Island City. Length, 330 miles, about 225 of which have been ascended by small steam-boats.

ROCKY MOUNTAINS, a name indefinitely given to the whole of the extensive system of mountains which covers a great portion of the western half of North America, but more properly applied to the eastern border of this mountain region, commencing in New Mexico in about 32° 30′ n. lat., and extending throughout the continent to the Polar sea; terminating west of the Mackenzie river, in lat. 69° n., lon. 135° w. The Rocky mountains in the United States are divided into two parts in Southern Wyoming by a tract of elevated plateaus. The chief groups of the southern half are the Front or Colorado range, which in Wyoming has a mean elevation of 9000 feet (at Evan's Pass, where it is crossed by the Union Pacific railway 8269 feet). In Colorado it increases to a mean height of 13,000 feet, its highest points being Gray's Peak (14,341 feet). Long's Peak (14,271 feet), and Pike's Peak (14,147 feet). The Sawatch range, south of the Arkansas river, has its highest peak in Mount Harvard (14,375 feet), with passes at an elevation of from 12,000 to 13,000 feet. The "Parks" of Colorado are high mountain valleys, known as North, Middle, South, and San Luis parks, with an elevation of

from 6000 to 10,000 feet, surrounded by ranges 3000 to 4000 feet higher. The west border of the San Luis park is formed by the San Juan range with at least a dozen peaks over 14,000 feet, and between one and two hundred above 13,000 feet. On the northeastern side this park is bounded by the Sangre de Cristo range, in which is Blanca peak (14,464 feet). The Uintah range, directly west of North park, has several points above 13,000 feet; and the Wahsatch range, which forms the western limit of the southern division of the Rocky mountains, rises to a height of 12,000 feet just east of Salt Lake City. The northern division of the Rocky mountains, with the exception of the Wind river range and the Yellowstone region (see Yellowstone), is lower and has less impressive scenery than the southern. In Idaho and Montana the groups are more irregular in outline than in the south, and the division into ranges more uncertain. Of these the Bitter Root mountains in part of their course form the divide between the Missouri and the Columbia. There two ranges reach altitudes of upward of 9000 feet, and are crossed by a number of passes at elevations of from 5500 to 6500 feet. The Northern Pacific railway crosses at Mullan's pass (5548 feet) through a tunnel 3850 feet long. The Crazy mountains, north of the Yellowstone, reach a height of 11,000 feet; other groups are the Big Horn mountains and the Black Hills, whose highest point is Mount Harvey (9700 feet). The highest peaks yet accurately measured in the Canadian Rocky mountains proper are Robson peak (13,700 feet) and Athabasca (13,500). Formerly the Canadian Rockies were regarded as culminating in Mount Brown, to which a height of 16,000 feet was assigned. Mount Logan (19,500) and Mount St. Elias (18,000), on or near the Alaska frontier, do not properly belong to the range. The Rocky mountains contain some of the finest scenery in the world, and are especially rich in deposits of gold, silver, iron, copper, etc.

ROCKY MOUNTAIN WHITE GOAT, The hair is long, especially about the fore quarters, and beneath it is a wooly underfur. It is about three feet high at the shoulders, which are somewhat arched

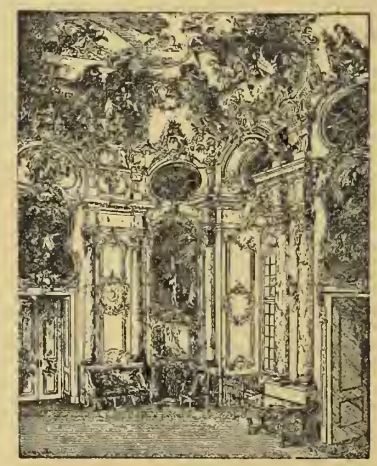
Rocky Mountain goat.

or humped, while the head is carried low. The nose is hairy, there is a beard, and the horns, present in both sexes, are slender, smooth, backward-curving, eight to ten inches long and black, which is also the color of the small hoofs. Its home is the mountains from the "high sierras" of California and the central Rocky mountains to Alaska. Its long silky coat and its pure white color indicate a snowy habitat, and this animal is an inhabitant of the glacial peaks and the great snow-fields alone, rarely coming down even as low as the timber-line, but finding its foliage among the alpine pastures that border the glaciers. It climbs with astonishing agility.

ROCO'CO, a debased variety of the Louis-Quatorze style of ornament, pro-

Rococo ornament.

ceeding from it through the degeneracy of the Louis-Quinze. It is generally a meaningless assemblage of scrolls and crimped conventional shell-work, wrought into all sorts of irregular and



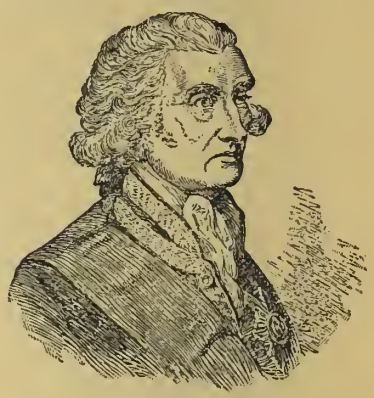
Rococo—An interior in Schloss Bruchsal, Baden, Germany.

indescribable forms, without individuality and without expression.

RODEN'TIA, or RODENTS, an order of mammalia, comprising the gnawing animals, such as rats, mice, squirrels, rabbits, etc. They are distinguished by the following characteristics; the teeth are limited to molars and incisors, canines, being entirely absent; the molars have tuberculated or flattish crowns, and are especially adapted for the attrition of food; the incisors are long, and spring from permanent pulps, thus being continually reproduced and shoved outward from their bases. In the typical species the outer faces of the incisors are covered with hard enamel, but not the inner ones, hence the latter are soft and wear away faster than the anterior surfaces, thus keeping a sharp edge on the teeth. The digits are generally four or five in number, and are provided with claws. The intestine is long, and the cæcum generally large. The brain is almost destitute of convolutions. The eyes are placed laterally.

The rodentia are divided into two main divisions or sub-orders. One represented by mice, rats, squirrels, marmots, beavers, porcupines, etc., having the incisors strictly limited to two in each jaw; and the other comprehending hares and rabbits, distinguished by four incisors in the upper jaw and two in the lower.

RODNEY, George Brydges, Baron Rodney, British naval hero, born in 1718 at Walton-upon-Thames. In 1759, having been promoted to the rank of admiral, he bombarded Havre de Grâce in face of the French fleet. In 1726 he reduced Martinique, and on his return was rewarded with a boronetcy. In



Lord Rodney.

1779 he was appointed to the chief command on the West India station, and in January, 1780, completely defeated a Spanish fleet under Langara off Cape St. Vincent. On April 12, 1782, he obtained a decisive victory over the French fleet under De Grasse. He died 21st May, 1792.

ROE, Edward Payson, American clergyman and novelist, was born in Moodna, Orange co., N. Y., in 1838. He was from 1865 until 1874 pastor of the Presbyterian church at Highland Falls, N. Y., after which he gave himself up to lecturing, writing, and fruit culture. His first novel, Barriers Burned Away, a story suggested by the Chicago fire, met with great success. All of his novels have been popular. Among them are What Can She Do, Opening of a Chestnut Burr, A Face Illumined, Near to Nature's Heart. He died in 1888.

ROEBUCK, Roe-deer, a European deer of small size, the adult measuring about 2 feet at the shoulders. The horns or antlers are small, and provided with three short branches only. The general body-color is brown, whitish beneath. These animals inhabit mountainous and wooded districts. When irritated or alarmed they may prove very dangerous adversaries, and are able to inflict severe wounds with their antlers. See Reebuck.

ROENTGEN (rĕnt'gen) Wilhelm Konrad, German physicist, was born at Lennep, in Rhenish Prussia in 1845. He received his doctor's degree in 1869 at the University of Zurich. In 1899 he was appointed professor of experimental physics at the University of Munich. He discovered the rays which bear his name in 1895. For this discovery he received the Rumford medal of the Royal society of London and the Barnard

medal of Columbia University, awarded in 1900 for the greatest discovery in science during the preceding five years. (See X-Rays.)

ROGERS, John, American sculptor, was born in Salem, Mass., in 1829. He exhibited the "Slave Auction" in 1860, and in 1860–65 he executed a series of war statuette groups in gray clay, among which were the "Picket Guard," "One More Shot," and "Union Refugees." Other statuette groups illustrate passages from Shakespeare, Irving's Rip Van Winkle, and Longfellow's Miles Standish ("John Alden and Priscilla"). His ambitious efforts include the equestrian statue in bronze of General Reynolds in front of the City Hall, Philadelphia, and a bronze group of "Ichabod Crane and the Headless Horseman." He died in 1904.

ROGERS, Randolph, American sculptor, was born at Waterloo, New York, in 1825. Among his works are a statue of "John Adams" in the cemetery at Mount Auburn, near Boston: the bronze doors of the new capitol extension in Washington, the bas-reliefs of which represent the principal events of the career of Columbus; and figures of Marshall, Mason, and Nelson for the Washington monument at Richmond, Va. His other works include a colossal bronze statue of Lincoln for Philadelphia; the "Genius of Connecticut" for the state capitol in Hartford; and a statue of W. H. Seward in New York. He died in 1892.

ROGERS, Samuel, English poet, born at Stoke-Newington, London, July 30, 1763; died 18th December, 1855. His first appearance before the public was in 1786, when he gave to the world his Ode to Superstition, and other Poems. The Pleasures of Memory, with which his name is principally identified, appeared in 1792, and An Epistle to a Friend (1798). In 1812 he published The Voyage of Columbus, a fragment; in 1814, Jacqueline, a tale; in 1819, Human Life; and in 1822, Italy, a descriptive poem in blank verse.

ROGERS, William Augustus, American astronomer and physicist, was born in Waterford, Conn., in 1832. He mapped a part of the skies north of the zenith and published "Observations" in the Annals of the observatory. His most important work was in the field of micrometry and included the construction of a dividing engine of high precision. His copies of English and French standards of length, obtained in 1880, are in regular use by American astronomers. He died in 1898.

ROGUE, in law, a vagrant or vagabond. Persons of this character were, by the ancient laws of England, to be punished by whipping and having the ear bored with a hot iron. The term rogues and vagabonds is given to various definite classes of persons, such as fortune-tellers, persons collecting alms under false pretenses, persons deserting their families and leaving them chargeable to the parish, persons wandering about as vagrants without visible means of subsistence, persons found on any premises for an unlawful purpose, and others. Rogues and vagabonds may be summarily committed to prison for three months with hard labor. See Vagrant.

ROHAN (rō-äṅ), Henri, Duke of, French Protestant leader, born in 1579. In his sixteenth year he joined the court of Henry IV., and after the death of the latter in 1610 became chief of the Huguenots. After the fall of Rochelle (1628) and the peace of 1629 Rohan withdrew from France and wrote his Memoires Sur les Choses Advenues en France depuis la Mort de Henry IV. Mémoires sur la Guerre de la Valteline Les Intérêts des Princes, and Discours Politiques. He died in 1639.

ROHAN, Louis René Edouard, Prince de, Cardinal-bishop of Strasburg, was born in 1734 at Paris. In 1772 he went as ambassador to the court of Vienna. He derives his notoriety, however, chiefly from the affair of the necklace. He was then grand almoner of France, and being thrown into the Bastile, continued in prison more than a year, when he was acquitted and released by the parliament of Paris, August, 1786. He died in Germany in 1803.

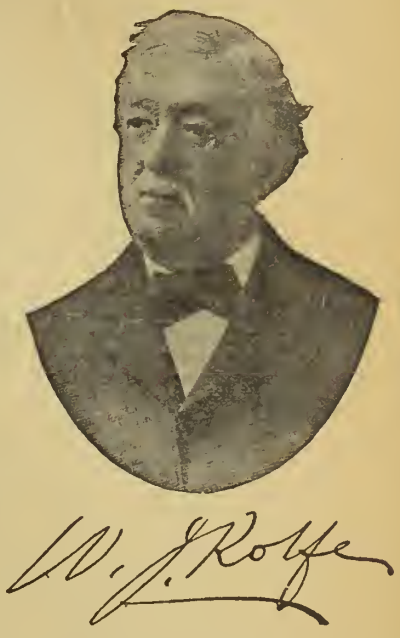
ROHILKHAND, or **ROHILCUND,** a division of British India, United Provinces; area, 10,885 sq. miles; pop. 5,343,674. It is subdivided into the districts Bijnur, Muradabad, Budaon, Bareli, Pilibhit, and Shahjahanpur. It incloses the native principality of Rampur.

ROHLFS (rōlfs), Friedrich Gerhard, a celebrated African traveler, born in 1831 at Vegesack, Germany. His works include, among others: Journey through Morocco (1869), Land and People of Africa (1870), Across Africa (1874–75), Journey from Tripoli to the Kufra Oasis (1881), My Mission to Abyssinia (1883). He died in 1890.

ROLAND, or **ORLANDO,** a celebrated hero of the romances of chivalry, and one of the paladins of Charlemagne, of whom he is represented as the nephew. His character is that of a brave, unsuspicious, and loyal warrior, but somewhat simple in his disposition. According to the Song of Roland, an old French epic, he was killed at the battle of Roncesvalles after a desperate struggle with the Saracens, who had attacked Charlemagne's rear-guard. The celebrated romantic epics of Boiardo (Orlando Innamorato) and Ariosto (Orlando Furioso) relate to Roland and his exploits.

ROLFE, William James, an American Shakespearean scholar and educator, born in Newburyport, Mass., in 1827. In 1867 he edited an edition of Craik's English of Shakespeare. This led to the preparation of a complete edition of Shakespeare (40 vols). He also edited the select Poems of Goldsmith; of Gray; of Tennyson; Enoch Arden and Other Poems; Scott's Complete Poems; Byron's Childe Harold; Macaulay's Lays of Ancient Rome; Wordsworth; In Memoriam; Idyls of the King; and a complete edition of Tennyson; Shakespeare, the Boy; Life of Shakespeare.

ROLLER, a genus of birds, generally of small size. The common roller is found in Europe as a summer visitor, but only occasionally visits Great Britain. Africa appears to be its native country. In size the roller averages the common jay. The plumage is in general an assemblage of blue and green, mixed with white, and heightened by the contrast of more sombre colors. The voice is noisy and harsh. The food consists of insects, small reptiles, and fruit.



ROLLIN (rol-an), Charles, a French historian, born at Paris in 1661, studied theology, obtained a chair in the Collége de France, and latterly was a rector of the University of Paris. He died in 1741. His Ancient History was long popular in English, but is now quite out of date.

ROLLING-MILL, a combination of machinery used in the manufacture of malleable iron and other metals of the same nature. It consists of one or more pairs of iron rollers, whose surfaces are made to revolve nearly in contact with each other, while the heated metal is passed between them, and thereby subjected to a strong pressure. The first rolling is to expel the scoriæ and other impurities, after which the mass of metal is cut into suitable lengths, which are piled on one another and reheated, when the mass which has been partially fused is again passed through the rollers. This second rolling determines its form into a hoop, rail, bar, or plate according to the form given to the surfaces of the rollers. See Iron.

ROMAN ARCHITECTURE, the style of building practiced by the ancient

Roman architecture.
Great hall in the baths of Caracalla.

Romans. Derived on the one hand from the Etruscans, and on the other from

the Greeks, the fusion ultimately resulted in an independent style. Its essential characteristics are, the employment of the Tuscan and the Composite order, and the introduction and free use of the semicircular arch and arcade, together with the use of rounded and prominent mouldings, often profusely decorated. In Roman architecture the great feature is the employment of the arch as well as the lintel, while Greek architecture employs the lintel only. It produced various constructions, unknown to Greek art, such as amphitheaters, circuses, aqueducts, bridges, baths, triumphal arches, etc. It has thus been of vastly greater practical utility than the Greek, and is bold and imposing in appearance. The column as a support, being no longer exclusively a necessity, was often of a purely decorative character, and was largely used in front of closed walls, in domes above circular interiors, and in the construction of cylindrical and groined vaulting over oblong spaces. The arch was freely used internally as well as externally, and became an important decorative feature of interiors. The Roman temples as a rule, from the similarity of the theogony to that of the Greeks were disposed after the Greek form, but a purely Roman type is seen in the circular temples such as the Pantheon at Rome, the temple of the Sibyl at Tivoli, the temple of Vesta at Rome, etc. This style of architecture was introduced by the Romans into all their colonies and provinces—vast existing remains evidencing the solid character of the buildings. It reached its highest stage during the reign of Augustus (B.C. 27), and after the translation of the seat of empire to Byzantium it degenerated and ultimately gave place to a debased style.

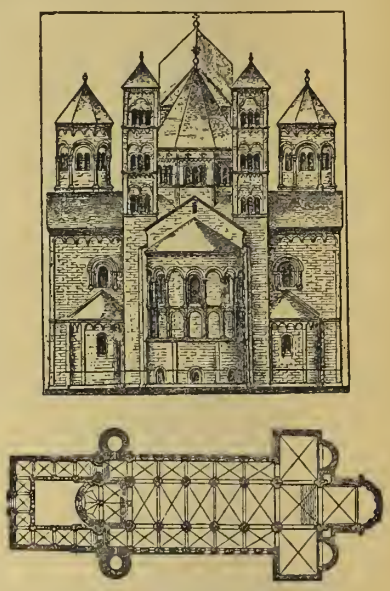
ROMAN CANDLE, a kind of firework consisting of a tube which discharges in rapid succession a series of white or colored stars or balls.

ROMAN CATHOLIC CHURCH, that society of Christians which acknowledges the bishop of Rome as its visible head. The foundation of the Christian church at Rome is uncertain, but St. Paul did not visit Rome until after he had written his Epistle to the Romans. The claim of supremacy on the part of the bishop of Rome is based on the belief that our Lord conferred on Peter a primacy of jurisdiction; that that apostle fixed his see at Rome; and that the bishops of Rome, in unbroken succession from Peter, have succeeded to his prerogative of supremacy. The distinctive character of the Roman church is the supremacy of the papacy. Its doctrines are to be found in the Apostles' creed, the Nicene creed, the Athanasian, and that of Pius IV. The latter added the articles on transubstantiation, invocation of saints, and others which chiefly distinguish the Roman from other Christian communities. The dogmas of the immaculate conception of the Virgin Mary and papal infallibility are recent additions. Roman Catholics believe that the mass is the mystical sacrifice of the body and blood of Christ, that the body and blood are really present in the eucharist, and that under either kind Christ is received whole and entire. They also believe in purgatory, that the Virgin Mary and the saints are to be honored and invoked, and that honor and veneration are to be given to their images. Seven sacraments are recognized, viz.: Baptism, confirmation, the holy eucharist, penance, extreme unction, holy orders, and matrimony. Fasting and confession form part of the discipline. The clergy of the church in the west are bound by a vow of celibacy implied in their ordination as sub-deacons. The clergy of those Greek and Armenian churches that are united in communion with the see of Rome, may receive orders if married, but may not marry after ordination. Under the generic name of Roman Catholics are comprised all churches which recognize the supremacy of the Pope of Rome, including the United Greeks, Slavonians, Ruthenians, Syrians Copts, and Armenians. The supreme council or senate of the Roman church is the college of cardinals, 70 in number, who are the advisors of the sovereign, and, on the death of the pontiff, elect his successor. The total number of members of the Roman Catholic church has been estimated at 229,000,000.

ROMANCE, a fictitious narrative in prose or verse, the interest of which turns upon incidents either marvelous or uncommon. The name is derived from the class of languages in which such narratives in modern times were first widely known and circulated: these were the French, Italian, and Spanish, called the Romance Languages.

ROMANCE LANGUAGES, those languages of South Europe which owe their origin to the language of Rome—the Latin—and to the spread of Roman dominion and civilization. They include the Italian, French, Provençal, Spanish, Portuguese, Roumanian, and Romansch. Their basis was not, however, the classic Latin of literature, but the popular Roman language—the Lingua Romana rustica spoken by the Roman soldiers, colonists, and others, and variously modified by uneducated speakers of the different peoples among whom it became the general means of communication. In all of these tongues Latin is the chief ingredient, and a knowledge of Latin helps very greatly in acquiring a knowledge of them.

ROMANESQUE ARCHITECTURE, a general and rather vague term applied to the styles of architecture which prevailed in Western Europe from the 5th to the 12th century. The Romanesque may be separated into two divisions: (a) the debased Roman, in use from the 5th to the 8th century; and (b) the later Romanesque of the 8th to the 12th century, which comprises the Lombard, Rhenish or German, and Norman styles. The former is characterized by a pretty close imitation of the features of Roman, with changes in the mode of their application and distribution; the latter, while based on Roman form, is Gothic in spirit, has a predominance of vertical lines, and introduces a number of new features and greatly modifies others. To the former belong especially churches of the basilica type in various cities of Italy, as also a number of circular churches, and many of these buildings have a certain affinity to the Byzantine type of architecture. The semicircular arch is used throughout the entire period and the general expression of the buildings is rather severe. It assumes different phases in different countries. In Romanesque churches of the 9th and the 11th century the prevailing features are: that in plan the upper limb of the cross is short and terminated by a semicircular or semioctagonal apse; the tran-



End view and plan of Romanesque church of Laach (Rhenish Prussia).

septs frequently short, and often rounded externally; the walls very thick, without buttresses or with buttresses having very slight projection; the pillars thick, sometimes simply cylindrical or clustered in large masses, and either plain or with but simple decoration; the capitals of cushion form, sometimes plain, at others enriched with various ornaments peculiar to the style. Externally, roofs of moderate pitch, towers square or octagonal, low or of moderate elevation, and with terminations of pyramidal character; windows round-headed and without mullions; doorways moderately recessed and

Romanesque ornament.

highly decorated with the cable, chevron and other distinctive ornaments; arcades much employed for decoration, frequently by a continuous series round the upper part of the apse and round the upper parts of transepts also, when the transepts are rounded externally. The principal front is frequently flat and decorated with arcades in successive rows from the apex of the roof till just above the portals, producing a rich effect. as at Pisa cathedral.

ROMANS, Epistle to the, the most elaborate, and, in a doctrinal point of

view, the most important composition of St. Paul. It sets forth that the gospel doctrine of justification by faith is a power unto salvation to all men, both Jews and Gentiles. The writer then deplores the rejection of the Jews, and in the practical part admonishes the Romans to exercise the various gifts bestowed upon each in a spirit of love and humility; he especially urges the strong to bear with the weak, and concludes with various salutations and directions. In modern times doubts have been thrown upon the authenticity of the concluding portion of this epistle, some critics regarding the whole of chapter xvi. as spurious.

ROMANTIC, a term used in literature as contradistinguished to antique or classic. The name romantic school was assumed about the beginning of the 19th century by a number of young poets and critics in Germany, the Schlegels, Novalis, Tieck, etc., whose efforts were directed to the overthrow of the artificial rhetoric and unimaginative pedantry of the French school of poetry. The name is also given to a similar school which arose in France between twenty and thirty years later, and which had a long struggle for supremacy with the older classic school; Victor Hugo, Lamartine, etc., were the leaders.

ROME, the most famous state of ancient times, originally comprising little more than the city of Rome, latterly an empire embracing a great part of Europe, North Africa, and Western Asia. The origin of Rome is generally assigned to the year 753 B.C., at which time a band of Latins, one of the peoples of Central Italy, founded a small town on the left bank of the Tiber, about 15 miles from the sea, the population being subsequently augmented by the addition of Sabines and Etruscans.

Toward the end of the 5th century B.C., after extending her territory to the south, Rome turned her arms against Etruria in the north. For ten years (405–396) the important city of Veii is said to have been besieged, till in the latter year it was taken by Camillus, and the capture of this city was followed by the submission of all the other towns in the south of Etruria.

During the period 343–264 Rome was engaged in many important wars, the chief of which were the four Samnite wars, the great Latin war, the war with the Greek cities of Southern Italy, and the war with Pyrrhus, the invader of Italy from Greece. Rome having conquered Italy, felt at liberty to contend for the possession of Sicily, at this time almost entirely under the dominion of the great maritime power of Carthage. An opportunity for interfering in Sicilian affairs was easily found, and in 264 B.C. the First Punic or Carthaginian war began. It lasted for more than twenty years, caused the loss of three large fleets to the Romans, and the defeat of a Roman army under Regulus in Africa; but in 241 a great victory over the Carthaginian fleet caused the latter power to sue for peace

Meanwhile the Carthaginians had been making considerable conquests in Spain, which awakened the alarm and envy of the Romans, and induced them to enter into a defensive alliance with the Greek colony of Saguntum, near the east coast of that country. In 221 B.C. Hannibal, the son of Hamilcar Barca, who had bravely and skilfully maintained the Carthaginian arms in Sicily, and had since founded and in great part established the Carthaginian empire in Spain, succeeded to the command of the Carthaginian forces. The taking of Saguntum, a city allied to Rome, occasioned the Second Punic war, during which Hannibal traversed Gaul, crossed the Alps, and invaded Italy. The war lasted for sixteen years (218–202 B.C.); and was carried on with consummate generalship on the part of Hannibal, who inflicted on the Romans one of the most disastrous defeats they ever sustained, at Cannæ, in 216 B.C. This great man was ill supported by his country, and the war terminated in favor of the Romans through the defeat of Hannibal by P. Cornelius Scipio at Zama in Africa in 202 B.C. (See Hannibal.) One of the results was that the power of Carthage was broken and Spain practically became a Roman possession.

Philip V. of Macedonia had favored Hannibal, and so gave Rome a pretext to mix in Grecian affairs. The result was that Macedonia was made a Roman province (148 B.C.), while in the same year that Carthage fell Corinth was sacked, and soon after Greece was organized into the province of Achaia. Previously Antiochus the Great of Syria had been defeated by the Romans and part of Asia Minor brought into vassalage to Rome. In the east Rome intrigued where she could, and fought when she was compelled, and by disorganizing states made them first her dependencies and then her provinces. In 130 B.C. she received by bequest the dominions of Attalus III. of Pergamus (Mysia, Lydia, Caria, and Phrygia), which was formed into the province of Asia. A serious war, almost of the nature of a civil war, followed with the Roman allies in Italy, who rose in 90 B.C. to demand the right of equal citizenship with the people of Rome. This war, known as the Social war, lasted for two years (90–88 B.C.), and ended in the victory of the Romans, who, however, found it advisable to concede the franchise to the Italian tribes to prevent another rising. The war had been concluded by Sulla, between whom and Marius great rivalry prevailed; and now sprang up the first Roman civil war, a struggle between the party of Marius (the people) and that of Sulla (the nobles). Sulla, the consul for 88, was on the point of starting for Asia to attack Mithridates, king of Pontus, a war that promised both glory and treasure. Marius was eager for the same command, and through intrigue on his behalf the populace deprived Sulla of the chief command and gave it to Marius. Thereupon Sulla marched on Rome with his legions, forced Marius to flee to Africa, and then proceeded to the Mithridatic war. In his absence Marius returned, wreaked a bloody vengeance on the partisans of his rival, and died after being appointed consul for the seventh time (86 B.C.). Three years later Sulla came back from Asia, having brought the Mithridatic war to a satisfactory conclusion, and now felt himself at liberty to take his revenge on the Marian party for the atrocities it had been guilty of toward his own party in his absence; and he took it in full measure. He was appointed dictator for an unlimited term (81 B.C.), and as such passed a series of measures the general object of which was to restore to the constitution its former aristocratic or oligarchical character. In the beginning of 79 B.C. Sulla retired into private life, and he died the year following.

The man who now came most prominently before the public eye was Pompey one of Sulla's generals. His first important achievement was the subjugatoin of the remnant of the democratic or Marian party that had gathered round Sertorius in Spain (76–72 B.C.). On his return to Italy he extinguished all that remained of an insurrection of slaves, already crushed by Crassus (71), and in 70 B.C. was consul along with Crassus. In 67 B.C. he drove the pirates from the Mediterranean, and afterward reduced Cilicia, which he made into a Roman province. He was then appointed to continue the war that had been renewed against Mithridates, king of Pontus, whom he finally subdued, forming part of his dominions in Asia Minor into a Roman province, and distributing the rest among kings who were the vassals of Rome. In 64 B.C. Pompey put an end to the dynasty of the Seleucidæ in Syria, and converted their kingdom into a province, and in 63 B.C. advanced southward into Judea, which he made tributary to Rome. All these arrangements were made by him of his own authority. In the very year in which they were completed a member of the aristocratic party, the great orator Cicero, had earned great distinction by detecting and frustrating the Catilinarian conspiracy.

Only three years after these events (60 B.C.) a union took place at Rome of great importance in the history immediately subsequent. Caius Julius Cæsar, a man of aristocratic family who had attached himself to the democratic party and had become very popular, joined Pompey and Crassus in what is called the first triumvirate, and practically the three took the government of Rome into their own hands. On the part of Cæsar, who was now elected consul, this was the first step in a career which culminated in the overthrow of the republic, and his own elevation to the position of sovereign of the empire. After the death of Crassus (53 B.C.) came the struggle for supreme power between Cæsar and Pompey. Cæsar had gained great glory by the conquest of Gaul, but now at Pompey's instigation was called on to resign his command and disband his army. Upon this he entered Italy, drove Pompey into Greece, and the short civil war of 49–48 B.C., and the great battle of Pharsalia in the latter year, decided the struggle in Cæsar's favor. Pompey's army was utterly routed; he himself was compelled to flee, and having gone to Egypt was there murdered. In a short time Cæsar utterly subdued the remains of the Pompeian party and became virtually

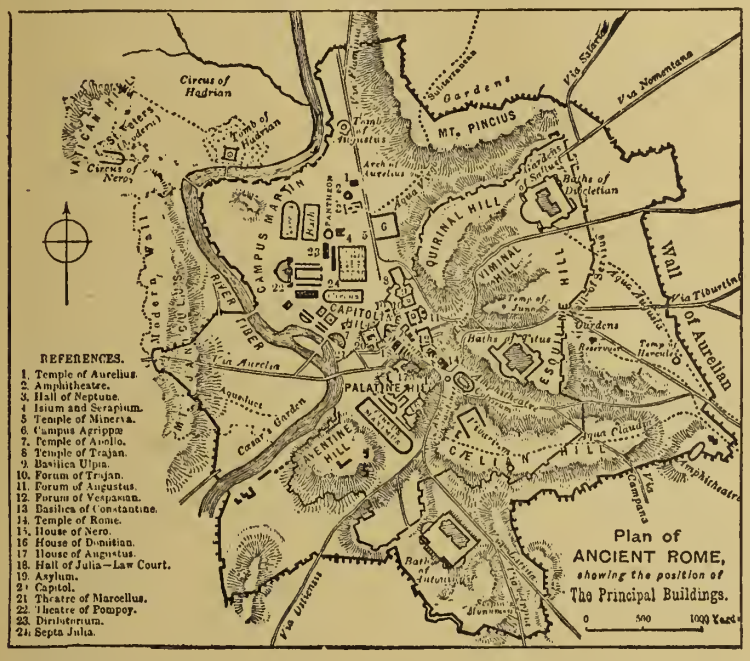
king in Rome. Cæsar was assassinated in 44 B.C., and the main result of the conspiracy by which he fell was that the first place in Rome had again to be contested. The competitors this time were Octavianus, the grand-nephew and adopted son of Cæsar, then only nineteen, and Mark Antony, one of Cæsar's generals. In 43 B.C. these two formed with Lepidus what is known as the second triumvirate; and after avenging the death of Cæsar and putting an end to the republican party in the battle of Philippi (42), Octavian and Antony, casting off Lepidus, who was a weakling, divided the empire between them, the former taking Rome and the West and the latter the East. In ten years war broke out between the two, and in the naval battle of Actium (31 B.C.) Antony was defeated, and the whole Roman world lay at the feet of the conqueror, Egypt being also now incorporated. Not long after this Octavian received the title of Augustus, the name by which he is known in history as the first of the Roman emperors.

In his administration of the empire Augustus acted with great judgment, ostensibly adhering to most of the republican forms of government, though he contrived in course of time to obtain for himself all the offices of highest authority. The reign of Augustus is chiefly remarkable as the golden age of Roman literature, but it was a reign also of conquest and territorial acquisition. Before the annexation of Egypt Pannonia had been added to the Roman dominions (35 B.C.), and by the subsequent conquest of Mœsia, Noricum, Rhætia, and Vindelicia, the Roman frontier was extended to the Danube along its whole course. Gaul and Spain also were now finally and completely subdued. The empire of Augustus thus stretched from the Atlantic to the Euphrates, and from the Rhine and the Danube to the deserts of Africa. This emperor died in 14 A.D. His reign is above all memorable for the birth of Christ in B.C. 4. Augustus was followed by a series of emperors forming, when he and Julius Cæsar are included, the sovereigns known as the Twelve Cæsars. The names of his successors and the dates of their deaths are: Tiberius, 37 A.D.; Caligula, 41; Claudius, 54; Nero, 68; Galba, 69; Otho, 69; Vitellius, 69; Vespasian, 79; Titus, 81; and Domitian, 96. Nerva's reign was short (96–98) but beneficent, and he was followed by four emperors, Trajan, Hadrian, Antoninus Pius, and Marcus Aurelius, who together reigned for more than eighty years, and under whom the countries making up the Roman empire enjoyed in common more good government, peace, and prosperity than ever before or after. Trajan (98–117) was a warlike prince, and added several provinces to the Roman empire. Hadrian (117–138), the adopted son of Trajan, devoted himself entirely to the internal affairs of his empire. It was in his reign that the southern Roman wall, or rampart between the Tyne and the Solway Firth, was erected. Antoninus Pius (138–161) was likewise the adopted son of his predecessor. In his reign the northern wall in Britain, between the Forth and Clyde, was constructed. The next emperor, Marcus Aurelius (161–180), was both the son-in-law and the adopted son of Antoninus Pius. He combined the qualities of a philosopher with those of an able and energetic ruler.

Commodus (180–192), the son and successor of Aurelius, inherited none of his father's good qualities, and his reign, from which Gibbon dates the decline of the Roman empire, presents a complete contrast to those of the five preceding emperors. In the long list of emperors who succeeded may be noted Septimius Severus, who reigned from 193 to 211, during which time he restored the empire to its former prestige. He reconquered Mesopotamia from the Parthians, but in Britain he confined the Roman province to the limit of Hadrian's Wall, which he restored. He died at York. Alexander Severus, who reigned from 222 till 235, was also an able ruler, and was also the first emperor who openly extended his protection to the Christians. His death was followed by a period of the greatest confusion. The empire was again consolidated under Aurelian (270–275), who subdued all the other claimants to the imperial dignity, and put an end to the Kingdom of Palmyra, which was governed by the heroic Zenobia. The reign of Diocletian (284–305) is remarkable as affording the first example of that division of the empire which ultimately led to the formation of the empire of the West and the empire of the East. This arrangement temporarily worked well, but in 323 Constantine, the son of Constantius, was left sole master of the empire. Ever since the time of Augustus and Tiberius, Christianity had been spreading in the Roman empire, notwithstanding terrible persecutions. The number of churches and congregations had increased in every city; the old religion had died out, and very few believed in it; so at last Constantine judged it wise to make the Christian religion the religion of the empire. He also removed the seat of government from Rome to Byzantium, which was hence called Constantinople (330), and completely reorganized the imperial administration. Constantine died in 337. The empire was left among his three sons, of whom Constantius became sole ruler in 353. The next emperor, Julian the Apostate, sought to restore the old religion but in vain. He was an able ruler, but fell in battle against the Persians in 363. He was succeeded by Jovian, who reigned less than one year; and after his death (364) the empire was again divided, Valens (364–378) obtaining the eastern portion, and Valentinian (364–375) the western. From this division, which took place in 364, the final separation of the eastern and western empires is often dated. In the reigns of Valens and Valentinian great hordes of Huns streamed into Europe from the steppes of Central Asia. After subduing the eastern Goths (Ostrogoths) they attacked those of the west (Visigoths); but these, since they had already been converted to Christianity, were allowed by Valens to cross from the left to the right bank of the Danube, and settle in Mœsia. In their new homes they found themselves exposed to the oppression and rapacity of the Roman governors, and when they could no longer brook such treatment they rose in rebellion, and defeated Valens in the sanguinary battle of Adrianople, in the flight from which the emperor lost his life (378). His son Gratianus created the heathen Theodosius co-regent, and intrusted him with the administration of the East. Theodosius became a Christian, fought successfully against the Western Goths, but was obliged to accept them as allies in their abodes in Mœsia and Thrace. In 394 the whole empire was reunited for the last time under Theodosius. After his death (395) the empire was divided between his two sons, Honorius and Arcadius, and the eastern and western sections became permanent divisions of the empire, the latter being now under Honorius. For the further history of the empire of the East, see Byzantine Empire.

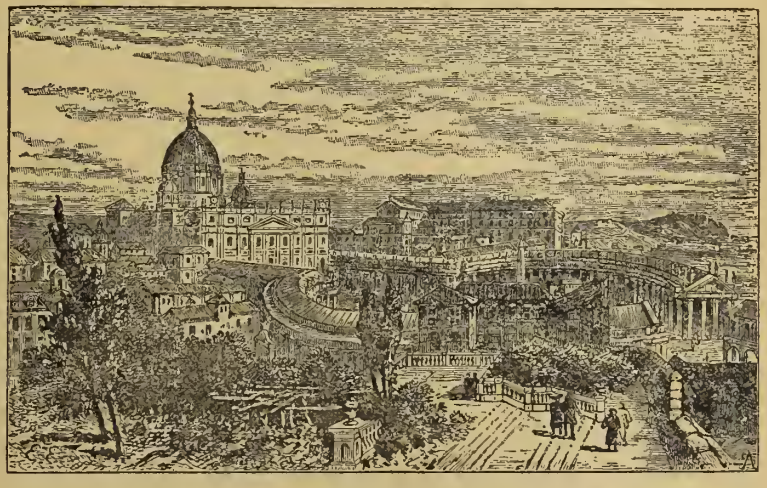
In 402 Alaric, king of the Visigoths who were settled on the south of the Danube, was incited to invade Italy, but he was soon forced to withdraw on account of the losses he suffered in battle (403). Scarcely had these enemies retreated when great hosts of heathen, Teutonic tribes, Vandals, Burgundians, Suevi, and others, made an irruption into Italy on the north; but these also were overcome by Stilicho, the guardian of the youthful emperor Honorius, in the battle of Fæsulæ (or Florence), and compelled to withrdaw (406). The Burgundians now settled in part of Gaul, while the Vandals and Suevi crossed the Pyrenees into Spain. In 408 Alaric marched into Italy, advanced up to the walls of Rome, and ultimately took the city by storm (410). Shortly after Alaric died, and his brother-in-law Athaulf (Adolphus) concluded a treaty with Honorius, and retired into Gaul, where the Visigoths founded in the southwest a kingdom that extended originally from the Garonne to the Ebro (412). About this time also the Romans practically surrendered Britain, by withdrawing their forces from it, and thus leaving it a prey to Teutonic pirates and northern savages. In 429 the Vandals wrested the province of Africa from the empire and set up a Vandalic kingdom in its place. In 452 the Huns left their settlements in immense numbers under their king Attila, destroyed Aquileia, took Milan, Pavia, Verona, and Padua by storm, laid waste the fruitful valley of the Po, and were already advancing on Rome when the Roman bishop, Leo I., succeeded in inducing them to conclude a peace with Valentinian, and withdraw. Soon after their leader Attila died (453), and after that the Huns were no longer formidable. Two years after the death of Attila, Eudoxia, the widow of Valentinian, the successor of Honorius, invited the assistance of the Vandals from Africa, who under their leader Genseric procceded to Rome which they took and afterward plundered for fourteen days, showing so little regard to the works of art it contained as to give to the word vandalism the sense it still expresses (455). They

then returned to Africa with their booty and prisoners. After the withdrawal of the Vandals, Avitus, a Gaul, was installed emperor. Under him the Suevian Ricimer, the commander of the foreign mercenaries at Rome, attained such influence as to be able to set up and depose emperors at his pleasure. The last of the so-called Roman emperors was Romulus Augustulus (475–476 A.D.). His election had been secured through the aid of the German troops in the pay of Rome, and these demanded as a reward a third part of the soil of Italy. When this demand was refused, Odoacer, one of the boldest of their leaders, deposed Romulus, to whom he allowed a residence in Lower Italy with a pension, and assumed to himself the title of King of Italy, thus putting an end to the Western Roman empire, A.D. 476.



ROME, the capital of Italy, as formerly of the Roman empire, republic, and kingdom, and long the religious center of western Christendom, is one of the most ancient and interesting cities of the world. It stands on both sides of the Tiber, about 15 miles from the sea. The ancient city occupied a series of eminences of small elevation known as the seven hills of Rome (the Capitoline, the Palatine, the Aventine, the Quirinal, the Viminal, the Esquiline, and the Cælian hill), while a small portion stood on the other side of the river, embracing an eighth hill (Janiculum). The city is tolerably healthy during most of the year, but in late summer and early autumn malaria prevails to some extent.

Ancient Rome was adorned with a vast number of splendid buildings, including temples, palaces, public halls, theaters, ampitheaters, baths, porticoes, monuments, etc., of many of which we can now form only a very imperfect idea. The oldest and most sacred temple was that of Jupiter Capitolinus, on the Capitoline Hill. The Pantheon, a temple of various gods (now church of S. Maria Rotonda), is still in excellent preservation. It is a great circular building with a dome-roof of stone 140 feet wide and 140 feet high, a marvel of construction, being 2 feet wider than the great dome of St. Peter's. The interior is lighted by a single aperture in the center of the dome. Other temples were the Temple of Apollo, which Augustus built of white marble, on the Palatine, containing a splendid library, which served as a place of resort to the poets; the Temple of Minerva, which Pompey built in the Campus Martius, and which Augustus covered with bronze; the Temple of Peace, once the richest and most beautiful temple in Rome, built by Vespasian, in the Via Sacra, which contained the treasures of the temple of Jerusalem, a splendid library, and other curiosities, but was burned under the reign of Commodus; the temple of the Sun, which Aurelian erected to the east of the Quirinal; and the magnificent temple of Venus, which Cæsar caused to be built to her as the origin of his family. The principal palace of ancient Rome was the Palatium or imperial palace, on the Palatine Hill, a private dwelling-house enlarged and adopted as the imperial residence by Augustus. Succeeding emperors extended and beautified it. Nero built an immense palace which was burned in the great fire. He began to replace it by another of similar extent, which was not completed till the reign of Domitian. Among the theaters, those of Pompey, Cornelius Balbus, and Marcellus were the most celebrated. That of Pompey, in the Campus Martius, was capable of containing 40,000 persons. Of the Theater of Marcellus, completed B.C. 13 a portion still remains. The most magnificent of the amphitheaters was that of Titus, completed A.D. 80, now known as the Coliseum or Colosseum. Although only one-third of the gigantic structure remains, the ruins are still stupendous. The principal of the circuses was the Circus Maximus, between the Palatine and Aventine, which was capable of containing 260,000 spectators. With slight exception its walls have entirely disappeared, but its form is still distinctly traceable. The porticoes or colonnades, which were public places used for recreation or for the transaction of business, were numerous in the ancient city, as were also the basilicas or public halls. Among them may be noticed the splendid Basilica Julia, commenced by Cæsar and completed by Augustus; and the Basilica Portia, which was built by Cato the censor. The public baths or thermæ in Rome were also very numerous. The largest were the Thermæ of Titus, part of the substructure of which may still be seen on the Esquiline Hill; the Thermæ of Caracalla, even larger, extensive remains of which still exist in the southeast of the city; and the Thermæ of Diocletian, the largest and most magnificent of all, part of which is converted into a church. Of the triumphal arches the most celebrated are those of Titus (A.D. 81), Severus (A.D. 203), and that of Constantine (A.D.



Rome.—St. Peter's and the Vatican.

311), all in or near the Forum and all well-preserved structures; that of Drusus (B.C. 8) in the Appian Way, much mutilated; that of Gallienus (A.D.262) on the Esquiline Hill, in a degraded style of architecture. Among the columns the most beautiful was Trajan's Pillar in the Forum of Trajan, 117 feet in height, still standing. The bas-reliefs with which it is enriched, extending in spiral fashion from base to summit, represent the exploits of Trajan, and contain about 2500 half and whole human figures. A flight of stairs within the pillar leads to the top. The most celebrated of the ancient sewers is the Cloāca Maxima, ascribed to Tarquinius Priscus, a most substantial structure, the outlet of which is still to be seen. The Roman aqueducts were formed by erecting one or several rows of arches superimposed on each other across a valley, and making the structure support a waterway or canal, and by piercing through hills which interrupted the watercourse. Some of them brought water from a distance of upward of 60 miles. Among others, the Acqua Paola, the Acqua Trajana, and the Acqua Marzia, still remain and contribute to the supply of the city, and also its numerous important ornamental fountains. Among the magnificent sepulchral monuments, the chief were the mausoleum of Augustus in the Campus Martius; and that of Hadrian, on the west bank of the Tiber, now the fortress of modern Rome, and known as the Castle of St. Angelo. The city was also rich in splendid private buildings, and in the treasures of art, with which not only the public places and streets, but likewise the residences and gardens of the principal citizens, were ornamented, and of which comparatively few vestiges have survived the ravages of time. The catacombs of Rome are subterranean galleries which were used as burial-places and meeting-places, chiefly by the early Christians, and which extend under the city itself as well as the neighboring country. The chief are the catacombs of Calixtus, St. Prætextatus on the Via Appia; of St. Priscilla 2 miles beyond the Porta Salora; of St. Agnese, outside the Porta Pia; of S. Sebastiano, beneath the church of that name, etc.

Among the principal streets and squares of modern Rome are the Piazza del Popolo immediately within the Porta del Popolo on the north side of the city near the Tiber, with a fine Egyptian obelisk in its center, and two handsome churches in front, standing so far apart from each other and from the adjoining buildings as to leave room for the divergence of three principal streets, the Via di Ripetta, the Corso, and the Via del Babuino. The Corso, recently widened and extended, stretches for upward of a mile in a direct line to its termination at the Piazza di Venezia, not far from the capitol, and is the finest street in the city. The appearance of the capitol has been entirely altered to permit the erection of a monument to Victor Emmanuel. The Via del Babuino proceeds first directly to the Piazza di Spagna, thence to the Quirinal, and by a tunnel opens out on the Esquiline. It contains a large number of handsome edifices. The whole of the city to the east of this street, and in the triangular space included between it and the Corso, is well aired and healthy, and is regarded as the aristocratic quarter. The Ghetto, or Jews' quarter, which occupied several mean streets parallel to the river and connected by narrow lanes, was cleared away by the municipal improvements in 1889. The city is supplied with good water partly by the above-mentioned aqueducts, which, constructed under the greatest difficulties five-and-twenty centuries ago, still serve the purpose for which they were built, and remain monuments of engineering skill. The chief open spaces besides the Piazza del Popolo are the Piazza S. Pietro, with its extensive colonnade; the Piazza Navona adorned with two churches and three fountains, one at each extremity and the third in the center; the Piazza di Spagna, adorned by a monumental pillar and a magnificent staircase of travertine, leading to the church of Trinità de' Monti, conspicuously seated on an eminence above it; the Piazza Berberini, beside the palace of the same name, adorned by a beautiful fountain; the Piazza Colonna, in the center of the city, with column of Marcus Aurelius; near it, in the Piazza di Monte Citorio, is the spacious Chamber of Deputies. Larger spaces for amusement or exercise have been formed only in a few spots. One of the finest is the Pincio, or "hill of gardens," overlooking the Piazza del Popolo, and commanding a fine view. It is a fashionable drive toward evening, and presents a gay and animated appearance. At a short distance outside the walls on the north of the city is the Villa Borghese, forming a finely-planted and richly-decorated park of 3 miles in circuit, which, though private property, forms the true public park of Rome, and is the favorite resort of all classes. Various localities in and near Rome that were malarious have been rendered healthy by planting eucalyptus trees.

The most remarkable of the churches is of course the cathedral of St. Peter, the largest and most imposing to be found anywhere, for the history and description of which see Peter's (St.). Another remarkable church is that of San Giovanni in Laterano, on an isolated spot near the south wall of the city. It was built by Constantine the Great, destroyed by an earthquake in 896, re-erected (904–911), burned in 1308, restored and decorated by Giotto. Again burned in 1360, rebuilt by Urban IV. and Gregory XI., and has undergone various alterations and additions from 1430 till the present façade was erected in 1734. A modern extension has involved the destruction of the ancient apse. From the central balcony the pope pronounces his benediction on Ascension-day; and the church is the scene of the councils which bear its name. The residence of the popes adjoined this church until the migration to Avignon; it is now occupied by the Gregorian museum of the Lateran. Santa Maria Maggiore, which ranks third among the basilicas, was founded by Pope Liberius (352–366), but has since had many alterations and additions, the more notable being those of the 15th and 16th centuries. Its interior, adorned with thirty-six Ionic pillars of white marble supporting the nave, and enriched with mosaics, is well preserved and one of the finest of its class. Santa Croce in Gerusalemme, the fourth of the Roman basilicas, takes its name from its supposed possession of a portion of the true cross, and a quantity of earth which was brought from Jerusalem and mixed with its foundation. Another church is that of San Clemente, on the Esquiline, a very ancient church, said to have been founded on the house of Clement, St. Paul's fellow-laborer, by Constantine, and containing a number of interesting frescoes by Masaccio. It consists of a lower and an upper church, and from an archæological point of view is one of the most interesting. Others are Il Gesu, on the Corso, the principal church of the Jesuits, with a façade and cupola by Giacomo della Porta (1577), and an interior enriched with the rarest marbles and several fine paintings, decorated in the most gorgeous style, and containing the monument of Cardinal Bellarmine; Sta. Maria-degli-Angeli, originally a part of Diocletian's Baths, converted into a church by Michael Angelo, one of the most imposing which Rome possesses and containing an altar-piece by Muziano, a fine fresco by Domenichino, and the tomb of Salvator Rosa; Sta. Maria in Ara Cœli, on the Capitoline, a very ancient church approached by a very long flight of stairs, remarkable for its architecture and for containing the figure of the infant Christ called the santissimo bambino; Sta. Maria in Cosmedin, at the northern base of the Aventine, remarkable for its fine Alexandrine pavement and its lofty and beautiful campanile of the 8th century; Sta. Maria sopra Minerva, so called from occupying the site of a temple of that goddess, begun in 1285 and restored 1848–55, remarkable as the only Gothic church in Rome; and Sta. Maria in Dominica or della Navicella, on the Cælian, remarkable for eighteen fine columns of granite and two of porphyry, and the frieze of the nave painted in camaieu by Giulio Romano and Perino del Vaga. Among other notable churches are Sta. Maria della Pace, celebrated for its paintings, particularly the four Sibyls, considered among the most perfect works of Raphael; Sta. Maria del Popolo, interesting from the number of its fine sculptures and paintings (Jonah by Raphael, ceiling frescoes by Pinturicchio and mosaics from Raphael's cartoons by Aloisio della Pace); Sta. Maria in Trastevere, a very ancient church, first mentioned in 449, re-erected by Innocent III. in 1140, and recently restored; San Paolo fuori le Mura, erected to mark the place of St. Paul's martyrdom, founded in 388, and restored and embellished by many of the popes, burned in 1823, and since rebuilt with much splendor. It is of great size, and has double aisles and transepts borne by columns of granite. Above the columns of the nave, aisles, and transepts there is a continuous frieze enriched by circular pictures in mosiac, being portraits of the popes from St. Peter onward, each 5 feet in diameter. Between the win-

dows in the upper part of the nave are large modern pictures representing scenes from the life of St. Paul.

The Vatican, adjoining St. Peter's, comprises the old and new palace of the popes (the latter now the ordinary papal residence), the sistine chapel, the Loggie and Stanze, containing some of the most important works of Raphael, the picture-gallery, the museums (Pio-Clementino, Chiaramonti, Etruscan and Egyptian), and the library (220,000 vols. and over 25,000 MSS.). The palace on the Quirinal was formerly a favorite summer residence of the popes, but is now occupied by the King of Italy. Among the other palaces are the Palazzo della Cancelleria, the Senatorial Palace in which the senate holds its meetings, the Palazzo Barberini, Borghese, Colonna, Corsini Farnese, etc., etc.

Associations and institutions connected with art, science, or learning are numerous; one of them, the Accademia de' Lincei, founded in 1603 by Galileo and his contemporaries, is the earliest scientific society of Italy. Besides the Vatican library mentioned above, the chief are the Vittorio Emanuelo, 500,000 vols.; Biblioteca Casanatense, 200,000 vols.; the Biblioteca Angelica, 150,000 vols.; the Biblioteca Barberini, 100,000 vols., and over 10,000 MSS., etc. For elementary education much has been done since the papal rule came to an end. Hospitals and other charitable foundations are numerous. The principal hospital, called Spirito Santo, a richly-endowed institution situated on the right bank of the Tiber, combines a foundling hospital (with accommodation for 3000), a lunatic asylum (accommodation for 500), an ordinary infirmary (accommodation for 1000), and a refuge for girls and aged and infirm persons. The chief theaters are the Teatro Apollo, Teatro Argentina, Teatro Valle, the Capranica, Metastasio, Rossini, Costanzi, etc.

The external trade is unimportant, and is carried on chiefly by rail, the Tiber being navigated only by small craft. There are railway lines connecting with the general system of Italy; and steamers run from Civita Vecchia and Fiumicino to Naples, Leghorn, Genoa, etc. For local passenger traffic there are now horse and electric tramways. A ship canal is projected to connect the city with the sea. The chief manufactures are woolen and silk goods, artificial flowers, earthenware, jewelry, musical strings, mosaics, casts, and various objects of art. The trade is chiefly in these articles, and in olive-oil, pictures, and antiquities. Pop. 490,620.

ROME, a city in Oneida co., New York, on the Mohawk river, 109 miles w.n.w. of Albany; has considerable manufactures of machinery, iron, and builders' wood-work, and a large trade in dairy produce. Pop. 15,343.

ROM'ULUS was the mythical founder and first king of Rome. His mother was the Vestal virgin, Sylvia or Ilia, a daughter of Numitor, king of Alba. By the god Mars she became the mother of the twins Romulus and Remus, who were ordered by Amulius, the usurping brother of Numitor, to be thrown into the Anio. The basket containing the two boys was stranded beneath a fig-tree at the foot of the Palatine Hill, and they were suckled by a she-wolf and fed by a woodpecker, until they were accidentally found by Faustulus, the king's herdsman, who took them home and educated them. When they had grown up they organized a band of enterprising comrades, by whose help they deposed Amulius and reinstated Numitor on his throne. They next resolved to found a city, but as they disagreed as to the best site for it, they resolved to consult the omens. The decision was in favor of Romulus, who immediately began to raise the walls. This is said to have happened in the year 753 (according to others 752 or 751) B.C. Remus, who resented his defeat, leaped over the rude rampart in scorn, whereupon Romulus slew him. Romulus soon attracted a considerable number of men to his new city by making it a place of refuge for every outlaw or broken man, but women were still wanting. He therefore invited the Sabines with their wives and daughters to a religious festival, and in the midst of the festivities he and his followers suddenly attacked the unarmed guests, and carried off the women to the new city. This led to a war, which was, however, ended at the entreaties of the Sabine wives, and the two states coalesced. Romulus is said finally to have miraculously disappeared in a thunderstorm (B.C.716).

RONDO (Italian), or **RONDEAU** (French), a poem of thirteen lines, usually octosyllabic, written throughout on two rhymes and arranged in three unequal stanzas; while the two or three first words are repeated as a refrain after the eighth and thirteenth lines. The term is also applied to a musical composition, vocal or instrumental, generally consisting of three strains, the first of which closes in the original key, while each of the others is so constructed in point of modulation as to reconduct the ear in an easy and natural manner to the first strain.

ROOD, a measure of surface, the fourth part of an acre, equal to 40 square poles or perches, or to 1210 square yards.

ROOF, the cover of any building, irrespective of the materials of which it is composed. Roofs are distinguished, 1st,

Shed Roof Gable Roof.

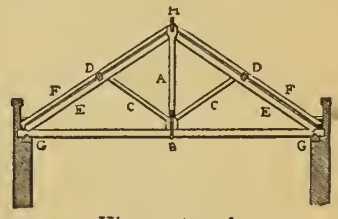
by the materials of which they are mainly formed, as stone, wood, slate, tile, thatch, iron, etc.; 2d, by their form

Hip roof. Conical roof. Ogee roof.

and mode of construction as shed, curb, hip, gable, pavilion, ogee, and flat roofs. The span of a roof is the width between the supports; the rise is the height in the center above the level of the supports; the pitch is the slope or angle at which it is inclined. In carpentry roof signifies the timber framework by which the roofing materials of the building are

Curb roof. M-roof.

supported. This consists in general of the principal rafters, the purlins, and the common rafters. The principal rafters, or principals, are set across the



King-post roof.

a, King-post. *cc*, Struts or braces. *ee*, Backs or principal rafters. *gg*, Wall-plates. *b*, Tie-beam. *dd*, Purlins. *ff*, Common rafters. *h*, Ridge-piece.

building at about 10 or 12 feet apart; the purlins lie horizontally upon these, and sustain the common rafters, which carry the covering of the roof. Some-

Queen-post roof.

aq, Queen-posts. *cc*, Struts or braces. *e*, Straining-beam. *gg*, Wall-plates. *b*, Tie-beam. *dd*, Purlins. *ff*, Common rafters. *h*, Ridge-piece.

times, when the width of the building is not great, common rafters are used alone to support the roof.

ROOK, a bird of the crow family, differing from the crow in not feeding upon carrion, but on insects and grain. It is also specially distinguished by its gregarious habits, and by the fact that the base of the bill is naked, as well as the forehead and upper part of the throat. In Britain and Central Europe the rook is a permanent resident; but in the north and south it is migratory in habits.

ROOSEVELT, Theodore, the twenty-sixth president of the United States, was born in New York City in 1858. He was elected to the New York assembly in 1881, and allied himself with the republican minority. He was a delegate to the republican national convention of 1884. In 1886 he was the republican candidate for mayor of New York City. From 1889 to 1895 he was a member of the United States civil service commission, being appointed by President Harrison and retained by President Cleveland. In 1895 he became president of the police board in New York City and served for two years. President McKinley in 1897 appointed him assistant secretary of the navy, and his work was of value in hurrying the navy to readiness for the

war with Spain. He resigned from the department in April, 1898, and was active in organizing the First United States Volunteer Cavalry, popularly known as "Roosevelt's Rough Riders." He was first lieutenant-colonel and afterward colonel, being promoted for gallantry in the action at Las Guasimas, Cuba.

He was elected in 1898 governor of New York. He was nominated for vice-president in 1900, and was elected in November of the same year. On September 14, 1901, at the death of McKinley, Roosevelt became his successor. He was nominated in 1904 for the presi-

Theodore Roosevelt

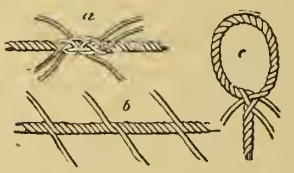
dency and was elected over Parker, his democratic opponent, by a plurality of 2,549,331, and a majority over all of 1,761,998. The vote in the electoral college was Roosevelt 336, Parker 140. This was the largest popular majority ever given a presidential candidate. Upon his election Roosevelt declared he would not accept a renomination and held to that determination despite the pressure upon him by his friends. His administration was marked by the real beginning of the Panama canal, his vigorous opposition to trusts and his attempts to reconcile capital and labor. Upon his retirement in 1909, he left for a hunting trip in Africa.

Mr. Roosevelt is the author of the following works: The Naval War of 1812, Life of Thomas Hart Benton and Life of Gouverneur Morris, Ranch Life and Hunting Trail, History of New York City, The Winning of the West, 4 vols.; Essays on Practical Politics, The Wilderness Hunter, American Political Ideals, The Rough Riders, Life of Oliver Cromwell, The Strenuous Life.

ROOT, Elihu, an American lawyer, was born at Clinton, N. Y., in 1845. He began to practice law in 1867, was especially successful as a corporation lawyer, and was counsel for the sugar trust, for New York street railways, and for various railroad companies. From 1883 to 1885 he was United States district attorney in New York City. In 1899 he was appointed secretary of war to succeed Russell A. Alger. He continued in office during McKinley's second administration and under President Roosevelt until the summer of 1903, when he resigned and was succeeded by William H. Taft. He was a member of the Alaskan boundary dispute in 1903, and in 1905 was appointed by President Roosevelt secretary of state.

ROOT, George Frederick, musician, was born in Sheffield, Mass., August 30, 1820. He was self-taught in the art, and in his eighteenth year he went to Boston to become a teacher of music. In 1844 he removed to New York; he taught there for a while, and in 1850 he went to Paris to study. In 1859 he became a member of the Chicago music house of Root and Cady. Many of his songs have achieved great popularity particularly his war songs, among which are Battle Cry of Freedom, Tramp, Tramp, Tramp, Just Before the Battle, Mother. He died in 1905.

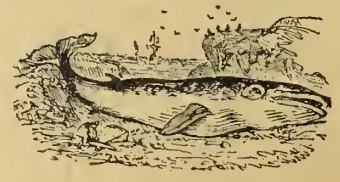
ROPE, a general name applied to cordage over 1 inch in circumference. Ropes are usually made of hemp, flax, cotton, coir, or other vegetable fiber, or of iron, steel, or other metallic wire. A hempen rope is composed of a certain number of yarns or threads which are first spun or twisted into strands, and the finished rope goes under special names according to the number and arrangement of the strands of which it is composed. A hawser-laid rope is composed of three strands twisted left-hand, the yarn being laid up right-hand. A cable-laid rope consists of three strands of hawser-laid rope twisted right-hand; it is called also water-laid, or right-hand rope. A shroud-laid rope consists of a central strand slightly twisted, and three strands twisted around it, and is thus called also four-strand rope. A flat rope



Splices of ropes.
a, Short splice. *b*, Long splice. *c*, Eye splice.

usually consists of a series of hawser-laid ropes placed side by side and fastened together by sewing in a zigzag direction. Wire ropes are made of a certain number of wires twisted into the requisite number of strands, and are now extensively used in the rigging of ships as well as for cables. For greater flexibility hempen cores are used; thus for instance we may have a rope of six strands around a hempen core, each strand consisting of six wires around a smaller hempen core. Steel-wire makes a considerably stronger rope than iron wire. Coir ropes are much used on board ships, as, though not so strong as hemp, they are not injured by the salt water.

RORQUAL, the name given to certain whales, closely allied to the common



Rorqual.

or whalebone whales, but distinguished by having a dorsal fin, with the throat and under parts wrinkled with deep longitudinal folds, which are supposed to be susceptible of great dilatation, but the use of which is as yet unknown. Two or three species are known, but they are rather avoided on account of their ferocity, the shortness and coarseness of their baleen or whalebone, and the small quantity of oil they produce. The northern rorqual attains a great size, being found from 80 to over 100 feet in length, and is thus the largest living animal known. The rorqual feeds on cod, herring, pilchards, and other fish, in pursuing which it is not seldom stranded on the British shores.

ROSA'CEÆ, a large and important order of plants, of which the rose is the type, distinguished by having several petals, distinct, perigynous, separate carpels, numerous stamens, alternate leaves, and an exogenous mode of growth. The species, including herbs, shrubs, and trees, are for the most part inhabitants of the cooler parts of the world. Scarcely any are annuals. The apple, pear, plum, cherry, peach, almond, nectarine, apricot, strawberry, raspberry, and similar fruits, are the produce of the order. Some of the species are also important as medicinal plants.

ROSA'RIO, a town of the Argentine Republic, in the province of Santa Fé, on the right bank of the Paraná, 170 miles northwest of Buenos Ayres. Pop. 93,584.

RO'SARY, among Roman Catholics the recitation of the Ave Maria and the Lord's Prayer a certain number of times. The name is also commonly given to the string of beads by means of which the prayers are counted. The complete or Dominican rosary consists of 150 small beads for the Aves, divided into groups of 10 by 15 large beads for the Paternosters. The ordinary rosary has only 50 small beads and 5 large beads; but if repeated thrice makes up the full rosary. A doxology is said after every tenth Ave. The use of rosaries was probably introduced by the Crusaders from the East, for both Mohammedans and Buddhists make use of strings of beads while repeating their prayers; but St. Dominic is usually regarded as the inventor in the Roman church.

ROSCOM'MON, an inland county of Ireland, in the east of the province of Connaught, has an area of 607,691 acres, of which 480,813 are productive. The chief towns are Roscommon, Boyle, and Castlerea. The county sends two members to parliament. Pop. 101,639.

ROSE, the beautiful and fragrant flower which has given name to the largest natural order Rosaceæ, seems to be confined to the cooler parts of the northern hemisphere. The species are numerous, and are extremely difficult to distinguish. They are prickly shrubs, with pinnate leaves, provided with stipules at their base; the flowers are very large and showy; the calyx contracts toward the top, where it divides into five lanceolate segments; the corolla has five petals, and the stamens are numerous; the seeds are numerous, covered with a sort of down, and are attached to the interior of the tube of the calyx, which, after flowering, takes the form of a fleshy globular or ovoid

berry. The rose is easily cultivated and its varieties are almost endless.

ROSEBERY, Archibald Philip Primrose, Earl of, born in 1847, was educated at Eton and Oxford, and succeeded his grandfather in 1868. In 1892–94 he was secretary for foreign affairs under Mr. Gladstone, and in 1894–95 he was himself Prime Minister. He has advocated the reform of the House of Lords, and is much interested in the questions of imperial federation and the social condition of the masses. In 1878 he married Hannah, daughter of Baron Mayer de Rothschild, but lost his wife in 1890. He is author of works on Pitt and on Napoleon.

ROSECRANS (rō′ze-krănz), William Starke, American general, was born at Kingston, Ohio, in 1819. He graduated at West Point in 1842. In June, 1861, he was appointed colonel of the twenty-third Ohio. He took part in General McClellan's West Virginia campaign and won the battle of Rich mountain. Shortly afterward he was put in command of the federal forces in western Virginia. In 1862 he commanded the right wing of the army of the Mississippi in the advance on Corinth, fought the battle of Iuka, and successfully defended Corinth against Generals Van Dorn and Price, and relieved General Buell as commander of the army of the Cumberland. He defeated General Bragg in the

W. S. Rosecrans.

battle of Murfreesboro, or Stoneriver. In 1864 he moved into East Tennessee, and was defeated by Bragg in the battle of Chickamauga. Rosecrans was succeeded by Thomas, and after a short period of service in charge of the department of Missouri he was relieved of all command. At the close of the war he resigned from the army; in 1868 he served as minister to Mexico. He was elected to congress in 1880 and again in 1882, as a democrat. From 1885 to 1893 he was register of the United States treasury. In 1889 congress passed an act restoring him to the rank and pay of a brigadier-general. He died in 1898.

ROSE-CHAFER, or ROSE-BEETLE, a beetle which frequents roses, feeding on the honey they contain. The rose-chafer or rose-bug of the United States is destructive to roses and other plants.

ROSEMARY, a shrubby aromatic plant, a native of S. Europe. It has but two stamens; the leaves dark green, with a white under surface; the flowers are pale blue. At one time of considerable repute for medicinal purposes, rosemary is now esteemed chiefly for yielding, by distillation, the aromatic perfume known as oil of rosemary.

ROSE OF JERICHO, a small cruciferous plant, growing in the arid wastes of Arabia and Palestine. When full grown and ripe its leaves drop and it becomes rolled up like a ball in the dry season, but opens its branches and seed-vessels when it comes in contact with

Rose of Jericho.

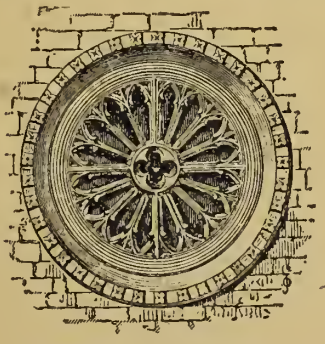
1, The plant. 2, The plant in a dry state. 3, The same expanded after being put in water.

moisture. The generic name has been applied to it from this circumstance, and in Greek signifies resurrection.

ROSES, Wars of the, the fierce struggle for the crown of England between the Lancastrians (who chose the red rose as their emblem) and the Yorkists (who chose the white); it lasted with short intervals of peace for thirty years (1455–85), beginning with the battle of St. Albans and ending with Bosworth Field.

ROSETTA-STONE, a tablet of black basalt, bearing an inscription in three versions (hieroglyphic, enchorial, and Greek) in honor of Ptolemy Epiphanes and belonging to about 196 B.C. It furnished the key for the deciphering of the hieroglyphic inscriptions. The stone, discovered by the French near Rosetta in 1799, is now in the British museum. See Hieroglyphics.

ROSE-WINDOW, a circular window, divided into compartments by mullions and tracery radiating from a center, also called Catharine-wheel, and marigold-window, according to modifications of the design. It forms a fine feature in the church architecture of the 13th and 14th



Rose-window, St. David's.

centuries, and is mostly employed in the triangular spaces of gables. In France it is much used, and, notwithstanding difficulties of construction, attained great size. Some examples, as that at Rheims cathedral, are over 40 feet in diameter.

ROSEWOOD, a wood so named because some kinds of it when freshly cut have a faint smell of roses. Most rosewood comes from Brazil, but it is also found in Honduras and Jamaica. The name is sometimes given to timber from other sources; but the French Bois de Rose (the German Rosenholz) is called tulip-wood in English.

ROSICRUCIANS, members of a secret society, the first account of which was published early in the 17th century in two books now generally ascribed to J. V. Andreæ, a Lutheran clergyman of Württemberg. Many regard Andreæ's writings as merely a veiled satire on his own times, and deny altogether the actual existence of any such society, in spite of the fact that since his day many persons (e.g. Cagliostro) have professed to belong to it. The aim of the Rosicrucians, or Brothers of the Rosy Cross, was said to be the improvement of humanity by the discovery of the "true philosophy," and they claimed a deep knowledge of the mysteries of nature, such as the permutation of metals, the prolongation of life, the existence of spirits, etc. According to Andreæ the society was founded in the 14th century by a German baron named Rosenkreuz (i.e. "rosy cross"), who was deeply versed in the mysterious lore of the East, and who assembled the initiated in a house called the Sancti Spiritus Domus. The "secret" of the order, if it ever existed, has been faithfully guarded by its members; and the general cloud of mystery shrouding its history and objects has led to its being connected in public opinion with the Cabalists, Illuminati, etc. Some regard Rosicrucianism as the origin of freemasonry.

ROSIN, the name given to the resin of coniferous trees employed in a solid state for ordinary purposes. It is obtained from turpentine by distillation. In the process the oil of the turpentine comes over and the rosin remains behind. There are several varieties of rosin, varying in color from the palest amber to nearly black, and from translucent to opaque. It differs somewhat according to the turpentine from which it is derived, this being obtained from numerous species of pine and fir. Rosin is a brittle solid, almost flavorless, and having a characteristic odor. It is used in the manufacture of sealing-wax, varnish, cement, soap, for soldering, in plaisters, etc. Colophony is a name for the common varieties.

ROSS, Alexander, born in Nairnshire, Scotland, 1783; died at Red River settlement (Winnipeg), 1856. He went to Canada in 1805; joined Astor's expedition to Oregon in 1810, and was afterward a fur-trader in the Hudson's bay service. He is the author of Adventures of the First Settlers on the Oregon, Fur Hunters of the Far West, and the Red River Settlement.

ROSS, Edward Alsworth, American economist and sociologist, born in 1866 in Virden, Ill. He was professor at Leland Stanford university from 1893 to 1900, first of economics and then of sociology. He resigned in 1900 under pressure and this action aroused considerable excitement over the right of academic free speech. Afterward he was appointed professor of sociology in the University of Nebraska. His publications include: Sinking Funds, Honest Dollars, a free-silver pamphlet, and

Social Control, a Survey of the Foundation of Order.

ROSS, Sir James Clark, Arctic and Antarctic explorer, was born in London in 1800; died in 1862. He commanded the expedition in the Erebus and Terror to the Antarctic ocean in 1839–43 and on his return published a narrative of that voyage, which has contributed largely to geographical and scientific knowledge generally. Captain Ross was knighted for his services, and received numerous other honors. In 1848 he made a voyage in the Enterprise to Baffin's bay in search of Sir John Franklin.

ROSS, Sir John, Arctic navigator, born in 1777, died in 1856, was the fourth son of the Rev. Andrew Ross, minister of Inch, Wigtownshire. His main expedition, in the steamer Victory, was equipped by Sir Felix Booth, and set out in May, 1829. Ross entered Prince Regent's Inlet, and discovered and named Boothia Felix and King William's Land. In 1832 he was forced to abandon his ships, and he and his crew suffered great hardships before they were picked up in August, 1833, by his old ship the Isabella. In 1834 Captain Ross was knighted, and in the following year published a narrative of his second voyage. In 1850 he made a last Arctic voyage in the Felix, in a vain endeavor to ascertain the fate of Sir John Franklin. He became a rear-admiral in 1851.

ROSS AND CROMARTY, formerly two separate counties of Scotland, now united into one. The latter consisted merely of detached portions scattered over the former. The county extends across the breadth of Scotland from the North sea to the Atlantic, between the counties of Inverness and Sutherland, and includes the island of Lewis and other islands. Area of the whole, 2,003,-065 acres, of which 220,586 belong to Cromarty. Principal towns: Dingwall (the county town), Stornoway, Cromarty, Invergordon, Tain, and Fortrose. Pop. 76,149.

ROSSE, William Parsons, third earl of, was born at York in 1800, died 1867. In 1827 he constructed a telescope, the speculum of which had a diameter of 3 feet, and the success and scientific value of this instrument induced him to attempt to cast a speculum twice as large. After innumerable difficulties, for every step had to be pioneered by experiment, and after many failures, Lord Rosse succeeded in 1845 in perfecting machinery which turned out the huge speculum, weighing 3 tons, without warp or flaw. It was then mounted in his park at Parsonstown, on a telescope 54 feet in length with a tube 7 feet in diameter. A series of cranks, swivels, and pulleys enables this huge instrument to be handled almost with as much ease as telescopes of ordinary size. The sphere of observation was immensely widened by Lord Rosse's instrument, which has been chiefly used in observations of nebulæ.

ROSSET'TI, Gabriel Charles Dante, better known as Dante Gabriel, painter and poet, was born in London in 1828, and died in 1882. In 1849 he exhibited his painting of the Girlhood of Mary, Virgin; but his later works, numerous as they were, were rarely seen by the public until the posthumous exhibition of a collection of his paintings in 1883 at the Royal Academy. Rossetti is even more famous as a poet; and his poems are characterized by the same vivid imagination, mystic beauty, and sensuous coloring as his paintings. In both arts he appears as a devotee of mediævalism. His chief poems are the House of Life, a poem in 101 sonnets; the King's Tragedy and other Ballads, Dante at Verona, Blessed Damozel, etc. His wife died in 1862, two years after marriage, and from this grief he never entirely recovered.—His sister, Christina Georgina (b. 1830, d. 1894), was a poetess of high merit. Her chief works are: Goblin Market and other Poems (1862), The Prince's Progress and other Poems (1866), The Pageant and other Poems (1881), besides prose stories, books for children, and several devotional works in prose and poetry.

ROSSI'NI, Gioachino Antonio, Italian operatic composer, was born at Pesaro, February 29, 1792; died November 13, 1868. He is specially considered to be a master of melody. His finest opera is William Tell (1829). Other chief works are: Othello (1816), Moses in Egypt (1818), and Semiramide (1823); and the comic operas, the Barber of Seville (1816) and La Cenerentola (1817). He also composed a Stabat Mater (1842), a Missa Solennis (first performed 1869), and various cantatas, oratorios, and pianoforte pieces.

ROSTAND (rō'stän'), Edmond, French dramatist, was born in Marseilles in 1868. His first drama Les Romanesques was a success and was followed by La Princesse Lointaine and La Samaritaine. In 1897 his Cyrano de Bergerac was a success on two continents and in 1900 his historical drama L'Aiglon having for its central figure the unhappy Duke of Reichstadt "Napoleon II" added greatly to his reputation. Rostand was elected a member of the French academy in 1901.

ROSTOV, or **ROSTOF,** a town of Southern Russia, in the province of the Don Cossacks, on the Don, about 20 miles above its mouth in the Sea of Azof. Pop. 150,000.

ROT, a disease incident to sheep (sometimes to other animals), and caused by the presence in the gall-bladder and biliary ducts of the common liver-fluke, developed from germs swallowed by the sheep with their food. The average length of the mature fluke is about 1 inch. Within the liver of a single sheep several dozen of these parasites may sometimes be found. The disease is promoted by a humid state of atmosphere, soil, or herbage. It has different degrees of rapidity, but is almost invariably fatal.

ROTATION, in physics, is the motion of a body about an axis, so that every point in the body describes a circular orbit, the center of which lies in the axis. It is thus distinguished from revolution, or the progressive motion of a body revolving round another body or external point. If a point, which is not the center of gravity, be taken in a solid body, all the axes which pass through that point will have different moments of inertia, and there must exist one in which the moment is a maximum, and another in which it is a minimum. Those are called the principal axes of rotation. When a solid body revolves round an axis its different particles move with a velocity proportional to their respective distances from the axis, and the velocity of the particle whose distance from the axis is unity is the angular velocity of rotation.

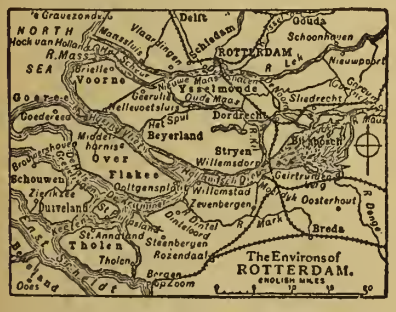
ROTATION OF CROPS, in agriculture and horticulture, is the system or practice of growing a recurring series of different annual crops upon the same piece of land. The system is based on the fact that different crops absorb different quantities of the various inorganic constituents of the soil, thus impoverishing it for crops of the same kind, but leaving it unimpaired, or even improved, for crops feeding upon other constituents. Different soils and climates require different schemes of rotation, but it is a tolerably universal rule that culmiferous or seed crops should alternate with pulse, roots, herbage, or fallow. The rotation of crops may be arranged in "courses" or "shifts" of any number of successive crops; 3, 4, or 5, years' courses are perhaps the commonest.

ROTH'ERHAM, a municipal borough of England, in the West Riding of Yorkshire, 5 miles northeast of Sheffield, on the Don, at its junction with the Rother. The fine Perpendicular church dates from the time of Edward IV.; the grammar-school from 1483. Rotherham has an Independent college, and extensive iron-works and manufactures of iron goods, soap, glass, etc. Pop. 54,348. It gives name to a parliamentary division.

ROTHSCHILD (rōt'shilt; in English generally pronounced roths'child or ros-child), the name of a family of Jewish bankers, distinguished for their wealth and influence. The founder of the original banking-house was Mayer Anselm Bauer (1743–1812), a poor orphan, born in Frankfort-am-Main. Though educated as a teacher, Bauer entered a bank in Hanover, and finally saved sufficient capital to found a business of his own in the famous Judengasse of Frankfort, at the sign of the Red Scutcheon (Roth Schild), which afterward gave name to the family. He gained the friendship of the Landgrave of Hesse, who appointed him his agent, and in 1802 he undertook his first government loan, raising ten million thalers for Denmark. At his death in 1812 he left five sons, the eldest of whom, Anselm Mayer von Rothschild (1773–1885), became head of the firm in Frankfort, while the others established branches at various foreign capitals; Solomon Mayer (1774–1855) at Vienna, Nathan Mayer (1777–1836) in London, Karl Mayer (1788–1855) at Naples, and Jacob (1792–1868) at Paris. These branches, though in a measure separate firms, still conduct their operations in common; and no operation of magnitude is undertaken by any without a general deliberation of all at Frankfort. The Naples branch was discontinued in 1860; the two sons of Karl Mayer (Mayer Karl, 1820–86, and Wilhelm Karl) succeeding their childless uncle Anselm at Frankfort. The bold,

yet skilful and cautious operations of the Rothschilds during the troubled political years after 1813 confirmed the fortunes of the firm. Nathan Mayer in particular distinguished himself by his energy and resource. By means of special couriers, carrier-pigeons, swift sailing-boats, etc., he was frequently in possession of valuable information (e.g. the result of the battle of Waterloo) even before the government, and skilfully turned his advantage to account. The Rothschilds do not contemn comparatively small operations; but they are chiefly famous for the enormous loans which they raise and manage for different European governments. In 1822 the five brothers were made barons by Austria; and in 1885 Baron Nathan von Rothschild (1840–1905) was raised to the English peerage. Lionel Nathan (1808–79), the father of the last-named, was the first Jew who sat in parliament (1858); and various other members of the family have risen to positions of honor and dignity both in Britain and other countries. Baron Alphonse, the head of the firm of Rothschild, governor of the bank of France, died in Paris in 1905.

ROTTERDAM, the chief port and second city in Holland, is situated on the



Nieuwe Maas or Meuse, at its junction with the Rotte, about 14 miles from the North sea, with which it is also directly connected by a ship canal (Nieuwe Waterweg) admitting the largest vessels and not interrupted by a single lock. The town is intersected by numerous canals, which permit large vessels to moor alongside the warehouses in the very center of the city. These canals, which are crossed by innumerable drawbridges and swing-bridges, are in many cases lined with rows of trees; and the handsome quay on the river front, 1¼ miles long, is known as the Boompjes ("little trees"), from a row of elms planted in 1615 and now of great size. Many of the houses are quaint edifices, having their gables to the street, with overhanging upper stories. The principal buildings are the town-hall, courthouses, exchange, old East India House, Boymans' museum, containing chiefly Dutch and modern paintings, and the government dockyards and arsenal, besides the numerous churches, of which the most conspicuous is the Groote Kerk, or church of St. Lawrence (15th century). The Groote Markt has a statue of Erasmus, a native of the town; and there are fine parks and a large zoological garden. Rotterdam contains ship-building yards, sugar-refineries, distilleries, tobacco-factories and large machine works; but its mainstay is commerce. It carries on a very extensive trade with Great Britain, the Dutch East and West Indies, and other transoceanic countries, and has an important commerce with Germany, Switzerland, and Central Europe. The Maas is crossed by a great railway-bridge and another for carriages and foot-passengers. Pop. 340,000.

ROUBAIX (rö-bā), a town of France, department Nord, 6 miles n.e. of Lille, is a highly important seat of the French textile industry. Woolens, cottons, and silk or mixed stuffs are chiefly made; also beet-sugar, machinery, etc. Pop. 124,977.

ROUBLE, a silver coin, the standard of money in Russia, with a legal weight (since January 1, 1886) of 19.99 grammes equal to about 76 cents. A rouble is divided into 100 copecks. Half and quarter roubles and smaller silver coins are also issued; but in actual circulation there is little but paper-money, current at about 30 per cent below its nominal value. The gold imperial is worth 10 roubles, the half-imperial 5 roubles.

ROUEN (rö-äṇ), the old capital of Normandy, now chief town of department Seine-Inférieure, in France, is situated on the Seine, 80 miles from the sea and 87 miles n.n.w. of Paris. It is the seat of an archbishop, and the fourth port in France. In its older parts the streets are narrow, picturesque, and ill-built, but interesting to the lover of mediæval architecture. The cathedral, erected in the 13th–15th centuries, is one of the finest Gothic monuments in Normandy, though it is surpassed in beauty by the exquisite church of St. Ouen, begun in 1318 and finished at the close of the 15th century. St. Maclou (15th century) is a fine example of florid Gothic. Among the secular buildings are the Palais de Justice (late 15th century), exuberant in decoration; the Hotel de Ville, formerly a part of the monastery of St. Ouen; the Hotel de Bourgthéroulde (15th century), with fine reliefs; the archbishop's palace; and the distinctive Tour de la Grosse-Horloge (1389). The new Musée, built in 1888, contains a large collection of paintings, chiefly of the French school. The municipal library has 120,000 volumes and 2500 MSS. Pop. 115,914; or including the faubourgs, 160,000.

ROUGE (rözh), a very fine scarlet powder, used by jewelers for polishing purposes, and prepared from crystals of sulphate of iron exposed to a high temperature. The name is also given to a cosmetic prepared from safflower.

ROUGE-ET-NOIR (rözh-ē-nwär; Fr. "red and black"), Trente-Un (trâṇt-un; "thirty-one"), or Trente et Quarante (trâṇt-ē-kâ-râṇt; "thirty and forty"), a modern game of chance played with the cards belonging to six complete packs. The punters or players stake upon any of the four chances: rouge, noir, couleur, and inverse. The banker then deals a row of cards for noir, until the exposed pips number between 30 and 40 (court-cards count 10, aces 1), and a similar row for rouge. That row wins which most nearly approaches the number 31, and players staking on the winning color receive their stake doubled. Couleur wins if the first card turned up in the deal is of the winning color; in the contrary case inverse wins. When the number of pips in both rows are equal it is a refait, and a fresh deal is made; but if both happen to count exactly 31 it is a refait de trente-et-un, and the banker claims one-half of all stakes. This last condition places the banker at an advantage calculated to be equal to about 1¼ per cent on all sums staked.

ROUGET DE LISLE. See Marseillaise Hymn.

ROULETTE (rö-let'; Fr. "little wheel"), a game of chance, in which a small ivory ball is thrown off by a revolving disc into one of 37 or 38 compartments surrounding it, and numbered from 1 to 36, with one or two zeros. Players who have staked upon the number of the compartment into which the ball falls receive thirty-six times their stake; less if they have staked upon more than one number.

Church of St. Laurens, Rotterdam.—After Sir A. W. Calcott, R. A.

There are also other chances on which stakes may be placed.

ROUMA'NIA, a European kingdom, bounded by Austria-Hungary, Servia, Bulgaria, the Black sea, and Russia; area, 50,760 sq. miles. It includes the former Danubian principalities of Walachia and Moldavia and the province of the Dobrudsha on the Black sea. Pop. 5,912,520. The capital is Bukarest; other chief towns are Jassy, Galatz, Braïla, and Giurgevo. The chief cereal crops are corn, wheat, barley, rye, and oats; tobacco, hemp, and flax are also grown; and wine is produced on the hills at the foot of the Carpathians. Cattle, sheep, and horses are reared in large numbers. Excellent timber abounds on the Carpathians. Bears, wolves, wild boars, large and small game, and fish are plentiful. The country is rich in minerals of nearly every description, but salt, petroleum, and lignite are the only minerals worked. Manufactures are still in a rudimentary state.

The Roumanians, who call themselves Romani, claim to be descendants

Roumanian peasants.

of Roman colonists introduced by Trajan; but the traces of Latin descent are in great part due to a later immigration, about the 12th century, from the Alpine districts. Their language and history both indicate that they are a mixed race with many constituents. Their language, however, must be classed as one of the Romance tongues, though it contains a large admixture of foreign elements. In Roumania there are about 4,500,000 Roumanians, 400,000 Jews, 200,000 gypsies, 100,000 Bulgars, 50,000 Magyars, 50,000 Germans, 15,000 Greeks, and 15,000 Armenians. Three-fourths of the population are peasants, who until 1864 were kept in virtual serfdom by the boiars or nobles. In that year upward of 400,000 peasant families were made proprietors of small holdings averaging 10 acres, at a price to be paid back to the state in fifteen years. About 4½ millions of the people belong to the Greek church. Energetic efforts are being made to raise education from its present low level. Roumania has two universities (at Bukarest and Jassy), several gymnasia, and a system of free primary schools, at which attendance is compulsory. Roumania is a hereditary constitutional monarchy, with a bicameral legislature.

ROUNDERS, a game played with a bat and a ball by two parties or sides, on a piece of ground marked off into a square or circle, with a batter's station and three goals all at equal distances. On the ball being thrown toward him the batter tries to drive it away as far as he can and run completely round the goals, or over any one of the four parts, before the ball can be thrown back to the batting station. The batter is declared out if he fails to secure a run after having had three balls, if a fielder returns the ball so as to strike him while running, or if the ball from his bat is caught in the air by one of the fielders. The modern game of base ball has been evolved and developed from Rounders.

ROUND-FISH, a fish of the salmon family, found in many of the lakes and rivers of the northern United States and Canada. When in good condition it is very fat and of exquisite flavor, weighing about 2 lbs.

ROUNDHEADS, a name formerly given by the Cavaliers or adherents of Charles I., during the English civil war, to members of the Puritan or parliamentary party, who distinguished themselves by having their hair closely cut, while the Cavaliers wore theirs in long ringlets.

ROUND ROBIN, a written protest or remonstrance, signed in a circular form by several persons, so that no name shall be obliged to head the list. This method of bringing grievances to the notice of superiors was first used by French officers, when its derivation from rond ruban "round ribbon."

ROUND TABLE, The, famous in the Arthurian legends, a table for the accommodation of a select fraternity of knights said to have been established by Uther Pendragon, father of King Arthur, and when it was complete to have had 150 knights of approved valor and virtue.

ROUND TOWERS, a class of tall nar-

Round tower on Devenish island, Fermanagh.

row circular edifices, tapering somewhat from the base upward, and generally with a conical top, from 60 to 130 feet in height, and from 20 to 30 in diameter. With the exception of three in Scotland, they are peculiar to Ireland. The doors are from 6 to 20 feet from the ground, the windows small. The interior contained no stairs, but the successive stories were reached, like the doors, by means of ladders. Authorities are now pretty well agreed that these towers were the works of a Christianized race, erected as places of refuge and as watch-towers. They date from the 8th or 9th to the 13th century.

ROUSSEAU, Jean Jacques, one of the most celebrated and most influential writers of the 18th century, was born in 1712, at Geneva. In 1752 he brought out a successful operatta (the music by himself), and soon after a celebrated Letter on French Music. In 1754 he revisited Geneva, where he was readmitted a free citizen on once more embracing Protestantism. Having returned to Paris he wrote a sort of novel, Julie ou La Nouvelle Héloïse, which was published

Jean Jacques Rousseau.

in 1760, being followed by Le Contrat Social, a political work, and Emile ou de l'Education, another story, in 1762. The principles expressed in these works stirred up much animosity against their author. The chief importance of his works lies perhaps in the fact that they contain the germ of the doctrines which were carried out with such ruthless consistency in the French revolution. Rousseau was also a musical author and critic of some importance.

ROUSSILLON (rō-sē-yōn), a former province of France, now occupied by the department of the Pyrénées Orientales. It gave name to a family of counts.

ROVI'GO, a town in Italy, 23 miles s.w. of Padua, capital of a province of its name, on the Adigetto, an arm of the Adige. The town-house contains a picture-gallery and a library of 80,000 vols. There is a handsome courthouse and two leaning towers belonging to a castle erected in the 10th century. Pop. 7272. The province has an area of 651 sq. miles; pop. 217,700.

ROWING is the art of propelling a boat by means of oars, which act as levers of the second order, the work being done between the power (i.e., the rower) and the fulcrum (i.e., the water, of which the actual displacement is very slight). That part of the operation during which the power is actually being applied, i.e., when the oar is in the water, is specifically called the stroke; while feathering is the act of turning the blade

of the oar so as to be parallel to the surface of the water, and carrying it thus through the air into position to repeat the stroke. Much skill is required to perform these operations satisfactorily; and in fact rowing can be learned only from observation and practice. Technically the word "rowing" is used by boating-men only when each oarsman has but a single oar; when he has one in each hand he is said to "scull," and the oars are called "sculls." Although rowing is certainly one of the most ancient methods of propelling vessels, it has only comparatively recently come into prominence as a form of sport. Boat-racing practically dates from the first quarter of the 19th century, and its development has lain almost entirely in the hands of the Anglo-Saxon races. In the United States the first amateur rowing-club was founded in 1834, but the sport did not make much progress until the universities of Yale (in 1843) and Harvard (in 1844) took it up, followed by other universities. Yale and Harvard have competed annually since 1878. The chief regatta is held on different courses in different years by the National Association of Amateur Oarsmen, founded in 1873. The use of outriggers was introduced about 1844, that of sliding-seats, an American invention, about 1871.

ROWLAND, (rō'land), Henry Augustus, American physicist, was born at Honesdale, Pa., in 1848. In 1876 he became professor of physics at Johns Hopkins university, a chair which he held until his death. His determination of the mechanical equivalent of heat was one of his most important investigations. His determination of the ohm was likewise of great value and his study of the magnetic properties of iron led to entirely new conceptions of magnetism. He investigated the solar spectrum and the arc spectra of various elements, and carried on many researches in allied fields. His most important discovery was that of the magnetic effect of electric convection, which has a wide-spread theoretical bearing upon electrical phenomena. He was the president of the American Physical society at the time of his death in 1901.

ROWLOCK, a contrivance on a boat's gunwale on which the oar rests in rowing; as, a notch in the gunwale, two short pegs, an iron pin, etc.

ROYAL ARCANUM, The, a fraternal and beneficial society organized at Boston in 1877. The society is governed through councils, which are dominated by the supreme council or governing body. Benefit certificates are issued for $1500 and $3000, payable at death of a member. It has an approximate membership of 258,746. The emblem of the society is a royal crown within a circle, on the circumference of which are ten small Maltese crosses with the motto, "Mercy, Virtue, and Charity."

ROYAL SOCIETY (London), The, the oldest learned society out of Italy, was founded for the study and promotion of natural science. It owes its origin to a club of learned men who were in the habit of holding weekly meetings in London as early as 1645, but the year 1660 is generally given as the year of its foundation. Charles II. took much interest in the proceedings of the society, and in 1682 granted a charter to the "President, Council and Fellows of the Royal Society of London for Improving Natural Knowledge." Lord Brouncker was first president of this incorporated Royal society. Meetings are held weekly from November to June for the purpose of reading and discussing scientific papers; and the more important of these are published in the annual Philosophical Transactions, first issued in 1665, and now forming a most valuable series. Accounts of the ordinary meetings, with abstracts of papers, etc., appear also in the periodical Proceedings, begun in 1800. Scientific research has at all times been both initiated and encouraged by the Royal society, and many of the most important scientific achievements and discoveries have been due to its enlightened methods. It deservedly enjoys an influential and semi-official position as the scientific adviser of the British government, which have borne valuable fruit, from the voyage of Capt. Cook in the Endeavour in 1768 down to the Challenger expedition, more than a century later. It awards the Copley, Davy, and two royal medals annually, and the Rumford medal biennially, for distinction in science; the first being the blue riband of scientific achievement, and bestowed both on foreign and British savants. The roll of the Royal society contains practically all the great scientific names of its country since its foundation. Among its presidents have been Samuel Pepys, Sir Isaac Newton, Sir J. Banks, Sir Hans Sloane, Sir Humphry Davy, Prof. Huxley, and Lord Kelvin.

RU'BENS, Peter Paul, the most eminent painter of the Flemish school, was born in 1577 at Siegen in Westphalia, though his childhood was spent chiefly at Cologne. In 1621 he was employed by Marie de' Medici to design for the gallery of the Luxembourg the well-known series of magnificent allegorical pictures illustrating the life of that princess. After the death of his wife in 1626 he was employed by the Archduchess Isabella in endeavoring to arrange a truce between Spain and the Netherlands; in 1628 he was engaged in the important private negotiations of a peace between Spain and England, in the course of which he visited Madrid and England (in 1629). He was knighted by Charles I., and his brush, never idle either in Madrid or London, decorated the ceiling of the banqueting-house at Whitehall. In 1630 he married Helena Fourment, who appears in many of his later works, and settled once more in Antwerp, where he continued to produce numerous pictures until his death in May, 1640. His works are in all branches of his art—history, landscape, portraiture, and genre—and are met with all over Europe. The Descent from the Cross in Antwerp cathedral is generally considered his master-piece. His pictures number upward of 2000, exclusive of about 500 drawings, a few etchings, etc.

RU'BICON, a river in North Italy (now the Fiumicino, a tributary of the Adriatic), famous in Roman history, Cæsar having by crossing this stream (49 B.C.), at that time regarded as the northern boundary of Italy, finally committed himself to the civil war. Hence the phrase "to pass the Rubicon" is to take the decisive step by which one commits one's self to a hazardous enterprise.

RUBID'IUM, a rare metal discovered by Bunsen and Kirchhoff in 1860, by spectrum analysis; symbol Rb, atomic weight 85.4. It is a white, shining metal, and at ordinary temperatures it is soft as wax. It is usually found in connection with cæsium, and belongs to the group of the alkali metals. See Cæsium.

RU'BINSTEIN, Anton Grigoryevitch, a Russian composer and pianist, born in 1829. As a composer he was very prolific being especially happy in his pianoforte pieces. His operas have had but a qualified success. He died in 1894. He had previously published an autobiography.

RUBRIC, in the canon law, signifies a title or article in certain ancient law books, thus called because written in red letters (L. ruber, red). In modern use rubrics denote the rules and directions given at the beginning and in the course of the liturgy for the order and manner in which the several parts of the office are to be performed. Where red ink is not employed now the rubrics are printed in italics, or in some other distinctive character.

RUBY, a precious stone of a deep-red color, of which there are two varieties—the oriental and the spinel. The oriental ruby or true ruby is a corundum formed nearly exclusively of alumina, of great hardness, and the most valuable of all precious stones. A ruby of five carats, if perfect in color, is said to be worth ten times as much as a diamond of the same weight. Oriental rubies are found chiefly in Burmah and Siam; inferior specimens have also occurred in North America and Australia. Spinel rubies consist of an aluminate of magnesium, and are much inferior to the true rubies in hardness and value. They are found in Burmah, Ceylon, and Australia. A lighter-colored variety, discovered in Badakshan, is known as the balas ruby.

RUBY-THROAT, a species of humming-bird, so named from the brilliant ruby-red color of its chin and throat. In summer it is found in all parts of North America, up to 57° n. lat., being thus remarkable for its extensive distribution.

RUDD, a fish of the carp family, having the back of an olive color; the sides and belly yellow, marked with red; the ventral and anal fins and tail of a deep-

Rudd.

red color. It is common in Great Britain and throughout Europe. Its average length is from 9 to 15 inches. Called also Red-eye.

RUDDER-FISH, a fish allied to the mackerel, very common in the Atlantic and Pacific oceans, so named from its habit of swimming around the sterns of ships, attracted, doubtless, by the refuse thrown overboard. The flesh is said to be coarse in flavor.

RUE, a strong-scented herbaceous plant, native of Southern Europe. The root is perennial, woody; the stems about 2 feet high; the leaves alternate, petiolate, and divided; and the flowers yellow. The odor of rue is strong and penetrating, and the taste acrid and bitter. It has useful medicinal properties. This plant is an ancient emblem of re-

Rue.

membrance from its evergreen quality. The old names "herb-grace" or "herb of grace" refers to this fact, or perhaps to its common use in sprinkling the people with holy water, and as a charm against witchcraft. About 20 species of rue are known.—Oil of rue is obtained by distilling garden rue with water; has a strong disagreeable odor and slightly bitter taste; and is used as an ingredient in aromatic vinegar.

RUFF, a bird belonging to the grallatores or waders, length, 10½ to 12½ inches; plumage, which varies greatly in color, generally variegated brown on back and wings, white on belly. In the breeding season the male has its neck surrounded by long plumes, which, when

Ruff.

raised form a kind of tippet or ruff, whence its English name. The scientific name ("pugnacious fighter") is derived from its pugnacious habits at the same season. The females are called reeves. These birds nest in swamps; the eggs, three or four in number, are pale green blotched with brown.

RUFFED GROUSE, a North American species of grouse of the same genus as the hazel-grouse of Europe. It is named from the tufts of feathers on the sides of its neck, and frequents forests and thickets.

RULE, BRITANNIA, a British national song, of which the words, almost certainly by James Thomson, form part of the masque of Alfred, by Thomson and David Mallet, which was first performed in 1740. The music was written by Dr. Arne.

RULE OF THREE, The, an application of the doctrine of proportion to arithmetical purposes by which we are enabled to find a fourth proportional to three given numbers, that is, a number to which the third bears the same ratio as the first does to the second. The rule is divided into two cases, simple and compound; now frequently termed simple and compound proportion. Simple proportion is the equality of the ratio of two quantities to that of two other quantities. Compound proportion is the equality of the ratio of two quantities to another ratio, the antecedent and consequent of which are respectively the products of the antecedents and consequents of two or more ratios.

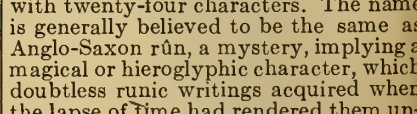
RUM, the liquor obtained by distillation from the skimmings and the molasses formed in the manufacture of cane-sugar. The pure distilled spirit is colorless, and receives its brown tint from the addition of caramel. Rum is obtained chiefly from the West Indies and British Guiana; the best sort is named Jamaica rum, no matter where manufactured. Pine-apple rum is ordinary rum flavored with sliced pine-apples; tafia is an inferior French variety of rum.

RUMINANTS, or **RUMINANTIA,** a group of herbivorous mammals, belonging to the great order of hoofed or ungulate mammals, included in the artiodactyle or "even-toed" section of these, and comprising the five families, camel and llama; chevrotain; true deer; giraffe; and ox, sheep, goat, antelope. The faculty of rumination, though it gives name to this order, is not quite peculiar to it. Ruminants are distinguished from other orders by certain peculiarities of dentition. The most typical of the group, the ox, sheep, antelope, etc., have no incisor or canine teeth in the upper jaw, but have instead a hardened or callous pad against which the six lower incisors bite. In the lower jaw are two canines quite similar to the incisors, and the camelidæ and tragulidæ possess also upper canines. In both jaws are six grinding teeth on either side, separated by an interval from the front teeth. The feet of ruminants are cloven. Horns, developed in pairs, are present in the majority of the species; either solid, as in the antlers of the true deer, or hollow as in the hornsof the ox, etc. The alimentary canal is very long. The stomach is divided into four compartments, frequently spoken of as four stomachs. The first and largest (rumen or paunch) receives the food roughly bruised by the first mastication, and transmits it to the second (recticulum or honey-comb), whence it is sent back in pellets to the mouth to be rechewed. This second mastication is called "chewing the cud." The food is then re-swallowed into the third stomach (psalterium, omasum, or manyplies), and passes finally into the true digestive cavity (abomasum). Fluids may pass directly into any part of the stomach. In young ruminants, which feed upon milk, the first three "stomachs" remain undeveloped until the animal begins to take vegetable food. Most of the ruminants are suitable for human food. They are generally gregarious, and are represented by indigenous species in all parts of the world except Australia.

RUMINATION, the faculty possessed by some mammals, notably ruminants (which see), of "chewing the cud"—that is, of returning the food to the mouth from the stomach for remastication prior to final digestion. Some marsupials and certain other mammals probably share this faculty with the ruminants.

RUMP PARLIAMENT, is the name by which the fag-end or remainder of the Long Parliament (1640–60) was known after the expulsion of the majority of its members on December 6, 1648, by Cromwell's soldiers, commanded by Colonel Pride. Only sixty members, all extreme independents, were admitted after this Pride's Purge, as it was called; and they, with the army, brought about the condemnation of Charles I. The Rump was forcibly dissolved by Cromwell in 1653, for opposing the demands of the army. Twice after this it was reinstated, but both times only for a brief period, and finally, on the 16th March, 1660, it decreed its own dissolution.

RUNES, the letters of the alphabets peculiar to the ancient Teutonic peoples of Northwestern Europe, found inscribed on monuments, tomb-stones, clog-calendars, bracteates, rings, weapons, etc., and only rarely and at a late period in MSS. They are formed almost invariably of straight lines, either single or in combination. Three runic alphabets (or "futhorks," as they are sometimes called from the first six letters) have hitherto been usually recognized; the Norse, with sixteen characters, the Anglo-Saxon, with forty, and the Ger-



Norse runic alphabet.

man; but modern researches have traced the common origin of these in an older primary Germanic or Teutonic futhork with twenty-four characters. The name is generally believed to be the same as Anglo-Saxon rûn, a mystery, implying a magical or hieroglyphic character, which doubtless runic writings acquired when the lapse of time had rendered them unintelligible to the common people; and runic wands or staves were smooth willow-wands inscribed with runic characters and used in incantations. The period of origin and the source of runes are not known. Scandinavian and Anglo-Saxon tradition ascribes their invention to Woden. Some have believed that the Scandinavians learned the art of writing from Phœnician merchants trading to the Baltic; Dr. Isaac Taylor recognizes in the Greek alphabet the prototype of

the futhorks; while others find it in the Latin. Runic inscriptions abound in Scandinavia, Denmark, Iceland, and the parts of England once known as Northumbria, Mercia, and East Anglia, but they are also found beyond these limits. Weapons and instruments, inscribed with runes and dating from 300–400 A.D., have been dug up in Norway. The use of runes gradually disappeared under the influence of the early Christian missionaries, who proscribed them on account of their magical reputation; but in England some Christian inscriptions have been found in the runic characters. The latest runic inscriptions in Sweden date about 1450.

RUNJEET SINGH, the "Lion of the Punjab" and founder of the Sikh kingdom, was born in 1780, and died 1839. In 1836 he suffered a heavy defeat from the Afghans, but he retained his power until his death. See Punjab.

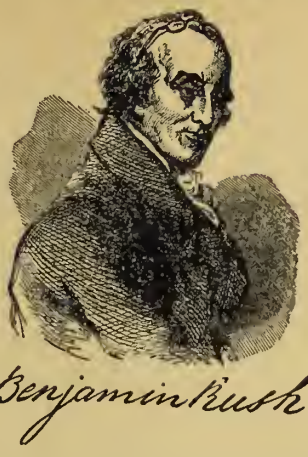
RUN'NYMEDE, the meadow on the right bank of the Thames, now a race-course, in Surrey, England, 4 miles below Windsor, where King John met the barons who compelled him to sign Magna Charta, June 15, 1215. The actual signing is said to have taken place on Magna Charta Island opposite Runnymede.

RUPEE', the standard silver coin of British India, the value of which is 48 cents, has, owing to the depreciation of silver, been much lower in recent years. Its value in India is now fixed by law at one-fifteenth of a sovereign, or 32 cents. A rupee equals 16 annas 100,000 rupees are called a lac; 100 lacs, a crore.

RUPERT OF BAVARIA, Prince, distinguished as a cavalry leader in the English civil war, the third son of Frederick V., elector palatine and king of Bohemia, by Elizabeth, daughter of James I. of England, was born in 1619 at Prague. In 1653 he joined Charles II. at Versailles. After the Restoration he was appointed lord-high-admiral, and served with Monk against the Dutch. He became governor of Windsor Castle and died in London in 1682 Many of his latter years were devoted to scientific study, and he is credited with the invention of mezzotint engraving, which at least he introduced into England. He was one of the founders and the first governor of the Hudson's bay company.

RUSH, the common term for a genus of plants, natural order Juncaceæ. The rushes have a glumaceous perianth of six sepals, glabrous filaments, three stigmas, and a three-celled many-seeded capsule. The leaves are rigid, mostly roundish, and smooth. Rushes are found chiefly in moist, boggy situations in the colder climates; about twenty species are noted in the British flora. The leaves are often employed to form matting and the bottoms of chairs, and the pith for the wicks of candles.

RUSH, Benjamin, famous American physician, was born in 1745 near Philadelphia. In 1766 he went to Edinburgh, and took his degree of M.D. there in 1768. He began to practice at Philadelphia in 1769, becoming at the same time lecturer in chemistry at the medical school of that city He afterward filled the chair of the theory and practice of physic in the University of Pennsylvania. He early identified himself with the patriotic party, was one of the



signers of the declaration of independence, and in 1787 was a member of the convention of Pennsylvania for the adoption of the federal constitution. In 1774 he was one of the founders of the first antislavery society in America. He died in 1813. Dr. Rush was a voluminous and versatile writer. His chief medical works are his Medical Inquiries and Observations, Diseases of the Mind, and Medical Tracts.

RUSH, Richard, statesman, was born in Philadelphia, August 29, 1780, and died there July 30, 1859. He was a graduate of Princeton and was admitted to the bar in 1800. He soon became a prominent advocate, and held several offices of importance. In 1811 he was comptroller of the currency, and in 1814 United States attorney-general. In 1817 he was for a short time secretary of state, and was then appointed minister to England, where he performed some important diplomatic services. In 1825 he was secretary of the treasury, and in 1828 he was candidate for the vice-presidency under Adams. From 1847 to 1851 he was minister to France.

RUSK, Jeremiah McLain, ex-governor of Wisconsin, secretary of agriculture, was born in Morgan co., Ohio, June 17, 1830. In 1862 he was made major of the 25th Wisconsin and served with Sherman till the close of the war, attaining the rank of lieutenant-colonel. In 1865 he was brevetted brigadier-general of volunteers. In 1870 he was sent to congress, and served three terms. He declined the offices of minister to Paraguay and Uruguay, and of chief of the bureau of printing and engraving. In 1882 he was elected governor of Wisconsin and served three successive terms. In 1889 he was appointed secretary of agriculture. He died in 1893.

RUSKIN, John, art critic and political economist, and one of the most eloquent English prose writers of last century, was born at London in February, 1819. In 1843 appeared the first volume of Modern Painters, by a Graduate of Oxford, in which Ruskin maintained the superiority of modern landscape painters, especially Turner, to the older masters, and at the same time advocated a complete revolution in the received conventions of art and art criticism. The subsequent volumes, of which the fifth and last appeared in 1860 expanded the subject into a most comprehensive treatise on the principles which underlie, or should underlie, art, while similar criticism was extended to another domain of art in his Seven Lamps of Architecture (1851) and his Stones of Venice (1851–53). In 1851 Ruskin appeared as a defender of pre-Raphaelitism, which had found inspiration in his works. As a political economist and social reformer he was an outspoken and uncompromising foe of what he considered the selfish and deadening doctrines of the so-called Manchester school, his chief works in this sphere being Unto this Last (1862), Munera Pulveris (1872), and Fors Clavigera (1871–84), a periodical series of letters

John Ruskin.

to the working-men and laborers of Great Britain. He died in 1900.

RUSSELL, John, Earl Russell, English liberal statesman, was the third son of the sixth duke of Bedford, was born in London in 1792, and died at Richmond in May, 1878. In Lord Melbourne's second cabinet (1835–41) Russell was home secretary, and in 1839 he became colonial secretary. From 1841 till 1845 he led the opposition against

John, Earl Russell.

Peel, with whom, however, he was in sympathy on the Corn Law question; and when Peel resigned in 1846 Russell formed a ministry and retained power, though with a small and uncertain majority, until February, 1852. He re-entered office in December, 1852, as foreign secretary under Lord Aberdeen, and in 1855 became colonial secretary in Lord Palmerston's cabinet. In 1865

Earl Russell succeeded Lord Palmerston in the leadership of the Liberal party, but when his new reform bill was rejected in 1866 the liberals resigned. Thenceforward Earl Russell held no farther office, though he warmly advocated all liberal measures.

RUSSELL, William Clark, novelist, born at New York in 1844. He went to sea at an early age, but abandoned his nautical career in 1865 and took to literature. Among his most popular books are John Holdsworth Chief Mate, The Wreck of the Grosvener, A Sea Queen, The Lady Maud, Jack's Courtship, Marooned, An Ocean Tragedy, etc.

RUSSIA, one of the most powerful empires of the world, second only in extent to the British Empire, which has about 11,000,000 sq. miles, and third as regards population; the Chinese Empire ranking first, with about 400 million inhabitants, the British Empire second, with some 380 millions. It comprehends most of Eastern Europe and all of Northern Asia, and is bounded n. by the Arctic ocean; w. by Sweden, the Gulf of Bothnia and the Baltic, Prussia, Austria, and Roumania; s. by the Black sea, Turkey in Asia, Persia, Afghanistan, the Chinese Empire; e. by the Pacific and Behring's strait. The total area in 1906 was officially estimated at 8,644,100 sq. miles; while the population was as follows:

Russia in Europe (including Poland), 103,662,138; Finland (1900), 2,712,562; Caucasian Provinces, 9,251,945; Siberia, 5,731,552; Central Asia, 7,721,684; total, 129,079,881.

European Russia consists almost wholly of immense plains, the Valdai Hills, between St. Petersburg and Moscow, averaging 500 feet and never exceeding 1200 feet above sea-level, forming the only elevated region of the interior and an important watershed. Russia is watered by numerous and important rivers, some of great magnitude and running a course of thousands of miles. The Petchora, the Mezene, Northern Dwina, and Onega are the principal rivers of European Russia which send their waters to the Arctic ocean; the Neva, Volkhoff, Soir, Narova, Velikaya, Duna, Niemen, and Vistula belong to the Baltic basin; the Black sea basin comprises the Pruth, Dniester, Dnieper, and the Don; while the Caspian receives besides other rivers the Volga, the largest of all Russian rivers. Asiatic Russia has also a number of very large rivers, as the Obi, Yenisei, and Lena in Siberia, and the Amur toward the Chinese frontier.

Boundless forests exist, especially in the northern European provinces and the more temperate parts of Siberia, the area of the forest land in Europe being 42 per cent of the total area. The fir, larch, alder, and birch predominate. In the south forests are less abundant, and the tracts around the Black sea and the Caspian, and the immense steppes of the south and east, are almost wholly destitute of wood.

Among wild animals may be mentioned the bear, the wolf, wild hog, elk, and various animals which are hunted for their furs. Wild fowl abound, particularly near the mouths of rivers. Both on the coasts and in the rivers a great number of productive fisheries are carried on. In the Arctic ocean vast numbers of seals are taken. The rivers of the Caspian, particularly the Ural and Volga, and the Sea of Azoff, are celebrated for their sturgeon. In the same quarters are also important salmon-fisheries. In the regions bordering on the Arctic ocean large herds of reindeer are kept; and in the south, among the Tartars of the Crimea and the inhabitants of the Caucasus, the camel is often seen.

Russia is rich in minerals. Gold, platinum, silver, copper, iron, lead, manganese, coal, salt, and saltpetre all exist in abundance, and there are copious petroleum springs in the Caspian region. The precious metals are chiefly obtained in the Ural and Altai regions, the annual production averaging: gold, 7200 lbs.; platinum, 5000–7000 lbs.; silver, 21,000–25,000 lbs. In the Ural, iron beds are also rich and numerous, exceeding all others in productiveness. Copper is most abundant in the government of Perm; lead in the Ural and some parts of Poland; saltpetre in Astrakhan. Of the coal-mines those of the Don basin are the principal at present, those of Kielce ranking second; the mines around Moscow come next. About 60,000 tons of manganese ore are annually extracted in the Ural and the Caucasus. The petroleum wells of Baku on the Caspian now send their products all over Europe.

Prior to the accession of Peter the Great Russia had no manufactories; he started them, and under the more or less fostering care of his successors they have steadily grown. Especially since 1865 a number of important industries have developed, this being mainly due to Russia's protective policy. The latest statistics give about 2,000,000 persons as being employed in the various manufacturing industries.

The bulk of Russia's external trade passes across the European frontier, and through the Baltic and Black sea ports. The chief exports are: grain (about one-half of entire exports), flax, linseed and other oleaginous seeds, timber, hemp, wool, butter and eggs, spirits, bristles, and furs, in the order indicated. The chief imports are cotton, wool, tea, machinery, coal and coke, cotton yarn, metal goods, wine, olive-oil, raw silk, herrings, textile goods, fruit, coffee, tobacco. The import trade is heaviest with Germany, Great Britain, China, United States, in order named. The more rapid development of the vast natural resources and trade of Russia is prevented by transport difficulties. The magnificent river and canal system is not available for a good part of the year, and railways are comparatively limited. The great railway across Siberia to Vladivostock and Port Arthur is practically complete. An important line recently constructed is the Transcaspian railway, from Michailovsk, on the southern shore of the Caspian, to Samarcand, via Bokhara The latter is preëminently a military line, but it will also largely stimulate trade in the heart of Asia. Trade is further assisted by immense fairs, which are much frequented by European and Asiatic merchants.

Until 1906 Russia was an absolute hereditary monarchy, the emperor (czar or tzar) being the supreme ruler and legislator, and the final tribunal in all matters political or ecclesiastical. The present emperor's income is about $12,500,000. His title is Emperor and Autocrat of all the Russias, Czar of Poland, and Grand-prince of Finland. The administration is divided into ten departments, formerly eleven, with a minister at the head of each nominated by the emperor. Finland has nominally preserved its ancient constitution with a national parliament of four estates, but it is really ruled by a governing-general and senate appointed by the emperor. Some of the Baltic provinces also possessed certain privileges, but these are being gradually curtailed. Each government of the empire is under a governor and vice-governor; there are also a few general-governors, who have more than one government under them. The communes into which the provinces and districts are divided possess a certain amount of local government, and elect their own local dignitaries, but these are again subject to an all-powerful police. Russia is heavily in debt, chiefly abroad, Germany in particular holding large amounts of Russian stocks. The bulk of the revenue is obtained by indirect taxation, spirits furnishing about one-third of it, other items are personal and land taxes, trade licenses, tobacco and sugar, customs.

Russia possesses one of the most powerful armies in the world. On a peace footing it is placed at 1,100,000 men, the war strength at 4,600,000. Only a certain number of those annually reaching their twenty-first year are drawn into the active army, however, the rest entering the first and second reserve. Liability to military service is universal from the age of 21 to that of 43; and five years must, in regular course, be passed in active service.

The result of the Japanese war has to a large extent demoralized the Russian army. Nothing absolutely accurate as to losses, etc., sustained by Russia can be ascertained, and, therefore, the actual condition or strength of the army cannot be positively stated. One fact, however, is patent: Russia never had in Asia and Manchuria so great a number of men as 500,000, since one line of railroad is absolutely inadequate to supply more than 300,000, while the country is too poor to live off of. In every battle of the war Japan outnumbered Russia on the battle-field by from 10 to 40 per cent. That was the essence of Japanese strategy. The navy comprises 3 first and 9 second class battle ships, 14 coast defense, 5 armored cruisers, 4 protected or first class cruisers, 26 second and third class cruisers, 112 torpedo boats, etc. It ranks seventh among the navies of the world.

A number of languages and a vast variety of dialects are naturally spoken in a country comprising such a heterogeneous population, but the Russian is the vernacular of at least four-fifths of the inhabitants, the literary and official

language being specifically the "Great Russian," or that belonging to Central Russia surrounding Moscow. It is one of the Slavonic family of the Aryan or Indo-European languages, and as such is a sister of Greek, Latin, Sanskrit, German, English, etc. Modern Russian has been much modified by the introduction of Greek, Tartar, and Mongolian terms. It has an alphabet of thirty-seven letters, a written and printed character of a peculiar form, and a pronunciation which it is hardly possible for any but natives to master. Its inflexions are both numerous and irregular; but it is soft, sonorous, remarkable for its copiousness, and affords unbounded facility for rhyme.

Until the 18th Century Russia was backward in the development of her literature. Lomonosof (1711–65) wrote a number of works both in prose and verse, and by his precepts and example did much to originate a national literature, and to fix the grammar of the language. His contemporary Sumarokoff carried the drama to a high degree of perfection; Derzhawin (1743–1816) distinguished himself highly in lyrical and other poetry; and since then many writers have distinguished themselves in all departments. It is, however, principally to Karamsin (1725–1826) that Russia owes the more general spread of literary taste. The foundation of the Russian academy in 1783, and the issue of its great dictionary, also contributed largely toward it. The same perfection which Karamsin gave to prose, Dimitrieff gave to poetry. Of the more modern authors particular mention is due to Alexander Pushkin, Russia's greatest poet, and Michael Lermontoff, not far his inferior. The most eminent novelists are Nicholas Gogol, Ivan Turgenieff, Feodor Dostoieffsky, Alexander Herzen, and Count Leo Tolstoi, the last not only a novelist but also one of the greatest of modern prophets. Russia possesses a number of valuable libraries. The first Russian press was set up at Moscow in 1554.

The established religion of Russia is the Eastern or Greek Church, and one of the fundamental laws of the state is that the emperor must belong to that church, and none of the imperial family may marry a wife belonging to another religion without the express sanction of the emperor.

The population of Russia is increasing faster than that of any other European nation, Great Britain, perhaps, excepted. As regards language (and so far also race) the peoples of Russia are comprised under the two great divisions of Aryans and Mongolians; the former include Slavonians, Germans, and Greeks, the latter the Finnish- and Tartar races. The Slavonians form about 86 millions of the population, including 6½ million Poles. There are about 5½ million Finns, 2½ million Lithuanians, and some 3½ million Jews. Of Germans about 1¼ million reside in Russia, of Roumanians and Servians 2½ millions. There are some 2½ million Georgians, Ossetes, and Lesghians, and 1 million Armenians. The Turco-Tartars count about 10 millions. A gradual absorption by the Slavonic races is going on. The political divisions of the Russian people comprise numerous grades of nobility, which are partly hereditary and partly acquired by military and civil service, especially the former, military rank being most highly prized in Russia. The clergy, both regular and secular, form a separate privileged order. Previous to the year 1861 the mass of the people were serfs, subject to the proprietors of the soil. The Emperors Alexander I. and Nicholas took some initial steps toward the emancipation of this class; but a bold and complete scheme of emancipation was begun and carried out by Alexander II. in 1861.

The origin of the Russian empire is involved in much obscurity, but it is usually regarded as having been founded by Rurik, a Scandinavian (Varangian), about 862, his dominions and those of his immediate successors comprising Novgorod, Kieff, and the surrounding country. Vladimir the Great (980–1015), the Charlemagne of Russia, introduced Christianity, and founded several cities and schools. But from this period down to 1237, when the country was overrun by the Tartars, Russia was almost constantly the scene of civil war.

In 1613 the house of Romanoff, whence the present czar is descended, was raised to the throne, and from this period the empire gained greater strength and consistency.

Russia's acquisition of territory for the past four centuries is shown by the following table:

		About sq. m.
Ivan the Great	1462,	382,716
Vassili Ivanovitch	1505,	510,288
Ivan the Terrible	1584,	1,530,864
Alexis Michaelovitch	1650,	5,039,094
Peter I	1689,	5,953,360
Anna	1730,	6,888,888
Katharine II	1775,	7,122,770
Alexander II	1868,	7,866,940
Do.	1881,	8,325,393
Alexander III	1887,	8,644,100

The population from 14 millions in 1722 has grown to 129 millions in 1906. The extension of the Russian empire in the east is still going on. In 1881 the Tekké Turcomans were subjected; in 1884 Merv was taken; and Penjdeh was occupied and annexed in 1885, which led to considerable friction between Russia and Britain. Of late years a great disturbing element to the government of Russia has sprung up in Nihilism (see Nilihists). The murder of the late emperor Alexander II. in the streets of St. Petersburg, by means of a bomb, was their doing; and repeated attempts on the life of his successor Alexander III. (1881–94) were also made. Alexander III. was succeeded by his eldest son, Nicholas II. Russian aggression in Manchuria and Corea led to the outbreak of war with Japan in February, 1904.

The most important events in the history of Russia have taken place within the last few years. These were the war with Japan (the greatest war of history) and the Russian Revolution, in which the monarchy was made a limited one. Previously to the year 1906 Russia was an absolute monarchy and affairs were in the hands of bureaus under the supreme will of the czar whose title was Emperor and Autocrat of all the Russias, Czar of Poland, and Grand Prince of Finland. The revolution began to take shape in 1903 with the mutterings of the workingmen in the cities and outbreaks against the Jews. On April 19th of that year the atrocities at Kishineff took place, in which 40 Jews were massacred outright and several hundred injured. This was but a bare month after the proclamation of the czar establishing religious toleration.

The first actual step taken by the revolutionists was the assassination on May 19th of the Governor of Ufa, and in August the great industrial strikes began. Petitions by the workingmen asking for a representative government had been everywhere circulated, and toward the end of 1904 the emperor, having the Japanese-Russian war on his hands, issued a proclamation virtually refusing to consider a proposal for the modification of the form of government. On January 18, 1905, Father Gapon, followed by thousands of workingmen, gathered in St. Petersburg to appeal to the czar at the palace, but the crowd was dispersed by the soldiery, who killed and wounded a thousand or more. This act of butchery only fanned the flame of revolution and great strikes were called at Moscow, Riga, Revol, Odessa, Warsaw, Lodz, Radom and Kovno. On February 17th the Grand Duke Sergius, uncle of the emperor, was assassinated by the throwing of a bomb at Moscow. The mutinies of Odessa and Sevastopol followed, in which the rebels fired on Russian forts from Russian warships. The emperor, having granted the demands of the people for a constitution and a legislature, or national council, called the Duma, set May 10,1906, as the day for its opening session. The chosen delegates gathered at the capital, but their meeting proved more or less farcical, as the Duma was dominated by the czar and dissolved by him before it could accomplish anything worth recording. The second Duma was likewise dissolved, and the third Duma was opened November, 14, 1907.

Meanwhile the war between Japan and Russia was brought to a close by the mediation of President Roosevelt, who had, on June 8, 1905, suggested a conference. The war had begun in 1903–4 with Russia's aggressions in Manchuria and the Russian Navy had been virtually wiped out. The following were the casualties:

	Russia	Japan
Army	314,779	163,086
Navy	6,000	3,670
Prisoners	67,101	646

The following table shows the naval losses of the two countries:

	Japan	Russia
Battleships sunk	2	12
Battleships captured		2
Armored cruisers sunk		5
Coast defense vessels "		1
Coast defense captured		2
Cruisers sunk	4	6
Other ships sunk	6	33
Other ships captured		16

On August 8, 1905, the peace delegates from Russia and Japan met at Ports-

mouth and in a few days the peace was concluded by Russia's consent to the limiting of Russian influence in the Orient and Japan's relinquishment of the claimed indemnity of $600,000,000 and the cession of one-half of Sakhalin.

RUSSIAN-JAPANESE WAR, in 1894 and 1895, through the intervention of Russia and Germany Japan was deprived of its conquests in Manchuria, and and in 1898 Russia secured by lease from China for 26 years, the harbors of Port Arthur, and Ta Lien Wau in the Liao-Tung peninsula, the very territory Japan had been forced to surrender possession of. The construction of the Manchurian railway connecting the newly acquired possessions with the main line of the Siberian railway was begun. During Boxer uprisings of 1900 a Russian force invaded Manchuria in retaliation of a Chinese attack of a Russian town on the Amur river. Russia refused to withdraw from Manchuria after agreeing with China to do so and after repeated delays on the part of Russia Japan, which declined its paramount interests in Korea, threatened by Russia, severed diplomatic relations with Russia and hostilities began on the night of February 7–8, 1904, with a torpedo attack delivered by the Japanese squadron against the Russian fleet in the harbor of Port Arthur. This was followed by the Japanese invasion of Korea, whose emperor was compelled to make common cause with Japan. The Japanese forces during the 18 months of war showed themselves superior on both land and water, defeating the Russians on land and compelling them to retreat as far north as Tie-lung and on sea by practically destroying the whole of the Russian fleet in the eastern waters.

The chronological story of the war is as follows:

Feb. 8–9, 1904—Variag and Korietz destroyed in Chemulpo harbor and Togo attacks Port Arthur fleet.

May 1—Japanese take Fengwangcheng.

May 5—Japanese land at Pitsewo and begin to invest Port Arthur.

May 11—Russians evacuate Dalny, destroying the town.

May 26–27—Battles of Nanshan hill and Kinchow; loss, 5,130.

June 14–15—Oku defeats Stackelberg at Vafangow; loss, 11,000.

June 17—Battle of Motien Pass; Russians driven back.

June 30–31—Battle of Haicheng; loss, 5,700.

July 25—Russian forces driven out of Newchwang.

Aug. 10—Sortie from Port Arthur harbor; Russian fleet dispersed and in part destroyed; Vice-Admiral Withoft killed.

Aug. 14—Kamimura defeats Vladivostok squadron; Rurik sunk.

Aug. 30-Sept. 4—Japanese, under Oyama, defeat Kuropatkin at Liaoyang; 365,000 engaged; loss, 35,000.

Sept. 11—Baltic fleet sails from Cronstadt under Rojestvensky.

Oct. 8–18—Kuroki defeats Kuropatkin at Shakhe river. Total casualties 61,679, with 23,000 killed.

Oct. 22—The "Doggerbank outrage." Two British fishermen killed.

Nov. 30—Japanese take 203-Meter hill by storm, losing 12,000.

Jan. 2—Stoessel surrenders Port Arthur to Nogi.

Jan. 26 to 31—Battle of the Hun river; Russians defeated with loss of 15,000; Japanese loss, 5,000.

LOSSES AND COST IN FIRST YEAR OF WAR—LOSSES IN MEN.

Russians killed, 60,000, wounded, 155,000, total, 215,000. Japanese killed, 65,000, wounded, 110,000, total, 175,000.

NAVAL LOSSES.

By Russia—Seven battleships, thirteen cruisers and fourteen gunboats, torpedo boats and destroyers. Total, 34 ships.

By Japan—One battleship, three cruisers, three transports and sixteen torpedo boats and destroyers. Total, 23 ships.

FINANCIAL COST.

Official figures by Russia, $475,000,000; estimates made by Japan, $360,000,000. Total cost to both countries, $835,000,000. See Manchuria.

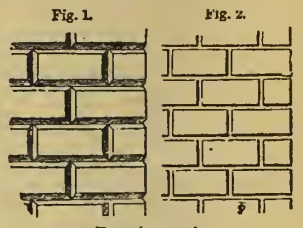
RUSSIA LEATHER is prepared in Russia chiefly from cow-hides tanned with willow, poplar, and larch bark, and is saturated with birch-bark oil, which gives it its peculiar odor. It is highly esteemed for its durability and imperviousness to water and insects, and is dyed in various colors, red and brown being the most frequent. It is much used for book-bindings and fancy articles. Similar leather from cow-hide is made of good quality in the United States. Large quantities of imitation Russia leather are made in Paris, but it lacks durability.

RUST, peroxide of iron, formed by the gradual oxidation of iron when exposed to the air. To remove rust the usual mode is to rub the object with a piece of oiled rag or emery paper. More rapid and more satisfactory results are secured by using very pure petroleum, and wiping with a hempen or woolen rag. To prevent rust, dip iron or steel articles in a mixture of equal parts of carbolic acid and olive-oil, rubbing the surface with a rag. Others rub the metal with a mercurial ointment, leaving a thin layer over the entire surface. If iron be dipped in a solution of carbonate of potash or soda in water the surface will be protected against rust for a long time, and objects can be protected for any period by burying in quicklime. Rubbing the surface with plumbago has a similar effect.

RUST, a disease which attacks cereals and many pasture grasses, known also by the names of red-gum, red-rag, red-robin. It is most common on the leaves, on which it is visible in the form of orange-colored mealy spots, but is by no means confined to them. It is produced by a species of fungus, the growth of which seems to be specially favored in ill-ventilated fields under excessive summer heat.

RUSTIC WORK in masonry is a term applied where the surface of a wall shows grooves between the different courses of stones thus giving the appearance of open joints.

RUTH, Book of, a canonical book of the Old Testament. It is a kind of appendix to the Book of Judges, and an introduction to those of Samuel, and is therefore properly placed between them. The story of Ruth records in simple language the ancient rights of kindred, redemption, and other interesting customs of Hebrew antiquity. The date of the history and the name of its writer are unknown, but it is probably of a date subsequent to the captivity.



Rustic work.
1, With chamfered joints. 2, With rectangul... joints.

RUTHE'NIANS, Russin'ians, Russniaks, Red or Little Russians, numerous Slavonic tribes inhabiting Eastern Galicia, Bukowina, and Northeastern Hungary, closely allied to the inhabitants of Podolia and Volhynia. The number of Ruthenians in the Austrain empire amounts to 3,000,000, of whom about 500,000 are settled in Hungary.

RUTHERFURD, Lewis Morris, American scientist, was born in Morrisania, N. Y., in 1816. He invented and constructed a number of instruments which proved of great value to astronomers. He constructed a micrometer for the measurement of astronomical photographs, for use upon pictures of solar eclipses or transits and upon groups of stars, of which he has measured several hundred, showing, that the photographic method is at least equal in accuracy to that of the heliometer or filar-micrometer and far more convenient. He was one of the original members named in the act of congress in 1863, creating the National Academy of Science. He died in 1892.

RUTLAND, the capital of Rutland co., Vermont, 117 miles n.n.w. of Boston. It is an important railway junction, and has valuable white marble quarries in its vicinity. Pop. 11,760.

RYE, a species of grain of which there are several varieties. It is an esculent grain bearing naked seeds on a flat ear furnished with awns like barley. It is a native of the Levant, but has been cultivated in Europe from time immemorial. It thrives in climates and in soils which forbid wheat; requires less manure, and ripens faster. It is extensively grown in northern Europe, and rye bread forms the chief subsistence of the laboring classes of many parts of Russia, Sweden, Norway, Denmark, Holland, and Prussia. Unmalted rye-meal mixed with barley malt and fermented forms the wash whence is distilled the spirit known as Hollands gin. The straw is long, flexible, does not rot easily, and is used by brickmakers and thatchers, also for stuffing horse-collars, mattresses, etc., and for making baskets, straw hats, and bonnets. Rye is subject to a disease called ergot, which renders it dangerous for food.

S

S, the nineteenth letter of the English alphabet, representing the hissing sound produced by emitting the breath between the roof of the mouth and the tip of the tongue placed just above the upper teeth. From this circumstance it has sometimes been reckoned among the linguals (as the tongue is essential in its pronunciation), sometimes among the dentals (as the teeth co-operate in producing the hissing sound). More descriptively it is classed as a sibilant It has a twofold pronunciation—sharp or hard as in sack, sin, this, thus; and soft or sonant (when it is equivalent to z), as in muse, wise.

SAALE (zä'lė), the name of several German rivers, the most important of which is that which rises on the north side of the Fichtelgebirge, in the north-east of Bavaria, and joins the Elbe after a course of above 200 miles. It passes the towns Hof, Jena, Naumburg, Merseburg, Halle, etc., and is of great commercial importance

SABBATH (a Hebrew word signifying rest) is the day appointed by the Mosaic law for a total cessation from labor, and for the service of God, in memory of the circumstance that God, having created the world in six days, rested on the seventh. Sabbath is not strictly synonymous with Sunday. Sunday is the mere name of the day; Sabbath is the name of the institution. Sunday is the Sabbath of Christians; Saturday is the Sabbath of the Jews and some minor Christian sects. The first notice in the Old Testament pointing to the Sabbath occurs in Gen. ii. 2, 3; but the first formal institution of the day as a holy day and a day of rest is recorded in Exod. xvi. 22–26, on the occasion of the children of Israel gathering manna in the wilderness. Soon after the observance of the day was re-enacted still more expressly and emphatically in the tables of the law. Prior to the captivity the Jews kept the Sabbath very indifferently, but after their return from Egypt Nehemiah exerted himself to secure the true observance. Gradually the original law became encumbered with a long list of petty pharisaical and rabbinical regulations. The Sabbath began at sunset on Friday and ended at sunset on Saturday. On the Sabbath the Jews were not allowed to go out of the city further than 2000 paces, that is, about a mile, and this distance was called a Sabbath-day's journey. And as every seventh day was a day of rest to the people, so was every seventh year to to the land. It was unlawful in this year to plough or sow, or prune vines; and if the earth brought forth anything of its own accord, these spontaneous fruits did not belong to the master of the ground, but were common to all. This year was called the Sabbatical year, and was also to be a year of release for Jewish debtors. In the gospels the references to the Sabbath are numerous, and they show us that Christ always paid respect to the institution although he did not regard the minute prohibitions that had been added to the original law. The desire of distinguishing the Christian from the Jewish observance early gave rise to the celebration of Sunday, the first day of the week, instead of the Sabbath In 366 the Council of Laodicea removed all scruples as to the duty of Christians to keep the Jewish Sabbath. See Sunday.

SAB'INES, an ancient people widely spread in middle Italy, allied to the Latins, and already an important nation prior to the foundation of Rome. Originally they were confined to the mountain districts to the n.e. of Rome, and their ancient capital was Amiternum near the modern Aquila. As an independent nation they ceased to exist in 290 B.C., when they were incorporated with the Roman state.

SABLE, a carnivorous mammal, nearly allied to the common marten and pine marten, found chiefly in Siberia and Kamtchatka, and hunted for its fur. Its length, exclusive of the tail, is about 18 inches. Its fur, which is extremely lustrous, and hence of the very highest value, is generally brown, grayish-yellow on the throat, and with small grayish-yellow spots scattered on the sides of the

Sable.

neck. It is densest during winter, and owing to the mode of attachment of the hairs to the skin it may be pressed or smoothed in any direction. The skins of these varieties are frequently dyed and otherwise manipulated to imitate the true Russian sable. Sable hair is also used in the manufacture of artist' pencils Sable fur has been of great value from very early times.

SABLE, in heraldry, black, one of the tinctures used in blazonry. In engraving it is expressed by perpendicular crossed by horizontal lines.

SABLE ISLAND, a low treeless sandy island in the North Atlantic, off the east coast of Nova Scotia, 20 miles long and 1 to 5 broad. It has a refuge for shipwrecked persons and a lighthouse. Many shipwrecks have occurred on it. It is gradually disappearing.

SABOTS (sà-bō), wooden shoes made each of one piece hollowed out by boring tools and scrapers. They are largely worn by the peasantry of several European countries, being well adapted to protect the feet against damp. In France their manufacture forms an important industry. The willow, beech, and ash are the favorite woods for sabotmaking.

SABRE, a broad and heavy sword, thick at the back and somewhat curved at the point. It is the chief weapon of cavalry regiments.

SABRE-TACHE, a leathern case or pocket won by cavalry officers at the left side, suspended from their sword-belt. It is rather ornamental than useful, and its face bears the regimental emblems, number, etc.

SACBUT, or **SACKBUT,** a musical instrument of the trumpet kind with a slide; in fact an old variety of trombone. The instrument called sabbeka in the Hebrew scriptures has been erroneously rendered as sacbut by the translators. The exact form of the sabbeka has been

Assyrian sacbut, from bas-relief.

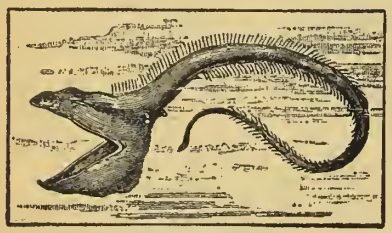
much disputed, but that it was a stringed instrument is certain, for the name passed over into Greek and Latin in the forms sambukē, sambuca, a harp-like instrument of four or more strings. The instrument shown in the accompanying illustration is believed to represent a form of the sacbut of scripture.

SACCH'ARIN, an artificial sugar prepared from coal-tar, first introduced to commerce in 1887 by its discoverer Dr. Constantin Fahlberg of Salbke (Germany). Its sweetening properties are enormous; one grain of saccharin is said to sweeten distinctly 70,000 grains of distilled water. It is not a fermentable sugar, and is already in common use in the treatment of disease, as diabetes, for instance; and in many cases in which the palate craves for sweets, but in which ordinary sugar cannot without danger be permitted. It is also used by stout persons, or those inclined to become so, in order to lessen the formation of fat. To a certain extent it now competes with natural sugars, especially in confectionery and preserving. There is some doubt as to its effects on the human system. The French Conseil d' Hygiène et de Salubrité appointed a commission to inquire into its properties, and their report, issued in 1888, stated that its use in food would seriously affect the digestive functions. The discoverer and other chemists, both British and foreign, have denied, however, that saccharin is injurious, and it is also asserted that the hostility to this sweetening substance emanates chiefly from persons interested in the beet-sugar industry. Saccharin has come largely into use in Germany in the manufacture of confectionery, in brewing, etc.

SACCHAROM'ETER, or **SACCHARIMETER,** an instrument for determining the quantity of saccharine matter in any

solution. One form is simply a hydrometer for taking the specific gravity of the solution; another is a kind of polariscope, so arranged that the solution may be interposed between the polarizer and analyzer, and by observing the angle through which the plane of polarization is turned in passing through the solution the datum is given for the calculation of the strength. (See Polarization.) Several saccharometers acting on this principle, but varying somewhat in construction, are now in use.

SAC'COPHARYNX, or **EURYPHARYNX,** a genus of eels. The best-known



Saccopharynx.

species was discovered only a few years ago. It inhabits the depths of the Atlantic, is of a perfectly black color, is sometimes 9 feet in length, and but seldom met with. It owes its name to its pouch-like pharynx, which enables it to swallow other fish of large dimensions. The muscular system is but little developed, and the bones are thin and soft.

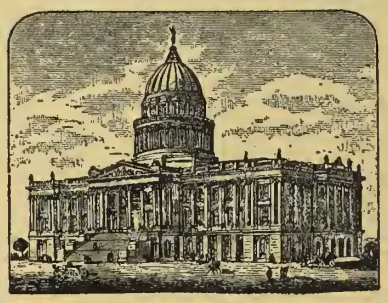
SACK, formerly a general name for the different sorts of dry wine, more especially the Spanish, which were first extensively used in England in the 16th century.

SACO, a river in the United States. It rises in New Hampshire, in the White mountains, and runs southeast into the Atlantic below Saco, in Maine. It is 160 miles long, and has falls of 72 feet at Hiram, of 42 feet at Saco, and numerous minor ones.

SACRAMENT, Latin, sacramentum, a pledge, an oath, in particular the military oath of allegiance. This word received a religious sense, in the Christian church, from its having been used in the Vulgate to translate the Greek mystērion, a mystery. Among the early Latin ecclesiastical writers sacramentum, therefore, signifies a mystery, a symbolical religious ceremony, and was most frequently applied by them to the rite of baptism. In modern Christian theology sacrament is defined as an outward and visible sign of an inward and spiritual grace, a solemn religious ceremony enjoined by Christ to be observed by his followers, and by which their special relation to him is created, of their obligations to him renewed and ratified. In early times the church had numerous sacraments, as many as thirty being enumerated in the first half of the 12th century. The Roman and Greek churches now recognize seven sacraments: baptism, confirmation, the Eucharist, penance, extreme unction, orders, and marriage. Protestants in general hold baptism and the eucharist to be the only sacraments. The Socinians regard the sacraments merely as solemn rites, having no divine efficacy, and not necessarily binding on Christians. The Quakers consider them as acts of the mind only, and have no outward ceremonies connected with them.

SACRAMEN'TO, a river in California. It rises in the Sierra Nevada, on the boarders of Oregon, and drains the central valley of California from the north. Its course is about 500 miles, 300 of which are navigable for small steamers. It discharges its waters into the Bay of San Francisco.

SACRAMENTO, the capital of California, in the county and on the river of same name, 80 miles northeast of San Francisco. It occupies a low and level site, and vast sums of money have been spent for embankments, and in raising the street levels, so as to secure the town against inundation by the river. Sacramento owes its origin and prosperity to the northern gold-fields. It has suffered much from water and fire during its short existence, but is now a regular and well-built city, boasting of many good buildings. The state capitol, centrally



State capitol, Sacramento, Cal.

situated in a large, well-laid-out park, is a grand structure, and cost about $5,000,000. Pop. 1909, 46,000.

SACRIFICES, gifts offered with some symbolic intent to the Deity, generally an immolated victim or an offering of any other kind laid on an altar or otherwise presented in the way of religious thanksgiving, atonement, or conciliation. The origin of sacrifice is a point much disputed; the two opposed views being that of a primeval appointment by the Deity, and that of a spontaneous origination in the instinctive desire of man to draw near to God. The symbolic character of sacrifice may be represented under three heads: (1) Propitiatory, or designed to conciliate generally the favor of the Deity; (2) Eucharistic, or symbolical of gratitude for favors received; (3) Expiatory, or offered in atonement for particular offenses. To a different class may be assigned deprecatory sacrifices designed to avert the wrath or appease the wicked disposition of deities. The customs of the Jews regarding sacrifice are noteworthy on account of their very express and explicit claims to a divine origin, and because of their connection with the Christian religion. Details are amply given in the Book of Leviticus. Few religions, whether ancient or modern, have omitted sacrifices from among their rites. The ancestors of all the existing races in Europe practiced human sacrifices, and similar usages widely prevailed throughout the world. Among Christians the Roman Catholic and Greek churches regard the mass as a mysterious sacrifice; but with Protestants it is not generally so regarded.

SA'CRUM, in anatomy, the bony structure which forms the basis or inferior extremity of the vertebral column. The human sacrum forms the back part

Pelvic bones. *s*, sacrum.

of the pelvis, is roughly triangular in shape, consists of five united vertebræ, and from its solidity it is well adapted to serve as the keystone of the pelvic arch, being wedged in between and articulating with the haunch-bones. In most mammals the number of vertebræ forming the sacrum is smaller than in man. In birds the lowest number is about ten. Fishes possess no sacrum at all. The sacrum in man is fully ossified and completed in development from the twenty-fifth to the thirtieth year of life, but the component parts can generally be perceived even in the most aged individuals.

SAD'DUCEES, one of the two chief sects or parties existing among the Jews in the time of Christ. Various accounts are given of their origin. Some critics recognize in the Sadducees the descendants and adherents of the Zadok mentioned in 1 Kings i. 39.

SAFE, a receptacle for valuables, of iron or steel, or both combined. A safe to answer all requirements should be fire, explosive, acid, drill, and wedge-proof. A fire-proof safe need only be so constructed that, although exposed to the intense heat of a conflagration, its inner recesses remain at a sufficiently low temperature to prevent combustion of the contents. A burglar-proof safe needs many other safe-guards, and the history of safe-making is mainly a record of struggles between the safe manufacturer and the burglar; the result is that safes can now be obtained which are all but impregnable. The safe consists of an outer and an inner wall, the space between being filled with some fire-proof material such as asbestos, silicate cotton, gypsum, etc. The outside casing, which may be single or compound, naturally receives the greatest attention, and various are the devices of manufacturers to render it sufficiently hard and solid to resist the finely-tempered drills of the burglar. To prevent wrenching, the door is secured by bolts moving straight or diagonally into slots on one or on all sides. These bolts are moved by the door handle, and the lock-key fixes them in their positions. With the modern safe of the best kind, the lock may be said to be the only vulnerable point, hence much care and ingenuity have been expended on its mechanism. The first great improvements in locks, as applied to safes, are due to Chubb of London, a name which still stands in the front ranks of safe-lock makers; but numerous

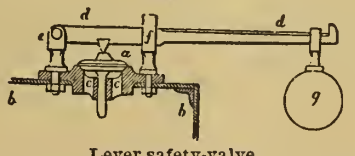
patents, mostly of American origin, have in recent years been introduced. Of these the keyless permutation locks deserve particular mention, as they obviate the danger which arises from lost or false keys. Such locks allow of opening only after an indicator has been moved in accordance with a certain combination of numbers arranged before closing the safe. Some safe-locks are so constructed that to be freed they require different keys on different days, some can only be opened at a certain hour, this being fixed on before the door is closed; while others again require two or more keys in charge of different persons; in fact, the arrangements contrived to render the plundering of safes next to impossible are too numerous even to mention. The connection of safes with electric alarms in a variety of ways forms another safeguard.

SAFE DEPOSIT COMPANIES, are among the comparatively recent additions to the list of bodies corporate, organized for a specific purpose, and operating under and by vitrue of statutory law or special acts of state legislatures. Deposit companies were formed for the purpose of receiving deposits of valuables of almost every description, such as bonds, notes, mortgages, jewelry, gold and silver ware, family heirlooms, wills, and other legal documents, etc., companies guaranteeing to owners, upon payment by the latter of a premium corresponding to the risk undertaken, absolute security, from loss by fire or otherwise, to the articles deposited. The acts of incorporation also authorize the construction of such buildings, safes, and other appurtenances as will promote the security contemplated and the faithful execution of the trust created for the benefit of depositors. The vaults or safe deposits for the storage of valuables are constructed after the latest designs, of the most substantial material, and provided with every appliance known to scientific investigation or mechanical development for attaining the end in view, i. e., absolute security from visitations either by burglars or the elements. The interior of these vaults is peopled, so to speak, with boxes and safes in which are contained the valuables of clients, access to which is obtained by keys, one being held by the lessee and the other by the company. The vaults are opened and closed by electricity at designated hours, and their protection is further guaranteed by locks and bolts, as also by the presence of custodians, who are relieved at intervals by colleagues. Automatic signals are connected with the police department and private detective agencies of cities in which the company does business, and either upon the sounding of the alarm or its failure to signal "all is well," as the device is constructed to do, investigation is at once instituted to ascertain the cause. A pass-word is employed by some of the companies as a further preventive against intrusion, and other agencies for the promotion of security are adopted as rapidly as they become available.

SAFETY-LAMP, a lamp for lighting coal-mines without exposing the miners to explosions of fire-damp. The first safety-lamp was invented by Sir Humphry Davy in 1816, and until a quite recent period his system, with some slight modifications, was in general use. It consists principally of a cistern to hold the oil, in the top of which the wick is placed. Over the cistern a cylinder of wire-gauze is fixed so as to envelop the flame. The lamp is closed by a bolt passing through both parts, and to prevent the miner from exposing the flame a locking arrangement exists. The diameter of the gauze wire is from $\frac{1}{40}$ to $\frac{1}{60}$ of an inch, and the apertures do not exceed the $\frac{1}{22}$ of an inch square. The Stephenson lamp, better known among miners as the "Geordie," has a glass chimney as well as the wire-gauze and the air to feed the flame enters through a perforated ring just below the wick. This lamp, though safer than the Davy, if used with care, becomes a source of danger if the perforated ring is allowed to get clogged and the glass chimney overheated. A series of trials with safety-lamps, made in Britain by a committee of the Midland institute, led to the condemnation of the ordinary Davy and Stephenson lamps and to the introduction of the Mueseler, Marsant, and several other lamps, which had been used with satisfaction in Belgian and French mines. They are, however, all modifications of the principle which underlies the original invention of Sir Humphry Davy. A safety-lamp recently brought before the public is the Thornebury, which is said to be self-extinguishing in an explosive mixture of fire-damp and air, to give a strong light, to be simple in construction, and absolutely safe. There are also several electric miner's lamps in the market.

SAFETY-VALVE, a contrivance for relieving the pressure of steam before it becomes too great for the calculated strength of the containing vessel. The commonest form of safety-valve on

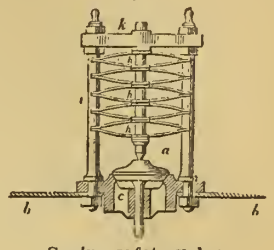
Fig. 1.



Lever safety-valve.

steam-boilers is a lid (valve), pressed against a hole (seat) by either a spring or a weight; the spring or weight not exerting a greater force than can be overcome by the pressure of the steam inside, part of which then escapes and obviates any danger. The valve is round, is bevelled round the edge, and is furnished with a spindle which moves loosely in a guide attached to the seat; the seat is bevelled to fit the edge of the valve. On locomotive and on ship's boilers the valve is pressed against the seat by a spring arrangement; but on stationary boilers a weight should always be employed. Fig. 1 shows a safety valve, in which a weight is employed. Here a is the valve, b b the boiler. cc the valve-seat, usually, like the valve itself, made of gun-metal, d the lever turning upon a fixed center at e, and pressing upon the valve by a steel point, f a guide for the lever, g a weight which may be shifted backward and forward according to the pressure desired. Fig. 2 shows a form of spring safety-valve, in which a series of bent springs hhh are placed

Fig. 2



Spring safety-valve.

alternately in opposite directions, their extremities sliding upon the rods i i, and the springs being kept down by the cross bar k; a being the valve, c the valve-seat, and b b part of the boiler.

SAFFRON, a low ornamental plant with grasslike leaves and large crocus-like purple flowers, cultivated in the East and in Southern Europe for the sake of its stigmas. These when dried form the saffron of the shops, which has a deep-orange color, a warm bitterish taste, and a sweetish penetrating odor. Its orange-red extract is used by painters and dyers, and the saffron itself also in cookery and confectionery as a coloring and flavoring substance.

SAGE, Russell, American capitalist, was born in Shenandoah, Oneida co., N. Y., in 1816. In 1852 he was elected to congress as a whig, and reëlected in 1854, serving on the Ways and Means committee. He removed to New York City in 1863 and became largely interested in railroad investments. He was associated with Jay Gould in the control of the Wabash, the St. Louis and Pacific, and other western roads, and in the Western Union Telegraph company and the Manhattan Elevated Railroad system of New York City. He died in 1906.

Sage. 1, inflorescence; 2, lower part of stem with leaves.

SAGE, the common name of a very large genus of plants containing about

450 species, widely dispersed through the temperate and warmer regions of the globe. They are herbs or shrubs of widely varying habit, usually with entire or cut leaves and various-colored (rarely yellow) flowers. The best known is the S. officinālis, or garden sage. This plant is much used in cookery, and is supposed to assist the stomach in digesting fat and luscious foods. Sage-tea is commended as a stomachic and slight stimulant.

SAGE-BRUSH, a low irregular shrub of the order Compositæ, growing in dry alkaline soils of the North American plains. The name is also given to other American species of Artemisia.

SAGINAW, the capital of Saginaw co., Michigan, on both sides of the Saginaw river, here navigable for the largest lake craft, about 17 miles from Lake Huron. Saginaw is well supplied with railway connections; and there are numerous saw-mills and other industrial establishments. Pop. 1909, about 55,000.

SAGITTA'RIUS (the Archer), in astronomy, the ninth sign of the zodiac, into which the sun enters November 22. The constellation consists of eight visible stars. It is represented on celestial globes and charts by the figure of a centaur in the act of shooting an arrow from his bow.

SAGO, a starchy product obtained from the trunk of several species of a genus of palms named Sagus, from which the finest sago is prepared. They form immense forests on nearly all the Moluccas, each stem yielding from 100 to 800 lbs. of sago. The tree is about 30 feet high, and from 18 to 22 inches in diameter. It is cut down at maturity, the medullary part extracted and reduced to powder like sawdust. The filaments are next separated by washing, and the meal laid to dry. For exportation the finest sago meal is mixed with water, and then rubbed into small grains of the size and form of coriander

Sago palm.

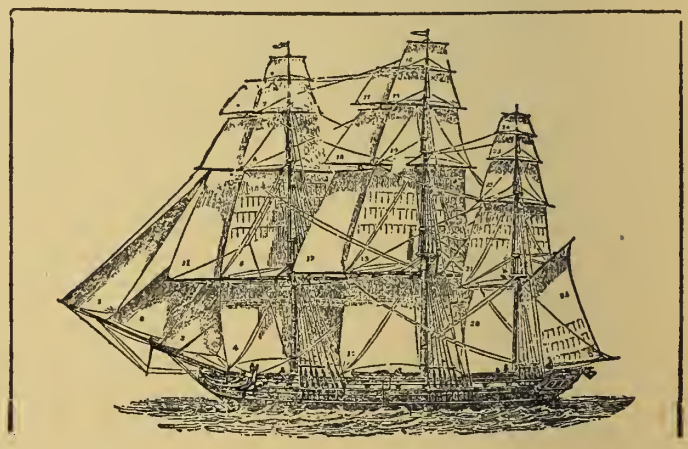
seeds. The Malays have a process for refining sago, and giving it a fine pearly luster, the method of which is not known to Europeans; but there are strong reasons to believe that heat is employed, because the starch is partially transformed into gum. The sago so cured is in the highest estimation in all the European markets. Sago forms a light, wholesome, nutritious food, and may be used to advantage in all cases where a farinaceous diet is required. It is also largely used in the manufacture of soluble cocoas, and for adulterating the common sorts of arrowroot.

SA'GOIN, or SAGOUIN, the native South American name of a genus of

Sagoin.

Brazilian monkeys of small size, and remarkably light, active, and graceful in their movements.

SAGUENAY (sag'e-nā), a river of Canada, province of Quebec, formed by two outlets of Lake St. John, which unite about 9 miles below the lake, from which point the river flows s.e., and falls into the St. Lawrence at Tadousac harbor; length about 100 miles.



Sails of a full-rigged ship.

SAHARA (sa-hā'ra; properly sä'ha-rä) The, that vast and mainly desert tract of Northern Africa lying north and south of the Tropic of Cancer, between the Atlantic and the Nile. In the north it extends to and forms part of Morocco, Algeria, Tunis, Tripoli, and Egypt; in the south it is chiefly bounded by the Soudan. This immense area, calculated at over 3½ million square miles, is not, as popularly supposed, a great level desert; on the contrary, it offers considerable variety of configuration and vegetation. The surface ranges from below sea-level to 8000 feet above it. There are the extensive and elevated plateaux of Tasili, Tibesti, etc., about the center of the Sahara, running from the north in a southeasterly direction, and presenting some very high mountain masses. Between Tibesti and the Niger we have the elevated region of Air, and toward the Atlantic Adrar. These plateaux are intersected by many fertile valleys fit for agriculture and pasture. Other parts of the desert are broken by large oases with a most luxuriant vegetation, such as Twat, Wargla, and Fezzan. On the borders of Algeria oases have been created artificially by means of artesian wells. A vast tract of true desert, El Djuf, lies in the west central region, and unites all the worst characters of the desert—want of water, intense heat, and moving sands. In the desert proper there is little of animal or of vegetable life. A few species of antelopes, the wild ass, the mountain sheep, the hyæna, the baboon, the tortoise, and the ostrich, are met with in favored spots. Lizards, jerboas, and serpents of many kinds retain undisturbed possession of the burning sands. Where herbage exists it is mainly composed of such plants as require but little moisture. The vegetable wealth of the desert-dweller lies in the date-palm. The population, estimated at about 2½ millions, consists of various tribes of Arabs, Berbers, and negroes. The Berbers are almost confined to the west-central and the negroes to the east-central parts, while the Arabs predominate in the other regions. Camel-breeding, slave and salt dealing, caravan conducting, and brigandage form the chief occupations of a large section. A number of caravan routes through the Sahara connect Timbuctoo and the Soudan with the maritime countries in the north. Recent explorations have finally disposed of the idea that the Sahara is the dried-up bed of a former inland sea, and that it could be restored to its former condition by admitting the waters of the ocean. The diluvial sea theory is now limited to the low-lying districts, El Djuf and Kufra, which abound in rock-salt deposits. A great part of the western Sahara is claimed by France. Spain has annexed a portion of the littoral and interior between Morocco and Senegal.

SAHARUNPUR (sa-hä-ran-pur'), a town in Hindustan, capital of the dis-

trict of the same name, in the United Provinces. It has many handsome residences in the European style, a government stud, a botanic garden, and a large sugar and grain trade. Pop. 66,254.

SAIL, a piece of cloth or tissue of some kind spread to the wind to impel or assist in impelling a vessel through the water. Sails are usually made of several breadths of canvas, sewed together with a double seam at the borders, and edged all round with a cord or cords called the bolt-rope or bolt-ropes. A sail extended by a yard hung by the middle is called a square sail; a sail set upon a gaff, boom, or stay, so as always to hang more or less in the direction of the vessel's length, is called a fore-and-aft sail. The upper part of every sail is the head, the lower part the foot, the sides in general are called leeches. The lower two corners of a square sail are in general called clues, and are kept extended by ropes called sheets. Sails generally take their names, partly at least, from the mast, yard, or stay upon which they are stretched; thus, the main-course, main-top sail, main-topgallant sail, are respectively the sails on the mainmast main-topmast and main-topgallant mast. The names of the sails shown in foregoing cut are: 1, flying jib; 2, jib; 3, fore-topmast staysail; 4, fore-course (or fore-sail); 5, fore-topsail; 6, fore-topgallant sail; 7, fore-royal; 8, fore-sky-sail; 9, fore-royal studding-sail; 10, fore-topgallant studding-sail; 11, fore-topmast studding-sail; 12, main-course (main-sail); 13, main-top sail; 14, main-topgallant sail; 15, main-royal; 16, main-sky-sail; 17, main-royal studding-sail; 18, main-topgallant studding-sail; 19, main-topmast studding-sail; 20, mizzen-course (cross-jack); 21, mizzen-top-sail; 22, mizzen-topgallant sail; 23, mizzen-royal; 24, mizzen-sky-sail; 25, spanker or driver. The vessel represented might, however, carry additional sails to those shown, in the shape of staysails, etc.; and in modern ships the top sails and topgallant sails are often divided into lower and upper. Four-masted ships are now not uncommon. See Ship.

SAINT CLAIR, a lake in North America, situated between Lake Huron and Lake Erie, and connected with the former by St. Clair river, with the latter by Detroit river. It is 30 miles long, greatest breadth 24 miles, area 360 sq. miles. It contains several fine islands. The river St. Clair, which separates Canada and the United States, is about 40 miles long, 1 mile wide, and navigable.

SAINT CLOUD, a city and the county seat of Stearns co., Minn., 65 miles northwest of Minneapolis; on the Mississippi river and the Great Northern and Northern Pacific railroads. It is the seat of a state normal school and of the Minnesota State reformatory. Pop. 10,663.

SAINTE AUGUSTINE, a city and seaport and capital of St. John's co., Florida on an inlet of the Atlantic, and a fashionable health resort during winter. It is said to be the oldest town in the United States, having been founded by the Spaniards about 1565. A few specimens of Spanish architecture remain, but these are rapidly making way for modern structures, and the town is putting on a new appearance. The Hotel Ponce de Leon is a monumental building in the early Spanish Renaissance style. It occupies a great extent of ground, and its architecture is rendered effective by distribution of plan, by lofty towers, corner turrets, arcades, and low-pitched overhanging tiled roofs. It has also garden courts and ornamental gardens. There are also other large hotels and several fine churches. Permanent population about 4800, but in winter over 10,000.

SAINTE-BEUVE (sant-beuv), Charles Augustin, a French writer, and one of the greatest of modern critics, born at Boulogne 1804, died at Paris 1869. The cross of the Legion of Honor was bestowed on him in 1859, and the senatorship in 1865. Most of his critical writings have been republished in various editions.

SAINT HELENA. See Helena (St.).

SAINT JOHN, a city and port of Canada, province New Brunswick, capital of St. John co., at the mouth of the river of the same name, which here enters the Bay of Fundy. It is built on rocky and irregular ground, and presents on the whole an attractive appearance. The harbor is commodious, spacious, never freezes, and is well protected by batteries. St. John is the great commercial emporium of New Brunswick, and has in particular a great trade in lumber. The fisheries are very important, and ship-building and a variety of other industries are briskly carried on Pop. 40,711.

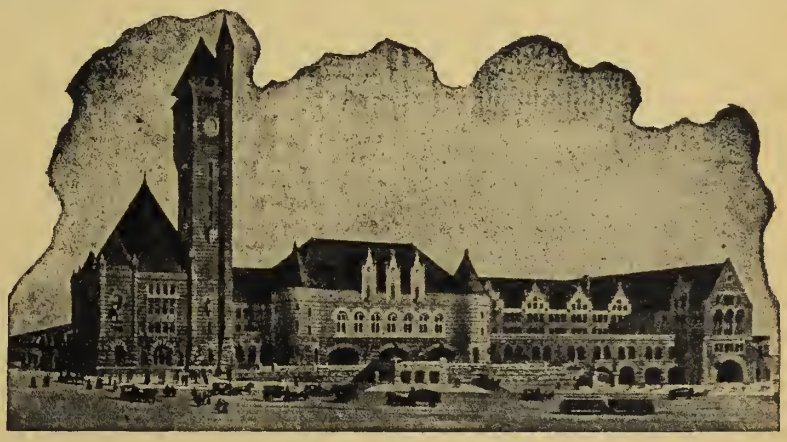
SAINT JOHN, a river partly belonging to the United States, partly to Canada, the last 230 miles of its course being in New Brunswick; total length 550 miles. It is navigable for large steamers to Fredericton, a distance of 80 miles. About 225 miles up are the Grand Falls, 75 feet high. The city of St. John is at its mouth.

SAINT JOHN'S, capital of Newfoundland, on Avalon peninsula in the southeast. Pop. 30,486.

SAINT JOSEPH, a highly prosperous city in the United States, capital of Buchanan county, Missouri, on the river Missouri, which is crossed by a fine iron railway bridge. It is noted for its colleges and schools, has a fine court-house, splendid opera-house, large central railroad depot, etc. It is the most commercial and populous town of Western Missouri, and an important railway center. It has manufactories of railway carriages and wagons, furniture, engines and boilers, stoves, clothing, flour-mills, boot factories, etc. Pop. 124,450.

SAINT-JUST (san-zhust), Antoine Louis Léon Florelle de, one of the most prominent men in the French revolution, born 1767, executed 1794. He was an effective speaker, but unscrupulous and uncompromising. The guillotine was his general answer to all arguments and actions which did not harmonize with his own. He fell with Robespierre through the events of the 9th Thermidor.

SAINT LOUIS (lu'i or lu'is), the chief city of the lower Mississippi valley, the commercial metropolis of the State of Missouri, is situated on the west bank of the Mississippi, less than 20 miles from its confluence with the Missouri, and 185 miles north of the influx of the Ohio. It is distant by river about 1,200 miles from New Orleans, and 729 miles from St. Paul, the head of navigation upon the upper Mississippi. It is situated in the center of the great valley, through which the waters of the Missouri, Mississippi, Ohio, Illinois and other, smaller but navigable streams find their way to the Gulf of Mexico. St. Louis is built upon a series of undulating hills or terraces that rise one above the other from the river for miles to the west.



Union station, St. Louis.

The plan of the city is rectilinear. In the old portion of the city, laid out by the early French inhabitants, the streets are narrow, and the blocks average 300 feet square. In the newer portion of the city the streets are wide and lined with shade trees. The east and west streets run from the river at right angles. One of these, Market street, is the dividing center line. The sewer system is most extensive, surface drainage being unknown in the city. The largest sewer, known as the Mill Creek, following the line of a natural drain, is twenty feet wide and fifteen feet high. The city is lighted every night of the year by electricity. The

alleys are brightly illuminated with incandescent electric lights, and the streets proper with arc-lights swung over the streets at an elevation of forty-five feet.

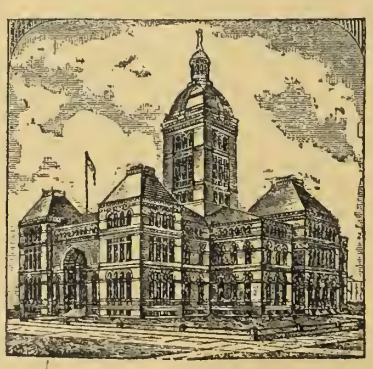
The twenty-three public parks, places, and gardens of the city have a total area of 2183 acres, including that part of Forest park temporarily used as part of the grounds of the Louisiana Purchase Exposition. Forest park, the largest of these, dates from 1874. It is almost directly west of the business center. Its area of 1371 acres represents a cost of $2,304,669 for ground and improvements. The school system of Saint Louis is notable in several particulars, chiefly in its application of the theory of manual training in connection with the work of Washington university, and in its pioneer work in illustrating the practical workings of the theories of Froebel. The city has begun supplying free books, and supports the free public library as an essential part of the system of public education. Among the private institutions are Washington university, with the Manual Training school and School of Fine Arts, University of Saint Louis, Forest Park University for Women, the Christian Brothers' college, the Saint Louis College of Physicians and Surgeons, the Homeopathic Medical College of Missouri, the Missouri School for the Blind, the Kenrick Theological seminary, and the Saint Louis Law school, now a department of Washington university. The principal libraries are the Public and the Mercantile. Among minor libraries, that of the Missouri Historical society is most important. The principal theatres are the Olympic, the Century, the Garrick, the Grand Opera House, the Imperial, Havlin's, the Odéon (Grand Avenue), and the Columbia. The Grand Opera House has a seating capacity of 2200, and the Olympic 2400.

The railroad systems of which Saint Louis is a center converge here from all parts of the United States and also from Mexico and Canada, though the country in which the city has fostered railroad development most in marketing its output lies south of Nebraska and west of the Mississippi. The twenty-four railroads of which it is a terminus have dwarfed the influence of the Mississippi as the determining factor of its trade without lessening the great advantage of direct river communication with tide water. Though Saint Louis is important as a manufacturing city and markets its own industrial output, it is still more important commercially as a distributing center for products representing the entire country. Its location makes it a point of clearing between manufactured products and the products of the soil for which they are exchanged. East Saint Louis, the principal industrial suburb on the Illinois side of the river, is connected by the magnificent Eads Bridge for railroads, wagons, and foot passengers. (See Bridge.) The Merchants' Bridge connecting the Illinois terminals of Saint Louis railroads with the Union Station system of terminals is for railroads only. The Union Station covers about eleven acres of ground with its main building and adjacent sheds. Saint Louis is a port of entry. Its exports are chiefly to Mexico, South America, and the West Indies. Its direct trade with the Philippines, mainly in malt liquors, has assumed some importance. The principal export shipments of flour and grain are to Central and South America, Cuba, England, Scotland, Ireland, Holland, and Germany. Exports to Europe consist largely of provisions. The principal items are dry-salt and sweet pickled meats, oleo, lard and hides. Exports of agricultural supplies, hardware, electrical supplies, machinery, glass, etc., are mostly to Spanish America. The city is "the largest tobacco market in the world." Population 1909, estimated at 704,000.

SAINT LOUIS WORLD'S FAIR, the international exposition held at Saint Louis from April 30, 1904, until November the same year. It was held to commemorate the centenary of the purchase of the Louisiana territory by the United States. Thirty-four states and territories and many foreign governments were largely represented, and many of them erected special and typical structures. The administrative system of the Exposition included four executive divisions: Exhibits, Exploitation, Works, and Concessions and Admission. The Division of Exhibits comprised the following fifteen departments: Education, Art, Liberal Arts, Manufactures, Machinery, Electricity, Transportation, Agriculture, Horticulture, Forestry, Mining and Metallurgy, Fish and Game, Anthropology, Special Economy, and Physical Culture.

SAINT MARY'S RIVER, the channel connecting Lake Superior with Lake Huron, having more the character of a lake than a river. At Sault Ste. Marie, or St. Mary's Falls, there is a fall of 18 feet, and to enable vessels to avoid this canals have been made both in the United States and in Canada.

SAINT PAUL, the capital of Minnesota and Ramsey co., on the Mississippi, 10 miles below the Falls of St. Anthony. Owing to its favorable position it has grown in about 50 years from an insignificant depot into a fine city, and a great commercial and manufacturing center. It is surrounded by a complete



State capitol, St. Paul, Minn.

net of railways, and its situation on the Mississippi offers water communication of exceptional value. Two bridges connect the city with Minneapolis. Two double-track interurban electric street car routes join the network in the two cities.

The city embraces an area of about 56 square miles. Of this area 1,204.42 acres, in 48 separate tracts, are devoted to park purposes. The park systems of the Twin Cities are connected by drives extending along the magnificent wooded gorge and the series of rapids below the Falls of Saint Anthony.

Saint Paul has numerous striking buildings. The finest is the new state capitol, of white Georgia marble, standing on a lofty eminence. It has a magnificent dome and entrances. The new post-office opposite Rice park, and the massive city hall and court house, occupying an entire square on Wabasha and Fourth streets, are other edifices of merit. Manufactures include agricultural machinery, joinery, railway rolling-stock, flour, leather, boots, and preserved provisions. There are medical and other colleges. Pop. 1909, 235,000.

ST. PETERSBURG. See Petersburg, (St.).

SAINT-PIERRE (saṇ-pi-ār), Jacques Henri Bernardin de, a French author, born 1737, died 1814. His Etudes de la Nature, published in 1783, first secured him a literary position. Then followed his chief works: Paul et Virginie (1787) and Chaumière Indienne (1790), both of them (especially the former) very popular. He was married twice when well advanced in years, each time to a young girl. In 1795 he was admitted to the Institute.

SAINTS, a word used in the New Testament as a general term to designate all believers in the gospel of Jesus Christ. In a specific sense it signifies persons whose lives have been deemed so eminently pious that the Greek and Roman Catholic churches have authorized practices of commemoration and invocation in regard to them. The points involved in the Roman Catholic doctrine are the intercession of the saints and the utility of invoking them. According to the Council of Trent "the saints reigning with Christ offer their prayers for men to God"; and it teaches that "it is good and useful to call upon them with supplication, and in order to obtain benefits from God through Jesus Christ, who alone is our Redeemer and Savior, to have recourse to their prayers, help, and aid." This help and aid is not expected to be given directly, but only through the favor the saints have with God, and through their intercession. As to how the saints are enabled to hear prayers addressed to them, there is no definite teaching. It is chiefly holy men who have died since the time of Christ that are spoken of as saints. The doctrine of saints, and the ideas and usages which grew out of them, form one of the main points of difference between the Protestants and the adherents of the abovementioned churches. The Roman Catholics regard their beliefs on the subject of saints as supported by different parts of the Bible and the writings of many of the early fathers. Protestants generally object to the whole doctrine, alleging that not only is the idea of saints as intercessors nowhere contained in the Bible but that it originated centuries after the establishment of Chris-

tianity; and that it is against the chief doctrine of Christianity, which declares all men to be sinners, and to be saved only by Christ. Countries, cities, arts, trades, orders, things, etc., have their patron saints, or saints who are supposed to be specially interested on their behalf; but the church, it seems, determines nothing in relation to them. St. Denis is the patron of France; St. George of England and Russia; St. Andrew of Scotland; St. Patrick of Ireland; Olaff of Norway; Canute of Denmark; Nepomuk of Bohemia; Cecelia of music; Hubert of hunting; Crispin of shoemakers, etc.

SAINT-SIMON (saṇ-sē-mōn), Claude Henri, Comte de, founder of a philosophico-religious sect of socialists, was born at Paris in 1760. During the ten years 1803–13 he wrote a number of works on scientific and political subjects, in which may be traced the gradual development of his socialistic theories, which found more definite expression in his subsequent and more important writings, such as L'Industrie ou Discussions Politiques, Morales et Philosophiques (1817–18), and Parabole (1819). Augustin Thierry, Saint Aubin, and Auguste Comte, who had become his disciples, collaborated in these later volumes. Finding the difficulty of procuring the means of subsistence and of publishing his works increasing, he attempted suicide by shooting (1823), but recovered with a mutilated visage and the loss of an eye. He lived for about two years after this, dying in 1825.

SAINT-SIMONIANS. See Saint-Simon.

ST. THOMAS, a West Indian island, belonging to the kingdom of Denmark, one of the Virgin group, 36 miles east of Porto Rico. Area, 33 sq. miles; pop. 14,389; capital, Charlotte Amalia, on the south side, with a safe and commodious harbor, dock, fort, etc. It is neither fertile nor healthy, and is subject to droughts, cyclones, and earthquakes, but used to be an important center of West Indian trade.

ST. VINCENT, a British West Indian island, in the center of the Windward group. Area, 132 sq. miles; pop. about 41,000; capital, Kingstown, on a bay of the same name near the s.w. extremity of the island, with a pop. of 5593.

ST. VINCENT, Cape, a promontory forming the s.w. extremity of Portugal. It is celebrated in naval history for the great victory gained here in 1797 by the British admiral Sir John Jervis over a Spanish fleet nearly twice the strength of his own. Sir John was raised to the peerage under the title Earl of St. Vincent.

SAKI, the common name of several species of monkeys inhabiting South America, closely allied to the sapajous, but differing from the latter in having nonprehensile tails. They are roughly subdivided into long and short-tailed sakis. They are all forest-dwellers, gregarious, nocturnal, timid, and live chiefly on honey and fruits.

SALA, George Augustus, a journalist and author, born in London 1828. His last work was his own Life and Adventures. Much of his work was contributed to the (London) Daily Telegraph, but All the Year Round, the Cornhill Magazine, and the Illustrated London News ("Echoes of the Week") contain many sparkling productions from his pen. He died in 1895.

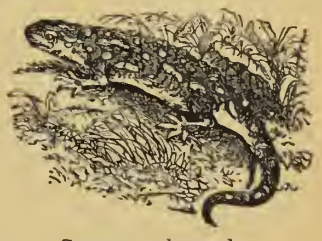
Saki Cuxio.

SAL'AD, a preparation of raw vegetables or herbs, such as lettuce, endive, red or white cabbages, celery, cresses, radishes, shalots, onions, green mustard, dandelion, corn-salad, etc; or of cooked beet-root, potatoes, French beans, etc., with salt, vinegar, oil, sauces and spices. A great number of salads may be made by suitable combination of the materials mentioned, and still further variety is obtained by the admixture of different kinds of shredded meat, fish, eggs, sausage, lobster, crabs, prawns, shrimps, sardines, etc.

SAL'ADIN, or properly Salah-ed-din, a celebrated sultan of Egypt and Syria, born 1137, died 1193. His father, a native of Kurdistan, was governor of Tekrit (on the Tigris). He early distinguished himself as a soldier, became vizier to the last of the Fatimite caliphs in succession to his uncle Shirkuh, and on the caliph's death in Egypt (1171) Saladin usurped his wealth and authority, with the approval of Nureddin, the sultan of Damascus. After the latter's death (1173), Saladin succeeded also in possessing himself of Damascus and Southern Syria. He rapidly extended his conquests over Syria and the neighboring countries, and thus came in contact with the Crusaders during the Third Crusade. The disastrous defeat he suffered from the Crusaders in 1177 compelled him to return to Egypt, but in 1182 he resumed his career of conquest. In 1187 he gained the famous victory of Tiberias, and Jerusalem surrendered to him after a gallant resistance. But the fall of Acre in 1191 after a two years' siege, and the defeats at the hand of Richard I., compelled Saladin to conclude a truce (1192), which was followed by the withdrawal of Richard. About a year after this event Saladin died at Damascus.

SALAMAN'CA, a city in Spain, capital of a province of the same name, 120 miles northwest of Madrid, on and between three hills, and on the river Tormes, here spanned by a fine bridge of twenty-six arches, the greater part of which is of Roman origin. In picturesqueness, and in the magnificence of its ancient edifices, Salamanca is hardly surpassed by any other Spanish city. Chief among the numerous attractions rank the cathedral (16th century), a splendid example of florid Gothic; the old cathedral, erected 1102, in Romanesque style; the university, the College of the Jesuits, King's college, and churches. The university is one of the oldest and most celebrated in Europe, and when at its zenith in the 16th century attracted some 15,000 students from all parts of Europe. Pop. 24,156.—The province of Salamanca, chiefly formed by the Douro basin, has an area of 4940 sq. miles, and a population of 320,765. It is rich in oak and chestnut forests and cereals, and produces wine, oil, and hemp.

SALAMAN'DER, the name given to various animals included in the class Amphibia (frogs, toads, newts, etc.), and in the order Urodela ("tailed") of that class. The salamanders may be divided into the land salamanders and the water salamanders, efts or newts. The land salamanders have an elongated lizard-like form, four feet, and a long tail. The skin is warty, with many glands secreting a watery fluid, which the animal exudes when alarmed. As this fluid is injurious to small animals the salamanders have the reputation of extreme venomousness, though they are in reality entirely harmless. The best-known species is the common salaman-



Common salamander.

der of Europe. It is 6 to 8 inches long, is found in moist places under stones or the roots of trees, near the borders of springs, in deep woods, etc., and passes its life in concealment except at night or during rain. It is sometimes called the spotted salamander, from the bright yellow stripes on its sides. There are various other species in Europe, Asia, and America. In America the name is often given to the menopome. Salamanders feed on worms, slugs, snails, and insects. The old legend that salamanders could live in the midst of fire is, like their venomousness, a fiction, although it is possible that the watery secretion of the skin might enable these animals to resist heat with impunity for a longer period than other forms.

SAL'AMIS, or **KOLURI,** an island of Greece, in the Gulf of Ægina, close to the shore of Attica. The celebrated battle, B.C. 480, in which the vast and unwieldy Persian fleet under Xerxes was signally defeated by a much smaller Grecian fleet, was fought here.

SAL-AMMONIAC, the chloride of ammonium, now generally obtained from the refuse of gas-works. It is used in calico-printing, in galvanizing iron, in soldering, etc.

SALEM, a city and seaport of Essex co., Massachusetts, about 14 miles n.n.e. of Boston. Its site is formed by two inlets of the sea; the North river, connected with Beverley by a bridge nearly 1500 feet long, and the South river, which forms the harbor. It has a large coasting trade and its manufac-

turing industries are in a flourishing condition, particularly in cotton, jute, leather and boots, spirits and chemicals. Pop. 38,940.

SALEM, a district and town of Hindustan, Madras presidency. Area of district, 7653, sq. miles; pop. 2,205,898. —Salem, the capital, is well situated in a long narrow valley traversed by the Tirumanimuttar, is clean and tolerably well built, and has a good trade and a weaving industry of some importance. Pop. 70,621.

SALER'NO, a town and seaport of Italy, capital of the province of the same name, on the Gulf of Salerno, 30 miles southeast of Naples, finely situated on the side and at the foot of a hill, crowned by the remains of an ancient Norman citadel. Pop. 22,328.—The province has an area of 2126 sq. miles, and a pop. of 583,838.

SALFORD, a municipal, parl., and county borough of England, in Lancashire, which may be considered an integral portion of Manchester, though it has a mayor and corporation of its own. Pop. 220,956. See Manchester.

SALIC LAW, the code of laws of the Salian Franks. One of the laws in this code excluded women from inheriting certain lands, probably because certain military duties were connected with the holding of those lands. In the 14th century females were excluded from the throne of France by the application of this law to the succession to the crown, and it is in this sense that the term salic law is commonly used.

SALISBURY, Robert Arthur Talbot Gascoyne Cecil, K.G., Third Marquis of, English statesman, was born at Hatfield (county of Herts) in 1830, and educated at Eton and Oxford. As Lord Robert Cecil he entered parliament as member for Stamford in 1853, and gradually made his way till in 1866, on the formation of Lord Derby's third administration, he was appointed secretary of state for India. He became premier as well as foreign secretary on the fall of the Gladstone government in 1885. Gladstone succeeded again to

Marquis of Salisbury.

power in the end of the same year, but in June following was defeated on the Irish bills, when Lord Salisbury again became premier and foreign secretary, with the approval and support of the liberal unionists. This position he held till 1892, and in 1895 he entered on a third term as premier. In 1900 he became premier for the fourth time, but he retired from political life in 1902. He died at Hatfield on August 22, 1903. He devoted much time to scientific pursuits.

SALI'VA, the transparent watery fluid secreted by glands connected with the mouth. The quantity secreted in twenty-four hours varies, its average amount is probably from 1 to 3 pints. The purposes served by saliva are mechanical and chemical. It keeps the mouth in a due condition of moisture, and by mixing with the food during mastication it makes it a soft pulpy mass, such as may be easily swallowed. The chemical action of saliva on the food is to convert the starchy elements into some kind of sugar. The salivary glands are compound tubular glands known as the parotid, the sub-maxillary, and the sub-lingual, and numerous smaller bodies of similar structure, and with separate ducts, which are scattered thickly beneath the mucous membrane of the lips, cheeks, soft palate, and root of the tongue. Salivary glands are absent in some mammals and reptiles, and in most fishes.

SALIVATION, a superabundant secretion of saliva, either determined locally by the use of masticating irritants, or by means which act upon the whole system, especially by mercurial preparations. In the last case it is accompanied by a coppery taste, by swelling of the gums, and sometimes by looseness of the teeth. Salivation is usually diminished by the use of astringents, laxatives, etc.

SALIX. See Willow.

SALMON, a well-known fish, forming the type of the family Salmonidæ. The salmon inhabits both salt and fresh

The salmon-trout.

waters, and ranks prominent among the food-fishes of Britain and other countries. It generally attains a length of from 3 to 4 feet, and an average weight of from 12 to 30 lbs., but these limits of size and weight are frequently exceeded. The typical color of the adult fish is a steel-blue on the back and head, becoming lighter on the sides and belly. Teeth are present in the upper and lower jaws, palate, and vomer or roof of the mouth; the edges of the tongue are also toothed or notched. The food consists of animal matter, and must vary with the change of habitat from salt to fresh water, and vice versa. In the autumn the salmon quits the sea and ascends the rivers for the purpose of spawning, often having to surmount considerable obstacles, such as falls of some height, in its progress. In many streams they are now assisted in this by artificial structures known as "salmon-ladders," or the like. The eggs are deposited in a shallow trough or groove excavated in the gravelly bed of the river. After spawning, the salmon, both male and female, return to the sea under the name of spent-fish, foul-fish, or kelts, the females being further distinguished as shedders or baggits. In from 70 to 150 days the young fish emerges from the egg, and in its embryo state it is not unlike a tadpole, being on the average about one and a quarter inches in length. About 50 days later it assumes the appearance of a fish and now approaches the definite or parr stage of its existence, beginning to be marked by transverse bars of dark color. It usually continues in the shallows of its native stream for two years after hatching, and during this period it attains a length of 8 inches. When the season of its migration arrives, generally between March and June, the fins have become darker and the fish has assumed a silvery hue. It is now known as a smolt or salmon fry. The smolts now congregate into shoals and proceed leisurely seaward. On reaching the estuary they remain in its brackish water for a short time and then make for the open sea. Leaving its native river as a fish, weighing it may be not more than 2 ozs., the smolt, after three months' absence, may return to fresh water as a grilse, weighing 4 or 5 lbs. In the grilse stage or salmon peel, as it is sometimes called, the fish is capable of depositing eggs. After spawning in the fresh water the grilse again seeks the sea in the autumn, and when its second stay in the ocean is over it returns after a few months' absence as the adult salmon, weighing from 8 to 10 lbs. The salmon returns as a rule to the river in which it passed its earlier existence. The fertility of the fish is enormous: it has been calculated that over 150,000,000 of salmon ova are annually deposited in the Scotch river Tay alone, and of these only about a third come to life and attain the parr stage, while of these parrs only 20,000,000 become smolts; and in time only 100,000 remain as perfect salmon, of which 70,000 are caught and 30,000 left for breeding purposes. In Europe the fish is found between the latitudes of 45° and 75°, in North America in corresponding latitudes. The flesh of the salmon when fresh is of a bright orange color, and is of highest flavor when taken from the sea-feeding fish. Of the same genus as the common salmon is the salmon-trout, the common river-trout, Lochleven trout, etc. What is known as the "land-locked" salmon, which is found in Norway, Sweden, Maine, and New Brunswick, and is so called because it remains in inland waters and does not descend to the sea, is by some regarded as a distinct species from the common salmon, by others not. In the waters of Northwestern America are several salmon belonging to a distinct genus, including the quinnat or king-salmon, blue-back salmon or red-fish, silver salmon, dog salmon, and hump-back salmon. The quinnat has an average weight of 22 lbs., but sometimes reaches 100 lbs. Both it and the blue-back salmon are caught in immense numbers in the Columbia, Sacramento, and Frazer (especially in spring), and are preserved by canning. Attempts have been made to introduce the quinnat into eastern North America and Europe. The flesh of these salmon is indistinguishable from that of the common form. The salmon is one of the fishes that are important objects of pisciculture, and various species

of the family have been introduced into waters not previously inhabited by them.

SALMON-FISHING. Law of. See Poaching.

SALMON'IDÆ, a family of teleostean fishes, belonging to the subdivision Malacopteri of that order. To this family belong the various species of salmon (see Salmon), the trouts, the char, the grayling, the smelt, the vendace, whitefish of America, etc. The Salmonidæ are abdominal Malacopteri, in that their ventral fins are placed backward on the belly. The body is covered with cycloid scales; the head is naked, and there are no barbels. The belly is rounded, and there is a small adipose fin behind the dorsal. Pyloric appendages of the stomach are generally numerous and rarely absent. The air-bladder is large and simple. The ova fall into the cavity of the abdomen before exclusion. Salmonidæ are inhabitants of the sea or fresh-water, or both

SALONI'CA (ancient, Thessalonica; Turkish, Saloniki), a large seaport of Turkey in Europe, on a gulf of the Ægean sea, 315 miles w.s.w. of Constantinople, rising from the sea in the form of an amphitheater, and forming a mixture of squalor and splendor. St. Paul preached the gospel here, and addressed two of his epistles to the Christian converts. Railways run to Vienna and Constantinople. Pop. 150,000, half being Jews and Greeks.

SALSETTE', a large island to the north of Bombay, and connected with Bombay island by bridge and causeway; area, 241 sq. miles. The coast abounds in cocoa-nut groves, and the palmyra-palm grows plentifully over most of the island. The island is remarkable for its cave architecture. Pop. 108,149.

SALT, in chemistry. It is impossible to state in very precise terms what is the idea attached to the word salt, as at present used in chemical science. It may perhaps be most correctly defined by saying that it implies the capability of readily undergoing double decomposition. In its most restricted signification the word salt suggests a substance, which, if soluble in water, can produce rapid double decompositions with other soluble substances, or if insoluble, can be produced as a precipitate, as the result of a rapid double decomposition taking place between soluble substances. This is certainly the idea suggested by the application of the word salt to nitrate of potassium, chloride of sodium, etc. The term salt is also sometimes applied to substances which, like chloride of ethyl, give rise to slow processes of double decomposition with aqueous solutions of the salts specially so called. The name is, however, most commonly and most appropriately applied to those bodies of which reaction by double decomposition is the most characteristic property, and which exhibit such reactions under the most familiar conditions.

SALT, Common (chloride of sodium, NaCl), a substance in common use as a seasoner and preserver of food from the earliest stages. It exists in immense quantities dissolved in sea-water, and also in the waters of salt springs, and in solid deposits, sometimes on the surface, sometimes at greater or less depths, in almost every geological series. Rock-salt, that is salt in the crystalline or solid form, is found in great abundance in Cheshire, Yorkshire, and Worcestershire. It is also found in abundance in nearly every country of Europe. The supply in other continents is equally great. The basin of the Indus and other parts of India possess extentive salt plains. In China deep salt-wells abound. The Sahara and Central and Southern Africa afford inexhaustible supplies. Most of the South American republics, the West Indies, and the United States also have large natural supplies. Salt manufactured from sea-water is produced extensively along the Mediterranean and Atlantic sea-boards of Europe as well as in America. It is chiefly made by natural drying in shallow reservoirs, but also by boiling. Sun-dried salt is the purest. Salt from sea-water is usually known as bay-salt. Most salt, however, is produced from rock-salt or from brine springs, the latter being due to the melting of rock-salt by water. Salt was subject to a duty in ancient Rome, and this example has been generally followed in modern states. One of the most oppressive of the salt taxes in Europe was the French gabelle. In Great Britain salt-duties were imposed in the reign of William III., but the tax was abolished in 1823. In British India salt is an important source of revenue. Salt is used as a glaze for coarse pottery, as a mordant, for giving hardness to soaps, for improving the clearness of glass; it is the source of soda and of chlorine, and is thus of immense industrial importance.

SALT LAKE, Great. See Great Salt Lake.

SALT LAKE CITY, the capital of the state of Utah, 2 miles from the Jordan, and 11 miles from Great Salt Lake. It stands at the base of Wasatch mountains 4550 feet above sea-level. The streets are wide, and the dwellings generally small and of one story. The most remarkable public buildings are the Mormon tabernacle, a large ungainly building with a roof like a dish-cover, the Mormon temple, and the city-hall. It is the metropolis of the Mormons, and was first settled in 1847 by the followers of Brigham Young. Pop. 100,000.

SALTS, Smelling, a preparation of carbonate of ammonia with some agreeable scent, as lavender or bergamot, used by ladies as a stimulant and restorative in fits of faintness.

SALVADOR', a republic in Central America, lies along the coast of the Pacific, and is bounded by Honduras on the north and east, and by Guatemala on the northwest; area, 7212 sq. miles. A range of volcanic peaks, varying in height from 4000 to 9000 feet, runs through the center of the country, dividing an interior valley from the lowlands on the coast. The largest river is the Lempe, which is only navigable in parts. The soil is remarkably fertile. The most important crop is indigo, which is of excellent quality. Corn, sugar, coffee, tobacco, cotton, etc., also thrive well. Cattle-breeding is carried on, but not extensively. The manufactures are unimportant. The chief exports are coffee, indigo, silver, raw sugar, balsam of Peru, leather, etc. They are of the annual value of about $400,000,000. The population consists of a small number of whites (of Spanish descent), Spanish-speaking Indians, and half-breeds. The established religion is Roman Catholicism. The government is carried on by a president and four ministers. There is a congress of seventy deputies elected by universal suffrage. The inhabitants had long the reputation of being the most industrious in Central America, and the state, in proportion to its size, is still the most densely peopled. Pop. 803,534. Salvador remained under Spanish rule until 1821, when it asserted its independence, and joined the Mexican confederation. In 1823, however, it seceded from the confederation, and subsequently formed part of the republic of Central America. In 1853 it became an independent republic. Its progress has been much hindered by internal dissensions, revolutions and counter-revolutions following each other without end. The capital is San Salvador.

SALVAGE, a recompense allowed by law to anyone, by whose voluntary exertions ships or goods have been saved from the dangers of the sea, fire, pirates, or enemies.

SALVATION ARMY, a religious organization originated in East London by William Booth, the leader and general, in 1865. The society was developed into its present form and received its name in 1878. Latterly several agencies more directly philanthropic have been grafted on it for helping the needy and outcast. With the name army came military phraseology. A semi-military attire was assumed, barracks were built, and the army marches out with banners displayed and bands of music. Music (drums, cornets, etc.) is also employed in the meetings, and other proceedings of a sensational character. The object is to attract people who would not enter church or chapel, and for this cause public-houses, prisons, etc., are visited and open-air meetings are held. The weekly journal of the army is the War Cry. As a temperance movement the Salvation Army has been the means of converting hundreds of thousands of confirmed drunkards. Total abstinence is a condition of membership. The International headquarters are at London, England. Its world-wide operations are carried on in 51 countries and colonies, embracing 7316 posts, under the charge of 20,054 officers and employes, with 45,339 local officers, 17,099 brass bandsmen, and about 50,000 musicians. Sixty-three periodicals are published in 24 languages, with a weekly circulation of about 1,207,223. There are 668 Social Relief Institutions in the world, under the charge of nearly 3,000 officers and employes. The headquarters of the Salvation army in America are in New York City.

SALVINI, Tommaso, Italian tragedian was born at Milan in 1829. After winning renown in juvenile characters he joined the Ristori troupe. He appeared

in the Edipo of Niccolini and achieved a great success. Alfieri's Saul was perhaps the greatest of all his characters. His first appearance in the United States was in 1873, and he was so well received that he repeatedly returned. In 1886 he and Edwin Booth played together for three weeks, Salvini as Othello and Booth as Iago. After Salvini's last tour in this country in 1890 he retired from the stage to his home in Florence. Died, 1896.

SAL VOLATILE (vo-lat'i-lē), carbonate of ammonia. The name is also applied to a spirituous solution of carbonate of ammonia flavored with aromatics.

SALZBURG (sâlts'burh), a city of Austria, capital of the Duchy (or province) of Salzburg, is most picturesquely situated on both banks of the rapid Salza, which is here hemmed in between two isolated hills, 63 miles southeast of Munich. The manufactures are varied, but not individually of importance. Pop. 32,934.—The Duchy or crown-land of Salzburg, area 2767 sq. miles, is a rugged mountainous country, intersected by numerous valleys, chiefly pastoral, but in many of them much corn and fruit are raised. Wood is abundant, and the minerals, which are very valuable, include gold, silver, lead, copper, cobalt, iron, salt, and marble. Pop. 193,247.

SAMAR', one of the Philippine Isles, separated by channels from Luzon on the north, and Leyte on the south. Area, 5000 sq. miles. The island is densely wooded and the soil fertile. The chief products are rice, cocoa, palm-oil, hemp, and timber. Pop. 194,027.

SAMA'RA, a town of Russia, capital of the government of same name, 550 miles e.s.e. of Moscow, at the confluence of the Samara with the Volga. Pop. 96,085.—The government lies on the left bank of the Volga, and has an area of 64,985 sq. miles. A great part is flat and fertile, but is at present little cultivated. There is little wood. Wheat and other kinds of grain are the chief products. There are a considerable number of Swiss and German colonists here, also Nogai Tartars, Bashkirs, and Kirghis. Pop. 2,650,580.

SAMARANG', town of Java, on the north coast of the island, near the mouth of the Samarang river. Next to Batavia and Surabaya it ranks as the most important commercial port of Java. Its harbor is not good, and large ships have to anchor at some distance from the shore. Pop. 83,000.

SAMARIA, an ancient town of Palestine, formerly capital of the Kingdom of Israel, finely situated on a hill surrounded by higher hills, 36 miles n.n.w. of Jerusalem. Samaria was built by Omri, king of Israel, about B.C. 925, and was the metropolis of the ten tribes till they were carried away into captivity about B.C. 720. After its destruction by John Hyrcanus it was rebuilt, and given by Augustus to Herod, who gave it the name of Sebaste. There is now an insignificant village here and some striking ruins.

SAMARITAN PENTATEUCH, an ancient version of the five books of Moses which has been preserved by the Samaritans as the canonical Scriptures have been by the Jews.

SAMARITANS, a mixed people, who inhabited the region between Judæa and Galilee, and who formed a sect among the Jews. They consisted partly of the tribes of Ephriam and Manasseh left in Samaria by the king of Assyria, when he had carried their brethren away captive, and partly of Assyrian colonists. On the return of the Jews from captivity they declined to mix with the Samaritans, though united with them in religion. The latter attempted to prevent the Jews from building the temple at Jerusalem, and, failing in this, they built a temple on Mount Gerizim exclusively for their own worship. A few of the race still exist at Nablus. They adhere strictly to the Mosaic law, but are regarded by the Jews as heretics, as they accept only the Pentateuch, of which they have a special version of their own. They believe in angels, in a resurrection and future retribution, and expect the coming of a Messiah, in whom they look only for a prophet. In the synagogue the Aramaic Samaritan dialect is used, but they speak Arabic. They avoid connection with other sects, and marry only among themselves.

SAMARKAND', a city of Asiatic Russia, on the Zerafshan river, 130 miles e. of Bokhara, situated in a fertile plain. It contains 80 schools with about 1500 pupils. Pop. 54,900. See Bokhara.

SA'MIAN WARE, a name given to an ancient kind of Greek pottery made of Samian earth, or to a variety of Roman pottery made in imitation of this. The vases are of a bright red or black color, covered with a lustrous siliceous glaze, with separatcly-moulded ornaments attached to them.

SAMNITES (-nītz), an ancient people of Lower Italy, who were of Sabine stock, and consisted of several tribes. They were a brave, frugal, and religious people. Their first war with the Romans resulted in favor of the latter, and secured a Samnite alliance during the Latin war (340–338 B.C.). The second Samnite war (326–304 B.C.) was a fierce contest, in which the Romans were shamefully defeated at the Caudine Forks, but were finally successful.

SAMO'A, or NAVIGATOR ISLES, a group of volcanic islands in the South Pacific, n.e. of the Fiji group, made up of three large islands, Upolu, Savaii, and Tutuila; and a number of smaller ones; total area about 1700 sq. miles, with a population of nearly 37,000. The most important island of the group is Upolu, with an area of 340 sq. miles, diversified by mountains and fertile plains; pop. about 17,000. Apia, the seat of government, is a town of 1500 inhabitants situated on a bay on the n.w. side of Upolu. Savaii, the largest of the group, has an area of 659 sq. miles, and is extremely mountainous (greatest height 5350 feet), the interior being hardly known. Tutuila has an area of 54 sq. miles. The government of Samoa is a limited monarchy presided over by a king and a vice-king, with a parliament of chiefs called the malo. The Samoans are of Polynesian extraction, and vary in color from a dark brown to a light copper, occasionally to a shade of olive. They are of fine physique and of a gentle disposition, and are now all Christians. Their language contains thirteen letters, and is soft and liquid. The leading industries are fishing, collecting copra, the cultivation of fruit, cotton, and taro, and the manufacture of tapa, a native cloth. The cocoa-nut, bread-fruit tree, taro, and banana form the staple food of the people. From 1889 till 1899 the islands were under the joint control of Germany, Britain, and the United States, but in 1899 an agreement was arrived at under which Britain withdrew entirely, while Germany received Upolu and Savaii, the United States obtaining Tutuila and other islands.

SAMOS, now Samo, an island in the Grecian archipelago near the coast of Asia Minor, 45 miles southwest of Smyrna, forming a principality tributary to Turkey, area, 180 sq. miles. In 84 B.C. it was united with the Roman province of Asia. In 1550 it was conquered by the Turks. It now occupies an exceptional position, having been erected into a tributary principality of the Sublime Porte in 1832, the ruler being a Greek prince. Pop. 55,000.

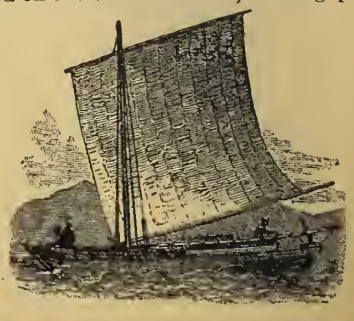
SAM'OTHRACE, or SAMOTHRAKI, an island in the n. of the Ægean sea, belonging to Turkey, about 14 miles long by 8 miles broad.

SAMOVAR', a Russian tea apparatus, the water in which is boiled by means of

Antique Russian samovar.

hot coals contained in an iron tube, and then poured over the tea.

SAM'PAN', a boat of various build used on the Chinese rivers, at Singapore



Sampan, Canton river.

and elsewhere, for the conveyance of merchandise, and also frequently for

habitation. They are swift sailers both with oar and sail.

SAM'PSON, William Thomas, American naval officer, was born at Palmyra, New York, in 1840. In June, 1864, he became executive officer of the iron clad Patapsco of the Charleston blockading squadron. From 1879 to 1882 he commanded the Swatara on the Asiatic station. In 1890 he was assigned to the command of the San Francisco, the first modern steel cruiser of the new navy. From January, 1893, until May, 1897, he was chief of the bureau of ordnance. He was appointed president of the naval court of inquiry to investigate the blowing up of the battleship Maine in the harbor of Havana and shortly afterward he was appointed as acting rear-admiral, to the command of the North Atlantic squadron. He attained the rank of commodore in regular line of promotion on July 3, 1898. When Admiral Cervera's Spanish squadron was destroyed Sampson himself was absent until the battle was practically over, but it was fought on lines laid down by him. After the war he served as a Cuban commissioner, was promoted rear-admiral on March 3, 1899, and until September, 1901, was in command of the Boston (Charlestown) Navy Yard. He was retired from active service February 9, 1902. He died in 1902.

SAMSON, an Israelite of the Tribe of Dan, the son of Manoah, reckoned one of the judges of Israel, a popular hero, and an inveterate enemy of the Philistines, flourished about 1116–1096 B.C. His peculiar gift of great bodily strength is strikingly shown in the nature of his deeds, as tearing in pieces a lion, breaking his bonds asunder, carrying away the gates of Gaza, and throwing down the pillars of the house of Dagon. Previous to the latter event Delilah, his concubine, deprived him of his strength for a period by cutting off his hair, which was a violation of his obligation as a Nazarite, but with the growth of his hair his strength returned, and at the great festival of Dagon Samson pulled down the building over the heads of the Philistines, who had blinded him, he himself perishing with them. Milton has made his death the subject of a drama—Samson Agonistes.

SAMUEL, the first of the order of prophets and the last of the judges of Israel. He was the son of Elkanah of Ramathaimzophim, belonging to the tribe of Levi, and was consecrated by Hannah, his mother, to the service of Jehovah. He was educated in the house of the chief priest Eli at Shiloh, and had the disasters revealed to him that should befall the house of Eli. He assumed the judgeship of Israel about twenty years after the death of Eli, and headed a successful expedition against the Philistines. He mentions his own name in the list of warlike chiefs by whom the Lord sent deliverance to his people, and it is recorded that he judged Israel as civil ruler all his life, going a yearly circuit from Ramah, where was his home, to Bethel, Gilgal, and Mizpeh. His administration was distinguished by the restoration of the neglected worship of Jehovah, He also gave a new vigor to the theocratical institutions of Moses by the establishment of schools of the prophets. In his old age Samuel anointed Saul as king, and when Saul failed in his duties Samuel anointed a new king, David. He did not live to see the contest between David and Saul decided.

SAMUEL, Books of, in the Old Testament, are two in number in the modern editions of the Hebrew text. In Hebrew MSS. the work is one; the division into two books, being first introduced by Bomberg, in 1518, at Venice. The contents of the books present us with a more or less consecutive narrative of events relating to the Israelites, from the priesthood of Eli to the death of David. The principal periods embraced in the record are: the restoration of the theocracy under Samuel (book i. chap. i–xii. B.C. 1171–1095); the history of Saul's reign, ending with his death (book i. chaps. xiii.–xxxi. B.C. 1095–55); and the history of David's reign (book ii. B.C. 1055–15). As regards the authorship of these books it is evident they could not have been written by Samuel, since his death is recorded in book i. chap. xxv.

SAN ANTONIO, or **SAN ANTONIO DE BEXAR,** a town on the San Antonio river, 80 miles southwest of Austin City, Tex. The principal public buildings are the hospital, orphan asylum, a Roman Catholic cathedral college and convent, arsenal, and schools. The town is a great center of trade in wool, horses and mules, hides, and grain. There are several breweries, tanneries, and flour mills. It is one of the oldest Spanish towns on the continent, and has a large trade with Mexico. Pop. 1909, 100,000.

SAND, fine particles of stone, particularly of siliceous stone in a loose state, but not reduced to powder or dust; a collection of siliceous granules not coherent when wet. Most of the sands which we observe are the ruins of disintegrated rocks, and differ in color according to the rocks from which they were derived. Valuable metallic ores, as those of gold, platinum, tin, copper iron, titanium, often occur in the form of sand or mixed with that substance. Pure siliceous sands are very valuable for the manufacture of glass, for making mortar, filters, ameliorating dense clay soils, for making moulds in founding, and many other purposes.

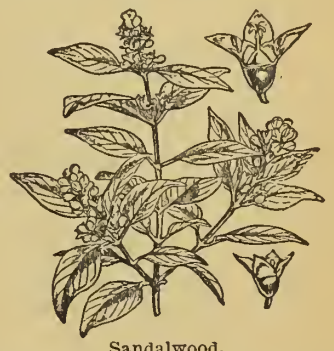
SAND, George. See Dudevant.

SANDAL, a kind of shoe or covering for the feet used among the ancient Jews, Greeks, and Romans. It consisted of a sole fastened to the foot by means of straps crossed over and wound round the ankle. Originally made of wood, vegetable leaves or fibers, or leather, they afterward became articles of great luxury, being made of gold, silver, and other precious materials, and beautifully ornamented. Certain religious orders of the present day wear sandals.

Sandals.
The pair in the middle are Roman, those on the sides are Greek.

SANDALWOOD, a tree belonging to the East Indies and the Malayan and Polynesian islands, remarkable for its fragrance. Its wood is used as a perfume, and is manufactured into glove-boxes and other light articles. It is largely used as incense in the worship of Brahmams and Buddhists. There are several species which furnish sandalwood, the common being S. album. Some trees of other genera are called false sandalwood. See also Adenanthera.

SANDALWOOD ISLAND, or **JEENDANA,** a large island in the Indian archipelago belonging to the Dutch residency of Timor, crossed by the meridian of 120°E.; area, 4000 sq. miles; with a population of about 2,300,000. The coast is bold, and terminates at the southern extremity in a lofty and inaccessible peninsula. The interior is mountainous. Edible birds' nests, beeswax, ponies, and sandalwood are obtained here. The natives are of the Malay race.



Sandalwood.

SANDARACH (san'da-rak), a resin which exudes from the bark of the sandarach tree. It is used as incense, and for making a pale varnish. It is also used as pounce powder for strewing over paper erasures. Called also Juniper-resin.

SANDARACH TREE, a large coniferous tree with straggling branches, yielding the resin described in preceding article. It is a native of Morocco, Algeria, and Northern Africa generally. The timber is fragrant, hard, and durable, and is largely used in the construction of mosques and other buildings, as well as for cabinet work.

SAND CRAB, or **RACING CRAB,** a genus of crabs, which live in holes in the sand along the seashores of warm countries, inhabits the Mediterranean, Red sea, and Indian ocean, and is remarkable for the rapidity of its motions.

SAND EEL, a genus of fishes. The body is slender and cylindrical, somewhat resembling that of an eel, and varying from 4 inches to about 1 foot in length, of a beautiful silvery luster, destitute of ventral fins, and the scales hardly perceptible.

SANDERLING, a wading bird averaging from 6 to 8 inches in length, which

breeds in the Arctic regions, and in winter migrates southward. It feeds on small marine animals, and chiefly inhabits the sandy tracts of the sea-beach and the estuaries of rivers. The flesh is nutritious and pleasant to the taste.

SAN DIEGO (sän dē-ā′gō). a port of entry and the county seat of San Diego co., Cal., 125 miles south by east of Los Angeles, on San Diego bay, and on the Atchison, Topeka and Santa Fe railroad, and several steamship lines. It is a favorite health resort, has a beautiful situation and a mild and equable climate. Coronado Beach with its large hotel, ostrich farm, botanical gardens and other attractions lies across the bay. The navy and the war department have separately large tracts of land on the bay, for a coaling station and fortifications respectively, the latter known as Fort Rosecrans. Pop. 1909, 45,000.

SAND FLIES, the name of certain flies found in various countries, the bite of which may give rise to painful swellings. They are included in the family Tipulidæ, which also includes the well-known "daddy long-legs" or crane-flies.

SAND GROUSE, a genus of rasorial or scratching birds, belonging to the family Pteroclidæ, and differing in several respects from the common grouse (which see), belonging to the family Tetraonidæ. They are natives chiefly of the warm parts of Asia and Africa, and are most abundant in arid sandy plains. The legs are longer than in other grouse, and the tail and wings are pointed. Pallas's sand grouse differs from these in having feathered tarsi and united toes. It is a native of the sandy plains of Central Asia, where it occurs in vast numbers.

SAND HOPPER, a species of small insect-like crustaceans of the order Amphipoda, common along most seashores, where they may be met with leaping about the sands in great quantities after the receding tide.

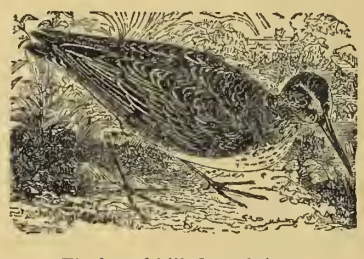
SANDHURST, a flourishing city of Victoria, Australia, about 100 miles n.n.w. of Melbourne, an important railway and gold mining center. It contains a handsome pile of public buildings, fine townhall, law courts, banks, hospital, benevolent asylum, mechanic's institute (with a library of 14,500 volumes), a theater, numerous places of worship, botanic gardens, etc. It is lighted with gas and electricity, and well supplied with water. Besides gold mining, which employs 4000–5000 miners, iron founding and making of railway rolling stock, coach building, stone cutting, tanning, vine growing, etc., are carried on. Pop. 50,000.

SAND MARTIN, or **BANK MARTIN,** a bird included in the family of swallows a summer visitant to Britain, where it is common in most localities. It is the smallest British member of its family, and is so named from its habits of nest-building in holes dug in the high banks of rivers, in the sides of sand or gravel pits, and in similar situations. The color of the sand-martin is a soft brown on the head and upper parts, and white below, with a dark brown band on the chest.

SAN DOMINGO (more properly Santo Domingo), the capital city of the Dominican republic, which includes the eastern part of the island of Hayti. The town is situated at the mouth of the Ozama on the south coast, and is the seat of the government and a bishop's see. It has spacious streets and squares, a cathedral dating from 1540, a university, etc. San Domingo is the oldest European city of the New World, and was founded by Bartholomew Columbus in 1496. Columbus was buried here in 1536; but his remains were removed to Havana in 1794. Pop. about 16,000.

SANDPAPER is made in the same way as emery-paper, with the difference that sand is substituted for emery. See Emery.

SANDPIPERS, a group of small grallatorial or wading birds, belonging to the family Scolopacidæ or snipes. These birds inhabit the shores of the sea and the estuaries and banks of rivers, and grope in the soft mud for the worms, small molluscs, insects, etc., upon which



The broad-billed sandpiper.

they feed. They migrate southward in winter in flocks, and appear to moult twice a year, the summer plumage differing from the winter dress. The voice is shrill and unmusical; and they are able both to run and to fly with rapidity. Sandpipers of various species are abundant in North America, and in winter in the West Indies.

SANDSTONES consist usually of grains of quartz aggregated into a compact rock, which may also contain particles of felspar, minute scales of mica, and an admixture of clay, indicating in many places their immediate derivation from the debris of granitic rocks. Sandstones are in most cases chiefly composed of particles of quartz, united by a cement. The cement is in variable quantity, and may be calcareous or marly, argillaceous or argillo-ferruginous, or even siliceous. The grains of quartz are sometimes scarcely distinguishable by the naked eye, and sometimes are equal in size to a nut or an egg, as in those sandstones called conglomerates, or sometimes pudding-stone or breccia. The texture of some sandstones is very close, while in others it is very loose and porous. Some sandstones have a fissile structure, and have been called sandstone slate. In color sandstone varies from gray to reddish-brown, in some cases uniform, in other variegated. In addition to quartz some sandstones contain grains of felspar, flint, and siliceous slate, or plates of mica. Some sandstones are ferruginous, containing an oxide or the carbonate of iron. Sandstones have been formed at different periods and under different circumstances, and are hence associated with different rocks or formations. They are in general distinctly stratified, and the beds horizontally arranged, but sometimes they are much inclined or even vertical. Sandstone in some of its varieties is very useful in the arts, and when it has no tendency to split is known by the name of freestone. When sufficiently solid it is employed as a building stone. Some varieties are used as millstones for grinding meal, or for wearing down other materials preparatory to a polish, and some are used for whetstones.

SANDUS'KY, a city of Ohio, on a sandstone ridge on the southern side of Sandusky bay, Lake Erie, about 61 miles w. of Cleveland. The site rises gradually from the shore and commands a fine view of the bay. The principal public buildings are a courthouse, a high school, and many churches. An extensive trade is done in fish, lumber, limestone, manufactured woodwork, grapes, and wine; and there are large machine shops, steel works, and engine and boiler works. It is celebrated for its manufacture of articles in bent wood; and its fisheries employ over 1000 hands. Pop. 23,764.

SANDWICH ISLANDS, a cluster of islands, thirteen in number, situated in the North Pacific, area, 647 square miles; pop. 31,194. Honolulu, the capital and chief port of the islands, is situated on Oahu. The remaining large islands are Kauai and Niihau, with an area of 657 square miles, and 11,859 inhabitants. The island of Molokai is a leper colony. The inhabitants of the group belong to the light-colored Oceanic stock, and have been civilized and converted to Christianity. After forming a republic for a short time, the monarchy having been overthrown in 1893, these islands now belong to the United States, having been annexed in 1898. The republican legislature consisted of a senate of fifteen members, and a chamber of representatives of fifteen members. The head of the government was a president, elected for six years by the two houses voting together, and he was assisted by a council of state. Honolulu, the capital, has become an important entrepot, and in it almost the whole trade of the islands is centered. The chief exports are sugar, rice, coffee, bananas, tallow, and hides; the imports are chiefly manufactured goods, provisions, grain, and timber. The currency is that of the United States. The islands were discovered by Cook in 1778, who afterward lost his life on Hawaii. Pop. 154,001. In 1900 the islands were constituted as the Territory of Hawaii. See Hawaii.

SANDY HOOK, a low sandy peninsula at the entrance of New York harbor.

SAN FRANCISCO, the largest city on the Pacific coast of the United States, almost totally destroyed by earthquake and fire on April 18–21, 1906. San Francisco was founded on October 9, 1776, by two Franciscan monks, Palon and Cambon, who established an Indian mission and called it San Francisco de Asisi. The place remained a mission until 1822, when California passed under the control of Mexico. Then a village gradually was established, called Dolores. In 1836 a small trading village called Yerba Bucna was established three

miles northeast of Dolores, in the bay. In 1846, when the United States took possession, Yerba Buena had a population of 450, and in that year the village dropped its new name and took that of the mission, San Francisco. The discovery of gold in 1848 brought thousands of men to the Pacific coast. In March, 1848, the population of San Francisco was 800. In September

1849, it was 10,000. From that year the city grew rapidly. In 1860 it was 56,802; in 1870, 149,473; in 1880, 233,959; in 1890, 298,997; in 1909, 400,000. In 1906 the city covered an area of

Comparative area of three great fires.

47 square miles, with 750 miles of streets, 20 miles of boulevards, 275 miles of street railway, 4,000 stone, brick, and steel buildings, 55,000 frame buildings, three museums and art galleries, eight public libraries, 47 hospitals, 98 public schools, and many hotels, theatres, opera houses, and clubs.

The city was almost completely destroyed by earthquake and fire on April 18, 19, and 20, 1906. Five times before had the city been visited by fire—on Dec. 14, 1849; May 4, 1850; June 14, 1850; May 2, 1851, and June 2, 1851. These five fires destroyed $16,000,000 worth of property. The great disaster, however, came at 5:13 o'clock on the morning of April 18, 1906, when three violent shocks of earthquake leveled many buildings, opened great fissures in the streets, and shut off the water supply by breaking the mains leading to the great reservoirs. Almost immediately fires started in a hundred different parts of the city. There was no water with which to fight the flames. Hundreds of buildings were blown up with dynamite and shot to pieces with artillery, but for three days the fire ravaged almost unchecked. In those three days an area of fifteen square miles, or approximately 10,000 acres, was burned. The burnt district included nearly two-thirds of the residence portion, thousands of mercantile and manufacturing establishments, 100 banks and financial institutions, all of the theatres, opera houses, hotels, public libraries, hospitals, and churches, and most of the public school buildings. More than 200,000 persons were left homeless and penniless. Three hundred and seventy-nine persons were killed or died of injuries and exposure.

Among the notable buildings destroyed by earthquake and fire were the Palace Hotel, the City Hall, which cost $6,000,000, and required 25 years to build; the famous residences of Nob Hill, the Call, Chronicle, and Examiner buildings, and the Flood, Mills, and Spreckles buildings. The disaster proved that the modern steel "skyscraper" can safely defy even violent earthquake shocks, for the steel structures in San Francisco stood, while massive stone and brick buildings of the old-fashioned construction were razed to the ground. United States and state troops took possession of the ruined city. The federal soldiers took charge of the hospital and relief work, established refugee camps, and put down lawlessness with an iron hand. Scores of thieves were shot down. The most drastic steps were taken to prevent a recurrence of the conflagration. Even in the houses untouched by the flames no lights or fires were permitted until after the water supply and fire protection had been restored. Every householder, millionaire, and mechanic alike was compelled to cook all meals in the street.

The nation was quick to respond to the cry of the homeless and hungry. Congress appropriated $2,500,000. All the cities raised huge sums. Carloads of provisions and clothing were hurried into the city, and in two days all danger of famine had passed. The property loss was estimated at $200,000,000, of which approximately three-fourths was covered by insurance. The city is being rapidly rebuilt on a more extensive scale and the new city will be one of the most modern on the continent.

SANGIR ISLANDS (sanger), a group of small islands in the Indian Archipelago, situated between the n. e.extremity of Celebes and the Philippine isle of Mindanao. The natives are of the Malay race, and profess Christianity. The islands belong to the Netherlands. Pop. about 50,000.

SAN'HEDRIM, or San'hedrin (corrupted from the Greek sunedrion, a council), the supreme judicial tribunal of the Jews, existing in the time of the Maccabees and in New Testament times. According to the Talmud it was founded by Moses when he elected seventy elders to assist him in judging the children of Israel in the wilderness, but this view is now generally rejected. The sanhedrim consisted of seventy members besides the president, who was usually the high priest. They were chosen from among the priests, elders, heads of families, and scribes or doctors of law, and had power to deal with both secular and spiritual matters. At the trial of our Lord they sat in the palace of the high priest. The council became extinct in 425.

SANITARY SCIENCE teaches how to maintain health and to ward off disease, and treats more especially of what is required of each individual in his duty to his neighbor, so that by using such means as may ensure his own health he may in a negative way preserve that of his neighbor also. The subject naturally divides itself into four main divisions: 1. That relating to our dwellings; 2. Food; 3. Clothing; 4. Cleanliness. As regards the first head, our dwellings should be situated so as to ensure a free circulation of air round them, and a thorough system of drainage. The rooms should be large, airy, and well ventilated A most pernicious source of impurity is sewer-gas, which can only enter houses where waste and soil-pipes are in direct communication with the main system of sewers. The decomposition of fæcal and other matters in drains produces both ammoniacal and other sulphurous gases. These gases, owing to their light specific gravity, rise to the highest point in the pipes, and from thence force their way through imperfections in drains and pipes, and also through the water-traps of closets, sinks, etc., into our houses, and become a most potent atmospheric impurity. They are of two kinds—an odoriferous and an odorless gas. The former is almost innocuous, but the latter is most deadly, since it depresses the general system and frequently contains the germs of disease. Sunlight and thorough ventilation destroy the properties of this gas. In order to prevent sewer-gas from entering a house, all waste-pipes in connection with the sewers should be carried along outside the house and furnished with a ventilator, so that the gas may escape into the external air. The ventilator should discharge at the roof of the house, and not near to a window or other opening into the dwelling. The outlet of pipes from wash-basins in bed-rooms should discharge in the open air, and should not be directly connected with drains. Foul smells and gases arise from many other causes, such as decomposition of organic matter within the house, emanations from the surface of the body, preparations of arsenic and copper in wall-paper etc. Flowers also give off carbonic acid

gas at night, and gas-jets also pour much impurity into the atmosphere. Overcrowding also greatly vitiates the atmosphere. Thorough drainage of our houses is also very necessary in order to prevent dampness, which is a most prolific source of disease. Every portion of a house should be kept scrupulously clean and after infectious or contagious disease there should be a thorough cleansing and disinfecting of the furniture, bedding, carpets, etc. The neglect of an efficient use of cold water is perhaps one of the most potent and prolific causes of disease. The first duty of every human being is to attend thoroughly to the cleansing of the whole body, and this can only be done by the free application of water. The daily use of a cold bath is not only conducive to health, but a powerful preventive against disease. It is always desirable when we leave a bath that a glow—called the reaction—should be felt all over the body, and this can be assisted by the vigorous use of a rough towel. Bathing in this way is a powerful natural tonic to the skin, nerves, and muscular system. It promotes digestion, regulates the bowels, and is in fact invaluable as a sanitary measure. All underclothing should be changed at least once a week; and socks and stockings every two days. All household furnishings should be kept thoroughly free from dirt. One or two other points should also be noticed. Exercise is one of these. It may be walking or horse exercise. Both are invigorating; both promote appetite and digestion and the healthy action of the functions generally. An outdoor occupation is to be preferred on the score of health. In addition, freedom from anxiety, cheerful society honesty, and the practice of all the virtues are most conducive to the promotion and preservation of health. See also Germ Theory of Disease, Disinfectant, Public Health Acts, etc.

SAN JOAQUIN (hō-à-kēn), a river of California which traverses the valley of the same name from the Tulare Lakes, joins the Sacramento, and falls into Suisun bay. It has a length of 350 miles.

SAN JOSE (hō-sā'), the capital of Santa Clara co., California, in the valley of Santa Clara, 46 miles by rail S. of San Francisco. The city is embowered in trees and shrubberies, and has a fine park, 6 miles distant, to which leads a beautiful avenue of trees. It contains a courthouse, a theater, state normal school, public halls, a public library, and other good public buildings. Wheat, wine, dried and canned fruits, tobacco, etc., are produced here. Pop. 25,615.

SAN JOSE, capital of the state of Costa Rica, Central America. It stands on a table-land 4500 feet above the sea level. The streets are narrow, and there are few public buildings worthy of note. It is the center of the trade of the state. The climate is healthy, and the town is surrounded with coffee plantations. Pop. 25,000.

SAN JUAN BOUNDARY QUESTION. By the treaty of Washington (15th June, 1846) it was provided that the boundary line between British North America and the United States should be continued to the middle of the channel between Vancouver's island and the continent, and thence south to the Pacific ocean. But the island of San Juan lies in the middle of this channel, and the question immediately arose to whom the island should belong. It was a subject of long and bitter dispute, but at last the matter was submitted to the arbitration of the Emperor William of Germany without appeal. The emperor's award, dated October 21, 1872, was given unreservedly in favor of the American claim on the ground that the American view of the treaty of 1846 was the more correct one.

SAN LUIS, a province of the Argentine republic. Area, 23,359 sq. miles. The climate is healthy, and rain seldom falls. The province is rich in copper and other metals. The leading industry is cattle-rearing. Pop. 100,000.—The chief town is San Luis de la Punta. It consists chiefly of mud huts surrounded by mimosa thickets. A trade is done in cattle and hides. Pop. 7000.

SAN LUIS DE POTOSI (pot-o-sē'), a city of Mexico, capital of the state of same name, 198 miles N.W. of Mexico, 6350 feet above sea-level; regularly built, with fine streets. It has a handsome cathedral; manufactures of clothing, shoes, hats, etc.; railway workshops; and a considerable trade. Pop. 62,573.—The state has an area of 27,500 sq. miles, is generally fertile, and has rich gold and silver mines. Pop. 516,486.

SAN SALVADOR, a town in Central America, capital of the state of Salvador, situated near the volcano of same name. The inhabitants are chiefly engaged in agriculture. The town was completely destroyed by earthquake on April 16, 1854, and has suffered severely since. It was founded originally in 1528. Pop. 50,000.

SANSKRIT LANGUAGE AND LITERATURE. Sanskrit is the name given to the learned and classical language of the Hindus, the language in which most of their vast literature is written, but which has not been a living and spoken language since about the 2d century before Christ. It is one of the Aryan or Indo-European family of tongues, and may be described as a sister of the Persian, Greek, and Latin, Teutonic, Slavonic, and Celtic tongues. It stands in the same relation to the modern Aryan languages of India as Latin stands to the Romance languages. It is a highly inflected language, having in this respect many resemblances to Greek. To philologists it has proved perhaps the most valuable of tongues and it was only after it became known to Europeans that philology began to assume the character of a science. Its supreme value is due to the transparency of its structure, and its freedom from the corrupting and disguising effect of phonetic change, and from obliteration of the original meaning of its vocables.

Sanskrit literature covers a period extending from at least 1500 B.C. to the present time. The great mass of the literature is in metre, even works on science and law having a poetical form. The oldest literary monuments are the Vedas—the Rig, the Yajur, the Sama, and the Atharva Veda. They are looked upon as the source of all the shāstras or sacred writings of the Hindus, which, however, include works upon ethics, science, and philosophy as well as religious works. In the department of epic poetry the chief productions are the epics called the Rāmāyana and the Mahābhārata. The Rāmāyana is believed to be the older of the two, and to have been current in India as early as the 5th century B.C. The Mahābhārata is a huge epic of about 220,000 lines, forming rather a cyclopædia of Hindu mythology, legendary history, and philosophy than a poem with a single subject. It is the production of various periods and various authors. In the province of lyric poetry we meet with poems of the greatest eloquence, tender sentiment and beautiful descriptions of nature. We must mention in particular the Meghadūta (Cloud Messenger) of Kālidāsa; the Ritusanhāra (Circle of the Seasons) of the same poet; and the Gitagovinda of Jayadeva, describing the adventures of Krishna. Though the Hindus can boast of some excellent specimens of dramatic poetry, yet, on the whole, their dramas are much inferior to those of the Greeks or of modern Europe. The scientific literature of India is likewise large. Grammar seems to have had a special fascination for the Hindus. The oldest extant grammar is that of Pānini, which belongs to the 2d or 3d century before Christ. In mathematics and astronomy the Hindus have greatly distinguished themselves, as also in medicine and philosophy. Sanskrit literature was first introduced to the western world by Sir William Jones at the end of the 18th century.

SANTA ANNA, Antonio Lopez de, Mexican president, born 1796, died 1876. He took a prominent part in the expulsion of the Spaniards from Mexico, and proclaimed the Mexican republic in 1822. He was in the front during all the Mexican troubles till 1833 when he became president. In 1836 he was defeated and taken prisoner by the Texans, but returned the following year. He was again president in 1846, but on the taking of Mexico by the United States troops in 1847 he resigned. He again held the office in 1853–55; was banished in 1867, but permitted to return in 1874.

Santa Anna.

SANTA CATHARI'NA, a maritime state of Brazil, in the south; area, 27,436 sq. miles. It is watered by numerous streams, the soil is fertile, the climate mild, and the seasons regular. Sugar, coffee, rice, corn, mandioca, and wheat are the chief cultivated products. Agriculture and cattle-rearing are the chief

industries. There are a number of German settlements, the inhabitants of that nationality being reckoned at 70,000. The capital is Desterro. Pop. 283,769.

SANTA CLARA (klä'rä), a province of Cuba, occupying the central portion of the island, and bounded by the sea on the north and south, the province of Matanzas on the west, and Puerto Principe on the east. Area, 9560 sq. miles. The province contains some of the largest sugar plantations and factories, while tobacco is also largely raised, and the upland savannas offer rich pasturage It is also rich in minerals, and asphalt, silver, and copper are mined. Population 156,536. The capital is Santa Clara.

SANTA CRUZ, capital and chief port of the Canary islands on the n.e. coast of Teneriffe. The streets are well paved, but the houses are small, and the public buildings few. There is an excellent harbor protected by a mole, and the coast is defended by a number of forts. Wine, brandy, and cochineal are the chief products. Pop. 15,000

SANTAL' PARGANAS, The, a district in the Bhagalpur division of Bengal area, 5456 sq miles. The Ganges, which bounds the district on the north and partly on the east, forms also its chief drainage. Various minerals, as coal, iron, and silver, have been found in this district. Pop. 1,754,196.

SANTALWOOD, a dyewood obtained from a leguminous tree of the East Indies, Madagascar, etc.; also called sanders or saunders wood and red sandalwood. Sontaline, a substance obtained from it, is used in dyeing blue and brown.

SANTANDER', a city and seaport of N. Spain, capital of the province of same name, on the Bay of Biscay, with a good and secure harbor. Pop. 54,694.—The province is bounded by Biscay, Burgos, Palencia, and Oviedo, and has an area of 2111 sq. miles. The soil is fertile, and produces large quantities of corn, hemp, flax, oranges, lemons, figs, etc. There are also lead, coal, and iron mines, quarries of limestone and marble The rearing of cattle is common, and the fisheries along the coast are well developed. Pop. 263,673.

SANTERRE (sän-tār), Antoine Joseph, born in Paris 1752, died 1809. As a wealthy brewer he was notable during the French revolution for his influence over the Parisian mob in the attacks on the Bastille and the Tuileries. He rose to be commander of the national guard and a major-general.

SANTIA'GO, the capital of the republic of Chile and of the province of the same name, is beautifully situated at the foot of the Andes, 112 miles by rail e. of Valparaiso. It is intersected by the Mapocho, a rapid stream issuing from the Andes, has water channels in many of the streets, is lighted by electricity, and furnished with tramways. Owing to the prevalence of earthquakes the houses are mostly of one story, and generally occupy a large space of ground, having gardens and patios or courts in the interior. The Plaza or Great Square is a large open area adorned with a fine fountain; around it are the municipal buildings and criminal courts, the post-office, the old palace, formerly the residence of the presidents, now used as barracks, the cathedral, etc. There are also a mint, a well-appointed university with about 1000 students, high class secondary schools, school of art, military school, normal schools, theater, museum, etc. The city was founded in 1541. The most memorable event in its history was the burning of a church, in which about 2000 persons perished in 1863. Pop. 291,725.

SANTIAGO DE CUBA, a seaport town on the southeast coast of the Island of Cuba. It is the oldest town of the island (having been founded in 1514), is the see of an archbishop, has a fine cathedral several other churches, and a harbor, which, though difficult of access, is spacious and deep. Its trade is considerable. Pop. 43,090.

SANTIAGO DEL ESTE'RO, a town of the Argentine republic, in the province of same name, in a fertile district on the Rio Dulce. Pop. 10,000.—The province has an area of 31,500 sq. miles, and is well suited for cattle-rearing and agriculture. Pop. 160,000.

SANTOS, a city and seaport of Brazil, in the state and 50 miles s.s.e. of Sao-Paulo, on the South Atlantic, in an unhealthy locality. The harbor is the best in the state, and the chief outlet for its products, which are coffee, sugar, tobacco, hides, etc. Pop. 50,000.

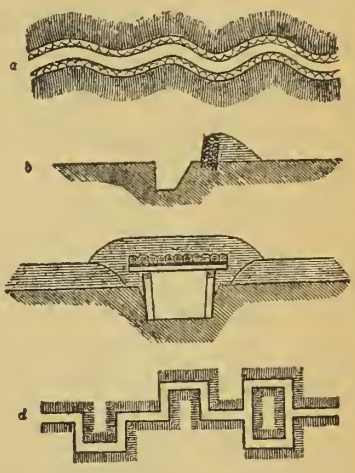
SAONE, Haute (ōt sōn, Upper Saone), a department in the east of France; area, 2028 sq. miles. Verone is the capital. Pop. 290,954.

SAONE-ET-LOIRE (sōn-ē-lwär), a department of E. France; area, 3270 sq. miles. Mâcon is the capital. Pop. 625,885.

SAO PAULO (sä-un-pä'u-lō), a maritime state of Brazil, between the two states of Minas-Geraes and Paranà; area, 112,940 sq. miles. Pop. 1,386,242, including 300,000 Italian colonists and 20,000 Germans.—Sao-Paulo, the capital is the center of the provincial railways, 86 miles from its seaport Santos, and 143 miles from Rio de Janeiro. The principal edifices are the cathedral, several monasteries and convents, the governor's and the bishop's palace, the townhouse, etc. Pop. 65,000.

SAP, in military affairs, a narrow ditch or trench by which approach is made to a fortress or besieged place when within range of fire. It runs in a zigzag, serpentine, or similar direction, so as not to be enfiladed by the fire of the fortress. The trench is formed by trained men (sappers), who place gabions as a cover, filled with the earth taken from trench along the intended line of parapet; the earth excavated, after the gabions have been filled, being thrown up to form a parapet capable of resisting artillery. The single sap has only a single parapet; the double has one on each side. Sometimes the sap is entirely covered in. The digging of a sap is generally a dangerous operation. In the accompanying figure a is a double sap on the serpentine plan; b, section of single sap, showing portion of gabions; c, section of covered sap; d, sap on rectangular plan.

SAP, the juice or fluid which circulates in all plants, being as indispensable to vegetable life as the blood to animal life. It is the first product of the digestion of plant food, and contains the elements of vegetable growth in a dissolved condition. The absorption of nutriment from the soil is effected by the minute root-hairs and papillæ, the absorbed nutriment being mainly composed of carbonic acid and nitrogenous compounds dissolved in water. This



Sap, as variously constructed.

ascending, or as it is termed crude sap, is apparently transmitted through the long cells in the vascular tissue of the stem and branches to the leaves, passing from cell to cell by the process known as endosmose.

SAPAJOU (sap'a-jō), the name generally given to a group of South American prehensile-tailed monkeys, including fifteen or sixteen species, whose characteristics it is exceedingly difficult properly to define. Among the species may be named the horned sapajou (also

Capucin sapajou.

called horned capucin); and the capucin. One of the most common species is the weeper. They are small in size, playful in disposition, leading a gregarious life, and feeding chiefly on fruits and insects.

SAPPHIRE (saf'īr), a precious stone, next in hardness and value to the diamond, belonging to the corundum class. Sapphires are found in various places, as Burmah, India, and Ceylon, in Asia; and Bohemia and Silesia, in Europe. The sapphire proper is a beautiful transparent stone of various shades of blue color.

SAPPHO (saf'ō), a distinguished Greek poetess, born at Mitylene, on the island of Lesbos, and flourished about 600 B.C. Little is known regarding her life, though she is made the subject of various legends. Of these may be mentioned the common story of her love for Phaon, which, being unrequited, caused her to leap down from the Leucadian rock. At Mitylene Sappho appears to have been the center of a female coterie, most of the members of which were her pupils in poetry, fashion, and gallantry. Her odes, elegies, epigrams, of which only fragments have come down to us, display deep feeling and imagination. Her reputation among the ancients almost borders on extravagance.

SAPSUCKER, the popular American name of several small woodpeckers.

SARACEN, an Arabian or other Mussulman of the early and proselytizing

Sapsucker.

period; a propagator of Mohammedanism in countries lying to the west of Arabia. By mediæval writers the term was variously employed to designate the Arabs generally, the Mohammedans of Syria and Palestine, or the Arab-Berber races of Northern Africa. At a later time it was also applied to any infidel nation against which crusades were preached, such as the Turks.

SARACENIC ARCHITECTURE, the style adopted by the followers of Mohamet in building their mosques, palaces, and tombs. Originally the Arabs possessed no distinctive architectural style, and the style which they at length made their own was developed by architects belonging to the countries which they had conquered. This style is chiefly represented in Egypt, Persia, Spain, Turkey, and India, but the Saracenic architecture of Spain is generally called by the distinctive name of Moorish. The most prominent features of the style are the dome, the minaret, and the pointed arch. The Saracenic domes rise from a square base, are graceful in form, sometimes in groups of three or more, and frequently enriched externally with colored tiles or other decorations. The minarets are slender towers of considerable height, rising in stages or stories, each with a balcony, and are most frequently octagonal, sometimes cylindrical, rising, however, from a square base. The arch is of the pointed variety, this form of arch having been used by the Arabs in Egypt before the rise of the Gothic in Europe. It is sometimes of the horse-shoe form. The use of clustered pendentives (honey-comb work) to form a transition from the quadrangular area under a dome to the arch of the dome itself is very peculiar and common. Ex-

Saracenic architecture.
Mosque of Kaid Bey, Cairo.

ternally the tops of walls are often finished off with an upright cresting, which may be regarded as an ornament taking the place of a cornice. Flat surfaces are freely ornamented with a profusion of scroll-work and conventional foliage, often in intricate and beautiful design. Stucco is much used in ornamentation.

SARAGOSSA, or **ZARAGOZA,** a city of Spain, in Aragon, capital of the province of the same name, as well as of the ancient kingdom of Aragon, about 20 miles n.e. of Madrid by rail in a fertile plain irrigated by the Ebro. Pop. 98,188.

SARATO'GA SPRINGS, a town in the state of New York, about 35 miles north of Albany, and 186 miles north of New York City by rail. It owes its prosperity to its mineral-springs, which have made it the most fashionable watering-place in the United States. The springs are characterized by their saline and chalybeate ingredients, combined with carbonic acid gas. It has numerous large and handsome hotels, several churches, etc., and during the season has an influx of about 35,000 visitors. Ordinary population about 14,000.

SARA'TOV, a city of Russia, capital of the government of same name, is built on broken and undulating ground on the right bank of the Volga, 459 miles southeast of Moscow, and surrounded by gardens. Pop. 137,109.—The government has an area of 32,613 sq. miles. The principal exports are corn, hemp, flax, tobacco, hops, and madder. Pop. 2,419,884.

SARA'WAK, a rajahship in the island of Borneo, under British protection. It is situated on the west and northwest side of the island, and has a coast-line of about 400 miles, while it extends inland for more than 100 miles; area about 50,000 sq. miles. The more important vegetable productions are cocoa-nuts, rice, and sago. The minerals include gold, antimony, and quicksilver, and diamonds are also found. The original inhabitants are Dyaks, but are now very much intermixed with Malays and Chinese. The rajahship was conferred upon Sir James Brooke by the Sultan of Borneo in 1841 in return for distinguished services in quelling disturbances and restoring order, and when he died in 1868 he was succeeded by his nephew. Capital, Kuching. Pop. 300,000.

SARCOPH'AGUS, a coffin or tomb of stone; a kind of stone chest, generally more or less ornamented, for receiving

Egyptian sarcophagus—Third pyramid.

a dead body. The oldest known sarcophagi are Egyptian, and have been found in certain of the pyramids. Two of the most celebrated of these are the great saracophagus taken by the British in Egypt in 1801, now in the British museum, and the alabaster sarcophagus in the Sloane museum, London. Sarcophagi were also used by the Phœni-

Roman sarcophagus—Tomb of Scipios.

cians, Persians, and Romans; and in modern times stone coffins have not been uncommon for royalty and persons of high rank.

SARD, a variety of chalcedony, which displays on its surface a rich reddish brown, but when held between the eye and the light appears of a deep blood-red carnelian.

SARDANAPA'LUS, the name in Greek of several kings of Assyria, one of whom is said to have been the last king of Assyria. He is represented by Ctesias as a very effeminate prince, wholly given to sensual indulgence and inactivity, and it is related that Arbaces, a Median satrap, in conjunction with Belesis, a Babylonian priest, raised an army of Medes against him about 785 B.C. This army, attacking his camp by night, gained a great victory, and pursued the fugitives to the gates of Nineveh. Here Sardanapalus defended himself for two years, but ultimately set his palace on

fire and perished in the conflagration with all his wives and attendants.

SARDINE, a small fish, now generally regarded as identical with the pilchard, abundant in the Mediterranean and also on the Atlantic coasts of France, Spain, and Portugal. It is much esteemed for its flavor, and large quantities are preserved by being salted and partly dried,

Californian sardine.

then scalded in hot olive-oil, and finally hermetically sealed in tin boxes with hot salted oil, or oil and butter.

SARDIN'IA, an island in the western half of the Mediterranean, forming part of the Italian kingdom and separated from the island of Corsica by the strait of Bonifacio, not quite 7 miles wide; length, 152 miles; central breadth, about 66 miles; area, 9350 sq. miles. The coast is in great part rugged and precipitous, and though the island is nearly in the form of a parallelogram there are some important indentations, such as the Gulf of Asinara in the northwest, the Bay of Oristano in the west, and the Gulf of Cagliari, in the southeast, on which Cagliari, the capital of the island, is situated. The interior is generally mountainous; the chain which traverses Sardinia sends out branches east and west, and culminates in Brunca, 6291 feet, and Gennargentu, 6132 feet. The rearing of live stock forms an important industry. Game of all kinds is very abundant. Wild boars, stags, deer, and mufflons frequent the woods and forests. The most valuable fishery is that of the tunny. For administrative purposes Sardinia is divided into the two provinces of Cagliari and Sassari. The inhabitants are of Italian race, with a mixture of Spanish, and are characterized by a chivalric sense of honor and hospitality, but the family feud or vendetta still exists. See next article. Pop. 789,314.

SARDINIA, KINGDOM OF, a former kingdom, of the south of Europe, composed of the Island of Sardinia, the Duchy of Savoy, the Principality of Piedmont, the county of Nice, the Duchy of Genoa, and parts of the Duchies of Montferrat and Milan; 28,229 sq. miles; pop. (1858), 5,194,807. In 1720 Victor Amadeus II., duke of Savoy, on receiving the island of Sardinia in exchange for Sicily, took the title of King of Sardinia. He was succeeded by Charles Emmanuel III., Victor Amadeus III., and Charles Emmanuel IV., who in 1802 abdicated in favor of his brother Victor Emmanuel I., the royal family having by this time, during the domination of Napoleon, taken refuge on the island of Sardinia. In 1814 the king returned to Turin, where the seat of government was established. An insurrection occasioned his abdication in 1821 in favor of Charles Felix, who, after a reign of ten years, was succeeded by Charles Albert. In 1848 he headed the league which endeavored to drive the Austrians from Italy. The defeat of the Sardinian forces at Novara (1849) by Radetsky, however, caused him to abdicate in favor of his son Victor Emmanuel II. The position of Sardinia was strengthened by the part which it played (1854) in the Crimean war, while in 1859 the co-operation of France was secured in a war against Austria. The brief campaign which followed ended in the defeat of the Austrians at Magenta and Solferino, and led to Sardinia receiving a large increase of territory, though she had to cede Savoy and Nice to France. Soon after this the Sardinian Kingdom was merged in a united Italian Kingdom under Victor Emmanuel. See Italy.

SARD'ONYX, a precious stone, a beautiful and rare variety of onyx, consisting of alternate layers of sard and white chalcedony. The name has sometimes been applied to a reddish-yellow or nearly orange variety of chalcedonic quartz resembling carnelian, and also to carnelians whose colors are in alternate bands of red and white.

SARDOU, Victorien, French dramatist, born at Paris in 1831 He was successful with two plays which he wrote for Déjazet called M. Garat (1860) and Les Prés-Saint-Gervais (1862). His better-known works, many of which have been produced on the English stage, are Les Pattes de Mocuhe, Nos Intimes, La Patrie, Daniel Rochat, Thermidor, and Madame Sans-gêne. Some of his successes have been associated with Madam Bernhardt. He wrote Fedora, Theodora, and La Tosca. He died in 1908.

SARGENT, Epes, an American poet, and dramatist, was born at Gloucester, Mass., in 1813; died at Boston in 1880. He was the author of that well-known lyric, A Life on the Ocean Wave.

SARGENT, John Singer, American portrait and figure painter, was born in Florence, Italy, in 1856. His first exhibited pictures were "En route pour la pêche," a group of fisher girls upon the beach, and "Neapolitan Children Bathing." He has received the highest medals and honors, including the Grand Prix at the Paris expositions of 1889 and 1900, and in 1889 he was made chevalier, and in 1895 officer of the Legion of Honor. Among the best known of his portraits are those of Carolus Duran and Dr. Pozzi, Edwin Booth, Lawrence Barrett, and Joseph Jefferson. He exhibited nine works at the Columbian exposition (1893), among which were Ellen Terry as Lady Macbeth. In 1903 he visited the United States and made portraits of President Roosevelt, Secretary Hay and others.

SARSAPARIL'LA, the rhizome of several plants of the genus Smilax. Sarsaparilla is valued in medicine on account of its mucilaginous and demulcent qualities.

SARTHE (sârt), a department of Northwest France; area, 2395 sq. miles. It has a diversified surface, presenting fertile plains, vineyards, and extensive forests. The capital is Le Mans. Pop. 436,111.

SA'SIN, the common Indian antelope, remarkable for its swiftness and beauty. It is abundant in the open dry plains of India, in flocks of from ten to sixty females to a single male. It is grayish brown or black on the upper parts of the body, with white abdomen and breast, and a white circle round the

Sasin or Indian antelope.

eyes, and stands about 2 feet 6 inches high at the shoulder.

SASKATCH'EWAN, a great river of Canada, which rises in the Rocky mountains near lon. 115° w. by two principal heads, the sources of which are not far apart. These branches, often called the North and South Saskatchewan, flow generally east to their junction about 150 miles northwest of the northwest angle of Manitoba, whence the river takes a curve northeast and southeast, and, passing through Cedar lake, empties itself into Lake Winnipeg, after a course of about 1300 miles, measuring along the south branch, some 70 less measuring along the north. The main stream and its branches afford about 1000 miles of navigable waterway.

SASKATCHEWAN, a province of Canada, named from the above river, bounded on the s. by Assiniboia, e. by Lake Winnipeg and Nelson river, n. by the 55th parallel, and w. by Alberta, Area. 250,650 sq. miles; pop. 94,000. Capital, Regina; Prince Albert and Battleford are the other chief towns, both being on the Saskatchewan.

SAS'SABY, an antelope found in South Africa, living gregariously in herds numbering from six to ten individuals.

Sassaby.

The body-color is a reddish-brown, the limbs being of dark hue, while a blackish stripe marks the forehead and middle of the face.

SAS'SAFRAS, a genus of plants. It is a small tree or bush inhabiting the woods of North America from Canada to Florida. The taste of sassafras is sharp, acrid, aromatic; it is used for flavoring purposes, and in medicine as a stimulant.

Swamp-sassafras is the Magnolia glauca, an American tree.

SAS'SARI, a town of Italy, in Sardinia, capital of the province of same name 105 miles n.n.w. of Cagliari. Pop. of town, 38,178; a province occupying the north and more fertile part of the island. Pop. 307,314.

SATA'RA, a district, in the Bombay presidency, India; area, 4987 sq. miles, forming part of the table-land of the Deccan, much broken by ridges, ravines, and isolated heights. The chief river is the Kistna, which flows southeast through its center. Pop. 1,146,521.—The capital of the district is also called Satára, and is situated 55 miles south of Poona, near the confluence of the Krishna and the Yena. Pop. 26,022.

SAT'ELLITE, a secondary planet, or moon; a small planet revolving round a larger one. The earth has one satellite, called the moon; Neptune is also accompanied by one; Mars by two; Uranus by six; Jupiter by four; Saturn by eight. Saturn's rings are supposed to be composed of a great multitude of minute satellites.

SATIN, a soft, closely-woven silk, with a glossy surface. In the manufacture of satin part of the weft is left beneath the warp, which, presenting a close and smooth surface, acquires, after being passed over heated cylinders, that luster which distinguishes it from other kinds of silks.

SATINET, a twilled cloth made of woolen weft and cotton warp pressed and dressed to produce a glossy surface in imitation of satin.

SATINWOOD, the wood of a large tree. It is a native of the mountainous parts of the Circars in the East Indies. The wood is of a deep yellow color, close-grained, heavy and durable.

SATIRE, in the widest sense of the word, pungent ridicule or cutting censure of faults, vices, or weaknesses. In a narrower sense it is a poem of which ridicule and censure are the object and chief characteristic. This species of poetry had its origin with the Romans, but satires may also take the forms of epistles, tales, dialogues, dramas (as with Aristophanes), songs, epics, fables, etc. The didactic satire originated with Lucilius (148–103 B.C.), and Horace, Juvenal, and Persius developed it. Satirists are common in all modern literatures.

SATOLLI (sȧ-tol'le), Francesco, Italian cardinal, was born at Perugia in 1831. In 1888 Satolli was made titular archbishop of Lepanto. In 1892 Mgr. Satolli was sent to the United States as papal ablegate with plenary power, which was confirmed by his appointment in 1893 as apostolic delegate to the American church, with an official residence in Washington. He was elevated to the cardinalate in 1895, and was re-called and succeeded by Archbishop Sebastiano Martinelli in 1896.

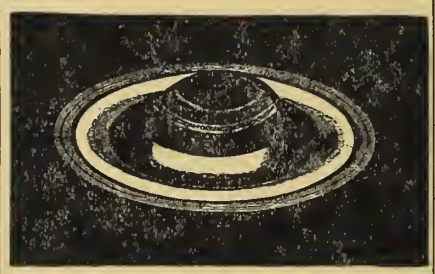
SATRAPS, in the ancient Persian empire, the governors of the provinces which were called satrapies. The power of the satrap, so long as he retained the favor of his sovereign, was absolute; he levied taxes at his pleasure and aped the capricious tyranny of his master unchecked.

SATURATION. In meteorology the air is said to be saturated with aqueous vapor, if, when the temperature is slightly lowered, condensation takes place. The degree of saturation at any place is called the hydrometric state. The term is applied in chemistry to the union, combination, or impregnation of one body with another in such definite proportions as that they neutralize each other, or till the receiving body can contain no more.

SATURDAY (A. Sax. Sæterdæg, Sæterndæg—Sater, Sætern, for Saturn, and dæg, a day—the day presided over by the planet Saturn), the seventh or last day of the week; the day of the Jewish Sabbath.

SATURN, an ancient Italian deity, popularly believed to have made his first appearance in Italy in the reign of Janus, instructing the people in agriculture, gardening, etc., thus elevating them from barbarism to social order and civilization. He was consequently elected to share the government with Janus, and his reign came afterward to be sung by the poets as "the golden age." He was often identified with the Cronus of the Greeks. His temple was the state treasury. Ops was his wife. He is often represented as an elderly man, with a sickle and ears of corn in his hand. See Saturnalia.

SATURN, one of the planets of the solar system, less in magnitude than Jupiter, and more remote from the sun. Its mean diameter is about 70,000 miles, its mean distance from the sun somewhat more than 872,000,000 miles, and



The planet Saturn.

its year or periodical revolution round the sun nearly twenty-nine years and a half. Its mass is about 90 times that of the earth. Saturn is attended by eight satellites, and surrounded by a system of flat rings, which are now supposed to be an immense multitude of small satellites, mixed probably with vaporous matter. See Planet.

SATURNA'LIA, a festival held by the Romans in honor of Saturn, and during which the citizens with their slaves gave themselves up to unrestrained freedom and mirth. It contained at first one day; then three; afterward five; and finally under the Cæsars, seven days, namely, from the 17th to the 23d of December. During its continuance no public business could be transacted, the law courts were closed, the schools kept holiday, and slaves were freed from restraint. Masters and slaves even changed places, so that while the servants sat at table, they were waited on by their masters and their guests. In the last days of the festival presents were sent by one friend to another

SATYRS, in Greek mythology, a class of woodland divinities, in later times, inseparably connected with the worship of Dionysus (Bacchus). The satyrs appear in works of art as half-man and half-goat, having horns on the head, and a hairy body with the feet and tail of a

Satyr—The Barberini Faun, at Munich.

goat. They are described as being fond of wine and of every kind of sensual gratification. One of the most famous specimens of Greek art is the Satyr (or Faun) of Praxiteles.

SAUERKRAUT (zou'êr-krout), a favorite German dish, consisting of cabbage cut fine, pressed into a cask, with alternate layers of salt, and suffered to ferment till it becomes sour.

SAUL, king of Israel, from about 1095 to 1056 B.C., and the son of Kish, a Benjamite. Selected for this office by Samuel, he obtained, by his personal courage and military capacity, several successes over the Philistines, Edomites, Moabites, and Ammonites by means of which he consolidated the tribes and confirmed his authority. After a long reign the wild nature of the king at length showed itself in a kind of religious frenzy. This frenzy, which is briefly described in the Bible as an "evil spirit of God," led him to the massacre of the priests of Nob and various similar excesses Meanwhile the prophet Samuel, estranged by the king's misdeeds, had anointed David as his successor, and this took effect when Saul was slain by his own sword in a battle with the Philistines on Mount Bilboa.

SAULT SAINTE MARIE (sōo sānt ma'rê), the county seat of Chippewa co., Mich., 350 miles west northwest of Detroit; on the Saint Mary's river, and on the Canadian Pacific, the Duluth, South Shore and Atlantic, and the Minneapolis, Saint Paul and Sault Ste. Marie railroads. The ship canal here, connecting Lakes Superior and Huron, is noted for its extensive freight traffic. The water power afforded by the rapids near the city generates electrical energy equivalent to 100,000 horse power. There are lumber mills, paper mills, a carbide manufactory, dredging machinery works

flour and woolen mills, and fish-packing establishments. Pop. 12,172.

SAU'RIA, the term by which the great order of lizards is sometimes designated, including not only the existing lizards, crocodiles, monitors, iguanas, chameleons, etc., but also those fossil reptiles the ichthyosaurus, plesiosaurus, iguanodon, pterodactyl, etc.

SAUROID FISHES, fishes, chiefly fossil, that combine in their structure certain characters of reptiles. The existing sauroid fishes consist of several species, the best known being the bony pikes and sturgeons.

SAUTERNE, a white Bordeaux wine of high repute, produced from grapes grown in the neighborhood of Sauternes, a village in the department of Gironde, s.e. of Bordeaux.

SAVAN'NA, Savannah, an extensive open plain or meadow in a tropical region, yielding pasturage in the wet season, and often having a growth of undershrubs. The word is chiefly used in tropical America.

SAVAN'NAH, a river of the United States, which forms the northeast boundary of Georgia, and separates it from South Carolina. It is formed by the junction of the Tugaloo and Keowee, 100 miles by the course of the river above Augusta, and is navigable for vessels drawing over 18 feet to the city of Savannah, 18 miles from the sea.

SAVANNAH, the capital of Chatham co., Georgia, on the south bank of Savannah river, 18 miles from the sea (by river). It is built on a flat sandy bluff 40 feet high, and is beautifully laid out with wide streets and many squares, most of which are adorned by magnolias, live-oaks, and other stately trees. It has a well-wooded park, several good monuments, handsome cotton exchange, court-house, and other public buildings. It is the second cotton port in the United States, and exports also quantities of timber, turpentine, rosin, etc., besides fruits and early vegetables coastwise. From evaporation of the surrounding waters the atmosphere during summer is very humid. Pop. 1909, 80,000.

SAV'ARY, Anne Jean Marie René, Duke of Rovigo, French general, born 1774; died 1833. When the emperor returned from Elba he was joined by Savary, who, after the defeat at Waterloo, desired to share his imprisonment in St. Helena. He was afterward employed by the government of Louis Philippe as commander-in-chief in Algeria.

SAVINGS BANKS, the first savings bank established in Europe is said to have been at Brumath, France, in 1765. The first German savings bank was established at Hamburg in 1778. The first English bank was established in 1799. Post office savings banks were established in England in 1861. In the United States the Philadelphia Saving Fund Society was founded in 1816, and received a charter in 1819; and between 1817 and 1846 twelve states had granted such charters to savings banks within their bounds, especially the New England states; fifty years later there were 684 banks in the United States. School savings banks have been largely introduced in the United States. Its usefulness, however, is still problematical. Most of the states have endeavored, ineffectually, to prevent the savings banks from becoming rivals to other banks, so as to reserve their privileges for the poorer classes. The following table shows the progress of savings banks in the United States:

SAVINGS BANKS, DEPOSITORS, AND DEPOSITS IN THE UNITED STATES EVERY TEN YEARS FROM 1830 TO 1890 AND ANNUALLY SINCE 1895.

Year	Number of Banks	Number of Depositors	Deposits
1830	36	38,085	$ 6,973,304
1840	61	78,701	14,051,520
1850	108	251,354	43,431,130
1860	278	693,870	149,277,504
1870	517	1,630,846	549,874,358
1880	629	2,335,582	819,106,973
1890	921	4,258,893	1,524,844,506
1895	1,017	4,875,519	1,810,597,023
1896	988	5,065,494	1,907,156,277
1897	980	5,201,132	1,939,376,035
1898	979	5,385,746	2,065,631,298
1899	942	5,687,818	2,230,366,954
1900	1,002	6,107,083	2,449,547,885
1901	1,007	6,358,723	2,597,094,580
1902	1,036	6,666,672	2,750,177,290
1903	1,078	7,035,228	2,935,204,845
1904	1,157	7,305,443	3,060,178,611
1905	1,237	7,696,229	3,261,236,119
1906	1,319	8,027,192	3,482,137,198
1907	1,415	8,588,811	3,690,078,945

The above table was compiled from the report of the Comptroller of the Currency.

SAVONARO'LA, Girolamo, Italian ecclesiastical reformer, born at Ferrara 1452. Educated for the medical profession, he yet secretly entered the order of Dominicans at Bologna in 1475. In 1482 he was sent to St. Mark's convent at Florence, and began to preach there, but with little success. He retired into Lombardy, and there his increasing fame as a preacher and theologian induced Lorenzo de' Medici to invite him (1490) to return to Florence. And now his discourses attracted such crowds that the church could not contain them the great theme of his eloquence being the corruptions in church and state, and the

Girolamo Savonarola.

general iniquity of the times. In 1491 he was elected prior of St. Mark's. At this time Italy enjoyed profound peace, but Savonarola startled his hearers by foretelling the advent of foreign enemies bringing desolation; and this prediction was considered by the people to have been fulfilled when Charles VIII. of France in 1494 invaded Italy. Further, this Dominican preacher of St. Mark's claimed to be a special messenger from God, to be the recipient of divine revelations, to see visions, and to have the gift of prophecy. He foretold the death of the pope, the king of Naples, and his patron Lorenzo. When the latter was on his deathbed (1492) Savonarola refused to grant him absolution unless under conditions which the prince refused. After the death of Lorenzo and the expulsion of his son Piero, Savonarola put himself at the head of those who demanded a more democratical form of government; and such was now his commanding influence in Florence that he organized the distracted city into a form of republic, with two councils and a governing signory. But in his zeal, not content with revolutionizing Florence, he meditated the reform of the Roman court and of the irregularities of the clergy. To this end he wrote to the Christian princes, declaring that the church was corrupt, and that it was their duty to convoke a general council. Alarmed at this, Alexander VI., who was then pope, excommunicated him in 1497, and the bull was read in the cathedral at Florence. But besides the papal and political influences which were now arrayed against Savonarola, his innovations in St. Mark's and other monasteries had excited the enmity of the monks, especially the Franciscans. In these circumstances Francesco di Puglia, a Franciscan friar, challenged Savonarola to test the truth of his divine pretensions by passing with him through the ordeal of fire. This Savonarola declined; scenes of tumult and riot arose; St. Mark's was stormed by an infuriated mob and Savonarola cast into prison. As the result of the mock trial with torture which followed in 1498, Savonarola, with two of his companions, was strangled and then burned. His writings consist of some theological works, a treatise on the Government of Florence, and numerous sermons.

SAVOY, Duchy of, formerly a division of the Sardinian kingdom, now forming two of the departments of France; bounded on the north and northeast by Switzerland, on the east and southeast by Piedmont, and on the south and west by the French departments of Isère and Ain. By treaty (1860) Savoy was ceded by Sardinia to France (see Sardinia, Kingdom of), of which it now forms two departments, Savoie, area 1769 sq. miles pop. 267,428, and Haute Savoie, area 1314 sq. miles, pop. 275,018. The capital of the former is Chambéry, of the latter Annecy.

SAWANTWA'RI, a native state in the Bombay preidency, situated about 200 miles south of Bombay, bounded north and west by the British district of Ratnigiri, and on the south by the Portuguese territory of Goa; area, 900 sq. miles. Pop. (mostly Hindu), 217,800.

SAWFISH, a fish nearly related on the one hand to the sharks, and on the other to the rays. It attains a length of from 12 to 18 feet, has a long beak or snout, with spines projecting like teeth on both edges, armed with which it is very destructive to shoals of small fishes, and is said to attack and inflict severe and even mortal injuries on the large cetaceans or whales.

SAWFLIES, a group of insects belonging to the order Hymenoptera, and distinguished by the peculiar conformation of the ovipositor of the females,

which is composed of two broad plates with serrated or toothed edges, by means of which they incise the stems

Saw-fly.

a, Turnip saw-fly. *b*, Ovipositor of saw-fly magnified to show the saw.

and leaves of plants, and deposit their eggs in the slits thus formed. The turnip-fly and the gooseberry fly are examples.

SAWS are instruments with a dentated or toothed edge employed to cut wood, stone, ivory, or other solid substance, and are either straight or circular. In form and size they vary from the minute surgical or dental tool to the large instrument used in sawmills. The cross-cut saw, for cutting logs transversely, is a large straight saw wrought by two persons, one at each end. The ripping saw, half-ripper, hand-saw, and panel saw are saws for the use of one person, the blades tapering in length from the handle. Tenon saws, sash saws, dove-tail saws, etc., are saws made of very thin blades of steel stiffened with stout pieces of brass, iron, or steel fixed on their back edges. They are used for forming the shoulders of tenons, dove-tail joints, etc., and for many other purposes for which a neat clean cut is required. Compass and keyhole saws are long narrow saws, tapering from about 1 inch to ⅛ inch in width, and used for making curved cuts. Machine saws are comprehended under three different classes — circular, reciprocating, and band saws. The circular saw is a disc of steel with saw teeth upon its periphery. It is made to revolve with great rapidity and force, while the log is pushed forward against it by means of a traveling platform. The reciprocating saw works like a two-handled hand saw, being driven upward and downward and the wood carried forward against its teeth. The band saw or ribbon saw consists of a thin endless saw placed like a belt over two wheels, and strained on them. The ribbon passes down through a flat sawing table, upon which the material to be cut is laid. Saws for cutting stone are without teeth. The sawing of timber is an important industry in some countries, especially the United States and Canada, where immense quantities of lumber are produced. Water power is often employed to drive the machinery of the sawmills, but steam is equally common.

SAXE (sâks), Herman Maurice, Comte de, Marshal of France, natural son of Augustus II., king of Poland, by Aurora, countess of Königsmark, born at Dresden 1696, died 1750. In 1747 he was victorious at Laufeldt, and in the following year took Maestricht, soon after which the peace of Aix-la-Chapelle was concluded. He wrote a treatise entitled Mes Rêveries, on the art of war.

SAXE, John Godfrey, American litterateur, born 1816, died 1887. His poems include Progress, a Satirical Poem (1846); Humorous and Satirical Poems (1850); Money King (1859); Flying Dutchman (1862); Clever Stories of Many Nations (1865); The Masquerade (1866); Fables and Legends (1872); and Leisure Day Rhymes (1875).

SAXE-ALTENBURG, an independent duchy in Thuringia, forming one of the states in the German empire, is divided into two nearly equal portions by a part of Reuss, and is bounded on the s.w. by the grand duchy of Saxe-Weimar-Eisenach, on the n. by Prussia, and on the e. by Saxony; area, 510 sq. miles. The capital is Altenburg. Pop. 194,914.

SAXE-COBURG-GOTHA, a duchy of Central Germany, one of the states of the German empire, comprising the province of Gotha, lying between Prussia, Schwarzburg, Meiningen, and Weimar; and the province of Coburg, lying between Meiningen and Bavaria; Coburg 218 sq. miles, and Gotha 542 sq. miles. The government is a constitutional monarchy, and each province has its own elective assembly, while the duchy sends one member to the Bundesrath and two to the Reischstag of the German empire. For affairs common to both divisions the assemblies meet conjointly at Coburg and at Gotha alternately. The ducal house and the greater part of the population are Lutherans. Albert Prince Consort of England, was a brother of Duke Ernest II., who was succeeded in the dukedom by the late Duke of Edinburgh, and he in 1900 by Leopold, son of the late Duke of Albany. Pop., Coburg, 66,814; Gotha, 162,736; total, 229,550.

SAXE-MEININGEN, a duchy of Central Germany, and one of the states of the German empire, consisting of a main body, and several minor isolated portions. Area, 955 sq. miles. The government is a hereditary and constitutional monarchy, and the great majority of the inhabitants are Lutherans. The duchy sends one member to the Bundesrath and two to the Reichstag of the German empire. The capital is Meiningen. Pop. 250,683.

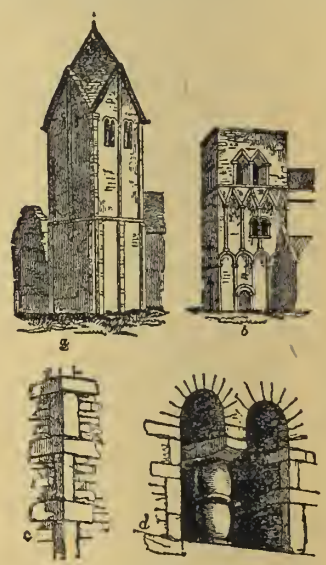
SAXE-WEIMAR, a grand duchy of Central Germany, one of the states of the German empire, and consisting of three larger portions, Weimar, Neustadt, and Eisenach, and twelve smaller parcels. Area of the whole, 1421 sq. miles. The goverment is constitutional, the legislative power being vested in a house of parliament, consisting of one chamber of thirty-one members. Saxe-Weimar sends one member to the Bundesrath and three to the Reichstag of the German empire. Pop. 362,873.

SAXHORN (after M. Sax, of Paris, the inventor), a name of several brass wind instruments, with a wide mouthpiece and three, four, or five pistons, much employed in military bands. These horns comprise the piccolo cornet or high small saxhorn, the soprano, the alto, the tenor, baritone, bass, and double bass.

SAX'IFRAGE, a popular name of various plants, mostly inhabitants of alpine and subalpine regions of the colder and temperate parts of the northern zone. Most of them are true rock plants, with tufted foliage and panicles of white, yellow, or red flowers; and many are well known as ornamental plants in gardens.

Bass Saxhorn.

SAXON ARCHITECTURE, the earliest stage of native English architecture, its period being from the conversion of England to Christianity till the Conquest or near it, when Norman architecture began to prevail (7th to 11th century). The few relics left us of this style exhibit its general characteristic as having been rude solidity and strength. The walls are of rough masonry, very thick, without buttresses, and sometimes of herringbone work; the towers and pillars thick in proportion to height,



Saxon architecture.

a, Tower of Sompting church, Sussex. *b*, Tower of Barton-on-Humber church, Lincolnshire. *c*, Long and short work. *d*, Window with a baluster.

the former being sometimes not more than three diameters high; the quoins or angle masonry are of hewn stones set alternately on end and horizontally; the arches of doorways and windows are rounded, or sometimes these openings have triangular heads, their jambs of long and short work carrying either rudely carved imposts or capitals with square abaci. Sometimes heavy mouldings run round the arches, and when two or more arches are conjoined in an

arcade these are on heavy low shafts formed like balusters. Window openings in the walls splay from both the interior and the exterior, the position of the windows being in the middle of the thickness of the wall.

SAXONS, a Teutonic race whose name is generally derived from the Old German word sahs (a knife or short sword). They are first mentioned by Ptolemy, who speaks of them as inhabiting a district bounded by the Eider, the Elbe, and the Trave. In the 3d century of the Christian era they were a numerous, warlike, and piratical people. In the 5th century considerable hordes of them crossed from the continent, and laid the foundations of the Saxon kingdoms in Britain—Essex or East Saxons, Sussex or South Saxons, etc. (See England and Anglo-Saxons.) Those who remained in Germany (Old Saxons) occupied a great extent of country, of vague and varying limits, which bore the general name of Saxony. Charlemagne waged a thirty years' war against the Saxons; and Wittikind, their national hero, with many of his countrymen, submitted to his arms, and embraced Christianity. See Saxony, Kingdom of.

SAXON SWITZERLAND, a name which has been given to part of the kingdom of Saxony, on the Elbe, southeast of Dresden and bordering on Bohemia. It consists of a group of mountains of sandstone, with valleys and streams of the most picturesque character, in which isolated masses of sandstone, large and small, occur in very fantastic shapes. It is about 24 miles long, and equally wide.

SAXONY, Kingdom of, a kingdom of Central Germany; bounded on the northwest, north, and east by Prussia, southeast and south by Bohemia, southwest by Bavaria and west by Reuss, Saxe-Weimar, and Saxe-Altenburg; greatest length, 135 miles; greatest breadth, 75 miles; area, 5786 sq. miles (or rather less than Yorkshire); pop. 4,199,758. For administrative purposes it is divided into the five districts of Dresden, Leipzig, Zwickau, Chemnitz, and Bautzen.

With the exception of a very small portion of the east, which sends its waters to the Baltic, Saxony belongs to the basin of the Elbe, which traverses it in a northwesterly direction for about 70 miles. On the Prussian frontiers, where the district subsides to its lowest point, the height above the sea is only 250 feet.

The most important crops are rye, oats, barley, wheat, potatoes; and orchard fruits, particularly apples, pears, and plums, are very abundant. Considerable attention is paid to the culture of the vine. Large numbers of horned cattle are exported. The wool of Saxony has long been celebrated for its excellence. Swine and horses are of a superior breed. The minerals are of great importance, and include silver, lead, tin, iron, cobalt, nickel, bismuth, and arsenic. Numerous seams, both of lignite and coal, are found in various districts, and are worked to a considerable extent. The quarries furnish in abundance granite, porphyry, basalt, marble, serpentine, and sandstone. Several mineral springs of reputation exist. Saxony is an important manufacturing country. The principal manufactures are cotton and woolen goods, linen, lace, ribbons, and straw-plaiting. Other industries are earthenware, Dresden ware, leather, chemicals, etc., and the printing establishments of Leipzig are well known. Saxony is connected with the great trunk lines which traverse Central Europe, and has over 1500 miles of railway.

The government is a constitutional monarchy (forming part of the German empire), in which the executive power is lodged solely in the crown, and the legislative power jointly in the crown and two chambers. The present ruling family in Saxony claims descent from Wittikind, the national hero who was conquered by Charlemagne and embraced Christianity. The territory became a duchy about 880, and in the 10th century Duke Henry was elected German emperor. In 1813 Saxony was the scene of Napoleon's struggle with the allies, and the battles of Lützen, Bautzen, Dresden, and Leipzig were followed by the congress of Vienna (1814), when a large part of the dominions then under the Saxon monarch was ceded to Prussia. A period of great progress followed, interrupted somewhat at the revolutionary period of 1848–49. In the Austro-Prussian war of 1866 Saxony took part with Austria, and was occupied by the Prussian troops. Prussia desired to incorporate the kingdom, but Austria, supported by France, opposed this arrangement, and Saxony was admitted into the North German confederation instead. In the Franco-German war Saxony united with the rest of Germany against France; and the late King Albert (then crown-prince) was commander of the German army of the Meuse. In 1871 Saxony became a member of the New German Empire.

SAXONY, Prussian, a province of the Prussian monarchy, of irregular shape, and with isolated districts, almost in the center of Germany, to the north of the kingdom of Saxony; area, 9729 sq. miles. Originally a part of Saxony, it was given to Prussia by the congress of Vienna (1814). The northern and large portion belongs to the North German plain; the southern and southwestern is elevated or hilly, partly belonging to the Hartz mountain system, and containing the Brocken (3742 feet). The chief river is the Elbe. The soil is generally productive, about 61 per cent being under the plough and 20 per cent forests. Beet sugar is largely produced. The mineral products are valuable, particularly lignite, salt, kainite, and other potash salts. The capital of the province is Magdeburg; other towns are Halle (with a university), Erfurt, and Halberstadt. Pop. 2,832,616.

SAX'TON, Joseph, American inventor, was born at Huntingdon, Pa., in 1799. He invented a machine for cutting the teeth of chronometer wheels, and an escapement and compensating pendulum for clocks, and constructed a clock for the steeple of Independence hall, Philadelphia. Among his inventions are the mirror comparator for comparing standard measures, and a new form of machine for dividing them; the deep-sea thermometer, used by the United States Coast Survey in exploring the Gulf Stream; the self-registering tide gauge and the immersed hydrometer. He died in 1873.

SCAB, a skin disease in sheep, analogous to itch in man and mange in horses and dogs, usually propagated by contagion, and caused by the presence of minute acari, which burrow under the skin. Various medicines have been recommended, such as lard or palm oil, 2 lbs.; oil of tar, ½ lb.; sulphur, 1 lb., mixed together and rubbed on the diseased spots.

SCABBARD FISH, a beautiful fish found in the Mediterranean and Eastern Atlantic, so called because in shape it bears some resemblance to the sheath of a sword. It is of a bright silvery whiteness, with a single dorsal fin running along its back.

SCAD, or **HORSE MACKEREL,** a genus of teleostean fishes included in the family Scomberidæ or mackerels, and

Scad.

found around the coasts of Britain. It appears in large shoals, and the flesh, although coarse, is esteemed and eaten salted during the winter months.

SCALDFISH, a marine flatfish, allied to the turbot, sole, and flounder.

SCALD-HEAD, a fungous parasitic disease of the scalp. See Favus.

SCALDS. See Burns and Scalds.

SCALE, a mathematical instrument consisting of a slip of wood, ivory, or metal, with one or more sets of spaces graduated and numbered on its surface for measuring or laying off distances, etc.

SCALE, in music, a succession of notes arranged in the order of pitch, and comprising those sounds which may occur in a piece of music written in a given key. In its simplest form the scale consists of seven steps or degrees counted upward in a regular order from a root or prime (the tonic or keynote), to which series the eighth is added to form the octave. It has been the practice among musicians to consider the scale having C for its keynote as the natural, model or normal scale. The diatonic scale ascends by five steps (tones) and two half-steps (semitones), taking for the names of the notes the syllables do, re, mi, fa, sol, la, si, do; the two semitones occur between E and F (mi and fa) and B and C (si and do). When the scale is graduated all the way by a series of twelve half-steps or semitones it is called the chromatic scale. A scale is said to be major when the interval between the keynote and the third above it as from C to E, consists of two tones; it is called minor when the interval between the keynote and its third, as from A to C, consists of a tone and a half. See Music.

SCALE FERN, a popular name for a fern so named from the imbricated tawny scales at the back of the fronds.

To this plant was formerly attributed a marvellous influence over the liver and spleen. It is a British species, and is said to be used as a bait for fish on the coast of Wales.

SCALENE′, in mathematics, a term applied to a triangle of which the three sides are unequal. A cone or cylinder is also said to be scalene when its axis is inclined to its base, but in this case the term oblique is more frequently used.

SCALES, the imbricated plates on the exterior of certain animals, as the pangolins or scaly ant-eaters, serpents and other reptiles, and especially fishes. The scales of the latter are developed beneath the true epiderm, and consist of alternate layers of membrane, of horny matter, and occasionally of phosphate of lime. Fishes are sometimes classed, in accordance with the structure of their

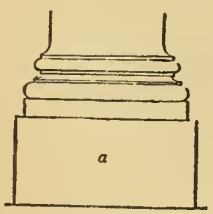
Scales of fishes.

1, Ctenoid scale of the perch. 2, Cycloid scale of the carp. 3, Ganoid scales of dipterus. 4, Placoid scale of ray.

scales, into Ctenoid, Ganoid, Cycloid, and Placoid, the general appearance and character of which are well shown in the accompanying figures. The term scale is applied also in botany to a small rudimentary or metamorphosed leaf, scale-like in form and often in arrangement, constituting the covering of the leaf buds of the deciduous trees in cold climates, the invalucrum of the Compositæ, the bracts of catkins, etc.

SCALP, the outer covering of the skull, composed of skin and of the expanded tendon of the occipito-frontal muscle, and of intermediate cellular tissue and blood vessels. Hence the skin of the head or a part of it, with the hair belonging to it, torn or cut off by the American Indians as a mark of victory over an enemy.

SCAMIL′LUS, in ancient architecture, a sort of second plinth or block under a

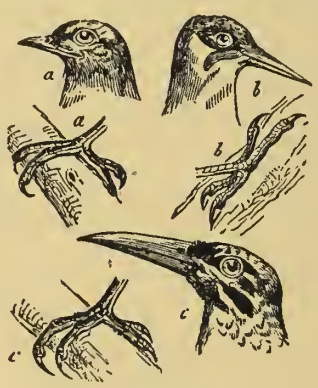


a, Scamillus.

column, statue, etc., to raise it, but not, like a pedestal, ornamented with any kind of moulding.

SCANDINAVIA, the ancient name of the region now comprehending the three northern kingdoms, Denmark, Sweden, and Norway, or Sweden and Norway alone, and still not uncommonly used. These countries were inhabited in the earliest times by people of the Teutonic stock, and B.C. 100 the natives of Jutland and Schleswig became formidable to the Romans under the name of Cimbri. But it was chiefly in the 9th century that they made their power felt in the western and southern parts of Europe, where hordes of Northmen or Vikings, as they were sometimes called, made repeated raids in their galleys on the coasts of England, Scotland, Ireland, Holland, Germany, France, Spain, and Italy, where they plundered, destroyed, and sometimes founded new states. The Old Norse or Scandinavian literature, so far as extant, is of considerable value, having preserved to us not only the old versification peculiar to all nations of Teutonic origin, but also the mythology, history, and laws of the pagan period of these northern countries. Among the most valuable remains are the Edda and the Sagas (which see).

SCANSO′RES, an order of birds, popularly known as climbing birds, having the feet provided with four toes, of which two are turned backward and two forward. Of the two toes which are directed backward one is the hallux or proper hind-toe, the other is the outermost of the normal three anterior toes. This conformation of the foot enables the scansores to climb with unusual



Scansores.

a, Head and foot of cuckoo. *b*, Do. of green woodpecker. *c*, Do. of great jacamar.

facility. Their food consists of insects and fruit; their nests are usually made in the hollows of old trees. The most important families are the cuckoos, the woodpeckers and wrynecks, the parrots, the toucans, the trogons, the barbets, and the plantain eaters. Not all of this order are actually climbers, and there are climbing birds which do not belong to this order.

SCAPEGOAT, in the Jewish ritual, a goat which was brought to the door of the tabernacle, where the high priest laid his hands upon him, confessing the sins of the people, and putting them on the head of the goat, after which the goat was sent into the wilderness, bearing the iniquities of the people. Lev. xvi.

SCAP′ULA, or **SHOULDER BLADE,** the bone which in most mammalia forms the chief bone of the shoulder girdle, and which chiefly supports the upper limb on the trunk or axial skeleton. In man the scapula exists as a flattened bone of triangular shape, which lies on each side of the body, on the back, and toward the upper and outer border of the chest or thorax. The internal surface of the scapula is concave, and is applied against the ribs. The outer or dorsal surface is divided into two portions by a strong ridge which runs obliquely across the bone.

SCAP′ULARY, a kind of garment or portion of dress, consisting of two bands of woolen stuff—one going down the breast and the other on the back, over the shoulders—worn by a religieux. The original scapular was first introduced by St. Benedict, in lieu of a heavy cowl for the shoulders, designed to carry loads.

SCARABÆ′US, an extensive genus of coleopterous insects, placed by Linnæus at the head of the insect tribes, and answering to the section Lamelli cornes of Latreille. They are sometimes called dung-beetles, from their habit of inclosing their eggs in pellets of dung, which are placed in holes excavated for their reception. The S. sacer, or sacred beetle of the Egyptians, was regarded

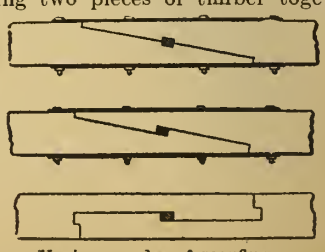
Sacred beetle.

Natural size.

with great veneration; and figures of it, plain or inscribed with characters, were habitually worn by the ancient Egyptians as an amulet. Large numbers of these scarabæi or scarabs, made of hard stone or gems, are still found in Egypt, often inscribed with hieroglyphics. Some of the carved scarabs are three or four feet long. The beetle itself was also embalmed.

SCARBOROUGH, a municipal and parliamentary borough and seaport, England, county of York (North Riding), is beautifully situated on two open sandy bays separated by a bold promontory of rock 300 feet high, on the North sea, 39 miles northeast of York. Pop. 38,160.

SCARFING, a particular method of uniting two pieces of timber together



Various modes of scarfing.

by the extremities, the end of one being cut or notched so as to fit into the other,

making the part where the junction takes place of the same thickness as the rest of the pieces of timber.

SCARIFICATION, the operation of making several incisions in the skin with a lancet or scarificator for the purpose of taking away blood, letting out fluids, etc.; or the removal of flesh about a tooth in order to get at it the better with an instrument.

SCARLET FEVER, or **SCARLETINA,** is an extremely infectious disease, not confined to, but common among children. In ordinary cases the beginning of the disease is indicated by great heat and dryness of the skin, shivering, headache, sickness, and sore throat. Another symptom is that the tongue is coated with a white fur through which numerous red points stand up, from which appearance it is called the "strawberry tongue." On the second day of the fever a rash appears and quickly spreads over the whole body, begins to fade on the fifth day, and disappears before the end of the seventh. After the rash has gone the skin begins to be shed in large flakes, and this continues about five weeks. During this latter stage the disease is most infectious. At the first symptoms the patient should receive a dose of castor-oil, and then be put in a warm bath. When the fever has gone, strengthening food and frequent bathing should be given, and an equal temperature in the room observed.

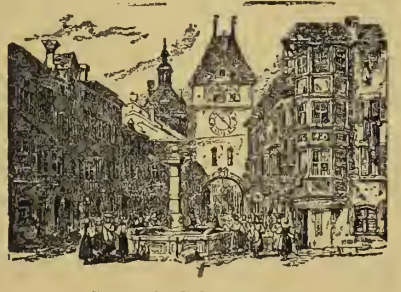
SCARP, in fortification, the interior slope or talus of the ditch next the fortified place and at the foot of the rampart.

SCAUP DUCK, a species of duck common in North America and the north of Europe; and is found in considerable numbers on the British coasts during the winter months. It feeds on small fish, molluscs, and hence its flesh is coarse.

SCEPTICISM, in the wide sense, that condition of mental conflict in the search for truth which involves suspension of judgment before opposing testimony. Specifically, however, it has been applied to the doctrines of the Greek philosophers called Pyrrhonists, whose scheme of philosophy denied the possibility of knowing anything with certainty. Pyrrho of Elis (360–270 B.C.), although he himself left no writings, was the founder of this school. Chief among his immediate disciples was Timon of Phliut, who taught that appearances are neither false nor true, that logical reasoning has no adequate sanction, and that imperturbability is the only possible attitude before the facts of life. This position was maintained by the founders of the Middle Academy, Arcesilaus and Carneades, who employed this philosophy of doubt against the dogmatism of the Stoics. Arcesilaus, who lived about 315–241 B.C., held that the report of our senses is untrustworthy. Carneades (213–129 B.C.) declared absolute knowledge to be impossible, and was the author of the doctrine of probability. To the later sceptical school of the 1st century B.C. belongs Ænesidemus of Cnossus, who expressed his doctrine of negation in ten tropes. These were reduced to five by Agrippa, the first of which is connected with the irreconcilability of human testimony; the second is based on the principle that every proof requires to be itself proved; the third that knowledge varies according to the conditions under which it is acquired; the fourth forbids the assumption of unproved opinion; and the fifth seeks to discredit the reciprocal method of proof in which one thing is proved by another and then the second adduced to prove the first. In later times Al-Ghazzali (1059–1111) taught at Bagdad a philosophic scepticism to enforce the truth of his Mohammedan doctrine. In this method he was followed by Pascal (1623–1662), who sought to establish the necessity of Christian faith by a sceptical exposure of the fallacy of human reason. Among modern sceptics may be mentioned Montaigne, Bayle, D'Alembert, and Hume. The latter limited the range of human reasoning to human experience, and affirmed that any knowledge concerning God or a future state transcends the scope of our faculties. See Agnostics.

SCHAFF (shâf), Philip, D.D., biblical scholar, born in Switzerland in 1819. He was professor in the theological seminary of the German Reformed church at Mercersburg (Pa.) from 1844 to 1863. He was a prolific writer, his works including History of the Apostolic Church; History of the Christian Church, Creeds of Christendom, Religious Encyclopedia (as editor), etc. He died in 1893.

SCHAFFHAUSEN (shâf'hou-zn), a town of Switzerland, capital of the canton of same name, situated on the right bank of the Rhine, 24 miles north of Zürich. It is remarkable for the antique architecture of its houses. About 3 miles below the town are the celebrated falls which bear its name, and by which the whole volume of the Rhine is precipitated over a height of more than 70



Street in Schaffhausen.

feet. Pop. 15,597.—The canton is the most northerly in Switzerland, and is situated on the right or German side of the Rhine; area, 116 sq. miles. The surface is very much broken, being traversed throughout by a series of ridges which ramify from the Jura. The only river is the Rhine. The inhabitants are generally Protestants, and the language spoken is principally German. Pop. 41,514.

SCHEELE (shā'lė), Karl Wilhelm, Swedish chemist, born in 1742; died in 1786. He discovered tartaric acid, chlorine, baryta, oxygen shortly after Priestley, glycerine, and arsenate of copper, called Scheele's-green.

SCHEELE'S-GREEN, a green pigment consisting of a pulverulent arsenate of copper, first prepared by Scheele (see above); it is used both in oil and water-color painting.

SCHELLING (shel'ing), Friedrich Wilhelm Joseph von, a German philosopher, born at Leonberg, Würtemburg, in 1775; died 1854. He studied at Tübingen, for a short time also at Leipzig, and from thence proceeded to Jena. His philosophical studies were mainly guided by Fichte, of whom he was first a colleague, and afterward successor. The principal writings of Schelling are: Ideas for a Philosophy of Nature (1797); The Soul of the World (1798), First Sketch of a System of the Philosophy of Nature (1799), System of Transcendental Idealism (1800), Exposition of My System of Philosophy, published in the Journal of Speculative Physics, edited by him (1801–3); Bruno, or the Divine and Natural Principle of Things (1802), Critical Journal of Philosophy (in conjunction with Hegel), 1802–3; Exposition of the True Relation of the Philosophy of Nature to the Amended Theory of Fichte (1806).

SCHENCK, Robert Cumming, diplomatist, was born in Franklin, Ohio, in 1809. He served three terms in congress. His first diplomatic mission was to Brazil, where he was sent in 1857. He received the first appointment of brigadier-general from President Lincoln, his commission being dated May 17, 1861. He was wounded at the second battle of Bull Run, and in 1862 was promoted to the rank of major-general. He was again sent to congress in 1866, and in 1870 he was appointed minister to Great Britain. He died in 1890.

SCHENEC'TADY, a city of New York, capital of the county of the same name, on the Mohawk river, about 17 miles from Albany. It is the seat of Union college, incorporated in 1794, and one of the most successful in the states. The Erie canal and the Delaware and Hudson canal pass through the city. It has manufactories of locomotives shawls, etc., besides woolen and flour mills. Pop 1909, about 77,000.

SCHILLER, Johann Friedrich Christoph von, one of the greatest of German poets, was born at Marbach, Würtemberg, in 1759. He published his play, The Robbers, at his own expense in 1781; it excited an immense amount of attention, and in 1782 it was performed at Mannheim. In 1785 he went to Leipzig and Dresden, where he studied the history of Philip II. In this way he prepared himself not only to write his drama of Don Carlos, which appeared in 1787, but also to publish a History of the Revolt of the Netherlands (1788). Visiting Weimar in 1787 he received friendly welcome from Wieland, Herder, and Goethe, the latter assisting to procure him (1789) a professorship of philosophy at Jena. Here he lectured on history, and began to publish Historical Memoirs from the Twelfth Century to the Most Recent Times (1790); and his History of the Thirty Years' War appeared in 1790–3. His first periodical, Thalia, begun in 1784 at Mannheim, having ceased in 1793, he formed a plan of publishing a new periodical, Die Horen (The Horæ or Hours). He had

long been in weak health, and being attacked by fever died in 1805. His correspondence with Goethe, William von Humboldt, and C. G. Körner has been published, his life has been written by Carlyle, and of his works there is among others an English translation in Bohn's library.

SCHIST (shist), a geological term applied to rocks which have a foliated structure and split in thin irregular plates, not by regular cleavage, as in the case of clay-slate, nor in laminæ, as flagstones. It is properly confined to metamorphic or crystalline rocks consisting of layers of different minerals, as gneiss, mica-schist, hornblende-schist, chlorite-schist, etc.

SCHLANGENBAD (shlång'en-bât), a watering-place of Prussia, in Hesse-Nassau, 6 miles w.n.w. of Wiesbaden, among wooded hills. It consists chiefly of lodging houses, and two large bathing establishments. The water has a temperature of from 80° to 88°, and is beneficial in hysteria, neuralgia, rheumatism, gout, paralysis, etc.

SCHLEGEL (shlā'gel), August Wilhelm von, a distinguished German scholar, born at Hanover 1767, died at Bonn 1845. He wrote various poems and ballads, delivered lectures on literature and art, published a tragedy called Ion, translated the most of Shakespeare's and Calderon's plays into German, and devoted the latter part of his life to oriental studies and the translation of various works from Sanskrit.

SCHLEGEL, Karl Wilhelm Friedrich von, brother of the foregoing, born 1772, died 1829. Besides the lectures which he published his chief works are: History of the Old and New Literature, Philosophy of Life, Philosophy of History, and the Philosophy of Language. His wife, a daughter of Moses Mendelssohn, was the author of some works published under Schlegel's name.

SCHLEIERMACHER (shli'er-mâh-er), Friedrich Ernst Daniel, German Protestant theologian and philosopher born at Breslau 1768, died at Berlin 1834. The works of Schleiermacher, besides numerous sermons, include: Outlines of a Critique of Ethics as Heretofore Taught, Translation of Plato's Works, Christian Belief According to the Fundamental Doctrines of the Evangelical Church, Sketch of a System of Morals, Philosophical Ethics, Dialectics, Æsthetics, etc.

SCHLESWIG-HOLSTEIN, since 1866 a province of Prussia, bounded on the north by Denmark; east by the Baltic, Lübeck, and Mecklenburg, south by Mecklenburg and the territory of Hamburg; southwest by the Elbe; and west by the North sea; area, 7273 sq. miles. Schleswig is the portion lying north of the Eider; Holstein that south of this river. Schleswig-Holstein forms part of the same peninsula with Jutland, to which in its general character it bears considerable resemblance. There are extensive moorlands; the west coast consists of sandy and marshy flats, protected in Schleswig by chains of islands, in Holstein by lofty dykes; the east coast is scooped out into natural harbors; the principal streams flow to the west, toward which for the most part the country slopes. Lakes are numerous. Schleswig is separated from Holstein by the river Eider and the Schleswig-Holstein canal. The Eider is the principal river. The country is fertile, and is chiefly agricultural. The great majority of the inhabitants are of German origin. The principal towns are Altona, Kiel, Flensburg, and Schleswig, the capital. Schleswig-Holstein, which became a united duchy in 1386, passed over to Denmark in 1773, and was appropriated by Prussia after the war of 1866. Pop. 1,387,587.

SCHLEY (shlā), Winfield Scott, a naval officer, was born in Frederick co., Md., October 9, 1839. He was graduated at the Naval academy and served on the frigate Niagara. On July 16, 1862, he was made a lieutenant, and from that time on he alternated between active service in different parts of the world and as instructor at the Naval academy. In 1884 he was sent by the United States government to find Greely. After a journey through 1400 miles of ice he found Greely and six companions at Cape Sabine, Grinnell Land. He was appointed commodore in 1898. When war was declared against Spain he was placed in charge of the flying squadron and ordered to find and destroy the Spanish fleet under Admiral Cervera, When the Spanish fleet attempted to escape from the harbor of Santiago it was completely destroyed in a running fight, by the American blockading squadron, which, during the temporary absence of Samson, was under the command of Schley. On August 10th he became a rear-admiral, and was appointed a member of the commission to arrange for the evacuation of Porto Rico by the Spanish. He retired from active service October 9, 1901. Schley wrote in collaboration with James Russell Soley, The Rescue of Greely.

SCHLIEMANN (shle'mân), Heinrich, German archæologist, born in 1822. He traveled widely and acquired many languages, and having made a fortune commenced a series of archæological investigations in the East. In 1869 he published at Paris his Ithaque, Le Péloponnese, Troie: Recherches Archæologiques, an account of his travels in these regions, and this was followed in 1874 by his Trojanische Alterthümer, giving the results of his researches and excavations on the plateau of Hissarlik, the alleged site of ancient Troy. In 1875 he commenced excavations at Athens and Mycenæ, and in 1877 discovered the five royal tombs which local tradition in the time of Pausanias asserted to be those of Agamemnon and his companions. Many treasures of gold and silver were brought to light. His Mycenæ, a narrative of researches and discoveries of Mycenæ and Tiryns, was published in 1877, with a preface by Gladstone. He received valuable assistance in his investigations from his wife, who is a native of Greece and an accomplished scholar. His Troja and his Tiryns are in a measure supplementary to his earlier works on Troy and Mycenæ. He died in 1890.

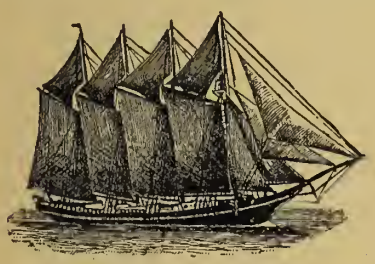
SCHOFIELD, John McAllister, American soldier, was born in Chatauqua co., N. Y., in 1831. Soon after the outbreak of the civil war he was appointed brigadier-general of volunteers. In 1864 he joined the army of General Sherman, and bore a prominent part in all its operations until the close of the war. In 1868, he was appointed secretary of war; but he resigned in March, 1869, and was assigned to the command of the department of Missouri, and in 1870 to that of the Pacific. From 1876 to 1881 he was superintendent of the Military academy at West Point. In 1882 he was placed in command of the department of the Pacific, from which he was transferred in April, 1886, to the division of the Atlantic, and upon the death of Gen. P. H. Sheridan, August 5, 1888, succeeded to the command of the United States army. In 1895 he retired with the rank of lieutenant-colonel. He published Forty-six Years in the Army. He died in 1906.

SCHOLAS'TICISM, the name given to the system of philosophy taught by the philosophers of the middle ages, who were called scholastics or schoolmen from the circumstance that their philosophy originated in the schools instituted by and after Charlemagne for the education of the clergy. The first period of the schoolmen may be considered as extending from the 9th to the 13th century, and is characterized by the accommodation of the Aristotelian logic, and of Neo-Platonic philosophemes to the doctrines of the church. The period begins with John Scotus Erigena, and numbers, among other names, those of Berengarius of Tours and his opponent Lafranc, Anselm, archbishop of Canterbury, Roscellinus, Abelard, Peter Lombardus, and John of Salisbury. The period is marked by the controversies that raged between the Nominalists and the Realists, and which terminated at length in the triumph of the latter. The second period of scholasticism, extending from the 13th to the 15th century—from Alexander of Hales to the close of the middle ages, when classical studies were revived and the sciences of nature and human nature began once more to be studied, presents us with the complete development of scholasticism, and also with its dissolution. During this period the Aristotelic philosophy exercised a more marked influence; Realism was also triumphant, until, towards the end of the period, William of Occam rose up as the champion of Nominalism, and in distinguishing thought from being, and the theoretical from the practical, gave to philosophy a wider range and a freer spirit. The zenith of scholasticism is constituted by Thomas Aquinas a Dominican (died 1274), and Duns Scotus, a Franciscan (died 1308), who were the founders of the two schools into which the entire movement was thenceforward divided.

SCHOOLCRAFT, Henry Rowe, an American ethnologist and geologist, born at Guilderland, in Albany co., New York, 1793. In 1820 he was appointed geologist to the expedition despatched by the government to explore the sources of the Mississippi, and in 1821 was appointed secretary to an Indian conference at Chicago. In 1832 he conducted a government expedition to the Upper Mississippi, in the course of which he explored the sources of that river.

In 1836 he negotiated the purchase for government of 16,000,000 acres in this region, and after this he was appointed acting superintendent of Indian affairs for the northern department. In 1847 he was appointed by the government to prepare an extensive work on the Indians, which appeared under the title of Historical and Statistical Information respecting the History, Condition, and Prospects of the Indian tribes of the United States (1851–57). His other works are: Algic Researches, comprising inquiries respecting the Mental Characteristics of the North American Indians; Thirty Years with the Indian Tribes of the Northwestern Frontier, The Indian in His Wigwam, and the Myth of Hiawatha and other Legends, besides poems, lectures, reports, etc. For his Lectures on the Indian Languages he received the gold medal of the French Institute. He died in 1864.

SCHOONER, a small fast-sailing sharp-built vessel with two masts, and the principal sails of the fore-and-aft type. There are two chief kinds of schooners, the top-sail schooner and the fore-and-aft schooner, the former carrying a square top-sail and top-gallant



Four-masted schooner.

sail (with sometimes a royal) on the fore-mast, and the latter having fore-and-aft sails on both masts, with sometimes a square sail on the fore-mast. The first schooner is said to have been launched at Gloucester, Massachusetts, in 1713. A three-masted schooner carries fore-and-aft sails on each mast.

SCHOPENHAUER (shō'pen-hou-er), Arthur, a German philosopher, born at Danzig 1788. From 1814 to 1818 he lived at Dresden, and occupied himself principally with the preparation of his most important work—The World as Will and Idea. Previous to this he had published a work on optics 1816. In 1818 he visited Rome and Naples, and from 1822 to 1825 was again in Italy, returning in the latter year to Berlin. The final teaching of Schopenhauer is that of a philosophic pessimism, having as its ideal the negation of the will to live. He died in 1860.

SCHOTTISCHE (shot-tish'), a dance performed by a lady and gentleman, somewhat resembling a polka; it is in $\frac{2}{4}$ time.

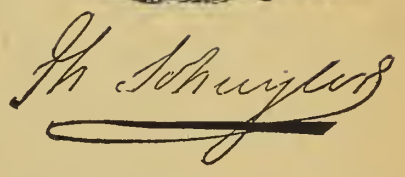
SCHUBERT (shö'bert), Franz, one of the greatest composers of modern times, born at Vienna in 1797, the son of a teacher; commenced his musical education in his seventh year, and in 1808 was admitted among the choristers of the court chapel. His songs and ballads, as exemplified in his three principal collections, the Winterreise (1826–27), the Müllerlieder (1828), and the Schwanengesang (1828), may be said to have revolutionized the Lied in making the accompaniment not less interpretative of the emotions of the poem than the vocal part, and in breaking through the limitations of the old strophic method. Besides his six hundred songs he left about four hundred other compositions, including fifteen operas, six masses, and several symphonies. Two only of the operas, Rosamond and the Enchanted Harp, were performed during his life, and they are considered inferior to his unproduced Fierabras. His symphonies take a higher rank, the Seventh (in C major) being ranked by Mendelssohn and Schumann with Beethoven's. His entire work justifies Liszt's description of him as the most poetic of musicians. He died in Vienna in 1828.

SCHUMANN (shö'mân), Robert, musical composer and critic, born at Zwickau in the kingdom of Saxony in 1810. Prior to 1840 his principal works were the Fantasias, the Scenes of Childhood, the Etudes Symphoniques, the Kreisleriana, the Abegg variations, the Papillons, the Carnival, and two sonatas in F sharp minor and G minor. He then commenced his great series of orchestral works, his symphony in B flat being first performed at the close of 1841. It was followed by his Overture, Scherzo and Finale, his D minor symphony, three quartets, the piano quintet and quartet, the cantata Paradise and the Peri, the C major symphony (1846), Genevieve (1847), Manfred (1848), the Faust music (1850), the E flat symphony (1851), and other works. Under stress of work, however, his reason failed him, and after an attempt to drown himself in 1854 he was confined in a lunatic asylum, where he died in 1856. In the line of musical descent Schumann stands between Beethoven and Wagner.

SCHUYLKILL (sköl'kil), a river of the United States, in Pennsylvania, which rises in the north side of the Blue mountains, runs southeast, passes through the confines of Philadelphia, and unites with the Delaware 7 miles below that city. It is 140 miles long, and navigable for boats of 300 or 400 tons to Philadelphia.

SCHUYLER, Philip John, American general, was born at Albany, N. Y., in 1733. He reached the rank of major in the French and Indian war, and at the beginning of the revolutionary struggle was made one of the American major-generals. He took the leading part in preparing to meet Burgoyne's expedition in 1778; but troops had to be called in from other states, and he was subjected to jealousies which thwarted him at every step. Nevertheless, his arrangements were so complete that he had really checkmated Burgoyne before congress superseded him in the command by the appointment of Bates, who reaped all the glory which should have accrued to Schuyler. Retiring from the army, he served for three years in the continental congress, and in the United States senate, 1789–91, and 1797–98. He died at Albany, November 18, 1804.

SCHURMAN (shur'mân), Jacob Gould, American educator, was born at Freetown, Prince Edward island, in 1854. In 1891 he was appointed dean of the Sage School of Philosophy at Cornell, and he succeeded Charles Kendall Adams as president of the university in 1892. He became editor of the Philosophical Review in 1892. In January, 1899, he was appointed by President McKinley chairman of the first Philippine commission, and spent the greater part of the succeeding year in the Philippine islands. He received a diploma and was appointed a life member of the American Academy in Rome in 1905. Among his works are Kantean Ethics and the Ethics of Evolution, The Ethical Import of Darwinism, Report of the Philippine Commission, etc.



SCHURZ (shurts), Carl, German-American soldier and political leader, was born at Liblar, Prussia, in 1829. He was engaged in the revolutionary movement of 1848–49, as a result of which he was forced to retire to Switzerland. In 1852 Schurz came to the United States, remained in Philadelphia for two years, and then settled in Wisconsin. In 1861 he was appointed minister to Spain, where he remained till December, 1861; returning to the United States, he entered the army, and in the May following was appointed brigadier-general of volunteers. He took part in the second battle of Bull Run, and commanded a division in the battles of Chancellorsville and Gettysburg. In the autumn of 1863 he went to Tennessee, and took part in several battles, but resigned in 1865. In 1868 he removed to St. Louis and in 1869 was elected United States senator from Missouri. In 1877 he was appointed secretary of the interior by President Hayes. At the expiration of his term, 1881, he removed to New York, and was the editor of the Evening Post until August, 1883. In 1884 he took a leading part in opposing the election of James G. Blaine and advocating that of Grover Cleveland. Schurz was an enthusiastic advocate of civil-service reform, in sup-

port of which he wrote many articles and reports and delivered many speeches. His publications include biographies of Henry Clay (1887) and of Abraham Lincoln (1891). He died in 1906.

SCHWAB, Charles M., first president of the United States Steel corporation and later president and chief owner of the Bethlehem Steel co., was born at Williamsburg, Pa., in 1862. In 1887 he was appointed superintendent of the Homestead works and under him these works were reconstructed and made the largest in the world. In 1889 he became general superintendent of the Edgar Thomson works. He was made president of the Carnegie Steel company in February, 1897. When the United States Steel corporation was formed he was made president at Mr. Carnegie's suggestion. He retired in 1904 to become president of the Bethlehem Steel company in which he owns a majority interest.

SCHWANN, Theodore, M. D., a German phys ologist, was born at Neuss, in the Rhine provinces, December 7, 1810. Doctor Schwann spent forty years in important work in connection with anatomy, and made some very valuable discoveries, one of them being that of the presence of pepsin in the gastric juice. He died at Cologne, January 11, 1882.

SCHWANTHALER (shvän'tä-ler), Ludwig Michael, German sculptor, born at Munich in 1802, where his father, the court sculptor, died in 1821. On the death of his father he succeeded him, and executed various commissions for King Maximilian, and a great number for his successor King Ludwig. He died in 1848. Schwanthaler was the chief representative of the "romantic" school in sculpture. and his works are often deficient in truth to nature and reality.

SCHWARZBURG - RUDOLSTADT (shvärts'burh-rö-dol-stät), a German principality, consisting of several isolated portions, situated between Prussian Saxony, the Saxon duchies, and the principality of Reuss. It lies on the northern side of the Thuringian Forest, and has an area of 362 sq. miles. The surface is rugged, and the soil by no means fertile The most important crop is flax, the culture of which is almost universal. A great part of the land is devoted to pasture, and great numbers of cattle are reared. The minerals include brown coal, iron, slate, and salt. The principal manufactures are glass and porcelain. The capital is Rudolstadt. Pop. 93,059.

SCHWARZBURG-SONDERSHAUSEN, a German principality on the northern side of the Thuringian Forest, between the territories of Prussian Saxony and the Saxon duchies, and consisting of several distinct portions; area, 332 sq. miles. One of the principal sources of revenue is derived from the forests, which furnish excellent timber. The only manufacture of any importance is porcelain. The capital is Sondershausen. Pop. 80,898.

SCHWATKA, Frederick, explorer, was born at Galena, Ill., September 29, 1849 In June, 1878, he sailed to the Arctic regions, in command of the Franklin search party, which returned in September, 1880, having discovered and buried many of the skeletons of Sir John Franklin's lost party, and cleared up much of the mystery that had shrouded their fate. He later explored the course of the Yukon river (1884). In 1890 Lieutenant Schwatka made an exploring expedition to Mexico. His works are: Along Alaska's Great River, Nimrod in the North, Children of the Cold. He died in 1892.

SCHWYZ (shvēts), a central canton of Switzerland, bounded on the north by the Lake of Zürich and canton St. Gall, west by Zug and Luzern, south by Lake Luzern, and east by Glarus; area, 353 sq. miles Schwyz being the most important of the cantons which first threw off the yoke of Austria, gave the name to the whole confederation. Its present government is an extreme democracy, the whole power, legislative and executive, being lodged in the male population of legal age, who hold a general assembly every two years. Pop. 55,497.

SCIAT'ICA, a term used in medicine to denote a rheumatic affection, in which the pain stretches along the course of the great sciatic nerve, that is, from the hip along the back part of the thigh toward the ham of the leg. There is stiffness and pain, increased by any change of temperature and moisture; there is generally swelling of the limb at the commencement of the disease, but after repeated attacks the limb seems to shrink, owing to the wasting of the muscles. In some cases the articulation of the hip seems affected, and permanent immobility of the limb takes place.

SCIENCES, a term applied to the generalized and systematized divisions of knowledge. Science and philosophy resemble each other in so far as they both have to do with knowledge; but while the latter deals with the whole sum of knowledge, the former takes up special branches of it, and it does not necessarily go back to first principles like philosophy. Given a sufficient number of inter-related facts, they may be so arranged and classified, by referring them to the general truths and principles on which they are founded, as to constitute a well-certified and more or less complete branch of knowledge, that is, a science. The sciences are broadly divided into pure or theoretic sciences and applied or practical sciences, the latter being definable as the knowledge of facts, events, or phenomena as explained, accounted for, or produced by means of powers, causes, or laws; the former as the knowledge of these powers, causes, or laws, considered apart or as pure from all applications. To the class of pure or fundamental sciences belong mathematics, physics, chemistry, psychology, and sociology; to the applied or concrete belong geology, mineralogy, botany, zoology, meteorology, geography, ethics, politics, law, jurisprudence, logic, grammar, rhetoric, philology, and political economy; navigation, engineering, and practical mechanics; surgery, midwifery, materia medica, etc.

SCILLY ISLANDS (sil'i), a group of granitic islands belonging to England, forming part of the county of Cornwall, at the entrance to the English channel, about 30 miles west by south of Land's End. They rise abruptly from a deep sea, form a compact group about 30 miles in circumference, and are said to amount altogether to about 140 in number (total area 3560 acres); but there are only six of any importance, the remainder being mere rocks and islets. The six alluded to are St. Mary's, St. Agnes, St. Martin, Trescow, Bryher, and Sampson. Pop. 2096.

SCIMITAR, a kind of sword in use among eastern nations. The blade is nearly semi-circular in form, with the edge upon the convex side. This form, while ill adapted for thrusting, is admirably adapted for striking.

SCIO, or SKIO (si'ō; skē'ō), an island of Asiatic Turkey, in the Ægean sea, separated from the coast of Asia Minor by a channel not more than 7 miles wide where narrowest, and about 53 miles west of Smyrna. Before the war of Greek independence Scio was peopled almost entirely by Greeks, of whom large numbers were massacred by the Turks after their subjugation in 1822. Scio contends for the honor of having given birth to Homer. It possesses few antiquities. In April, 1881, the island suffered much from repeated shocks of earthquake. Pop. 70,000.

SCIP'IO AFRICA'NUS, The Elder, Publius Cornelius Scipio Africanus Major, one of the most illustrious of Roman warriors, was born about 235 B.C. In 212 B.C. he was unanimously elected ædile, and a few years after was appointed proconsul in Spain. His first successful enterprise of importance was the conquest of New Carthage, the stronghold of the Carthaginians in Spain. The next year (209 B.C.) Scipio totally defeated Hasdrubal, Hannibal's brother, and subsequently a fresh army, led by Mago and Hasdrubal the son of Gisco. The result was to drive the Carthaginians wholly from Spain, and Scipio was empowered to lead an army against Carthage herself. The Carthaginians recalled Hannibal from Italy, but the great battle of Zama, fought 19th October, 202 B.C., resulted in the total defeat of the Carthaginians, who, on the advice of Hannibal, sought for peace. On his return to Rome Scipio was honored with a triumph, and received the surname of Africanus. He died, it is believed, in B.C. 183, the same year as his great opponent Hannibal.

SCIP'IO AFRICA'NUS, The Younger, Publius Cornelius Scipio Æmilianus Africanus Minor, son of L. Æmilius Paullus, the conqueror of Macedonia, and adopted son of P. Cornelius Scipio, the son of Scipio Africanus Major, was born about 187 B.C. In B.C. 152 he accompanied the consul Lucius Licinius Lucullus to Spain as military tribune, and in B.C. 149, on the outbreak of the third Punic war, commanded in Africa under the consul M. Manlius Nepos. His services were so important that in B.C. 147, contrary to the usual custom, not being of the legal age, he was unanimously chosen consul and leader of the forces against the Carthaginians. In B.C. 146 he took, and by command of the senate burned Carthage, for which

he was honored with a triumph at Rome and with the surname of Africanus. He was found dead in his bed in B.C. 129, Carbo being suspected of having murdered him. He was a friend of Polybius, the historian, and a patron of Terence.

SCIRPUS. See Bulrush.

SCISSORBILL, a genus of Laridæ or gulls, so named from the possession of an elongated beak of compressed form, the lower mandible exceeding the upper one in length, and shutting into the latter somewhat after the fashion that the blade of a knife does into its handle. This curious beak is of an orange color at its base, and black at its tip. The bird, which inhabits the coasts of America, and Africa is a dark brown on the upper aspect of the head and body; the under surface white, and a band of white across the wings. The average length of the scissorbill is about 1½ foot.

SCORE, in music, the original draught or its transcript, of a musical composition, with the parts for all the different voices or instruments arranged and placed in juxtaposition; so called from the practice of drawing the bar through all the parts.

SCORPION, the name of animals of the class Arachnida (which includes also the spiders). The largest of their class. Scorpions have an elongated body suddenly terminated by a long slender tail formed of six joints, the last of which terminates in an arcuated and very acute sting, which effuses a venomous liquid. This sting gives rise to excruciating pain, but is usually unattended either with redness or swelling, except in the glands of the arm-pit or groin. It is very seldom, if ever, fatal to man. The animal has four pairs of limbs borne by the thorax or chest-segments, and the maxillary palpi (organs of touch belonging to the maxillæ or lesser jaws) are

Scorpions.

largely developed, and constitute a formidable pair of nipping claws. With these claws they seize their insect prey, which is afterward killed by the sting. The eyes, which are of the simple kind number six, eight, or twelve. The female scorpions are said to exhibit great care for their young, and carry them on their backs for several days after being hatched, while they tend them carefully for about a month, when they are able to shift for themselves. Scorpions generally live in dark places, and under stones. They are found in the south of Europe, in Africa, in the East Indies, and in South America.

SCORPION FISH, or **SEA SCORPION,** a genus of teleostean (acanthopterous) fishes, belonging to the Triglidæ or gurnard family. The first dorsal fin possesses eleven spines, the second dorsal possessing one spiny ray and nine or ten soft rays. The anal fin is short, and has three spines and five soft rays. The red scorpion-fish is a familiar form. The spotted scorpion-fish is a second species, and, like the preceding form, occurs in British waters, as well as in the Mediterranean, Atlantic, and the tropical seas.

SCORPION FLY, a genus of insects belonging to the order Neuroptera, or that of the dragon flies. The name scorpion fly is derived from the appendages seen attached to the abdomen of some species. The male in the common species, for example, has the sixth and seventh joints of the abdomen attenuated, and capable of extensive motion; while the last joint forms a pair of forceps resembling those of the earwigs. When at rest this tail is curled over the back, but when irritated the forceps are used as weapons of offense or defense.

SCOTLAND, the northern division of the Island of Great Britain, between lat. 54° 38′ and 58° 40′ 30″ n.; and lon. 1° 46′ and 6° 8′ 30″ w. It is separated from England substantially by the Solway, Cheviots, and Tweed, the border isthmus being about 60 miles across; but the irregular boundary line measures fully 100 miles. On all other sides it is bounded by the sea. Few points in the mainland are more than 40 miles from the sea, the country being so much penetrated by inlets. The country was formerly divided into a number of districts, many of the names of which are still familiar, such as Lothian, Tweeddale, Galloway, Breadalbane, etc., but for political purposes is now divided into 33 counties, of which Lanark, Edinburgh, Aberdeen, Forfar, Ayr, Fife and Renfren are the most important. Pop. 4,772,103. Edinburgh (the capital), Glasgow, Dundee, and Aberdeen each contain upward of 100,000 inhabitants. After these come, in order of population, Paisley, Leith, Greenock, Coatbridge, Kilmarnock, Kirkcaldy, Perth, Hamilton, Motherwell, and Falkirk.

The islands of Scotland number altogether nearly 800. On the east coast they are few and small; but on the northeast are the two large groups of the Orkneys and Shetlands, the former numbering 52 islands, 28 permanently inhabited; the latter 100 islands, 29 inhabited; while on the west coast the islands are large and numerous. Here the Hebrides extend for 200 miles from north to south, and are divided into the Inner and Outer Hebrides, the former lying close to the western coast of the mainland and stretching from Skye to Islay; the latter, parted from the Inner Hebrides by the straits of the Minch and the Little Minch, comprise the long chain of islands from Lewis to Benbecula. Inclosed in the Firth of Clyde are the islands of Arran, Bute, and the Cumbraes, forming a county by themselves. The west coast of the mainland is generally a wild, deeply-indented mountain-wall, presenting a series of inlets or sea lochs, while toward the middle the coast is cleft by two great inlets with openings to the southwest, the Firth of Lorn and its continuation Loch Linnhe, and the Firth of Clyde and its ramifications running far inland. The east coast is sometimes low and sandy, but is often formed of steep rocky cliffs of considerable elevation, the chief inlets being the Firths of Forth and Tay, and the Moray Firth, Cromarty Firth, etc.

Both from the configuration of the surface and the geological structure the country divides into three divisions, the Highlands, Central Lowlands, and Southern Uplands. The first of these divisions lies north of a line stretching in a s.w. direction from the coast of Kincardineshire to the Firth of Clyde; the third is the country s. of a line drawn from Dunbar southwesterly to Girvan; the country between these lines forms the Central Lowlands.

The chief rivers flow to the east, and enter the German ocean, the largest being the Tweed, Forth, Tay, South Esk, North Esk, Dee, Don, Deveron, Spey, Findhorn, etc.; those entering the sea on the west are the Clyde, Ayr, Doon Dee, Nith, Annan, and Esk. The Clyde, however, in its lower course carries a vast traffic, this being rendered possible chiefly by dredging. Many of the rivers are valuable from the numbers of salmon they produce. A striking feature of the country is the great multitude of lakes, varying in size from Loch Lomond (28 sq. miles) to the pool-like mountain tarns. In the Northern Highlands almost every glen has its lake and every mountain hollow is filled by a stream or spring.

For Agriculture, Manufactures, Trade, etc., see Britain.

The parliament of Scotland anciently comprised all who held any portion of land, however small, from the crown by tenure of military service, till the reign of James VI., when the small barons or freeholders were excused from attendance in person, "two or more wise men," being deputed from each county in proportion to its size. Its powers were nominally extensive, but the supreme power was virtually in the king, who by his influence often entirely controlled its proceedings. The parliament in the whole consisted of three estates—the nobility, the dignified clergy (consisting of bishops, abbots, and priors), and the lesser barons, or representatives of shires and burghs. When Presbyterianism was formally ratified by law after the revolution of 1688, the ecclesiastical estate ceased to have a place in parliament. Every measure brought before parliament was previously prepared by a committee, styled the lords of the articles, chosen from each of the three orders, but in effect little better than royal nominees. Before the Union there were four great officers of state—the lord high-chancellor, the high-treasurer, the lord privy-seal, and the secretary; and there were also four lesser officers—the lord clerk-register, the lord-advocate, the treasurer-depute, and the justice-clerk. Previously to the era of the Revolution the privy-council of Scotland assumed inquisitorial powers, and even torture was administered under the sanction of its authority; but it is now entirely merged in the privy-council of Great Britain. The number of peers in the Scottish parliament was latterly 160, and of commons 155, and all sat in one house, and voted promiscuously.

At the union of the kingdoms the political system of Scotland was almost entirely incorporated with that of England.

Scotland has had the advantage of a national system of elementary education for over two centuries, a school having been established in every parish by a law of 1696 (where such a school was not already established), according to a system proposed by John Knox long before. This scheme did effective service for the education of the people, till the great increase of population, especially in towns, rendered it unequal to the task laid upon it, and this notwithstanding the erection of many schools by various religious denominations. By the passing of the Education Act of 1872 board-schools have superseded the old parish schools, there being also numerous grammar or high schools and academies in every town of any size, though no systematic scheme of secondary education. Other institutions are the normal or training schools and colleges of the different religious bodies and the four universities of Edinburgh, Glasgow, Aberdeen, and St. Andrews.

The country now called Scotland emerges from pre-historic obscurity during the Roman occupation of Britain, though for many centuries little is known of its history. A Celtic (and Aryan) people seem to have entered the country, and to have gained predominance over the non-Aryans, the combined people occupying at the Roman invasion most of the country north of the Forth and Clyde estuaries, which was called Caledonia by the Romans, and its people Caledonians. The southern part of the country was inhabited by another Celtic race, the Brythons or Britons, of the same blood as the Welsh. The descendants of the Caledonians were afterwards called Picts, and were the predominant people in North Britain at the beginning of the 6th century, when a colony of Scots or Dalriads from Ireland effected a settlement in Argyle, and gradually spread over the adjacent regions. It is from these Scots (a Celtic and Gaelic-speaking people) that the country afterward received the name of Scotland, the original Scotland (Scotia) being Ireland. The Teutonic element was introduced into Scotland as early as the 4th century About the middle of the 9th century Kenneth MacAlpin, son of a ruler of a body of Scots established in Galloway, but of Pictish descent through his mother, united in his own person the sovereignty of both the Picts and the Scots. The reigns of Kenneth and his immediate successors were one continued scene of warfare with the Norsemen on one hand and with the Britons of Strathclyde and the English of Northumbria on the other. On the advent of Malcolm Canmore (1058) to the throne after the death of Macbeth, the able ursurper and murderer of Duncan (see Macbeth), the purely Celtic monarchy came to an end.

On the death of Malcolm the Celtic tribes placed his brother Donald Bane on the throne, but he was driven from it before he had reigned a year by Duncan, a natural son of the late king, who now seized the scepter. In 1098, however, Edgar Atheling, obtained a force from the English king, and succeeded in gaining the kingdom for Edgar, the lawful son of Malcolm. Edgar was succeeded by his brother Alexander I., a prince whose reign is chiefly signalized by his severe administration of justice. He assisted Henry I. of England, who had married his sister, in a war with the Welsh, and died in 1124, leaving the throne to his younger brother David. David was brought into feudal relations with the Norman king of England. On the accession of the usurper Stephen to the English throne in 1135, to the prejudice of Maud or Matilda, wife of the Emperor Henry V., only child of Henry I. and niece of David, the latter made several expeditions into England in support of his niece's claim to the throne. His death in 1153 was preceded by that of his only son, so he was succeeded by his grandson, Malcolm the Maiden, whose reign of twelve years is only remarkable for his giving up Northumberland and Cumberland to the English king. On the death of Malcolm IV. in 1165 the crown fell to his younger brother William, who is known by the title of William the Lion. During an expedition into England for the purpose of regaining Northumberland he was taken prisoner (1175), and sent to Falaise in Normandy, where a treaty was concluded acknowledging the supremacy of England, and declaring Scotland a fief and himself a vassal of the English crown. This treaty remained in force till 1189, when Richard I. restored Scottish independence for the sum of 10,000 marks in order to equip a force to join the third crusade. The rest of William's reign was devoted to the consolidation of his kingdom in the north and west. The Scottish alliance with France, and many of the Scottish burgh charters, date from this reign. His successors were Alexander II., 1214–49, and Alexander III., 1249–1286. Margaret of Norway was only three years old at Alexander's death, and a regency consisting of four barons and two bishops was appointed. Margaret died in 1290 and was succeeded by John Baliol, who was crowned at Scone (1292) acknowledging Edward as his overlord. Edward had succeeded in conquering Scotland when Wallace, the man of the people, appeared. William Wallace, assisted by some of the barons and a considerable body of men, defeated the English governor, the Earl of Surrey, at Stirling Bridge (11th September, 1297), drove Edward's garrison out of the country, and made a raid into England. Edward, who was in Flanders, hastened home, and marching at the head of a large army, defeated Wallace at Falkirk (22d July, 1298), and before 1303 had repossessed himself of the whole country. In 1305 Wallace was betrayed into the hands of the English near Glasgow by Sir John Menteith; was carried to London, and after a mock trial was condemned as a rebel and traitor to Edward and executed (23d August, 1305). Wallace soon had a more fortunate, though not a more valiant, successor in Robert de Bruce. He had long been an unwilling and restless retainer of Edward, but latterly determined to push his claims in Scotland, and was crowned as king of the country at Scone in 1306. At first his career was not successful, but the death of Edward I. at Burgh-on-Sands, on his way to Scotland, and the inactivity of his son Edward II., were turning-points in the recovery of the independence of Scotland. Gradually Bruce recovered the whole country, till in 1313 the only English garrison left was Stirling Castle, which was closely besieged by the Scotch. To relieve it Edward II. led into Scotland a great army, which was totally defeated by Bruce in the battle of Bannockburn (24th June, 1314). After this victory Bruce reigned with almost uninterrupted success, and died in 1329. On the death of Robert Bruce his son, David II., a boy six years old, was proclaimed king, and acknowledged by the great part of the nation. Edward Baliol, however, the son of John Baliol (who died 1314) formed a party for the purpose of supporting his pretensions to the crown; he was backed by Edward III. of England. At first Baliol was successful; and on the 24th September, 1332, he was crowned king at Scone, but eventually David succeeded in driving him from the kingdom. At his death in 1370, childless, the succession fell to Robert, son of Walter, the high steward, and of Marjory Bruce, daughter of Robert I. (Bruce), Robert II. being thus the first of the Steward, or as it came to be written, Stewart or Stuart, dynasty. Robert II. died in 1390 and was succeeded by his son, John, who upon his accession took the name of Robert III. The latter part of the reign of Robert III. was disturbed by the ambition of his brother, the Duke of Albany, who is said to have caused the death of the profligate young Duke of Rothesay, the heir to the throne. Afraid for the safety of his second son, James, Robert designed to send him to France; but the ship in which he was being conveyed was captured by the English, a misfortune which hastened the king's death (1406). James I. being then only eleven years of age, and a captive, the regency devolved on the Duke of Albany. After nineteen years of captivity he was crowned at Scone (1423). James' efforts to diminish the power of the great nobles provoked a conspiracy against him, and he was murdered in the Blackfriars' monastery at Perth (20th February, 1437). His son and successor James II. being only seven years of age, the country was subjected to the miseries of a long and feeble regency. One of the chief events of his reign was the rebellion and temporary overthrow of the powerful house of Douglas. James was accidentally killed by the bursting of a cannon at the siege of Roxburgh Castle (3d August, 1460). James III. was not quite eight years of age when he succeeded to the kingdom, which was again subject to all the troubles of a minority. In 1467 the young king married Margaret, daughter of the Norse king Christian, and in the shape of a pledge of payment of her dowry the Orkney and Shetland islands were given up to Scotland, of which they have ever since formed a

part. A confederation against him was formed by a number of his nobles in 1488; the forces met at Sauchieburn, near Stirling, where the royal army was defeated, and James was murdered in the flight. James IV., who had been induced to join the nobles hostile to his father, was sixteen years old when he ascended the throne. In 1503 he married Margaret, daughter of Henry VII. of England, and thus paved the way for the future union of the two kingdoms. The king was killed at Flodden Field (9th September, 1513); his infant successor James V. had not yet reached the age of two years. His cousin, the Duke of Albany, was appointed regent, but from an early part of the reign James was almost entirely in the hands of the Earl of Angus, who had married the queen dowager, and had almost complete control of affairs till 1528, when James then in his seventeenth year managed to escape to Stirling, take the government in his own hands, and drive Angus into England. His alliance was sought by England, France, and Spain, and in 1537 James married Madeleine, daughter of Francis I. The young queen died a few weeks after her arrival in Scotland, and in the following year James married Mary of Lorraine, daughter of the Duke of Guise. James died at Caerlaverock Castle (14th Dec., 1542), having just received tidings of the birth of his daughter, the future Mary Queen of Scots. The eventful period which followed the accession of Mary was dominated by the Reformation movement, and the questions affecting the Union of Scotland and England. In 1558 she was married to the dauphin who succeeded to the throne the following year, but died in 1560. Mary then returned to Scotland. Mary's reign was popular until her unfortunatem arriage with Darnley in 1565. Darnley was murdered by the Earl of Bothwell and his servants, but whether Mary was accessory to the murder is yet a matter of controversy. The fact remains that she married Bothwell within three months, and alienated the greater number of her subjects. A confederacy was formed against her and she was imprisoned in Lochleven Castle. She escaped and fled to England and put herself under the protection of Elizabeth. Here she drops from Scottish history, but her after-life till her execution in 1587 was a continual series of plots to regain her lost throne. James VI., the son of Mary, being a mere child, Moray held the regency of the kingdom. The chief events of the reign, prior to the union of the crowns by the accession of James to the throne of England as James I., were the raid of Ruthven, the marriage of James to Ann of Denmark, and the Gowrie conspiracy. On the death of Elizabeth in 1603, James succeeded as the nearest heir through his descent from Margaret, daughter of Henry VII. and wife of James IV. He was crowned at Westminster, and assumed the title of King of Great Britain, France, and Ireland.

There were seven Scottish parliaments called by James after his accession, wherein he was represented by a commissioner sitting as president. His chief energies were directed to an attempt to draw England and Scotland into a closer union by means of harmonizing the laws of the two countries, and by establishing episcopacy in Scotland. James VI. died in 1625, and was succeeded by his son, Charles I. Foreign wars and domestic troubles prevented Charles from visiting Scotland till 1633 when he was crowned at Edinburgh. At the outbreak of the civil war in England, Scotland took the part of the parliament against the king, and was of considerable assistance to the parliamentary forces at Marston Moor and elsewhere. The affairs of the king becoming hopeless in England, Charles gave himself up to the Scottish army posted before Newark 5th May, 1646, and was surrendered to the English parliament 30th January, 1467. After the execution of Charles (30th January, 1649) the Scots proclaimed his son king, under the title of Charles II. The young king was then in Holland. He arrived in Scotland, landing at the mouth of the Spey, 3d July, 1650, and marched southward by Aberdeen, Dundee, and St. Andrews to Falkland palace. Cromwell at Worcester utterly scattered the royalist forces, and compelled Charles to become a fugitive (3d September, 1651). Cromwell's death was soon followed by the fall of his son, Monk's march to London at the head of the army, and the restoration of Charles II. (1660). The Scottish parliament assembled under the Earl of Middleton, the king's commissioner, January 1, 1661, and it soon became apparent that Charles was determined to carry out the favorite scheme of his father and grandfather of establishing episcopacy in Scotland. Charles died in 1685, and was succeeded by his brother, James VII. of Scotland and II. of England. The chief events of his reign, so far as Scotland was concerned, were the rising, defeat, and execution of Argyle. At the Revolution a convention of the estates at Edinburgh proclaimed William, prince of Orange, James' son-in-law and nephew, and his wife Mary, James' daughter, king and queen of Scotland. Religious freedom was again restored, and in 1690 a general assembly of the Presbyterian church again met.

The death of William III. in 1702 transferred the crowns of the two nations to Queen Anne, sister of Mary. A joint commission was appointed to draw up articles of union in 1706. A majority of the parliament carried the measure (16th January, 1707); it received the royal assent (March 4); and the union took effect (May 1). The chief provisions of the Act of Union were (1) That the two kingdoms should be united under the name of "Great Britain;" (2) that the succession to the crown of the United Kingdom should be in the Electress Sophia of Hanover and her heirs, being Protestants; (3) that 16 Scottish peers and 45 Scottish members of the House of Commons should be elected to the one parliament sitting in London; (4) that the Established Presbyterian church of Scotland should be maintained; (5) that Scotland should keep unchanged her own laws and customs relating to property and private rights, and also the court of session and other Scotch courts; (6) that all the rights of trade, free intercourse, and citizenship should be of the same for Scotch and English subjects. Henceforth the general history of Scotland may be said to be entirely identified with that of England.

SCOTT, Michael, author of Tom Cringle's Log and The Cruise of the Midge, was born at Glasgow, 1789, and died in 1835 The two brilliant seanovels of which he was the author appeared anonymously in Blackwood's Magazine.

SCOTT, Sir Walter, Bart., poet and novelist, was born in Edinburgh, August 15, 1771. He was a younger son of Walter Scott, writer to the signet, by Anne, daughter of Dr. John Rutherford, professor of medicine in the University of Edinburgh, both connected with old Border families. In 1805 he became prominent as an original poet with the Lay of the Last Minstrel, an extended specimen of the ballad style, which fell upon the public as something entirely new, and at once became widely popular. In 1808 he published Marmion, another poetic romance which greatly increased his reputation; and in 1810 the Lady of the Lake, in which his poetical genius seems to have reached the acme of its powers. The appearance of Waverley, in 1814, forms an epoch in modern literature as well as in the life of Scott. This romance or novel was rapidly followed by numerous others, forming,

Sir Walter Scott.

from the name of the first, the series known as The Waverley Novels. The earlier of these were Guy Mannering (1815), The Antiquary, The Black Dwarf, Old Mortality (1816), Rob Roy (1817), The Heart of Midlothian (1818), The Bride of Lammermoor, A Legend of Montrose, and Ivanhoe (1819). These splendid works of fiction which surprised and enchanted the world, it is held by most, mark the high tide of his genius, those which follow being placed on a somewhat lower level, although there are several, especially in the second period, up to 1825, in which no falling-off is perceptible. Ivanhoe was followed by The Monastery, The Abbot (1820), Kenilworth, The Pirate (1821), The Fortunes of Nigel, Peveril of the Peak (1822), Quentin Durward, St. Ronan's Well (1823), Redgauntlet (1824), The Betrothed and The Talis-

man (1825), Woodstock (1826), The Chronicles of the Canongate, The Fair Maid of Perth (1829), Anne of Geierstein (1829), Count Robert of Paris and Castle Dangerous (1831). The Waverley novels were all published anonymously, nor did Scott cease to be the "Great Unknown" until 1827, although their authorship had long been an open secret to many. He died in 1832 and was interred in his family burial aisle amid the ruins of Dryburgh Abbey. His life was written by his son-in-law, John Gibson Lockhart, a work which has taken the position of a classic.

SCOTT, Winfield, commander-in-chief of the United States army, was the son of a Scottish Jacobite, and was born near Petersburg, Virginia, 1786; died at West Point, 1866. He was brought up to the law, and admitted to the bar, but never practiced. Entering the army he served with distinction in the war of 1812–14, and afterward visited Europe, and studied military science at Paris. In 1832 and the following years General Scott was employed in operations against the Indian tribes, and in 1841 he was appointed commander-in-

Winfield Scott.

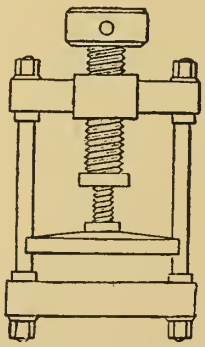
chief. His fame rests upon his brilliant conduct of the Mexican war of 1846–47, in which he gained several victories over Santa Anna, made himself master of Mexico, and concluded an advantageous peace. He was twice an unsuccessful candidate for the presidency. On the outbreak of the great civil war he remained true to the federal government, but was too infirm to take any actual command. He retired from active service in 1861, and in 1864 he published his autobiography.

SCOTUS, Duns. See Duns.

SCRANTON, the capital of Lackawanna co., Pennsylvania, in a valley near the Lackawanna river, 150 miles w.n.w. of New York. It owes its rapid prosperity to the numerous collieries in the vicinity, to its large rolling-mills and steel works, and extensive manufactures of railway rolling-stock, machinery edge-tools, leather, window sashes and blinds, silk fabrics, etc. The city was founded in 1840. Pop. 1909, 130,000.

SCREAMER, the name given to two genera of South American grallatorial or wading birds, the horned screamer and the closely allied crested screamer. The latter has no horn, but its head is furnished with a dependent crest of feathers.

SCREW, a wooden or metal cylinder having a spiral ridge (the thread) winding round it in a uniform manner, so that the successive turns are all exactly the same distance from each other, and a corresponding spiral groove is produced. The screw forms one of the six mechanical powers, and is simply a modification of the inclined plane. The energy is transmitted by means of a hollow cylinder (the female screw) of equal diameter with the solid one (the male screw), having a spiral channel cut on its inner surface so as to correspond exactly to the spiral ridge raised upon the solid cylinder. Hence the one will work within the other, and by turning the convex cylinder, while the other remains fixed, the former will pass through the latter, and will advance every revolution through a space equal to the distance between two contiguous turns of the thread As the screw is a modification of the inclined plane it is not difficult to estimate the mechanical advantage obtained by it. If we suppose the power to be applied to the circumference of the screw, and to act in a direction at right angles to the radius of the cylinder and parallel to the base of the inclined plane by which the screw is supposed to be formed, then the power will be to the resistance as the distance between two contiguous threads to the circumference of the cylinder. But as in practice the screw is combined with the lever and the power applied to the extremity of the lever, the law becomes: The power is to the resistance as the distance between two contiguous threads to the circumference described by the power. Hence the mechanical effect of the screw is increased by lessening the distance between the threads or making them finer, or by lengthening the lever to which the power is applied. The law, however, is greatly modified by the friction, which is very great. The uses of the screw are various. It is an invalu-



Hunter's screw-press.

able contrivance for fine adjustments such as are required in fine telescopes, microscopes, micrometers, etc. It is used for the application of great pressure as in the screw-jack and screw-press; as a borer in the gimlet; and in the ordinary screw-nail we have it employed for fastening separate pieces of material together. The differential screw or Hunter's screw, is formed of two screws, a larger and a smaller, the former being screwed internally to allow the latter to screw into it; the pitch of the two screws differs slightly, and for each turn of the chief or larger screw the progress of the point of the compound screw is the difference of pitch. Greater power is in this way attained without the weakness due to a screw with fine threads. See also Screw-propeller, Archimedean Screw, Endless Screw.

SCREW-PINE, the type of an order of trees or bushes known as the Pandanaceæ or Screw-pine order. They are natives of tropical regions, and abound in insular situations, such as the Eastern archipelago. They branch in a dichoto-

Screw-pine.

mous or forked manner, and are remarkable for the peculiar roots they send out from various parts of the stem. These roots are called aerial or adventitious, and serve to support the plant. The seeds are edible; and the flowers of some species are fragrant.

SCREW-PROPELLER, an apparatus which, being fitted to ships and driven by steam, propels them through the water, and which, in all its various forms, is a modification of the common screw. Originally the thread had the form of a broad spiral plate, making one convolution round the spindle or shaft, but now it consists of several distinct blades, forming portions of two, three, or four threads, as illustrated by a, b, c, Fig. 1, which give an idea of the various forms of blades for different sizes of propellers: a has a good shape for the larger sizes; b, having three blades, is successfully applied for twin screw steamers, and is also useful with two blades for medium sizes; c is suitable for small diameters and a moderate number of revolutions per minute. Either two or three blades of this shape answer well for barges and towing purposes. The usual position for the screw propeller is immediately before the stern-post, as shown in fig. 2, the shaft passing parallel to the keel into the engine-room, where it is set in rapid

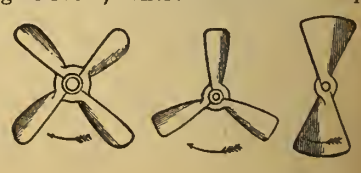


Fig. 1.—Forms of screw-propeller.

motion by the steam-engines. This rotary motion in the surrounding fluid,

which may be considered to be in a partially inert condition, produces, according to the well-known principle of the screw, an onward motion of the vessel more or less rapid, according to the velocity of the shaft, the obliquity of the blades, and the weight of the vessel. In 1827 Mr. Wilson of Dunbar produced

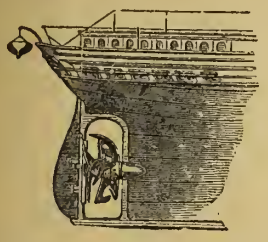


Fig. 2.—Screw-propeller in position.

a screw-propeller which proved satisfactory, but the successful introduction of the screw-propeller is due to Mr. F. P Smith and to Ericsson, who both independently and about the same time (1838) secured patents. Numerous modifications of the screw-propeller have been proposed and adopted since it was first introduced, and it has now practically superseded the paddle-wheel for sea-going vessels.

SCRIBES, among the Jews, were officers of the law. There were civil and ecclesiastical scribes. The former were employed about any kind of civil writings or records. The latter studied, transcribed, and explained the Holy Scriptures.

SCROF'ULA, or **SCROPHULA,** a disease due to a deposit of tubercle in the glandular and bony tissues, and in reality a form of tuberculosis or consumption. It generally shows itself by hard tumors, of the glands in various parts of the body, but particularly in the neck, behind the ears, and under the chin, which, after a time, suppurate, and degenerate into ulcers, from which, instead of pus, a white curdled matter is discharged. The first appearance of the disease is most usually between the third and seventh year of the patient's age; but it may arise at any period between this and the age of puberty; after which it seldom makes its first attack. It is by no means a contagious disease, but is of a hereditary nature, and is often entailed by parents on their children. It may, however, remain dormant through life and not show itself till the next generation. The disease generally goes on for some years; and appearing at last to have exhausted itself, all the ulcers heal up, without being succeeded by any fresh swellings, but leaving behind them an ugly puckering of the skin, and a scar of considerable extent. This is the most mild form under which scrofula appears. In more virulent cases the eyes and eyelids are inflamed, the joints become affected, and caries of the bones supervenes. Hectic fever at last arises, under which the patient sinks; or the disease ends in tuberculated lungs and pulmonary consumption. Scrofula is also called struma and king's-evil

SCROLL, a very frequent ornament in architecture, consisting of a band arranged in undulations or convolutions. The name is also given to the volute of the Ionic and Corinthian columns.

SCROPHULARIA'CEÆ, a very large natural order of herbaceous or shrubby monopetalous exogens, inhabiting all parts of the world except the coldest, containing about 160 genera and 1900 species. They have opposite or alternate entire toothed or cut leaves, and usually four or five lobed irregular flowers with didynamous stamens, placed in axillary or terminal racemes; with a two-celled ovary and albuminous seeds. Many of the genera, such as the foxglove, calceolaria, veronica, mimulus, antirrhinum, pentstemon, etc., are valued by gardners for their beautiful flowers.

SCULPTURE, is the art of imitating living forms in solid substances. The word means strictly, a cutting or carving in some hard material, as stone, marble, ivory, or wood; but it is also used to express the moulding of soft substances, as clay or wax, and the casting of metals or plaster.

In producing a work of sculpture two processes are involved, "modelling"

Assyrian.—From Nimroud, 930-920 B. C.

and "casting," the former alone being truly the work of the artist. For ornament and figure the same method is employed. In the former a ground of clay is prepared, and upon it the lines of the ornament are lightly sketched, usually with a tool. These are then clothed upon firstly with important masses, then the connecting lines, and, lastly, the minor detail, the whole being afterward modelled to the forms desired. For a head or bust a flat board, set on a high stand, with a piece of wood standing at right angles to it, is used. Lead-piping is sometimes further employed to raise the height of this piece of wood, and around this structure the clay is roughly built up, a cylindrical mass for the neck, and an egg-shaped form for the head. Upon this latter the position of the features is marked, and the work carried on by reference to the living model. For a full-length figure an "armature" is prepared, consisting of an iron passing through the center and attached to which are other irons in the case of statues, or of lead-piping for statuettes. These are bent to the required positions, the whole when complete representing in line the pose and

Egyptian.—From large figure in bronze.

character of the intended figure. Upon and around this framework the figure is first roughly built up with clay, care being taken to add just as much as is requisite, and to follow the general form and direction of the muscles. The essential difference between modeling and carving is that in the former the artist works from within outward by the additions of material, while in the latter from without inward by the taking away of material. The sculptor's work proper generally ends with the completion of the clay model. The next process is that of casting. Plaster of Paris of the consistency of thick cream is poured over the model to the depth of from 2 to 3 inches, the inner layer being colored. When this is set, the clay is carefully removed, and what is termed a "waste mould" is formed. This is carefully washed and when dry is then oiled. Into this mould plaster of Paris is poured, and when filled and set hard the waste mould is chipped off. The plaster of Paris has taken the place of the clay, and formed what is called a "cast." A head is usually cast in halves, and a similar treatment is adopted in the case of complete figures. This is termed "piece moulding." Parts which project very much are removed and cast separately, being afterwards attached by means of plaster of Paris. The reproduction of

Grecian.—1, Faun of Praxiteles—Florence. 2, Niobe—Florence. 3, Amazon—the vatican.

SCULPTURE

this plaster cast in marble or stone is a mechanical operation, usually intrusted to a skilled workman. To aid him he employs a "pointing machine," by which he first finds out the distance of any point on the cast from an imaginary vertical plane placed in front, and into the block of marble drills a hole whose depth from the same plane equals this distance. Innumerable holes are thus drilled, and the solid marble cut away until the bottoms of all the holes are reached. This gives the form roughly, and the carver proceeds to copy from the plaster cast, carrying on the work under the supervision of the sculptor, who rarely carves the work himself except in finishing touches. For casting in metal a plaster mould is first made as already described. Within this is fixed a rudely-formed, solid, but removable mass called a "core," the space between it and the surface of the mould being filled with the molten metal. Another method for smaller work is called "cire perdue." In this the mould is lined with wax and the core inserted close up to the wax lining. The wax is then melted out and the molten metal poured into the mould to take its place, the core being afterward removed. The earliest records of sculpture that we possess, exhibit the art in complete bondage to religion. Thus the sculptures of India and China are semi-barbaric and naturalistic; and in the colossal figures of the rock-cut temples of India there is a superadded symbolism, which led to the most extravagant deformities of the human figure. It is to Egypt that we must turn for the first signs of higher and more vital art. The distinctive characteristics of Egyptian sculpture are colossal size, stability, and symmetry, the expression being that of calm repose and solemnity, with a suggestion of the supernatural. The best period of Egyptian sculpture was from 1450 to 1000 B.C. The best period of Assyrian sculpture as a style, is inferior to that of Egypt. Its characteristics are an intense and vigorous spirit of representation without the least reference to ideal beauty of any kind. Persian sculpture (560–331 B.C.) differs but little from Assyrian, and is usually included with it. Roughly hewn and badly modeled, the force of the animal forms yet gives it a sense of the gigantic, analogous to that obtained by the Greeks in their treatment of Hercules, but withal possessing no sense of ideal beauty.

Renaissance—1, St. George, Donatello, Florence. 2, Moses, Michael Angelo. 3, Nymph, Goujon.

St. Michael and satan.—Flaxman.

John Hampden.—Foley.

These early products of art, valuable in themselves, are nevertheless chiefly interesting as leading the way to the full development of sculpture under the Greeks. Greek sculpture, in its infancy, is strongly stamped with oriental character, as may be seen by a careful examination of the reliefs from the temple of Assos now in the Louvre, and the metopes from Sellinus, casts of which are in the British Museum. But from the end of the 6th century B.C. the development of Greek art was rapid and continuous. Upheld on the one hand by a noble mythology, that magnified without distorting human attributes, and supported on the other by an increasing knowledge of nature, the ultimate perfection of Greek art became only a question of time. It came to perfection in Phidias, whose statues of Athene in the Parthenon at Athens (B.C. 438), and of Zeus in the temple at Olympia, mark the period of the highest style of Greek art. We have in the sculpture of this period, the highest type of human beauty joined to a god-like calm and reticence of emotion. Examples of the grand style of this epoch are the sculptures of the Parthenon; the colossal bronze head of Artemis in the British museum; the Venus of Milo, in the Louvre; and the exquisite relief representing the parting of Orpheus and Eurydice, in the museum at Naples. From the death of Alexander the Great, B.C. 323, onward to the conquest by the Romans, B.C. 146, the progress of Greek sculpture is only a further, and often a weaker, development of the same ideal. The celebrated group of the Laocoön, the head of the Dying Alexander, the Dying Gladiator, and the Apollo Belvedere, are some of the works of this epoch that are preserved to us.

The history of sculpture in Italy is only a continuance of its story in Greece. It was Greek art produced by Greek workmen that adorned the palaces of the emperors; and the Roman sculptors, in so far as they had any independent existence, can only claim to have impoverished the ideal they received from Greece. The special tendencies of Italian sculpture may be said to have reached their full expression in the work of Michael Angelo (1475–1564). Here we see all previous efforts to interpret passion and feeling summed up and concluded. His figures are charged with all the possibilities of human experience and emotion. It was toward this complete understanding of the resources of physical expression that all Italian art had been tending, and it is only more fully exhibited in Michael Angelo because be was the greatest master that Italy produced. His works are the statues in the chapel of the Medici at Florence, the Captives in the Louvre, the colossal David at Florence, the Moses in Rome, and the Madonna in Bruges. For a long period after Michael Angelo, Italian sculptors were content to imitate, and sometimes to exaggerate his manner. American sculpture is entirely due to Italian influence exer-

cised over Americans working in Italy. Among American sculptors are Crawford, Akers, Hiram Powers, W.W. Story, Wm. Henry Rinehart, Miss Hosmer, Gould, Ball, Couper, Saint Gaudens, MacMonnies, Partridge, Bartlet and Barnard.

SCULPTURED STONES, a name specially given to certain ancient monuments with sculptured ornaments or devices, sometimes with inscriptions, found in the British islands. Some of the inscriptions are in debased Latin. A good example of this class, called the Catt Stane, is found in the parish of Kirkliston, near Edinburgh. It is a monolith, composed of a large boulder of trap about 4½ feet in height, with an imperfect inscription, which marks it as a sepulchral stone. The peculiarity of these stones consists in certain symbols, supposed to be of religious character, but of which nothing certain is known, and no plausible interpretation has been given.

SCUPPERS, channels cut through the sides of a ship at the edges of the deck to carry water off the deck into the sea.

SCURVY, a disease of a putrid nature prevalent in cold and damp climates, and which chiefly affects sailors, and such as are deprived of fresh provisions and a due quantity of vegetable food. It seems to depend more on a defect of nourishment than on a vitiated state; and not to be of a contagious nature. It comes on gradually, with heaviness, weariness, and unwillingness to move about, together with dejection of spirits, considerable loss of strength, and debility. As it advances in its progress the countenance becomes sallow and bloated respiration is hurried on the least motion; the teeth become loose; the gums are spongy; the breath is very offensive; livid spots appear on different parts of the body; old wounds, which have long been healed up, break out afresh; severe wandering pains are felt, particularly by night; the skin is dry; the urine small in quantity; and the pulse is small, frequent, and toward the last intermitting; but the intellect, for the most part, clear and distinct. By an aggravation of the symptoms the sufferer in its last stage exhibits a most wretched appearance. Scurvy as usually met with on shore is unattended by any symptoms other than slight blotches, with scaly eruptions on different parts of the body, and a sponginess of the gums. In the cure, as well as the prevention of scurvy, more is to be done by regimen than by medicines, obviating as far as possible the several remote causes of the disease; but particularly providing the patient with a more wholesome diet, and a large proportion of fresh vegetables. Both as a preventive and as a curative agent lime or lemon juice is of the first importance in this disease.

SCU'TARI, a town of Asiatic Turkey, on the Bosphorus, opposite Constantinople, of which it is a suburb. It is built on an amphitheater of hills, and contains numerous mosques, fine bazaars and baths, barracks, and a seraglio of the sultan. Behind the town is an immense cemetary. Scutari contains granaries and is a fruit market. The manufactures are saddlery, silk, muslin, and cotton stuffs. Pop. 60,000.

SCYLLA, a rock in the Strait of Messina, on the Italian side nearly opposite the whirlpool of Charybdis. Various legends were associated with Scylla and Charybdis, which were esteemed highly dangerous to navigators.

SCYM'NIDÆ, a family of sharks, distinguished by the absence of an anal fin, and by dorsals unfurnished with spines. The lobes of the caudal fin or tail are nearly equal, and the head is furnished with a pair of small spiracles. The Greenland shark is the best-known species.

SCYTHE, an instrument used in mowing or reaping, consisting of a long curving blade with a sharp edge, made fast at a proper angle to the lower end of a more or less upright handle, which is bent into a convenient form for swinging the blade to advantage. Most scythes have two short projecting handles fixed to the principal handle, by which they are held. The real line of the handle is that which passes through both the hands, and ends at the head of the blade. This may be a straight line or a crooked one, generally the latter, and by moving the short handles up or down the main handle, each mower can place them so as best suits the natural size and position of his body. For laying cut corn evenly, a cradle, as it is called, may be used. The cradle is a contrivance somewhat resembling a rake with three or four long teeth so fixed to the scythe as to stretch the cut grain properly at each sweep of the scythe. A species of scythe which has been called the cradle-scythe is regularly used with the cradle for reaping in some localities. One form of scythe has a short branching handle somewhat in the shape of the letter **Y** having two small handles fixed at the extremities of the two branches at right angles to the plane in which they lie. The Hainault scythe is a scythe used with only one hand, and is employed when the corn is much laid and entangled. The person has a hook in one hand with which he collects a small bundle of the straggling corn, and with the scythe in the other hand cuts it.

SCYTH'IANS, a name very vaguely used by ancient writers. It was sometimes applied to all the nomadic tribes which wandered over the regions to the north of the Black and the Caspian seas, and to the east of the latter. In the time of the Roman empire the name Scythia extended over Asia from the Volga to the frontiers of India. The people of this region, being little known, were the subject of numerous fables.

SEA. See Ocean.

SEA-ANEMONE, the popular name given to a number of animals including the genus Actinia and other genera. They are among the most interesting organisms met with on the sea-beach, and in aquaria from a great attraction. All sea-anemones, however varied in coloration or form, present the essential structure and appearance of a fleshy cylinder, attached by its base to a rock or stone, and presenting at its free extremity the mouth, surrounded by a circlet of arms or tentacles. With these tentacles, which may be very numerous, in some cases exceeding 200 in number, they seize and secure their food—small crustacea, molluscs, such as whelks, etc. —which they paralyze by means of the thread-cells common to them with all Cœlenterata. The mouth leads into a stomach-sac, which, however, is imperfectly specialized, and is such that a generalized idea of the structure of a sea-anemone may be gained by supposing that the animal in transverse section represents a double tube, the outer tube corresponding to the body-walls, and the inner tube to the stomach-sac. When fully expanded the appearance of the anemones in all their varieties of color is exceedingly beautiful. But upon the slightest touch the tentacles can be quickly retracted within the mouth-aperture, the fluids of the body are expelled by the mouth, and the animal, from presenting the appearance of a fully expanded flower, becames a conical mass of jelly-like matter. Although these forms are attached to rocks and fixed objects, they appear able to detach themselves at will. They are, most of them, diœcious, that is, having the sexes situated in different individuals. The young are developed within the parent body, and appear in their embryo-state as free swimming ciliated bodies of an oval shape. The sea-anemones resemble the Hydræ in their marvelous powers of resisting injuries and mutilation. Thus if a sea-anemone be divided longitudinally, a new animal will in due time be formed out of each half. They appear singularly insusceptible also to the action of hot or cold water, and seem to be wonderfully long-lived. They are eaten as food in Italy, Greece, Provence, and on various other coasts.

Sea-anemones.

SEA-BATHING produces the stimulating effects of the ordinary cold bath with the additional stimulus due to the salt, so that it acts as an invigorating tonic. Persons who are anæmic—that is of deficient quality of blood—and those suffering from any internal complaint ought to refrain from sea-bathing. It has, however, been found very salutary in several complaints, as diseases of the glands of all kinds, and of the skin in scrofula and a scrofulous predisposition, exhausting sweats, and tendency to catarrhs, chronic nervous diseases, particularly hysteric attacks, epilepsy, St Vitus' dance; also sometimes in chronic rheumatism.

SEA-COW. See Manatee.

SEA-DACE. See Bass

SEA-DEVIL. See Engler.

SEA-DRAGON, a teleostean fish included among the Lophobranchii. The breast is very wide, and the large size

of the pectoral fins, which form wing-like structures, together with its general appearance, have procured for this fish its popular name. The sea-dragon occurs in Javanese waters. The dragonets, fishes of the goby family, are also known as sea-dragons.

SEA-EAGLE, a name applied to one or two members of the eagle family; but probably with most distinctive value to the cinereous or white-tailed eagle or erne found in all parts of Europe. It is generally found inhabiting the sea-coasts, and although living mainly upon fish, yet makes inland journeys in search of food, and seizes lambs, hares, and other animals. The head is covered with long drooping feathers of ashy brown color, while the body is of a dark-brown hue, streaked in some places with lighter tints, and having the primary feathers of the wing mostly black. The tail is rounded, and is of white color in the adult, but brown in the young bird. The bird breeds in Shetland and in the Hebrides. Its average size appears to be about 3 feet in length, and from 6 to 7 feet in expanse of wings. The American baldheaded eagle from its frequenting the sea-coasts is also named the sea-eagle. See Eagle.

SEA-HARE, the name of a genus of gasteropodous mollusca. These animals are slug-like in appearance, and derive their popular name from the prominent character of the front pair of tentacles, which somewhat resemble the ears of a hare. The shell is either absent or is of very rudimentary character, and is concealed by the mantle. Four tentacles exist, and the eyes are situated at the

Depilatory sea-hare.

base of the hinder tentacles. The sea-hares are widely distributed throughout most seas, and generally inhabit muddy or sandy tracts. They emit a fluid of a rich purple hue, which, like the ink of the cuttle-fishes, has the property of diffusing itself quickly throughout the surrounding water. They are also known to discharge an acrid fluid of milky appearance, which has an irritant effect on the human skin.

SEA-HOG. See Porpoise.

SEA-HORSE. See Hippocampus.

SEAL, an engraved stamp bearing a device or inscription pertaining to the owner; also the impression of such a stamp on a plastic substance as wax. A seal upon a document was originally a substitute for a signature; a seal upon a place of deposit answered the purpose of security in a different manner from a lock. The use of seals is of the highest antiquity, and one of the earliest and commonest forms is the signet-ring. In Egypt impressions of seals were made in fine clay, and attached to documents by slips of papyri. The Romans used clay, bees'-wax, and in the time of the empire lead for taking impressions. In the time of Constantine flat metal seals called bullæ were used. The metals used were gold, silver, and lead, and the bullæ were attached to documents by silk or woolen bands. The leaden seal was adopted by the popes. The western monarchs generally used bullæ up to the 16th century. The use of bees'-wax was introduced by the Normans; sealing-wax was invented in the 17th century.

SEAL, the name applied collectively to certain genera of mammals.

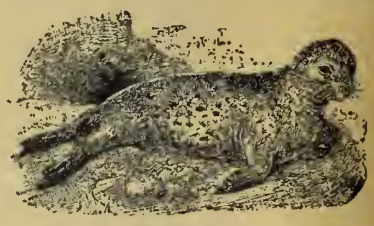
The true or hair seals, have a body of fish-like contour. They have no external ear, and the hind limbs are permanently stretched out behind the body and parallel with the tail, a conformation obviously inappropriate and unsuited for supporting the body for locomotion on land, but admirably adapted for swimming. Five toes exist on each foot and the middle digits of the hinder feet are much shorter than the outer ones. The toes, which are provided with claw-like nails, are united by a web of skin, and so form effective swimming paddles.

Marbled seal.

The fore limbs are mere flippers. The dentition resembles that of carnivora generally. The fur generally consists of a dense thick under-fur and of an outer coat of longer and coarser hairs. The bones are of light spongy texture, and beneath the skin is a thick layer of blubber or fat. The eyes are large and intelligent, and the sense of smell is also well developed. The sense of touch appears to reside chiefly in the "whiskers" of the face. The brain is of large size in proportion to the body, and when domesticated seals exhibit a very high degree of intelligence. They are polygamous, and seldom produce more than two young at a birth, one being the common number. They occur almost in all seas except those of tropical regions. In the northern regions they are more especially plentiful. They are largely hunted for their skins, which are converted into leather, and for their blubber, from which a valuable oil is obtained. The

Hooded or crested seal.

common seal is found widely throughout the northern regions, and also around the more northern coasts of Britain. Its average length is from 3 to 5 feet, and the fur is a grayish-brown, mottled with black. It is very destructive to most of the food fishes. It is much attached to its young, and is strongly attracted by musical sounds. It is never met with in large numbers, or far away from the land. Closely allied to the common seal is the marbled seal met with on some of the European coasts. The harp seal, Greenland seal, saddle-



Sea-leopard.

back, or atak, inhabits almost all parts of the Arctic ocean. The males average 5 feet in length, are colored of a tawny gray, and on the back there is a dark mark resembling a harp or saddle in shape. In the spring, at breeding season, these seals resort in immense herds to the floes of the Arctic ocean, around Jan Mayen island, where great numbers of them are killed annually by crews of the sealing vessels. The great seal, which measures 8 or 10 feet in length, occurs in Southern Greenland. The gray seal attains a length of from 8 to 9 feet and is found on the Scandinavian and Icelandic coasts. The best known fur seal is the northern fur-seal which breeds

Sea-lion.

in the islands of the Pribyloff group, off the coast of Alaska, and at the Commander islands in the Behring sea. The outer and longer hairs of its fur are of a grayish-brown color, the thicker under-fur being darker or reddish-brown; and it is this fine under-fur which, when stripped of the coarse outer hairs and dressed by the furrier, affords one of the most beautiful and valued of the "seal-skins" of commerce.

The fur-seal fishery is carried on chiefly at the Pribyloff islands, the United States government having leased them to a company with the right of killing 100,000 young males per annum. The states claimed the right to entirely prohibit sealing in Behring sea, a claim which led to difficulties with Britain, and the case was decided against them by arbitration, except as regards the

three-mile limit. However, by mutual arrangement, a close time is now in force for the seals within a certain area, and killing is entirely prohibited within certain limits.

SEALING-WAX, a resinous preparation used for securing folded papers and envelopes, and for receiving impressions of seals set to instruments. Ordinary red sealing-wax is made of pure bleached lac, to which when melted are added Venice turpentine and vermilion. Inferior qualities consist of a proportion of common rosin and red-lead, and black and other colors are produced by substituting appropriate pigments. Sealing wax was invented in the 17th century.

SEA-LION. See Seal.

SEARCH-WARRANT, in law, a written authority granted by a magistrate to a legal officer to search a house or other place for property alleged to have been stolen and suspected to be secreted in the place specified in the warrant. Similar warrants are granted to search for property or articles in respect of which other offenses are committed, such as base coin, coiners' tools, explosives, liquors, etc., kept contrary to law.

SEA-SERPENT, a marine serpentine form of large size or sea-monster of doubtful character, frequently alleged to have been seen. From the numerous substantiated accounts of animals of one kind or another, but differing from all described and known forms having been seen, often close at hand, by the crews and passengers of ships, and by respectable observers on land, we are shut up to the choice either of believing that in every case the senses of the observers must have been mistaken, or that some living form must have been seen in the majority of cases. Careful research, and the weighing of the evidence presented in the accounts of "sea-serpent" phenomena, show that the subject demands, at least, investigation.

SEA-SICKNESS, the name given to the nausea and other disagreeable sensations produced on those unaccustomed to a sea-faring life by the rolling motion of a vessel at sea. The exact causes and etiology of this complaint are as yet imperfectly understood. Some observers have referred the malady to causes entirely dependent upon the altered or affected functions of the nervous centers, others to the regurgitation of the bile into the stomach; and others, again, to the irritation of the liver consequent on the unusual movements of the body. Probably all three views contain a certain amount of truth. The measures which have been suggested for sea-sickness are preventive or curative. Preventive measures, so far as the construction of the vessels themselves are concerned have not proved of much practical utility. Preventive measures, regarded from the patient's point of view, are practically limited to the regulation of the diet, which for some days previously to undertaking the voyage should be plentiful, but of light and nutritious character. The bowels should not be constipated above all things; and food should not be taken for at least five or six hours before going on board. A cup of strong coffee, swallowed just before embarking, proves beneficial to some as a nerve stimulant; while others derive benefit from a nerve sedative, such as bromide of potassium, chloral, or opium; but these, especially the two last, should never be used save under strict medical direction. Nitrate of amyl and cocaine have also been used. Once on board the ship, a position as near the center of the vessel as practicable is to be preferred, and the posture in lying should be that on the back, with the head and shoulders very slightly elevated. With reference to curative measures, during the attack of nausea and vomiting, some derive benefit from a bandage applied moderately tight across the pit of the stomach; some from small doses of brandy and ice; some from saline effervescing drinks; and some from frequent draughts of lukewarm or even cold water.

SEA-SNAKE, a name common to a family of snakes. These animals frequent the seas of warm latitudes. They are found off the coast of Africa, and are plentiful in the Indian archipelago.

Sea-snake.

They are all, so far as known, exceedingly venomous. They delight in calms, where the ripple collects numerous fish and medusæ, on which they feed. One species inhabits the Australian seas, and is as thick as a man's thigh.

SEASONS, the four grand divisions of the year—spring, summer, autumn, winter. These have distinctive characters, best seen in the temperate zones. Within the tropics they are not so much marked by differences of temperature as by wetness and dryness, and are usually distinguished as the wet and dry seasons. Astronomically speaking, spring is from the vernal equinox, when the sun enters Aries, to the summer solstice; summer is from the summer solstice to the autumnal equinox; autumn is from the autumnal equinox to the winter solstice; winter is from the winter solstice to the vernal equinox. The characters of the seasons are reversed to inhabitants of the southern hemisphere. See Spring, Summer, Autumn, Winter; also Climate, Earth, Equinox, etc.

SEA-SPIDER, or **SPIDER-CRAB,** a marine crab. Its body is somewhat triangular in shape, and its legs are slender and generally long. It lives in deep water, and is seldom seen on the shore.

SEA-SURGEON, or **SURGEON-FISH,** so named from the presence of a sharp spine on the side and near the extremity of the tail, bearing a resemblance to a surgeon's lancet It occurs on the Atlantic coasts of South America and Africa, and in the Caribbean seas. Its average length is from 12 to 19 inches.

SEA-SWALLOW, a name given to the common tern and also to the stormy petrel. Which see.

SEA-TOAD, a name given to the great spider-crab found on British coasts at low-water mark.

SEATTLE (sē-at'l), capital of King co., state of Washington, on Seattle bay, east side of Puget sound, the largest city in the state and the seat of the state university. It is a rapidly growing place, with numerous industrial establishments, such as shipyards, foundries, machine-shops, saw-mills, breweries, and an active trade in coal and lumber. Pop. in 1909, estimated at 300,000.

SEA-URCHIN. See Echinus.

SEA-WATER, the salt-water of the sea, or ocean. Sea-water contains chlorides and sulphates of sodium (chloride of sodium = common salt), magnesium, and potassium, together with bromides and carbonates, chiefly of potassium and calcium.

SEA-WEED, any plant growing in the sea; but the name is usually confined to members of the natural order Algæ.

SEBA'CEOUS GLANDS, small structures of glandular nature and sacculated form which exist in the substance of the corium, or deeper layer of the dermis or true skin, and secrete a fatty matter. They are very generally distributed over the entire skin surface, but are most numerous in the face and scalp. Those of the nose are of large size, but the largest in the body are those of the eyelids—the so-called Meibomian glands. They appear to be absent from the skin of the palms of the hands and soles of the feet. Each sebaceous gland consists essentially of a lobulated or sac-like structure, with cells which secrete the sebaceous or glutinous humors, and with a single efferent duct; and these ducts open into the hair-follicles, or sac-like involutions of the skin which surround and inclose the roots of hair, or simply on the external surface of the skin. The functions of the sebaceous secretion are chiefly those of keeping the skin moist.

SEBASTIAN, St., Christian martyr, was born at Narbonne, and under Diocletian was captain of the prætorian guard at Rome. He rose to high favor at court, but declared himself a Christian, and refusing to abjure, he was tied to a tree and pierced with arrows. A Christian woman named Irene, who came by night to inter his body, finding signs of life in him, took him home, and nursed him till he recovered. He then presented himself before Diocletian, and remonstrated with him on his cruelty; whereupon the emperor ordered him to be beaten to death with rods (January 20, 288), and his body to be thrown into the cloaca. His protection was invoked against pestilence, and his martyrdom has been a favorite subject with painters.

SEBAS'TOPOL, a Russian town and naval station on the Black sea, in the southwest of the Crimea. On the outbreak of the Crimean war, when the population amounted to 43,000 it became the point against which the operations of all the allies were mainly directed and its siege forms one of the most remarkable episodes in modern history. Railway communication with Moscow has greatly improved the trade. There are many important public buildings, and the monuments and relics of the

siege are interesting. Pop. 50,710, largely military.

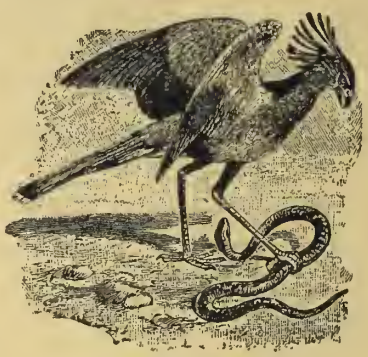
SECESSIONIST, one who maintains the right of a state included under the constitution of the United States to withdraw from the Union and set up an independent government; specifically one who took part or sympathized with the inhabitants of the southern states in their struggle, commencing in 1861, to break away from union with the northern states.

SECOND, in the measurement of time and of angles, the 60th part of a minute; that is, the second division next to the hour or degree.

SECONDARY FORMATIONS, in geology, the Mesozoic strata, midway, in ascending order, between the Primary or Palæozoic below and the Tertiary or Kainozoic above. They range from the top of the Permian Formation to the base of the Eocene, and include, therefore, the Trias, Lias, Oolitic, and Cretaceous Formations.

SECOND SIGHT, a Highland superstition, formerly very common, which supposed certain persons endowed with the power of seeing future or distant events as if actually present. These visions were believed to be not as a rule voluntary, but were said to be rather dreaded than otherwise by those who were subject to them; yet it was also believed that those who possessed this gift might sometimes induce visions by the performance of certain awful rites The subject is treated at length in Martin's Description of the Western Islands of Scotland (1703); Macleod of Hamir's Treatise on the Second Sight (1763), and is discussed also in Dr. Johnson's Journey to the Hebrides (1775).

SECRETARY BIRD, the sole representative of the genus Serpentarius order Accipitres or birds of prey. It derives its popular name from the peculiar plumes of feathers which project from the back and sides of its head, and give it the appearance of having bundles of pens stuck behind each ear It has very long legs, and stands nearly 4 feet in height. The wings are elongated, and carry a blunt spur on the shoulder, the third, fourth, and fifth quills being the longest. The tail is also very long, and wedge-shaped, the two middle feathers projecting beyond the others. The tibiæ are feathered all the way down. The skin around the eyes is destitute of feathers. The general color is a slaty gray, the pen-like feathers of the head being black, as also are the feathers of the tibiæ and the primaries of the wings. The secretary bird can fly with ease when once it takes wing, but it seems to prefer the ground. It is found over the greater part of Africa, especially in the south It derives its generic name from its habits of destroying serpents, striking them with its knobbed wings and kicking forward at them with its feet until they are stunned, and then swallowing them. As a foe to venomous snakes it is encouraged and protected in South Africa, where it is frequently brought up tame.



Secretary-bird.

SECRETARY OF STATE. See State, Department of.

SECRETION, in animal physiology, is the separation of certain elements of the blood, and their elaboration to form special fluids, differing from the blood itself or from any of its constituents, as bile, saliva, mucus, urine, etc. Secretion is performed by organs of various form and structure, but the most general are those called glands. Of these glands the essentially active parts are the cells, which elaborate from the blood a peculiar fluid in each instance predetermined by the inherent function of the gland or organ of which the cells are integral parts. The chief general conditions which variously affect secretion are the quantity and quality of the blood traversing the gland and the influence of the nervous system. Mental conditions alone, without material stimuli, will excite or suppress secretion; but this is a branch of the subject which is yet ill-understood. Animal secretions have been arranged into—(1) Exhalations, which are either external, as those from the skin and mucous membrane, or internal, as those from the surfaces of the closed cavities of the body and from the lungs; (2) Follicular secretions, which are divided into mucous and cutaneous; and (3) Glandular secretions, such as milk, bile, urine, saliva, tears, etc.

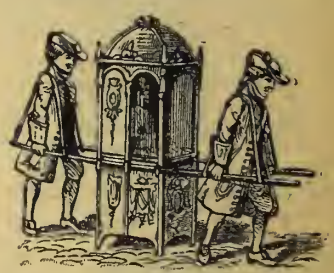
Secretion, in vegetable physiology, is the separation of certain elements from the sap, and their elaboration by particular organs. These secretions are exceedingly numerous, and constitute the great bulk of the solid parts of plants. They have been divided into (1) General or nutritious secretions, the component parts of which are gum, sugar, starch, lignin, albumen, and gluten; and (2) Special or non-assimilable secretions, which may be arranged under the heads of acids, alkalies, neutral principles, resinous principles, coloring matters, milks, oils, etc.

SECULARISM, a philosophy of life, the gist of which consists in the advocacy of free thought and the assertion of some corollaries derived from this leading tenet. It is not atheistic, inasmuch as it is no tenet of that system either to affirm or deny the existence of God; nor does it deny the truth of Christianity, for that is none of its business any more than it is to affirm or deny some scientific theory. Secularism in England is an offshoot of the socialism of Robert Owen, but its immediate founder is George Jacob Holyoake, a native of Birmingham, where he was born in 1817, and began to promulgate his views about 1846. It is to him that British legislation is chiefly indebted for the Evidence Amendment Act, which legalized affirmations in lieu of oaths. Mr. Charles Bradlaugh, Mr. Holyoake's successor in the leadership of the English secularists, carried this question a step further by his refusal to take the parliamentary oath and by the act of 1888 allowing affirmation instead.

SECUNDERABAD', or **SIKANDARABAD** (Alexander's Town), British military cantonment in India, in the Nizam's Dominion, 6 miles northeast of Hyderabad. It is the largest military station in India, covering a total area of 19 sq. miles, including many interspersed villages, and forms the headquarters of the Hyderabad subsidiary force, which constitutes a division of the Indian army. Pop. 74,000.

SEDA'LIA, the capital of Pettis co., Missouri, 189 miles west of St. Louis, is a railroad center and the seat of the machine shops and carriage factories of two railroad companies. Pop. 17,160.

SEDAN', Sedan chair, a covered chair for carrying one person, borne on poles



Sedan chair, time of George II. (Shut).

Sedan. (Open).

by two men, and differing from the litter or palanquin in that the traveler was carried in a sitting posture. It is said to

have taken its name from the town of Sedan in France, It was introduced into England in 1581, and was very fashionable during the reigns of Anne and the early Georges, but disappeared at the beginning of the 19th century, on the introduction of the cab.

SED'ATIVES, medicines that moderate the excessive action of an organ or organic system. Digitalis, for example, is a sedative of the action of the heart and the circulatory system; and gum-resins are sedatives that act on the nervous system. Besides these aconite, chloroform, conium, carbonic acid, and prussic acid are among the principal sedatives.

SEDGE, an extensive genus of grass-like plants, containing thousands of species, mostly inhabiting the northern and temperate parts of the globe. The greater proportion of the species are marsh plants. The stems are usually triangular, without joints. The sedges in general are but of little utility to man. They furnish coarse fodder, which is ejected by most of the domestic quadrupeds. The decomposed roots and leaves contribute largely to turn the soil of marshes into peat.

SEDGE-WARBLER, a species of insessorial bird of the warbler family,

Sedge-warbler.

which frequents the sedgy banks of rivers, visiting Britain about the middle of April and migrating in September.

SEDGWICK, John, American soldier, was born in Cornwall, Conn., in 1813; died near Spottsylvania Courthouse, Virginia, May 9, 1864. He took part in the Mexican war, and at the beginning of the civil war was lieutenant-colonel of the second cavalry. In August, 1861, Sedgwick was commissioned brigadier-general of volunteers, and assigned to the army of the Potomac. At Antietam Sedgwick was wounded, but would not allow himself to be taken from the field. While directing the gunners in placing some pieces of artillery in position in front of Spottsylvania Courthouse, he was shot in the head and instantly expired.

SEDITION, a term including all offenses against the crown and government which do not amount to treason, and are not capital, as seditious libels, seditious meetings, seditious conspiracies. The offenses classed under the head of sedition are of the same general character with those called treason, but are without the overt acts which are essential to the latter.

SEDUCTION, in law, the act of persuading a female, by flattery or deception, to surrender her chastity. English law does not give a right of action either to the woman seduced or to her parents or guardians; it only gives a right of action for seduction as occasioning loss of service; but the word "service" is interpreted with the greatest liberality, and damages are estimated not only with reference to the loss of service, but also to the distress and dishonor brought upon the woman's family by her seducer. By the law of Scotland an action for seduction is competent to a husband against the seducer of his wife, and to an unmarried woman against her own seducer, but she must show that deceit was used toward her. In neither country is seduction a criminal offense. The statutory rule which prevails widely in the United States rests both the right and remedy where the wrong is inflicted, in the family and parental relations. The action is therefore brought in the case of an unmarried woman by the parent (or guardian) as the head of the family, and in the case of a married woman by the husband.

SEE, a word derived (through the French) from the Latin sedes, a seat, and properly applied to the seat or throne of a bishop, but more generally employed as the designation of the city in which a bishop has his residence, and frequently as that of the jurisdiction of a bishop, that is, as the equivalent of diocese.

SEED, the impregnated ovule of a plant. It consists essentially of two parts, namely, the nucleus or kernel, and the integuments. The latter consists of two seed-coats—the outer named the episperm or testa, the inner the tegmen or endopleura; and the two together are sometimes termed the spermoderm. The testa of some seeds is furnished with hair, which cover the entire surface, as in various species of Gossypium, where they constitute the material called cotton; or they may be confined to certain points of the surface, as in the willow, Epilobium, etc.; while in the pine the testa forms a wing. On the outside of the integument of the seed there is sometimes an additional partial covering, which has received the name of aril, and in the nutmeg forms the mace. The nucleus or kernel of the seed is the fully developed central portion of the ovule. It consists either of the embryo alone, as in the wallflower, or of the embryo along with a separate deposit of nourishing matter called albumen, as in the cocoanut and wheat. The embryo is the young plant contained in the seed, and is the part to the development of which all the reproductive organs contribute. It consists of a general axis, one part of which is destined to form the root, the other to form the stem. The axial portion is provided with fleshy organs called cotyledons or seed leaves, which serve to nurse the young plant before the appearance of the true leaves. Plants possessing one cotyledon are termed monocotyledonous, those having two are denominated dicotyledonous and plants having only a cellular embryo, as in the cryptogamic or flowerless plants, are called acotyledonous. When seeds are contained in an ovary, as is usually the case, the plants are called angiospermous; when the seeds are not contained in a true ovary, with a style or stigma, the plants are called gymnospermous, as conifers.

Various forms of seeds magnified.

1, Eschscholtzia californica. 2, Corn bluebottle. 3, Oxālis rosea. 4, Opium poppy. 5, 5, Stellaria media. 6, Sweet-william. 7, Foxglove. 8, Saponaria calabrica.

SE-GAN FOO, the capital of the province of Shen-se, in the northwest of China. It was long the capital of the empire, and is still of great importance; silk, tea, and sugar being the principal articles of commerce. Pop. estimated at about 1,000,000.

SEGO'VIA, a town in Spain, capital of the province of the same name, on a lofty rock, washed by the Eresma and Clamores, 43 miles northwest of Madrid. —The province, area 2713 sq. miles, is watered by streams which rise in the Guadarrama range and flow northward to the Douro. The inhabitants are for the most part employed in agricultural and pastoral pursuits. Pop. 160,111.

SEIDLITZ POWDERS, an aperient medicine, named after the Seidlitz spa in Bohemia. These powders are usually put up in a blue and a white paper, the blue containing tartrate of soda and potash (Rochelle salt) with bicarbonate of soda, and the white tartaric acid. The former is dissolved in half a tumbler of water, and the acid powder is then added, which produces effervescence, and the draught is taken while the effervescence is going on.

SEINE (sen or sān), a river in France, which rises on the Platcau de Langres, dep. of Côte-d'Or, 20 miles northwest of Dijon. It flows generally in a northwest direction; receives on the right the Aube, Marne, and Oise, and on the left the Yonne and Eure; passes the towns of Chatillon, Troyes, Corbeil, Paris, St. Denis, St. Germain, Poissy, Mantes, Elbœuf, Rouen, Quillebœuf, and, after a somewhat tortuous course, falls into the English channel between Honfleur and Havre. Its total length is 480 miles, and 250 miles in a direct line; and its basin has an area of about 30,000 sq. miles.

SEINE, a department in France, completely inclosed by the department of Seine-et-Oise, and at once the smallest and most populous of the French departments, including as it does the city of Paris. Area, 185 sq. miles; pop. 3,669,-930. The department has 3 arrondissements (Paris, St. Denis, and Sceaux), 28 cantons (20 in Paris), and forms the archiepiscopal diocese of Paris

SEINE Sean (sēn), a large net for catching fish, buoyed up and weighted so as to float perpendicularly, the fish being enclosed and caught by bringing

the ends of the net together by means of ropes

SEINE-ET-MARNE (sen-e-mârn), a French department in the basin of the Seine and Marne, east of Seine-et-Oise. Area, 2215 sq. miles; pop. 355,136. The capital is Melum.

SEINE-ET-OISE (sen-e-wäz), a French department, in the basin of the Seine and Oise, inclosing the department of Seine. Area, 2163 sq. miles; pop. 707,325. The capital is Versailles.

SEINE-INFERIEURE (sen-an-fā-ri-eur), a maritime department of France, on the English channel, mostly n. of the estuary of the Seine. Area, 2330 sq. miles; pop. 833,386. The capital is Rouen.

SEISMOLOGY (sis-mol'o-ji), the science which treats of volcanoes and earthquakes.

SEISMOM'ETER, an instrument for measuring the force and direction of earthquakes and other earth movements. It records both the horizontal and vertical movements by means of an index, the record being traced on smoked glass. There are various forms of seismometer or seismograph. One which is used in the observatory on Mount Vesuvius consists of a delicate electric apparatus, which is set to work by the agitation or change of level of a mercurial column, which records the time of the first shock, the interval between the shocks, and the duration of each; their nature, whether vertical or horizontal, the maximum intensity; and in the case of horizontal shocks the direction is also given.

SEJA'NUS, Aelius, the son of a Roman knight, and noted as the favorite of Tiberius, was born as Vulsinii in Etruria. He contrived to remove all the members of the imperial family who stood between him and power, but having awakened the suspicion of Tiberius, he was executed in A.D. 31.

SELECTMEN, in New England, officers chosen annually to manage the affairs of a town, provide for the poor, etc. A town has usually from three to seven selectmen, who constitute a kind of executive authority.

SELE'NIUM, a rare chemical element discovered by Berzelius in 1817 in the refuse of a sulphuric acid manufactory near Fahlun, in Sweden. It occurs in several minerals, chiefly in combination with copper, lead, mercury, and silver, and is closely related, in its general chemical deportment to sulphur and tellurium, these three elements forming a group which is characterized by certain well-marked general properties. Selenium takes fire when heated to a tolerably high temperature in air or in oxygen, burning with a blue flame, and with the production of the dioxide. With hydrogen selenium forms the very disagreeably smelling gas seleniuretted hydrogen, the analogue of sulphuretted hydrogen. To selenium the symbol Se and the atomic weight 96.5 are given.

SELIM I., Sultan of Turkey, was the son of Bajazet II., born in 1467, died 1520. Selim was succeeded on the throne by Solyman I.

SELIM III., Sultan of Turkey, son of Mustapha III., was born 1761, assassinated 1808. He succeeded his uncle Adbul-Hamed in 1789, and attempted reforms in his government after European methods, but wars with Russia, Austria, etc., prevented their being carried out.

SELI'NUS, one of the most important of the Greek colonies in Sicily, founded probably about 628 B.C. on the southwestern coast of that island.

SELKIRK, or **SELCRAIG,** Alexander, the prototype of "Robinson Crusoe," was born in Largo, Fifeshire, in 1676; died on board the royal ship Weymouth, 1723. He took part in bucaneering expeditions in the South seas, and in consequence of a quarrel with his captain he was put ashore, at his own request, on the island of Juan Fernandez. There he lived alone for four years and four months, when he was taken off by the captain of a privateer. He returned home in 1712, and his adventures became known to the public. Defoe's Robinson Crusoe appeared in 1719, but Crusoe's experiences have but little in common with those of Selkirk. Selkirk afterward rose to the rank of lieutenant in the navy. A monument was erected to him in his native town in 1885.

SELMA, a city in Dallas co., Alabama, on the Alabama river, 93 miles below Montgomery. It has mills and various manufactories. During the civil war it an important military station, and was taken by the federals in April, 1865. Pop. 10,362.

SELTERS (or Seltzer) **WATER,** a mineral water found naturally in the village of Niederselters, in the German province of Hesse-Nassau, and elsewhere, but also largely manufactured. Its chief ingredients are carbonic acid, carbonate of soda, and common salt. It acts as a mild stimulant of the mucous membranes, and as a diuretic.

SEM'APHORE, a term originally applied to telegraphic or signalling machines the action of which depended upon the motion of arms round pivots placed at or near their extremities. Many kinds of semaphores were in use before the invention of the electric telegraph, and a simple form is still employed on railways to regulate traffic at or near stations.

SEM'IBREVE, in music, a note of half the duration or time of the breve. The semibreve is the measure note by which all others are now regulated. It is equivalent in time to two minims, or four crotchets, or eight quavers, or sixteen semiquavers, or thirty-two demisemiquavers. See Music.

SEM'ICOLON, in grammar and punctuation, the point (;), the mark of a pause to be observed in reading or speaking, of less duration than the colon, and more than that of the comma. It is used to distinguish the conjunct members of a sentence.

SEM'INOLES, a tribe of North American Indians, an offshoot from the Choctaw Muskogees. They separated from the confederation of the Creeks, settled in Florida 1750 under the name of Seminoles, that is, fugitives. They were subsequently joined by other Indians as well as negroes, and in 1822 they numbered 3900 souls. As a punishment for their continual plundering and murdering of the white settlers, General Jackson was sent against them in 1818. They latterly sold their lands and agreed to be transferred beyond the Mississippi, but refused to implement their agreement, and under their chief Osceola carried on a long and determined resistance. At last they were finally driven from the Everglade morasses by United States troops, and obliged to succumb in 1842, when all but a scanty remnant were transferred to the Indian territory, where they now form an industrious community.

SEMIPALATINSK, or **SEMIPOLATINSK,** a town of Central Asia, on the Irtish. It consists chiefly of wooden buildings facing the river, and carries on a considerable trade with the Kirghis and with Tashkend, Khokand, Bokhara, and Kashgar. Pop. 26,353.—The province of Semipalatinsk has an area of 198,192 sq. miles, and a population of 685,197, chiefly Kirghiz, Cossacks, etc. It is mountainous in the southeast, consists of steppe land in the northwest, and is one of the warmest of Russian Asia in summer, though the winter is rather extreme. The chief occupation of the people is cattle-rearing.

SEMIQUAVER, in music, a note half the length of the quaver. See Music.

SEMIR'AMIS, a queen of Assyria, whose history is enveloped in fable. As the story goes, she was a daughter of the fish-goddess Derceto of Ascalon, in Syria, by a Syrian youth. Being exposed by her mother, she was miraculously fed by doves until discovered by the chief of the royal shepherds, who adopted her. Attracted by her beauty, Onnes, governor of Nineveh, married her. She accompanied him to the siege of Bactra, where, by her advice, she assisted the king's operations. She became endeared to Ninus, the founder of Nineveh (about B.C. 2182), but Onnus refused to yield her, and being threatened by Ninus, hanged himself. Ninus resigned the crown to Semiramis, and had her proclaimed queen of Assyria. She built Babylon, and rendered it the mightiest city in the world. She was distinguished as a warrior, and conquered many of the adjacent countries. Having been completely defeated on the Indus, she was either killed or compelled to abdicate by her son Ninyas, after reigning forty-two years. According to popular legend she disappeared or was changed into a dove, and was worshiped as a divinity. Her whole history resembles an oriental tale, and even her existence has been questioned. She is probably a mythological being corresponding to Astrate, or the Greek Aphroditē.

SEMIT'IC LANGUAGES, the languages belonging to the Semites or Semitic peoples, that is those regarded as descendants of Shem. The Semitic languages form an important linguistic family, which is usually divided into a northern and a southern section. To the northern belong the ancient dialects of Assyria and Babylonia (recovered by means of the cuneiform inscriptions); the Hebrew, with the Samaritan and Moabitic; the Phœnician and Carthaginian; and lastly the Aramaic, which includes the Chaldee and the Syriac. The northern Semitic languages are now

almost entirely extinct as spoken languages, though Hebrew is to some extent still used in writing. The most important of the south Semitic tongues, and the only one now in extensive use, is the Arabic, which as a spoken language may be divided into the four dialects of Arabia, Syria, Egypt, and Barbary. To this branch also belong the Mimyaritic, formerly spoken in part of Arabia, the Ethiopic, or ancient ecclesiastical language of Abyssinia, and the Amharic and other modern dialects of the same country. The most prominent characteristic of the Semitic tongues is the triliteralism of their roots, that is, the peculiarity that their roots regularly consist of three consonants which always remain unchanged, the various words and word forms being produced by the insertion of vowels between the consonants of the root. Another peculiarity is the absence of compound words.

SEMMES, Raphael, American naval officer, born 1809, died 1877. He entered the navy in 1832, having previously studied law; took part in the Mexican war, and on the outbreak of the civil war joined the confederate service, and gained much prominence from his feats in command of the Sumter and the Alabama. He was imprisoned after the war, but gained his liberty at the amnesty. The rest of his life was devoted to law practice. He was the author of Service Afloat and Ashore, Cruise of the Alabama and Sumter, etc.

SENATE, originally the supreme legislative body of ancient Rome, first instituted according to tradition by Romulus. Tarquinius Priscus is said to have increased the number of members from 100 to 300, thus making 100 representatives for each of the Patrician tribes. Under the republic the consuls, consular tribunes, and later the censors, had the power of choosing the senators; but they were restricted to those who had previously held magistracies, and as the magistrates were chosen by popular election the senate was ultimately a representative body Curule magistrates and quæstors had a seat ex officio in the senate, and a right to speak, but not to vote. In the administration of affairs the senate was supreme, and during national crises could invest the consuls with absolute and dictatorial authority. A decree of the senate was called senatus consultum. The number of senators necessary to form a quorum during the republic is uncertain. After this body had remained for several centuries at 300, their number was raised by Sulla to 600, he having added 300 equites to the senate. Julius Cæsar made a further increase of 300, and at one time there were 1000, but Augustus lowered their number to 600, and required the presence of 400 to constitute a full assembly. He afterward further reduced them, and later 70 members were considered sufficient. The majority of votes always decided a question. Latterly, under the republic, the tribunes of the people could veto every proposition before the senate. Under the emperors the senate gradually lost its political consideration; finally it often accepted and passed the imperial decrees without deliberation. In modern times the term is applied to the upper or less numerous branch of a legislature in various countries, as in France, in the United States, in most of the separate states of the Union, and in some of the Swiss cantons. It is also used to designate the governing body of certain universities.

SEN'ECA, a lake in the western part of New York state, 25 miles s. of Lake Ontario, into which its waters flow. It is about 37 miles long, from 2 to 4 miles broad, and 630 feet deep. It communicates with the Erie canal, and steamers ply upon it.

SEN'ECA, Lucius Annæus, called Senaca the philosopher, son of the following, was born at Corduba (Cordova) A.D. 3. The good government of the first years of Nero's reign was largely due to Seneca (though Seneca had consented to the assassination of Nero's mother), but he lost his influence, and being accused of complicity in the conspiracy of Piso he was forced to commit suicide (A.D. 66).

SENECA, Marcus Annæus, rhetorician and the father of the preceding, was a native of Corduba, in Spain, and was born about 61 B.C. He died at Rome toward the close of the reign of Tiberius (A.D. 37). He was the author of a collection of extracts showing the treatment of school themes by contemporary rhetoricians, but of no importance as literature.

SENECA INDIANS, a tribe originally inhabiting the western part of New York state, and belonging to the Six Nations. They number upward of 3000 on New York reservations, and a small band are in the Indian territory.

SEN'EFELDER, Aloys, the inventor of lithography, born at Prague 1771, died at Munich 1834.

SEN'EGA, or **SEN'EKA,** a plant common in the United States. It has a woody, branched, contorted root, about ½ inch in diameter, and covered with ash-colored bark. This has been celebrated as a cure for the bite of the rattlesnake. Medically it is considered stimulating, expectorant, and diuretic, and is now almost exclusively used in cough mixtures, being similar in its effect to squill.

Senega.

SEN'EGAL, a river of Western Africa, which rises in the interior not far from some of the Niger sources, and after a course of some 1000 miles falls into the Atlantic near lat. 16° n. It is navigable for about 700 miles from its mouth, as far as the cataracts of Félou, beyond which its capabilities have not been ascertained.

SENEGAL, a French colonial dependency in West Africa, in Senegambia, comprising the island and town of St. Louis, at the mouth of the Senegal, several forts along the banks of that river, the island of Goree, Albuda on the Gambia, and other stations south of Cape Verd. Area (including dependencies), 140,000 sq. miles. Pop. 2,000,000.

SENEGAM'BIA, an extensive region of Western Africa, comprising the countries between lat. 8° and 17° n.; lon. 4° and 17° 30′ w.; bounded n. by the Sahara, e. by Soudan, s. by Guinea, and w. by the Atlantic. Rice, maize, and other grains, with bananas, manioc, and yams are grown, while the orange, citron, and other fruits introduced by the Portuguese are now extensively cultivated on the hills. Wild animals comprise the elephant, hippopotamus, monkeys, antelopes, gazelles, lion, panther, leopard, hyenas, jackal, crocodile, etc. The climate is intensely hot, and very unhealthy for Europeans. The region may be divided into French Senegambia (Senegal and territories protected or under French influence); British Senegambia (Sierra Leona, Gambia, etc.); Portuguese Senegambia (Bissao, Casamanza, etc.); and Liberia. The total population of Senegambia is estimated at 12,000,000, and its area at perhaps 700,000 sq. miles.

SENILITY, in man special physiological conditions and pathological changes mark the decline of life and the approach of old age. Death never results from old age. In all cases some lesion points the way to the cause of death. The precautions to be taken against the rapid advance of age include avoidance of alcohol during one's whole life; moderate eating, especially after the age of forty; moderate exercise after the age of sixty is reached, or after senescence has begun to manifest itself; avoidance of strain, physical or mental; avoidance of worry, anger, and grief; proper clothing for all seasons and conditions, and other avoidance of exposure; together with out-of-door air.

SENNA, a substance used in medicine, consisting of the leaflets of several species of Cassia, but the exact botanical source of some of the commercial kinds is still uncertain. Alexandrian senna is grown in Nubia and Upper Egypt, and imported in large bales from Alexandria. It is frequently adulterated with the leaves of other plants.

Senna.

SENNAAR', or **SENAAR'**, a region of Africa, in the Soudan, area about 115,000 sq. miles, between the Bahr-el-Azrek, or Blue Nile and the Bahr-el-Abiad, or White Nile. The population, estimated at 1,500,000, is greatly mixed.

SENSATION, the name applied to indicate the consciousness of an impression produced on sensory nerve fibers (See Nerve.) An impression might be produced upon a sensory nerve and transmitted to a nerve center, leading to stimulation of the center and to some subsequent change, but if no consciousness of such existed it could not be called a sensation. Thus, an impression made on an organ of sense might reach a lower nerve center, and by reflex action induce a muscular movement, while the centers devoted to consciousness being asleep or preoccupied remained unaffected. To this kind of impression the term sensation is not applicable. The external organs by means of which particular kinds of impressions are primarily received, and thence transmitted to the brain, are called the organs of the senses; these are the eye, the ear, the nose, and the tongue, besides the nerves dispersed under the common integument, which give rise to the common sensation feeling or touch. This last is of a more general kind than the others, making us aware of heat and cold, rough and smooth, hard and soft, etc. In addition to these, according to Professor Bain, "the feelings connected with the movements of the body, or the action of the muscles, have come to be recognized as a distinct class, differing materially from the sensations of the five senses. They have been regarded by some metaphysicians as proceeding from a sense part, a sixth or muscular sense." Of the sensations which are most readily perceived by animals that of resistance or touch is perhaps the most widely diffused. By the resisting feel of matter we judge of its shape and of its other attributes. Next to resistance sensibility to heat is the best defined and most frequently displayed sensation. The sense of consciousness of light or luminosity succeeds that of temperature; taste comes next in order; then hearing; while smell is probably one of the least diffused of sensations. The special senses and the structure of the organs of sense are described under the headings Eye, Ear, Nose, Smell, Touch, etc. (which see).

SENSES. See special articles Eye, Ear, Nose, Smell, Touch, etc.; also Nerve, Sensation, etc.

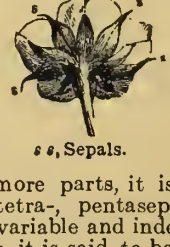
SENSITIVE FLAMES, gas flames which are easily affected by sounds, being by them made to lengthen out or contract, or change their form in various ways. The most sensitive flame is produced in burning gas issuing under considerable pressure from a small taper jet. Such a flame will be affected by very small noises, as the ticking of a watch held near it, or the chinking of small coins 100 feet off. The gas must be turned on so that the flame is just at the point of roaring.

SENSITIVE PLANT, a plant celebrated for its apparent sensibility, a native of tropical America. The leaves are compound, consisting of four leaves, themselves pinnated, uniting upon a common footstalk. At the approach of night the leaflets all fold together; and the common footstalk bends toward the stem; at sunrise the leaves gradually unfold, and recover their usual state. So far, this is evidently the effect of light, but the same phenomena take place on touching the plant roughly, only that it recovers itself in a short period. The same property belongs to other species of Mimosa and to species of other genera.

SENTENCE, in grammar, a combination of words which is complete in itself as expressing a thought or proposition, and in writing is marked at the close by a full point. It is the unit or ground-form of speech. According to the grammars a sentence must always contain two members—the subject or thing spoken of, and the predicate or that which is enunciated regarding the subject. Accordingly every sentence must have a finite verb, though in impassioned language the verb is frequently understood. Sentences are distinguished into simple, complex, and compound. A simple sentence has only one subject and one finite verb, as "The man is brave." This may be more or less expanded by the use of adjuncts, and still retain its character of a simple sentence. A complex sentence is a principal sentence with one or more subordinate sentences, as "The man, who is truly patriotic, will risk his life fo rhis country. A compound sentence consists of two or more simple sentences connected by conjunctions, as "The sun rises in the east and sets in the west." It differs from the complex sentence in having its clauses co-ordinate, and not, as in the other, in subordination to a principal clause.

SENTRY, or **SENTINEL**, a soldier set to watch or guard an army, camp, or other place from surprise, by observing and giving notice of the approach of danger. At night each sentinel is furnished with the countersign (a certain word or phrase), and no one may pass him without giving this signal.

SE'PAL, in botany, one of the separate divisions of a calyx when that organ is made up of various leaves. When it consists of but one part the calyx is said to be monosepalous; when



s s, Sepals.

of two or more parts, it is said to be di-, tri-, tetra-, pentasepalous, etc. When of a variable and indefinite number of parts, it is said to be polysepalous.

SEPIA, a genus of Cephalopoda or cuttle fishes, included in the family Sepiadæ. These cephalopods, of which the common sepia is a typical example, belong to the dibranchiate or "two-gilled" section of their class, and to the group of decapoda or "ten-armed" forms. The family Sepiadæ possesses an internal calcareous shell, the so-called sepiostaire or "cuttle-fish bone," which is often cast up upon some coasts, and was formerly in repute as an antacid in medicine, and as the source of the "pounce" once used for spreading over eroded ink marks to form a smooth surface for the corrected writing. There are four rows of pedunculated suckers on the arms of the genus Sepia. Lateral fins exist. The two tentacles or arms, which are longer than the remaining eight, possess suckers at their expanded extremities only. The eggs of the sepia resemble bunches of grapes in form, and hence are sometimes called "sea-grapes." The eggs are each protected in a leathery capsule. The common sepia occurs on the southern English coasts, but more especially in the Mediterranean sea. It is chiefly sought after on account of the inky matter which it affords. This secretion, which is insoluble in water, but extremely diffusible through it, is agitated in water to wash it, and then allowed slowly to subside, after which the water is poured off, and the black sediment is formed into cakes or sticks. When prepared with caustic lye it forms a beautiful brown color, with a fine grain, and has given name to a species of monochrome drawing now extensively cultivated.

SE'POYS, the name given to the native forces in India. The native Indian army—infantry, cavalry, artillery, and sappers and miners—now numbers 145,683 men, including 2795 native officers, and 1580 European officers. Though not generally equal in courage and dexterity to European soldiers, the sepoys are hardy and endurant, and very temperate in their food.

SEPTEMBER (from the Latin septem, seven), the ninth month of our year, but the seventh of the old Roman year, which began in March. It has always contained thirty days.

SEP'TUAGINT, or the LXX., the Version of the Seventy, the Alexandrine Version, etc., is the oldest Greek version of the Old Testament. It is so called either because it was approved and sanctioned by the sanhedrim, or supreme council of the Jewish nation, which consists of about seventy members, or because, according to tradition, about seventy men were employed on the translation. The language is the Hellenistic Greek of Alexandria, based upon the Attic dialect. The translation is reported by Josephus to have been made in the reign and by the order of Ptolemy Philadelphus, king of Egypt, about 270 or 280 years before the birth of Christ. It is believed, however, by modern critics that the Septuagint version of the several books is the work, not only of different hands, but of separate times. It is probable that at first only the Pentateuch was translated, and the remaining books gradually. The Septuagint was in use up to the time of our Savior, and is that out of which most of the citations in the New Testament from the Old are taken. It is an invaluable help to the right understanding of the Hebrew Scriptures. The principal extant MSS. known are the Codex Alexandrinus in the British museum, the Codex Vaticanus in Rome, and the

Codex Sinaïticus (imperfect) in St. Petersburg. The principal printed editions are the Complutensian (1514–17), the Aldine (Venice, 1518), the Roman or Sextine (1587), and the new Cambridge (1887–95).

SEPULCHRAL MOUND. See Tumuli, Barrow.

SEQUENCE, in music the recurrence of a harmonic progression or melodic figure at a different pitch or in a different key to that in which it was first given. In the Roman Catholic church the term sequence is applied to a hymn introduced into the mass on certain festival days.

SEQUO'IA (from the American Indian Sequoyah, who invented the Cherokee alphabet), a genus of conifers, otherwise called Wellingtonia or Washingtonia, consisting of two species only—the redwood of the timber trade, and the Wellingtonia, the big or mammoth tree of the western states, the latter having been discovered in the Sierra Nevada in 1852. One specimen in Calaveras co., Cal., has a height of 325 feet, and a girth 6 feet from the ground of 45 feet. The Mariposa Grove, 16 miles south of the Yosemite valley, contains upward of 100 trees over 40 feet in circumference and one over 93 feet at the ground, and 64 feet at 11 feet higher. This grove is government property. Some of these trees indicate an age of over 2000 years.

SERAGLIO (se-ral'yō), properly Serai, the palace of the Turkish sultan at Constantinople. It stands in a beautiful situation, on a point of land projecting into the sea. Its walls embrace a circuit of about 9 miles, including several mosques, spacious gardens, the harem, and buildings capable of accommodating 20,000 men, though the number of the sultan's household does not amount to above 10,000. The principal gate of the seraglio is called Babi Humayum (Sublime Porte).

SERAING (sè-ran), a town of Belgium, in the province of Liége, 3 miles southwest of Liége, on the Meuse. Cockerill's extensive iron, steel, and machine works (including also coalpits), employing 12,000 hands, are established here, and other industries are carried on. Pop. 67,942.

SER'APH, plural Seraphim, a name applied by the prophet Isaiah to certain attendants of Jehovah in a divine vision presented to him in the temple (Isa. vi. 2). Very commonly by these seraphim have been understood to be angels of the highest order—angels of fire. The term seraphim is only used elsewhere of the serpents of the wilderness (Num. xxi. 6, 8 and Deut. viii. 15).

SERA'PIS, or **SARA'PIS,** an Egyptian deity whose worship was introduced into Egypt in the reign of Ptolemy I. Forty-two temples are said to have been erected to him in Egypt under the Ptolemies and Romans; his worship extended also to Asia Minor, and in 146 A.D. it was introduced to Rome by Antonius Pius. The image of Serapis perished with his temple at Alexandria, which was destroyed in 389 by the order of Theodosius.

SERENADE, music performed in the open air at night; often, an entertainment of music given in the night by a lover, to his mistress under her window; or music performed as a mark of esteem and good will toward distinguished persons. The name is also given to a piece of music characterized by the soft repose which is suppozed to be in harmony with the stillness of night. The Italian name Serenata is now applied to a cantata having a pastoral subject, and to a work of large proportions, in the form to some extent of a symphony.

SERFS, a term applied to a class of laborers existing under the feudal system, and whose condition, though not exactly that of slaves, was little removed from it. Under this system, from the vassals of the king downward, the whole community was subject only on condition of specific services to be rendered to his superior that any individual held his fief. In the case of the lower classes this servitude amounted to an almost complete surrender of their personal liberty. There were two classes of laborers, the villeins and the serfs proper. The former occupied a middle position between the serfs and the freemen. Hallam remarks, in reference to these two classes, that in England, at least from the reign of Henry II., one only, and that the inferior, existed; incapable of property and destitute of redress except against the most outrageous injuries. A serf could not be sold, but could be transferred along with the property to which he was attached. The revival of the custom of manumission counteracted the rapid increase of serfs. A serf could also obtain his freedom by purchase, or by residing for a year and a day in a borough, or by military service. By these various means the serf population gradually decreased. In most parts of the continent they had disappeared by the 15th century. The extinction of serfdom in England and Scotland was very gradual. As late as 1574 Elizabeth issued a commission of inquiry into the lands and goods of her bondsmen and bondswomen in specified counties in order to compound for their manumission; and even in the 18th century, a species of serfdom existed among Scottish minors. Serfdom in Russia was abolished by a manifesto of Alexander II. on March 17, 1861.

SERGEANT, a non-commissioned officer in the army, ranking next above the corporal. He is appointed to see discipline observed, to teach the soldiers their drill, and also to command small bodies of men, as escorts and the like. A company has four sergeants, of whom the senior is called color-sergeant. Staff-sergeants are higher than these, and above all is the sergeant-major, who acts as assistant to the adjutant.

SERGIPE (ser-zhē'pe), or **SERGIPE-DEL-REY,** a maritime state of Brazil, n. of Bahia; area, 12,034 sq. miles. The coast is low and sandy, but the interior is mountainous. The chief river is the Sao-Francisco on the north. Cotton, sugar cane, rice, tobacco, etc., are grown, and the woods furnish good timber, dyewoods, and quinine. Pop. 311,170. The chief town is Aracajú; pop. 5000.

SERIE'MA, a gallatorial bird of the size of a heron inhabiting the open grassy plains of Brazil and other parts of South America. Its feathers are of a gray color, and a kind of crest rises from the root of the beak, consisting of two rows of fine feathers curving backward. The eye is sulphur-yellow, the beak and feet red. It is of retired habits, and utters

Seriema.

a loud screeching cry, which somewhat resembles that of a bird of prey or the yelping of a young dog. The seriema is protected in Brazil on account of its serpent-killing habits and is often domesticated.

SERINGAPATAM' (properly, Sirranga-patanam, "city of Vishnu"), a celebrated town and fortress in the province of Mysore, Madras presidency, India. Pop. 10,594, once 140,000.

SEROUS MEMBRANES are certain double membranes in the human body, as the pleura, pericardium, peritoneum, etc., which form a sort of closed sac surrounding certain organs, the interior surfaces of the sac secreting a small quantity of serous fluid. Their chief function is to allow free action to the organs, and they are also intimately connected with the absorbent system, the vessels of which freely open on their surfaces. These membranes are liable to various diseases, as inflammation (pleurisy, pericarditis, etc.), morbid growths, dropsical effusions, hæmorrhage, etc.

SERPENT-CHARMING, an art of great antiquity, confined in practice exclusively to eastern countries. Several allusions are made to it in the Bible, as Ps. lviii. 5; Eccl. x. 11; Jer. viii. 17, and also in classical writers. The power exercised by the charmers over poisonous serpents is unquestionably remarkable, and though there is little doubt that the common practice of the charmer is to extract the fangs before exhibiting their feats, yet we have good authority for believing that it is not unusual to dispense with this. The instrument usually employed in serpent-charming is a kind of pipe, which is varied by whistling and the use of the voice. The effect of this medley of sounds is to entice the serpents from their holes, and this done the serpent-charmer pins them to the ground with a forked stick. In India and other places the art of serpent-charming is an hereditary profession,

and is practiced for the purpose of gaining a livelihood by administering to the amusement of the public. Besides the evident power music has upon the serpents, they appear to be influenced in a marked degree by the eye of the charmer who controls them by merely fixing his gaze upon them.

SERPENT EATER. See Secretary Bird.

SERPENTS, or **SNAKES,** an order of reptiles, characterized by an elongated and cylindrical body covered with horny scales, but never with bony plates. There is never any breast bone nor pectoral arch, nor fore-limbs, nor as a rule any traces of hind-limbs. In a few cases, however (as in the python), rudimentary hind-limbs may be detected. The ribs are always numerous, some serpents having more than 300 pairs. These not only serve to give form to the body and aid in respiration, but are also organs of locomotion, the animal moving by means of them and of its scales which take hold on the surface over which it passes. The vertebræ are formed so as to give great pliancy, most if not all serpents being able to elevate a large portion of their body from the ground. They have hooked, conical teeth, not lodged in distinct sockets useless for mastication, but serving to hold their prey. In the typical non-poisonous or innocuous serpents, both jaws and the palate bear continuous rows of solid conical teeth. In the venomous serpents, as vipers, rattlesnakes, etc., there are no teeth in the upper jaw excepting the two poison fangs. These are long, firmly fixed in a movable bone, above which there is a gland for the elaboration of poison. Each tooth is perforated by a tube through which the poison is forced. The tongue, which is forked, and can be protruded and retracted at pleasure, is probably rather an organ of touch than of taste. The eye is unprotected by eyelids, but it is completely covered and protected by an anterior layer of transparent skin attached above and below to a ridge of scales which surround the eye. No external ear exists. The nostrils are situated on the snout. The heart has three chambers, two auricles and a ventricle. The digestive system comprises large salivary glands, a distensible gullet, stomach, and intestine, which terminates in a cloaca with a transverse external opening. A urinary bladder is absent. The lungs and other paired or symmetrical organs of the body generally exhibit an abortive or rudimentary condition of one of these structures. As regards reproduction they are either oviparous or ovoviviparous, the eggs being either hatched externally or within the animal's body. Many serpents, especially the larger species, as the boas, subsist on prey thicker than themselves, which they crush by constriction, and which they are able to swallow from the throat and body being capable of great dilatation. The order is generally divided into two sub-orders, Viperina and Colubrina, the former having only two poison fangs in the upper jaw, the latter having solid teeth, besides grooved fangs. The different kinds or species of snakes will be found described in articles under their respective headings, such as Rattlesnake, Python, etc. See also Reptiles.

SER'PULA, a genus of Annelida or worms, belonging to the order of Tubicola or tube-dwelling worms, inhabiting cylindrical and tortuous calcareous tubes attached to rocks, shells, etc., in the sea. The worm fixes itself within

Serpula, detached and in tube.

its tube by means of the bristles attached to its body-segment. Its head segments are provided with plume-like gills or granchiæ. No eyes exist in this creature, although it is extremely sensitive to the action of light.

SERTO'RIUS, Quintus, a Roman general, born about 120 B.C. After serving with reputation under Marius against the Teutones in Spain he was made questor in Cisalpine Gaul in 91 B.C. He was treacherously assassinated at a feast by his friend Perperna B.C. 72. Sertorius has been made the subject of a tragedy by Corneille.

SERUM, the thin transparent part of the blood. The serum of the blood, which separates from the crassamentum during the coagulation of that liquid, has a pale straw color, or greenish-yellow color, is transparent when carefully collected, has a slightly saline taste, and is somewhat unctuous to the touch. It usually constitutes about three-fourths of the blood, the pressed coagulum forming about one-fourth. The term is also applied to the thin part of milk separated from the curd and oil. See Blood.

SERVAL, or **BUSH CAT,** a carnivorous animal nearly related to the leopard and its allies, a native of Africa. Its general body color is a bright yellow or golden luster, with a grayish tint, and

Serval.

marked with black spots. The average length is about 2 feet 10 inches including the thick bushy tail, which is from 10 to 12 inches long. This animal is readily domesticated. Its fur is in great request, and obtains high prices. The name of tiger cat is frequently applied to the serval.

SERVE'TUS, Michael (properly Miguel Servede), a learned Spaniard, memorable as a victim of religious intolerance, was born in 1509 at Villa Neuva, in Arragon. He was arrested for heresy and imprisoned in 1553, but contrived to escape, and purposed to proceed to Naples. He was, however, apprehended at Geneva on a charge of blasphemy and heresy, and his various writings were sifted in order to ensure his condemnation. The divines of all the Protestant Swiss cantons unanimously declared for his punishment, and Calvin was especially urgent and emphatic as to the necessity of putting him to death. As he refused to retract his opinions he was burnt at the stake on the 27th October, 1553. Servetus is numbered among the anatomists who made the nearest approach to the doctrine of the circulation of the blood.

SERVIA, an independent kingdom of Eastern Europe, bounded n. by Austria-Hungary, from which it is separated by the Save and the Danube; e. by Roumania and Bulgaria; s. by Turkey; and w. by Bosnia; area, 18,855 sq. miles; pop. 2,535,915. The surface is elevated and is traversed by ramifications of the Carpathians in the northeast, of the Balkans in the southeast, and of the Dinaric Alps in the west. The summits seldom exceed 3000 feet, though the highest reaches 6325. The chief agricultural products are corn, wheat, flax, hemp, and tobacco. Wine is grown in the districts adjoining Hungary, and the cultivation of prunes is extensive. Lead, zinc, quicksilver, copper, iron, and coal are found. Manufactures include carpet-weaving, embroidery, jewelry, and filigree work. The principal exports are dried prunes, pigs, wool, wheat, wine, hides, cattle, and horses; imports, cotton, sugar, colonial goods, hardware, etc. The bulk of the trade is with Austria. There are 340 miles of railway and 1800 miles of telegraph. The great majority of the inhabitants are Slavonians, and adhere to the Greek church. The standing army numbers about 18,000 men, with a reserve of 155,000 men. Servia is divided into fifteen (formerly twenty-two) administrative districts, of which Belgrade (the capital) forms one by itself. Other principal towns are Nisch, Leskovatz, and Pozarevatz.

Servia was anciently inhabited by Thracian tribes; subsequently it formed part of the Roman province of Mœsia. It was afterwards occupied in succession by Huns, Ostrogoths, Lombards, Avares and other tribes. The Servians entered it in the 7th century, and were converted to Christianity in the next century. They acknowledged the supremacy of the Byzantine emperors, but latterly made themselves independent and under Stephen Dushan (1336–56), the Kingdom of Servia included all Macedonia, Albania, Thessaly, Northern Greece, and Bulgaria. About 1374 a new dynasty ascended the throne in the person of Lazar I., who was captured by the Turks at the battle of Kossova (in Albania) in 1389, and put to death.

Servia now became tributary to Turkey. About the middle of the 15th century it became a Turkish province, and so remained for nearly 200 years. By the Peace of Passarowitz in 1718 Austria received the greater part of Servia, with the capital, Belgrade. But by the Peace of Belgrade in 1739 this territory was transferred to Turkey. The barbarity of the Turks led to several insurrections. Early in the 19th century Czerny George placed himself at the head of the malcontents, and, aided by Russia, succeeded after eight years of fighting in securing the independence of his country by the Peace of Bucharest, May 28, 1812. The war was renewed in 1813, and the Turks prevailed. In 1815 all Servia rose in arms under Milosh, and after a successful war obtained complete self-government, Milosh being elected hereditary prince of the land. Milosh was compelled to abdicate in 1839, and was nominally succeeded by his son Milan, who died immediately, leaving the throne vacant to his brother Michael. In 1842 this prince was compelled to follow the example of his father and quit the country, Alexander Kara-Georgevitch, son of Czerny George, was elected in his room; but in December, 1858, he also was forced to abdicate. Milosh was then recalled, but survived his restoration little more than a year. His son Michael succeeded him (1860), but was assassinated by the partisans of Prince Alexander on July 10, 1868. The princely dignity was then conferred on Milan (Obrenovitch), grand-nephew of Milosh. After the fall of Plevna in the Russo-Turkish war of 1877–78 Servia took up arms against Turkey, and by the Treaty of Berlin (13th July, 1878) it obtained an accession of territory and the full recognition of its independence. It was erected into a kingdom in 1882. In 1885 a short war took place between Servia and Bulgaria, resulting in favor of the latter. In 1889 Milan abdicated in favor of his son Alexander I. He and his queen were assassinated in 1903, and Peter Kara-Georgevitch succeeded.

SES'AMUM, or **SES'AME,** a genus of annual herbaceous plants, natural order Pedaliaceæ. The species, though now cultivated in many countries, are natives of India. They have alternate leaves and axillary yellow or pinkish solitary flowers.

SESOS'TRIS, a name given by the Greeks to an Egyptian king, who is not mentioned by that name on the monuments, and who is often identified with Ramses II. See Ramses.

SES'SILE, in zoology and botany, a term applied to an organ attached or sitting directly on the body to which it belongs without a support; as, a sessile leaf, one issuing directly from the main stem or branch without a petiole or footstalk; a sessile flower, one having no peduncle; a sessile gland, one not elevated on a stalk.

Sessile leaves.

Sessile flower.

SEVEN STARS. See Pleiades.

SEVENTH-DAY BAPTISTS. See Baptists and Sabbatarians.

SEVENTY, The. See Septuagint.

SEVEN WONDERS OF THE WORLD, an old designation of seven monuments, remarkable for their splendor or magnitude, generally said to have been: the pyramids of Egypt, the walls and hanging gardens of Babylon, the temple of Diana at Ephesus, the statue of the Olympian Jupiter at Athens, the Mausoleum at Halicarnassus, the Colossus of Rhodes, and the Pharos or lighthouse of Alexandria.

SEVEN YEARS' WAR, the war carried on from 1756–63, by Frederick the Great of Prussia, in alliance with England, against Austria, Russia, France, Sweden and most of the smaller German states. The war was closed by the Peace of Paris (February 10, 1763), by which England obtained Canada from France, and Florida (in exchange for Havannah) from Spain; and by the treaty of Hubertsburg (February 15), by which Prussia obtained Silesia. The Seven Years' war raised Prussia to the rank of a Great Power.

SEVERN, the second largest river in England, formed by the union of two small streams which rise in Mount Plinlimmon, Montgomeryshire. It flows through Montgomeryshire, Shropshire, Worcestershire, and Gloucestershire, passing the towns of Newton, Welshpool, Shrewsbury, Worcester, Tewkesbury, Gloucester, and Bristol, and after a circuitous southerly course of about 210 miles falls into the Bristol channel. It receives the Tern, Upper Avon, and Lower Avon on the left, and the Teme and Wye on the right. Its basin has an area of 8580 sq. miles. A railway tunnel 4½ miles long has been driven below the river from near Avonmouth, in Gloucestershire, across to Monmouthshire, and a railway bridge 3581 feet long crosses the river at Sharpness higher up.

SEVILLE (se-vil'), **SEVILLA** (se-vēl'-yȧ), a city of Spain, in Andalusia, on the left bank of the Gaudalquivir, capital of a province of the same name, 62 miles n.n.e. of Cadiz. It is largely built in the Moorish style, with narrow, ill-paved streets, the old Moorish houses having spacious interior courtyards with a fountain in the middle. The city has a large and handsome Gothic cathedral dating from the 15th century, with its famous Moorish Giralda or tower, part of a mosque which gave place to the present cathedral, and dating from 1196; an alcazar or palace in the Moorish style; an exchange called the Casca Lonja; a bull ring, a fine stone building holding 12,000 persons; an aqueduct of 410 arches built by the Moors, a university, a picture gallery rich in examples of Murillo and Zurbaran, etc. Pop. 148,315.—The province has an area of 5300 sq. miles, and the greater part consists of fertile plains producing all kinds of cereals, seeds, vegetables, oranges and other fruits; wine, oil, tobacco, etc. Large numbers of horses are reared. The chief river is the Guadalquivir. Minerals include iron,

Seville.—La Giralda and part of the cathedral.

silver, lead, and copper. The chief exports are wheat, barley, oranges, oil, wool, copper, etc. Pop. 555,256.

SEWAGE (sū'āj), the matter which passes through the drain, conduits, or sewers, leading away from human habitations singly, or from houses collected into villages, towns, and cities. It is made up of excreted matter, solid and liquid, the water necessary to carry such away, and the waste water of domestic operations, together with the liquid waste products of manufacturing operations, and generally much of the surface drainage water of the area in which the conveying sewers are situated. Until very recent times human excreta was deposited in outhouses or pits, commonly called cesspools. The invention of water-closets necessitated the use of the sewers and the water-carriage of excreta was until lately regarded as the most satisfactory method of disposing of these matters. It was argued that the oxygen of the air held in solution by the water destroyed the organic matter and rendered it innoxious. But experience has shown that no river in the kingdom can oxidize the excreta of the towns on its banks, and that whenever these are passed into the rivers at some distance from the sea they are apt to become offensive. Sewage, when fresh and freely exposed to the air, is almost inodorous, but once it accumulates putrefaction sets in, it becomes vilely odorous, and pollutes the atmosphere by the production of poisonous gases. To prevent this it has been suggested that all sewers should have a greater fall than at present, and many attempts have been made to prevent the accumulation of gases in sewers by ventilation. Many methods for the ultimate disposal of sewage have been proposed, but these all may be divided into three great classes, viz. precipitation, irrigation, and filtration, since the throwing of sewage into a body of water in order that it may be carried away by currents, diluted and oxygenated, has ceased to hold a place in modern sanitary schemes. The precipitation of sewage, by which the solid matter is

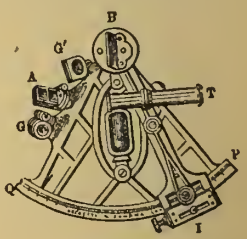
separated from the liquid and used as a manure or otherwise, has been the subject of numerous patents, and many chemicals have been employed for that purpose. Lime, lime and phosphate of alumina, and sulphate of iron have all been used with some degree of success. In the A B C process the sewage is first clarified by blood, charcoal, and clay, and afterwards treated with sulphate of alumina, producing a valuable manure. Irrigation—by which the sewage is directly applied to a piece of ground—has been fully tried in several localities, and many people consider it the most successful solution of the problem as to the ultimate disposal of sewage. The ground is carefully prepared, and the sewage allowed to flow over its surface by gravitation, and by this process the productiveness of the soil is enormously increased. But farmers will only use the liquid when their land requires it; consequently when this system is adopted the local authorities have had to add a farm trust to their many other responsibilities, and the system is generally carried out at a heavy annual loss to the public. Filtration—the purification of sewage by causing it to filter through the earth—has been proposed in cases where land is very valuable or difficult to be secured for the disposal of sewage, on the supposition that this system will only require one acre for every 10,000 inhabitants. As the sewage passes down through the earth the air must of necessity follow it, the oxygen of which will re-aerate the earth and make it again fit for use. In recent systems of filtration the sewage is made to pass through special filter-beds, constructed of such materials as cinders, coke, sand, gravel, etc., the purification of the sewage being assisted by the action of bacteria contained in it. Some methods of dealing with the sewage difficulty are based on the principle of keeping all excremental matters out of the sewers and dealing with them so as to prevent decomposition. Moule's earth-closet has been successfully used in detached houses and villages in Great Britain, but the bulk of material renders it difficult to apply the system in towns. Other systems equally successful render the excreta innocuous by mixing them with charcoal, sweepings, refuse, etc., and manufacturing the mass into manure. Seaweed charcoal has been used instead of earth with satisfactory results. In Hoey's system the soil pipe from the closet flows into a reservoir underground, from which the excreta are removed by pneumatic pressure and manufactured into portable manure. In Leinur's system, now in operation at Leyden, Amsterdam, and other European towns, the excreta are forced by vacuum power into hermetically closed tanks above the floor of the central station. The matter is then conducted by air-tight pipes to drying retorts and reduced to a state of powder, or is decanted in a fluid form into vessels for immediate transport to the country. With regard to indoor drainage care should be taken to see that each trap connected either with bath, water-closet, sink, or fixed basin is ventilated to the open air, and the pipe from the bath, sink, or fixed basin should never pass into the trap of the water-closet, as the heated water promotes decomposition. The overflow pipe from the cistern should not open into the soil pipe, and the main soil pipe should be of iron, well covered with protecting composition. Cesspools should in all cases be abolished.

SEWARD (sū'ard), William Henry an American statesman, born at Florida, Orange co., New York, May 16, 1801; died at Auburn, Cayuga co., in the same state, October 10, 1872. He studied for the bar, and began practicing in Auburn in 1823, but gradually drifted into politics, and in 1830 was elected a member of the New York senate. Displaying marked abilities as a politician he was in 1838 and 1840 chosen governor of his native state, and in 1849 was elected to a seat in the United States senate. He was the friend and advisor of President Taylor, and distinguished himself by his firm resistance to the extension of slavery. In 1860 he was a candidate for the presidency, but being defeated in the convention by Abraham Lincoln he exerted himself to secure Lincoln's election. Lincoln afterwards nominated Seward as secretary of state for foreign affairs, in which post he discharged his duties with great ability. He was dangerously wounded in April, 1865, when Lincoln was assassinated, but recovered and fulfilled the same office under Lincoln's successor, Andrew Johnson. He resigned his post on the accession of President Grant in 1869. He wrote a life of John Quincy Adams; his Speeches, Correspondence, etc., appeared in 1869; and an Autobiography, with continuation, in 1877.

SEWING MACHINES, the first attempts to devise machines for replacing hand labor in sewing were made early in the 19th century. The first machines were contrivances for imitating mechanically the movements of the hand in sewing. In the machines of Thomas Stone and James Henderson (1804) there were two pairs of pincers, one of which seized the needle below and the other above the cloth, and pulled it quite through on either side alternately. In Heilmann's machine, exhibited at Paris in 1834, the needle had the eye in the middle and a point at each end. The machine was intended for embroidery work. Previous to this (in 1830) Thimmonier and Ferrand had contrived a machine producing what is known as the chain stitch. But the great disadvantage of this stitch is that the whole seam becomes undone if the end of the thread is pulled. In 1854 Singer, an American, devised a machine calculated to remedy this defect of the chain stitch by means of a mechanism for tying a knot in the seam at every eighth stitch. But long before Singer's invention Elias Howe, a poor American mechanic, had invented the first really satisfactory sewing machine for which he obtained a patent in May, 1841. Howe's machine used two threads, one of which passed through the eye of the needle, while another was contained in a small shuttle; and it produced a seam in which each stitch was firmly locked, so that it could not come undone by pulling. Many improvements have since been made by other inventors. The principle of the two threads and the lock-stitch has been adhered to in most of the machines that have been invented subsequently to that of Howe, but various details applying that principle have been altered for the better. In the Wheeler and Wilson machine the place of the shuttle is supplied by a reel which revolves in a vertical plane within a round piece of mechanism so contrived as to form a loop with the reel-thread, which becames interlocked with that held by the needle. Of single-thread machines one of the best is that of Wilcox and Gibbs, which, while it is easy, quick, and noiseless in working, makes a securer stitch than one-thread machines generally. Sewing machines have now been adapted to produce almost all kinds of stitching which can be done by the hand. Most sewing machines are worked by the foot, but many are worked by the hand, and some may be worked by either. Steam and electricity are also sometimes employed as a motive power for sewing machines. The manufacture of sewing machines is most extensively carried on in America.

SEX, the name applied to indicate the particular kind of generative or reproductive element in the constitution of an animal or plant, being that property or character by which an animal is male or female. Sexual distinctions are derived from the presence and development of the characteristic generative organs—testes and ovary—of the male and female respectively. See Reproduction.

SEXTANT, an improved form of quadrant, capable of measuring angles of 120°. It consists of a frame of metal, ebony, etc., stiffened by cross-braces, and having an arc embracing 60° of a circle. It has two mirrors, one of which is fixed to a movable index, and various other appendages. It is capable of very general application, but it is chiefly employed as a nautical instrument for measuring the altitudes of celestial objects and their apparent angular distances. The principle of the sextant, and of reflecting instruments in general,



Sextant.

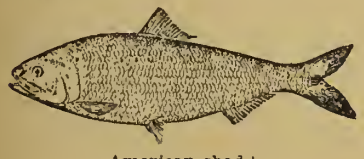
depends upon an elementary theorem in optics, viz. if an object be seen by repeated reflection from two mirrors which are perpendicular to the same plane, the angular distance of the object from its image is double the inclination of the mirrors. The annexed figure shows the usual construction of the sextant. QP is the graduated arc, BI the movable index, B mirror fixed to the index, A mirror (half-transparent) fixed to the arm, GG' colored glasses, that may be interposed to the sun's rays. To find the angle between two stars hold

the instrument so that the one is seen directly through telescope T and the unsilvered portion of the mirror, and move the index arm so that the image of the other star seen through the telescope by reflection from B and A is nearly coincident with the first, the reading on the arc gives the angle required; half degrees being marked as degrees, because what is measured by the index is the angle between the mirrors, and this is half that between the objects.

SEXTON, a corruption of sacristan, an under officer of the church, whose business, in ancient times, was to take care of the vessels, vestments, etc., belonging to the church. The greater simplicity of Protestant ceremonies has rendered this duty one of small importance, and in the Church of England the sexton's duties now consist in taking care of the church generally, to which is added the duty of digging and filling up graves in the churchyard. The sexton may be at the same time the parish clerk.

SEYMOUR, Horatio, American political leader, was born at Pompey Hill, Onondaga co., N. Y., in 1810. In 1842-46 he was mayor of Utica, and in 1852 and 1862 he was elected governor of New York. In 1868 he was president of the democratic national convention which met in New York City and by which he, himself, was nominated for the presidency. He received only 80 electoral votes to 214 for General Grant. He died in 1886

SHAD, a name of several European fishes, of the family Clupeidæ or herrings, and including two species, the common or allice shad and the twaite shad. The common shad inhabits the sea near the mouths of large rivers, and in the spring ascends them for the purpose of depositing its spawn. The form of the shad is the same as that of the other herrings, but it is of larger size, and in some places receives the name of "herring king." Its color is a dark blue



American shad.

above, with brown and greenish lusters, the under parts being white. The twaite shad is about a half less than the common species, and weighs on an average about 2 lbs. An American species of shad varying in weight from 4 to 12 lbs., is highly esteemed for food, and is consumed in great quantities in the fresh state. They are found all along the coast from New England to the Gulf of Mexico, and have been successfully introduced on the Pacific coast.

SHADOOF', Shaduf', a contrivance extensively employed in Egypt for raising water from the Nile for the purpose of irrigation. It consists of a long stout rod suspended on a frame at about one-fifth of its length from the end. The short end is weighted so as to serve as the counterpoise of a lever, and from the long end a bucket of leather or earthenware is suspended by a rope. The worker dips the bucket in the river, and, aided by the counterpoise weight, empties it into a hole dug on the bank, from which a runnel conducts the water to the lands to be irrigated. Sometimes two shadoofs are employed side by side. When the waters of the river are low two or more shadoofs are employed, the one above the other. The lowest lifts the water

Raising water by shadoofs.

from the river and empties it into a hole on the bank, a second dips into this hole, and empties the water into a hole higher up, and a third dips into the hole just below, and empties the water at the top of the bank, whence it is conveyed by a channel to its destination.

SHADOW, the figure of a body projected on the ground, etc., by the interception of light. Shadow, in optics, may be defined a portion of space from which light is intercepted by an opaque body. Every opaque object upon which light falls is accompanied with a shadow on the side opposite to the luminous body, and the shadow appears more intense in proportion as the illumination is stronger. An opaque object illuminated by the sun, or any other source of light which is not a single point, must have an infinite number of shadows, though not distinguishable from each other, and hence the shadow of an opaque body received on a plane is always accompanied by a penumbra, or partial shadow the complete shadow being called the umbra. See also Penumbra.

SHAF'TER, William Rufus, American soldier, was born in Michigan in 1835. He enlisted and soon after the outbreak of the civil war was made colonel of volunteers, and in 1865, was brevetted brigadier-general. In 1897 he was promoted to be brigadier-general and commanded the department of California until the beginning of the Spanish-American war, when, he was put in command of the first expedition to Cuba. On July 1st he carried the heights of El Caney and San Juan. On July 3d Cervera's fleet, attempting to escape from Santiago, was destroyed by the American battle ships. Two weeks later the surrender of Santiago took place. In 1901 he was retired with the rank of major-general in the regular army. He died in 1906.

SHAFTESBURY, Anthony Ashley Cooper, first Earl of, was born at Wimborne St. Giles', in Dorsetshire, in 1621, and succeeded to a baronetcy on the death of his father in 1631. He entered into the plots of the Monmouth party and had to fly to Holland, where he died in 1683. He is the Achitophel of Dryden's famous satire.

SHAFTESBURY, Anthony Ashley Cooper, third Earl of, grandson of the preceding, a celebrated philosophical and moral writer, was born at Exeter House, in London, 1671. In 1708-9 he published several works of a philosophical character, among others a Letter on Enthusiasm and an Inquiry concerning Virtue or Merit. In 1710 his rapidly declining health led him to fix his residence at Naples, where he died in 1713.

SHAG, a species of cormorant, also called the crested or green cormorant, from its dark green plumage. Its average length is about 26 inches, and its nest, composed of roots and stalks of seaweed lined with grass, is usually found on rocky ledges. The young birds have a brownish tint amid the green plumage, with brown and white under-surfaces.

SHAGREEN', a species of leather prepared without tanning, from horse, ass, and camel skin, the granular appearance of its surface being given by imbedding in it, while soft, the seeds of a species of plant, and afterwards shaving down the surface, and then by soaking causing the portions of the skin which had been indented by the seeds to swell up into relief. It is dyed with the green produced by the action of sal-ammoniac on copper filings. It is also made of the skins of the shark, sea otter, seal, etc. It was formerly much used for watch, spectacle, and instrument cases.

SHAH, in Persian, signifies "king." The proper title of the king in Persia is Shah-in-shah, King of kings.

SHAHJEHANPUR, a town in India, in the United Provinces, 95 miles northwest of Lucknow, in the executive district of the same name. There is a cantonment at the place, an American Methodist mission station with churches and schools; and sugar works in the neighborhood. Pop. 76,458.—The district forms a portion of the Rohlkhand Division; has an area of 1744 sq. miles, and pop. of 921,624.

SHAKERS, or **SHAKING QUAKERS,** a sect which arose at Manchester, in England, about 1747, and has since been transferred to America, where it now consists of a number of thriving families. The formal designation which they give themselves is the United Society of Believers in Christ's Second Appearing. The founder of the sect was Ann Lee, an expelled Quaker, born in Manchester in 1756. She went to America in 1774 with seven followers and formed the first settlement at Watervliet, near Albany. They agree with the Quakers in their objections to take oaths, their neglect of certain common courtesies of society, their rejection of the sacraments etc. The societies are divided into smaller communities called families, each of which has its own male and female head. Celibacy is enjoined upon all, and married persons on entering the community must live together as brother and sister. In America there are about twenty communities with between two and

three thousand members, chiefly in the New England states.

SHAKESPEARE, William, English poet and dramatist, was born in 1564, at Stratford-upon-Avon, a town in Warwickshire, England. The first absolutely authentic event in Shakespeare's life is his marriage with Anne Hathaway, daughter of a yeoman in the hamlet of Shottery, near Stratford. The marriage bond is dated November 28, 1582, at which time Shakespeare was in his nineteenth year, while, from the date on her tombstone, it is known that his wife was eight years older. On the 26th May following their first child, named Susanna, was baptized, and in February of 1585 a son and daughter were born, who received the names of Hammet and Judith.

From this date until we find Shakespeare established in London as a player and dramatist there is a gap of seven years, during which we are again left to tradition, and conjecture. The first date in Shakespeare's life after his arrival in London which is settled by clear evidence is 1593. In that year he published his Venus and Adonis, with a dedication

William Shakespeare, from monumental bust at Stratford-upon-Avon.

of this "the first heir of my invention," to Henry Wriothesly, earl of Southampton; and in the following year he dedicated to the same patron his other poem of The Rape of Lucrece. His fame as a lyrical poet and dramatist was also being securely established. For in 1598 there was published the Palladis Tamia, by Francis Meres, in which twelve of his plays are enumerated. Yet, notwithstanding this literary activity, he was still a player, for when Jonson's comedy of Every Man in his Humor was produced in 1598, Shakespeare took part in the performance. At what time he ceased to appear upon the stage is not known; we are even left in doubt when he ceased to live in London and retired to Stratford, though this was probably between the years 1610 and 1612. Of his life in Stratford after his return we have no information except doubtful stories and a few scraps of documentary evidence. In February, 1616, his younger daughter Judith married; on the 25th of the following month he executed his will; and in another month he was dead. He was buried in the chancel of Stratford church, on the north wall of which a monument, with bust and epitaph, was soon afterward set up. The face of this bust, which may have been modeled from a cast taken after his death, was colored, the eyes being hazel, the beard and hair auburn. This bust, and the portrait engraved by Droeshout, prefixed to the first folio edition of his writings (1623), are the chief sources of our information regarding the appearance of the poet. There is also a death-mask dated 1616, and what is known as the Chandos portrait, which are interesting but not authoritative.

In classifying the plays of Shakespeare by the aid of such chronology as is possible, modern critics have found it instructive to divide his career as a dramatist into four marked successive stages. The first period (1588–93) marks the inexperience of the dramatist and gives evidence of experiment in characterization, looseness in the construction of plot, with a certain symmetrical artificiality in the dialogue. To this stage belong:—Titus Andronicus (1588–90) and part I. Henry VI. (1590–91), both of which, it is thought, Shakespeare merely retouched; Love's Labor's Lost (1590); The Comedy of Errors (1591); The Two Gentlemen of Verona (1592–93); A Midsummer Night's Dream (1593–94), parts II. and III. Henry IV. (1591–94), in which it is thought probable that Marlowe had a hand; and King Richard III. (1593). The second period (1594 to 1601) is that in which, with increased security in his art, the dramatist sets forth his brilliant pageant of English history, his brightest conception of the comedy of life, and more than proves his capacity for deeper things by one great romantic tragedy. To this stage belong: King Richard II. (1594); parts I. and II. Henry IV. (1597–98); King Henry V. (1599); King, John (1595); Romeo and Juliet (1596–97); The Merchant of Venice (1596); Taming of the Shrew (1597); Merry Wives of Windsor (1598); Much Ado about Nothing (1598); As You Like It (1599); and Twelfth Night (1600–1). The third period (1602–8) shows that the dramatist, having mastered all the resources of his art and tasted life to the full, is strangely fascinated by mortal mischance, so that even his comedy becomes bitter, while his tragedy is black with the darkest tempests of passionate human experience. To this stage in his development belong: All's Well that Ends Well (1601–2); Measure for Measure (1603); Troilus and Cressida (1603); Julius Cæsar (1601); Hamlet (1602); Othello (1604); King Lear (1605); Macbeth (1606); Antony and Cleopatra (1607); Coriolanus (1608); and Timon of Athens (1607–8). The fourth period (1608 to 1613) is that in which Shakespeare, after having passed through a season which was probably darkened by his own personal experience suddenly attained the glad serenity of mind which enabled him to write his last romantic plays. To this period belong: Pericles (1608), which is only partly from Shakespeare's hand; Cymbeline (1609); The Winter's Tale (1610–11); The Tempest (1610); with (the doubtful) Two Noble Kinsmen (1612) and King Henry VIII. (1612–13), which are partly by another writer, supposed to be Fletcher. Of non-dramatic pieces Shakespeare was the author of Venus and Adonis (1593), The Rape of Lucrece (1594), the Sonnets and A Lover's Complaint (1609); while it is agreed that only a few of the poems in the collection published under the name of The Passionate Pilgrim (1599) were written by him.

SHALE, a term applied in geology to all argillaceous strata which possess to a greater or less degree the quality of splitting into layers parallel to the planes of deposition. It is the solidified mud of ancient waters, and is various in color and composition, the chief varieties being sandy, calcareous, purely argillaceous, and carbonaceous. Shale is frequently found deposited between seams of coal, and commonly bears fossil impressions. The sub-variety known as bituminous shale burns with flame, and yields an oil, mixed with paraffin, of great commercial importance. Alum is also largely manufactured from the shales of Lancashire, Yorkshire, and Lanarkshire.

SHAMOKIN (shâ-mō'kin), a city of Northumberland co., Pa., 40 miles north by east of Harrisburg; on the Lehigh valley, the Northern Central, and the Philadelphia and Reading railroads. It is the center of an extensive anthracite coal-mining industry. Pop. 21,262.

SHAMOY LEATHER, a soft leather prepared from the skins of goats, deer, and sheep (originally the chamois, whence the name) by impregnating them with oil. This leather can be washed without losing its color, and is put to innumerable uses.

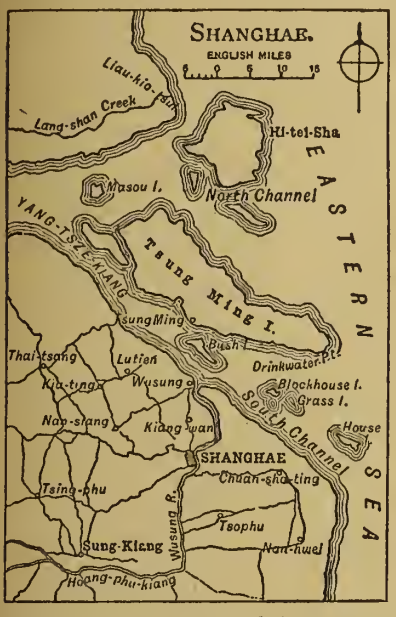
SHAMPOOING, the name given in the East Indies to a process connected with bathing, in which the whole body is pressed and kneaded by the hands of the attendants.

SHAMROCK, the name commonly given to the national emblem of Ireland. It is a trefoil plant, generally supposed to be the plant called white clover; but some think it to be rather the wood-sorrel. The plant sold in Dublin on St. Patrick's Day is the small yellow trefoil.

SHAMROCK I., II., and III., three racing yachts owned by Sir Thomas Lipton, built to compete for the American Cup in the international yacht races off Sandy Hook, N. Y. The first Shamrock competed in the 1899 cup races and was defeated by the American yacht Columbia in the first three races of the series. Although defeated in the 1901 series by the Columbia which was again selected to defend the cup, Shamrock II. came nearer to actual victory than any of its predecessors. Shamrock III. was defeated in the 1903 series by the Reliance.

SHANGHAI, or **SHANGHAE** (shang-hi'), a large city and seaport of China, province of Kiangsoo, on the Woosung or Whangpoo, about 12 miles above its entrance into the estuary of the Yantsze-kiang. The Chinese city proper is inclosed within walls 24 feet high, the streets being narrow and dirty, and the buildings low, crowded, and for the most part unimportant. In 1843 Shanghai

was opened as one of the five treaty ports, and an important foreign settlement is now established (with a separate government) outside the city walls. The Chinese authorities retain complete control over all shipping dues, duties on imports and exports, etc. Shanghai has water communication with about a third of China, and its trade since the opening of the port has become very extensive,



the total of exports and imports together, native and foreign, amounting to $280,000,000 annually. The chief imports are cottons, yarns, woolens, and opium; and the exports, silk, tea, rice, and raw cotton. The largest part of the foreign trade is in the hands of British merchants. The foreign population is about 3000, and the native population is estimated at 300,000.

SHANNON, the largest river of Ireland rises at the base of Cuilcagh mountain in County Caven; flows s.w. and s. through loughs Allen, Boderg, Bofin and Derg; divides Connaught from Leinster and Munster; and enters the Atlantic by a wide estuary, at the mouth of which are Loop Head in Clare and Kerry Head in Kerry; length about 250 miles. It is connected with the Royal Canal and the Grand canal, which give a direct communication to Dublin, and also a communication south into the basins of the Barrow and Suir. The tide rises in springs 17 or 18 feet, and in neaps about 14 feet.

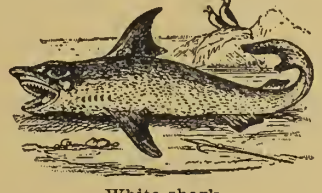
SHANSEE', an inland province of Northern China, with an area of 65,950 sq. miles, is the original seat of the Chinese people, and in its lowland parts is well cultivated. The capital is Taeyuen-foo. Pop. 14,000,000.

SHANGTUNG', a maritime province of China, on the Yellow sea; area, 53,760 sq. miles. It was in this province that Confucius was born. The capital is Tse-nan-foo, and the pop. 29,000,000.

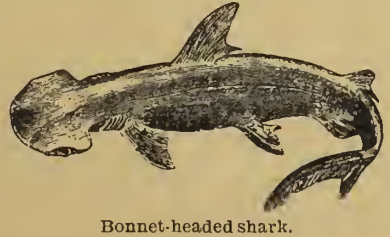
SHARK, the general name for a group of elasmobranchiate fishes, celebrated for the size and voracity of many of the species. The form of the body is elongated and the tail thick and fleshy. The mouth is large, and armed with several rows of compressed, sharp-edged, and sometimes serrated teeth. The skin is usually very rough, covered with a multitude of little osseous tubercles or placoid scales. They are the most formidable and voracious of all fishes, pursue other marine animals, and seem to care little whether their prey be living or dead. They often follow vessels for the sake of picking up any offal which may be thrown overboard, and man himself often becomes a victim to their rapacity. The sharks formed the genus Squalus of Linnæus, which is now divided into several families, as the Carcharidæ, or white sharks; Lamnidæ, or basking sharks; Scymnidæ, including the Greenland shark; Scyllidæ, or dog-fishes, etc. The basking shark is by far the largest species, sometimes attaining the length of 40 feet, but it has none of the ferocity of the others. The white shark is one of the most formidable and voracious of the species. It is rare on the American coasts, but common in many of the warmer seas, reaching a length of over 30 feet. The hammer-headed sharks which are chiefly found in tropical seas, are very voracious, and often attack man. They are noteworthy for the remarkable shape of their head which resembles somewhat a double-headed hammer, the eyes being at the extremities. Other forms are the porbeagle, blue shark, fox shark, sea-fox, sea-ape or thresher, and Greenland or northern shark. The shark is oviparous or ovoviviparous, according to circumstances. Large numbers of sharks are caught in some places (Russian Lapland the north of Norway) for the oil contained in their livers.

Hammer-headed shark.

Man-eating shark.



White shark.



Bonnet-headed shark.

SHARP, in music, the sign (♯) which, when placed on a line or space of the staff at the commencement of a movement, raises all the notes on that line or space or their octaves a semitone in pitch. When, in the course of the movement, it precedes a note, it has the same effect on it or its repetition, but only within the same bar.—Double sharp, a character (×) used in chromatic music, and which raises a note two semitones above its natural pitch.

SHAW, George Bernard, British critic, and dramatist, was born in Dublin in 1856. In 1876 he settled in London and became known as a brilliant writer. His best known works are: The Irrational Knot, Love Among the Artists, Cashel Byron's Profession, and An Unsocial Socialist, Plays Pleasant and Unpleasant, Three Plays for Puritans, and Mrs. Warren's Profession. In 1889 he edited Fabian Essays, contributing two to the collection, and his writings include many socialistic pamphlets.

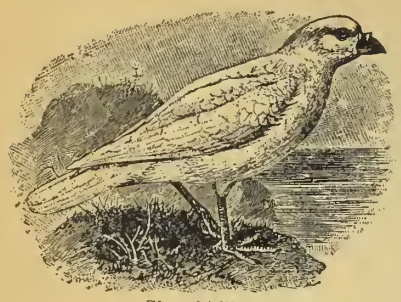
SHAW, Henry Wheeler, American humorist, better known as Josh Billings, was born at Lanesborough, Mass., in 1818. His amusing phonetic spelling won great favor in the early sixties. His Farmers' Allminax, published annually (1870–80) increased his reputation. He contributed to the Century under the pen name "Uncle Esek," and collected his works in 1877. Among American humorists Josh Billings ranks high in pith and point, and is regarded by many as a true moralist. He died in 1885.

SHAWL, an article of dress usually of a square or oblong shape worn by both sexes in the East, but in the West chiefly by females. Some of the Eastern shawls, as those of Cashmere, are beautiful and costly fabrics. The usual materials in the manufacture of shawls are silk, cotton, hair, or wool. Norwich and Paisley were long famed for their shawls made in imitation of those from India. The shawl was introduced into Europe in the nineteenth century.

SHEAR-TAILS, a genus of hummingbirds, of which the slender shear-tail and Cora's shear-tail are two familiar species. These birds occur, the former in Central America generally; the latter in Peru and in the Andes valleys. They derive their name from the elongation of two central tail-feathers of the males.

SHEATH-BILL, a bird belonging to the order Grallæ. They derive their name from the horny sheath which overlies the nostrils, and is continued back until it extends in a kind of hood, thickly feathered, covering the face. In appearance and flight they are not unlike pigeons, their plumage being

dazzlingly white. They inhabit the islands of the southern oceans, more



Sheathbill.

especially Kerguelen's Island and the Crozets.

Sheartail.

SHEBOY'GAN, a town in Wisconsin, on Lake Michigan, at the mouth of the Sheboygan river. It has a good harbor and a trade in wheat and lumber. Pop. 25,000.

SHEEP, a ruminant animal nearly allied to the goat. It is one of the most useful animals to man, as its wool serves him for clothing, its skin is made into leather, its flesh is an excellent article of food, and its milk, which is thicker than that of cows, is used in some countries to make butter and cheese. The varieties of the domestic sheep are numerous, but it is not known from what wild species they were originally bred, although it is probable that the smaller short-tailed breeds with crescent-shaped horns are descended from the wild species known as the moufflon. The ordinary life of a sheep is from twelve to fifteen years; but it is usually fattened and sent to market at the age of two or three years unless its fleece be the object desired. The latter is shorn every year about the month of May. The chief English varieties of the sheep are the large Leicester, the Cotswold, the Southdown, the Cheviot, and the black-faced breeds. The Leicester comes early to maturity, attains a great size, although the mutton is not of the finest quality, and its fleece weighs from 7 to 8 lbs. The Cotswold breed, which has been improved by crossing with the Leicesters, has fine wool, and a fine grained mutton. The Southdowns are large, their wool is short, close, and curled, and the mutton is highly valued. The Cheviot is a hardier breed than any of the preceding; its wool is short, thick, and fine, while its mutton is of excellent quality. The black-faced breed is the hardiest of all, its wool is long and coarse, and its mutton is considered the finest. The Merino variety of sheep originally belonged to Spain (where in summer they feed upon the elevated districts of Navarre, Biscay, and Arragon, and winter in the plains of Andalusia, New Castile, and Estremadura), but they are now reared in other parts of the continent, as also in Australia and New Zealand. Their wool is long and fine, but the mutton is of little value. Of the other breeds, which are numerous, mention may be made of the broad-tailed or fat-tailed sheep common in Asia and Egypt, and remarkable for its large tail, which is loaded with fat; the Iceland variety; which has sometimes three, four, or five horns; the fat-rumped sheep of Tartary; the Astrakan or Bucharian sheep, the wool of which is twisted in spiral curls of a fine quality; the Wallachian or Cretan sheep, which has long, large, spiral horns; and the Rocky Mountain sheep, a native of the United States, and notable for its large horns.

SHEEP LAUREL, a small North American shrub. It is a favorite garden shrub, and receives its name from its leaves and shoots being hurtful to cattle.

SHEEPSHEAD, the name of a fish caught on the shores of Connecticut and Long Island. It is allied to the gilt-head

Sheepshead.

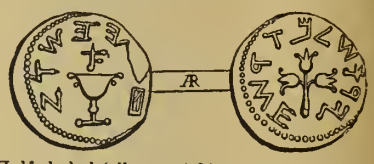
and the bream, and is considered a delicious food. It receives its name from the resemblance of its head to that of a sheep.

SHEEP TICK, a well-known insect belonging to the family of horse flies. The pupæ produced from the eggs are shining oval bodies which become attached to the wool of the sheep. From these issue the tick, which is horny, bristly, of a rusty ochre color, and wingless. It fixes its head in the skin of the sheep, and extracts the blood, leaving a large round tumor. Called also sheep louse.

SHEFFIELD, a municipal, parl., and county borough of England, county of York (West Riding), situated on hilly ground at the junction of the Sheaf and Don, about 160 miles north of London by rail. The trade of Sheffield is chiefly connected with cutlery, for which it has long been famous, and the manufacture of all forms of steel, iron, and brass work. The steel manufacture includes armor plating, rails, engine castings, rifles, etc. They are also manufactures of engines, machinery, plated goods, Britannia-metal goods, optical instruments, stoves and grates, etc. Pop. 380,717.

SHEIK (shēk or shāk), a title of dignity properly belonging to the chiefs of the Arabic tribes, but now largely used among Moslems as a title of respect. The head of the Mohammedan monasteries, and the head man of a village are sometimes called sheiks. The chief mufti at Constantinople is the Sheik-ul-Islam.

SHEK'EL, a Jewish weight and in later times a coin. The weight is believed to have been about 218 or 220 grains troy, and the value of the silver coin sixty cents. There were also half-shekels



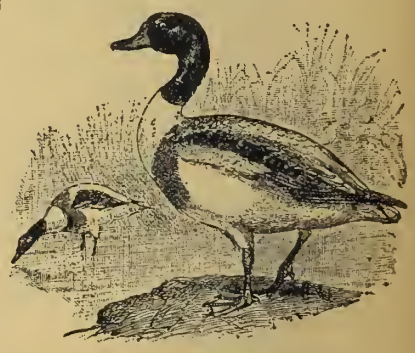
Half-shekel (silver) of Simon Maccabæus.

coined both of silver and copper. A shekel (weight) of gold was worth $5.00. The shekel of the sanctuary is supposed to have been originally worth double the common shekel.

SHEL'BYVILLE, the county seat of Shelby co., Ind., 26 miles southeast of Indianapolis, on the Blue river, and on the Cleveland, Cincinnati, Chicago and St. Louis and the Pittsburg, Cincinnati, Chicago and St. Louis railroads. Pop. 10,160.

SHEL'DON, Charles Monroe, American clergyman, born at Wellsville, N. Y., in 1857. Among his numerous publications are: The Crucifixion of Philip Strong, His Brother's Keeper. In His Steps, published in 1896, had a wonderful sale, and aroused much criticism.

SHELDRAKE, or **SHELDRAKE,** the name given to two species of British ducks, namely, the common sheldrake



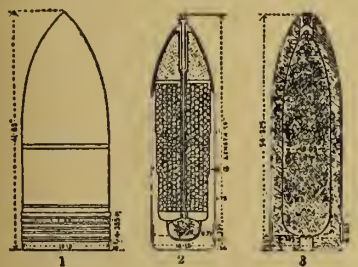
Sheldrake.

and the ruddy sheldrake. They are sometimes called burrow ducks, from their habit of making their nests in rabbit burrows.

SHELL, the name applied to the external limy covering secreted by various groups of invertebrate animals, but restricted in a scientific sense to that form of exoskeleton secreted by the mantle of the mollusca. Thus the hard coverings of crabs, sea urchins, lobsters, foraminifera, etc., are scientifically known as "tests," and are not to be regarded as true shells. The shell in mollusca grows with the growth of the animal, to which it affords protection.

The shell or test of a crustacean does not grow after it has once been formed, but is cast and renewed from time to time. In its most elementary form the molluscan shell exists as simply a covering to the gills Each separate piece is termed a valve. So that when the shell consists of one piece, as in whelks, limpets, etc., it is called a univalve; when in two pieces, as in oysters, mussels, etc., it is called a bivalve; and in the Chiton family of gasteropoda it is called, because of its eight pieces, a multivalve. In their chemical composition shells are usually composed of carbonate of lime, mixed with a small proportion of organic matter. Shells are much used in ornamental manufactures

SHELL, a hollow projectile filled with a bursting charge of gunpowder or other explosive composition, and fitted with a fuse to fire it at the desired point. Shells are usually made of cast-iron or steel, and for mortars or smooth-bore cannon are spherical, but for rifled guns are as a rule elongated. There are many kinds of shells.—Common shells are simple hollow projectiles filled with powder. On explosion they act like a mine. They are very effective in breaching earth-works or masonry.—Palliser shells are made of mottled iron with pointed heads, nearly solid, and chilled white by being cast in iron moulds. They are intended for use against armor-clad vessels; the chilled point, in virtue of its intense hardness



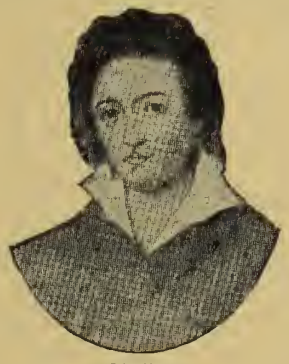
Shells.

1, Armour-piercing steel shell for 111-ton gun. 2, Shrapnel for 111-ton gun. 3, Common shell for 111-ton gun.

and great crushing strength, penetrates to an extraordinary depth. Steel shells of similar power have also been made.—Shrapnel shells are shells filled with bullets, and with a small bursting charge just sufficient to split the shell open and release the bullets at any given point.—Segment shells are of the nature of shrapnel. They contain iron segments built up round the inside of the shell. From their construction they are inclined to spread much more than shrapnel on bursting, and they should consequently be fired to burst close to the object. With percussion fuses great results are produced.

SHELLEY, Mary Wollstonecraft, the second wife of the poet Shelley, was the daughter of William Godwin and Mary Wollstonecraft, and was born in London 1797, died 1851. Her romance of Frankenstein, which excited an immense sensation, was published in 1818, when she was at most twenty-one years old. In 1840–41 she edited Shelley's works, with preface and biographical notes.

SHELLEY, Percy Bysshe, born at Field Place, Horsham, Sussex, 4th August, 1792. At Oxford, in his second year at the university, he published anonymously, apparently as a challenge to the heads of the colleges, to whom it was sent, a scholastic thesis entitled A Defense of Atheism. The authorship being known he was challenged, and refusing either to acknowledge or deny it was at once expelled. After leaving the university he completed his poem of Queen Mab, begun some time previously and privately printed in 1813. His first great poem, Alastor, or the Spirit of Solitude, saw the light in 1816; and this was followed in 1817 by the Revolt of



Shelley.

Islam, a poem in the Spenserian stanza. His principal poems, besides those already mentioned, are Rosalind and Helen, and Julian and Maddola (the latter a poem recording some of his intercourse with Byron), produced in 1818; the Cenci and the Prometheus Unbound, in 1819; the Witch of Atlas, in 1820; and the Epipsychidion, the Adonais (an elegy on Keats), and the Hellas, in 1821. He was drowned in the Bay of Spezia, Italy, July 8, 1821. Many memoirs of Shelley have appeared the best of which is the Life by Prof. Ed. Dowden published in 1886.

SHEM, the eldest son of Noah, and ancestor of Abraham, who was the eighth in descent from him according to the genealogies in the book of Genesis.

SHENANDO'AH, a town in Schuylkill, co., Pennsylvania, 12 miles n. of Pottsville. Founded in 1863, it is the center of a great coal district. Pop. 22,416.

SHENANDOAH, a river of the United States, which flows northeast through the valley of Virginia, and immediately below Harper's ferry joins the Potomac, of which it is the principal tributary. Its length is 170 miles, the greater part of which is navigable for boats The valley of the Shenandoah was the scene of numerous military operations in the American civil war, and was devastated by General Sheridan in 1864.

SHEN-SE, a province of China, bounded on the north by the Great Wall, and on the east by the Yellow river; area, 80,900 sq. miles. Pop. 8,276,967.

SHEOL, a Hebrew word frequently occurring in the Old Testament, and rendered in the Septuagint by "hades," in the Authorized Version of "grave," "pit," and "hell," but in the Revised Bible of 1885 never, except in one instance, by the last term. It was, as originally conceived, the gloomy underworld, the abode of the ghosts or spirits of the dead. No retributive idea was connected with it until the time of the exile.

SHERE ALI KHAN, Amir of Afghanistan, was born about 1823, and succeeded his father, Dost Mohammed, in 1863. Shere Ali in 1879 died, a fugitive, in Afghan Turkistan. He was succeeded by his second son, Yakub Khan, who, however, on account of the Cavagnari massacre, was speedily deposed and deported to India, and was succeeded by his cousin, Abdur Rahman Khan, in 1880.

SHER'IDAN, Philip Henry, American general, and the greatest cavalry leader produced by the American civil war, was born at Somerset, Ohio, in 1831, graduated at the Military academy, West Point, in 1853, and from 1855 to 1861 served on the frontiers of Texas and Oregon. At the outbreak of the civil war he was a captain in the 13th infantry. Having greatly distinguished himself in the earlier battles of the war, in April, 1864, Grant appointed him chief of cavalry of the Army of the Potomac, and he made several daring cavalry raids into the south. His rush from Winchester to Cedar Creek, a distance of 20 miles, in October, 1864, which turned a federal defeat into a brilliant victory, is known as "Sheridan's Ride." During the final advance upon

Philip H. Sheridan.

Richmond he was Grant's right-hand man; he fought the battle of Five Forks, which necessitated Lee's evacuation of Richmond and Petersburg; and as Lee fled he constantly harassed and attacked him until he compelled his surrender at Appomattox Courthouse, April 9, 1865. After the war he held various military commands. In March, 1869, he became lieutenant-general, and in February, 1884, on the retirement of Sherman, he succeeded to the command of the army. He died August 5, 1888. An account of his military career, written by himself, appeared in 1889.

SHERIDAN, Richard Brinsley Butler, was born at Dublin in 1751, his father being Thomas Sheridan, actor, and latterly teacher of elocution. Without means or a profession he applied himself to composition for the stage, and on 17th January, 1775, brought out The

Rivals, which, after a temporary failure, from bad acting, attained a brilliant success. On 21st November, he produced the comic opera, The Duenna, which had a run of seventy-five nights an unprecedented success. In 1776 he managed to find money to become one of the proprietors of Drury Lane Theater, where, in 1777, appeared The School for Scandal, his most famous comedy, and in 1779 The Critic, a farce, which like the Duenna and The School for Scandal was a model of its kind, and shared in their brilliant success. His dramatic reputation, and especially his social gifts, brought him into intimacy with Fox, Burke, Windham, and other whig leaders, and in 1780 Fox got him returned to parliament for Stafford. In 1782 he became under-secretary of state; in 1783 secretary of the treasury; in 1806 treasurer of the navy and privy-councillor. He never became a statesman, but his fame soon rose high as an orator. His greatest effort was his "Begum" speech on the impeachment of Warren Hastings (1787), which Pitt said "surpassed all the eloquence of ancient and modern times." His wife died in 1792. In 1795 he married Miss Ogle, a daughter of the Dean of Winchester, with whom he received a considerable accession of means. His parliamentary career ended in 1812, and the remainder of his life was constantly harassed by debt and disappointment. He died in 1816, having narrowly escaped arrest for debt on his death-bed.

SHER'IFF, in England, the chief officer of the crown in every county, appointed annually. The custody of the county is committed to him by letters-patent, and he has charge of all the business of the crown therein. During his tenure of office he takes precedence within the county of any nobleman, and is entitled to sit on the bench with the justices of assize. The person appointed is bound under a penalty to serve the office, except in specified cases of exemption or disability, but a person who has served one year is not liable to serve again till after an interval of three years if there be another sufficient person in the county. The sheriff is specially intrusted with the execution of the laws and the preservation of the peace and for this purpose he has at his disposal the whole civil force of the county—in old legal phraseology the posse comitatus. The most ordinary of his functions, such as the execution of writs, he universally performs by a deputy called under-sheriff, while he himself only performs in person those duties which are either purely honorary, such as attendance upon the judges on circuit, or which are of some dignity and public importance, such as presiding over elections and holding county meetings, which he may call at any time. The office of sheriff was formerly hereditary in some counties, and continued so in Westmoreland till the death of the last hereditary sheriff the Earl of Thanet, in 1849.

In the United States the sheriff is a very different functionary, not holding the position of a judge at all, but acting as the highest peace officer of his county, having to pursue and arrest criminals, to carry out sentences, to take charge of the jail, etc.

SHERMAN, a city in Grayson co., Texas, 73 miles n. of Dallas. It is the center of a cotton and grain district. Pop. 12,240.

SHERMAN, JAMES SCHOOLCRAFT, born in Utica, N. Y., Oct. 24, 1855; graduated from Hamilton College, 1878; admitted to the bar, 1880; president Utica Trust and Deposit company and of the New Hartford Canning company; mayor of Utica, 1884; elected as Republican to 50th, 51st, 53d, 54th, 55th, 56th, 57th 58th, 59th and 60th congresses; nominated for vice president of the United States and elected to that office in November, 1908.

SHERMAN, John, American statesman, was born in 1823, at Lancaster, Ohio In 1855 he was elected to the thirty-fourth congress in the interest of the Free-Soil party, and was reëlected to the thirty-fifth and thirty-sixth congresses. He became a power on the floor and in committees, and was recognized as the foremost man in the house, particularly in matters affecting finance. He was again elected to congress in 1860, but in the following year was chosen to the United States senate, where he at once became a leader. In March, 1877, Senator Sherman was appointed, by President Hayes, secretary of the treasury. It was due to his management while at the head of the treasury, that the resumption of specie payments was effected in 1879 without disturbance to the financial or commercial interests of the country. He was a prominent candidate for the republican presidential nomination in 1880, and again in 1888. In 1897 he resigned from the senate to become secretary of state in the cabinet of President McKinley. He resigned this office shortly after the outbreak of war with Spain in 1898, retired to private life, and prepared his Forty Years in the House and Senate. He died in 1900

SHERMAN, Roger, born in Newton, Mass., April 19, 1721; died in New Haven, Con., July 23, 1793. When the revolution began he sided with the patriots, and in August, 1774, was chosen as delegate to the continental congress. Later, with Adams, Franklin, Jefferson, and Livingston, he was one of the committee who drew up the declaration of Independence. From 1784 until his death he was mayor of New Haven, and in 1791 was United States senator for Connecticut.

SHERMAN, William Tecumseh, American general, was born at Lancaster, Ohio, 1820, graduated at the military academy, West Point, in 1840, and served in Florida, Mexico, and elsewhere till 1852, when he resigned his commission. On the breaking out of the civil war he offered his services to the United States government, and was appointed colonel of the 13th regiment of infantry. He was present at the battle of Bull Run, greatly distinguished himself at Shiloh, and subsequently took a prominent part in the operations under Grant around Vicksburg and Memphis. In March, 1864, he succeeded Grant as commander of the military division of the Mississippi, and at the beginning of May, simultaneously with Grant's advance in the east, he entered upon his invasion of Georgia. On September 2, after a number of battles, he received the capitulation of Atlanta, and on December 21, of Savannah; and then turning northward into the Carolinas and fighting more battles, he received the surrender of General J. E. Johnston, at Durham station, April 26, 1865, a

William Tecumseh Sherman.

surrender which brought the war to a close. Sherman was made a major-general in August, 1864, lieutenant-general in July, 1866, and general and commander-in-chief in March, 1869. He was retired in 1884. His military career is detailed in his Memoirs, written by himself, and published in 1875. He died in 1891.

SHERRY, a Spanish wine made in the neighborhood of Xeres de la Frontera, in the province of Andalusia, near Cadiz. The soil of the best vineyards consists chiefly of carbonate of lime, with a small admixture of silex and clay, and occasionally magnesia. The dry sherry is the most esteemed, the finest variety being the Amontillado sherry. The sherry wines are shipped for the most part at Cadiz, and are principally exported to England. No wine is more largely imitated and adulterated than sherry.

SHETLAND, or **ZETLAND,** an insular county of Scotland, about 50 miles n.e. of Orkney; area, 352,876 acres. It consists of about ninety islands and islets, of which twenty-nine are inhabited, the largest being the following: Mainland, Yell, Unst, Whalsey, Fetlar, and Bressay, the first occupying about three-fourths of the whole area of the group. The Shetland pony is well known, and is not surpassed by any horse of its dimensions for strength and hardihood. The fisheries, especially the herring-fishery, are very valuable, and afford the chief employment. The knitting of woolen articles may be said to be the only native manufacture. For parliamentary purposes Shetland unites with Orkney in returning one member. The only town is Lerwick. Pop. 26,185.

SHIB'BOLETH, a word which was made by Jephthah the criterion to distinguish the Ephraimites from the Gileadites at the fords of Jordan.

SHIELD, a piece of defensive armor,

borne on the left arm. Shields gradually disappeared with the introduction of firearms, but the target and broadsword were the favorite arms of the Scotch Highlanders up to the middle of the 18th century.

SHIELD, in heraldry, the escutcheon or field on which are placed the bearings in coats of arms. The shape of the shield upon which heraldic bearings are displayed is left a good deal to fancy; the form of the lozenge, however, is used only by single ladies and widows. The shield used in funeral processions is of a square form, and divided per pale, the one half being sable, or the whole black, as the case may be, with a scroll border around, and in the center the arms of the deceased upon a shield of the usual form.

SHIELDS, South, a municipal, parl., and county borough of England, in the county of Durham, near the mouth of the Tyne, opposite to North Shields, and communicating with it by steam-ferry. The industries comprise glass earthenware, alkali and chemicals, cordage, steam-engine boilers, and chain-cables and anchors, besides ship-building. Pop. 97,267.

SHIITES (shi'itz), one of the two great sects of Mohammedans, who do not acknowledge the Sunna as a law, and believe that Ali, the fourth caliph after Mohammed, was his first lawful successor. The Persians are Shiites. See Sunnites.

SHIKARPUR', chief town of Shikarpur District, Sind Province, Bombay presidency, India, 18 miles west of the Indus and 26 southeast of Jacobabad. It is an emporium for transit trade between the Bolan Pass and Karachi, but has lost much of its commercial importance since the opening of the Indus Valley railway. The principal manufactures are carpets and coarse cotton cloth. Pop. 50,000.

SHILLING, an English silver coin, equal in value to 12 bronze pence or one-twentieth of a pound sterling, and approximate in value to 24 American cents, to 1.25 French francs, and to 1.11 German marks.

SHILOH, Battle of, one of the most memorable battles of the American civil war. Shiloh is in Tennessee, 2 miles west of Pittsburg Landing, on the Tennessee river, and took its name from a log chapel known as "Shiloh church." The battle was fought on the 6th and 7th of April, 1862, Grant and Sherman leading the federals, and A. S. Johnson and Beauregard the confederates. The first day the confederates, taking the federals by surprise, drove them from their lines, with heavy loss in men and guns; but the second day the federals, having received reinforcements, and largely outnumbering the confederates, regained their lines, and forced the confederates to retreat to their former position at Corinth.

SHINGLE, a thin piece of wood resembling a roofing slate, and used for the same purpose and in the same way. In Canada and the United States, and other places where timber is plentiful, shingles are extensively used for a roof-covering. They are usually cut by ingenious machinery devised for the special purpose.

SHINGLES, an eruptive skin disease, which usually starts from the backbone and goes half way round the body, forming a belt of inflamed patches, with clustered vesicles. It rarely encircles the body, though the popular opinion that if it does it will prove fatal is a delusion. It is sometimes produced by sudden exposure to cold after violent exercise, and sometimes follows acute affections of the respiratory organs. It seems to depend upon abnormal nervous action, as it frequently marks out upon the surface the part of the integument supplied by some one branch of a nerve. It is usually attended with more or less neuralgic pain and fever. It is a self-limited or cyclical disease, usually running its coarse in about a fortnight.

SHINTO'ISM, one of the two great religions of Japan. In its origin it was a form of nature worship, but the essence of the religion is now ancestor worship and sacrifice to departed heroes.

SHIP, in the most general sense, a vessel intended for navigating the ocean. In contradistinction to boat, which is the most general term for a navigable vessel, it signifies a vessel intended for distant voyages. Ships are of various sizes, and fitted for various uses, and receive various names, according to their rig and the purpose to which they are applied, as man-of-war ships, transports, merchantmen, barques, brigs, schooners, luggers, sloops, xebecs, galleys, etc.

The ancient art of ship-building, like many other arts, was lost in the overwhelming tide of barbarism which overthrew the last of the great empires of antiquity. The ruder nations of Europe had to begin again in great measure on their own resources. The war galley of the ancients may possibly be so far preserved in the mediæval galleys applied to the same purpose. On the Mediterranean, too, an unbroken line of coasting ships may probably have continued to sail. But it appears evident that the progress made in ship-building under the Roman Empire, not to speak of the Phœnicians and other earlier navigators, was much greater than was transmitted to mediæval Europe. Ship-building made little progress in Europe till the discovery of the compass, which was introduced in a rude form in the 12th century, and had been improved and had come into common use in the 14th century. The opening up of the passage to India and the discovery of America made another epoch in its progress. In the building of large vessels the Spaniards long took the lead, and were followed by the French, who especially distinguished themselves in the theoretical study of the art. In the early progress of the art of ship-building the English took little or no part. When Henry VII. built the Henry Grace de Dieu, which is regarded as the parent of the British navy, the English were greatly inferior to the nations of Southern Europe both in navigation and in ship-building. In the reign of Elizabeth the English fleet proved its superiority to that of Spain in respect of fighting capacity, but it was afterward rivaled by that of Holland. Rapid improvement was made in ship-building during the 17th and 18th centuries in England as well as the maritime states of the Continent. The first three-decker was built in England in 1637. She was called the Sovereign of the Seas, and was deemed the best man-of-war in the world. In 1768 the French adopted three-deckers; and from their application of science they acquired a decided superiority in the size and models of their ships over the English. In the early part of the present century the lead in improvement was taken by the United States. English builders were at first skeptical as to American improvements; but in 1832 Scott Russell theoretically established the principles on which speed in sailing depends—principles which had already been practically applied not only by the Americans but by the Spaniards. From the time of their theoretical establishment they were rapidly adopted in England, and a race of improvement began between Great Britain and America. The true principles of construction both in build and rig were exemplified in the celebrated Baltimore clipper schooners, which were sharp in the bow, deep in the stern, of great length, and lying low in the water, with long, slender masts, and large sails cut with great skill. The same principles were afterward applied to square-rigged vessels, and produced the English and American clipper ships which did so much to develop the trade of India, China, and Australia with both Europe and America.

A great change came over the art of ship-building when steam was introduced and wood gave place to iron and then to steel. The first steamer built expressly for regular voyages between Europe and America was the Great Western, launched in 1837. She was propelled by paddles, but about the same time Ericsson invented his screw-propeller, which was soon adopted in sea-going ships, and the British Admiralty possessed a screw vessel in 1842. Iron vessels were built early in the 19th century for canal service, then for river service, and later for packet service on the coasts. About 1838 iron vessels were built for ocean service, but the first ocean-going steamship in its present form, built of iron and propelled by the screw, was the Great Britain, launched in 1842. Compound engines were first introduced with high-pressure steam in 1854. The progress of steam navigation is marked by special types of vessels built from time to time. Many of the vessels belonging to the great ocean lines are splendid specimens of naval architecture, some of them being nearly 800 feet in length, having a displacement of 30,000 or 40,000 tons or even more, and with engines working up to 30,000 or 40,000 horse-power, and making the trip from Queenstown to New York in less than five days. The largest vessels are all propelled by steam, but very large sailing vessels are now constructed also, especially since it became not uncommon to fit them with four, and even five, masts.

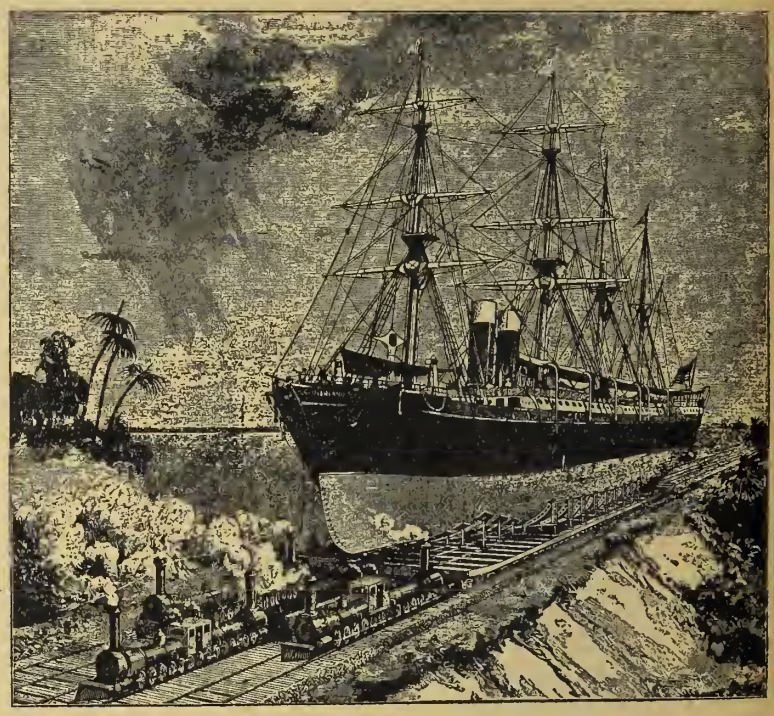
An iron vessel is lighter than a wooden one of the same size, and with iron the same strength may be obtained with less weight. Iron is also far more manageable than wood, as it can be

bent with ease into any required shape. Steel, which is now superseding iron for building ships, is a still lighter material and is equally manageable. See Sail and Steamship.

SHIP CANAL, a canal for the passage of sea-going vessels. Ship canals are intended either to make an inland, or comparatively inland place, a seaport, or to connect sea with sea, and thus obviate a long ocean navigation. Of the former kind are the Manchester Ship Canal, making that city a seaport, and the Amsterdam Canal, which gives Amsterdam a direct passage to the North Sea at Ymuiden. Of the latter kind are the Suez Canal, the Caledonian Canal, the North Sea and Baltic Canal, and (not yet completed) the Panama Canal, Nicaragua Canal, etc. The Caledonian Canal was formed by the British government for military purposes. It is a good example of a ship canal which traverses high districts and surmounts the elevation by locks. The Suez Canal (1860-69) is the greatest of all ship canals yet complete. It has no locks whatever, and communicates freely with the sea, connecting the Mediterranean with the Red Sea, 88 miles, and reducing the length of the voyage from London to India from 11,379 to 7628 miles. The Panama Canal, designed to connect the Atlantic Ocean with the Pacific, will be the greatest engineering work of the kind the world has ever seen.

SHIPKA PASS, a pass in the Balkans, about 4600 feet above the sea, the scene of a desperate and bloody ten days' struggle during the Russo-Turkish war (August and Sept. 1877). In his futile endeavors to take Fort Nicholas at the summit of the pass from the Russians, Suleiman Pasha lost 20,000 of his best men.

SHIP RAILWAY, a railway composed of several tracks, with some sort of carriage for transporting vessels from one body of water to another. Captain J. B. Eads's proposed plan for the Tehuantepec Ship Railway, across the isthmus between North and South America in Mexican territory, consists essentially of a series of some eight or ten tracks, having a carrying car or cradle of some five sections, with altogether 1000 wheels. Calculated for a vessel of 10,000 tons, this would not give a pressure so great as that of an ordinary locomotive. A ship railway has been constructed by the Canadian government between Chignecto Bay, in the Bay of Fundy across the isthmus to Northumberland Straits, a distance of 17 miles, which enables vessels to go from Prince Edward Island to St. John, New Brunswick, in twelve hours, and greatly facilitates the transport of grain in bulk from the lake ports to New Brunswick. The vessels are raised by hydraulic pressure a height of 40 feet to the level of the railway, and placed on a double track 18 feet from center to center. The flexible car system of ship railway invented by William Smith, harbor engineer of Aberdeen, is designed to allow of the use of ordinary railway gradients. The car is in sections, each carried on a compound bogie running on parallel lines. Vertical and lateral flexibility are secured, and the ship is sustained on the car by water-cushions, so that it is virtually kept floating. The ship is raised on to the cars by means of a submerged shipway inclosed within a wet dock.



Ship railway.

SHIP-WORM, the popular name of a lamellibranchiate mollusc belonging to the Pholadidæ or pholas family, and distinguished by the elongation of the respiratory "siphons" or breathing-tubes conveying water to the gills, which give to this mollusc a somewhat vermiform or wormlike aspect. The two valves or halves of the shell are of small size and globular shape, and are situated at its anterior extremity, the valves

Ship-worm, and piece of wood perforated by teredos.

being three-lobed. In length the ship-worm averages about a foot, and in thickness about ½ inch. It has gained great notoriety from its boring habits, occasioning great destruction to ships and submerged wood by perforating them in all directions in order to establish a habitation. In boring into the wood (the shell is the boring instrument) each individual is careful to avoid the tube formed by its neighbor, and often a very thin film alone of wood is left between the cavities, which are lined with a calcareous incrustation. Various plans are tried to protect ships, piers, etc., from this destructive animal, such as copper-sheathing, treating with creasote, etc.; but the plan which appears to have been most successful in arresting its ravages is that of driving a number of short nails with large heads into the exposed timber. The rust from the heads of the nails appears to prevent its operation. A large species of teredo occurs in warm latitudes, where it bores into the hardened mud or sand of the sea-bed, as well as into timber.

SHITTIM-WOOD, of which the tabernacle in the wilderness was principally constructed, was the wood of the shittah tree of the Bible, which is supposed to be the Acacia seyal of the Sinaitic peninsula. (See Acacia.) It is a light but cross-grained and enduring wood, of a fine orange-brown color.

SHOCK, in medicine, a sudden vital depression of the system produced by violent injuries or violent mental emotions. It is especially a surgical term. The vital phenomena of the body —consciousness, respiration, heart-action, capillary circulation—are depressed in proportion to the shock received by the nerve-centers. In the state of collapse consequent upon a shock the patient lies completely prostrate, the face pale and bloodless, the skin cold and clammy, and the features contracted and expressive of great languor. There is also extreme muscular debility, and the pulse is frequently, so weak as scarcely to be perceptible. Incoherency, drowsiness, or complete insensibility, is often manifested on the part of the patient. Shock results either in a com-

plete suspension of the action of heart, causing death, or passes into reaction; and the treatment of shock is to be directed to the immediate development of reaction. In mild cases external warmth, a little stimulant, and rest are all that is required; but in the severer forms a more liberal recourse to heat and stimulants is absolutely necessary, and should be continued until indications of commencing reaction appear. The heat should be applied to the pit of the stomach and the extremities by means of hot flannel, hot-water tins, or like appliances. The stimulant most recommended is brandy in hot water, and this should be followed by nourishment, such as beef-tea.

SHODDY, the fibrous substance composed of woolen rags torn fine in a machine called a "devil," and converted into cheap cloth by being mixed and spun with a certain proportion of fresh wool.

SHOES, coverings for the feet, generally made of leather in Europe and America, but in Holland and France often of wood, and in China and Japan of paper and other fabrics. The shoe is a combination of the sandal of the oriental races and the moccasin of untanned hides of savage races—sole without upper and upper without sole. The first allusion to a shoe in the Old Testament is where Abraham refuses to take so much as a "shoe-latchet" from the King of Sodom. For "shoe" in this instance we are probably to understand "sandal;" but shoes proper, as well as sandals, seem to have been used among the Jews; for on the black obelisk from Nimroud Jews are represented as wearing shoes or boots with turned-up toes, similar to those worn by orientals in the present day. The Romans used various kinds of shoes, such as the solea or sandal; the calceus, which covered the whole foot, somewhat like our shoes, and was tied with a latchet or lace; and the caliga, a very strong kind of shoe, sometimes shod with nails, worn by the soldiers, who were thence called caligati. Both in ancient and in modern times the fashion of shoes has varied much, just as in other articles of dress. In the reigns of Henry I. and Stephen, shoes were made for the fashionable with long points stuffed with tow, and made to curl in the form of a ram's horn; and in the reign of Richard II. the points had increased to such an extent that they reached the knee, to which they were secured by chains of silver or gold. In the 18th century, among the ladies, absurdly high-heeled shoes were the rage, a fashion which has been revived within the last few years. The present simple form of shoe was adopted in the early part of the 17th century, and somewhat later the shoe buckle came into use. In the early part of the 19th century buckles appear to have become unfashionable, their place being supplied by the simpler and less costly shoestrings. To the same period belongs another improvement, that of making shoes right and left. Boots are a variety of shoe with the upper leathers lengthened so as to protect part of the leg. Till recently the making of boots and shoes was a purely manual handicraft; now, with the exception of the finest and best finished qualities, the manufacture is done almost entirely by machinery.

SHOLAPUR', chief town of Sholapur district, Bombay presidency, India, 150 miles by rail from Poona. Its situation between Poona and Haiderabad has made it, especially since the opening of the railway in 1859, the center for the trade of a large extent of country. Its chief industry is the manufacture of silk and cotton cloth. Pop. (including cantonment), 75,288.—The district of Sholapur has an area of 4521 sq. miles, and pop. 720,978.

SHOOTING-STAR, a meteor in a state of incandescence, caused by the resistance of the atmosphere, seen suddenly darting along some part of the sky. See Aerolite and Meteor.

SHORTHAND, the method of writing by which the process is so abbreviated as to keep pace with speech. It is also known, according to the principle underlying the particular system, as tachygraphy (quick writing), brachygraphy (short writing), stenography (compressed writing,)and phonography (sound writing). It was practiced by the ancient Greeks and Romans, not only on account of its brevity but for purposes of secrecy; but all knowledge of the art was lost from the 10th century until the end of the 16th, when modern shorthand had its birth in the publication by Dr. Timothy Bright of his Characterie (1587), and by Peter Bales of his Arte of Brachygraphie (1590). In these early systems abritrary signs were used in most cases to denote each word. The earliest system of shorthand of any practical importance was that of John Willis, whose Arte of Stenographie (1602) became very popular. It was based on the common alphabet, with the addition of arbitrary signs; and this, indeed, was the character of the numerous systems which obtained until the time of Pitman (1837).

Pitman had a number of predecessors, whose systems, like his own, were strictly phonetic. These systems, however, never obtained any footing, while Pitman's almost immediately became popular, and is now used by a larger number of reporters and shorthand writers than any other. Like all other phonetic systems, Pitman's rejects the ordinary orthography, and writes words according to their sounds; thus, though becomes tho,' plough becomes plow, and enough becomes enuf. Discarding the common alphabet, which formed the basis of the stenographic systems, it has adopted an alphabet of its own, consisting of a series of straight lines, curves, dots, etc., each representing a distinct sound. This alphabet is the basis of a highly ingenious and complex system, which aims at securing the greatest degree of brevity consistent with legibility. This end it endeavors to attain by a variety of devices, forming integral parts of the system. In rapid writing on Pitman's system the vowels are generally omitted

SHORTHORNS, a breed of cattle externally distinguished by the shortness of their horns, which originated in the beginning of the 19th century in the valley of the Tees, and under the name of Durhams, Teeswaters, or Shorthorns, soon spread over all the richly pastured districts of Britain. They are excellent for grazing purposes, being of rapid and large growth with aptness to fatten, but are inferior to some other breeds for dairy purposes.

SHOSHONE FALLS (sho-shō'nē), on Lewis or Snake river, in the state of Idaho, United States. They rank among the waterfalls of North America next to those of Niagara in grandeur, being about 300 yards wide and 200 feet high.

SHOSHONES (sho-shō'nēz), or **SNAKES,** a tribe of North American Indians inhabiting a considerable stretch of territory in Idaho, Utah, Nevada, etc. They live partly by hunting and fishing, many of them also on roots and small animals. They number about 5000.

SHOT, a term applied to all solid projectiles fired from cannon, and also to hollow projectiles without bursting charges, as the Palliser shot. Solid shot have gradually disappeared since the introduction of rifled guns, which fire elongated shot with more or less conical heads. Some of the shot fired by the immense guns now used weigh not far short of a ton. Smooth-bored ordnance still use solid round shot and case-shot Case-shot consists of iron balls packed in iron or tin cylindrical cases. Grape differs only in the balls being larger. Shot is also the name given to the small round pellets of lead used with sporting guns for shooting small quadrupeds and birds. This kind of shot is made by dropping the melted lead through the holes of a colander set at a considerable height above water, the drops naturally assuming the globular form.

SHOULDER-JOINT, the articulation of the upper arm or humerus with the plenoid cavity of the scapula or shoulder-blade. The shoulder-joint forms an example of the ball-and-socket joints, the ball-like or rounded head of the humerus working in the shallow cup of the glenoid cavity. Such a form of joint necessarily allows of very considerable movement, while the joint itself is guarded against dislocation or displacement by the strong ligaments surrounding it, as well as by the tendons of its investing and other muscles. The muscles are the supraspinatus above, the long head of the triceps below, the subscapularis internally, the infraspinatus and teres minor externally, and the long tendon of the biceps within. The deltoid muscle lies on the external aspect of the joint, and covers it on its outer side in front, and behind as well, being the most important of the muscles connected with it. The movements of the shoulder-joint consist in those of abduction, adduction, circumduction, rotation—a "universal" movement being thus permitted; and its free motion is further aided, when the bony surfaces are in contact, by separate movements of the scapula itself, and by the motions of the articulations between the sternum and clavicle, and between the coracoid process and clavicle also. The biceps muscle, from its connection with both elbow and shoulder joints, brings the

movements of both into harmonious relation. The shoulder-joint is liable to various diseases and injuries. Local injury may result in inflammation of the joint, while special diatheses or diseased conditions of constitutional origin may each give rise, either per se or through injuries, to such lesions as strumous or scrofulous disease of the joint, to syphilitic lesions, and to gouty or rheumatic attacks. Of the accidents to which the joint is liable dislocations are by far the most frequent.

SHOVEL-FISH, a genus of fishes belonging to the sturgeon family, and found in North American rivers. It is so named from the flattened form of the head.

SHOVELLER-DUCK, a genus of ducks, distinguished by its long bill, of which the tip is hooked and broadened. The average length of this bird is about 18 or 20 inches. In the male the colors are rather gay and varied—green, white, brown, pale, blue, and black. The coloring of the female is more somber. The shoveller-duck is found in Britain during the winter months.

SHOWBREAD, in the Bible, the twelve loaves of bread, representing the twelve tribes of Israel, which were exhibited before the Lord on the golden table in the sanctuary. They were made of fine flour unleavened, were changed every Sabbath, and were eaten by the priests only.

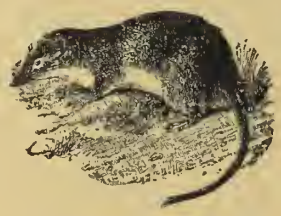
SHRAPNEL, Lieutenant-general Henry, entered the Royal Artillery in 1779, served with the Duke of York's army in Flanders, and shortly after the siege of Dunkirk invented the case-shot known by the name of shrapnel-shells, an invention for which he received from government a pension of $6000 a year in addition to his pay in the army. He retired from active service in 1825, attained the rank of lieutenant-general in 1827, and died in 1842.

SHREVEPORT, a city in the state of Louisiana, on the Red river, 327 miles by rail n.w. of New Orleans, with which it has regular steamboat communications. It is situated in a splendid cotton-growing region, and is one of the principal cotton-markets in the southwest of the United States. Its industries are varied. Pop. 19,161.

SHREW, or SHREW-MOUSE, a genus of mammals belonging to the order Insectivora, and to be carefully distinguished from the ordinary and common mice which are included in the order Rodentia; and from the dormice, also belonging to the Rodent order. The shrews form the family Soricidæ, and the genus Sorex includes the typical members, namely, the common shrew. the lesser shrew, and the water shrew, The common shrew averages about 4 inches in length, the square tail making up half of this measurement. It may readily be distinguished by its prolonged muzzle, by the teeth being colored brown at the tips, and by the reddish-brown fur. It feeds upon insects and their larvæ, and inhabits dry places, making a nest of leaves and grasses. Its habits are chiefly nocturnal. Shrews are very voracious in their habits, and frequently kill and devour one another. They secrete a fluid of disagreeable odor in special glands, and this odor prevents larger animals from eating their flesh. In former days the bite of the shrew was accounted venomous, while its body, variously treated, was regarded as a cure for many complaints. The lesser shrew closely resembles the common shrew in external form, differing from it chiefly in point of size. The water shrew attains a total length of from 4½ to 5 inches. The snout is not so

Common European shrew.

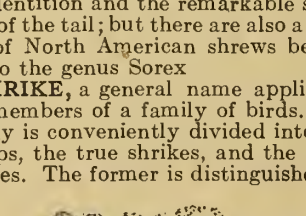
pointed as that of the common shrew. The ears are very small. The color is black on the upper and white on the under parts. A prominent swimming fringe of stiff white hair is found on the tail and on the toes, and forms a distinctive features of the species. Its food resembles that of the common shrew, but aquatic larvæ appear to form a large part of its nutriment. It makes its bur-



American water-shrew.

rows in the overhanging banks of rivers and lakes, and dives and swims with great facility. The red-toothed shrews characteristic of the North American continent belong to the allied genus Blarina, distinguished from Sorex by the dentition and the remarkable shortness of the tail; but there are also a number of North American shrews belonging to the genus Sorex

SHRIKE, a general name applied to the members of a family of birds. The family is conveniently divided into two groups, the true shrikes, and the bush-shrikes. The former is distinguished by



Great gray shrike.

the broad base of the bill, which is hooked at the tip. The nostrils, which are situated laterally, are surrounded by bristles. The fourth quill is longest in the wings, and the tail is of graduated or conical shape. The name of drongos or drongo-shrikes has been given to certain birds allied to the shrikes, and forming the family Dicrurinæ. The forked-tailed crested shrike, a bird inhabiting India, about 10 inches in length, is an example of these.

SHRIMP, the name applied to many small crustaceans, and especially to the common shrimp, which belongs to the ten-footed crustacea and to the sub-order Macroura (long-tailed). The common shrimp reaches a size of about 2½ inches, inhabits the sand of many parts of coasts and is caught for the market by means of a bagnet placed transversely on a pole, which is pushed through the sand at a depth of about 1½ or 2 feet. When alive it is of a light-brown or almost white color, resembling that of the sand in which it lives, but after boiling it assumes the well-known brown-color. It is common on the east and west coasts of North America as well as those of Britain. The red shrimp inhabits deeper water than the common shrimp, and is not nearly so abundant. It reaches a size of from 2 to 2½ inches. When alive it is of a reddish-gray, with spots of deeper red; after boiling it is of a uniform deep red. This species is sometimes confounded with the common prawn; but it never reaches the size of the prawn, which, when adult, is above 4 inches in length.

SHRINE, originally a reliquary, or some kind of receptacle, for holding the bones or other relics of saints. Sometimes shrines were merely small boxes with raised tops like roofs; sometimes actual models of churches; sometimes the tombs or mausoleums of saints—

Portable shrine, Malmesbury abbey.

large constructions, like that of Edward the Confessor at Westminster. Many were (and are) ornamented with gold, precious stones, or inlaid work; and among Roman Catholics some shrines are still objects of pilgrimage.

SHROPSHIRE, or **SALOP,** an inland county of England, bounded by Cheshire, the detached part of Flintshire, Denbighshire, Montgomeryshire, Radnorshire, Herefordshire, Worcestershire, and Staffordshire. Area, 841,167 acres, of which about seven-eighths are under crop. Pop. 239,321.

SHROUDS, a range of large ropes extended from the heads of the lower masts to both sides of a ship to support the masts, and named, from the masts to which they belong, the main, fore, and mizzen shrouds. Topmast, topgallant, and bowsprit shrouds are all similar in their object.

SHROVE-TUESDAY, the day before the first day of Lent or Ash-Wednesday,

so called as a day on which confession was specially made and "shrift" received. (See Carnival and Lent.) It was a day of considerable festivity, and from the common practice of eating pancakes then the day came to be called Pancake Tuesday.

SHRUBS, plants in which the perennial portion forms the greater part, which branch near the base, which are taller than bushes but not so tall as trees, seldom exceeding the height of a man. For practical purposes shrubs are divided into the deciduous and evergreen kinds. Among ornamental shrubs the best known are those belonging to the genera Rosa, Ribes, Rhododendron, Azalea, etc. Among evergreen shrubs are the box, the laurel, and various heaths.

SIAM', a kingdom embracing a great part of the Indo-Chinese Peninsula and part of the Malay peninsula, and lying between Burmah on the west, and Anam and Cambodia on the east and southeast. Its chief natural boundaries are the Mekong and the sea. Its area is estimated at about 200,000 sq. miles, and its population at 6,000,000, including 2,000,000 Siamese, 2,000,000 Laotians, 1,000,000 Chinese, and 1,000,000 Malays. The minerals include gold, tin, iron, copper, lead, zinc, and antimony, besides several precious stones, such as the sapphire, oriental ruby, and oriental topaz. During the dry season, which lasts from November to May, there is an utter absence of rain in this region, which again is so flooded by rain during the wet season as to be converted into a vast swampy forest. Cocoa and areca palms are numerous in Siam; fruits are abundant and of excellent quality; black pepper, tobacco, cardamoms, and gamboge are important products. The forests produce aloes-wood, sappan-wood, teak-timber, bamboos, rattans, gutta-percha, dammar, catechu, benzoin, etc. Among wild animals are the tiger, leopard, bear, otter, ourang-outang, single-horned rhinoceros, and elephant, which here attains a size and beauty elsewhere unknown. The last, when of a white color, is held in the highest reverence. The forests abound with peacocks, pheasants, and pigeons; and in the islands are large flocks of the swallows that produce the famed edible birds'-nests. Crocodiles, geckoes, and other kinds of lizards, tortoises, and green-turtles, are numerous. The python serpent attains an immense size, and there are many species of snakes.

The chief export is rice, after which come teak, pepper, dried fish, birds'-nests, cattle, and teel seed. The chief imports are gold-leaf and treasure, and cottons, after which come opium, china goods, gunny bags, hardware, kerosene-oil, and silk goods. The chief direct exports are teak-wood and rice. Telegraph lines connect Bangkok with Tavoy in Lower Burmah, with Pnom-penh in Cambodia, and with Cheingmai, the chief city of North Siam, and others are being constructed. There is a postal service at Bangkok, and in 1885 Siam joined the International Postal Union. A railway from Bangkok inland is being made.

The Siamese are members of the great Mongolian family, and of the same race as the people of Burmah and Anam. In stature they do not average more than 5 feet 3 inches in height; they have a lighter-colored skin than the western Asiatics, but darker than the Chinese. The Siamese profess Buddhism, introduced into the country about the middle of the 7th century. Christianity is now making some progress in the country. The language of the chief Buddhist works is Pali. The printing-press has been introduced in recent years, and many of the best Siamese works can now be had in a printed form.

The legislative power is exercised by the king in conjunction with a council of ministers. There is a small standing army, officered to some extent by Europeans, and a general armament of the people, in the form of a militia. The navy consists of 4 steam corvettes, mostly officered by Europeans, chiefly Englishmen. There are 41 provinces, each administered by a governor.

Siam appears to have no place in history prior to A.D. 638, and the credible records go back only to 1350, the date of the foundation of Ayuthia, the old capital.

SIAMANG, one of the higher anthropoid or manlike apes. This animal, the largest and one of the best known of the

Siamang.

gibbons, inhabits Sumatra. It averages about 3 feet in height in its adult state, has very long arms, and leads an essentially arboreal life.

SIAMESE TWINS, the best-known example of two male individuals having their bodies connected inseparably from their birth, being joined by a thick fleshy ligament from the lower end of the breast-bone of each, having the common navel on its lower border, so that they stood in a sort of oblique position toward each other. Born in Siam in 1811, of a Chinese father and a Chino-Siamese mother, and named Eng ("right") and Chang ("left"), they were brought to the United States in 1829. They were on exhibition in Europe and America a number of times, and ultimately settled in the state of Pennsylvania. They married two sisters and had large families of children, none of whom exhibited any malformation. Chang received a paralytic stroke in 1870, and three years later was affected with an imflammatory disease of the respiratory organs. He died unexpectedly (January 17, 1874) while his brother was asleep, and Eng died a few hours afterward. The Siamese twins attracted great attention during their lifetime, particularly from physiologists and medical men, some of whom thought that the ligament connecting them might have been cut without causing the death of either.

SIBE'RIA, a great division of the Russian dominions. It occupies all North Asia, stretching uninterruptedly eastward from the Ural mountains to the Pacific Ocean, and southward from the Arctic ocean to the Chinese dominions and Russian Central Asia. It has a total area of 4,824,570 sq. miles., with a population of fully 5,000,000, and is divided into the governments of Tobolsk and Tomsk, the governor-generalship of Irkutsk, including the governments of Irkutsk and Yeniseisk, and the province of Yakutsk; and the governor-generalship of the Amur, including the province of the Amur, the province of Transbaikalia, the provinces of the Coast and the Anadir, and the island of Saghalin. The division into Western Siberia, Eastern Siberia, and the Amur regions was familiar for a number of years, but is no longer official. A region of such vast extent has naturally a very diversified configuration; but generally speaking Siberia may be considered as a vast inclined plane sloping gradually from the Altai, Sayan, and Yablonoi mountains on the south to the Arctic ocean on the north. In the east it is traversed in different directions by several mountain ranges, but elsewhere it is almost unbroken by any greater heights than a few hills. It is drained chiefly by the Obi (2120 miles), with its great tributary the Irtish (2520 miles), the Yenisei, and the Lena (3000 miles), all of which pursue a northerly course to the Arctic ocean; and by the Amur (2700 miles, 2400 of which are navigable), which flows in an easterly and northeasterly direction to the Pacific. The principal lake is Lake Baikal in the south, 400 miles long, 20 to 53 broad, and 1560 feet above sea-level. The chief islands are the New Siberia group in the Arctic ocean, and the island of Saghalin, off the mouth of the Amur, in the Sea of Okhotsk, an arm of the Pacific. The coast-line is very extensive, but the Arctic ocean is ice-bound at least ten months out of the twelve, and is almost valueless for commercial purposes, and the Sea of Okhotsk, on the Pacific, is infested with masses of floating ice and dense fogs. The principal ports are Vladivostock, on the Sea of Japan, the chief naval station of Russia on the Pacific; Okhotsk, on the Sea of Okhotsk; and Petropavlovsk, on the east coast of Kamchatka. Siberia enjoys a warm summer, but the winter is exceedingly severe. South Siberia has, in many parts, a very fertile soil, which yields rich crops of wheat, rye, oats, and potatoes; but immense tracts of Siberia are utterly unfit for tillage, more particularly the tundras or great stretches of boggy country along the Arctic ocean. In the west are extensive steppes. Roughly speaking, the northern limits of agriculture are 60° n. lat. Cattle-breeding and bee-keeping are largely pursued. Hunting and fishing are also

sources of remuneration, ermines, sables, and other fur-bearing animals being numerous. The wild animals include the elk, reindeer, and other deer, bear, wolf, white and blue fox, lynx, etc. The forests are extensive and valuable. Large quantities of gold are obtained, as well as silver, platinum, lead, iron, coal, etc. The chief towns are Irkutsk, capital of Eastern Siberia and a trading city; Tomsk, capital of gov. Tomsk, a trading city, with a university; and Tobolsk (20,130), capital of Western Siberia. Yermak the Cossack entered Western Siberia in 1580, and made a rapid conquest of the western portion of the country, which he handed over to Ivan the Terrible of Russia. Bands of hunters and adventurers then poured across the Urals, attracted by the furs, and gradually penetrated to the Arctic ocean and the Pacific. The latest acquisitions by Russia were the Amur territory, and coast regions of Manchuria ceded by China in 1858 and 1860. Exile to Siberia began soon after the conquest, and ever since Siberia has been a great penal colony. Hardened convicts and important political offenders are kept under close control, but the great majority of the exiles are simply placed in a particular district and allowed to shift for themselves. The Russian population of Siberia, which is more than three-fourths of the whole, consists mainly of exiles or the descendants of exiles. The other inhabitants include Buriats, Yakuts, Tungus, Tartars, Kirghiz, Samoyedes, etc. Some railways exist in Western Siberia, and a great trunk-line has been laid across Siberia, crossing also Manchuria, to Port Arthur and Vladivostock on the Pacific. Attempts have been made with partial success to open up an over-sea trade between Britain and Siberia by way of the Kara sea and the Yenisei.

SICARD (sē-kär), Roch-Ambroise Cucurron, famous in the history of the education of deaf-mutes, was born in 1742 near Toulouse, France. He became in 1786, director of the school for deaf-mutes established by the Archbishop of Bordeaux in the city of that name, whence, in 1789, he removed to Paris as successor to the Abbé de l'Epée, in whose system he made some important improvements. He also wrote several works on the instruction of deaf-mutes. He died in 1822.

SICILIES, Kingdom of the Two, a former kingdom of Italy, consisting of Naples (or South Italy) and Sicily. In 1860, an insurrection broke out in Sicily, and an expedition of volunteers from Piedmont and other Italian provinces under Garibaldi sailed from Genoa to the assistance of the insurgents. The result was that the Neapolitan troops were driven from the island. Garibaldi, following up his success, crossed over to the mainland, where he met little or no opposition; Francis II. fled from Naples; the strong places in his hands were reduced; and by a popular vote the Kingdom of the Two Sicilies ceased to exist as such, and became an integral part of the Kingdom of Italy.

SICILY, the largest island of the Mediterranean, belonging to Italy, from the southwestern extremity of which it is separated by the narrow strait of Messina, about 2 miles wide; area, 11,289 sq. miles, divided into seven provinces; pop. 3,529,266. The soil is very fertile. Three-fourths of the cultivated surface are covered with cereals, chiefly wheat, though oats and barley are also grown. Cotton, sugar, and tobacco are also cultivated to some extent. Fruits of every variety are extensively grown, including large quantities of oranges and lemons. The vine flourishes almost everywhere, and much wine is produced. The chief exports are fruits, wine, and sulphur, besides olive-oil, sumach, cream of tartar, etc. Sicilian sulphur is extensively exported, the center of this trade being Girgenti on the south coast. Tunny and sardine fisheries are carried on round the coast. The chief seats of foreign commerce are the three principal towns, Palermo, Messina, and Catinia. At the dawn of history the older races inhabiting Sicily the Iberian Sicani, from Iberia (Spain), and the Siculi from Italy, are seen to be hemmed in by Phœnician and Greek colonies. The Greeks, who entered the island in the 8th century B.C., founded the great cities of Syracuse, Agrigentum, and Messina, drove the Phœnicians to the northwest coast, and spread their influence and culture over the whole island. Greek art and literature here flourished, and many Greek names of distinction are connected with Sicily. The Carthaginians latterly took the place of their kinsmen, the Phœnicians, and between them and the Greeks a struggle ensued, which ended in favor of the latter (480 B.C.). War with the Carthaginians (1st Punic war) brought the Romans to Sicily, and having acquired the Carthaginian portion of the island (241 B.C.) they extended their rule over the whole, Sicily becoming a Roman province in 212 B.C. On the decline of the Roman Empire the island was overrun by the Goths, who retained possession till A.D. 551, when Sicily became part of the Byzantine empire. In the beginning of the 9th century the Saracens became masters, and continued so till their expulsion by the Normans in the 11th century, who remained long enough in possession to establish the feudal system in all its rigor. For a continuation of the history of Sicily see Sicilies (Kingdom of the Two).

SICKLE, a reaping-hook; a curved blade of steel with a handle, and having the edge of the blade in the hollow of the curve, used for cutting grain and the like. The sickle has been mostly superseded by the scythe, and the scythe in turn has given place to the reaping-machine.

SICKLES (sik"lz), Daniel Edgar, American soldier and politician, was born in New York City in 1825. In 1853 he was appointed corporation counsel of New York City, and was secretary of legation at London under United States Minister Buchanan from 1853 to 1855. In 1856 he was elected to the New York state senate. From 1857 to 1861 he was a democratic member of congress. He was appointed brigadier-general of volunteers in September, 1861, and major-general in November, 1862. On the second day of the battle of Gettysburg his corps sustained the brunt of the confederate attack upon the Peach Orchard, on the federal left, and Sickles himself lost a leg. In 1869 he was retired with the full rank of major-general. He was United States minister to Spain from 1869 to 1873. He was sheriff of New York county in 1890, was again elected to congress as a democrat in 1892, and for several years was president of the New York State Board of Civil Service Commissioners.

SIDDONS, Mrs. Sarah, daughter of Roger Kemble, was born at Brecon, South Wales, in 1755. She commenced her theatrical career when quite a child, and in her nineteenth year was married to William Siddons, an actor in her father's company. For thirty years she continued to astonish and enchant the lovers of the drama, and having acquired an ample fortune, she took her leave of the stage in 1812. Her greatest characters were Queen Catharine in Henry VIII., and Lady Macbeth. In her art she was a close and systematic student, while in private life she enjoyed the respect of all who knew her. She died June 8, 1831.

SIDEREAL TIME, time measured by the apparent motion of the stars. A sidereal day is the time from the passage of a star across the meridian till its next passage, and is exactly the period of the revolution of the earth on its axis. It is the most constant unit of time which we possess. Its length is 23 hours 56 minutes 4.098 seconds. A sidereal year is the period in which the fixed stars apparently complete a revolution and come to the same point in the heavens, and is the exact period of the revolution of the earth round the sun. There are 366.2563612 sidereal days in a sidereal year. See Day.

SIDNEY, Sir Philip, one of the most conspicuous figures at the court of Queen Elizabeth, was the son of Sir Henry Sidney of Penhurst, Kent, where he was born in 1554. In 1585 he went to the Netherlands with his uncle Dudley, earl of Leicester, who commanded the forces sent to assist the Dutch against the Spaniards, and he was appointed governor of Flushing and general of horse, but at Zutphen, September 22, 1586, he was mortally wounded, and died at Arnheim, October 7. He was a soldier and statesman of great promise, and his contributions to literature, though not numerous, were of great importance They include the Arcadia (1590), a romance in a medley of prose and verse in Italian style then popular. Astrophel and Stella (1591), the first important body of sonnets in the English language; and the Defense of Poesy, first published in 1595 as an Apologie for Poetrie.

SIDON, or **ZIDON,** a seaport of Syria, situated on the eastern coast of the Mediterranean, between Lebanon and the sea, about midway between Beyrout and Tyre, was long the principal city of Phœnicia (1600–1300 B.C.). Its artistic products were famous at an early period, as also its manufactures of glass, linen, purple dye, and perfumes, and in commercial enterprise it occupied a distinguished position. In the Persian, Grecian, and Roman periods it was still

great and populous, and even in the middle ages it was a place of considerable importance. During the crusades it was taken and retaken several times. It was almost completely destroyed during the troubles of the 13th century, but in the 15th it reappeared, under its modern name of Saida, as the port of Damascus. The trade is now unimportant. Pop. 9000.

SIEDLCE (syed'l-tse), a town of Russian Poland, capital of the government of the same name, 57 miles e.s.e. of Warsaw, the seat of a bishop. Pop. 23,714.—The government of Siedlce, between the Vistula and the Bug, has an area of 5535 sq. miles, and a pop. of 775,316.

SIEGE, the surrounding or investment of a fortified place by an army with a view to its capture. The taking of a fortified place may be attempted (1) by surprise, (2) by a sudden onset, (3) by blockade out of gunshot, (4) by a siege, properly so called. In a regular siege the fortress is first blockaded, so as to cut off all intercourse from without, the besieging force encamping just beyond reach of the enemies' guns. Then if any detached works are situated before the fortress, their capture must be effected in order to admit the opening of the trenches. The trenches are formed in the direction of the fortress; but that they may not be enfiladed from thence, they must proceed in a zigzag form. For the protection of the workers trenches called parallels, because they run in a direction parallel or nearly so to the sides of the fortress, are dug at intervals. While the trenches are being opened, the besieged, by sallies and counter operations of every kind, strive to drive off the besiegers, and to destroy their work; and the besiegers make efforts to establish themselves more and more securely, to raise batteries, and then, by means of trenches and advanced parallels, to approach the walls of the fortress; and all the while the artillery is kept constantly playing from the batteries of the besiegers as well as from the works and guns of the besieged. From the last parallel, which approaches very near the fortress, the besiegers prepare to make breaches. Here likewise mining operations are carried on whenever they are found advisable. When at last the breaches are practicable the storming or scaling of the walls follows.

SIEMENS, Sir Charles William, engineer, born in Hanover, 4th April, 1823, was educated at the gymnasium at Lübeck, the polytechnic school at Magdeburg, and the University of Göttingin. After a training in engineering and electricity in the workshops of Count Stolberg he migrated to London in 1843, and at a later date was joined by his brother (Werner), who joined with him in his various undertakings. The great works of Siemens Brothers at Charleston, West Woolwich, for the manufacture of submarine electric telegraph cables, were established in 1858; and the great steelworks at Landore, Swansea, in 1868. He labored mainly in two distinct fields, the applications of heat and the applications of electricity, and won a great reputation in both. He was knighted April, 1883. He died November 19, 1883. Werner died in 1892.

SIENKIEWICZ (syĕn-kyĕ'vēch), Henryk, famous Polish novelist, was born in Wola Okrzejska, Government of Siedlce, in 1846. In 1880 he published the novel The Tartar Bondage. Among his other works are: With Fire and Sword, with its sequels, The Deluge and Pan Michael, Without Dogma, The Children of the Soil, and Knights of the Cross. The success of Quo Vadis was enormous, and it has several times been dramatized. His works have been translated into several European languages.

SIEN'NA, or SIENNA EARTH a ferruginous ochreous earth, which when raw is of a fine yellow color, and when burned assumes a rich orange-red tint. It is used as a pigment in both oil and water-color painting.

SIERRA LEONE (si-er'ra le-ō'ne), a British colony and protectorate on the coast of Western Africa. The colony proper consists of the peninsula of Sierra Leone, Sherbro and other small islands, and the coast region from the French territory on the northwest to Liberia on the southeast; area in occupation, about 3000 sq. miles. The protectorate, bounded inland by French territory, has an area of 30,000 sq. miles, and is divided into districts under commissioners. The inhabitants of the colony depend chiefly upon trade, and are mostly collected in Freetown (the capital) and the neighboring villages. The exports are palm kernels, palm-oil, rubber, ground-nuts, kola-nuts, gum-copal, hides, ginger, and benné-seed. The trade is chiefly with Great Britain. One great obstacle to the prosperity of the colony is the deadly nature of its climate, particularly to Europeans, and Sierra Leone was long known as the "white man's grave." But Freetown (pop. 40,000), in particular, has become healthier since getting a supply of good water, with other sanitary improvements. It is the chief seaport of western Africa. Pop. 1,080,000.

SIERRA NEVA'DA (Spanish, "Snowy Range"), a chain of mountains in Southern Spain, the most elevated in the peninsula. The greater part of it is in the province of Granada, running east and west, and the highest peak is Mulahacen, which has an elevation of about 11,678 feet, and is capped with everlasting snow. The range is rich in fertile valleys and picturesque scenery.

SIERRA NEVADA, a mountain range of the United States, in California, extending north and south along the eastern boundary of the state. It consists of an aggregate of ranges, some 70 miles wide, with numerous peaks reaching 10,000 and several nearly 15,000 feet, Mt. Whitney (14,868) being the highest in the states. The Yosemite valley is in the Sierra Nevada.

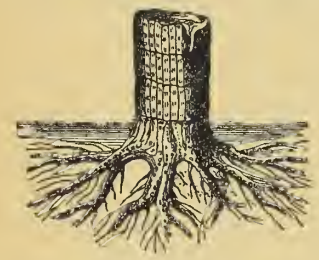
SIEYES (sye-yās), Emmanuel Joseph, better known as the Abbé Sieyès, was born at Fréjus in 1748, and pursued his studies for the church at Paris. He originated the idea of the new geographical division of France into departments, arrondissements, and communes. In 1791 he became member for the Seine department, and in 1792 deputy for the department of Sarthe. In 1799, on his return from a mission to Berlin, by which he secured the neutrality of Prussia, he became a member of the directory. He retired with the title of count, and obtained grants of land and property to the value of at least $200,000. He was exiled at the restoration, but returned on the July revolution of 1830, and died at Paris in 1836.

SIGEL (sē'gel), Franz a German-American soldier, was born at Sinsheim, in Baden, in 1824. In 1852 he emigrated to the United States. On the outbreak of the civil war he took the side of the north, organized a regiment of infantry and a battery of artillery, which rendered good service in the occupation of Camp Jackson. At the battle of Pea Ridge, March 8, 1862, he ordered a well-timed charge which decided the day. He commanded the First Corps in the campaign which terminated with the second battle of Bull Run, August, 1862, and in February, 1864, was given command of the department of West Virginia: He successfully defended with 4000 men Maryland Heights against General Early with 14,000 men. He resigned from the army in May, 1865. From 1871 until 1874 he was register of New York City, and from 1886 until 1889 was United States pension agent at the same place. He died in 1902.

SIGHT, Defects of, are usually caused by anomalies in the shape of the eye. (See Eye.) The normal eye is an optical apparatus so constructed that the images of distant objects are thrown with sharpness on the retina; if this is not the case the objects are not seen distinctly. There are two very common instances of defective eyesight, short-sight or myopia and long-sight hypermetropia, the one being the reverse of the other. In the former case, owing to the too great power of the crystalline lens, or to the eye cavity extending too far backward, images from objects at some distance are formed in front of the retina. The sight of the myope is thus confused or absolutely defective for objects beyond a certain short range, but on the other hand it is very clear for near objects. The remedy for myopia is the employment of biconcave glasses, which, if the myopia is not considerable, need only be used for looking at distant objects. In the case of hypermetropia objects are seen distinctly only at a range beyond that belonging to normal vision. Owing to the shortness of the eye cavity the lenses in this case are unable to converge the rays to a focus within the limits of the eye-chamber, the image being therefore formed (theoretically) behind the eye. This defect is corrected by the use of convex lenses, which, by converging the rays of light, cause the image to fall on the retina. Both these defects are usually congenital. A similar defect to hypermetropia is that of presbyopia, which usually comes on with advancing years, and is due to diminished focussing power and lessed elasticity of the lens, the result being that the image of a near object is not clearly formed on the retina but behind it, while distant objects are seen as well as ever. The remedy in this case also is convex lenses.

Astigmatism is a defect usually characterized by asymmetry in the curvature of the cornea in different meridians. Opacities in the cornea or crystalline lens, etc., are also not uncommon causes of defective eyesight.—Double-vision is when, as in some cases of squinting, each eye sees things separately: or it may result from muscular paralysis.—Night-blindness or hemeralopia is a peculiar defect by which a person becomes suddenly and entirely blind when night comes on, though he can see perfectly well in the daytime.

SIGILLARIA, a genus of fossil plants found in great abundance in the coal measures. The plant occurs in the form of compressed stems attaining a height of 40 to 50 feet, and a breadth of 5 feet. The stem generally occurs as a double layer of coal with a fluted outer surface, and showing, at regular intervals, the



Sigillaria in a coal-mine.

scars produced by the bases of the leaf-stalk. Their roots are found in the shale and are known by the name of stigmaria, being at first supposed to be distinct plants. No foliage of any kind has been found connected with the trunk. Some suppose sigillarias to be allied to tree-ferns, others to Coniferæ.

SIGISMUND (sij'is-mund), German emperor from 1411–37, was born in 1368, and on the death of his father, the emperor Charles IV., he obtained the margraviate of Brandenburg. He married Mary, daughter and heiress of Louis the Great of Poland and Hungary; but on the latter's death in 1383 the Poles elected Mary's sister as queen; Sigismund, however, was crowned king of Hungary in 1387. He was crowned emperor at Aix-la-Chapelle in 1841, and at Milan, and again at Rome in 1433. He was now in possession of the imperial crown and the crown of four kingdoms. He died at Znaim in 1437.

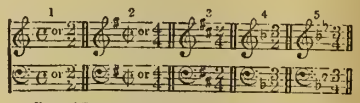
SIGNAL CORPS, the system of signal service now in use throughout the United States was first suggested immediately prior to the civil war by Gen. A. J. Meyer, an officer of the United States army, at that date connected with the surgeon-general's department. The difficulty of communication between various divisions of the army, particularly at points where facilities for communicating by telegraph were wanting, was the cause of serious embarrassment at times, and gave birth to the service which has since obtained. General Meyer's plan was to adopt certain principles of telegraphy, as for example the dots and dashes used to represent letters of the alphabet, substituting therefor flags, which were waved in one direction to indicate dots, and in another direction to indicate dashes. By this means operators separated at a distance of from half a mile to ten miles would be enabled to frame communications that could be readily comprehended by those to whom they were addressed. After nightfall, or at times when the atmosphere was obscured to a degree that prevented the successful employment of flags, colored lights were used and found equal to the requirements of the occasion. The plan was first utilized at points on the frontier; and when, during the progress of the civil war, the difficulty that brought the system into existence was experienced, it was adopted, and became one of the most valuable auxiliaries enlisted in the service.

Appropriations for the support and maintenance of the system were regularly included in the bills adopted by congress for the support of the army, and its worth and efficiency were further acknowledged by the same authority in providing for the establishment of a school of instruction at Arlington, near Washington. The education there obtainable, both practical and theoretic, is designed to thoroughly equip students for the scientific work they will be called upon to execute, and results show that expectations thus indulged have been fairly realized.

When the war terminated the system had attained a high degree of perfection, its value was universally recognized, and its development was continued, with improved results. It was introduced into the navy, and was the chief impulse in the establishment of the international code in 1901. Wireless telegraphy is now an important subject of experiment for purposes of signaling. The signal corps of the United States army has perfected its own system and has in successful operation stations in San Francisco harbor and elsewhere. See Weather Signals.

SIGNALS are the means of communicating to the eye—as by flags, lights, etc., and to the ear—as by guns, steam-whistles, fog-horns, rockets, etc., intelligence to greater distances than can be reached by the human voice. The most complete system of signaling is that devised to enable ships to communicate when at some distance. The new system introduced in 1902, provides a flag for each letter of the alphabet, five being pennants, two burgees, and the rest square flags. Besides these there is the code flag or answering pennant. All are distinctly colored so as to be visible for a considerable distance. With the twenty-six alphabetical flags, 650 two-flag signals and 15,600 three-flag signals can be hoisted; and in the code-book definite meanings are attached to most of these combinations. If the code flag be hoisted above two alphabetic flags, a latitude or longitude is signalled; if below two such flags, the signal denotes a number. Some single flags have special meanings when hoisted alone; few signals require more than three flags, and there are never more than four flags hoisted at once. When, owing to distance or the state of the atmosphere, the colors of the flags cannot be made out, one of three systems of distant signals is used. These involve the use of (1) cones, balls, and drums; (2) balls, square flags, pennants, and whefts; and (3) a fixed semaphore. In the army signalling is carried on during the day by means of flags, sun-flashes (see Heliograph), etc.; and during the night by means of colored lamps, or by a system of long and short flashes of light. On the railways signaling is effected by the semaphore, colored lights, and during fog by cases filled with detonating powder and placed on the rails at certain places, to be exploded by the wheels of the passing locomotive. See Fog-signals and Heliostat, and Weather Signals.

SIGNATURE, in music, the signs placed at the commencement of a piece of music. They are of two kinds, the time signature and the key signature. The key signature, including the clefs, is usually written on every stave; and the sharps or flats there occurring affect all



Key and Time Signatures on the Treble and Bass Clefs.

1, Key of C; two minims (or their equivalents) in the bar. 2, Key of G, four crotchets in the bar. 3, Key of D; two crotchets in the bar. 4, Key of F; three minims in the bar. 5, Key of B flat, three crotchets in the bar.

notes of that degree (with their octaves) throughout the piece. The time signature is only placed at the beginning of the first line and where changes occur. It indicates the number of aliquot parts into which the bar is divided, as shown above.

SIGSBEE, Charles Dwight, American naval officer, was born at Albany, N. Y., in 1845. From 1874 to 1878 he was employed in exploring the bottom of the Gulf of Mexico, and received the order of the Red Eagle of Prussia and a gold medal for improvements which he introduced in the work. In 1882 he was assigned to the command of the battleship Maine, which, while still under his command, was destroyed in the harbor of Havana, Cuba, on February 15, 1898. During the war against Spain he commanded the auxiliary cruiser Saint Paul. From September, 1898, to January, 1900, he commanded the battleship Texas. He wrote Deep Sea Sounding and Dredging, U. S. Coast Survey, and Personal Narrative of the Battleship Maine.

SIGURD, or **SIGURDR,** in northern mythology, the hero of the Volsunga Saga, on which the Nibelungenlied is based. According to the legend of the Volsungs, Sigurd (the Siegfried of the Nibelungenlied) is the posthumous son of Sigmund, son of Volsung, a descendant of Odin. After obtaining the golden treasure by slaying the dragon Fafnir with his good sword Gram he eats the monster's heart, and thus acquires the power of understanding the songs of birds. He then rides through a volume of flame surrounding a house in which the fair Brenhyldr (Brunhild) lay asleep. He wakes Brenhyldr, to whom he plights his troth, and then rides to the palace of Giuki the Niflung, whose wife gives him a potion which causes him to forget Brunhyldr, and he marries Gudrun (Chriemhild), Giuki's daughter. Her

brother Gunnar (Gunther) determines to marry Brenhyldr, but is unable to ride through the flames; so his mother by her arts causes Sigurd to go through the flames and bring away Brenhyldr in the form of Gunnar. Sigurd then resumes his shape, and Brenhyldr is handed over to Gunnar. When Brenhyldr hears the true story of her rescue her love for the hero turns to hatred, and she seeks to slay him. Sigurd is eventually killed by Gunnar's half-brother. His death revives Brenhyldr's love, and she dies of a broken heart.

SIKHS (from a Sanskrit word meaning "disciple"), a religious sect in Northwestern Hindustan which worships one only and invisible God. Its founder was Nanak Shah, born in 1469 in the province of Lahore. He labored to lead the people to a practical religion, to a pure worship of God and love to mankind. He died about 1540. Of his successors Arjun-mal gave stability and unity to the religion by publishing Nanak's writings in the Aid-Granth, the first sacred book of the Sikhs. The Sikhs had now rejected the authority of the Koran and the Vedas, and thus aroused the enmity both of the Mohammedans and Brahmans. Arjunmal was thrown into prison, where he died. His son and successor Har Govind transformed the Sikhs from peaceful believers into valiant warriors, and under his reign began the bloody contest with the Mohammedans. The real founder of the Sikh state was Govind Sinh or Singh, the tenth ruler from Nanak. He abolished the system of castes, and gave all men equal rights. His followers, owing to their valor in the protracted contest with the Mohammedans, received the title of Sinhs or lions. Govind Sinh wrote the Dasema Padshah ke Granth, or book of the tenth prince, which, besides treating of religious subjects, contained the history of the author's exploits. The Sikhs hold it in equal veneration with the Adi-Granth. Govind Sinh died in 1708, and the Sikhs gradually yielded to the superior power of the Mohammedans. A small number of the Sikhs escaped to inaccessible mountains, and preserved the doctrines of their fathers and an inextinguishable hatred toward the Mohammedans. After Nadir Shah's return to Persia they left the mountains and subdued all Lahore. The Sikhs then broke up into a number of independent communities, each governed by a sidar; but in 1792 Runjeet Singh established himself as despotic ruler of the Sikhs, with the title of Maharajah. The territory of the Sikhs now comprehended the whole Punjab, part of Multan, and most of the country between the Jumma and Sutlej; total area, 69,000 sq. miles. After Runjeet Singh's death in 1839 a period of anarchy followed. In 1845 (first Sikh war) the Sikhs attacked the British under Sir Hugh Gough at Mudki. Here they were repulsed (December 18), and again defeated at Ferozeshah three days later. On January 20, 1846, the Sikhs were routed by Sir H. Smith near Aliwal, and on the 10th February by Gough at Sobraon. A treaty was signed by which Britain held the city of Lahore, and a British resident took supervision of the government. In 1848 a general revolt broke out, and it was evident that the Sikhs had resolved on a decisive struggle, being also assisted by the Afghans. In this the second Sikh war Lord Gough advanced with an army against them, but received a severe check at Chillianwalla, 13th January, 1849. Both armies were then reinforced and on the 21st February, at Gujerat, the power of the Sikhs was completely broken. The Sikh dominion was proclaimed at an end on the 29th March,

Sikh soldiers.

and the Punjab was annexed to the British empire in India, the Maharajah Dhulip Singh receiving an annuity of $250,000. (See Punjab.) The bulk of the Sikhs are of Jât origin; they are of fine physique, and possess great powers of endurance as well as courage. During the mutiny the Sikhs displayed the utmost loyalty to the British. They number about 1,876,500, or $\frac{1}{18}$th of the population of the Punjab, and compose the mass of the gentry in the region between the Five rivers.

SILE'SIA, a territory of Central Europe, now divided politically between Prussia and Austria. Prussian Silesia (15,556 sq. miles; pop. 4,868,378) is bounded east by Posen and Poland, south by the Austrian territories, west and north by Saxony and Brandenburg. The province is intersected by branches of the Sudetic mountains in the south, but is level toward Brandenburg and Posen, and although in parts marshy and sandy, is yet fertile. The principal river is the Oder. Silesia produces corn, flax, madder, hemp, hops, tobacco, fruits, and tolerable wines. The mountainous parts yield timber and afford good pasturage and meadow land. Minerals include iron, copper, lead, silver, coal, sulphur, etc., and there are mineral waters in several places. Linen, cotton, and woolen goods, and leather are the chief manufactures. Silesia is divided into three governments—Breslau, Liegnitz, and Oppeln. Breslau is the capital. Austrian Silesia consists of that part of Silesia which was left to Austria; area, 1988 sq. miles. It is mountainous, and although the soil is not in all parts favorable, it is rendered productive by the industry of the inhabitants, who are also extensively engaged in linen, cotton, and woolen manufactures. Pop. 680,422.

SILHET, or **SYLHET,** chief town in the district of the same name, Assam, Hindustan, on the right bank of the Surmá. Pop. 14,407.—The district, area 5413 sq. miles, consists of a uniform level, intersected by a network of rivers and drainage channels. During the rainy season the western part of the district is submerged. The principal crop of the low ground is rice. Pop. 1,969,009.

SILHOUETTE (sil-u-et') is the representation of the outlines of an object filled in with black color, in which the inner parts are sometimes indicated by lines of a lighter color, and shadows or extreme depths by the aid of a heightening of gum or other shining medium. The name comes from Etienne de Silhouette, French minister of finance in 1759, in derision of his economical attempts to reform the financial state of France while minister. During this period all the fashions in Paris took the character of parsimony, and were called à la Silhouette. The name has only remained in the case of these drawings.

SIL'ICA, a compound of oxygen and silicon, forming one of the most frequently occurring substances in the materials of which this globe is composed. Silica forms a principal ingredient in nearly all the earthy minerals, and occurs either in a crystallized form or in amorphous masses. In its naturally crystalized form it is known as rock-crystal. Colored of a delicate purple these crystals are known as amethyst, and when of a brown color, as Cairngorm stone. Silica is also met with in the form of chalcedony and carnelian. It enters largely into the lapidary's art, and we find it constituting jasper, agate, cat's-eye, onyx, and opal. In opal the silica is combined with water. The resistance offered by silica to all impressions is exemplified in the case of flint, which consists essentially of silica colored with some impurity. Silica is found to constitute the great bulk of the soil which serves as a support and food of land plants, and it enters largely into the composition of many rocks. Many natural waters present us with silica in a dissolved state. It is, however, not soluble in pure water. The action of an alkali is required to bring it into a soluble form. Silica forms a number of hydrates, which have acid properties, and from which a vast number of salts known as silicates are obtained.

SILICATE PAINT, natural silica, when dried and forming an almost impalpable powder, mixed with colors and oil. Unlike the ordinary lead paints, all the silicate colors are non-poisonous. Silicate white has great covering power; it is not affected by gases; and heat of 500° is successfully resisted.

SILIQUA'RIA, a genus of marine gasteropodous molluscs, found both fossil and recent. The shell is tubular, spiral, at its beginning, continued in an irregular form, divided laterally through its whole length by a narrow slit, and formed into chambers by entire septa.

SILK, the peculiar glassy thread spun

by the caterpillars or larvæ of certain species of moths, and a well-known kind of fabric manufactured from it. The chief silk-producing larvæ belong to the family of the Bombycidæ, of which group the common silk-moth (Bombyx mori) is the most familiar species, being that which is by far the most important in artificial culture. This family of moths is distinguished by the small size of the proboscis, by the thick hairy body; and by the large broad wings. The common silk-moth possesses a short body, stout legs, and white wings, which are marked by black lines running parallel with the wing borders. The female moth deposits her eggs in summer on the leaves of the mulberry-tree. For hatching artificially the eggs are placed in a room heated gradually up to a temperature of about 80° Fahr. In eight or ten days the young appear. The caterpillars are then covered with sheets of paper on which mulberry leaves are spread, and make their way through perforations in the paper to the mulberry leaves, their natural food. The leaves when covered with caterpillars are laid on shelves of wicker-work covered with brown paper. When first hatched the larvæ or worms are black and about ¼ inch long. The larval or caterpillar stage lasts from six to eight weeks, and during this period the insect generally casts its skin four times. After casting its last skin the insect is about 2 inches long, and in ten days attains its full growth of 3 inches. The insect's body consists of twelve apparent segments, with six anterior forelegs, and ten fleshy legs or "prolegs" provided with hooks in the hinder body-segments. The mouth is large, with powerful jaws. At this stage the insect becomes languid, refuses food, and prepares for its next change into the pupa or chrysalis stage. Oak, broom, or other twigs are now laid on the wicker-frames, and the worms crawl into these, where they spin their cocoon by winding a self-produced silk thread many times round their body. This silky thread is formed from a glutinous secretion contained in two tubular glands on either side of the body, opening on the lower lip of the larva in a prominent aperture called the spinneret. This secretion becomes tenacious and threadlike when brought in contact with the air, and the two filaments unite as they issue from the spinneret, apparently by the glutinous secretion of another and special gland. The spinning of the pupa-case or cocoon lasts from three to five days. After passing about three weeks in the nymph or chrysalis stage, the larval form emerges from the cocoon as the perfect moth or imago. But those insects destined to afford the silk material are not allowed to enter the imago stage. The completed cocoon with its contained larva is thrown into warm water, which dissolves the glutinous matter cementing the threads together, and facilitates the unwinding of the silk. The average length of a thread furnished by a single cocoon is 300 yards. About 12 lbs. of cocoons yield 1 lb. of raw silk, and 1 oz. of silk-worms' eggs will give 100 lbs. of cocoons. The female moth produces from 300 to 500 eggs.

The Chinese appear to have been the first to render the filamentous cocoon substance serviceable to man, and China is still the chief silk-producing country in the world. Before the reign of Augustus the use of silk was little known in Europe, and the culture of the silk-worm was not introduced until the 6th century. It was at first confined to Constantinople, but soon spread to Greece, and then through Italy to Spain. When the Duke of Parma took Antwerp in 1585 a check was put on its trade in silk goods, and many of the weavers from Flanders and Brabant took refuge in England. In 1685 the Edict of Nantes drove hosts of silk weavers into exile, as many as 50,000 having settled in Spitalfields, London. A silk-throwing machine, constructed

Silk-worm—Larva, chrysalis, and cocoon.

on Italian models secretly obtained, was fitted up at Derby in 1714 by Thomas Lombe (afterward Sir Thomas Lombe), who obtained a patent in 1719. In France looms were set up at Lyons in 1450, and at Tours in 1470. The first nursery of white mulberry-trees was founded by a working gardner of Nismes, who ulitmately propagated them in many districts in the south of France. Italy is now the chief silk-producing country in Europe, France coming next.

In the manufacture of silk the first operation is the unwinding of the cocoon and the reeling of the silk. For this purpose they are placed in shallow vessels containing hot-water, which softens the gummy matter of the cocoons. The ends of the filaments are then conducted by guides to large reels moved by machinery. Four or five (or more) threads from as many different cocoons are thus brought together, and uniting by the gum form one thread. When the cocoon is half unwound the filament decreases 50 per cent in thickness. The silk thus produced is called raw silk. Before it can be woven into cloth the raw silk must be thrown. This is often a special trade, and is usually conducted by machinery in large mills. Previous to throwing, the silk is carefully washed, wound on bobbins, and assorted as to its quality. In the throwing-machine it is again unwound from the bobbins, twisted by the revolutions of a flyer, and then wound on a reel. The twist of the silk is regulated as required by varying the relative velocities of the flyer and reel. The silk thus prepared is called singles, and is used for weaving common or plain silks and ribbons. The next operation, called doubling, is the twisting of two or more of these threads on one bobbin. This is done in a throwing machine, and the silk thus spun is called tram silk, commonly used for the weft of richer silks and velvets. Two or more of these threads of tram-silk twisted in the throwing-mill together constitute organzine, a species of silk thread used for warps of fine fabrics. But in tram-silk the threads are all twisted in one direction, forming individual strands like twine, whereas in organzine the collected threads are twisted in an opposite direction to the twist of the strands, like cable or rope. The silk in this condition is called hard in consequence of the gum, which is, however, separated by careful boiling The throwing-machine has been greatly improved both as to accuracy and produce by assimilating it to the cotton throstle. The manufacture of waste silk is quite different from that just described, being more akin to that of wool or cotton. Waste silk consists of the floss-silk or outer fibres of the cocoons; of the silk of defective cocoons, such as those from which the moths have been allowed to issue; of the remains of cocoons from which the fibre has been mostly reeled, etc. Until about 1857 this was entirely useless, but is now the object of an important industry, being cleared of the gum by boiling, and subjected to such processes as breaking, combing, drawing, and roving, till it is ready for spinning. Owing to the protective policy the manufacture of silk in the United States has attained considerable dimensions.

SILK-COTTON TREE, a tree belonging to the natural order Sterculiaceæ, indigenous to the West Indies and South America. It has a reddish and prickly stem and palmated leaves. The flowers change from white to red, and the wood is soft and spongy. The down which is contained in the seed capsule is used for stuffing pillows, chairs, sofas, etc. Canoes are constructed from the timber.

SILKWORM-GUT, a substance prepared from the silky secretion of the caterpillars of the ordinary silk-worm taken from the insects' body, and constituting the lustrous and strong lines well known to anglers under the name of "gut."

SILU'RIUS, a genus of fishes of the family Siluridæ, order Physostomi. This genus, of which five species are known, inhabits the temperate parts of Europe and Asia. The head and body are covered with soft skin, and the jaws have four or six barbeds. The only

Sly silurus.

species which occurs in Europe is sly silurus or sheat-fish (Silurus planis), found in the fresh waters east of the Rhine. It attains to a weight of 300 or 400 lbs., and the flesh is firm and well flavored. The family Siluridæ (otherwise named sheat-fishes) constitutes a very extensive section of fishes, the

species of which are, for the most part, confined to the fresh waters of warm climates. They present great diversity of form, but their most obvious external characters are the want of true scales. The mouth is almost always provided with barbules.

SILVER, one of the best-known metals. It appears to have been known almost as early as gold, and, without doubt, for the same reason, because it occurs very frequently in a state of purity in the earth, and requires but an ordinary heat for its fusion. Pure silver is of a fine white color. It is softer than copper but harder than gold. When melted its specific gravity is 10.47; when hammered, 10.510. Its chemical symbol is Ag. It is next in malleability to gold, having been beaten into leaves only $\frac{1}{100000}$ of an inch in thickness. It may be drawn out into a wire much finer than a human hair, and a wire of silver 0.078 of an inch in diameter is capable of supporting a weight of 187.13 lbs. avoirdupois. It excels all other metals as a conductor of heat and electricity. Silver melts when heated completely red-hot, and may be boiled and volatilized by a very strong and long-continued heat. It is rapidly volatilized when heated on charcoal by the flame of the compound blow-pipe. When cooled slowly crystals of silver may be obtained. Silver is not oxidized by exposure to the air neither is it affected by water, but it is blackened or tarnished by sulphuretted hydrogen. The atomic weight of silver is 108. Oxide of silver is produced by dissolving silver in a solution of nitric acid and precipitating with an alkali. Its specific gravity is 7.14. The compound called horn silver or chloride of silver is obtained by dissolving silver in nitric acid and mixing the solution with a solution of common salt. Its specific gravity is 5.550. When exposed to the light it turns to a blackish color, hence its great use in photography. Bromide of silver is the most sensitive to light of any known solid. It is used for coating the "dry-plates" employed in photography. When silver is long exposed to the air it acquires a covering of a violet color, which deprives it of its luster; this coating is sulphide of silver. Sulphide of silver occurs native as silver-glance. Silver readily forms alloys with iron, steel, lead, tin, and mercury. Of all the combination of acid and silver the most important is nitrate of silver, obtained by dissolving silver in nitric acid. If the silver and acid are pure the solution of silver nitrate is colorless, very heavy, and caustic; it stains the skin, and all animal substances, of an indelible black; after evaporation it deposits, on cooling, transparent crystals of nitrate of silver (which see).

There are five important silver ores, viz. native silver, vitreous silver (or silver-glance), black silver, red silver, and horn silver. The first is usually found in dentiform, filiform, and capillary shapes, also in plates formed in fissures and in superficial coatings; luster metallic; color silver-white, more or less subject to tarnish; ductile; hardness between gypsum and calcareous spar; specific gravity, 10.47. Native silver occurs principally in veins traversing gneiss, clay-slate, and other palæzoic rocks, but not usually in great quantity. It often forms a natural alloy with gold. Vitreous silver presents itself in various shapes, and is of a blackish lead-gray color with a metallic luster. It is malleable, about as hard as gypsum, and subject to tarnish; specific gravity, 7.19. It is more or less pure silver sulphide, and has been found almost exclusively in veins along with ores of lead, antimony, and zinc. It occurs in Saxony, Bohemia, Hungary, Mexico, and Peru; and is an important species for the extraction of silver. Black silver generally occurs in granular masses of an iron-black color. It is sectile and about as hard as gypsum; specific gravity, 6.2. This mineral is a composition of silver (about 68.5 per cent) with antimony and sulphur and traces of iron, copper, and arsenic. It is found in veins along with other ores of silver, and is a valuable ore for the extraction of silver. It occurs chiefly in Saxony, Bohemia, Hungary, and the American continent. Red silver is found in crystals and often massive, granular, and even as an impalpable powder. It is a double sulphide of silver and antimony, containing on an average 60 per cent of silver. It occurs in veins with other silver ores, galena, and blende. It is found in various parts of Saxony, also in Bohemia, Hungary, and Norway; but chiefly in Mexico, Peru, and the western states of America. Horn silver, or silver chloride, occurs in crystals and also in crusts and granular masses. It contains about 76 per cent of silver. It is found in the upper parts of veins in clay-slate, and also in beds with other silver ores or with iron-ochre. It is not abundant in Europe, but occurs in large masses in Mexico and Peru. The above are the ores of silver from which silver is chiefly extracted; but argentiferous sulphides of lead and copper are also smelted for the small proportion of silver they contain.

Silver is extracted from its various ores by smelting or amalgamation. The former method is founded on the great affinity of silver for lead, which, when fused with silver, acts as a solvent and extracts it from its union with baser metals. The silver is afterwards separated from the lead by the process of cupellation (see Assaying), which consists in exposing the melted alloy to a stream of atmospheric air, by which the lead is converted into an oxide (litharge) while the silver remains untouched. The latter method depends upon the property of mercury to dissolve silver without the aid of heat. The first is called the dry, the last the wet way of treating silver ores. One or the other process is employed according to the nature of the ores. The ores which are treated in the dry way are usually those consisting principally of argentiferous sulphide of lead. By this method the ore is first pulverized and roasted to expel the sulphur, and is then freed from the lead. The ores best adaped to the process of amalgamation are native silver and vitreous silver. The ores are first selected to form a proper mixture with reference to the quantity of silver and sulphur they contain. The sulphur is then got rid of by adding to the mixture of an ore 10 per cent of common salt, by which, during the furnace operation, the sulphur is oxidized, and the acid thus formed unites with the base of the salt and forms sulphate of soda; while the hydrochloric acid thus set free combines with the silver in the ore that was not in the metallic state, and forms chloride of silver. In this state the ore is reduced to an impalpable powder by various mechanical processes. It is then submitted to the action of mercury, with which it forms what is called an amalgam. This amalgam is subjected to the action of heat in a distilling furnace, by which the mercury is sublimed, and the silver remains. Silver is sometimes separated from copper by the process of eliquation. This is effected by means of lead, which when brought into fusion with the alloy combines with the silver. The argentiferous lead thus obtained is subjected to the usual processes of cupellation, and the coarse copper from which the silver has been separated is refined. Large quantities of silver are now obtained from argentiferous lead ores by a process known as Pattinson's process, which depends on the property pure lead possesses of crystallizing at a temperature at which an alloy of silver and lead is still fluid, so that the solid crystals of lead can thus be removed.

The silver mines of North and South America are incomparably more important than those of all the rest of the world. The Mexican mines were worked before the Spanish conquest, and then produced large quantities of silver. Up to the present time their total yield has been estimated at $3,000,000,000. Great deposits of silver have been discovered in the western states of America, particularly in Nevada, Arizona, California, Colorado, Idaho, Montana, New Mexico, and Utah, and the yield amounts to about $35,000,000 annually. Silver ore, chiefly argentiferous galena, has also been found in great quantities in the Barrier ranges of New South Wales. Some of the mining concerns here are the largest in the world. Considerable quantities of silver are also produced in Europe. The average production of Germany is estimated at about $4,000,000. In Britain silver is obtained from argentiferous lead ore to the value of over $100,000 annually. The world's total production of silver at present is about $100,000,000 annually.

SILVER-FIR, a species of fir, so called from two silvery lines on the under side of the leaves. It is a native of the mountains of the middle and south of Europe, but has long been common in Britain. It grows to the height of 150 to 180 feet, forming a very fine tree. Its timber is not so much prized as that of some other species, but is used for various purposes, and is durable under water. It yields resin, turpentine, tar, etc., especially the fine clear turpentine known as Strasburg turpentine. The American silver-fir, the balm of Gilead fir, yields the Canada-balsam used for optical purposes. Other species are also called silver-firs.

SILVER-FOX, a species of fox in-

habiting the northern parts of Asia, Europe, and America, and distinguished by its rich and valuable fur, which is of a shining black color, having a small quantity of white mixed with it in different proportions.

SILVERING, the application of silver leaf is made in the same way as that of gold, for which see Gilding. Several mixtures containing silver have long been in use for coating base metallic objects, but they have been almost all superseded by the modern process of electro-plating. (See Electro-metallurgy.) For a description of the silvering of mirrors see the article Mirror.

SIMBIRSK', an eastern government of Russia; area, 29,657 sq. miles. It consists in general of an extensive fertile plain watered by the Volga and its affluents. Agriculture and cattle-breeding are the leading industries. The principal crops are grain, hemp, flax, hay, and tobacco. Minerals are unimportant. There is an abundance of fish in the rivers and numerous small lakes. Pop. 1,481,811.—Simbirsk, the capital, stands on a lofty bank of the Volga, 448 miles e.s.e. of Moscow. It has wide streets and squares, a cathedral, etc. There is an annual fair, and a good trade in corn and fish. Pop. 43,298.

SIMEON, Tribe of, the descendants of Simeon, the second of Jacob's sons by Leah. They received a section in the southwest of Canaan, which was originally allotted to Judah.

SIMLA HILL STATES, a collection of twenty-three Indian native states surrounding the sanitarium of Simla; total area, 6569 sq. miles. The mountains of these states form a continuous series of ranges ascending from the low hills of Ambála (Umballa) to the great central chain of the Eastern Himálayas. The chief river is the Sutlej. The climate is genial, and the winters comparatively mild. Pop. 502,853.

SIMMS, William Gilmore, American author, born at Charleston, South Carolina, 1806; died 1870. He published in 1827 a volume of poems; but his best poem, Atalantis, a Tale of the Sea, appeared in 1833. This was followed by a series of romances founded on revolutionary incidents in South Carolina, and by several border tales and historical romances. Among these we may mention Guy Rivers, The Yemassee, The Partisan, The Scout, Eutaw. He was editorially connected with several periodicals, and filled several political offices.

SIMON (sē-mōn), Jules (properly Jules François Suisse Simon), a French philosopher and statesman, born at Lorient, department of Morbihan, 31st December, 1814, and educated in the Ecole Normale, Paris. In 1876 he became leader of the republicans, and was minister of the interior until 16th May, 1877, when he was dismissed by MacMahon. He afterward edited the Echo Universel. His chief works include Histoire de l'Ecole d'Alexandrie (1844), Le Devoir (1854), La Liberté de Conscience (1859), L'Ouvrière (1863), L'Ecole (1864), Le Travail (1866), La Peine de Mort (1869), Souvenirs du 4 Septembre (1873), and Le Gouvernment de M. Thiers (two vols, 1878). He died in 1896.

SIMON'IDES (dēz), a Greek lyric poet, born in the island of Ceos about B.C. 556. At a competition for the best elegy upon those who fell on the field of Marathon, he gained the prize over Æschylus himself. Simonides is credited with the addition to the Greek alphabet of the long vowels and the double letters. Only fragments of the works of this poet have come down to us.

SIMOOM', a hot suffocating wind that blows occasionally in Africa and Arabia, generated by the extreme heat of the parched deserts or sandy plains. The air, heated by contact with the noonday burning sand, ascends, and the influx of colder air from all sides forms a whirlwind or miniature cyclone, which is borne across the desert laden with sand and dust. Its intense, dry, parching heat, combined with the cloud of dust and sand which it carries with it, has a very destructive effect upon both vegetable and animal life. The effects of the simoom are felt in neighboring regions, where winds owing their origin to it are known under different names, and it is subject to important modifications by the nature of the earth's surface over which it passes. It is called Sirocco in South Italy, Kamsin in Egypt and Syria, and Harmattan in Guinea and Senegambia.

SIMPLON (san-plōn), a mountain, 11,117 feet high, belonging to the Alps, in the canton of Valais, Switzerland, and celebrated for the road that passes over it, which commences near Brieg, on the Swiss side, and terminates at the town of Domo d'Ossola, in Piedmont. A railway tunnel 12½ miles long, costing over $20,000,000, has recently been completed, which connects the lines from Geneva to Brieg, and from Domo d'Ossola to the Lago Maggiore.

SIMPSON, Sir James Young, M.D., the most eminent medical practitioner of his day, and the discoverer of the anæsthetic properties of chloroform, was born in 1811 at Bathgate in Linlithgowshire, died at Edinburgh 1870. His first paper on chloroform was read before the Medico-Chirurgical Society of Edinburgh on March 10, 1847, and it soon came into general use. He received honors from numerous scientific societies in Europe and America, and in 1853 was elected a foreign associate of the Academy of Medicine of Paris. In 1856 he received the laureateship and gold medal of the French Academy of Sciences, with the Monthyon prize of 2000 francs awarded for "most important services done to humanity." He first expounded acupressure in a paper read before the Royal Society of Edinburgh in 1859, and afterward in his treatise on Acupressure (1864). For twenty years he devoted himself to the subject of hospital reform, and in his leisure found time to engage in antiquarian research. In 1847 he was appointed her majesty's physician-accoucheur for Scotland; in 1856 he was made a knight of the royal order of St. Olaf of Sweden; and in 1866 a baronetcy was conferred on him.

SIMS, George Robert, journalist and dramatic writer, born 1847. He became a contributor to Fun under the pen name of "Dagonet," and has written much on the London slums. His most successful dramas are The Lights o' London, The Romany Rye, and in collaboration The Harbor Lights, In the Ranks, and London Day by Day. He has also written novels, etc.

SINAI (si'nā), properly the general name of a mountain mass in Arabia Petræa, in the south of the peninsula of the same name, which projects into the Red sea between the gulfs of Akaba and Suez. Sometimes the name is confined to the culminating mountain of the mass, which rises 8551 feet above sea-level. The whole mass is of a triangular shape, about 70 miles long from north to south, and consists of a series of mountains, composed for the most part of granite, syenite, and porphyry, with occasional strata of sandstone and limestone, and intersected by numerous wadis or valleys. The principal peaks of the mass are Jebel Zebir, 8551 feet; Jebel Katerin, 8536 feet; Jebel Umm Shomer, 8449 feet; Jebel Músá, 7375 feet; and Jebel Serbál, 6734 feet. From the time of Justinian downward Jebel Músá, or Mount of Moses, has been almost universally regarded as the mountain of the law.

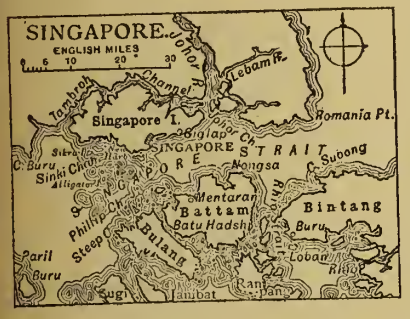
SINALO'A, or **CINALOA,** a state of Mexico, bordering on the Bay of California; area, 22,630 sq. miles. The western portion of the state is sandy and barren, but the center is very fertile. The eastern division is traversed by the Mexican Cordilleras. In the fertile districts vegetation is luxuriant, the chief products being sugar, tobacco, cotton, figs, pomegranates, etc. The inhabitants are chiefly engaged in cattle-rearing and mining. Pop. 296,701.—The chief town is Culiacan. Pop. 10,380.

SIND, SINDH, or **SCINDE,** a province of British India, in the northern part of the presidency of Bombay. It consists of the lower valley and delta of the Indus, and is bounded on the west and northwest by Baluchistan and Afghanistan; northeast by the Punjab; east by Rajputana; and south by the Runn or Ran of Kach and the Indian ocean; area, 48,014 sq. miles. It is divided into five districts, Haidarabad, Karáchi, Shikarpur, Thar, and Parkar, and Upper Sind Frontier, and also includes the native state of Khairpur (6109 sq. miles). The chief city and port is Kurrachee or Karáchi, but the ancient capital Haidarabad is still a populous town. About 78 per cent of the population are Mohammedans; 12 per cent Hindus; 5 per cent Sikhs; and the rest Christians, Jains, Parsees, Jews, Buddhists, etc. Pop. (exclusive of Khairpur, 131,937), 3,210,910.

SINE, in trigonometry, a line drawn perpendicularly from one end of an arc of a circle upon the diameter drawn through the other end. The sine of the arc is also the sine of the angle subtended by the arc; that is, C E is the sine of the arc C H and the angle C O H.

SINGAPORE, a British possession, forming one of the Straits Settlements, and consisting of a small island, lat. 1° 17′ n.; lon. 103° 50′ e.; and its capital of the same name, with numerous surrounding islets, off the southern extremity of the Malay peninsula, and

separated from the mainland by a narrow strait 2 miles to ½ mile in breadth. The principal island, which is undulating and well clothed with wood, is about 25 miles long and 14 miles average breadth; area, 206 sq. miles. Though so near the equator the island is remarkable for its salubrity. Cultivated products include nutmegs, cloves, ginger, pepper, sugar-cane, coffee, pine-apples and other fruits, sweet-potatoes, and other vegetables. Singapore possesses all the fruit-bearing trees of the Indian archipelago. Birds include pea-fowls, pheasants, partridges, etc. Among reptiles are turtles, tortoises, crocodiles, cobras and other serpents. The coast and rivulets abound with fish. Pop. 184,554. The town of Singapore is



situated on a rivulet on the south side of the island. It is divided into three parts —the western, inhabited by Chinese; the central, by the Europeans; and the eastern, by the Malays. Singapore is the great entrepôt of Southern Asia and the Indian archipelago, and the port is practically free. Exports consist of tin, coffee, rice, sago, tapioca, pepper, nutmegs, rattans, gambier, sugar, bees'-wax, raw silk, gutta-percha, mother-of-pearl, etc. Imports from Great Britain include cottons, woolens, coals, iron, arms, wines, and various manufactures; and from Europe and the United States wines, spirits, liquors, manufactured goods, provisions, etc. Singapore is the capital of the Straits Settlements and the residence of the governor. Pop. 228,555.

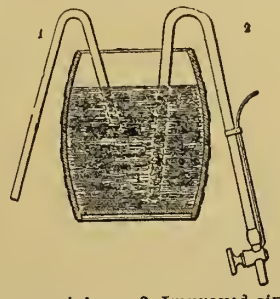
SING-SING, since 1901 called Ossining, a town of the United States, on the left bank of the Hudson, sloping to a height of 200 feet, in the state and 30 miles north of the city of New York. It has a large state prison with 1320 cells, military and other schools, fine private residences, etc. There are manufactories of tools, carriages, and hardware. Pop. 10,106.

SIOUX (sōō), or **DAKOTA INDIANS,** a North American family of Indian tribes dwelling chiefly in S. Dakota and Nebraska, and originally extending from Lake Winnipeg on the north to the Arkansas river on the south. They have several times engaged in hostilities with the United States settlers and troops, chiefly because faith was not kept with them by the government. In 1862 more than a thousand settlers were killed. In 1876 a body of them who had taken up a position in the Black Hills cut off General Custer and 1100 men.

SIOUX (sōō) **CITY,** the county seat of Woodbury co., Iowa, 156 miles northwest of Des Moines; on the Missouri river, at the junction of the Big Sioux and the Floyd. Among the railroads that enter the city are the Chicago, Milwaukee and St. Paul, the Chicago and Northwestern, the Chicago, St. Paul, Minneapolis and Omaha, the Illinois Central, the Great Northern, and the Union Pacific. There are large flouring and grist mills, foundries, machine shops, meat packing establishments, breweries, and large railway machine and repair shops. Pop. 1909, 62,000.

SIOUX FALLS, the county seat of Minnehaha co., S. D., 90 miles north of Sioux City, Iowa; on the Big Sioux river, here spanned by four bridges, and on the Chicago, Milwaukee and St. Paul, the Great Northern, the Illinois Central, the Chicago, St. Paul, Minneapolis and Omaha, and the Chicago, Rock Island and Pacific railroads. Pop. 12,164.

SIPHON, a bent pipe, one leg of which is longer than the other, through which a liquid may, by the action of gravity, be transferred from one place to another at a lower level over an obstruction which must be lower than a height which depends on the specific gravity of the liquid. In order to accomplish this the shorter leg is plunged into a vessel containing liquid, and the air in the tube is now exhausted by being drawn through the longer leg, whereupon the liquid will flow out of the vessel through the siphon until the surface of the liquid is brought

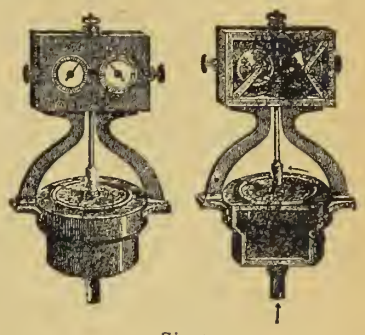


1, Common siphon. 2, Improved siphon, with exhausting tube for filling it.

down to the level of the opening of the short leg of the siphon. The water rises by the weight of the atmosphere, and the leg by which it is discharged must always be longer than the other to give a greater weight of water in this leg. Sometimes an exhaust tube is attached to the longer leg for the purpose of exhausting the air by motion and causing the flow to commence; but an equally effectual method is to fill the tube with liquid and then to put it in position while still full, the ends of course being at first stopped. The principle of the siphon has been employed in aqueducts and in drainage works. Water can be siphoned to a height of 32 feet. The principal use of the siphon is for racking wines and liquors from off their lees.

SIR, as a title, belongs to knights and baronets, and is always prefixed to the Christian name.—Sire is a term of respect by which kings are addressed. The word sir is the same as sire, and is derived from old French, senre, and that from senior, whence also seignior, signor, similar terms of courtesy.

SIREN, an instrument for producing continuous or musical sounds, and for measuring the number of sound waves or vibrations per second, which produce a note of given pitch. In its original form it consists of a disc with a circular row of oblique holes, revolving close to the top-plate of a wind-chest perforated with corresponding holes of a contrary obliquity, so that the jets of air from the



Siren.

latter passing through the former keep the disc in motion, and produce a note corresponding to the rapidity of the coincidences of the holes in the two plates, the number of coincidences or vibrations in a given time being shown by indices which connect by toothed wheels with a screw on the axis of the disc. See also Fog-signals.

SIRENS, in Greek mythology, the name of several sea-nymphs, who by their singing fascinated those who sailed by their island, and then destroyed them. When Ulysses approached their island, which was near the coast of Sicily, he stuffed the ears of his companions with wax, while he bound himself to the mast, and so they escaped. The Sirens then threw themselves into the sea, where they became formidable rocks. Another story is that they threw themselves into the sea because vanquished in music by Orpheus.

SIRIUS, the brightest star in the heavens, also called the Dog-star, situated in the mouth of the constellation Canis Major, or the Greater Dog. It is estimated to have more than 13 times the sun's magnitude. See Dog-days.

SIROCCO, a hot, relaxing, and oppressive southeast wind, which blows in Sicily and South Italy.

SIRO'HI, a native state in the Rajputana agency, India; area, 3020 sq. miles. The country is much intersected and broken up by hills and rocky ranges, and frequently suffers from drought. Wheat and barley are the staple crops. Pop. 154,350.

SIRSA, a British district in the Punjab, India; area, 3004 sq. miles. It forms for the most part a barren and treeless plateau. A great cattle fair is held at Sirsá, the chief town, in August and September. Pop. 253,275; of town 12,292.

SISAL', or **GRASS HEMP,** a species of agave yielding a valuable fiber, a native of Mexico, Honduras, Central America, and specially cultivated in Yucatan. It is grown upon stony ground, and the leaves, from which the fiber is prepared, are between 2 and 3 feet long. The pulp

is cleaned away from each side of the leaf and the remaining fiber is then washed and sun-dried. It has considerable commercial value in the manufacture of cordage and coarse cloth.

SIS'COWET or SISKOWIT, a species of North American lake-trout, inhabiting chiefly the deep water of Lake Superior and other lakes.

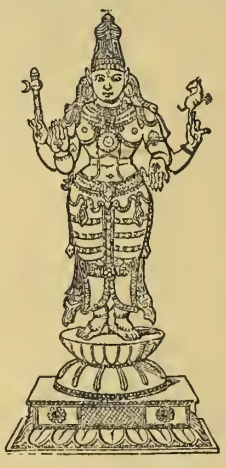
SISMON'DI, Jean Charles Léonard Simonde de, historian and political economist, was born in Geneva, 9th May, 1773. In 1803 he published a work entitled De la Richesse Commerciale, ou Principes d'Economie Politique appliquée à la Législation du Commerce. This essay was afterward remodeled so as to form the groundwork of his treatise published in 1819 under the title of Nouveaux Principes d'Economie Politique. In 1807 appeared the first two volumes of his Républiques Italiennes, which ultimately reached sixteen volumes, and was not completed till 1818. In 1819 he commenced his Histoire des Français, a great work which was to occupy the greater part of his remaining life. He died of cancer, June 25, 1842.

SISTERHOODS, a name given to various religious and charitable orders or associations of women. These are very numerous, and have recently increased in number. Among the more important are: (1) Sisters of Charity (also called Gray Sisters, Daughters of Charity, Sisters of St. Vincent de Paul) a Roman Catholic order founded in 1634 at Paris by St. Vincent de Paul for the work of nursing the sick in hospitals. The sisters take simple vows of poverty, chastity, and obedience, which are annually renewed; they add a fourth vow binding themselves to serve the sick. They number about 40,000 in upward of 2000 houses scattered over all parts of the civilized world. Besides nursing and conducting orphanages, the sisters sometimes undertake the management of poor schools. (2) Sisters of Charity (Irish), a congregation in no way connected with the above, founded in 1815 by Mary Frances Aitkenhead for the purpose of ministering to the sick and poor in hospitals, and at their own homes. (3) Little Sisters of the Poor, founded in France in 1840, now spread over the world. Their chief object is the care of the aged poor, and they beg from house to house. (4) Sisters of Mercy (Irish), an important and flourishing order, founded by Catherine M'Auley, Dublin, in 1827, for carrying on works of mercy both spiritual and corporal. (5) Sisters of Mercy (Anglican), an important body founded in 1845 by Dr Pusey, the original London house being the pioneer of many charitable sisterhoods connected with the English church, and passing under various names. See Mercy (Sisters of).

SISTINE CHAPEL, a chapel in the Vatican, so called from Pope Sixtus IV., by whom it was erected in 1473. See Vatican.

SISTRUM, a kind of rattle or jingling instrument used by the ancient Egyptians in their religious ceremonies, especially in the worship of Isis. It consisted of a thin somewhat lyre-shaped metal frame through which passed loosely a number of metal rods, to which rings were sometimes attached.

SIVA, the name of the third deity in the Hindu triad (Brahma, Vishnu, and Siva), in which he is represented as the destroyer and also as the creator or regenerator. His worshipers (the most numerous of the Brahmanic sects) are termed Saivas, and assign to him the first place in the trinity, attributing to him also many attributes which properly belong to the other deities. His symbol is the lingam or phallus, emblematic of

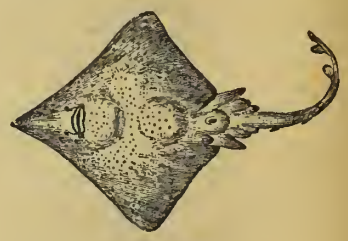


Siva.

creation. He is frequently represented riding on a white bull, with five faces and two, four, eight, or ten hands, having a third eye in the middle of his forehead pointing up and down, and carrying a trident. Serpents commonly hang about him, and he may be seen with a sort of mace in one hand and an antelope in another. See Brahmanism.

SIXTUS V. (Felix Peretti), the greatest ruler and statesman among the popes of the four last centuries, was born in 1521 near Montalto, died 1590. He entered the Franciscan order in 1534, and distinguished himself in scholastic philosophy, theology, and Latin literature. In 1544 he taught the canon law at Rimini, and two years later at Siena. In 1548 he was made priest, doctor of divinity, and superintendent of the monastic school at Siena. In 1556 he was appointed director of the Franciscan school at Venice, and afterward inquisitor-general. In 1560 he went to Rome, where the pope conferred upon him several dignities. In 1570 he was created cardinal, and took the name Montalto. Under Gregory XIII. he lived a retired life for some years in his villa, and is said to have assumed the mask of pious simplicity and old age in order to prepare himself for the papal chair. On Gregory's death in 1585 he was unanimously elected pope, and immediately manifested himself an able and energetic ruler. He restored order in the states of the church, cleared the country of bandits, and regulated the finances. He re-established discipline in the religious orders, and fixed the number of cardinals at seventy. He took a part in most of the great political events then agitating Europe. He supported Henry III. against the Huguenots, and Philip II. against England. The great aim of his foreign policy was the promotion of the cause of Roman Catholicism throughout Europe against Protestantism.

SKATE, a name popularly applied to several species of the genus of fishes Raia or rays. The skeleton is cartilaginous, the body much depressed, and more or less approaching to a rhomboidal form. The common skate agrees with the other members of the genus Raia in possessing a flat broad body, the chief portion of which is made up of the expanded pectoral fins, which are concealed, in a manner, under the skin. The tail is long and slender, and the snout pointed, with a prominent ridge or keel. The teeth are



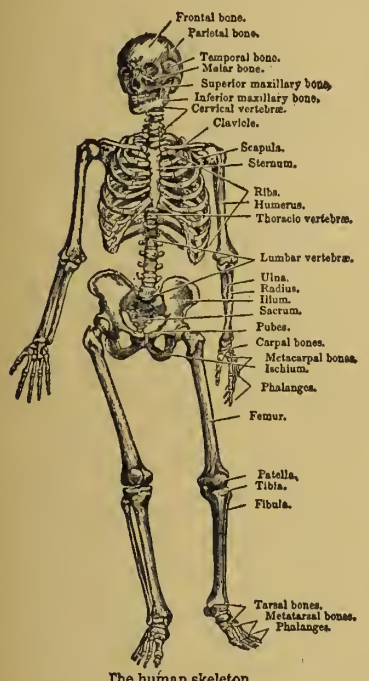
Gray skate.

arranged in a mosaic or pavement-like pattern. This fish, although commonly seen of moderate dimensions, may attain a weight of 200 lbs. or more.

SKATES and SKATING. A skate consists of a frame shaped somewhat like the sole of a shoe, underneath which is fastened a metallic runner, the whole being intended to be fastened one under each foot, for gliding rapidly over the ice. Skating seems to be of great antiquity, mention being made of it in the Edda. In Holland, from time immemorial, skates have been used by all classes of people upon the canals and rivers for the facility of locomotion they afford. Great variety in the manufactures of skates has been introduced within a comparatively short period. In the most improved forms the wood of the older skate has been replaced by metallic fittings, and the skate is attached to the foot by spring fastenings which obviate the need for straps. A kind of skates, termed "parlor skates" or roller skates, in which the metal runner is replaced by small wheels, is used on a prepared asphalt or other smooth flooring.

SKELETON, the name applied specially to the hard structures, mostly of bony or osseous nature, which form the internal axis or support of the soft parts in the higher or vertebrate animals. But in comparative anatomy the term endoskeleton is applied to the internal hard parts, proper to the Vertebrata, while exoskeleton denotes the exterior hard parts both of Vertebrates and Invertebrates, such as the shell of lobster, scales of fishes, etc. The parts of any endoskeleton may generally be grouped under the two heads of the spinal or axial skeleton, and the appendicular parts. The former includes the skeleton of the head and trunk, the latter that of the limbs. The spinal skeleton involves the consideration of the skull;

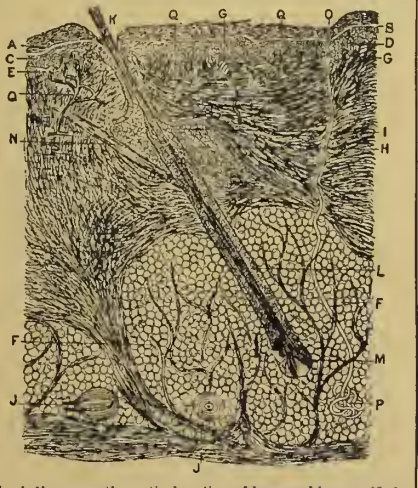
spinal or vertebral column, composed of its various vertebræ; and of the thorax, or chest, and pelvis. The limbs consist of homologous or corresponding parts, and are attached to a series of bones constituting the "arch," or support of the upper or fore and the lower or hind limbs respectively. The scapulæ or shoulder-blades and collar-



The human skeleton.

bones or clavicles constitute the shoulder-girdle or arch supporting the fore or upper limb, while the lower limb is attached to the pelvic arch or pelvis. See Skull, Spine, Thorax, Rib, Shoulder, Arm, Hand, Pelvis, Leg, Foot, etc.

SKIN, the name given to the external layer or tissue of the bodies of most animals, forming at the same time a protective and a blood-purifying organ. Structurally viewed, the skin of all vertebrates consists of two layers—an outer and inner layer. To the outer layer the name of cuticle, epidermis, or scarf skin is popularly given. This layer is destitute of nerves and of blood-vessels, and is thus a non-sensitive structure. The inner layer is, on the contrary, a highly vascular and sensitive layer, and is named the dermis, corium, or true skin. At the lips and elsewhere the epidermis becomes continuous with the more delicate mucous membrane which forms the lining membrane of the internal passages. This membrane is to be viewed, however, as a mere modification of the epidermis itself. The epidermis is composed of several layers of epithelial cells. The upper cells of the epidermis, as seen in a vertical section of the skin, are flattened, and of scaly conformation, the lower cells being of rounded or elongated shape. The elongated cells have their long axes arranged vertically to the general skin surface. The deeper portion of the epidermis, or rete mucosum, is of softer and more opaque consistence and appearance than the upper layer; and it is in the rete mucosum that coloring matters are present, which give the hue to the skin. The dermis or true skin rests upon a layer of adipose and cellular tissue, and is composed of interlacing fibers of fibro-cellular tissue. It is richly supplied with blood-vessels, so that when cut it bleeds; and nerve-fibers are likewise disposed in it, conferring sensibility. The surface of the true skin is thrown into a series of elevations, papillæ, or minute prominences, which are specially rich in capillary blood-vessels and nerve endings, and which are thus particularly vascular and sensitive. The special glands of the skin are the sudoriparous or sweat glands; they are in the form of tubes coiled up into balls, and the total number of them in the human skin is estimated at over two millions. There are also sebaceous glands, which secrete an oily fluid useful for lubrication. Though the most ostensible function of the skin seems to be that it covers in and protects the more delicate structures that lie beneath it, its functions as an excretory organ and as a regulator of the temperature of the body are also of high importance. The hair and nails are modifications of the epidermis, as are also the feathers of birds and the claws of animals. Extensions of skin, as between the toes of ducks, etc., or between the arms and legs of flying squirrels, and as seen in bats, may exist. And pendulous skin-folds, horns, callosities, horny plates scales, and other modifications of the epidermis, are met with in various animals. The scutes or bony plates seen in the armadillos are dermal structures united to horny plates formed by the



Semi-diagrammatic vertical section of human skin magnified.

A, Stratum corneum; B, stratum lucidum; C, stratum granulosum; D, stratum spinosum; E, corium with papillæ; F, subcutaneous fat; G, tactile corpuscles; H, sebaceous gland; I, duct of sebaceous gland; J, pacinian corpuscles; K, shaft of hair; L, root-sheath of hair; M, root of hair; N, arrector pili muscle; O, duct of sweat-gland; P, Sweat-gland; Q, blood-vessels.

epidermis. In many reptiles and in some lizards the two layers of the skin similarly participate in forming the exo-skeleton. The scales of fishes are formed by the dermis or true skin; but those of serpents are epidermic in their nature.

SKIN DISEASES, a name for such diseases as eczema, shingles, ringworm, pityriasis, lichen, itch, etc.

SKIN-GRAFTING, in surgery, a method for the treatment of large ulcerated surfaces by the transplantation of small pieces of skin from another part of the body.

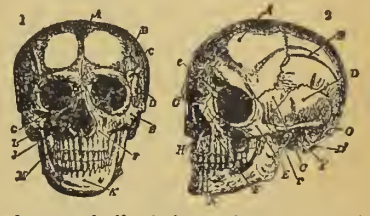
SKINK, the common name of small lizards. They have a long body entirely covered with rounded inbricate scales, and are natives of warm climates. One species, the adda, is celebrated throughout the East as being efficacious in the

Adda or common skink.

cure of various cutaneous diseases, to which the inhabitants of Egypt, Arabia, etc., are subject. It is about 6 inches in length, has a cylindrical body and tail, and burrows in the sand.

SKIO. See Scio.

SKULL, the name applied to the skeleton of the head, composed in most vertebrates of a facial and a cranial portion, and which incloses the brain and organs of special sense. The skull of man includes twenty-two bones. In the cranial portion there are eight bones, the occipital bone o, or hinder portion of the skull, two parietal bones b, forming the sides of the head; two temporal bones d d′; the frontal bone a; the sphenoid bone c, mainly in the base of the skull; and the ethmoid bone e, between the skull and the face, and between the eye cavities. The facial portion includes fourteen bones—two


The human skull.—1, front view. 2, side view.

nasal bones g; two superior maxillary, or upper jaw-bones f; two lachrymal bones h; two molar or cheek bones e; two palate bones; two turbinated bones l m; the vomer, dividing into two the cavity of the nose j, and the inferior maxillary or lower jawbone k. This is the only bone which is movable, a hinge-joint being formed between its strong prominences at p. The left zygomatic arch is shown at r. At the base of the occipital bone is the large aperture termed the foramen magnum, through which the brain and spinal marrow become continuous. The two lesser foramina, one in either orbit, transmit the optic nerves. The size and shape of the skull vary in the different races of man, and at different ages from infancy to old age. The skulls of most vertebrata differ widely from that of man in the relative development of their various parts. See also special articles, such as Ichthyol-

ogy, Orinthology, Reptilia, etc., and also Ear, Eye, Nose, etc.

SKUNK, a carnivorous animal belonging to the weasel family. It inhabits North America, and its average size is about that of a large cat. Its fur is of a dark-brown hue, streaked longitudinally with black and white, and its tail is long and bushy. The skunk is notorious from the potent and disgusting odor which it emits from its

Common skunk.

anal glands, and which can be perceived a mile away. The secretion of these glands can be forcibly ejected at the will of the animal, and its stench is so persistent that no amount of washing will remove it from clothes impregnated with it. This nauseous secretion has been alleged to possess therapeutical virtues. The skunk is largely hunted for the sake of its fur, which is purified for commercial purposes by heat. There are two other less common species, now classed in separate genera.

SKYLARK, the skylark is found all over Europe, as well as in Northern Africa and the corresponding zones of Asia. It frequents meadows, and does not perch. It feeds chiefly on the seeds

Skylark.

of various plants and larvæ. Its nest is formed on the ground. It lays four or five eggs of a whitish gray. Its length is about 7 inches, the tail being 3. It is almost equally esteemed for the delicacy of its flesh and the melody of its song.

SLAG, a secondary product of the processes of extracting metals from their ores. It is mainly a compound of silica with alumina or lime, or both, together with various other substances in small quantity. It always contains more or less of the metal from the extraction of which it results. The presence of silica gives a glossy appearance to the mass. Slag is sometimes cast into blocks, and used for road-making and building, and when reduced to powder it is used in making mortar and to impart a glaze to bricks. It is also utilized in the manufacture of glass. Slag phosphate meal is a fertilizer made from basic slag (which see).

SLANDER. See Libel.

SLANG, colloquial words and phrases originating for the most part in the lower classes of society. Slang is not exclusively of modern date. It was known in the classic age of Greece and Rome, and abounds in the writings of Aristophanes, Plautus, Terrence, and Martial. Slang consists in part of new words and in part of words of the legitimate language invested with new meanings. Poker players cash their "chips" at the close of the game. From this comes the use of the phrase "to pass in his chips," as slang for death. Certain words and phrases formerly regarded as strictly literary are now slang. As examples of this may be cited "awful," "fierce," "devilish," "keen," "wise," in such phrases as "an awful swell," "a fierce hat," "devilish good," "to be keen on something," or "to put a man wise to a thing." Another class is the slang of clipped words, as "enthuse," for "enthusiastic," "beaut" for "beauty," "gent" for "gentleman." All grades of society and every profession has its slang. These vary so much as to be almost or even quite mutually unintelligible. The slang of the race course, the prize ring, the barroom, and the variety show are distinct from one another. The linguistic necessity of slang is shown by its universality. It is current in all modern languages, and reaches its acme in the most highly developed tongues, as English, French, and German.

SLATE, or CLAY-SLATE, called sometimes argillite, a well-known hard variety of rock which splits into thin plates, the type being roofing slate. The lamination of slate is not that of its bedding, but is often at right angles to it. It is produced by lateral pressure, and is confined to disturbed and metamorphosed rock. The prevailing color is gray, of various shades; it yields to the knife, but varies considerably as respects hardness in its different varieties. Slate occurs in all countries where there are metamorphic rocks. It is commonly divided into elevated beds of various degrees of thickness; and from the natural divisions of the rock, they often form peaked and serrated mountains. The finest variety which is used for the covering of roofs is generally embedded in other slate rocks of a coarser kind. Slate-pencils are made of certain varieties of soft slate.

SLAVE COAST, a maritime strip on the west of Africa, on the Guinea Coast, extending between the Volta and Akinga, a stretch of about 240 miles. It consists mainly of long narrow islands. The principal towns on the coast are Badagry and Whydah. A large traffic in slaves was formerly carried on at the ports of this region, hence its name.

SLAVERY, the system by which certain persons are kept as the property of others, a system of great antiquity and formerly of wide prevalence. Among the Hebrews the system of slavery was one of great mildness. Native Hebrew slaves were released every seventh year, and their owners were enjoined to treat them kindly. Among the Greeks and Romans slavery was a rooted institution. At Athens the slaves were commonly treated with mildness, but at Sparta they are said to have been treated very harshly. The slaves of the ancient Romans were either captives or debtors that were unable to pay. In Rome the slave had originally no rights at all. He could be put to death for the smallest misdemeanor. Slaves were exceedingly numerous, and latterly almost monopolized all the various handicrafts and occupations, those of the clerk, the doctor, and the literary man included. In the time of Augustus a single person is said to have left at his death over 4000 slaves. Hosts of slaves were employed in the gladiatorial exhibitions. Slaves, however, were often set at liberty, and these freedmen were a well-known class at Rome. But it was not till the time of the empire that any great change took place in the condition of the slaves. Augustus granted the slave a legal status, and Antonius took away from the masters the power of life and death over their slaves. The early Christian church did nothing to suppress slavery, and slavery and the slave-trade continued to exist for 1000 years in the Christian nations of Europe that rose on the ruins of the Roman empire. It was not till the 13th century that the severity of slavery began to decline in Europe. The Koran expressly permits the Moslems to acquire slaves by conquest, but this method of acquiring slaves was not resorted to until the Crusades. Previous to the Crusades they kept negro slaves imported from Africa. Latterly the Mohammedans began to obtain white slaves not only by war but also by purchase, Rome being the center of the trade. The Mohammedans of the Barbary states also obtained white slaves by piracy in the Mediterranean.

After slavery had become all but extinct in Europe, it had a new birth in the American colonies of European origin. The Portuguese were the first to hunt negroes in the interior of Africa for use as slaves in the colonies. The first shipment of negroes to the New World took place in 1503, when the Portuguese landed some in St. Domingo. From that time to the nineteenth century a traffic in negroes across the Atlantic was carried on by all the Christian colonial powers. In 1562 the English first took part in the trade, and in course of time outdid all other nations in the extent to which they carried this traffic, as also, it is said, in the cruelty with which they conducted it. About 1770 nearly 200 English vessels were engaged in the trade.

The first persons who liberated their slaves, and labored to effect the abolition of the slave-trade, were some Quakers in England and North America early in the 18th century. In 1783 a petition was addressed to parliament for the

abolition of the trade, which Wilberforce eloquently supported. A bill passed the House of Commons for the abolition of the slave-trade in 1792, but it was rejected by the lords. On February 4, 1794, the French national convention declared all the slaves in the French colonies free. Wilberforce brought in a bill with a like object in 1796, but it was rejected. In March 1807, the famous Abolition Act was passed. January 1, 1808, was fixed as the time when this trade, on the part of the British should cease. The abolition of slavery itself gradually followed that of the trade in slaves. In 1831 the British government emancipated all the slaves of the crown, and in 1833 a bill was passed for the emancipation of all the slaves in British colonies. The greatest slave-holding nation till recent times was the United States, in which, however, slavery was only an institution of the Southern states. As a result of the civil war it was abolished by proclamation in 1863, and by constitutional amendment in 1865. In 1873 the Spanish government abolished slavery in Porto Rico, and in 1886 abolition in Cuba took place. In Brazil slavery existed till 1888.

The efforts made to suppress the slave-trade on the east coast of Africa have not hitherto proved quite successful. In 1817 a treaty for its suppression was concluded with Madagascar, and in 1822 with the Imam of Muscat (ruler of Oman); but the slave-trade was, until recently, as active as ever along the whole coast. Those chiefly engaged in the trade are Arabs, who sell the slaves in the African countries bordering on the Mediterranean and at the ports of the Red sea. They are all ultimately destined for Mohammedan masters. The suppression of the trade was one of the objects of Sir Samel Baker's expedition up the Nile in 1870–73; and much more vigorous and effective measures were carried out by General Gordon in 1877 and subsequent years. In May, 1873, a treaty was signed stipulating for its suppression within the dominions of the Sultan of Zanzibar; and the slave-market at Zanzibar was thereupon closed. At the present time, through the extension of the influence of Britain and other European powers, the traffic has been put down in many districts where it was formerly rampant.

SLAVES, SLAVS, or SLAVONIANS, a branch of the Aryan family of nations, among which it is most nearly allied to the Lithuanian and more distantly to the Germanic branch. In the 4th century Slavs lived in great numbers in the neighborhood of the Carpathians, and thence they appear to have spread northward to the Baltic and south to the Adriatic. About the beginning of the 6th century they are found on the northern banks of the Lower Danube, whence they passed over to the southern banks, occupying Mœsia and Thrace; at this time Slaves also peopled Bohemia and Moravia, and before the end of the century they had penetrated into Transylvania, Hungary, Upper Austria, Styria, Carinthia, and Carniola. The Slavonic tribes of Chorvatians (Croats) and Servians settled probably between 634 and 638 in Dalmatia and the whole of ancient Illyricum (Bosnia, Servia, and the neighboring districts). Finally, Slavonic tribes spread from their first settlements also to the north and east, over the remainder of modern Russia. Of this wide territory the Slavonians again lost in process of time the Elbe and Oder regions, Upper Austria, and part of Carinthia and Styria, all of which they were deprived by Germanic tribes; large parts of Transylvania and Hungary, which fell to Roumanians and Magyars; and parts of the regions on the south of the Danube, which came into the hands of Greeks and Turks.

The Slaves in the districts in which they still exist form two great groups, the southeastern and the western Slaves. The former include (1) Bulgarians, (2) Servians, (3) Croats, (4) Slovenians, (5) Russians; and the latter include (1) Czechs (comprehending Czechs in the narrower application, Moravians, and Slovaks); (2) Sorbs (Lusatians), divided into Upper and Lower Sorbs; and (3) Poles. The total number of Slaves is said to be about 116,000,000, five-eighths of whom are Russians. With few exceptions the Russian and Bulgarian Slaves belong to the Greek church, the western Slaves mostly to the Roman Catholic. There are eleven different Slavonic literary dialects. The four principal dialects and literatures are the Czech or Bohemian, the Polish, Russian and Servian.

SLAVONIA, a region of Austria-Hungary, which with Croatia and the Military Frontiers forms a province or administrative division of the empire; area of Slavonia, 3720 sq. miles. Pop. 377,613.

SLEDGE, a vehicle moved on runners or on low wheels, or without wheels, for the conveyance of loads over frozen snow or ice, or over the bare ground; called also a sled. Also a kind of traveling carriage mounted on runners, otherwise called a sleigh; much used in Russia, America, and other northern countries during winter, instead of wheel carriages.

SLEEP, the state in which the activity of the senses and cerebrum or brain proper appears to be naturally and temporarily suspended. This state is consistent with a kind of passive activity of these nervous centers, as seen in the acts or phenomena of dreaming, as well as in other concomitant phenomena of sleep. All parts of the body which are the seat of active change require periods of rest. In the case of the brain it would be impossible that there should be short periods of activity and repose, that is, of consciousness and unconsciousness, hence the necessity of sleep, a condition which is an unusually perfect example of what occurs at varying intervals in every actively working portion of our bodies. Sleep, therefore, affords the interval during which nervous energy expended during the waking hours is renewed. The respective influences of habit, age, temperament and occupation have much to do with the induction and maintenance of sleep in different individuals. An abnormal condition of irritability caused by great mental effort or strain for a considerable time, frequently results in preventing the access of sleep when it is desired. This indicates a revolt of the nervous centers, which may prove dangerous if the cause of it be not speedily done away with. Sleep often occurs in very different degrees in different parts of the nervous system. The phenomena of dreams and somnambulism are examples of differing degrees of sleep in different parts of the cerebro-spinal nervous system. Physiologists are all agreed that the dreamless sleep is the most refreshing, the lighter sleeper being liable to be disturbed by the most trifling noises. In some cases of diseased conditions sleep may be prolonged for indefinite periods, although obviously the distinction between coma and sleep is only made with great difficulty in such cases; while, on the contrary, periods of active wakefulness may occur and extend for days, weeks, or even months, without a single interval of sleep or repose. Insensibility is equally produced by a deficient and an excessive quantity of blood within the cranium; but it was once supposed that the latter offered the truest analogy to the normal condition of the brain in sleep, and, in the absence of any proof to the contrary, the brain was said to be during sleep congested. Direct experimental inquiry has led, however, to the opposite conclusion. The condition of the brain during sleep is one of considerable bloodlessness. There seems to be both a diminished quantity of blood circulation through the brain, and the speed of its movement is much lessened. See Dreams, Somnambulism.

SLIDELL', John, American politician, born in New York City in 1793. In December, 1853, he became United States senator, but resigned upon the secession of Louisiana from the Union. As commissioner to France he, with James M. Mason, commissioner to England, embarked upon the British mail steamer Trent, which was overhauled on November 8th by the United States sloop San Jacinto, and they were arrested and confined for a time in Fort Warren, Boston. Upon the demand of England the act of Captain Wilkes was disavowed and the commissioners sailed for England January 1, 1862. Mr. Slidell failed in his mission to France and at the close of the war settled in England. He died in 1871.

SLIDE-VALVE, a contrivance extensively employed in regulating the admission or escape of steam or water in machinery. A familiar example of the slide-valve is found in the ordinary steam-valve of a steam-engine.

SLIDING-RULE, a mathematical instrument or scale, consisting of two parts, one of which slides along the other, and each having certain sets of numbers engraved on it, so arranged that when a given number on the one scale is brought to coincide with a given number on the other, the product or some other function of the two numbers is obtained by inspection. The numbers may be adapted to answer various purposes, but the instrument is chiefly used in gauging and for the measuring of timber.

SLIGO, a seaport town of Ireland, prov. Connaught, capital of county

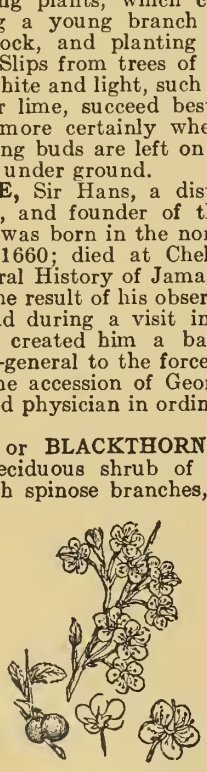
Sligo, 134 miles n.w. of Dublin. Sligo was disfranchised in 1870. Pop. 10,870. —The county is bounded n. by the Atlantic, e. by Leitrim, s. by Roscommon and Mayo, and w. by Mayo; area, 461,796 acres, of which about 320,000 acres are cultivated. The principal crops are oats and potatoes. Coarse woolens and linens are manufactured for home use. The coast fisheries are extensive. Pop. 84,022.

SLING, an instrument for throwing stones or bullets, consisting of a strap and two strings attached to it. The velocity with which the projectile is discharged is the same as that with which it is whirled round in a circle, having the string for its radius. The sling was a very general instrument of war among the ancients. With a sling and a stone David killed Goliath. The name is also given to a kind of hanging bandage in which a wounded limb is sustained; and to a device for holding heavy articles, as casks, bales, etc., securely while being raised or lowered.

SLIPS, Propagation by, a mode of propagating plants, which consists in separating a young branch from the parent stock, and planting it in the ground. Slips from trees of which the wood is white and light, such as willow, poplar, or lime, succeed best. A slip succeeds more certainly when two or three young buds are left on the lower part of it under ground.

SLOANE, Sir Hans, a distinguished naturalist, and founder of the British museum, was born in the north of Ireland, in 1660; died at Chelsea 1753. His Natural History of Jamaica (1707–25) was the result of his observations in that island during a visit in 1687–89. George I. created him a baronet and physician-general to the forces in 1716, and on the accession of George II. he was named physician in ordinary to his majesty.

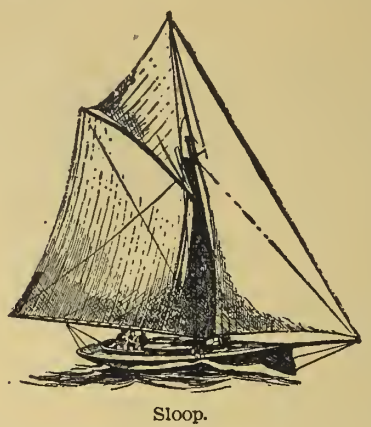
SLOE, or BLACKTHORN, a well-known deciduous shrub of the plum genus with spinose branches, and pos-



Flower and fruit of sloe.

sessing a very hard, tough wood. It blossoms with white flowers in the early spring, and has a black, round, austere fruit which is used for preserves, for making a fictitious port wine, and for dyeing black. The sloe is from 8 to 15 feet high. There are two or three varieties, including a double-flowered, variegated-leaved, and egg-shaped fruited forms.

SLOOP, a small vessel furnished with one mast and a fixed bowsprit. It is fore-and-aft rigged, and usually carries a main-sail, fore-sail (jib-shaped,) a jib, and a gaff-sail. It is a common rig for yachts. A sloop-of-war, was formerly a vessel, of whatever rig, between a corvette and a gunboat, carrying from ten to eighteen guns. The name is still



Sloop.

retained for certain vessels of no great size or fighting power.

SLOTH, the name applied to several genera of edentate mammalia inhabiting south and central America, and forming the family Bradypodidæ. This family is distinguished by the flat short head, and by the elongated legs, furnished with powerful claws of compressed and curved shape. No incisor-teeth exist, but simple molars are developed. The stomach is of somewhat complex nature. The fore-limbs are longer than the hind-limbs, and have a powerful muscular organization. The palms and soles of the feet are turned inward, and the claws are bent inward toward the soles, so that the sloth's movements on the ground are both awkward and painful; but in their natural habitat amid the trees, the curved and inwardly-disposed claws and limbs are seen to be admirably adapted for locomotion in their characteristic fashion, back downward, through their native forests. Of the sloths the best-known species has three toes and is of a brownish-gray color, with darker tints on the face and limbs. The fur is of very coarse character.

SLOVAKS', the name of the Slavonian inhabitants of Northern Hungary, also found in Moravia in the districts adjoining Hungary, and in detached settlements in Lower Austria, Bukowina, and Slavonia. The total number of Slovaks is under 2,000,000.

SLOYD, SLOJD (a Scandinavian word equivalent to the English sleight), a system of manual training for pupils in elementary and higher schools, in which the pupils are accustomed to the use of tools in a handicraft, which is not necessarily intended to form their future exclusive or main occupation. It is applied to any useful handiwork such as carpentry, metal-work, basket-work, fret-work, book-binding, etc., but is usually confined to wood-sloyd, or the use of the knife and carpenter's tools. It is already practically introduced into America under the name of manual training.

SLUG, the name applied to several genera of molluscs, included in the pulmoniferous (or "lung-bearing") section of the class, and resembling the snails, but not having an external shell. The typical slugs possess a rudimentary shell, internal in its nature, and generally concealed more or less completely by the mantle. The body is elongated, depressed, and attenuated backward, the head and tentacles retractile. The latter are four in number, the eyes being borne on the tips of the larger pair. Of this genus the great gray slug and the black slug are the two familiar species. The former usually frequents hollow trees, undisturbed heaps of decaying vegetable matter, and like situations. The black slug is more common than the gray species, and is usually of smaller size. Other familiar genera are the red slug; and the Testacella, represented by the little carnivorous species which feed chiefly upon earthworms, and is generally found in the loose soil of gardens.

SLUR, in music, a sign in the form of a curve, placed over two or more notes on different degrees, to indicate that they are to be played legato.

SMACK, a small vessel rigged as a cutter, sloop, or yawl, used in the coasting trade and in fishing.

SMALL-ARMS, a general name for all portable fire-arms. (See Musket, Rifle, Revolver, etc.) The name of small-arms factories is given to certain government establishments for the manufacture of small-arms. The different parts of the rifles are made so accurately on the same model that a part belonging to any one of the rifles manufactured will do equally well for any other.

SMALL-POX, an infectious disease characterized by a pustular eruption accompanied by high fever. The first symptoms of the disease appear about seven days after infection, when a feverish shivering pervades the body, followed about three days later by the appearance of red spots on the face, breast, hands, and gradually over the whole body. After about three days these spots develop pustules, which become inflamed and suppurate. About the eleventh day the pustules begin to dry up and form a crust. Commonly the small-pox virus infects but once and then only those persons who have a certain susceptibility for it. This disease is first mentioned by Arabic writers. It is not certain how it was introduced into Europe, but from the 13th century downward it raged with great destructiveness among the western nations, until it was checked by the introduction of vaccination. It is more fatal on its first appearance in a country, and commits greater ravages, than after having prevailed for some time, as it did in Iceland in 1707, and in Greenland in 1733. The violence of the disorder is lessened when it is produced artificially by inoculation with the small-pox virus. Inoculation was introduced into Western Europe from Turkey by the celebrated Lady Montagu; but it has been entirely superseded by vaccination, which is safer. See Vaccination.

SMELL, the sense exercised in the perception of odors, through the functions of the olfactory nerves. The sense is one of the special senses in that the nerves devoted to the appreciation of

odors exercise that function alone, and are not affected by any other kind of impressions; while again, no nerves are capable of receiving the particular impressions of odors but the olfactory filaments. The sense of smell is derived exclusively through those parts of the nasal cavities in which the olfactory nerves are distributed. (See Nose.) The matters of odor must in all cases be dissolved in the mucus of the mucous membrane before they can be immediately applied to or affect the olfactory nerves; thus for the perception of odors the mucous membrane of the nasal cavity must be moist. In animals living in the air it is also requisite that the odorous matter should be transmitted in a current through the nostrils. This is effected by an inspiratory movement, the mouth being closed. The voluntary nature of the act of smelling is also thus exemplified, since by interrupting the respiration or breathing, the sense cannot be duly exercised. The delicacy of the sense of smell is most remarkable; it can discern the presence of bodies so minute as to be undiscoverable even by spectrum analysis; $\frac{1}{100,000,000}$ of a grain of musk can be distinctly smelt. The olfactory nerves form the first pair of cranial nerves, or those given off directly from the brain as a center. The facility with which different odors are perceived varies in different animals. Thus carnivorous mammalia are most susceptible to the odors of other animals than herbivorous forms; and the latter in their turn are more readily affected by the smell of plants. Although the sense of smell in man is less acute than that of many animals, yet his sphere of susceptibility to various odors is more uniform and extended. The influence of habit is very marked in the exercise of this sense, custom enabling the individual to inhale odors which at first might be distasteful or nauseous to him. Certain diseases of the brain may produce anomalous effects on the olfactory sense.

SMELLIE, William, naturalist and general writer, born at Edinburgh about 1740, died there in 1795. In 1765 he compiled and conducted the first editions of the Encyclopædia Britannica, which began to be published in numbers at Edinburgh in 1771, and was completed in three vols., quarto. In 1780 he gave to the world the first part of his Translation of Buffon's Natural History.

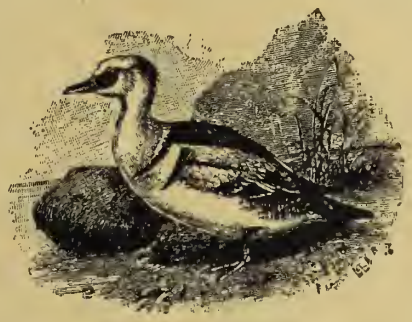
SMELT, a small but delicious European fish, allied to the salmon, inhabiting the salt water about the mouth of

Smelt.

rivers. It is of a silvery-white color, the head and body being semi-transparent, and is from 4 to 8 inches long. It inhabits fresh water from August to May, and after spawning returns to the sea. When first taken out of the water smelts have a strong smell of cucumber. It is called also the sperling, or sparling. The American smelt inhabits the coasts of New England; but the name is given in America also to other fishes. The name of sand smelt is given to a small fish allied to the mullets and climbing perches. It averages about 6 inches in length, and is of a pale pink color, with black spots on the head and back.

SMELTING, the process by which a metal is obtained from its ore in a melted state by applying great heat. Iron is smelted in lofty furnaces known as blast-furnaces.

SMEW, a swimming bird of shy habits. It flies well, but has an awkward gait on land. Its average length is from 15 to 18 inches. The head, chin, neck, and under parts of the male are white; the back is black, the wings black and



Smew, adult male.

white; the back of the head bears a crest of elongated feathers. The plumage of the female is reddish brown mixed with gray tints.

SMILA'CEÆ, a natural order of endogenous plants, belonging to the subclass Dictyogenæ, or those having reticulated leaves. They are mostly climbing plants, with woody stems and small unisexual flowers. They are found in small quantities in most parts of the world except in Africa. The genus Smilax embraces the various species of sarsaparilla.

SMILES, Samuel, LL.D., was born at Haddington, Scotland, in 1812. He is the author of many works on industrial enterprise, the chief of which are: Life of George Stephenson, Self-Help, Character, Thrift, Self-Effort and Duty. These works are characterized by their good moral teaching; they are written in a clear and simple style, and many of them have been translated into various European languages. The University of Edinburgh conferred the degree of LL.D. on Smiles in 1878. He died in 1904.

SMITH, Adam, a distinguished writer on political economy and on morals, was born June 5, 1732. His first publication, The Theory of Moral Sentiments, appeared in 1759, and was most favorably received. His theory makes sympathy the foundation of all our moral sentiments. To this work he afterward added an Essay on the Origin of Languages. In 1766 he retired with his mother to Kirkcaldy, where, after ten years of close study, he wrote his celebrated Inquiry into the Nature and Causes of the Wealth of Nations. This work may be deemed the formal precursor of the modern science of economics. He died in July, 1790.

SMITH, Charles Emory, American journalist and politician, was born at Mansfield, Conn., in 1842. In 1865 he became editor of the Albany Express, and several years later of the Evening Post. He removed to Philadelphla in 1880, and became editor of the Press.

Adam Smith.

From 1890 till 1892 he was American minister to Russia. From 1898 till 1902 he was postmaster-general of the United States. Rural mail routes were established during his administration. He died in 1908.

SMITH, Charles Henry, American humorist, was born at Lawrenceville, Ga., in 1826; served in the confederate army and after the war was a planter and took some interest in politics. He was widely known for his newspaper letters, under the signature "Bill Arp," which began in 1861, and with their homely, genuine humor cheered the hearts of the southern people. The letters were subsequently collected as Bill Arp's Letters, to which were added Bill Arp's Scrap Book and other volumes. He died in 1903.

SMITH, Francis Hopkinson, American artist and author, was born in Baltimore, Md., in 1838. Some of his best known pictures are: "The Old Man of the Mountains," "In the Darkling Wood," "Peggothy on the Harlem," "A January Thaw," His work in charcoal and as an illustrator is of a high quality. His fame as an author has almost eclipsed that of the artist. Among his works are: Well-Worn Roads, Colonel Carter of Cartersville, A Gentleman Vagabond and Some Others, Tom Grogan, Caleb West, Master Driver, the Fortunes of Oliver Horn, and The Under Dog.

SMITH, George, assyriologist, born about 1840. In 1872 he made known his striking discovery of a series of tablets in the British museum containing, among other records, the Babylonian legend of the flood. He died in 1876.

SMITH, Goldwin, English historical writer, worn at Reading, Berks, in 1823, He was appointed member of the senate of the University of Toronto in 1871, where he has ever since resided. Among his chief works are: Lectures on Modern History, Three English Statesmen (Pym, Cromwell, and Pitt), The United States, The United Kingdom.

SMITH, Green Clay, American soldier, was born at Richmond, Ky., in 1832. He served through the Mexican war as lieutenant in a Kentucky regiment. In 1860 he was elected to the Kentucky

legislature. On the outbreak of hostilities he recruited and became colonel of the Fourth Kentucky cavalry (federal), took part in the Tennessee campaigns of 1862, and in June of that year was commissioned brigadier-general of volunteers. In 1863 he was elected to the thirty-eighth congress. He was re-elected to congress in 1864 and in 1866 was appointed by President Johnson governor of Montana territory. In 1876 he was the candidate of the prohibition party for the presidency. He died in 1895.

SMITH, John (commonly known as Captain John Smith), one of the founders of the English colony in Virginia,was born at Willoughby in Lincolnshire in 1580. After many adventures as a soldier of fortune in Europe, Asia, and Africa, he joined in the project to colonize Virginia. The first expedition left London in 1606. He made important geographical discoveries, obtained supplies from the natives, and was finally intrusted with the guidance of the colony. For a time he was a prisoner among the Indians; but the story of Pocahontas connected with this seems to be, like others of Smith's adventures, undeserving of credibility. He died in 1631.

SMITH, Joseph, Mormon leader, born in Sharon, Vt., December 23, 1805; died in Carthage, Ill., June 27, 1844. In 1823 he pretended to have had visions and interviews with angels, by whom the book of Mormon was revealed to him. This volume was eventually published at Palmyra, N. Y., in 1830. A Mormon church was established on April 6th of that year in Fayette, N. Y. The Mormons later wandered to Illinois,. Subsequently Smith was chosen mayor and sole trustee of the Mormon church, with unlimited powers; a military organization of 1500 men was formed, called the "Nauvoo Legion," and Smith was appointed lieutenant-general. Missionaries sent to England brought large accessions of members, and the erection of a new temple attracted others. Driven from Missouri on the ground of forming polygamy, Smith as mayor of Nauvoo, Ill., and head of the Nauvoo Legion, was accused of attempting to found a military church. He was indicted for perjury and adultery and was murdered in Carthage jail on June 27, 1844. He was succeeded in the presidency of the church by Brigham Young.

SMITH, Samuel Francis, American clergyman and hymn writer, was born in Boston in 1808. From 1842 to 1848 he was editor of The Christian Review, and of the publications of the American Baptist Missionary Union. He wrote "My Country, 'Tis of Thee," "The Morning Light Is Breaking," and other favorite hymns. He died in 1895.

SMITH, Sydney, English clergyman, noted for his wit and humor, was born at Woodford, Essex, in 1771; died in 1845 He was one of the founders in 1802 of the Edinburgh Review, being also one of its most influential contributors. In 1831, during the ministry of Earl Grey, he became one of the canons of St. Paul's, London, where he henceforth resided. A few years before his death a collected edition of his writings was published under his own supervision, including papers contributed to the Edinburgh Review, Sketches of Moral Philosophy, etc.

SMITH, Thomas Southwood, M. D., physician and sanitary reformer, was born at Martock, Somersetshire, in 1778. In 1825 he was appointed physician to the London Fever Hospital. He published in 1830 a Treatise on Fever, the best work on the subject that has ever been written. His reports led to the passage of the Factory Act; to the exclusion of women and children from mines; to the Public Health Act, etc. He died in 1861.

SMITH, William, the "father of English geology," born at Churchill, in Oxfordshire, in 1769; died at Northampton in 1839. He became convinced that each stratum contained its own peculiar fossils, and might be discriminated by them, and in 1815 he was able to submit a complete colored map of the strata of England and Wales to the Society of Arts.

SMITH, Sir William, LL.D., D.C.L., English scholar, born in London in 1813, died 1893. He edited the well-known series of Classical, Biblical, and Ecclesiastical Dictionaries, and wrote or edited many educational books. He was for some time classical examiner in London university. From 1867 he was editor of the Quarterly Review. He was knighted in 1892.

SMITH, William Henry, was born in London in 1825. From 1868 to 1885 he represented Westminster, when, after the Redistribution Bill, he was returned for the Strand, for which division he was member till his death in 1891. Mr. Smith was financial secretary to the treasury (1874–77), first lord of the admiralty (1877–80), secretary for war (1885). In 1886, on the resignation of Lord Randolph Churchill, Mr. Smith vacated the war office, and assumed the leadership of the House of Commons as first lord of the treasury.

SMITH, William Robertson, biblical scholar, was born at Keig, Aberdeenshire, in 1846. From 1881 Professor Smith was connected with the editorship of the Encyclopædia Britannica, and after the death of Professor Baynes was editor-in-chief. He was a member of the Old Testament revision committee, in 1879–80. He is the author, among other works, of The Old Testament in the Jewish Church, The Prophets of Israel and their Place in History to the Close of the 8th Century B.C., Kinship and Marriage in Early Arabia, and Religion of the Semites. He died in 1894.

SMITH, Admiral Sir William Sidney, born in Westminster in 1765, died in 1841. He entered the navy at the age of twelve, received his lieutenancy at sixteen, and when nineteen was created post-captain. He was created rear-admiral of the blue in 1805, and in 1806 inflicted signal injuries on the French off the coast of Naples. In 1807 he distinguished himself by the destruction of a Turkish squadron. He was made vice-admiral in 1810, admiral in 1821, and in 1830 succeeded King William IV. as lieutenant-general of marines.

SMITHSON, James, philanthropist, born in England about 1754; died in Genoa, Italy, June 27, 1829. He was a natural son of the duke of Northumberland. In 1786 he was graduated at Oxford. He spent much time in traveling on the European continent, engaged in scientific observations, carrying with him a portable laboratory, and formed a large collection of gems and minerals. Mr. Smithson was a member of the Royal Society of England, and of the French Institute. He bequeathed his property, about $600,000 for the purpose of founding an institution at Washington to be called the Smithsonian institution for the increase and diffusion of knowledge among men. In 1846 this institution was founded. (See following article.)

SMITHSONIAN INSTITUTION, a scientific institute in Washington, organized by act of congress in 1846, to carry into effect the provisions of the will of James Smithson, the founder. He died at Genoa in 1829, leaving his property to his nephew, with the condition that if the latter died without issue the property was to go to the United States to found an establishment for the increase and diffusion of knowledge. In 1835 the nephew died childless, and in 1838 the sum of 515,169 dollars was paid to the treasury of the United States. In 1846 the interest on this sum (the principal itself must remain untouched) was applied to the erection of a suitable building, with apartments for the reception and arrangement of objects af natural history, including a geological and mineralogical cabinet, a chemical laboratory, a library, a gallery of art, and the necessary lecture-rooms. The building is one of the largest in Washington. A portion of the funds of the institution is devoted to scientific researches and the publication of works too expensive for private enterprise. Three series of publications are issued: Contributions to Knowledge, Miscellaneous Collections, and Annual Reports. The building contains the National museum, which is, however, wholly maintained by the government. The institution is administered by regents, composed of the chief-justice of the United States, three members of the senate and three of the house of representatives, with six other persons, not members of congress. The president vice-president, and members of the cabinet for the time being have the positions of governors or visitors of the institution, the president being ex-officio at the head.

SMOKE, the exhalation or visible vapor that arises from a substance burning. In its more extended sense the word smoke is applied to all the volatile products of combustion, which consist of gaseous exhalations charged with minute portions of carbonaceous matter or soot; but, as often used in reference to what are called smoke-consuming furnaces, the term is frequently employed to express merely the carbonaceous matter which is held in suspension by the gases. There are many practical difficulties in the way of consuming smoke, but experience has shown that none of them are insuperable. The prin-

ciple involved is that of mixing air with the combustible vapors and gases generated, by the action of heat on the fuel so that by virtue of a due supply of oxygen they may be made to burn with flame, and become entirely converted into incombustible and invisible vapors and gases.

SMOKELESS POWDER, an explosive substance that burns without making much smoke, used chiefly for military purposes. The use of smokeless powder began with the invention of poudre B. in France in 1886. They are divided into three classes, as follows: (1) Powders in which guncotton, either the insoluble or the soluble variety alone, is used, which, by the aid of a solvent, has been converted into a horny substance and then is formed into flakes or cords; (2) powders in which a mixture of nitroglycerin and either dinitro- or trinitrocellulose is transformed into a similar horn-like substance, either with or without the aid of a solvent; and (3) powders that contain nitro-derivatives of the aromatic hydro-carbons, either by themselves or in connection with nitrocellulose.

Some of the various smokeless powders are: Ballistite, cordite, Du Pont powder, indurite, cibalite, poudre J., poudre pyroxyée, Troisdorf, Von Förster, Walsrode, and Wetteren powders.

SMOLENSK', a government in Russia, west of Moscow; area, 21,547 sq. miles. Pop. 1,551,068. The climate, though cold, is healthy, and the soil tolerably fertile, producing good crops of rye, hemp, and flax, hops and tobacco. The pastures are excellent, and the forests yield excellent timber.—Smolensk, the capital, is situated on the Dnieper, 250 miles w.s.w. of Moscow. Pop. 46,889.

SMOL'LETT, Tobias George, novelist and miscellaneous writer, was born near Renton in Dumbartonshire in 1721; died at Monte Nuovo, near Leghorn, 1771. In 1748 he published his Adventures of Roderick Random, a novel which brought him both fame and fortune. He went to Paris in 1750, and about this time wrote his Adventures of Peregrine Pickle, which appeared in 1751. In 1755 he brought out a new translation of Don Quixote. Soon after this he was induced to take the chief management of the Tory organ, the Critical Review. In 1757 he produced The Reprisal, a comedy in two acts, which proved a success. In 1758 appeared his History of England, from Julius Cæsar to the Treaty of Aix-la-Chapelle in 1748. In 1761, 1762, and 1765 appeared his Continuation of the History of England down to 1765, since often reprinted as a continuation of Hume's History. In 1770 he wrote his Humphry Clinker, which is regarded as the best of all his works. The humor of Smollett is of the broad full-flavored kind, not seldom degenerating into burlesque; his characters are well marked and varied; and though his work is frequently coarse and vulgar, it has had much influence on English fiction.

SMUT, a disease, also called Dust-brand, incidental to cultivated corn, by which the farina of the grain, together with its proper integuments, and even part of the husk, is converted into a black, soot-like powder. It does not affect the whole body of the crop. Some attribute the smut to the richness of the soil, and others consider it as a hereditary disease transmitted by one generation to another through the seed. It is produced by a minute fungus. The safest mode for the farmer to pursue to prevent smut, is never to sow grain from a field in which the smut has prevailed.

SMYRNA, an ancient city and seaport of Asiatic Turkey, on the west coast of Asia Minor, at the head of the gulf of the same name. Smyrna has been for centuries the most important place of trade in Asia Minor. The chief imports are cotton manufactures, woolen cloths, colonial goods, iron, steel, and hardware goods. The principal exports are dried fruits (especially figs), cotton, silk, goats'-hair, sheep and camels' wool,

valonia, madder-root, yellow-berries, sponges, and opium. The origin of Smyrna is lost in antiquity. It laid claim to the honor of being the birthplace of Homer, and no doubt was a Greek city as early as the date assigned to the poet. It early received Christianity, and was one of the "seven churches" of Asia. In the 13th century only the ruins of its former splendor were left; but after the Turks became masters of the country it revived. It has repeatedly suffered from earthquake. Pop. estimated at 200,000.

SMYRNA, Gulf of, formerly the Hermæan gulf, an inlet of the Ægean sea on the coast of Asiatic Turkey, so called from the town of Smyrna, which stands at its head. It is 40 miles in length by 20 at its broadest part, and contains several islands and affords good anchorage.

SNAIL, a slimy, slow-creeping, air-breathing mollusc differing from the slugs chiefly in having a spiral shell. The head is furnished with four retractile horns or tentacles; and on the superior pair, at the extremity, the eyes are placed. The sexes are united in the same individual, but the union of two such hermaphrodite individuals is necessary for fertilization. The common garden snail is the most familiar species of the typical genus. The mischief done by it to garden produce on which it feeds is very extensive. Nearly equally well known is the edible snail, largely found in France, and cultivated there and elsewhere for food purposes.

SNAKE, a name equivalent to serpent. (See Serpents.) It is applied especially to the common harmless ringed-snake.

SNAKE INDIANS. See Shoshones.

SNAKEROOT, the popular name of numerous American plants of different species and genera, most of which are, or formerly were, reputed to be efficacious as remedies for snake bites.

SNAKE-STONE, a popular name of those fossils otherwise called Ammonites. The name is also given to certain small rounded pieces of stone or other hard substance, popularly believed to be efficacious in curing snake bites.

SNAPPING-TURTLE, a species of fresh water tortoise common to all parts of the United States. It feeds on small animals, is bold and fierce, and is so named from its propensity to snap at

Snapping-turtle.

everything within its reach. Another tortoise of similar habits, but larger (sometimes weighing 100 lbs.), receives the same name.

SNEEZING is a convulsive action of the respiratory organs brought on commonly by irritation of the nostrils. It is preceded by a deep inspiration, which fills the lungs and then forces the air violently through the nose. Sneezing produced in the ordinary way is a natural and healthy action, throwing automatically from the delicate membrane of the nostrils whatever irritable or offensive material may chance to be lodged there. When it becomes violent, recourse must be had to soothing the nasal membrane by the application of warm milk and water, or decoction of poppies. The custom of blessing persons when they sneeze is very ancient and very widely spread.

SNIPE, the common snipe is a beautifully marked bird, about 10 or 11 inches long. It frequents marshy or moist grounds. It feeds on worms, insects, and small molluscs. It is remark-

Common snipe.

able for the length of its bill, its peculiar bleating cry, and the drumming-like noise it makes in summer. The jack snipe closely resembles the common snipe in its general habits and appearance. In North America, there are several species of snipe, Wilson's snipe,

being one of the chief. The name of sea snipe is sometimes given to the dunlin, while the name summer snipe is applied to the common sandpiper.

SNOW. Snow-flakes are assemblages of minute crystals of ice; they are formed when the temperature in a region of air containing a considerable quantity of aqueous vapor is lowered below the freezing-point. The particles of moisture contained in the atmosphere are then condensed and frozen, and form flakes, which descend to the earth. Each flake which falls is composed of a number of minute crystals of ice, which present countless modifications of the hexagonal system. They have great diversities of density, and display innumerable varieties of the most beautiful forms. These crystals usually adhere together to form an irregular cluster; and consequently the incident rays of light, which are refracted and reflected so as to present individually the prismatic colors, are scattered after reflection in all directions, and combine to give to the eye the color sensation of white. When sufficient pressure is

Crystals of snow, after Scoresby.

applied the slightly adhering crystals are brought into true molecular contact, when the snow, losing its white color, assumes the form of ice. Snow answers many valuable purposes in the economy of nature. Accumulated upon high regions it serves to feed, by its gradual melting streams of running water, which a sudden increase of water, in the form of rain, would convert into destructive torrents or standing pools; and in many countries it tempers the burning heats of summer by previously cooling the breezes which pass over them. In severer climates it serves as a defense against the rigors of winter by protecting vegetation from the frost, and by affording a shelter to animals which bury themselves under it. Even in more temperate climates it is found that vegetation suffers more from an open winter than when the fields, during that season, lie hidden beneath a snowy covering. Snow purifies the air and leaves it remarkably clear and pure. It has a greater purifying effect than rain and it is thought that the action of the snow on the oxygen in the air may form ozone; at any rate it intensifies the vital qualities of the air, and this is why snow swept air is so exhilarating and exercise in the snow is so bracing.

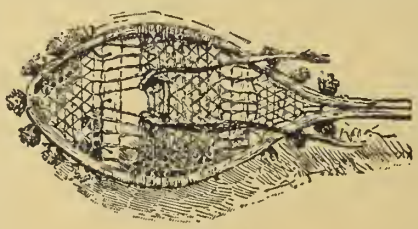
SNOWDROP, a well-known garden plant. It bears solitary drooping, and elegant white flowers.

SNOWDROP TREE, a name of ornamental trees of the southern states with flowers like snowdrops, belonging to the stynrax family.

SNOW-LINE, the limit of perpetual snow, or the line above which mountains are covered with perpetual snow. Since the temperature of the atmosphere continually diminishes as we ascend from the lower into the higher strata, there must be in every latitude a certain limit of elevation at which the temperature of the air is reduced to the freezing-point. This limit is called the snow-line, or line of perpetual congelation, and the mountains which rise above it are always covered with snow. The snow-line varies according to latitude, being highest near the equator and lowest near the poles. Local circumstances, however, affect it, as the configuration of the country, the quantity of snow falling annually, the nature of the prevalent winds, etc. From these circumstances the snow-line is at different heights in the same latitude.

SNOW-PLOW, an implement for clearing away the snow from roads, railways, etc. There are two kinds: one adapted to be hauled by horses on a common highway; the other to be placed in front of a locomotive to clear the rails of snow. A variety of the latter is adapted to street railways.

SNOW-SHOE, a kind of flat shoe, either made of wood alone, or consisting of a light frame crossed and recrossed by thongs, the broad surface of which pre-



Snow-shoe.

vents the wearer from sinking in the snow. Snow-shoes are usually from 3 to 4 feet in length, and from 1 to 1½ foot broad across the middle.

SNUFF, a powdered preparation of tobacco inhaled through the nose. It is made by grinding, in mortars or mills, the chopped leaves and stalks of tobacco in which fermentation has been induced by moisture and warmth. The tobacco is well dried previous to grinding, and this is carried sometimes so far as to give to the snuff the peculiar flavor of the high-dried snuffs, such as the Irish, Welsh, and Scotch. Some varieties, as the rappees, are moist. The admixture of different flavoring agents and delicate scents has given rise to fanciful names for snuffs, which, the flavor excepted, are identical. Dry snuffs are often adulterated with quicklime, and the moist kinds with ammonia, hellebore, pearl-ash, etc. See Tobacco.

SOAP, a chemical compound of common domestic use for washing and cleansing, and also used in medicine, etc. It is a compound resulting from the combination of certain constituents derived from fats, oils, grease of various kinds both animal and vegetable, with certain salifiable bases, which in household soaps are potash and soda. Chemically speaking soap may be defined as a salt, more especially one of the alkaline salts of those acids which are present in the common fats and oils, and soluble soaps may be regarded as oleates, stearates, and margarates of sodium and potassium. There are many different kinds of soaps, but those commonly employed may be divided into three classes: 1. Fine white soaps, scented soaps, etc.; 2. Coarse household soaps; 3. Soft soaps. White soaps are generally combinations of olive-oil and carbonate of soda. Perfumes are occasionally added, or various coloring matters stirred in while the soap is semifluid. Common household soaps are made chiefly of soda and tallow. Yellow soap is composed of tallow, resin, and soda, to which some palm-oil is occasionally added. Mottled soap is made by simply adding mineral and other colors during the manufacture of ordinary hard soap. Marine soap, which has the property of dissolving as well in salt-water as in fresh, is made of cocoa-nut oil, soda, and water. Soft soaps are generally made with potash instead of soda, and whale, seal, or olive-oil, or the oils of linseed, hemp-seed, rape-seed, etc., with the addition of a little tallow. Excellent soaps are made from palm-oil and soda. Soap is soluble in pure water and in alcohol; the latter solution jellies when concentrated, and is known in medicine under the name of opodeldoc, and when evaporated to dryness it forms what is called transparent soap. Medicinal soap when pure, is prepared from caustic soda, and either olive or almond oil. It is chiefly employed to form pills of a gently aperient antacid action.

SOBIES'KI, John. See John III. (Sobieski).

SOCIALISM, the name applied to various theories of social organization, having for their common aim the abolition of that individual action on which modern societies depend, and the substitution of a regulated system of co-operative action. The word socialism, which originated among the English communists, and was assumed by them to designate their own doctrine, is now employed in a larger sense, not necessarily implying communism or the entire abolition of private property, but applied to any system which requires that the land and the intruments of production shall be the property, not of individuals, but of communities, or associations, or of the government, with the view to an equitable distribution of the products. It is looked on by those who believe in it as an evolutionary phase of society, as indeed a natural development—slavery gave way to feudalism, feudalism to capitalism, and the latter is bound to fall before the latest

stage, socialism. The earliest and most concrete forms of socialist philosophy are those promulgated by Robert Owen, St. Simon, and Fourier. Later theorists on the social question have taken wider, and even wilder views, their theories often ramifying into the more or less vague and disruptive schemes of the anarchists and nihilists. The literature on the subject is very extensive, and has had an important influence on modern thought, and, indeed, upon constructive legislation. Among the leading works to be consulted are Karl Marx's Capital; Fourier's Œuvres Complètes; Comte's Traité de Sociologie; Louis Blanc's L'Organization du Travail; Hyndman's Historical Basis of Socialism in England; Bax's Religion of Socialism; etc.

SOCIAL SCIENCE, the science that deals with the social conditions, the relations, and institutions which are involved in man's existence and his well-being as a member of an organized community. It concerns itself more especially with questions relating to public health, education, labor, punishment of crime, reformation of criminals, pauperism, and the like. It thus deals with the effect of existing social forces, and their result on the general well-being of the community, without directly discussing or expounding the theories or examining the problems of sociology, of which it may be considered as a branch. (See Sociology.)

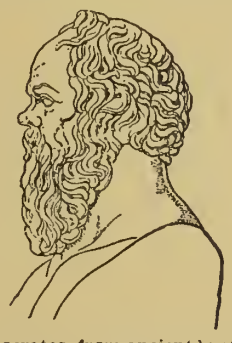
SOCIETY ISLANDS, an important group of islands of the South Pacific, between lat. 16° 11′ and 17° 53′ s., and lon. 148° and 155° w.; and between the Low islands on the east and the Friendly islands on the west. The group consists of the principal island of Tahiti or Otaheite—which is about 32 miles long, and is divided into two peninsulas by an isthmus about 3 miles broad; area, 412 sq. miles—and a number of comparatively small islands, Eimeo, Raiatea Huahine, etc., all now belonging to France. All the islands are elevated, and more or less mountainous. Pop. estimated at about 12,000.

SOCI'NUS, the Latinized name of two celebrated theologians, uncle and nephew, who have given their name to a religious sect, the Socinians, whose modified doctrines are now known as Unitarianism.—Laelius Socinus (Lelio Sozzini), born in 1525 at Siena, in Tuscany, abandoned jurisprudence for the study of the Scriptures. In 1546 he was admitted a member of a secret society at Vicenza, formed for the discussion of religious questions, which arrived at the conclusion that the doctrine of the Trinity was untenable, and that many of the dogmas of the Roman Catholic church were repugnant to reason. The nature of their deliberations having become known the society was broken up, several of its members put to death, and others, among who was Socinus, fled the country. He died at Zürich in 1562.—Faustus Socinus (Fausto Sozzini), a nephew of the preceding, born at Siena in 1539, was obliged to leave that town in his twentieth year on account of his heretical notions. On the death of his uncle he came into possession of the manuscripts of the latter, by the study of which he found his former opinions confirmed. His death took place in 1604. See Unitarians.

SOCIOLOGY, the science which investigates the laws of forces which regulate human society in all its grades, existing and historical, savage and civilized; or the science which treats of the general structure of society, the laws of its development, and the progress of actual civilization. Comte was the first to treat the subject from a scientific point of view. He was followed by Quetelet, Spencer, Ward and others. (See Social Science.)

SOCK, a low shoe or slipper, worn by the Greeks, and also by the Roman women, who had them highly ornamented. They were likewise worn by comic actors, the buskin, or cothurnus, being used in tragedy; hence sock and buskin are used figuratively as equivalent to comedy and tragedy.

SOC'RATES (-tēz), an ancient Greek philosopher, born at Athens in or about 469 B.C. He served as a common soldier in the campaign of Potidæa (432–429 B.C.), fought at the battle of Delium



Socrates, from ancient bust.

(424), and in 422 he marched with Cleon against Amphipolis. After the naval battle of Arginusæ (406) against the Spartans, ten Athenian officers were arraigned for neglecting the sacred duty of burying the slain. The clamor for their condemnation rose so high that the court wished to proceed in violation of all legal forms; but Socrates, the presiding judge at the trial, refused to put the question. Soon after he was summoned by the tyrannical government of the Thirty to proceed with four other persons to Salamis to bring back an Athenian citizen who had retired thither to escape the rapacity of the new government. Socrates alone refused. After this he declined to take any further share in public affairs, giving as a reason the warnings of an internal voice of which he was wont to speak. Following the promptings of this divine mentor he trained himself to coarse fare, scanty clothing, and indifference to heat or cold, and brought into thorough subjection his naturally impetuous passions. But though a sage he was wholly removed from the gloom and constraint of asceticism; he indeed exemplified the finest Athenian social culture, was a witty as well as a serious disputant, and did not refrain from festive enjoyment. Socrates wrote nothing, and neither sought to found a school nor a system of philosophy. His plan was to mix with men freely in any place of public resort, when he questioned and suggested the right path to real knowledge. Aristophanes attacked him violently in his Comedy of the Clouds as a sophist, an enemy of religion, and a corrupter of youth. But he had many distinguished friends, such as Plato, Xenophon Euclid of Megara, Antisthenes, Aristippus, Æschines, and Alcibiades. In 399 B.C. a formal accusation was brought against him charging him with not believing in the gods which the state worshiped, with introducing new divinities and with corrupting youth. His bold defense is preserved by Plato, under the title of the Apology of Socrates. He dwelt on his mission to convict men of their ignorance for their ultimate benefit; declared himself a public blessing to the Athenians; assuring them if his life were spared he would continue in the same course; and regarded the approach of death with utter indifference. He was condemned to death by a majority of his judges; refused help to escape, and thirty days after his sentence drank the hemlock cup with composure, and died in his 70th year (B.C. 399). The account of his last hours is given in full detail in the Phædo of Plato.

SODA, a term applied, in common language, to two or more substances—protoxide of sodium, hydroxide of sodium, and carbonate of sodium, being known under the name of soda. In scientific language, however, the name is only given to the protoxide of sodium the hydroxide being frequently called caustic soda. The protoxide of sodium is formed when sodium is burned in dry air or oxygen. It is a white powder, which attracts moisture and carbonic acid from the air. When this protoxide is dissolved in water there is formed the true alkali or hydrate of sodium, called also caustic alkali, which is a white brittle mass of a fibrous texture, having a specific gravity of 2.13. Caustic soda has a most corrosive taste and action upon animal substances; it dissolves readily both in water and alcohol; in the solid form it readily attracts water and carbonic acid from the atmosphere, the final product being an efflorescent carbonate. It forms soaps when boiled with tallow, oils, wax, rosin; dissolves wool, hair, silk, horn, alumina, silica, sulphur, and some metallic sulphides. With acids soda forms salts which are soluble in water, and many of which crystallize. The carbonate of soda is the soda of commerce in various states, either crystallized in lumps or in a crude powder called soda-ash. It is obtained from the ash of plants growing near the sea, from native sources, or by chemical processes. The soda obtained from plants contains from 3 to 30 per cent of carbonate. It is imported from Spain under the name of barilla, from France as silicar or blanquette, and from Normandy and Brittany as varec. Native soda comes to us chiefly from the mineral waters of Karlsbad, Aix, Vichy, and the geysers of Iceland; from the Caspian and Black sea, from California and Virginia. But the amount of soda derived from these sources is as nothing compared with that manufactured every year by chemical processes. In these

the first process is the decomposition of common salt (chloride of sodium) by means of sulphuric acid; the second, the conversion of the sulphate of sodium so produced into crude carbonate of soda by strongly heating with chalk and carbonaceous matter; third, the purification of this crude carbonate, either into a dry white soda-ash or into crystals; and, fourth, the treatment of the by-products—hydrochloric acid and calcium sulphide. The chief uses of soda are in the manufacture of glass and of hard soap. The carbonate of soda is used in washing, and is a powerful detergent. It is also used in medicine. Sulphate of soda is glauber-salts.

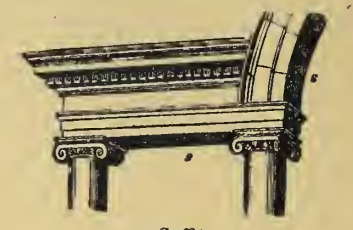
SODA-WATER, an effervescing drink generally consisting of ordinary water into which carbonic acid has been forced under pressure. It rarely contains soda in any form. It is useful in cases of debility of the stomach, accompanied with acidity.

SODIUM, the metal of which soda is the oxide. It was discovered by Sir Humphry Davy in the year 1807. Previously the oxide of the metal, soda, was looked on as an elementary body, but Davy succeeded in breaking it up, by the action of electricity, into oxygen and a new metal. Gay-Lussac and Thénard soon afterward procured it in greater quantity by decomposing soda by means of iron; and Brunner showed that it may be prepared with much greater facility by distilling a mixture of carbonate of soda with charcoal; it is now prepared by the latter process in considerable quantities. Sodium is a silver-white metal, having a very high luster. It melts at 204° Fahr., and oxidizes rapidly in the air, though not so rapidly as potassium. It decomposes water instantly, but does not spontaneously take fire when thrown on water, unless the water be somewhat warm, or the progress of the globule of sodium upon the surface of the water be impeded. When heated in air or oxygen it takes fire and burns with a very pure and intense yellow flame. It is perhaps more abundant in our globe than any other metal, for it constitutes two-fifths of all the sea-salt existing in sea-water, in the water of springs, rivers, and lakes, in almost all soils and in the form of rock-salt. It is used as an agent in the manufacture of aluminium and magnesium, and as a reagent in chemical operations. Common salt is a compound of chlorine with sodium. Sodium also occurs as oxide of sodium or soda in a good many minerals; and more especially in the form of carbonate, nitrate, and borate of soda. Sodium is contained in sea plants, and in land plants growing near the sea. It occurs also in most animal fluids. The only important oxide of sodium is the protoxide known as soda. See Soda.

SODOM, the principal of the five cities (Sodom, Gomorrah, Admah, Zeboïm, and Zoar) described in the book of Genesis and the cities of the plain (i.e. of Jordan). They were overthrown on account of the wickedness of the inhabitants (Gen. xix.), with the exception of Zoar, which was spared at the supplication of Lot.

SODOM, Apple of, a fruit mentioned by early writers as growing on the shores of the Dead sea, which was beautiful to the eye, but when eaten filled the mouth with ashes; supposed to have been a gall produced on dwarf oaks by an insect, or the fruit of a species of Solanum.

SOFFIT, in architecture, any ceiling divided into square compartments, or



s s, Soffits.

panels; also the lower surface of an architrave, an arch, a balcony, a cornice, etc.

SO'FIA, So'phia, the capital of the principality of Bulgaria, situated in a plain on the river Bogana, near the foot of the north side of the Balkan mountains, 310 miles w.n.w. of Constantinople. Pop. 67,920.

SOIL, mould, or that compound earthy substance which furnishes nutriment to plants, or which is particularly adapted to support and nourish them. Wherever the surface of the earth is not covered with water, or is not naked rock, there is a layer of earth more or less mixed with the remains of animal and vegetable substances in a state of decomposition, which is commonly called the soil. In uncultivated grounds soils generally occupy only a few inches in depth on the surface; in cultivated grounds their depth is generally the same as that to which the implements used in cultivation have penetrated. The stratum which lies immediately under the soil is called the subsoil, which is comparatively without organized matter. Soil is composed of certain mixtures or combinations of the following substances: the earths, silica, alumina, lime, magnesia; the alkalies, potassa, soda, and ammonia; oxide of iron and small portions of other metallic oxides; a considerable proportion of moisture, and several gases, as oxygen, hydrogen carbonic acid. Besides these every soil contains vegetable and animal matters, either partially or wholly decomposed.

SOLANA'CEÆ, a natural order of monopetalous exogenous plants, composed of herbs or shrubs, natives of most parts of the world, and especially within the tropics. They have alternate leaves, terminal or axillary inflorescence, and regular, or nearly regular monopetalous flowers.

SOLAR CORONA. See Corona.

SOLAR DAY. See Day.

SOLAR ENGINE, an apparatus for utilizing the heat of the sun as a motive power, by causing it, through the medium of a reflecting metallic mirror, to heat the water in a small boiler and convert it into steam.

SOLAR MICROSCOPE, an instrument by means of which a magnified image of a small transparent object is projected on a screen, the light employed being sunlight. It is really a magic lantern, in which the microscopic object is affixed to a clear glass plate, and the light employed bright sunlight reflected into the instrument.

SOLAR PROMINENCES, red flame-like masses seen in the atmosphere of the sun at a total solar eclipse. See Sun.

SOLAR SYSTEM, in astronomy, that system of which the sun is the center. To this system belong the planets, planetoids, satellites, comets, and meteorites, which all directly or indirectly revolve round the sun, the whole being bound together by the mutual attractions of the several parts. See Astronomy, Planets, Sun, Moon, Gravitation, etc.

SOLAR TIME, time as indicated by a sun-dial. The successive hours so indicated are not equal intervals of time. See Day, Equation of Time.

SOLDERS, metallic cements consisting of simple or mixed metals, by which ordinarily metallic bodies are firmly united with each other. It is a general rule that the solder should always be easier of fusion than the metal intended to be soldered by it. The usual solders are compound, and are divided into hard and soft. The hard solders are ductile, will bear hammering, and are commonly prepared of the same metal with that which is to be soldered, with the addition of some other, by which a greater degree of fusibility is obtained. Under this head comes the hard solder for gold, which is prepared from gold and silver, or gold and copper, or gold, silver and copper. The hard solder for silver is prepared from equal parts of silver and brass, but made easier of fusion by the admixture of one-sixteenth of zinc. The hard solder for brass is obtained from brass mixed with a sixth, or an eighth, or even one-half of zinc, which may also be used for the hard solder of copper. The soft solders melt easily, but are partly brittle, and therefore cannot be hammered. Of this kind are the following mixtures: tin and lead in equal parts; bismuth, tin, and lead in equal parts; one or two parts of bismuth, of tin and lead each one part. In soldering, the surfaces to be united must be made perfectly clean and free from oxide. This is commonly effected by scraping the surfaces; and in order that the formation of any oxide may be prevented during the process, borax, sal ammoniac, or rosin is used, either mixed with the solder or applied to the surfaces.—Autogenous soldering is the union of two pieces of metal without the intervention of any solder, by fusing them at the point of junction by jets of flame from a gas blowing-pipe or by other means.

SOLDIER. See Army, Conscription, Enlistment, Militia, etc.

SOLDIER-BEETLE, a name given to carnivorous coleopterous insects of the genus Telephorus, from their reddish color, or from their combativeness.

SOLE, a marine fish belonging to the flat-fishes, of an oblong or oval form. These fish abound on the British coast, and also on all the coasts of Europe, except the most northern, where the bottom is sandy. They furnish a wholesome and delicious article of food. They

sometimes ascend rivers, and seem to thrive quite well in fresh water. The

Sole.

sole sometimes grows to the weight of 6 or 7 lbs.

SOLEURE (so-leur), a canton of Switzerland, bounded on the north by Basel-Land; west, south, and southeast by Bern; and east by Aargau; area, 306 sq. miles. Pop. 100,838.—Soleure, the capital, is situated on the south side of the Jura chain, on both sides of the Aar. Pop. 10,116.

SOL-FA SYSTEM. See Tonic Sol-fa System.

SOLIDIFICATION, the passage of a body into the solid state. A body, on solidifying from the liquid state, gives up a quantity of heat without exhibiting a decrease of temperature. Two laws are recognized in the solidifying of bodies from a state of fusion:—(1) A substance begins to solidify at a temperature which is fixed if the pressure is fixed; at ordinary atmospheric pressure this temperature is the temperature or point of fusion for the particular substance. (2). From the moment solidification commences till it is completed the temperature of the liquid portion is constant. There are some substances, such as glass and iron, which become plastic before liquefying, and therefore possess no definite point of fusion; and for such substances the above laws do not hold. Solidification is called crystallization when crystals which may be seen are formed. When water solidifies the resulting ice is about $\frac{1}{11}$ larger than the volume of water which produced it, and on this account ice floats on the surface. Cast-iron is larger, at the temperature of the fusing-point, in the solid than in the liquid state; so also is bronze and other metals which give good sharp castings. In many cases however, a substance contracts in the act of solidifying.

SOLIMAN' II. See Solyman II.

SOLMIZATION, in music, an exercise for acquiring the true intonation of the notes of the scale, first by singing them in regular gradation upward and downward, and then by skips over shorter or longer intervals. To facilitate this various expedients have been devised, the most popular being the association of the several sounds with certain syllables, such as ut, re, mi, fa, sol, la, said to have been first used by Guido of Arezzo in the 11th century—an additional syllable, si, for the seventh of the scale, being introduced at a much later date. In the tonic sol-fa method these syllables are thus modified—doh ray, me, fah, soh, lah, te. See Tonic Sol-fa.

SOLO, a tune, air, or strain to be played by a single instrument or sung by a single voice without or with an accompaniment, which should always be strictly subordinate.

SOLOMON, son of David, king of Israel, by Bathsheba, formerly the wife of Uriah, was appointed by David to be his successor in preference to his elder brothers. By his remarkable judicial decisions, and his completion of the political institutions of David, Solomon gained the respect and admiration of his people; while by the building of the temple, which gave to the Hebrew worship a magnificence it had not hitherto possessed, he bound the nation still more strongly to his throne. The wealth of Solomon, accumulated by a prudent use of the treasures inherited from his father; by successful commerce; by a careful administration of the royal revenues; and by an increase of taxes—enabled him to meet the expense of erecting the temple, building palaces, cities, and fortifications, and supporting the extravagance of a luxurious court. Fortune long seemed to favor this great king; and Israel, in the fulness of its prosperity, scarcely perceived that he was continually becoming more despotic. Contrary to the laws of Moses, he admitted foreign women into his harem; and from love of them he was weak enough in his old age to permit the free, practice of their idolatrous worship and even to take part in it himself. The forty years' reign of Solomon is still celebrated among the Jews, for its splendor and its happy tranquility, as one of the brightest periods of their history. The writings attributed to Solomon are the Book of Proverbs, Ecclesiastes, and the Song of Solomon, with the apocryphal book the Wisdom of Solomon; but modern criticism has decided that only a portion of the Book of Proverbs can be referred to Solomon.

SOLOMON ISLANDS, (1) a chain of islands in the Western Pacific, east of New Guinea, and between New Britain and New Hebrides. (2) A group of small islands with no permanent inhabitants, in the Indian ocean, dependencies of Mauritius.

SOLOMON'S SEAL, the common name of plants, a genus of liliaceous but not bulbous plants, with axillary cylindri-

Solomon's seal.

cal six-cleft flowers, the stamens inserted in the top of the tube, and the fruit a globuse three-celled berry.

SOLOMON'S SONG (called also the Song of Songs, or Canticles), one of the canonical books of the Old Testament. From the earliest period this book has been the subject of voluminous controversies. It seems to have been a recognized part of the Jewish canon in the time of Jesus. Till the beginning of the 19th century the author of the book was almost universally believed to be Solomon. Modern critics, however, attribute it to an author of northern Israel, who wrote it about the middle of the 10th century B.C., shortly after the death of Solomon, in a spirit of protest against the corrupt splendor of the court of Zion. The unity of the poem is sufficiently evidenced by the continuity of names, characters, and subject, and is taken for granted by the majority of critics. The main subject of dispute has been as to its interpretation. The various theories in regard thereto are too numerous to specify; but they naturally fall into two classes, the literal and allegorical. The highest form of allegorical significance contended for is the mystical or spiritual interpretation, by which the whole poem becomes a figurative representation of the hopes and aspirations, together with the trials and difficulties, of a spiritual life. This interpretation, whether applied individually or collectively to the church or nation of Israel, was almost universally received both by Jews and Christians until recent times. The most favored literal interpretation is that originally given by Jacobi, that the poem represents the temptation and triumph of virtuous love. The supporters of the allegorical interpretation of the book strongly urge the frequency with which the marriage relation is employed, both in the Old and New Testament, to represent the relation of Jehovah to Israel in the old, and of Christ to the church in the new dispensation.

SOLON, one of the seven wise men of Greece, and great legislator of Athens, born about B.C. 640. He was of good family, and acquired a wide knowledge of the world in commerce and travel. One of his earliest public transactions was in stirring the Athenians up to the recovery of Salamis, after which he was chosen chief archon (B.C. 594) and invested with unlimited powers, the state of parties in Athens being such as to threaten a revolution. He established a new constitution, divided the citizens according to their wealth, and added to the powers of the popular assembly. He made many laws relating to trade, commerce, etc. He either entirely abrogated all debts, or so reduced them that they were not burdensome to the debtors; and abolished the law which gave a creditor power to reduce his debtor to slavery. When he had completed his laws he bound the Athenians by oath not to make any changes in his code for ten years. He then left the country, to avoid being obliged to make any alterations in them, and visited Egypt, Cyprus and other places. Returning after an absence of ten years, be found the state torn by the old party hate; but all parties agreed to submit their demands to his decision. It soon became evident, however, that Pisistratus would succeed in seizing the sovereignty, and Solon left Athens. Though Athens now fell under the despotic rule of Pisistratus, much of Solon's legislation remained effective. He is supposed to have died in his eightieth year, about B.C. 558.

SOLSTICE, in astronomy, the point in the ecliptic at the greatest distance from

the equator, at which the sun appears to stop or cease to recede from the equator, either north in summer or south in winter. There are two solstices—the summer solstice, the first degree of Cancer, where the sun is about the 21st of June; and the winter solstice, the first degree of Capricorn, where the sun is about the 22d of December. The time at which the sun is at either of these points also receives the same name.

SOLUTION, the transformation of matter from either the solid or the gaseous state to the liquid state by means of a liquid called the solvent, or sometimes the menstruum. When a liquid adheres to a solid with sufficient force to overcome its cohesion, the solid is said to undergo solution, or to become dissolved. Thus sugar or salt are brought to a state of solution by water, camphor or resin by spirit of wine, silver or lead by mercury, and so on. Solution is facilitated by increasing the extent of surface in a solid, or by reducing it to powder. Heat also, by diminishing cohesion, favors solution; but there are exceptions to this rule, as in the case of lime and its salts, water just above the freezing-point dissolving nearly twice as much lime as it does at the boiling-point. If a solid body be introduced in successive small portions into a definite quantity, of a liquid capable of dissolving it, the first portions disappear most rapidly, and each succeeding portion dissolves less rapidly than its predecessor, until solution altogether ceases. In such cases the forces of adhesion and cohesion balance each other, and the liquid is said to have saturated. Various solids dissolve in the same liquid at very different rates; thus baric sulphate may be said to be insoluble in water; calcic sulphate requires 700 parts of water for solution; potassic sulphate, 16; magnesic sulphate 1.5. When water is saturated with one salt it will dissolve other salts without increase of bulk. It sometimes happens that the addition of a second solid will displace the first already in solution.

SOLYMAN', or **SULEIMAN II.,** surnamed the Magnificent, Sultan of Turkey, was the only son of Selim I., whom he succeeded in 1520. Having put down a revolt which occurred in Syria and Egypt, and concluded an armistice with Persia, he besieged and took Belgrade in 1521. The next year he captured the island of Rhodes, which had been in the possession of the knights of St. John for 212 years. Turning his arms now against Hungary, he gained the battle of Mohács and captured Buda and Pest. In 1529 he advanced on Vienna, but was forced to raise the siege with great loss. His armies next gained considerable territories from Persia. In 1541 he overran a great part of Hungary, but an armistice was concluded for five years in 1547 though war was renewed in 1551. In 1565 he attempted the capture of Malta in vain. Next year he died at the siege of Szigeth, in Hungary, in the seventy-sixth year of his age. See Ottoman Empire.

SOMAULI, or **SOMALI LAND,** a country of Eastern Africa, forming the "eastern horn" of the continent, bounded on the north by the Gulf of Aden, and on the east by the Indian ocean from Cape Guardafui to the equator and the river Jub. The Somâli are a fine race, mainly Mohammedans though still in a barbarous state. The principal articles of trade or produce are myrrh, ivory, ostrich-feathers, hides and horns, coffee, indigo, and gum-arabic. The ports of Berbera and Zeilah with an adjacent strip on the northern coast now belong to Britain; a part is claimed by Italy.

SOMERSET, a county of England, bounded by Gloucestershire, Wiltshire. Dorsetshire, and Devonshire; area, 1,049,812 acres, nearly nine-tenths of which are now under cultivation. The chief minerals worked are lead, iron, and slate. The principal rivers are the Avon and Parret. Wheat and cattle of excellent quality are raised. The manufactures are mostly woolen and worsted goods, gloves, silk, linen, crape, and lace. Pop. 508,104.

SOMERS ISLANDS. See Bermudas Islands.

SOMERVILLE, a city in Massachusetts, 3 miles from Boston, of which it may be regarded as a suburb. Pop. 1909, estimated at 75,000.

SOMME, a department of France, bounded on the northwest by the English channel, with an area of 2379 sq. miles. The capital is Amiens. Pop. 548,982.

SOMME, a river of France, which rises in the department of Aisne, 7 miles northeast of St. Quentin; flows southwest into the department of the Somme, and falls into the English channel about 15 miles beyond Abbeville; length, 150 miles.

SOMNAM'BULISM, a peculiar perversion of the mental functions during sleep, in which the subject acts automatically. The organs of sense remain torpid and the intellectual powers are blunted. During this condition some instinctive excitation may take place and there may be the reproduction of impulses, in consequence, of different kinds. Walking in sleep is the most palpable, but not the most marvellous characteristic of this condition. The person affected may perform many voluntary actions implying to all appearance a certain degree of perception of the presence of external objects. The somnambulist gets out of bed, often dresses himself, goes out of doors, and walks frequently over very dangerous places in safety. On awakening in the morning he is either utterly unconscious of having stirred during the night, or remembers it as a mere dream. Sometimes the transactions of the somnambulist are carried much further; he will mount his horse and ride, or go to his usual occupation. In some cases somnambulists are capable of holding conversation. Somnambulism occurs in the sensitive and excitable, often in conjunction with other nervous affections, and is hereditary. Artificial somnambulism is induced by hynoptism, and the consciousness is for the time entirely absorbed by one set of ideas.

SONA'TA, in music, a term originally applied to any kind of composition for instruments, in contradistinction to vocal compositions, which were called cantatas. The name was subsequently, however, restricted to compositions for solo instruments (generally the pianoforte). Sonatas are of a certain form, consisting of several movements—at first three, the allegro, adagio, and rondo, to which afterward a fourth was added, the minuetto or scherzo—which differ from each other in time and sentiment, but are held together by their general character.

SON'DRIO, a town in North Italy, capital of the province of the same name. Pop. 6990.—The province lies between the Grisons and the Tyrol, with an area of 1257 sq. miles. Pop. 120,516.

SONG, a little poem intended to be sung; a lyric. The term is applied to either a short poetical or musical composition, but most frequently to both in union. As a poetical composition a song may be defined as a short poem divided into portions of returning measure, and turning upon some single thought or feeling. As a union of poetry and music, it may be defined as a brief lyrical poem, founded commonly upon agreeable subjects, to which is added a melody for the purpose of singing it. As denoting a musical composition, it is generally confined to an air for a single voice—airs for more than one voice being, however, sometimes called part-songs.

SONNET, a species of poetical composition consisting of fourteen rhymed verses, ranged according to rule. It is of Italian origin, and consists of two stanzas of four verses each, called the octave, and two of three each, called the sestette. The octave of the proper sonnet consists of two quatrains, the rhymes of which are restricted to two—one for the first, fourth, fifth, and eighth lines; the other for the second, third, sixth, and seventh. In the sestette, which is commonly made up of two tercets, the rhymes may be two or three, variously distributed. This is the Petrarchan or Italian form, but the verses may also be arranged in the Shakespearean form of three quatrains of alternate rhymes clinched by a couplet, or in the irregular form practiced by Coleridge and others. The sonnet generally consists of one principal idea, pursued through the various antitheses of the different strophes. The lightness and richness of the Italian, Spanish, and Portuguese languages enable their poets to express every feeling or fancy in the sonnet; but in English it has been found most suitable to grave, dignified, and contemplative subjects. Among the most successful writers of English sonnets are Shakespeare, Milton, Drummond, of Hawthornden, Bowles, Wordsworth, and Rossetti,

SONO'RA, one of the states of Mexico, lying on the Gulf of California, on which it has several good ports. Guaymas is the principal port, and has a splendid harbor. The capital is Hermosillo. Pop. 220,553; area, 79,021 sq. miles.

SOO-CHOW-FOO, a town of China, in the province of Kiangsoo, on a lake in the line of the Imperial canal, 125 miles southeast of Nankin. It was opened to foreign trade in 1895. Pop. above 500,000.

SOOT, a black substance formed by combustion, or disengaged from fuel in the process of combustion, rising in fine particles and adhering to the sides of the

chimney or pipe conveying the smoke. The soot of coal and that of wood differ very materially in their composition, the former containing more carbonaceous matter than the latter. Coal-soot contains substances usually derived from animal matter; also sulphate and hydrochlorate of ammonia; and has been used for the preparation of the carbonate. It contains likewise an empyreumatic oil; but its chief basis is charcoal, in a state in which it is capable of being rendered soluble by the action of oxygen and moisture; and hence, combined with the action of the ammoniacal salts, it is used as a manure, and acts very powerfully as such. The soot of wood has been minutely analyzed, and found to consist of fifteen different substances, of which ulmin, nitrogenous matter, carbonate of lime, water, acetate and sulphate of lime, acetate of potash, carbonaceous matter insoluble in alkalies, are the principal.

SOPHISTS, the name of a school or congeries of schools of philosophical teachers or "thinkers," who appeared in Greece in the period immediately preceding and contemporary with Socrates in the latter part of the 5th century B. C. It was a period of political decline and social corruption, and the sophists were men who, although often able and sometimes well meaning, were not strong enough to rise above the unwholesome influences under which they were placed. Their philosophy (if it can be called so) was one of criticism of those that had gone before; there was nothing creative in it, nothing even formative. The tendency of the teaching of the sophists was mainly skeptical as regards previous philosophical speculation; and while the chief point of convergence of their teaching was in an ethical direction, the influence of their ethical teaching was mostly mischievous. But the sophists rendered considerable service to science and literature, and even indirectly to philosophy.

SOPH'OCLES (-klēz), the second in order of time of the three great Greek tragic dramatists, was born at Colonos, a village in the immediate vicinity of

Sophocles, from ancient bust.

Athens, in the second year of the seventy-first olympiad, B.C. 495. Sophocles first appeared as a dramatist in B.C.468, when he took the first prize in competition with Æschylus. Æschylus retired to Sicily, and only returned to enter again for a brief period into the lists with Sophocles. Sophocles accordingly held all but undisputed supremacy until the appearance of Euripides, who took the first prize in 441. In his old age he suffered from family dissension. His son, Iophon, jealous of the favor he showed to his grandson Sophocles, and fearing he himself would suffer from it in the disposition of his property, summoned him before the judges, and charged him with being incompetent to manage his affairs. In reply Sophocles read a part of the chorus of his Œdipus at Colonos, which he had just composed, and at once proved that his faculties were unimpaired. He died about the age of ninety. One hundred and thirty plays in all are ascribed to him, of which seventeen are supposed to be spurious. Eighty-one of his dramas, including the seven now extant, were brought out after he had attained the age of fifty-five. The chronological order of the existing plays is given as follows: Antigone, Electra, Trachiniæ, Œdipus Tyrannus, Ajax, Philoctetes, Œdipus at Colonos. Sophocles brought the Greek drama to the highest point of perfection of which that form of art is susceptible. His subjects are human, while those of Æschylus are heroic, and in his management he shows himself a perfect master of human passions. The tendency of his plays is ethical, and he subordinates the display of passions to an end. He also introduced scenic illustration and a third actor. No tragic poet in ancient or modern days has written with so much elevation and purity of style. The versification of Sophocles stands alone in dignity and elegance, and his iambics are acknowledged to be the purest and most regular.

SOPRA'NO, the highest register of female voices. Its ordinary range is from C below the treble staff to A above it, though some sopranos may go as high as E. The mezzo-soprano register is from A to F, that is, a third lower than the soprano.

SORGHUM, a genus of grasses, some species of which are known by the general name of millet. They are tall

Sorghum.

grasses with succulent stems, and are found in the tropical parts of Asia, whence they have spread to other warm regions. It is the largest of the small cereal grains, and is called Guinea-corn and Indian millet. Sorghum has been introduced into the south of Europe, where is it chiefly used for feeding cattle and poultry, but it is also made into cakes. In the United States they are grown as forage plants in the western states where they have become important crops.

SO'RIA, a town of Northeastern Spain capital of the province of that name, on the Douro. Pop. 5869.—The province of Soria has an area of 3836 sq. miles, and a pop. of 160,684.

SORREL-TREE. It inhabits the range of the Alleghanies from Virginia to Georgia. The leaves are 4 or 5 inches long, oval-acuminate, finely tootned, and strongly acid in taste. The flowers are small, white, and disposed in long one-sided racemes, clustered in an open panicle.

SOUDAN', or **SUDAN',** is the Arab name given to the vast extent of country in Central Africa which lies between the Sahara on the n., Abyssinia and the Red sea on the e., the countries draining to the Congo basin on the s., and Senegambia on the w. Its area is estimated at 2,000,000 sq. miles., and its pop. at from 7 or 8 to 30 millions. The inhabitants comprise numerous nations of different races, chiefly the Negro, together with Arab colonists and traders. The Western and Central Soudan are divided into a number of more or less independent states under British, French or German influence, as Gando, Sokoto, Bornu, Baghirmi, Wadai, etc. The Eastern Soudan includes Darfur, Kordofan, etc. Egyptian rule was first extended to the Eastern Soudan in the early part of the 19th century by Mohammed Ali, under whom Ibrahim Pasha carried it as far south as Kordofan and Senaar. An Egyptian expedition under Sir Samuel Baker in 1870 led to the conquest of the equatorial regions on the Nile farther south than the Soudan proper, of which General Gordon was appointed governor-general in 1874. On the fall of Ismail Pasha of Egypt Gordon was recalled, and hordes of Turks, Circassians, and Bashi-Bazouks were let loose to plunder the Soudanese. Egyptian misrule then became intolerable and in this crisis appeared Mohammed Ahmed of Dongola, who gave himself out to be the Mahdi, the long-expected redeemer of Islam. Emin Pasha (Eduard Schnitzer) was appointed governor of the Equatorial Province on the Upper Nile, north of the Albert Nyanza, by Gordon in 1878, and he continued to hold his ground here till 1889, when he was relieved by Henry M. Stanley, and conveyed with his followers to Zanzibar. The Eastern Soudan was wrested from the Mahdi's successor in 1898, and is now under Anglo-Egyptian rule.

SOUL, the rational and spiritual part in man which distinguishes him from the brutes, the indwelling spirit of man, which is both immaterial and immortal. Soul is sometimes used as synonymous with mind, but generally it is used in a wider sense as being a whole to which pertain the faculties that constitute mind. Soul and spirit are more nearly synonymous, but each is used in connections in which it would be improper to use the other. Nearly all philosophies agree in regarding the soul as that part of man which enables him to think and reason, and which renders him a subject of moral government; but they differ when it comes to a question of origin and detail. Many philosophers maintain the indestructibility as well as the immateriality of the soul; but a whole

host of others, both in ancient and modern times, have assigned a material basis to consciousness, and all that we regard as belonging to the soul. Modern materialists usually make the soul, or what others regard as such, merely a result of organism.

SOUL (sė-ụl), capital of Corea, about 27 miles from the sea, not far from the right bank of the Han river, a tributary of the Yellow sea. Pop. 150,000, or with suburbs 300,000.

SOULT (sölt), Nicolas Jean de Dieu, Duke of Dalmatia and Marshal of France, was born at Saint Amans la Bastide, in the department of Tarn, in 1769. Raised from the ranks he became successively lieutenant and captain in his regiment. After successive promotions he was named general of division by Masséna, to whose army he was attached. In 1803 he had the command of one of the three camps of the army intended against England, that at St. Omer. He was one of the marshals created immediately after the formation of the empire in 1804. He acquired new fame in the Prussian campaign; and in 1807, after the battle of Friedland, took Königsberg. From 1808–12

Marshal Soult.

he fought in Spain, but, overmatched by Wellington, was unable to gain many laurels. In 1813 he was recalled in consequence of Napoleon's disasters, to take the command of the fourth corps of the grand army, and commanded the infantry of the guard at Lützen. On the news of Wellington's victory at Vittoria he was sent back to reorganize the French force in Spain, and did his utmost to oppose Wellington's triumphant career till Napoleon's abdication. Soult gave in his adhesion to Louis XVIII., who appointed him commander of the thirteenth military division; and in 1814 made him minister of war. On Napoleon's return he joined his standard, and held the post of major-general of the army in the campaign of Waterloo. After the second restoration he took up his residence at Düsseldorf, but was permitted to return to France in 1819; and in 1827 was raised to the peerage. After the July revolution of 1830, and on two subsequent occasions, he held ministerial office, and in 1846, on retiring from public life, was created grand-marshal of France. He died in 1851.

SOUND. See Acoustics and Ear.

SOUNDING, the operation of trying the depth of water and the quality of the bottom, especially by means of a plummet sunk from a ship. In navigation two plummets are used, one called the hand lead, weighing about 8 or 9 lbs.; and the other, the deep-sea lead, weighing from 25 to 30 lbs. The former is used in shallow waters, and the latter at a distance from shore. The nature of the bottom is commonly ascertained by using a piece of tallow stuck upon the the base of the deep-sea lead, and thus bringing up sand, shells, ooze, etc., which adhere to it. The scientific investigation of the ocean and its bottom has rendered more perfect sounding apparatus necessary, and has led to the invention of various contrivances for this purpose, among the most simple and common of which is Brooke's sounding apparatus. Some of the deepest sea-soundings yet obtained that can be relied on have been obtained by H. M. S. Challenger. See Ocean.

SOUP, a decoction of flesh in water, properly seasoned with salt, spices, etc., and flavored with vegetables and various other ingredients. There are very many kinds of soup, the introduction of a different ingredient furnishing the occasion for a distinctive name, but they may all be divided into two classes —clear soup and thick soup. Maigre soup is a soup made without meat.

SOURABAYA (sö-rà-bä'yà), a seaport of Java, capital of a province of the same name, on the Strait of Madura. Pop. 100,000.

SOURAKRATA, or SOLO, a town of Java, capital of the province of the same name, 140 miles w.s.w. of Sourabaya. Pop. 50,000.

SOUSA (sōōzà), John Philip, American bandmaster and author, was born in Washington, D. C., in 1854. From 1880–1892 he was bandmaster of the United States Marine Corps at Washington and during this period made the organization one of the finest military bands in America. In 1892, he formed the organization known as Sousa's Band. His compositions have been eminently successful. His ability as a composer of marches soon secured for him the popular title of the "March King." His compositions include the following operas: The Smugglers, Désirée, El Capitan, The Bride Elect, The Charlatan. Marches: The Washington Post, Manhattan Beach, El Capitan, Bride Elect, The Stars and Stripes Forever. He has written several books which have had great success, among them being The Fifth String and Pipetown Sandy.

SOUTH, University of the, an institution of learning at Sewanee, Tenn., founded in 1857 by the Protestant Episcopal church of the south and opened in 1868 with a grammar school and an academic department. The theological department was opened in 1878, a medical department in 1892, law department in 1893. The academic department embraces 15 schools, a certificate and diploma being given in each school. The degrees conferred are B.A., M.A., M.S., and C.E. The work is mostly prescribed. In theology the degrees of B.D. and graduate in divinity are given; in law, LL.B.; in medicine, M.D. A school of pharmacy, with the degree of graduate of pharmacy, and a training school for nurses are connected with the medical school

SOUTH AFRICAN REPUBLIC. See Transvaal.

SOUTH AMERICA is a vast peninsula of a roughly triangular form, with its apex pointing southward, extending in length from lat. 12° 30′ n. to Cape Horn in lat. 55° 59′ s. Its greatest length is 4800 miles; its greatest breadth 3230 miles; area, about 7,000,000 sq. miles. Some of the general features and relations of South America to North America are already described under America, but supplementary particulars are here given.

South America is united to North America by the Isthmus of Panamá. The coast-lines of South America, particularly the west, are comparatively little broken or interrupted by indentations, and in this respect resemble those of Africa. Toward the southern extremity is a group of islands, forming the archipelago of Tierra del Fuego. They are penetrated in every direction by bays and narrow inlets, ending often in glaciers. The mountainous and elevated tracts of the continent are chiefly limited to the borders of the Pacific and Atlantic oceans; the intervening space being occupied by a great series of plains, reaching from one extremity of the continent to the other, at an elevation generally less than 1000 feet above the level of the sea. There are four chief mountain systems, the most remarkable of which is the Andes, that stretch along the whole of the west coast from south to north for a distance of 4500 miles. They are of inconsiderable width comparatively, but attain great elevations, ranking in this respect next to the Himálaya mountains; the highest known peak, Aconcagua, in Chile, being 22,860 feet high. (See Andes.) The second system is that of Parima, also called the Highlands of Guiana, in the northeast; culminating point, Maravaca, about 10,500 feet high. The third system is near the north coast, and is known under the general name of the Coast chain of Venezuela; culminating point, the Silla de Caracas, with an elevation of 8600 feet. The fourth is that of Brazil in the southeast; culminating point, Itatiaia, 10,040 feet high. There are altogether upward of thirty active volcanoes in South America. They all belong to the Andes, and consist of three separate and distinct series; the series of Chile, of Peru and Bolivia, and of Quito. The loftiest is Gualateiri in Peru, which reaches a height of 21,960 feet. The immense plains are one of the remarkable features of South America, sometimes stretching for hundreds of miles without exhibiting the slightest perceptible inequality. They are variously designated, being known as pampas in the south, as selvas in the Amazon region, and as llanos in the north. All the South American rivers of any magnitude carry their waters to the Atlantic. The principal rivers are the Amazon, the Orinoco, and the Plata (which see), the first being the greatest as regards volume of water among the rivers of the world. One of the most singular features in the hydrology of

South America is the water connection existing between the Orinoco and the Amazon through the natural channel of the river Cassiquari. As explained under Brazil (which see) it would not be difficult to establish inland communication by water from the Orinoco to the Plata. The lakes of any considerable size are few; the largest, Lake Titicaca in the Andes, covers an area of above 4000 sq. miles. Naturally there are considerable diversities of climate in the different parts of the continent, but only in comparatively few are the extremes of heat and cold very great, and on the whole South America is neither very hot nor unhealthful, though so much of it is within the tropics. Over great part of it the rains are adequate, and in many parts abundant; but on the west coast there are small regions where rain seldom or never falls. The most distinguishing features of the vegetation of South America is its prodigious forests, which cover about two-thirds of the whole continent, and yield valuable timber, ornamental woods and dyewoods, cinchona, india-rubber, vegetable ivory, etc. In the tropical regions vegetation is on the grandest scale, grandeur also being combined with great beauty. Fruits abound, including oranges, limes, pine-apples, mangoes, bananas, pomegranates, and many others. Southward of the line coffee, sugar-cane, corn, and cacao are among the chief products. The most valuable vegetable products exported are coffee, cotton, wheat, and cacao. Among plants specially belonging to South America are cacao, cinchona, cocoa, and Paraguay tea. Among the domesticated native animals of South America are the llama and alpaca, both used as beasts of burden, and yielding a kind of hair which is exported and manufactured into tissues. Horses, at first imported, and cattle now roam wild over the southern plains. Large numbers of sheep are also reared, and wool, hides and skins, live animals, meat, etc., are now exported. Gold and silver, copper, nitre, guano, and precious stones are also products of South America. The aborigines of South America are undoubtedly of the same race as those of North America, as there exists a very striking general physical resemblance between the native races throughout the whole of the American continent, from Cape Horn to Bering's straits. (See America and Indians.) They are almost all of a copper color, with long black hair, deep-set black eyes, aquiline nose, and often handsome slender form. In South America these red men are far more numerous than in North America, and though many are half-civilized, a greater number are in a state of barbarism. A considerable portion of the population also consists of persons of Spanish and Portuguese blood, and along with these a far greater number of mixed Indian and European blood, civilized, and forming an important element in the various states of the continent. To these are now being added considerable numbers of Spanish and Italian immigrants. South America comprises the republics of Colombia, Ecuador, Venezuela, Peru, Bolivia, Chile, Argentine Republic, Brazil, Paraguay and Uruguay, besides the colonies of British, French, and Dutch Guiana and the Falkland Islands (British). The areas and populations are as follows:

	Area sq. m.	Pop.
Colombia	504,500	3,879,000
Ecuador	251,300	1,400,000
Venezuela	566,200	2,324,000
Peru	439,000	2,980,000
Bolivia	472,000	2,370,000
Chile	293,300	3,414,000
Argentine Republic	1,200,000	4,043,000
Paraguay	98,000	432,000
Uruguay	72,000	825,000
Brazil	3,124,000	16,930,000
British Guiana	109,000	281,000
French "	35,000	30,000
Dutch "	60,000	72,000
Falkland Islands	6,500	2,000
	7,230,800	38,882,000

The first discoverer of the continent of South America was Christopher Columbus, who reached the mouth of the Orinoco in his third voyage (1498). The adventurer who followed next was Alonzo de Ojeda, a Spaniard, who examined the coast of Venezuela. Ojeda was accompanied by Amerigo Vespucci, a native of Florence, who, on his return to Spain, published an account of his voyage, and whose name gradually came to be given to the continent. Brazil was discoveed in 1500 by Vincent Yanez Pinzon, who explored the mouths of the Amazon. Later in the year Alvarez Cabral reached the coast of Brazil farther south than the point touched by Pinzon, and took possession of the country in the name of the king of Portugal. In 1513 Vasco Nuñez de Balboa crossed the Isthmus of Darien, and discovered the Pacific ocean. In 1531 Pizarro embarked at Panamá with a small force, and made himself master of Peru. Almagro, a companion of Pizarro, pushed southward into Chile, and in 1537 the country between Darien and Peru was traversed by Vadillo, and Quito was soon after taken possession of by the Spaniards. In 1540 Gonzales, the brother of Pizarro, crossed the Andes and came upon the Amazon, which Orellana, one of his officers, descended to the ocean. In the meantime Juan de Solis had discovered the La Plata in 1515, and Fernando Magellan sailed along the southeast coast and through the strait that bears his name into the Pacific (1520). In 1526 Sebastian Cabot ascended the Paraná and Paraguay, and established two or three forts, and in 1536 the city of Buenos Ayres was built. The discoveries of the Spanish and Portuguese gave the possession of almost the whole of South America to these nations — Portugal holding Brazil, while Spain, held the remainder. The colonial system of Spain was a highly vicious and oppressive one, and the colonies seized the first opportunity to cast off their allegiance to the mother country, early in the 19th century, when Spain was in difficulties from Napoleon's conquests. The Spaniards attempted to bring them back to their allegiance by force, and a series of struggles took place between the colonial and Spanish troops which lasted till 1824, when the independence of the colonies was finally secured.

SOUTHAMP'TON, a borough and seaport town of England, in the county of Hants, on a peninsula at the mouth of the Itchen, near the head of Southampton Water, 18 miles n.w. of Portsmouth, and 79 miles s.w. of London. There is ample dock accommodation, and Southampton is the most important mail-packet station in the kingdom. The manufactures are chiefly confined to brewing, coach-building, iron-casting, sugar-refining, and ship-building. Pop. 104,911.

SOUTH AUSTRALIA, a British colony forming the central of the three sections (running north and south), into which Australia is divided. Its length from north to south is 1850 miles; its breadth from east to west 650; its area 903,690 sq. miles. Pop. 500,000.

SOUTH BEND, the chief town of St. Joseph county, state of Indiana, on the St. Joseph river. It has important manufactures of wagons, buggies, agricultural implements, furniture, doors and window-frames, sewing-machines, paper, etc. It possesses two Roman Catholic colleges, the University of Notre Dame, etc. Pop. 43,100.

SOUTH BETHLEHEM', a town in Northampton county, Pa., 56 miles north by west of Philadelphia; on the Lehigh river, opposite Bethlehem, and on the Lehigh Valley and the Philadelphia and Reading railroads. South Bethlehem has large iron and steel manufactures, the principal being the large establishment of the Bethlehem Iron company. Pop. 16,164.

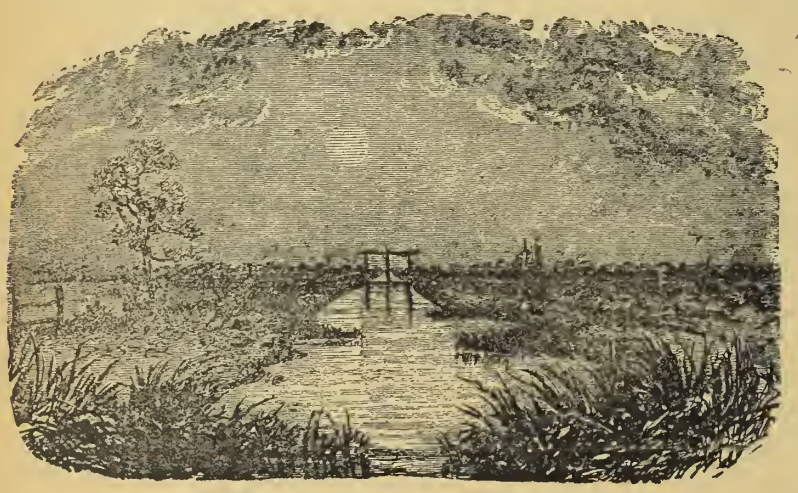
SOUTH'BRIDGE, a town in Worcester county, Mass., 20 miles south by west of Worcester; on the Quinebaug river, and on the New York, New Haven and Hartford railroad. Pop. 11,643.

SOUTH CAR'OLINA, one of the original thirteen states of the Union, bounded on the north by North Carolina on the southeast by the Atlantic ocean,

Seal of South Carolina.

and on the southwest by Georgia. Area 30,570 sq. miles, and thirty-sixth in size among the states. South Carolina may be about equally divided into high, middling, and low land, the last named rising from the sea coast, where it is very flat and level, and gradually increasing in elevation toward the interior, where it attains a mean of about 250 feet, continuing to the north line, where, after varying from 300 to 800 feet, it reaches its highest elevation of 1000 feet. The land along and near the coast

is low, marshy, and swampy, especially on the rivers' banks, rolling and diversified toward the center, and undulating near the mountain slope, but in places abrupt, King's mountain rising almost perpendicularly 500 feet. The land is irrigated and well drained by numerous rivers, the largest of which is the Santee. The climate is mild, and especially healthful in the uplands and pine barrens, but unhealthful in the low swamp regions. Snow in measureable amounts generally does not fall on more than two or three days in a year, except in the mountains, where there is a considerable snowfall. The average annual rainfall is 47 inches, fairly evenly distributed both as to localties and seasons. Hurricanes visit the coast occasionally, and sometimes do considerable damage. In 1886 the state suffered from a severe earthquake which caused great destruction at Charleston. The palmetto, live oak, magnolia, long leaf pine, cypress, oaks, hickories are common. The persimmon, locust, and plane tree grow in this state. The most valuable minerals found are granite, gneiss, mica, slate, and rock phosphate. Gold and silver are



A rice-field in South Carolina.

mined in small quantities and the iron ores existing in large quantities are but little worked. The most important species in the fish industry of the state are oysters, whiting, shad, and sea bass. South Carolina ranks first among southern states and second in the Union in the value of its cotton products. Cotton seed oil and cake, planing mill products, flouring and grist mill products are among the other industries. The railroads are mostly owned or controlled by three large systems—the Southern, the Seaboard Air line and the Atlantic coast line. A considerable foreign trade, principally exports, passes through the port of Charleston, which ranks tenth among the Atlantic coast ports. Corn, wheat, oats, rice, and hay are the principal crops. Tobacco is grown in small quantities. Dairy cows, horses, mules and asses and swine are raised. The state provides higher education for both sexes at the South Carolina college located at Columbia. Of the nine colleges and seminaries for females Converse college, a non-sectarian institution at Spartanburg, is the largest. The state has an agricultural college at Clemson college, at which also courses in civil, electrical, mechanical, and textile engineering are given. The negro population of South Carolina is greatly in excess of the white and consequently is one of the most serious of the educational problems. That considerable success has been attained is shown by the decrease in illiteracy. In 1562 Jean Ribault, acting for Admiral Coligny, attempted to form a colony of French Huguenots at Port Royal. In 1670 three shiploads of English settlers under William Sayle landed near Port Royal. In 1680 the settlement was removed to the present site of Charleston. The colony was divided into North and South Carolina in 1710. The colony joined Oglethorpe's unsuccessful expedition against the Spaniards in 1710. The colony was prompt in its resistance to the Stamp Act, and troops were quartered in Charleston. Famous leaders of irregular bands of patriots were Sumter and Marion. Charleston was captured by the British in 1780, and held until 1782. The state adopted the Federal constitution May 23, 1788, Columbia was made the capital in 1790, and a new constitution was adopted which gave the legislature practically all power. On the election of President Lincoln in 1860, a convention was called on December 20th, which unanimously passed an ordinance of secession. The attack on Fort Sumter in April, 1861, precipitated the civil war. The state furnished 60,000 soldiers to the confederate armies. The state suffered greatly from Sherman's march and during the war it was the scene of active operation between the federal and confederate armies. On the refusal of the state to ratify the fourteenth amendment, a military government was established. In 1868 another constitution allowing negro suffrage was adopted and the state was readmitted June 25th. A severe earthquake destroyed property valued at $5,000,000 August 31, 1886. In 1893 a great storm on the coast caused the loss of more than 1000 lives. In 1901-02 the South Carolina Interstate and West Indian exposition was held at Charleston. In national elections the state has been democratic, except in 1792. The largest cities are Charleston, Columbia, Greenville. Population of state about 1,490,000.

SOUTH CAROLINA COLLEGE, a non-sectarian, coeducational college in Columbia, S. C., chartered in 1801 and opened in 1805. It was closed in 1863 and was reopened in 1866 as the University of South Carolina. It was divided into two branches in 1878; one, the South Carolina college, the other Claflin college, for negroes, at Orangeburg. In 1894 women were admitted to all courses. It has a system of accredited schools, the certificate of which admits students without examination. The college has a department of law.

SOUTH DAKO'TA, a north central state of the Union bounded on the north by North Dakota, on the east by Minnesota and Iowa, on the south by Nebraska, and on the west by Wyoming and Montana. The area is 77,650 sq. miles, of which 76,850 are land surface, and ranks twelfth in size among the states. In general the face of the country is like that of North Dakota; but west of the Missouri river the level and rolling portions rise to numerous hills, and buttes, and terminate in the rugged elevated, mineralogically rich Black Hills. The state is divided into the Missouri, Big Sioux, James, and Central Dakota valleys, and the Sioux reservation and Black Hills regions. The Missouri river flows through the state from about the center of the northern boundary to the extreme southeastern corner and forms the southern boundary for about 200 miles. The Big Sioux valley lies in the eastern and southeastern parts of the state. South Dakota has a climate with great extremes of temperature, the mean annual temperature is 44.3° F. The mean for January is 15° and for July 72.2°, while the absolute extremes may rise to more than 115° above or fall to more than 40° below zero. But owing to the dryness of the atmosphere, the heat and cold are much more endurable than more moderate temperatures and renders the climate bracing and pleasant. The soil in the greater part of the state is of excellent quality, and when sufficiently watered is rendered highly productive. The state is as a whole a treeless prairie country. Forests are found only in the Black Hills above an altitude of 4000 feet, where there is a good growth of pine. The mineral wealth of the state lies chiefly in the area of the Black Hills which is noted for the richness, abundance, and diversity of its resources, there being deposits of copper, gold, silver, argentiferous lead, iron ores, manganese, nickel, tin, mica, and some graphite. The clays contain beds of gypsum, and beds of lignite as well as reservoirs of natural gas. South Dakota ranks among the first wheat states in the Union. Corn, oats, barley, hay, and forage and potatoes are the other principal crops. The state has excellent grazing facilities. The number of cattle has increased over one hundred per cent and there has also been a large

increase in the number of horses, sheep, and swine. The railroads are confined to the region east of the Missouri river and to the mining region in the southwest corner. The Chicago, Milwaukee and St. Paul, the Great Western, and the Chicago and Northwestern have the greatest mileage. Much interest has been taken in the cause of education, during the entire time of South Dakota's statehood, and the advances made have been rapid indeed. There are normal institutions in every county. The leading educational institution in the state is the University of South Dakota. Among the more important colleges are Black Hills college at Hot Springs, Dakota university at Mitchell, and Pierre university at East Pierre. The state maintains a School of Mines at Rapid City, and the State Agricultural college at Brookings. There are charitable institutions and libraries in most of the

Great seal of South Dakota.

larger cities. The first real and permanent white settlement in Dakota was probably established by French-Canadians near Pembina about 1780. There were fur-trading posts established as early as 1808. By a treaty with the Dakota Indians in 1851 a large part of the country was opened to white settlement. The territory was established and organized in 1861. Yankton was the capital until 1883, when Bismarck became the seat of government. During the congressional session in 1888–89 provision was made to admit it into the Union as two states, North Dakota and South Dakota. In national elections the state has been Republican, excepting in 1892, when it went Democratic. Pop. about 490,000.

SOUTH DAKOTA, University of, a coeducational state institution at Vermillion, S. D., organized in 1882. The university has established a loan fund for the assistance of needy students. Military science and tactics form part of the course. The degrees conferred are those of Bachelor of Arts, Law, Commerce, and Music. The institution carries on the state geological survey.

SOUTHERN CROSS, a constellation of the southern hemisphere, composed of four stars, one of which is of the first, and two of the second magnitude. They form a figure not unlike a cross, especially when seen above the pole, and are the best-known of the southern constellations.

SOUTHEY (sou'thi), Robert, an English poet and miscellaneous writer, was born in 1774. He left Oxford in 1794, and having formed an acquaintance with Coleridge, they were married on the same day to two sisters in 1795. Among his poetical productions may be mentioned—Joan of Arc; Thalaba; Madoc; The Curse of Kehama; Roderick, the Last of the Goths; a Poet's Pilgrimage to Waterloo; and a Vision of Judgment. Several of his minor pieces show to more advantage than his larger poems. His prose works are remarkable for their excellent style. Among others may be mentioned his Life of Nelson, which is almost a perfect model of its kind; Life of Wesley, History of Brazil, The Book of the Church, and the Doctor. He died in 1843.

SOUTH OMAHA (ō'mȧ-hȧ), a city in Douglas county, Neb., adjoining Omaha; on the Missouri river, and on the Union Pacific, the Chicago, Rock Island and Pacific, the Burlington and Missouri river, and other railroads. South Omaha was settled in 1882 and was incorporated in 1886. Its rapid growth dates from the establishment in 1884 of the Union Stock Yards. Pop. 30,000.

SOUTH POLAR EXPEDITIONS, exploring expeditions in the Antarctic regions. The first discovery of land in the proximity of the Antarctic circle was made accidentally by Dirk Cherrits, a Dutch navigator, who, in endeavoring to enter Magellan's straits, was driven southward to lat. 64°, where he discovered the South Shetland islands. Captain Cook is the first who is known to have sailed within the Antarctic circle. He reached the southernmost point attained by him on 30th January, 1774, in 71° 10′ s. and 107° w. In 1821 the Russian Bellinghausen discovered Peter the Great and Alexander islands. Enderby Land and Kemp Land were discovered by Biscoe in 1831–33. The first of these is the easternmost point of a supposed continuous coast, and lies in lat. about 67° 30′. Sabina Land and Balleny islands were discovered in nearly the same latitude by Balleny in 1839. In 1840 two important exploring expeditions, one French, the other American, reached the southern seas. The French expedition, under Dumont d'Urville, found traces of what they believed to be a continuous coast from 136° to 142° e., to which they gave the name of Adélie Land. The American expedition, under Wilkes, passed very near the southern magnetic pole, the position of which at the time he calculated to be lat. 70° s., lon. 140° e., and traced land from lon. 154° 27′ to 97° 30′ e., which Wilkes concluded to be continuous. An English expedition under James Clark Ross in 1839 passed the Antarctic circle about lon. 178° e., and in 172° 36′ e. lon. and 70° 41′ s. lat. found a continuous coast trending south, with mountain peaks 9000 to 12,000 feet in height. He gave the country the name of South Victoria Land. In 77° 32′ s. lat., 167° e. lon., he discovered an active volcano, Mount Erebus, 12,400 feet high. The farthest south point reached by Ross was 78° 10′; in 1899 M. Borchgrevink reached lat. 78° 50′, and located the south magnetic pole in lat. 73° 20′ s. and lon. 146° e. In 1901 several expeditions, including a British one on board the Discovery, set out for the Antarctic regions. The southern polar region is much colder than the northern. The only mammals found are seals and cetaceans. No vegetation has been found further south than Cockburn island in the South Shetland group. See Polar Expeditions.

SOUTH SEA BUBBLE, a disastrous financial speculation which arose in England in the beginning of the 18th century. It originated with the directors of a joint-stock company, which, in consideration of certain exclusive privileges of trading to the South seas, offered the government easier terms for the advance or negotiation of loans than could be obtained from the general public. In 1720 the proposal of the company to take over the entire national debt (at this time about $155,000,000) in consideration of receiving annually 5 per cent was accepted, and the company promised in return for this privilege (as it was regarded) a premium in their own stock of $37,500,000. Professing to possess extensive sources of revenue the directors held out promises to the public of paying as much as 60 per cent on their shares. It soon became apparent that such magnificent promises could never be fulfilled, and in a few months' time the collapse came which ruined thousands.

SOUTH SEA ISLANDS. See Polynesia.

SOUTHWARK (south'ȧrk), a division of London south of the Thames, in Surrey, a metropolitan parl. and mun. borough, directly opposite the City of London. For parliamentary purposes it is divided into three divisions—West Southwark, Rotherhithe, and Bermondsey, one member to each. Pop. parl. bor., 214,085.

SOUVALKY, a town of Russian Poland, capital of the government of the same name, with considerable trade, some manufactures, and a population of 66,533.

SOVEREIGN, the person in whom is vested the highest governing power in a state.

SOVEREIGN, a gold coin, the standard of the English coinage. It exchanges for $4.80 and has a standard weight of 123.274 grains, being of 22 carats fineness, and coined at the rate of 1869 sovereigns from 40 lbs. troy of gold.

SOWING-MACHINES, machines for sowing grain. Among the simplest and earliest forms of sowing-machine is a cylindrical vessel with small holes at regular intervals round its circumference for sowing round seed, such as turnip-seed. The machine is placed on wheels, and drawn over the land at a regulated speed, when by its mere revolution the seed is delivered with tolerable uniformity. Another class of machines consists of those having a fixed seed-box, the delivery from which is regulated by internal revolving machinery. The holes for delivery are placed at regular intervals near the bottom of one side of the seed-box. One of the best modes of delivery is regulated by cups attached to projecting arms on a revolving disc. The cups dip into the seed and lift successive portions, which they deliver at the height of their revolution into a funnel placed for its

removal to the ground. Another mode of delivery is by an oscillating movement given to a false bottom of the seed-box. The real and the false bottom are both provided with holes, and when the holes correspond the seed falls. An objection is made to these machines that they are liable to cut the seed. In broadcast machines no special apparatus is needed for conveying the seed to the ground, the intervals of the holes causing it to fall evenly on the ground. In the machines called drills the funnel into which the seed is dropped is designed to convey it accurately into the row in which it is to be sown, the rows being parallel to the course of the machine. For this purpose the funnel terminates in a heavy coulter, which opens a channel of uniform depth for the deposit of the seed, which is then covered by a harrow. By further improvements drop drills and dibbling machines have been contrived, which not only deposit the seed in rows but at regular intervals within the rows. The regular delivery of manure is also secured by similar machines.

SPACE, in philosophy, extension considered independently of anything which it may contain, extension considered in its own nature. Aristotle defines it as the possiblity of motion, and possessing the quality, therefore, of being—potentially, not actually—divisible ad infinitum. Space and Time are two of the so-called innate ideas. According to one school these ideas are intuitive to the mind; according to another they are the result of experience. Locke maintained that we acquire the idea of space by the senses of sight and touch. Space and Time, according to Kant, are the ultimate forms of external and internal sense, and these forms are contained a priori in the human mind. Space is the form of external sense by means of which objects are given to us as existent without us, and as existent also apart from and beside one another. If we abstract from all that belongs to the matter of sensation (in any perception), there remains behind only space, as the universal form into which all the materials of the external sense dispose themselves. Herbert Spencer, while making no attempt to analyze the notion of space, says: "It will be sufficient for present purposes to say that we know space as an ability to contain bodies. I am aware that this is no definition properly so called, seeing that as the words 'contain' and 'bodies' both imply ideas of space, the definition involves the thing to be defined. But leaving out as irrelevant all considerations of the mode in which we come by our ideas of space, and of bodies as occupying space, it will I think be admitted that the antithesis between bodies and an ability to contain bodies truly represents the contrast in our conceptions of the sensible non-ego (matter) and the insensible non-ego (space)."

SPADIX, in botany, a form of the inflorescence of plants, in which the flowers are closely arranged round a fleshy radius, and the whole surrounded by a large leaf or bract called a spathe, as in palms and arums.

SPAIN, a state in the southwest of Europe, forming with Portugal the great southwestern peninsula of Europe. It is separated from France on the northeast by the chain of the Pyrenees, and is otherwise bounded by Portugal and the Atlantic and Mediterranean. In greatest breadth n. and s. it measures 540 miles; greatest length e. and w., 620 miles; total area, 196,000 sq. miles; pop. 18,089,500. Besides the Balearic and Canary Islands, Spain retains of her colonial possessions a large strip on the west coast of the Sahara; and the island of Fernando Po, with some smaller West African possessions. Their total area is about 244,000 sq. miles; pop. about 144,000. Spain formerly comprised the ancient kingdoms and provinces of New and Old Castile, Leon, Asturias, Galicia, Estremadura, Andalusia, Aragon, Murcia, Valencia, Catalonia, Navarre, and the Basque provinces. These since 1834, for administrative purposes, have been divided into forty-nine provinces, including the Balearic and Canary islands. The capital is Madrid; next in population are Barcelona, Valencia, Seville, and Malaga. The coast-line is not much broken, but sweeps round in gentle curves, presenting few remarkable headlands or indentations. The interior is considerably diversified, but its characteristic feature is its central table-land, which has an elevation of from 2200 to 2800 feet, and a superficial extent of not less than 90,000 sq. miles. It is bounded on the n. by the Asturian and Cantabrian mountains; on the s. by the Sierra Morena; and is crossed from east to west by the rivers Douro, Tagus, and Guadiana. Between these limits it is intersected by two important ranges of mountains running nearly e. and w., the northern being the Guadarrama with its continuations, separating the valleys of the Douro and Tagus; and the southern, the Sierra de Toledo and its continuations between the Tagus and the Guadiana. South of the Sierra Morena is the valley of the river Guadalquivir. Besides these ranges there is the chain of the Pyrenees, which, though partly belonging to France, presents its boldest front to Spain and has its loftiest summits within it. The chief rivers enter the Atlantic, but in the northeast is the Ebro, a tributary of the Mediterranean. The Douro, Tagus, and Guadiana belong partly to Portugal. The lakes are few and unimportant. The whole country teems with mineral wealth, the minerals, including in greater or less quantities gold, silver, quicksilver, lead, copper, iron, zinc, calamine, antimony, tin, coal, etc. The climate varies much in different localities. On the elevated table-land it is both colder in winter and hotter in summer than usual under the same latitude. In the plains and on the coasts the hot summer is followed by a cold rainy season, terminating in April in a beautiful spring. The mean temperature at Malaga in summer is 77° F., in winter 57°; at Barcelona 77° and 50°; and at Madrid 75° and 44.6°. The rainfall is small, in the interior between 8 and 12 inches per annum. In some parts of the south the climate is almost tropical. About one-sixth of the acreage is under wood; the more remarkable trees being the Spanish chestnut and several varieties of oak, and in particular the cork-oak. Fruits are extremely abundant, and include, in addition to the almond, date, fig, orange, citron, olive, and pomegranate; and in the lower districts of the south, the pine-apple and banana. The more important farm crops are wheat, rice, corn, barley, and legumes. In the south cotton and the sugar-cane are grown. Hemp and flax, the mulberry for rearing silk-worms, saffron, liquorice, are also to be mentioned. The only large animals in a wild state are the wolf, common in all the mountainous districts, and the bear and chamois, found chiefly in the Pyrenees. Domestic animals include the merino sheep in great numbers, horses, mules, asses, horned cattle, and pigs. The manufactures of Spain are not as a whole important, but considerable advances have been made in recent times. The most important industries are the manufactures of cotton, of woolens and linens, of cutlery and metal goods, paper, silk, leather, tobacco and cigars, besides wine, flour, and oil. The chief articles of export are wine, fruits (especially oranges and raisins), cork, lead, copper and copper ore, iron ore, oils, soap, and agricultural produce (including cattle and wool). The chief trade is with France, next to which is Britain. The country is imperfectly provided with roads; the rivers are of little use for navigation; and though railways have a considerable aggregate length (about 6000 miles), much is still required. The length of telegraphs is about 11,500 miles. The chief denomination of money is the peseta, of which about 5 are equivalent to $1.00. The present constitution dates from 1876, and enacts that the government be a constitutional monarchy, the legislative power resting "in the Cortes with the king," the executive being vested, under the monarch, in a council of nine ministers. The Cortes consists of two independent bodies—the senate and congress, the former consisting of 360 members, one-half of whom are elected by corporations and similar bodies, the other half being life senators nominated by the crown, and "senators by their own right." The congress is formed by deputies in the proportion of one to each 50,000 of the population. The various provinces, districts, and communes are governed by their own municipal laws with local administration. Each commune has its affairs directed by an elected ayuntamiento, and each province has its diputacion provincial, or parliament, whose members are elected by the ayuntamiento. The army consists of

a, Spathe. *b*, Spadix.

(1) a permanent army, in which all above the age of twenty are liable to serve for three years; (2) an active reserve with three years' service; and (3) a sedentary reserve, with service for other six years. By the payment of $300 exemption from service may be obtained. For military purposes the country, with the islands, is divided into fourteen districts, and the strength of the army (exclusive of the reserve) is 130,000 in peace and 310,595 in war. The navy is manned by about 6000 men, besides about 9000 marines; the vessels comprise four battle-ships, three first-class protected cruisers, three second-class, and a large number of third-class and gunboats, etc. The people of Spain are of very mixed origin, the most ancient inhabitants, the Iberians (now represented probably by the Basques or Biscayans of the northeast), being afterward mingled with Celts, Phœnicians, and Carthaginians, Roman colonists, Goths, Jews, and Arabs or Moors. They are generally of medium height and of spare habit, with black hair, dark eyes, and sallow complexion. Under the constitution the state binds itself to maintain the Roman Catholic religion, but a restricted liberty of worship is permitted to Protestants, of whom, however, there are very few. The most ancient known inhabitants of Spain were the Iberians. To these afterward were joined certain tribes of Celts, and subsequently the two races united. The Phœnicians made settlements at a very early date, having founded Cadiz about B.C. 1100; later the Greeks founded several cities, and then (B.C. 238), the history of Spain may properly be said to begin with the Carthaginian invasion. Hamilcar Barca undertook, with considerable success, to subjugate the tribes of the peninsula, and in this effort he was followed by Hasdrubal and Hannibal. War between Rome and Carthage brought the Romans to Spain, and (B.C. 205) ended in their driving out the Carthaginians. In 256 A.D. the country was invaded by the Franks, and after their departure Spain became peaceful until the advent of the Goths. A Visigothic kingdom was established about 418 A.D. But after retaining the mastery of the country for nearly three centuries the Visigoths were in their turn conquered (711 A.D.) by the Saracens under Tarik, and the greater part of Spain became a province of the caliphs of Bagdad. For some years they held it as a dependency of the province of North Africa, but it was afterward (717) governed by emirs appointed by the caliphs of Damascus. Dissensions ultimately arose between the central power and the province, with the result that an independent dynasty was established by Abd al-Rahman at Cordova (756 A.D.), which received additional power and magnificence from Hisham (788) and his son Al Hakam (796). Meanwhile several small kingdoms had been formed in the mountainous districts of the Pyrenees, probably by descendants of the Visigoths. The chief of these were the kingdoms of Asturias, Leon, Navarre, Aragon, and Castile. These states were often at war with each other, and in the struggle for supremacy Castile and Aragon ultimately absorbed all the others. By the marriage (1469) of Isabella, the heir to the crown of Castile with Ferdinand of Aragon, begins the modern history of Spain. To strengthen the central government and curtail the power of the nobility the Santa Hermandad, or Holy Brotherhood, was formed (1476) to act as the administrators of justice; the Inquisition was instituted (1481) to promote religious orthodoxy and unity; the Jews were expelled for heterodoxy; and the Moors were completely subjugated by the conquest of Granada (1492) and afterward expelled. In this same year Columbus discovered the West Indies, and the colonial power of Spain, thus begun, was soon greatly extended. When Ferdinand died in 1516 his daughter Joanna, who had married Philip, son of Maximilian I., succeeded to the kingdom of Aragon, but her son, Charles I., became regent and ultimately king of the whole of Spain. He was also ruler of the Netherlands, which he inherited from his father, and in 1519 he was proclaimed Charles V. emperor of Germany. As the champion of the Catholic church he successively declared war with the French, the German Protestants, and the Turks. But as the expense of this vast policy overtaxed his own kingdom and was only partially met by the wealth acquired by the conquest of Mexico (1518) and Peru (1531), he finally retired in despair, and was succeeded (1556) by his son, Philip II., who failed to establish the Spanish influence in France and sustained defeat from England by the destruction of the Invincible Armada. He was succeeded (1599) by Philip III., who, by expelling all the Moriscos from his kingdom and engaging in the Thirty Years' war, impoverished the country. Further disasters overtook Spain on the accession of Philip IV. (1621). Under his son, Charles II. (1665), a prince who was feeble both in mind and body, the country declined still more, and at his death in 1700 without an heir there began the war of the Spanish succession. After a prolonged European war it was agreed by the Treaty of Utrecht (1713) to acknowledge the Bourbon Philip V. as king of Spain on condition that the Netherlands and the Italian provinces were given to Austria, while England claimed Gibraltar and Minorca. Under the administration of Cardinal Alberoni Spain regained a large part of its power in Europe. This revival was continued under Ferdinand VI., who succeeded to the throne in 1746; but it received its greatest impulse from Charles III. (1759), who developed the agricultural and other resources of his country, and broke the power of the Inquisition by banishing the Jesuits (1767). The full effect of these and other liberal measures was arrested, however, by the accession of Charles IV. (1788), whose policy, directed by Godoy, first brought about a rupture with the French republic, and then a close alliance with France and a war against the British, resulting in the battle of Trafalgar (1805), when the naval power of Spain was destroyed. The result was an insurrection and the abdication of the king (1808) in favor of his son, Ferdinand VII. Napoleon caused the whole Bourbon family to be set aside and gave the crown to Joseph, his brother. War was declared and the council entered into an alliance with Great Britain. In several battles the British army routed the French and advanced into Spain; but it was not until the spring of 1813 that Wellington was able to clear the peninsula of French soldiers and to fight his way through the Pyrenees into France. In consequence of this success the Bourbon prince, Ferdinand VII., returned and was proclaimed king (1814). During the Napoleonic war the South American colonies had asserted their independence, Florida had been sold to the United States, and the finances misused. In 1829 Ferdinand abolished the Salic law by a "pragmatic sanction," and as the result of this his daughter was proclaimed queen, on the death of her father in 1833, under the title of Isabella II. As this queen was only three years old, her mother, Maria Christina, undertook the regency; but she was opposed by Don Carlos, a brother of the late king, and a serious civil war broke out. The Carlist party achieved considerable success at first, but the civil strife was ultimately brought to an end by the triumph of the royalists (1840) under Espartero and O'Donnell. Notwithstanding this the regent, who found it impossible to control the various factions, retired into France, and Espartero was recognized as regent. By the influence of Louis Philippe, the French king, a marriage was brought about in 1845 between Isabella and her cousin, Don Francisco d'Assiz. For some years after this event the political history of Spain became a medley of party intrigue and petty political and military revolution. In 1873 the cortes declared in favor of a federal republic, and the presidency was intrusted to Castelar; but the outbreak of a Carlist war in the Basque provinces made this form of government impossible. Accordingly as it had been proved that a republican form of government was impossible, the throne was offered (1874) to the son of the exiled Isabella. In 1875 the young king, with the title of Alfonzo XI., landed at Barcelona, and successfully established his government by a complete defeat of the Carlist insurgents. The present king is his son, Alfonso XII., who was crowned in 1902. The chief event in the recent history of Spain is the war with the United States (1898), which stripped her of her richest remaining colonies: Cuba, Porto Rico and the Philippines. In 1906 Alfonso married the English princess Victoria Ena, daughter of Princess Beatrice. In June, 1907, an heir to the throne was born. The Spanish language, which is also the language of Mexico and a great part of South America, belongs to the group known as the Romance or Romanic languages. Its formation was influenced by the lengthened duration in Spain of Roman institutions, by the Teutonic element introduced by the Visigoths, and by words of Arabic origin added during the long occupation of the country by the Moors. The national literature of Spain dates from the 12th century, ballads and metrical romances being its earliest prod-

ucts. To this period the Poema del Cid is usually ascribed, an epic in which are narrated the adventures of Rodrigo Diaz de Bivar, the national hero. Following this early historical and legendary theme came the didactic verse of the Benedictine monk Gonzalo Berceo (1198–1268). The most remarkable piece of writing of this age was Las Siete Partidas (1265), a Castilian code of laws published under the patronage of Alfonso X. In the 16th century there were published the Amadis de Gaula, the first of the Spanish caballerias, or "books of chivalry." It was not, however, until the kingdoms of Castile and Aragon were united under Ferdinand and Isabella that Spanish literature attained its chief distinction. The principal writers were Juan Boscan Almogaver, Diego de Mendoza, Garcilaso de la Vega, Fernando de Herrera, and Hernando de Acuña. Characteristic of this period was the vigorous development of the novela, with a picaroon or rogue for hero. The earliest of these picaresque novels was Guzman de Alfarache, by Mateo Aleman; Alonzo Mozo, by Geronimo de Alcalá; Gran Tacaño, by Quevedo, and numerous other romances. But these were all surpassed, and the chivalric extravagance of this period burlesqued to extinction by Don Quixote (first part 1605), the masterpiece of Miguel Cervantes de Saavedra. But this movement received its full perfection and refinement in the poetical and philosophical dramas of Pedro Calderon de la Barca (1600–81). Among the historical writings of this era were the Historia de España, by Juan de Mariana; Guerra de Granada, by Diego de Mendoza; the Historia Verdadera de la Conquista de la Nueva España, by Bernal Diaz del Castillo; and the Historia de las Indias, by Bartolomé de las Casas. With the accession of the Bourbons in the 18th century there was introduced from France an element of revival into Spanish literature which was furthered by the Poetica of Ignacio de Luzan, the Retorica of Gregorio de Mayans, and the Teatro Critico of Benito Feyjoo. This French element had also its influence upon the poets of the latter half of the 18th and beginning of the 19th centuries, among whom were Valdes, Cienfuegos, Iriarte, Gonzales, Moratin, de la Rosa, etc.; while the romance was revived in the Fray Gerundio of José de Isla, who was also the translator of Gil Blas. The romantic movement of France had its Spanish adherents, among whom, as the most notable poets, are to be named Zorrilla, Espronceda, Diaz, Escosura, and Pacheco; the chief classicists being Quintana, Reinoso, Calderon, and Carvajal; while as a satirist, José de Lara (Figaro), and as a dramatist Manuel Breton de Herreros, are worthy of mention. More recently the poets Campoamor, Arce, Becquer, de Trueba, and Aguilera, and the novelists Caballero, Valera, Galdos, de Trueba, Gonzales, and Alarcon have attained a certain distinction.

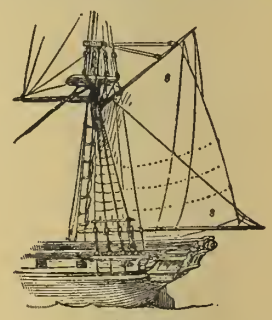
SPANGLES, metal ornaments, used chiefly for theatrical dresses, and consisting for the most part of thin circular pieces of gilt or silvered tin.

SPANISH AMERICAN WAR, the war between Spain and the United States in 1898. The struggle between the Cubans and their home government for over a century, the increase of bloodshed, starvation and general devastation of the island, the systematically disregarded rights of American citizens by the Spanish authorities, finally decided the United States to interpose its friendly offices. President Cleveland, in December, 1896, in his annual message, spoke of "higher obligations" than those due to Spain, which would devolve upon the United States if conditions should grow worse in the island and if Spain's inability to deal successfully with the insurrection should become manifest. On the evening of February 15th the battleship Maine was blown up in Havana harbor and 266 of the crew killed. Congress immediately appropriated $50,000,000 for national defense. Public opinion decided that the Spanish officials in Cuba were responsible for the disaster. On April 23d President McKinley called for 125,000 volunteers and ordered the North Atlantic squadron to blockade Havana and other Cuban ports. Formal declaration of war by Spain on the 24th and by the United States on the 25th inst. were followed by the proclamations of neutrality by Great Britain and other foreign powers. The first act of war was the capture, April 22, of the merchantman Buena Ventura, by the gunboat Nashville. On April 24 Dewey, with orders to capture or destroy the Spanish fleet in the Philippines, set sail from Hong Kong. April 25, the Spanish forts opened fire upon the American fleet off Havana. April 27, the earthworks of Matanzas were shelled; the Spanish steamship Guido was taken and the enemy's fleet gathered in Manila bay to meet Dewey. April 29, Cienfugos was bombarded and Cervera's fleet made its first start for Cape Verde islands. May 1 came the victory of Dewey when he destroyed the Spanish fleet of 11 warships in Manila bay and subsequently took possession of Cavite. May 19, the Cape Verde fleet was reported at Santiago. June 3, Lieut. Hobson, with seven volunteers, sank the Merrimac in the entrance to the harbor of Santiago, one of the most thrilling performances of the war. June 21, Gen. Shafter's troops arrived off Santiago and landed at Baquiri, June 23. July 1, the assault upon Santiago began, when El Caney and San Juan were taken with heavy losses. July 3, Cervera's Cape Verde fleet was destroyed while making a dash to escape from Santiago harbor. Commodore Schley was acting-admiral in the absence of Admiral Sampson. July 14, Gen. Toral, commanding the Spanish forces, surrendered Santiago and the east side of Cuba. July 25, Gen. Miles and the Porto Rico expedition began landing on that island. July 26, Spain formally sued for peace through the French ambassador. July 28, the city of Ponce surrendered to Gen. Miles, the inhabitants welcoming the invaders with shouts of joy. The president, July 29, named the conditions under which peace would be discussed and which were made public Aug. 2. These banished Spain entirely from this hemisphere; gave the United States an island in the Ladrone group; also Luzon of the Philippines and the latter to be a further question in the later negotiations. August 6 it was announced that Spain accepted the terms proposed, and shortly afterward the peace protocol was signed in Washington; the French ambassador acting for Spain. Admiral Dewey and General Merritt, August 13, made a combined attack on Manila, the result being its capture.

SPANISH AMERICAN WAR, 1898, Chronology of, Maine, blown up, February 15; Spain asked to leave Cuba, April 19; diplomatic relations broken, April 21; Cuban blockade declared, April 22; war declared by Spain, April 24; war declared by United States, April 25; Dewey's victory at Manila, May 1; Hobson's Merrimac exploit, June 3; United States army corps land in Cuba, June 21; battle at El Caney and San Juan, July 1; Cervera's fleet destroyed, July 3; General Toral surrenders, July 14; Santiago de Cuba surrenders, July 17; campaign in Porto Rico begins, July 25; peace protocol signed, August 12; surrender of Manila, August 13; peace treaty signed in Paris, December 12; signed by the president February 10, 1899; by the queen regent, March 17.

SPANISH MAIN, the name formerly given to the Atlantic ocean and coast along the north part of South America, from the Leeward islands to the Isthmus of Darien.

SPANKER, a large fore-and-aft sail set upon the mizzen-mast of a ship or barque, the top extended by a gaff, the



ss. Spanker.

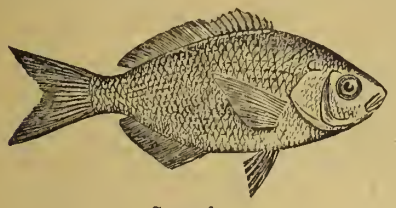
foot by a boom. It is also called the mizzen.

SPAR, in mineralogy, a term employed to include a great number of crystalized, earthy, and some metallic substances, which easily break into rhomboidal, cubical or laminated fragments with polished surfaces, but without regard to the ingredients of which they are composed. Among miners the term spar is frequently used alone to express any bright crystalline substance.

SPAR-DECK, nautical, a term somewhat loosely applied, though properly signifying a temporary deck, consisting of spars supported on beams, laid in any part of a vessel. It also means the quarter-deck, gangways, and forecastle of a deep-waisted vessel, and is applied to the upper entire deck of a double-banked vessel without an open waist.

SPA'RIDÆ, a family of acanthopterygious, teleostean fishes, of which the

genus Sparus is the type. They somewhat resemble the perches in form, the body being generally of an ovate form and covered with large scales. The Sparidæ are mostly inhabitants of warm



Sparada.

climates. They are edible, and some of them highly esteemed.

SPARKS, Jared, born at Willington, Connecticut, 1789; died 1866. He was educated at Harvard, where he became mathematical tutor, and he was subsequently (1819–23) pastor of a Unitarian church at Baltimore. He was afterward editor of the North American Review, and was appointed professor of history (1839) and president (1849) of Harvard. He is chiefly known in literature as the author of Life and Writings of Washington (twelve vols., 1834–37); Diplomatic Correspondence of the American Revolution (twelve vols., 1829–30); Library of American Biography (two series, 25 vols.); and Works of Benjamin Franklin (ten vols., 1836–40).

SPARROW, a well-known bird of the finch family, which inhabits the British islands and other parts of Europe, and has been introduced into North America and Australia. Their amazing fecundity, their strong attachment to their young, their familiarity, not to say impudence, and their voracity, are familiar to all. They often do great injury in cornfields, and gardens, but they also do great service in destroying grubs, caterpillars etc.

SPARROW-HAWK, the common name of several hawks. The male is colored dark brown on the top of the head, and on the upper aspect of the body and wings. The under parts are of a reddish-brown color, marked with

Sparrow-hawk.

narrow bands of darker tint. The female bird is of a duller brown hue on the back and head; and her plumage is diversified by numerous white spots. It is a bold, active bird, very destructive to pigeons, small birds and chickens.

SPARTANBURG, a city and capital of Spartanburg co., S. C.; on the Port Royal and W. Car. and the Southern railways; 73 miles w.s.w. of Charlotte, N. C., 95 miles n.w. of Columbia, the state capital. It is in a gold and iron mining and limestone-quarrying region. Pop. 12,462.

SPASM, in medicine, an abnormal, sudden, and more or less violent contraction of one or more muscles or muscular fibers. Spasm is either clonic or tonic. In clonic spasm the muscles or muscular fibers contract and relax alternately in very quick succession, producing the appearance of agitation, as in epilepsy. In tonic spasm the muscles or muscular fibers contract in a steady and uniform manner, and remain contracted for a comparatively long time, as in tetanus.

SPAT'ULA, a flat sort of knife with a thin flexible blade, used by druggists, painters, etc., for spreading plasters, working pigments, etc. In surgery, it is a flat instrument, angular or straight, for depressing the tongue and keeping it out of the way in operations about the throat or larynx.

SPATULARIA, or **POLYODON,** a genus of fishes belonging to the sturgeon tribe. They are remarkable for the form

Spatularia, upper (1) and under (2) view.

of their snouts, which are enormously long and leaf-like in form. The type of the genus is the paddle-fish of the Mississippi.

SPAV'IN, a disease of horses, affecting the hock-joint, or joint of the hind leg, between the knee and the fetlock. It occurs in two forms. In the first, which is called bog or blood spavin, the joint is distended by joint-oil (synovia). In the other form there is a morbid deposition of body substance, such as to unite separate bones. It causes lameness, gradually growing worse until finally the various bones become to a great extent united and solidified by the mass of fibrous bone which grows over them. The disease is caused by strains.

SPAWN, the eggs or ova of fishes, frogs, etc., from which, when fertilized by the males, a new progeny arises that continues the species. In the oviparous fishes with distinct sexes the eggs are impregnated externally, and arrive at maturity without the aid of the mother. The spawn being deposited by the female, the male then pours upon it the impregnating fluid. In the ovoviviparous fishes sexual intercourse takes place, and the eggs are hatched in the uterus. Fishes exhibit a great variety in regard to the number of their eggs. In the spawn of a cod-fish, for example, no fewer than three and a half millions of eggs have been found. In general, before spawning, fish forsake the deep water and approach the shore, and some fish leave the salt water and ascend the rivers before spawning, and then return again.

SPEARMINT, a European and North American species of mint often cultivated for making sauce and in order to obtain a flavoring essence from it.

SPECIAL LICENSE. See Marriage.

SPECIES, as ordinarily defined, is any one group of animals or plants the members of which generally bear a close resemblance to each other in the more essential features of their organization, which produce fertile progeny, and which may, in the generality of cases, produce individuals varying from the general type of the group, the variation, however, being in all cases of a limited kind. Under this definition the various species, "kinds" of animals and plants, and their included varieties, used to be comprehended, while naturalists regarded species as unchanging throughout the longest succession of ages, except within narrow and marked limits. Thus Buffon defines a species as "a constant succession of individuals similar to and capable of reproducing each other;" and Cuvier as "a succession of individuals which reproduces and perpetuates itself." Since the publication, however, of Darwin's Origin of Species this conception has been greatly modified by the view that, as Haeckel defines it, "the species is the whole succession of organisms which exhibit the same form in the same environment." In this conception no absolute standard of what constitutes a species can be set up, nor can the number of species, especially among the transitional varieties of the lowest forms of life, be determined. In mineralogy, chemistry, and such sciences as relate to inorganic substances, species is regarded by some writers as being determined by identity of physical properties, as specific gravity, hardness, etc.; and by others, as constituted by chemical composition, the physical properties going for nothing. In scientific classification species unite to form groups called genera, which are included in orders, the orders forming classes, and so on.—Species in logic is a group of individuals agreeing in common attributes and designated by a common name; a conception subordinated to another conception, called a genus or generic conception, from which it differs in containing or comprehending more attributes, and extending to fewer individuals; thus "man" is a species under "animal" as a genus, and "man" in its turn may be regarded as a genus with respect to European, Asiatic, and the like.

SPECIFIC GRAVITY is the relative gravity or weight of any body or substance considered with regard to an equal bulk of some other body which is assumed as a standard of comparison. The standard for the specific gravities of solids and liquids is pure distilled water at the temperature of 62° Fahr., which is reckoned unity. By comparing the weights of equal bulks of other bodies with this standard we obtain their specific gravities. Thus the specific gravity of cast-iron is 7.21; that is, any particular mass of cast-iron will weigh 7.21 times as much as an equal bulk of water. The practical rule is, weigh the body in air, then in pure distilled water, and the weight in air, divided by the loss of weight in water will give the specific gravity of the body. In designating the specific gravities of gases the standard of unity is atmospheric air.

The specific gravity of various substances is as follows:

Liquids.		*Timber.*	
Water	100	Cork	24
Sea-water	103	Poplar	38
Dead Sea	124	Fir	55
Alcohol	84	Cedar	61
Turpentine	99	Pear	66
Wine	100	Walnut	67
Urine	101	Cherry	72
Cider	102	Maple	75
Beer	102	Ash	84
Woman's milk	102	Beech	85
Cow's milk	103	Mahogany	106
Goat's milk	104	Oak	117
Porter	104	Ebony	133

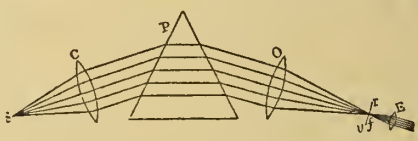
Sundries.		*Metals and Stones.*	
Indigo	77	Granite	278
Ice	92	Diamond	353
Gunpowder	93	Cast iron	721
Butter	94	Tin	729
Clay	120	Bar iron	779
Coal	130	Steel	783
Opium	134	Brass	840
Honey	145	Copper	895
Ivory	183	Silver	1,047
Sulphur	203	Lead	1,135
Marble	270	Mercury	1,357
Chalk	279	Gold	1,926
Glass	289	Platina	2,150

The weight of a cubic foot of distilled water at a temperature of 60° F. is 1,000 ounces Avoirdupois, very nearly, therefore the weight (in ounces, Avoirdupois) of a cubic foot of any of the substances in the above table is found by multiplying the specific gravities by 10, thus: one cubic foot of oak weighs 1,170 ounces; one cubic foot of marble 2,700 ounces, and so on. See Hydrometer.

SPECIFIC HEAT, is a term applied to the quantity of heat required to raise equal weights of different substances through equal intervals of temperature. Water is taken as the standard substance in measuring quantities of heat. The thermal capacity of unit mass of cold water is unity; and the number which denotes the thermal capacity of a body expresses the mass of water which has the same thermal capacity as the body. Thus the thermal capacity of unit mass of a substance is called its specific heat, and is identical with the ratio of the thermal capacity of any mass of the substance to that of an equal mass of water. The specific heats of the metals and of many other substances have been carefully determined, and are tabulated in all the larger books on heat.

SPECTACLES, a well-known and invaluable optical instrument supposed to have been invented by Roger Bacon in the 13th century, and used to assist or correct some defect in the organs of vision. Spectacles consist generally of two oval or circular lenses mounted in a light metal frame which is made up of the "bows," "bridge," and "sides." The lenses are usually bi-concave, bi-convex, or concavo-convex, though lenses forming segments of a cylinder are used in some cases of astigmatism. In long-sighted persons the defect of the eye is counteracted by convex lenses, in short-sighted persons by concave lenses. (See Sight.) Divided spectacles have each lens composed of two semicircles of different foci nearly united one above the other; one half for looking at distant objects, and the other for examining things near the eye. Another kind, called periscopic spectacles, has been contrived in order to allow considerable latitude of motion to the eyes without fatigue. The lenses employed in this case are either of a meniscus or concavo-convex form, the concave side being turned to the eye.

SPECTROSCOPE, the instrument employed in spectrum analysis. It usually consists of the following parts: 1st, a tube with a narrow slit at one end, and a convex lens at the other, from which parallel rays of light proceed when light is made to pass through the slit, the two forming together what is called the collimator. 2d. A prism of dense flint-glass on which the rays fall after emerging from the collimator. 3d. An observing telescope so placed that the rays traverse it after emerging from the prism. The accompanying figure gives



Arrangement of parts in spectroscope.

a ground plan of the arrangement; s is the slit, c the collimating lens, p the prism, o the object-glass of the telescope, and e the eye-piece. An image of the slit will be formed at f by rays of given refrangibility, others between f and v by rays of greater refrangibility, and others between f and r by rays of less refrangibility, thus giving a complete spectrum.

SPECTRUM, the oblong figure or stripe formed on a wall or screen by a beam of light, as of the sun, received through a narrow slit and passed through a prism, being thus decomposed or separated into its constituent rays. (See Light.) This stripe is colored throughout its length, the colors shading insensibly into one another from red at the one end, through orange, yellow, green, blue, indigo, to violet at the other. These colors are due to the different constituents of which solar light is made up, and the stripe seen is formed by an indefinite number of images of the slit ranged in order and partially overlapping. The analysis of decomposition of the beam is due to the different refrangibilities of the component rays, the violet being the most refrangible and the red the least. Besides the colored rays, the spectrum contains thermal or heating rays, and chemical or actinic rays which are not visible to the eye. The heating effect of the solar spectrum increases in going from the violet to the red, and still continues to increase for a certain distance beyond the visible spectrum at the red end, while the chemical action is very faint in the red, strong in the blue and violet, and sensible to a considerable distance beyond the violet end. The actinic rays beyond the violet may be rendered visible by throwing them upon a surface treated with some fluorescent substance. A pure spectrum of solar light is crossed at right angles by numerous dark lines, called Fraunhofer's lines, each dark line being invariable in position. The figure shows the positions of the most conspicuous of these fixed lines, and the letters above them are the names by which they are known, being those assigned to them by the discoverer Fraunhofer. For the proper understanding of the import of these lines, five principles require to be kept in view. First, an incandescent solid or liquid body gives out a continuous spectrum. Second, an incandescent gaseous body gives out a discontinuous spectrum, consisting of bright lines. Third, each element when in the state of an incandescent gas gives out lines peculiar to itself. Fourth, if the light of an incandescent solid or liquid passes through a gaseous body, certain of its rays are absorbed, and black lines in the spectrum indicate the nature of the substance which absorbed the ray. Fifth, each element, when gaseous and incandescent, emits bright rays identical in color and position on the spectrum with those which it absorbs from light transmitted through it. The spectrum of sodium, for instance, shows two bright lines which correspond in position with the double black line at d (the sodium line) shown in figure. Now, applying these principles to the solar spectrum, we find, from the nature and position of the rays absorbed, that its light passes through hydrogen, potassium, sodium, calcium, barium, magnesium, zinc, iron, chromium, cobalt, nickel, copper, and manganese, all in a state of gas, and constituting part of the solar envelope, whence we conclude that these bodies are present in the substance of the sun itself, from which they have been volatilized by heat. The moon and planets have spectra like that of the sun, because they shine by its reflected light, while, on the other hand, each fixed star has a spectrum peculiar to itself. It has been already said that the incandescent vapor of each elementary substance has a characteristic spectrum, consisting of fixed lines, which never changes. This furnishes the chemist with a test of an exquisitely delicate nature for the detection of the presence of very minute quantities of elementary bodies. Thus, by heating any substance till it becomes gaseous and incandescent and then taking its spectrum, he is able by the lines to read off, as it were, from the spectrum, the various elements present in the vapor. Several new elements, as rubidium, cæsium, indium, and thallium, have thus been detected. See Spectroscope.

Solar Spectrum, showing Principal Lines.

SPECTRUM ANALYSIS. See Spectrum.

SPECULUM, in optics and astronomy, a reflecting surface, such as is used in reflecting telescopes, usually made of an alloy of copper and tin, but frequently now of glass. Those of glass are covered with a film of silver on the side turned toward the object, and must not be confounded with mirrors which are

coated with tin-amalgam on the posterior side. In surgery the name is given to an instrument used for dilating any passage, as the ear, or parts about the uterus, with a reflecting body at the end, upon which a light being thrown the condition of the parts is shown.

SPEECH, spoken language; uttered sounds intended to convey meaning, and produced by the organs of voice, namely, the larynx, and the mouth and its parts, including the tongue and teeth. In speech two great classes of sounds are produced, these being usually known as vowels and consonants. Vowels are pronounced by sounds coming primarily from the larynx and passing with comparative freedom through the mouth cavity, though modified in certain ways; while consonants are formed by sounds caused by the greater or less interruption of the current of air from the larynx in the mouth. Vowels can be uttered alone and independently of consonants, and their sounds can be prolonged at will; consonants have no importance in speech as apart from vowels, and are named consonants from being used along with vowels. Both vowel and consonant sounds are very numerous if we investigate the different languages of the world, but any one language only has a fraction of those that may be used. A single sound may convey an idea of itself and thus form a word, or several may be combined to form a word, and if the word is uttered by several distinct successive changes in position of the vocal organs it is a word of so many syllables. Words, again, are combined to form sentences or complete statements, and the aggregate of words used by any people or community in mutual intercourse forms its language.

SPENCER, Herbert, English philosopher, born at Derby 1820. In 1848 he became sub-editor of the Economist; published Social Statics, and Principles of Psychology. About the year 1859 he projected his Scheme of Philosophy, based on the principle of evolution in its relation to life, mind, society, and morals This large scheme has been completely expounded in the following works: First Principles, one vol., Principles of Biology, two vols.; Principles of Psychology, two vols.; Principles of Sociology, three vols.; and Principles of Ethics, two vols. Portions of this great work are known under separate titles, as Data of Ethics, Ceremonial Institutions, Political Institutions, Ecclesiastical Institutions, etc. His other works include Education, Essays, Scientific, Political, and Speculative; Classification of the Sciences, The Study of Sociology, Man versus the State, The Factors of Organic Evolution. He published also an elaborate Descriptive Sociology compiled by other writers, but classified and arranged by himself. He died in 1903. Spencer's works have been translated into various languages.

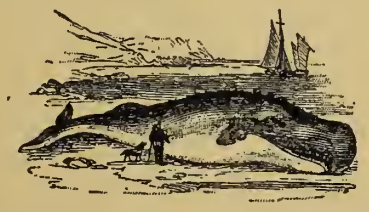
SPENSER, Edmund, English poet, was born in London about 1553. In 1859 he was engaged in the composition of the Faerie Queene, of which he had written the first three books. These were published in 1590, with a dedication to Queen Elizabeth. In 1595 he published various volumes such as Colin Clout's Come Home Again, and Astrophel and The Mourning Muse of Thestylis; his sonnets and Epithalamium in one volume; the fourth, fifth, and sixth books of the Faerie Queene, together with a new edition of the first three books. As a poet, although his minor works contain many beauties, Spenser will be judged chiefly from the Faerie Queene. He died in 1599.

SPERMACE'TI, a fatty material obtained chiefly from cavities in the skull of the sperm whale. During the life of the animal the spermaceti is in a fluid state, forming part of the oily liquid which is found when the head of the whale is opened. On exposure to the air the spermaceti concretes, and deposits from the oil. Some of the larger whales have been known to yield twenty-four barrels of spermaceti, and from seventy to a hundred barrels of oil. After being purified the spermaceti concretes into a white, crystallized, brittle, semitransparent unctuous substance nearly inodorous and insipid. It is bland and demulcent, with considerable nutritive qualities when taken internally. It is chiefly employed externally as an ingredient in ointments and cerates. It is also largely used to form candles.

SPERMATOZO'A, the microscopic animalcule-like bodies developed in the semen of animals, each consisting of a body and a vibratile filamentary tail exhibiting active movements. Spermatozoa are essential to impregnation.

SPERM OIL, the oil of the spermaceti whale, which is separated from the spermaceti and the blubber. This kind of oil is much purer than train oil, and burns away without leaving any charcoal on the wicks of lamps. In composition it differs but slightly from common whale oil.

SPERM WHALE, or **CACHALOT,** a species of cetacea belonging to the section of the whale order denominated "toothed" whales, generally met with in the Pacific, but occasionally also on the



Sperm whale.

coast of Greenland. The large blunt head in an old male is sometimes 30 feet long, and forms about a third of the total length of the body; while the "blowholes" or S-shaped nostrils are situated in the front part of the head. The weight of an adult animal is estimated at about 200 tons, and in a male 66 feet long the flipper measured 5 feet 3 inches, and the two-lobed tail-fin had a breadth of nearly 20 feet. The top of the back is continued almost in a straight line from the upper part of the head; the belly is enormous, but the body thins off toward the wide tail. The color is a blackish-gray, which may exhibit greenish or bluish hues on the upper parts. The teeth of the lower jaw average each about 3 inches in length. This whale is of considerable commercial value. See Spermaceti.

SPHE'NOID BONE. See Skull.

SPHERE, in geometry, a solid body contained under a single surface, which in every part is equally distant from a point called the center. It may be conceived to be generated by the revolution of a semicircle about its diameter, which remains fixed, and which is hence called the axis of the sphere. A section of a sphere made by a plane passing through its center is called a great circle of the sphere; and when the cutting plane does not pass through the center the section is called a small circle of the sphere. A sphere is two-thirds of its circumscribing cylinder. Spheres are to one another as the cubes of their diameters. The surface of a sphere is equal to four times the area of one of its great circles, and the solidity is found by multiplying the cube of the diameter by .5236 or $\frac{2}{3}$ of .7854; or by multiplying the area of a great circle by $\frac{2}{3}$ of the diameter.

SPHE'ROGRAPH, a nautical instrument consisting of a stereographic projection of the sphere upon a disc of pasteboard, in which the meridians and parallels of latitude are laid down to single degrees. By the aid of this projection, and a ruler and index, the angular position of a ship at any place, and the distance sailed, may be readily and accurately determined on the principle of great circle sailing.

SPHINX, a fabulous monster which figures both in the Grecian and Egyptian mythologies. The sphinx of the Greeks is represented with a body like that of a lion, with wings, and with the breasts and upper parts of a woman. Hēra, says the fable, provoked with the Thebans, sent the sphinx to punish them. The sphinx proposed a riddle and devoured anyone who undertook but was unable to interpret its meaning. In this enigma the question proposed was, What animal walked on four legs in the morning, two at noon, and three in the evening. This was at last explained by Œdipus, who said that man walked on his hands and feet when young, or in the morning of life; at the noon of life he walked erect; and in the evening of his days he supported himself upon a stick. Whereupon her riddle being read, the sphinx de-

Egyptian sphinx, from the Louvre museum.

stroyed herself. The sphinx was used by the Greeks for artistic and decorative purposes, and seems to have been in some sense symbolic. The Egyptian sphinx had a human head (male or fe-

male) on the body of a lion (not winged), and was always in a recumbent posture, with the fore-paws stretched forward, and a head-dress resembling an old-fashioned wig. The features are like those of the ancient Egpytians found in the ancient ruins. The largest sphinx, that near the group of pyramids at Gizeh, is about 150 feet long and 63 feet high; the body is monolithic, but the paws, which are thrown out 50 feet in front, are constructed of masonry. There were also sphinx figures in Egypt with rams' heads and hawks' heads. The Egyptian sphinx was probably a purely symbolic figure, having no historical connection with the Greek fable, and the Greeks may have applied the term to the Egyptian statues merely on account of an accidental external resemblance to their own figures of the sphinx.

SPHINX MOTH, a species of moth belonging to the family Sphingidæ, and deriving its popular name from a supposed resemblance which its caterpillars present when they raise the fore part of their bodies to the "sphinx" of Egyptian celebrity. The sphinx moth is found very sparingly throughout England.

SPICES, the name given to all those vegetable substances, having an aromatic odor and a hot and pungent flavor, and used for seasoning food; such as cinnamon, cassia, mace, nutmeg, allspice, pepper, cloves, ginger, vanilla.

SPIDER, the common name of insect-like animals. The head and chest are united to form one segment known as a cephalothorax; no wings are developed, and breathing is effected by means of pulmonary or lung sacs. For the most part they are oviparous. The abdomen is furnished with from four to six cylindrical or conical mammillæ or processes, with fleshy extremities, which are perforated with numberless small orifices for the passage of silky filaments of extreme tenuity, with which they form webs, and which proceed from internal reservoirs. The spider's web is usually intended to entangle their prey (chiefly flies), but spiders also spin webs to make their abodes, and for other purposes. The legs number four pairs, and no antennæ are developed. Their mandibles are terminated by a movable hook, flexed inferiorly, underneath which, and near its extremity, is a little opening that allows a passage to a venomous fluid contained in a gland of the preceding joint. After wounding their prey with their hooked mandibles they inject this poison into the wound, which suddenly destroys the victim.

SPIDER CRAB, the name given to crabs from the rough general resemblance their bodies and long legs possess to those of spiders. The common or thornback spider crab, is a familiar species, and is very commonly taken in the crab pots of fishermen. The four-horned spider crab has a triangular body, possessing four horn-like processes in front, the two central ones forming the rostrum or beak.

SPIDER FLY, a dipterous insect of the family Pupipara. There are many species of these found parasitic on birds and quadrupeds.

SPIDER MONKEY, a general name applied to many species of platyrhine or New World monkeys, but more especially to the members of the genus which are distinguished by the great relative length, slenderness, and flexibility of their limbs, and by the prehensile power of their tails. A familiar species is the

Spider monkey.

chameck, which occurs abundantly in Brazil. The body is about 20 inches, the tail 2 feet long, and the color is a general black. The coaita, another typical species, has an average length of 12 inches; the tail measures over 2 feet long, and the fur is of a dark, glossy, black hue.

SPIKENARD, a highly aromatic herbaceous plant growing in the East Indies. The root has a strong smell and a sharp bitterish taste. This is the true spikenard of the ancients, and it has enjoyed celebrity from the earliest period on

Spikenard.

account of the valuable extract or perfume obtained from its roots, which was used in the ancient baths and at feasts. It is highly esteemed in the East as a perfume, and is used to scent oil and unguents.

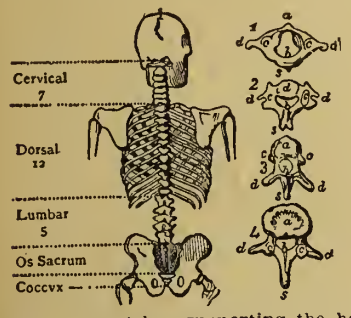
SPIKING, the operation of driving a nail or spike into the touchhole of a cannon so as to make it unserviceable. When the spiking was intended to be only temporary a spring spike was used, which was afterward released by the stroke of a hammer. In other cases a new touchhole required to be drilled.

SPIN'AGE, SPIN'ACH, a genus of plants. There is only one species, well-known on account of its use in the kitchen. It is eaten sometimes in salads, but more frequently cooked in various ways. It is wholesome and agreeable, but contains little nutriment.

SPINAL CORD, the name given in anatomy to the great cord or rod of nervous matter which is inclosed within the backbone or spine of vertebrates. The spinal cord in man, which is from 15 to 18 inches long, has direct connection with the brain by means of the medulla oblongata, and passes down the back until it terminates in a fine thread at the level of the first lumbar vertebra. Lodged in the bony vertebræ it varies in thickness throughout, and like the brain is invested by membranes called respectively pia mater and dura mater. Situated between these two are the delicate layers of the arachnoid membrane, inclosing a space which contains the cerebro-spinal fluid. Besides these protective coverings there is also a packing of fatty tissue which further tends to diminish all shocks and jars. The spinal nerves, to the number of thirty-one on each side, pass out from the cord at regular intervals, pierce the dura mater, escape from the backbone, and ramify thence through the soft parts of the body. Eight pairs pass off in the region of the neck called the cervical nerves, twelve pairs are dorsal, five are lumbar, and five sacral, while the last pair comes off behind the coccyx. In its structure the spinal chord consists of gray and white matter. The gray matter, which is characterized by large cells, is gathered in the center into two crescent shaped masses connected at the central part of the cord. The white matter, consisting mainly of fibres, is outside of and surrounds these gray crescents. In its functions the spinal cord forms a tract along which sensory impressions may pass to the brain, and along which motor impulses may travel to the muscles. It is besides a great reflex center. See Brain, Nerve, and Spine.

SPINE, the term applied to the backbone of a vertebrated animal, and so called from the thorn-like processes of the vertebræ. The human vertebral column is composed, in the child, of thirty-three separate pieces, but in the adult the number is only twenty-six, several pieces having become blended together. These separate bones are arranged one on the top of the other, with a layer of gristle between each which helps to unite them, while this union is completed by partially movable joints and strong fibrous ligaments. The first seven vertebræ, which are called cervical, occupy the region of the neck; twelve form the supports from which spring the ribs, and constitute the main portion of the back, being accordingly called dorsal; five in "the small of the back" are denominated lumbar; five pieces follow which, in the adult, unite to form the sacrum; and four which unite to form the coccyx. The vertebral column so arranged presents two forward curves, the first in the neck; the second at the lower part of the back; and two corresponding backward curves. The vertebræ differ in form according as they belong to the cervical, dorsal, or lumbar region, but they have all certain characteristics in common. Each possesses what is called a body, an arch which incloses a ring, and various projections and notches by means of which the bones are articulated.

When the vertebræ are in position the rings are all situated one above the other, and so form a cavity or canal in which lies the protected spinal cord (which see). The disease to which this bony structure is most liable is called angular curvature of the spine. Beginning with inflammation it goes on to ulceration (caries), until one or more of the vertebræ becomes soft and breaks down. The result of this is that the vertebræ are crushed together, the backbone bent, and a projection or hump gradually formed behind. The modern method of treatment is to apply to the patient's body, from the hips to the arm-pits, a continuous bandage of plaster of Paris, which affords to the back a close-fitting support. Lateral curvature of the spine, unlike the former



1, Atlas, or vertebra supporting the head. 2, Cervical vertebra. 3, Dorsal vertebra. 4, Lumbar vertebra. *a*, Body. *b*, Ring. *c*, Oblique or articular process. *d*, Transverse process. *s*, Spinous process.

is not so much due to disease of the column as to a relaxed condition of the body. It is most liable to attack young rapidly-growing persons between the ages of ten and fifteen. Treatment by plaster-of-Paris bandage may be necessary; but strengthening food, regular, moderate exercise, and cold bathing may prove sufficient to effect a cure.

SPINE, in botany, a sharp process from the woody part of a plant. It differs from a prickle, which proceeds from the bark. A spine sometimes terminates a branch, and sometimes is axillary, growing at an angle formed by the branch or leaf with the stem. The wild apple and pear are armed with spines; the rose, bramble, gooseberry, etc., are armed with prickles.

SPIN'ET, an old stringed instrument with a keyboard for the fingers, somewhat similar to the harpsichord but smaller in size, one of the precursors of the piano. The strings, which were placed at an angle with the keys, were sounded by means of crow-quill plectra attached.

SPINNING is the art of twisting a thread from wool, flax, cotton, or other such material. From remote times this process was accomplished by means of a distaff round which the wool or other fiber to be spun was coiled, and a spindle or round stick tapering at each end and with a notch for fixing the yarn or thread at the upper end as the spinning went on. The spindle was twirled round, for the purpose of twisting the thread, generally by a movement against the right leg, and while the left hand of the spinner guided and supplied the fiber, the right hand fashioned it into a thread between finger and thumb. The earliest improvement on this method was to fix the spindle horizontally in a frame and cause it to revolve rapidly by means of a band passed round a large wheel. At a later period a treadle motion was added, and the spinner's hands were left free (see Spinning-wheel); while a further improvement was effected by the introduction of a double spindle-wheel, with twisting arms on the spindles. This was the spinning implement which obtained until the invention about 1767, of the spinning-jenny.

SPINNING JENNY, the name given to the first spinning-machine by means of which a number of threads could be spun at once. It was invented about 1767 by James Hargreaves, a Lancashire weaver, and consisted of a number of spindles turned by a common wheel or cylinder worked by hand.

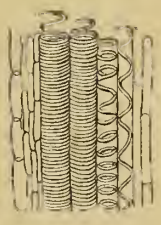
SPINNING WHEEL, a machine for spinning wool, cotton, or flax into threads by the hand. It consists of a wheel, band, and spindle, has a distaff attached, and is driven by foot or by hand, usually the former, a treadle being employed. Before the introduction of machinery for spinning there were two kinds of spinning wheels in common use, the large wheel for spinning wool and cotton, and the small or Saxon wheel for spinning flax.

SPINO'ZA, Baruch, or as he afterward called himself, Benedict de Spinoza was born in 1632, died in 1677. He was trained in Talmudic and other Hebrew lore, acquired a knowledge of Latin, came under the influence of the new philosophic teaching of Descartes; ceased to attend the synagogue, and was expelled from the Israelitish community; fled from Amsterdam to the suburbs to escape the enmity of the fanatical Jews; removed from thence, after five years' seclusion, to Rynsburg, where he lived until 1663; subsequently went to Voorburg; and ultimately (1671) settled in The Hague, where he died. He published anonymously in 1670 under the title of Tractatus Theologico-Politicus

Benedict de Spinoza.

and, because it put forth a strong plea for liberty of speech in philosophy, it was placed on the Index by the Catholics, and condemned by the authorities in Holland. Such, indeed, was the storm which this treatise occasioned that the author himself published nothing further. After his death all his unpublished writings were conveyed to Amsterdam, and there the Opera Posthuma was published (1677). In the Ethics, therein included, his system of philosophy was developed; each of its five books being dignified by a series of axioms and definitions after the method of Euclid in his geometry. In all there are twenty-seven definitions, twenty axioms, and eight postulates; and the central conception of the whole system is, that God who is the inherent cause of the universe, is one absolutely infinite substance, of which all the several parts which we recognize are but finite expressions; that man, being but a part of this greater whole, has neither a separate existence nor a self-determining will; but that he can, by means of knowledge and love, so far control his passions as to enter into the joy which springs from this idea of an all-embracing God.

SPIRAL VESSELS, in vegetable anatomy, fine transparent membranous tubes, with one or more spiral fibers coiled up in their interior. They are generally present among the other vessels of plants, and in trees are found chiefly in the medullary sheath surrounding the pith. The fiber may be single or double, or it may be composed of numerous threads. Their function is



Spiral vessels of Rhubarb, with cell tissue on each side—highly magnified.

supposed to be that of the conveyance of air. They are easily discovered on breaking asunder the leaves and stalks of many plants, when the fibers may be unrolled, and present themselves as delicate filaments like the threads of a cobweb.

SPIRIT, immaterial intelligence, intelligence conceived of as apart from any physical or corporeal embodiment, or an intelligent being so existing apart; also applied to the soul, to a disembodied soul, a specter, etc.

SPIRIT, Spirits. See Alcohol.

SPIRIT LEVEL, an instrument employed for determining a line or plane parallel to the horizon, and also the relative heights of ground at two or more stations. It consists of a tube of glass nearly filled with spirit of wine, and hermetically sealed at both ends, so that when held with its axis in a horizontal position the bubble of air which occupies the part not filled with the liquid rises to the upper surface and stands exactly in the middle of the tube. The tube is placed within a brass or wooden case, which is laid on the surface

to be tested, and the slightest deviation from the horizontal is indicated by the bubble rising toward the higher end of the tube.

SPIRITUALISM, is the term used in philosophy to indicate the opposite of materialism, but is now also specifically applied to the belief that communication can be held with departed spirits by means of rappings or noises, writings, visible manifestations, etc. The belief in such manifestations has long obtained, but in its limited and modern form spiritualism dates from the year 1848. In this year a Mr. and Mrs. Fox, who lived with their two daughters at Hydeville, New York, were disturbed by repeated and inexplicable rappings throughout the house. At length it was accidentally discovered by one of the daughters that the unseen "rapper" was so intelligent as to be able to reply to various pertinent questions, and so communicative as to declare that he was the spirit of a murdered pedlar. When this discovery was noised abroad a belief that intercourse could be obtained with the spirit-world became epidemic, and numerous "spirit-circles" were formed in various parts of America. The manifestations thus said to be got from the spirits were rappings, table-turnings, musical sounds, writings, the unseen raising of heavy bodies, etc. Part of the peculiarity of these phenomena was that they were always more or less associated with the medium, who was supposed to have an organization sensitively fitted to communicate with the spirit-world. In America the believers in spiritualism are very numerous and have many newspapers, magazines, and books to explain and enforce their belief. The investigations of the Psychical society, seem to show that there are forces connected with hypnotism and its kindred phenomena which may explain the occult occurrences of spiritualism on natural, though hitherto, little known laws. The literature on the subject is extensive.

SPIROM'ETER, a contrivance for determining the capacity of the human lungs. The instrument most commonly employed consists of an inverted chamber submerged in a water-bath. The breath is conducted by a flexible pipe and internal tube, so as to collect in the chamber, which rises in the water, and is fitted with an index which marks the cubic inches of air expired after a forced inspiration.

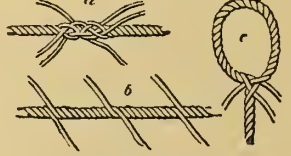
SPIR'ULA, a genus of cuttlefishes or cephalopods, comprising only three known species, so named from their very delicate shell being rolled into a spiral form. The shells are very numerous on the shores of New Zealand, but the animal forming them is extremely rare, being seldom found except in a fragmentary state,

1, Spirula australis. 2, Its shell.

SPITZBER'GEN, a group of three large and several small islands in the Arctic ocean. Very little is known of their interior, but the coasts have been repeatedly explored, and present immense glaciers and mountain chains, some of which exceed 4000 feet in height. The climate is intensely cold; and vegetation is confined to a few plants of rapid growth. For four months in winter the sun is below the horizon, and for an equal period in summer the sun is always above the horizon. The larger forms of animal life are foxes, bears, and reindeer, while sea fowl are numerous. The minerals are known to include marble and good coal.

SPLEEN, The, in man, is the chief of the ductless or blood glands, and its action is supposed to affect the quality of the blood. This gland, which in man is situated in the belly to the left side of the stomach, is an elongated, flattened structure about 5 inches in length, 3 inches broad, and 7 ounces in weight. Its supply of blood is received directly from the aorta by means of the splenic artery, and, after passing through the organ, is carried off by the splenic vein which joins the portal vein. It is composed of a fibrous tissue divided into an irregular net-work of spaces which contain the spleen pulp. This pulp consists of masses of round white corpuscles, some larger and some smaller, which are called the Malpighian bodies of the spleen. Through each one of these cellular masses there passes a branch from the splenic artery, and in this way the blood filters through the pulp as though it were a sponge, and is then collected by the veins. The function of the spleen is not clearly known, but it is supposed that the active cells of the pulp either remove old red cells from, or add new white cells to, the blood current in its passage through the organ. The ancients supposed the spleen to be the seat of melancholy, anger, or vexation, and of evil humors generally.

SPLICING, the union or joining together of two ropes or parts of a rope by a particular manner of interweaving part of the untwisted strands. The long splice occupies a great extent of rope, but by the three joinings being fixed at a distance from one another, the increase of bulk is diminished, hence it is adapted to run through the sheave-hole of a block, etc. The short splice is used upon ropes not intended to run through blocks, and the eye splice forms a sort of eye or circle at the end of a rope.



Splices of ropes.
a, Short splice. *b*, Long splice. *c*, Eye splice.

SPLINT, in surgery, a thin piece of wood, or other substance, used to hold or confine a broken bone when set, or to maintain any part of the body in a fixed position. A plaster-of-Paris splint is made by charging a bandage of muslin or other open material with plaster of Paris, and washing over each layer with water. The plaster hardens rapidly.

SPLINT BONE, one of the two small bones extending from the knee to the fetlock of a horse, behind the canon or shank bone.

SPOF'FORD, Ainsworth Rand, American librarian, born at Gilmanton, N. H., in 1825. From 1864 to 1899 he was librarian in chief of the congressional library, and became known for exceptional knowledge of books. He edited with others a Library of Choice Literature (10 vols., 1881–88), and a Practical Manual of Parliamentary Rules (1884). He published The American Almanack and Treasury of Facts, Statistical, Financial, and Political, and a work on the collection and preservation of books and founding of libraries. He died in 1908.

SPOFFORD, Harriet Elizabeth (Prescott), an American novelist, born at Calais, Me., in 1835. She first attracted attention in 1859 by a story of Parisian life, In a Cellar, printed in the Atlantic Monthly. Some of her later books are New England Legends, Art Decoration Applied to Furniture, Marquis of Carabas, Poems, Scarlet Poppy and Other Stories, In Titian's Garden and Other Poems. Four Days of God, etc.

SPOKANE, (spō-kān'), the county seat of Spokane co., Wash., 450 miles east of Puget sound, on the Spokane river and on the Northern Pacific railway, the Great Northern railway, the Oregon Railroad and Navigation company, and several local branch lines. Fort Wright, a large United States army post, is situated on the river just outside the city. Spokane is the mining center of the Pacific northwest for gold, silver, copper, and lead. Pop. 42,761.

SPONGE, the name commonly given to the animals of the class Porifera, a class of organisms representing a distinct morphological type, intermediate between the Protozoa and the Cœlenterata. The typical members are composed of two elements, an internal supporting framework or skeleton, and a soft gelatinous investing substance called sarcode, or "flesh." The framework consists of horny, reticulated, elastic fibers, which interlace in every direction, strengthened by calcareous, or, more generally, by siliceous spicula. This framework is the sponge of commerce. The sponge flesh investing this framework is composed of an aggregation of organless, protoplasmic, and amœbiform bodies, some ciliated and others capable of emitting pseudopodia. A constant circulation of water goes on in the living sponge, and by this circulation the animal is nourished. Reproduction takes place both by gemmation and true ova. In common usage the term sponge is employed to designate the fibrous framework of sponges as sold in our shops. This framework is soft, light, and porous, easily imbibing fluids, and as readily giving them out again upon compression. Sponges are usually prepared before they come into the market, by being beaten and soaked in dilute muriatic acid, with a view to bleach them and dissolve any adherent portions of carbonate of lime,

SPONTANE'ITY, the doctrine that there is a tendency, for the various muscular movements called voluntary, to begin without reference to any purpose or end, being prompted simply by the discharge of power from the brain, and being entirely independent of the stimulus of sensations. The great activity of young animals, as puppies and kittens, after refreshment and repose. is a good example of spontaneity.

SPONTANEOUS COMBUSTION. See Combustion (Spontaneous).

SPONTANEOUS GENERATION. See Generation (Spontaneous).

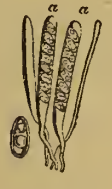
SPOONBILL, the popular name of birds belonging to the heron family from the shape of the bill, which is somewhat like a spoon, being curiously widened out at the tip. They live in society in wooded marshes, generally not far from the mouths of rivers, and on the seashore. The color is pure white, the

White spoonbill.

breast being yellow, with a naked patch of skin on the throat; the legs are black, and the bill, which is about 8 inches in length, is black, and yellow at the tip.

SPORAD'IC, applied to a disease which occurs in single and scattered cases as distinct from epidemic and endemic, when many persons are affected.

SPORID'IUM, in botany, a name given to the spores of fungi and lichens when they are contained in asci or little sacs. Sporidia, like spores, may consist of one or more cells, and these may be



Sporidia.

covered with a distinctly organized cuticle, as in many truffles. In the figure a shows asci and sporidia of a species of Peziza, b sporidium.

SPRAIN, the violent straining or twisting of the ligaments and tendons which form the soft parts surrounding a joint. The ordinary consequence of a sprain is to produce some degree of swelling and inflammation in the injured part. The best treatment is to give the limb perfect rest, by means of splints or otherwise, and to foment the part for an hour or two with warm water. If the inflammation increases leeches should be applied. When this has passed the joints should be gently rubbed with a liniment of soap and opium. The joint often remains weak and faint for a length of time, and too great caution cannot be observed in bringing it again into use.

SPRAT, a small fish of the herring family. At one time the sprat was thought to be the young of the herring, pilchard, or shad; but it can be easily distinguished from the young of either of these fishes by means of the sharply-notched edge of the abdomen, the ventral fins beginning beneath the first ray of the dorsal fin, and by the want of axillary scales to the ventral fins.

SPRING, one of the four seasons of the year. For the northern hemisphere the spring season commences when the sun enters Aries, or about the 21st of March, and ends at the time of the summer solstice, or about the 22d of June. In common language, spring is usually regarded as commencing with March and ending with May. In the southern hemisphere the astronomical spring begins September 23, and ends December 21.

SPRING, an outflow of water from the earth, or a stream of water at the place of its source. Springs have their origin in the water which falls upon the earth in the form of rain or snow, and sinks through porous soils till it arrives at a stratum impervious to water, where it forms subterranean reservoirs at various depths. When the pressure of the water which fills the channels through which it has descended is sufficient to overcome the resistance of the superincumbent mass of earth, the water breaks through the superficial strata and gushes forth in a spring; or it may find some natural channel or crevice by which to issue. In descending and rising through various mineral masses the water of springs often becomes impregnated with gaseous, saline, earthy, or metallic admixtures, as carbonic acid gas, sulphuretted hydrogen gas, nitrogen, carbonate of lime, silica, carbonate of iron, etc. When these substances are present in considerable quantity the springs become what are known as mineral springs. Warm and hot springs are common, especially in volcanic countries, where they are sometimes distinguished by violent ebullitions. (See Geysers.) Some springs run for a time and then stop altogether, and after a time run again, and again stop; these are called intermittent springs. Others do not cease to flow, but only discharge a much smaller quantity of water for a certain time, and then give out a greater quantity; these are called variable springs.

SPRING, an elastic body, the elasticity of which is made practically available. Springs are made of various materials, as a strip or wire of steel coiled spirally, a steel rod or plate, strips of steel, suitably joined together, a mass or strip of india-rubber, etc., which, when bent or forced from its natural state, has the power of recovering it again in virtue of its elasticity. Springs are used for various purposes—diminishing concussion, as in carriages; for motive power, acting through the tendency of a metallic coil to unwind itself, as in clocks and watches or to communicate motion by sudden release from a state of tension, as the spring of a gun-lock, etc.; others are employed to measure weight and other force, as in the spring-balance, as regulators to control the movement of wheel-works, etc.

SPRING BALANCE, a contrivance for determining the weight of any article by observing the amount of deflection or compression which it produces upon a spiral steel spring properly adjusted and fitted with an index working against a graduated scale. See Balance.

SPRINGBOK, Springboc, a species of antelope nearly allied to the gazelle, found in vast herds in South Africa, and used as food by the colonists. It is a very beautiful animal, of graceful form and fine colors—fulvous brown on the upper parts, pure white beneath, with a broad band of deep vinous red where

Springbok.

the colors meet on the flanks. It is larger than the roebuck, and its neck and limbs much longer and more delicate. The horns curve in a lyre-shape, and are small in the female. It receives its name from its singular habit of leaping perpendicularly to the height of several feet.

SPRINGFIELD, a city, capital of Hampden co., Massachusetts, situated on the left bank of the Connecticut, here navigable, about 98 miles west by south from Boston. It contains many fine churches and other buildings, and the streets are wide and planted with shade trees. Here is the United States armory, in which large numbers of rifles are manufactured, and there is also a government arsenal capable of storing 300,000 stand of arms. The water-power furnished by Mill river has developed various industries, such as iron-works, machine-shops, paper, cotton, and other mills, and railway-car manufacturing. Pop. 1909, estimated at 82,000.

SPRINGFIELD, the capital of Illinois, and seat of justice for Sangamon co.,96 miles n.n.e. of St. Louis. Its public edifices include a state-house or capitol, a large and imposing building in the classic style with a dome 320 feet high; a courthouse and post-office building, and the national monument to Abraham Lincoln, who is buried here, an obelisk nearly 100 feet high. Among the manufacturing establishments are woolen

mills, rolling-mills, foundries, and there are coal-mines in the neighborhood. Pop. 1909, estimated at 68,000.

State-house, Springfield, Ill.

SPRINGFIELD, a city, capital of Clarke co., Ohio, on the east fork of Mad river, 43 miles west by south of Columbus. It has a courthouse and other public buildings, numerous mills and manufacturing establishments (especially for agricultural implements and machines, including reapers and mowers), and an extensive trade. Pop. 1909, estimated at 60,000.

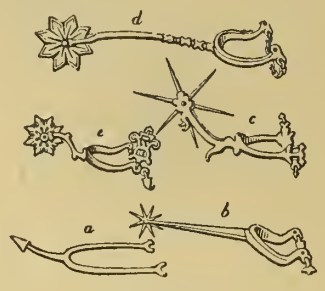
SPRINGFIELD, the capital of Greene co., Missouri, on the summit of the Ozark mountains, in the midst of rich lead and zinc mines. Pop. 25,217.

SPRINGTIDE, the tide which happens at or soon after the new and full moon, which rises higher than common tides. At these times the sun and moon are in a straight line with the earth, and their combined influence in raising the waters of the ocean is the greatest, consequently the tides thus produced are the highest. See Tide.

SPRIT, a small boom, pole, or spar which crosses the sail of a boat diagonally from the mast to the upper aftmost corner, which it is used to extend and elevate. Such a sail is called a sprit sail. The same name was formerly given to a sail attached to a yard under the bowsprit of large vessels.

SPRUCE, the name given to several species of trees. The Norway spruce-fir yields the valuable timber known under the name of white or Christiania deal. It is a native of great part of Northern Europe and is a noble tree of conical habit of growth, reaching sometimes the height of 150 feet. The white spruce and the black spruce-fir are natives of North America. The latter attains the height of 70 or 80 feet, with a diameter of from 15 to 20 inches. Its timber is of great value on account of its strength, lightness, and elasticity, and is often employed for the yards of ships and the sides of ladders. From the young shoots is extracted the essence of spruce, a decoction used in making spruce beer. The hemlock spruce-fir is a noble species, rising to the height of 70 or 80 feet, and measuring from 2 to 3 feet in diameter. It grows abundantly over great part of Canada and part of the United States. The wood is employed for laths, fences, coarse indoor work, etc. The bark is exceedingly valuable for tanning. Douglas' spruce or fir, of Northwestern America, reaches a height of 100 to 180 feet in its native forests.

SPUR, an instrument having a rowel or small wheel with sharp points, worn on a horseman's heel, and used for goading the horse. In early times it took the simple form of a sharp-pointed goad, the rowel first appearing in the end of the



Ancient spurs.

a, Frankish spur (10th cent.). *b*, Brass spur (time of Henry IV.). *c*, Long-spiked rowel spur (time of Edward IV.). *d*, Long-necked brass spur (time of Henry VII.). *e*, Steel spur (time of Henry VIII.).

13th century. Spurs were especially the badge of knighthood. Hence, to win one's spurs, was to become a knight, and the phrase is now used to indicate the achievements of distinction in one's profession.

SPURGEON (spur'jn), Rev. Charles Haddon, was born at Kelvedon, Essex, in 1834; accepted the pastorate of a small Baptist congregation at Waterbeach while be was only eighteen; removed from thence in 1853 to a chapel in New Park Street, Southwark, which, becoming too small for his audience, required him to engage the Surrey music hall, and ultimately to build, in 1861, the well-known Metropolitan tabernacle. He died in 1892. He wrote numerous volumes, of which the best-known are The Saint and his Savior, John Ploughman's Talk, The Metropolitan Tabernacle, Farm Sermons, Storm Signals, and he edited the monthly magazine Sword and Trowel.

SPY, a secret emissary sent into the enemy's camp or territory to inspect their works, ascertain their strength and their intentions, to watch their movements, and report thereon to the proper officer. By the laws of war among all civilized nations a spy is subjected to capital punishment.

SQUAD, a small body of troops assembled for drill, inspection, or other purposes. The awkward squad is composed of those recruits who have not received sufficient training to take part in regimental drill.

SQUADRON, the principal division of a regiment of cavalry. The actual strength of a squadron varies with that of the component troops, but it ranges from 120 to 200 sabers. A squadron is divided into two troops, each of which is commanded by its captain. Each regiment of cavalry consists of three or four squadrons. The term is applied also to a division of a fleet, being a detachment of ships of war employed on a particular service or station, and under the command of a commodore or junior flag-officer.

SQUARE, in geometry, a quadrilateral figure, both equilateral and equiangular, or, in other words, a figure with four equal sides and equal angles. In measuring superficial areas it is only necessary to multiply one side by itself to have the area of the square, because each of the sides may be considered as the basis or as the perpendicular height. Thus a square the sides of which measure 4 feet is equal to 16 square feet, that is, sixteen squares each 1 foot high and 1 foot long. To square a figure (for example a polygon) is to reduce the surface to a square of equivalent area by mathematical means. It has often been attempted to square the circle, but this cannot be done. In arithmetic and algebra the square of a number is the number or quantity produced by multiplying a number or quantity by itself. Thus 64 is the square of 8, for $8 \times 8 = 64$.

SQUARE, in military tactics, a body of infantry formed into a rectangular figure with several ranks or rows of men facing on each side, with officers, colors, etc., in the center. The front rank kneels, the second and third stoop, and the remaining ranks (generally two) stand. This formation is usually employed to resist a cavalry charge. Hollow squares are frequently formed with the faces fronting inwards when orders and instructions, etc., are to be read, and the like.

SQUARE-RIGGED, a term applied to a vessel carrying chiefly square sails, that is, whose principal sails are extended by yards suspended by the middle, and not by stays, gaffs, booms, and lateen yards. Thus a ship and a brig are square-rigged vessels.

SQUARE ROOT. See Root.

SQUARE-SAIL. See Square-rigged.

SQUASH, a plant cultivated in America as an article of food. The name is also given to other species. See Gourd.

SQUASH-BUG, a name given in North America to several hemipterous insects, best known as destroyers of squash, pumpkin, and other plants.

SQUATTER SOVEREIGNTY. See Popular Sovereignty.

SQUATTER, a person that settles on a piece of land, particularly on public land, without a title. In Australia the term is also applied to one who occupies an unsettled tract of land as a sheep-farm under lease from government at a nominal rent.

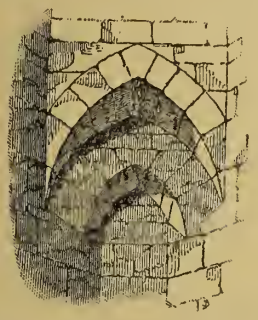
SQUID, a popular name of certain cuttlefishes belonging to the dibranchiate group of the class Cephalopoda, and included in several genera, of which the most familiar is that of the calamaries. See Calamary.

Squill.

SQUILL, a plant nearly allied to the hyacinths, onions, etc. The term squill

is more particularly applied to the officinal squill or sea-onion, which has a large acrid bulbous root like an onion. It is a native of the sandy shores of the Mediterranean. The bulb has been known as a medicine from the earliest ages, and is still used as a diuretic and expectorant. In large doses it causes vomiting, purging, and may even prove fatally poisonous.

SQUINCH, Sconce, in architecture, a small pendentive arch (or several com-



Squinch, Maxstoke Priory, Warwickshire.

bined) formed across an angle, as in a square tower to support the side of a superimposed octagon.

SQUINT, in architecture, an oblique opening passing through the wall of many old churches, usually constructed for the purpose of enabling a person in the transepts or aisles to see the elevation of the host at the high altar. Generally they are not above a yard high and 2 feet wide, but sometimes they form narrow arches 10 or 12 feet in height, as at Minster-Lovell, Oxfordshire. The name hagioscope is sometimes applied to them.

SQUINTING, or **STRABISMUS,** a defect of the eyes owing to which they cannot both be brought to bear upon the same object at once. It is usually due to one of the lateral muscles of the eye having a longer pull than the other. It may also arise from paralysis of one muscle caused by a blow. There are several kinds of squint, the two chief being inward or convergent and outward or divergent, the axes of the eyes in the one case tending to meet, in the other to separate. For persons so affected, and especially children, it is well not to look too long at small objects or read in ill-lighted rooms, and glasses to correct the sight should be obtained. It is also a good thing to have the sound eye (when there is but one squinting eye) bandaged up for a short time each day. When these measures fail the muscle can be lengthened by means of a simple surgical operation.

SQUIRREL, a small rodent mammal of the family Sciuridæ. This family comprehends three groups—the true squirrels, the ground-squirrels, and the flying-squirrels. The true squirrels are distinguished by their strongly compressed inferior incisors and by their long bushy tail. They have four toes before and five behind. The thumb of the fore-foot is sometimes marked by a tubercle. They have in all four grinders variously tuberculated, and a very small additional one above in front, which very soon falls In color they are usually of a rich ruddy brown on the upper parts, merging into reddish or grayish-white on the under parts of the body, but the fur varies with the season and climate so that in winter it may be of a gray appearance. The head is large, and the eyes projecting and lively. Several species are enumerated, as the common squirrel, which inhabits Europe and the north of Asia; while the cat squirrel, gray squirrel, black squirrel, red squirrel, and the great-tailed squirrel are American species. The common squirrel and several other species are remarkably nimble, running up trees and leaping from branch to branch with surprising agility. They subsist on nuts, acorns, seeds, etc., of which they lay up a store for winter, some of them in

Squirrel.

hollow trees, others in the earth. Their nest, which consists of woody fiber, leaves, and moss, is usually situated in a fork of a tree, and the young, of which there are three or four, are born in June. When engaged in eating they sit on their haunches with their tail thrown upward on the back, grasp the eatables with their fore-paws, and gnaw with their powerful teeth. The fur of some of the American species is an article of commerce. See also Ground Squirrel and Flying Squirrel.

SQUIRREL MONKEY, a monkey inhabiting Brazil, resembling in general appearance and size the familiar squirrel. A well-known species is colored grayish olive, and under surface being gray, the ears white, and the tail tipped with black.

SRINAGAR, a city, the capital of the state of Cashmere, in the Western Himalayas, situated in the valley of Cashmere, on both banks of the Jehlum. Pop. 122,536.

STABAT MATER, the first words, and hence the name, of a mediæval hymn still sung in the ecclesiastical service of the Roman Catholic church during Holy Week, and at the festival of the Seven Dolours of the Virgin Mary.

STACCA'TO, in music, disconnected; separated; a direction to perform the notes of a passage in a crisp, detached, distinct, or pointed manner. It is generally indicated by dots or dashes placed over the notes, the dash implying the strongest or most marked degree of staccato or crispness. A certain amount of time is subtracted from the nominal value of any note performed staccato.

STADIUM, a Greek measure of 125 paces, or 625 Roman feet, equal to 606 feet 9 inches English; consequently the Greek stadium was somewhat less than our furlong. It was the principal Greek measure of length. This term was also applied to the course for foot-races at Olympia in Greece, which was exactly a stadium in length. The name was also given to all other places throughout Greece wherever games were celebrated.

STAEL-HOLSTEIN, Anne Louise Germaine Necker, Baroness de, the only child of Necker, Swiss banker and minister of finance to Louis XVI., was born in 1766, died 1817. In 1786 she published Sophia, a comedy, and two tragedies entitled Lady Jane Grey, and Montmorency; while in this same year she married Baron de Staël-Holstein, Swedish ambassador at the French court. In 1788 she printed her Lettres sur les Ecrits et le Caractère de J. J. Rousseau. During the Reign of Terror she fled to Coppet (1792), her father's estate in Switzerland, after vainly endeavoring to save her friends and the royal family. In 1793 she sought refuge in England, where she published Reflections on the Trial of the Queen, and Reflections on the Peace. During the Directory Madame de Staël-Holstein returned to Paris, where she again became an influence in politics, and published her essay on the Passions. Subsequently she was banished by Napoleon on account of her bold advocacy of liberal views, and her wanderings through Europe are described in her Ten Years of Exile. Her other writings comprise De la Littérature Considérée dans ses Rapports avec les Institutions Sociales; Delphine (1802); Corinne ou l'Italie (1807), a novel in which Italian life and scenery are exhibited with thorough knowledge, her most popular work.

STAFF, a body of officers whose duties refer to an army or regiment as a whole, and who are not attached to particular subdivisions. In the United States this body is divided into the military staff and the administrative staff. The former is charged with the more purely military duties, and comprises the chiefs of staff, the adjutants-general, the inspectors-general, the chief of artillery, the chief of cavalry, the chief of engineers, the chief signal officer the provost-marshal-general, and the aides-de-camp. The administrative staff is charged with the service of administration and supply, and comprises the judge advocate, the commissary of musters, the chief ordnance officers, the chief quarter-masters, the chief commissaries, the chief paymasters, and the medical directors and their respective assistants.

STAFF, in music, the five parallel lines and their intermediate spaces, on which the notes, sharps, flats, and other musical characters are placed. See Music.

STAFFORD, a municipal and parliamentary borough of England, the county town of Staffordshire, situated on the river Sow, about 130 miles n. w. of London. The principal industries are the making of boots and shoes, brewing, and tanning. Since 1885 Stafford sends one member to parliament, instead of two, as formerly. Pop. 20,894.—The county is one of the central counties of England,

and is bounded by Cheshire, Derbyshire, Warwickshire, Worcestershire, and Shropshire; greatest length from north to south, 50 miles; central breadth, 35 miles; area, 748,433 acres, or 1170 square miles. The chief industries are coal-mining, iron-ore mining, smelting, and manufacturing, and North Staffordshire is the chief center in the kingdom for the various earthenware manufactures. Pop. 1,234,382.

STAG, or RED DEER, a large and handsome deer which is a native of Europe and Northern Asia, and in Britain is now found wild only in the Highlands of Scotland. In summer the back and flanks of the stag are of a reddish-brown color, while these parts in winter are gray-brown. A full-sized male stag with antlers well developed stands about 4 feet high at the shoulder, and has horns 3 feet in length, while the female is smaller and has no horns. They feed on grass, buds and young shoots of trees, and in winter they roam in herds. The pairing season occurs in August, and the calf is dropped in May. The male is known distinctively as the hart (or stag), the female as the hind. The stag is represented in North America by the wapiti, which is even larger. See Wapiti.

STAG BEETLE, the common stag bettle is one of the largest of insects, and is especially distinguished by the enor-

Stag beetle.

mous size of the horny and toothed mandibles in the males.

STAGECOACH. See Coach.

STAGGERS is the vague and popular name of certain diseases of horses and sheep. In the horse mad or sleepy staggers is due to inflammation of the brain, while grass or stomach staggers arises from acute indigestion, generally the result of overfeeding on wet grass. In sheep the staggers is caused by the presence within the brain of the immature embryo of a species of tapeworm which, in its mature state, is found in the intestines of the dog.

STAINED GLASS is glass painted with metallic oxides or chlorides, ground up with proper fluxes and fused into its surface at a moderate heat. See Glass-painting.

STALAC'TITES, masses of calcareous matter, usually in a conical or cylindrical form, pendent from the roofs of caverns, and produced by the filtration of water containing particles of carbonate of lime through fissures and pores of rocks. Similar masses of small size are frequently to be seen also depending from stone bridges. The water being evaporated leaves a deposit of lime behind it, which, by the continued trickling of the water, gradually increases in size. Simultaneously with the formation of the stalactite a similar but upward growth, called a stalagmite, takes place at the spot vertically below where the successive drops of water fall and evaporate. This sometimes forms con-

Cave with stalactites and stalagmites.

tinuous sheets over the surface, sometimes rises into columns, which meet and blend with the stalactites above.

STAMBOUL. See Constantinople.

STAMENS, in botany, the male organs of fructification in plants, formed principally of cellular tissue. They are situated immediately within the petals, and are each composed, in most cases, of three parts, the filament, the anther, and the pollen (contained in the anther), of which the two latter are essential, the other not. The stamens and pistils constitute the sexual or reproductive organs of plants. Generally they both exist in the same flower, which is thus said to be hermaphrodite or perfect. The number of stamens varies in different plants, from one to a hundred or more. With respect to their directions they are named erect, inflexed, reflexed, spreading, ascending, declinate; and their insertions with regard to the ovary are said to be hypogynous, epigynous, or perigynous. It was on the number of stamens and their arrangements and

Inside of corolla showing the stamens.

relations, that Linnæus founded the classes of his sexual system of plants. See Botany, Anther, Pollen.

STAMFORD, a town in Fairfield co , Connecticut, near the mouth of the Mill river, 36 miles northeast of New York, for the inhabitants of which it is a favorite summer resort. It has woolen and iron manufactures, and a small coasting trade. Pop. 17,306.

STAMMERING, an affection of the faculty of speech characterized by irregular, imperfect, or spasmodic actions of the muscles concerned in articulation. It manifests itself in a difficulty in beginning the enunciation of words, especially such as begin with an explosive consonant, or in a spasmodic and for a time an incontrollable reiteration of the same syllables after the word is begun; this latter defect being also called stuttering. Stammering is always increased by emotional disturbance, and is much mitigated and often cured, by the patient acquiring confidence in himself, never attempting to speak in a hurry or when the chest is empty of air, or by reading measured sentences slowly and with deliberation.

STAMP, a term specifically applied to the public mark or seal made by a government or its officers upon paper or parchment whereon private deeds or other illegal agreements are written, and for which certain charges are made for purposes of revenue. The name is also applied to a small piece of stamped paper issued by government, to be attached to a paper, letter, or document liable to duty.

STAMP ACT, an act regulating the imposition of stamp duties; especially, an act passed by the British parliament in 1765, imposing a duty on all paper, vellum, and parchment used in American colonies, and declaring all writing on unstamped materials to be null and void. This act roused a general opposition in the colonies, and was one cause of the revolution.

STANDARD, a flag or carved symbolical figure, etc., erected on a long pole or staff, serving as a rallying-point or the like. In a more strict sense the term is applied to a flag which bears the arms, device, or motto of the owner, long in proportion to its depth, tapering toward the fly, and, except when belonging to princes of the blood-royal, slit at the end.

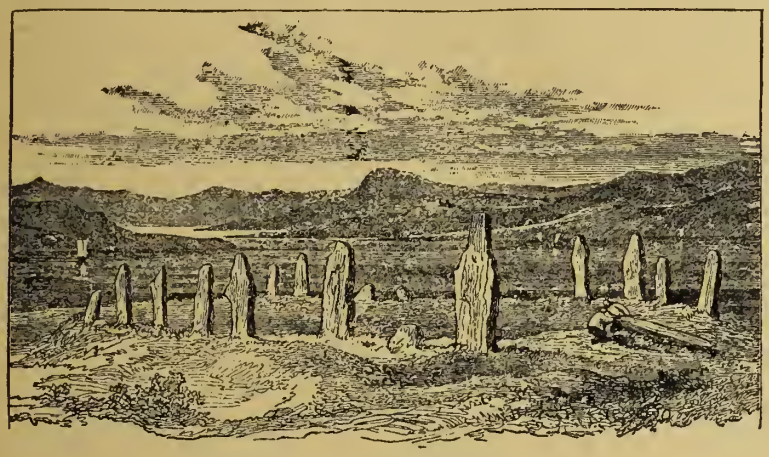
STANDARD OF MONEY, in coinage, the proportion of weight of fine metal and alloy established by authority. The standard of gold coins in the United States is at present 25.8 grains to the dollar. The standard of silver coins is 412.5 grains to the dollar. The fineness to be 9 parts of gold or silver to 1 of alloy.

STANDING STONES, are large rough, erect monoliths found not only in all parts of Europe, but also in some countries of the East and even in the New World, and nowhere more common than in Great Britain. They sometimes occur singly, sometimes in groups. The principal purposes of the single standing stones appear to have been to serve as boundary-marks, as memorials of battle, and as sepulchral monuments. The groups of standing stones that exist in various parts of Great Britain, as well as in some parts of the continent, were thought by antiquaries to be connected with the Druidical worship of the Celts, but, for want of sufficient evidence, this theory has been abandoned.

STANDISH, Miles, born in Lancashire about 1584, died 1656. He claimed to be the descendant of the Standish family of Duxbury Hall, served as a captain in the Netherlands, and joined the Puritans when they sailed for New England in the Mayflower (1620). He took an active part in the early struggles of the colony, and a tradition regarding his courtship is celebrated in a well-known poem by Longfellow.

STANFORD, Leland, American capitalist, was born at Watervliet, N. Y., in

1824. He removed to California in 1852, and engaged in mining and commercial ventures. He was a delegate to the Chicago convention that nominated Abraham Lincoln. In 1861 he was elected governor of California; also president of the Central Pacific; to the construction of which he gave his personal attention. In 1885 and 1891 he was elected to the United States senate. In 1886 he donated the sum of $20,000,000 to the State of California for the purpose of founding the Leland Stanford Junior University in memory of his son. See Leland Stanford Junior University. He died in 1893.



Standing stones of Stennis, Pomona, Orkney.

STANISLAUS AUGUSTUS, Stanislaus II., the last king of Poland, son of Count Stanislaus Poniatowski, was born at Wolczyn in Lithuania 1732, died 1798. He protested against the various partitions of Poland, formally resigned his sovereignty in 1795, and finally died in St. Petersburg as a pensioner of the Emperor Paul I.

STANISLAUS LESZCZYNSKI (lesh-chin'ski), Stanislaus I., King of Poland, afterward Duke of Lorraine and Bar, was born at Lemberg in 1677, died 1766. He was recommended to the Warsaw assembly by Charles XII. of Sweden as a candidate for the vacant throne of Poland. He was accordingly elected and crowned (1705), but after the disastrous battle of Poltava (1709), when his patron Charles XII. was defeated, he had to flee from Poland. He found refuge in France ultimately, where his daughter Maria became wife to Louis XV. Assisted by the French king he sought to establish his claim to the throne of Poland in 1733, but, opposed by the united powers of Saxony and Russia, he had again to retire into France, where he held possession of the duchies of Lorraine and Bar until his death.

STANLEY, Sir Henry Morton, born near Denbigh, in 1840, was placed in the poorhouse of St. Asaph at the age of three; subsequently in 1855 shipped as cabin boy to New Orleans. Stanley enlisted in the confederate army, where he was taken prisoner, but after his discharge he volunteered into the United States navy. At the close of the war he went to Turkey as a newspaper correspondent, and as war correspondent for the New York Herald be joined the Abyssinian expedition of 1867–68. He afterward traveled in Spain, and it was while there in 1869 that he was asked by the proprietor of the New York Herald "to go and find Livingstone." He met and relieved the traveler at Lake Tanganyika in November of the same year and returned to England. As correspondent of the Daily Telegraph and the New York Herald he in 1874 undertook an expedition into Africa, and for the first time traced the Congo river from the interior to its mouth (1877). For the purpose of developing this vast region he returned in 1879, and after planting stations and establishing steam navigation this territory secured by Stanley was named in 1885 the Congo Free State.

Henry Morton Stanley (Jan. 1886).

He is the author of How I Found Livingstone, Through the Dark Continent, The Congo, and the Founding of its Free State, and In Darkest Africa. He was made G.C.B. in 1899. Died 1904.

STANLEY FALLS. See Congo Free State.

STANTON, Edwin M'Masters, an American statesman, was born at Steubenville, Ohio, 1814; died at Washington 1869. He acquired a large practice in the supreme court at Washington, and when Buchanan was elected president (1857) he entered the cabinet. Shortly after the outbreak of hostilities between the north and the south, President Lincoln appointed him head of the war department (January, 1862), and his acceptance of the office marked the beginning of a vigorous military policy. He selected General Grant for promotion after the victory at Fort Donelson; and it was he who, in 1863, placed Grant in supreme command of the three armies operating in the southwest. In all the important movements of the war Stanton was consulted by the president. After the assassination of Lincoln he had some controversy with his successor, Andrew Johnson, who demanded his resignation. This he refused, and was upheld by the senate. In 1869 he was appointed justice of the supreme court, but he died a few days afterward.

STANTON, Elizabeth (Cady), American reformer and promoter of the woman's rights movement, was born at Johnstown, N. Y., in 1815. She became interested in the anti-slavery and other reform movements, and through acquaintance with Lucretia Mott was led to sign the call for the first woman's rights convention, which was in July, 1848. This convention made the first formal demand for the extension of the suffrage to women, and of the National Women's Suffrage association there formed Mrs. Stanton became the first president, retaining that office until 1893. In 1868 she was a candidate for congress. She was a frequent contributor to magazines, and was joint author of A History of Woman's Suffrage. Eighty Years and More, an autobiography, was published in 1895. She died in 1902.

STANZA, in poetry, a number of lines or verses connected with each other, and properly ending in a full point or pause. A stanza presents in meter, rhymes, and the number of its lines a combination which repeats itself several times in the course of the same poem.

STAPE'LIA, an extensive and curious genus of plants or milkweeds. Most of the species are natives of the Cape of Good Hope. They are succulent plants, without leaves, frequently covered over with dark tubercles, giving them a very grotesque appearance. In most instances the flowers give off a very unpleasant odor. They are, nevertheless, cultivated on account of their singular and beautiful flowers.

Stapelia variegata.

STAPHYLO'MA, a name given to different tumors of the anterior surface of the globe of the eye. Called also staphylosis.

STAR, Polar. See Pole-star. There is a Swedish order of knighthood so named. It is bestowed specially on those who have distinguished themselves in a civil capacity. Its motto is, "Nescit occasum."

STAR-APPLE, the popular name of several species of plants whose fruit is esculent. It is a native of the West

Indies. The fruit resembles a large apple, which in the inside is divided into ten cells, each containing a black seed,

Star-apple.

surrounded by a gelatinous pulp, which is very palatable.

STARBOARD, the right side of a ship when the eye is directed toward the head, stem, or prow. See Port.

STARCH, a proximate principle of plants, universally diffused in the vegetable kingdom, and of very great importance. It occurs in seeds, as in those of wheat and other cereal grains, and also in leguminous plants; in roots, as in the tubers of the potato; in the stem and pith of many plants, as in the sago plant; in some barks, as in that of cinnamon; and in pulpy fruits, such as the apple. Finally, it is contained in the expressed juice of most vegetables, such as the carrot, in a state of suspension, being deposited on standing. The starch of commerce is chiefly extracted from wheat flour and potatoes. When pure, starch is a snow-white powder of a glistening appearance, which makes a crackling noise when pressed with the finger. It is composed of transparent rounded grains, the size of which varies in different plants, those of the potato being among the largest, and those of wheat and rice the smallest. It is insoluble in cold water, alcohol, and ether; but when heated with water it is converted into a kind of solution, which, on cooling, forms a stiff semi-opaque jelly. If dried up this yields a translucent mass, which softens and swells into a jelly with water. It is employed for stiffening linen and other cloth. When roasted at a moderate heat in an oven it is converted into a species of gum employed by calico-printers; potato starch answers best for this purpose. Starch is convertible into sugar by boiling with dilute sulphuric acid. Starch forms the greatest portion of all farinaceous substances, particularly of wheat flour, and it is the chief ingredient of bread.

STAR-CHAMBER, formerly an English court of civil and criminal jurisdiction at Westminster. It consisted originally of a committee of the privy-council, and was remodeled during the reign of Henry VII., when it consisted of four high officers of state, with power to add to their number a bishop and a temporal lord of the council, and two justices of the courts of Westminster. It had jurisdiction of forgery, perjury, riots, maintenance, fraud, libel, and conspiracy, and could inflict any punishment short of death. Its process was summary and often iniquitous (especially in the reigns of James I. and Charles I.), and the punishment it inflicted often arbitrary and cruel. This court was abolished (1640) by statute 16 Charles I.

STAR-FISHES, the star-fishes proper are covered with a tough leathery skin beset with prickles, and have the form of a star, with five or more rays radiating from a central disc. In the middle of the under surface of the disc is situated the mouth, opening into a digestive system which sends prolongations into each ray. If the prickly skin be removed it will be seen to be supported by a series of plates beautifully jointed together. On the under surface of each ray the plates exhibit a series of perforations, through which, in the living state, the ambulacra or tubular feet can be protruded so as to effect locomotion. Star-fishes are found in almost all tropical and European seas, and some species are found as far north as Greenland.

STARLING, called also Stare, a bird belonging to a family of birds widely distributed throughout the world, and allied to the crows. The common starling is between 8 and 9 inches in length; the color is blackish, with blue, purplish, or cupreous reflections, and each feather is marked at the extremity with a whitish triangular speck, giving

Common European starling.

the bird a speckled appearance. Starlings live mostly upon insects, build in old walls and hollow trees, and the eggs, usually five, are of a pale bluish tint. These birds are often kept in cages, and may be taught to whistle some tunes, and even to pronounce words and sentences.

STAR OF BETHLEHEM, a bulbous-rooted plant with white star-like flowers. It is common in many parts of Europe, and is much cultivated in gardens for ornament.

STARS, those self-shining bodies seen in the heavens at night, constituted like the sun, situated at immense distances from us, and doubtless like our sun, the centers of systems similar to our own. To superficial observation stars are distinguished from planets by remaining apparently immovable with respect to one another, and hence they were called fixed stars, although their fixity has been disproved in numerous cases, and is no longer believed in regard to any. In order to distinguish the stars one from another the ancients divided the heavens into different spaces containing groups of stars called constellations. (See constellation.) The stars are divided, according to their brightness, into stars of the first, second, third, etc., magnitudes; but no magnitude, in the proper sense of the word, has yet been observed in any star. All the stars beyond the sixth or seventh magnitude are called telescopic stars, as they cannot be seen without the aid of the telescope; and these are continued by astronomers down to the sixteenth magnitude. As to the absolute size of the stars little is known; but the light given out by Sirius is estimated at 63½ times that of the sun. The colors of the stars vary considerably, red, yellow, green, and blue being noticed. The stars are very irregularly distributed over the celestial sphere. In some regions scarcely a star is to be seen, while in others they seem crowded together, especially in the Milky Way. In some cases a certain number of stars evidently belong to a system by themselves. Of the stars visible to the naked eye at any one time the number probably does not exceed a few thousands, but in the telescope their number is so great as to defy all calculation. The distances of the stars from the earth are very great. The shortest distance yet found, that of *α* Centauri, a double star in the southern hemisphere, has been calculated at 20 billions of miles, so that the light takes 3½ years to travel from it to our earth. Many stars have been observed whose light appears to undergo a regular periodic increase and diminution of brightness, amounting, in some instances, to a complete extinction and revival. These are called variable and periodic stars. It is found that some stars, formerly distinguished by their splendor have entirely disappeared. Such stars are called temporary stars. Many of the stars that usually appear single are found, when observed with telescopes of high magnifying power, to be really composed of two, and some of them three or more stars in close juxtaposition. These are termed double and multiple stars. By means of spectrum analysis some valuable results regarding the stars have latterly been obtained. In particular, many of the elements familiar to us have been detected in them, and the spectroscope has also proved that the star Arcturus is approaching us and Sirius receding. See Astronomy, Nebulæ, and Meteor.

STARS AND BARS, the popular name applied to the flag adopted by the confederate states of America early in 1861. See Flag.

STAR SPANGLED BANNER, The the national hymn of the United States written by Francis Scott Key on board the frigate Surprise during the bombardment of Fort McHenry, Md., by the British, in 1814. "The Star Spangled Banner" was first sung in a tavern near the Holiday Street theater, Baltimore by Ferdinand Durang.

STARVATION, or **INANITION,** is the physical effect produced by the total want of food and water. The symptoms of starvation in man are: an increasing loss of weight, severe pain in the stomach, loss of strength, sleeplessness, great thirst, in some cases stupor, and

in other cases nervous excitement with convulsions. Meanwhile the face assumes a haggard expression, the skin is said to become covered with a brown secretion, and at last death occurs in about eight days. With a good supply of water, however, life may be prolonged, in the absence of solid food, for a period of two or three weeks, and a moist atmosphere will even seem to favor the prolongation of life. Certain diseases, such as stricture or cancer of the opening of the stomach, etc., may occasion starvation, and it is to be noted that gradual starvation may result from the continued low percentage of nutritive matter in the daily diet. See Fasting.

STATEN ISLAND, an island belonging to New York state, constituting nearly the whole of Richmond county, and separated from Long Island by the Narrows which form the entrance to New York harbor, and from New Jersey by Staten Island sound, about ½ mile broad. Its length is 14 miles, and its greatest breadth 8 miles. It contains numerous villages, abounds in pleasant scenery, and has constant communication with New York by steam ferry-boats

STATES-GENERAL, thus called to distinguish them from the provincial states, the name given in France till 1789 to the assemblies of the deputies of the three orders of the nation, the clergy, the nobility, and the third estate. This assembly had little legislative power, its chief function being to register the king's decrees in matters of taxation.

STATE, Department of, one of the nine executive departments of the government of the United States, presided over by a secretary who is a member of the cabinet and first in the line of succession to the presidency after the vice-president. The department of state is the organ of communication between the government of the United States and all foreign governments, as well as with the governors of the individual states. The secretary of state conducts all such correspondence; has charge of the negotiation of all treaties and conventions; he preserves the originals of all treaties, public documents and correspondence with foreign governments as well as of the laws of the United States; he publishes all statutes and resolutions of congress and proclamations of the president; he is the custodian of the great seal which is affixed to all commissions of appointment requiring the consent of the senate, proclamations, warrants for extradition, pardons, etc., emanating from the president; he issues and keeps a record of passports granted to American citizens traveling abroad; issues warrants for the extradition of criminals to be delivered to foreign governments; presents foreign ministers to the president, etc. He makes an annual report of the conduct of foreign affairs for the year, publishes the consular reports and the "foreign relations" of the United States, and performs such other duties relative to the conduct of foreign affairs as the president may direct.

STATES AND TERRITORIES, Popular Names of, Alabama, Cotton state; Arkansas, Toothpick and Bear state; California, Eureka and Golden state; Colorado, Centennial state; Connecticut, Land of Steady Habits, Freestone state and Nutmeg state; Dakota, Sioux state; Delaware, Uncle Sam's Pocket Handkerchief and Blue Hen state; Florida, Everglade and Flowery state; Georgia, Empire state of the South; Idaho, Gem of the Mountains; Illinois, Prairie and Sucker state; Indiana, Hoosier state; Iowa, Hawkeye state; Kansas, Jayhawker state; Kentucky, Corn-cracker state; Louisiana, Creole state; Maine, Timber and Pine Tree state; Maryland, Monumental state; Massachusetts, Old Bay state; Michigan, Wolverine and Peninsular state; Minnesota, Gopher and North Star state; Mississippi, Eagle state; Missouri, Puke state; Nebraska, Antelope state; Nevada, Sage state; New Hampshire, Old Granite state; New Jersey, Blue state and New Spain; New Mexico, Vermin state; New York, Empire state; North Carolina Rip Van Winkle, Old North and Turpentine state; Ohio, Buckeye state; Oregon, Pacific state; Pennsylvania, Keystone, Iron and Oil state; Rhode Island, Plantation state and Little Rhody; South Carolina, Palmetto state; Tennessee, Lion's Den state; Texas, Lone Star state; Utah, Mormon state; Vermont, Green Mountain state; Virginia, Old Dominion; Wisconsin, Badger and Copper state.

STATICS, that branch of dynamics which treats of the properties and relations of forces in equilibrium—equilibrium meaning that the forces are in perfect balance, so that the body upon which they act is in a state of rest. According to the classification still employed by many writers on the subject the word statics is used in opposition to dynamics, the former being the science of equilibrium or rest, and the latter of motion, both together constituting mechanics. But among more recent authors mechanics is used to express not the theory of force and motion, but rather its application to the arts. The word dynamics is employed as expressing the science which treats of the laws of force or power, thus corresponding closely to the old use of the term mechanics; and this science is divided into statics and kinetics, the first being the science which treats of forces considered as producing rest, and the second as treating of forces considered as producing motion. See Dynamics.

STATIS'TICS, a collection of facts relating to a part or the whole of a country or people, or of facts relating to classes of individuals or interests in different countries; especially, those facts which illustrate the physical, social, moral, intellectual, political, industrial, and economical condition or changes of condition, and which admit of numerical statement and of arrangement in tables. The collection of statistics may have the object merely of ascertaining numbers, as is often the case with statistics collected for purely administrative purposes; or it may be undertaken with the view of learning what happens on an average of a great number of cases, as is the case of insurance statistics; or its object may be to detect the causes of phenomena that appear in the consideration of a number of individual cases—such phenomena, for example, as the decline of a certain trade, the prevalence of a certain disease, etc. In all civilized countries the collection of statistics forms an important part of the administrative duties of government, and in some cases it is intrusted to a special bureau. The first country to possess an institution of this nature was Belgium, its organizer being the eminent statistican Lambert Quetelet.

STATUE. See Sculpture.

STATUTE, a law proceeding from the government of a state; a written law. Statutes are either public or private (in the latter case affecting an individual or a company); but the term is usually restricted to public acts of a general and permanent character. Statutes are said to be declaratory of the law as it stood before their passing; remedial, to correct defects in the common law; and penal, imposing prohibitions and penalties. The term statute is commonly applied to the acts of a legislative body consisting of representatives. In monarchies not having representative bodies, the laws of the sovereign are called edicts, decrees, ordinances, rescripts, etc.

STAVRO'POL, a government of Russia in the Caucasus, and bordering on the Caspian sea; area, 26,500 sq. miles. Pop. 876,298.—Stavropol, the capital of this district, is strongly fortified, and has a large trade in horses, cattle, sheep, etc. Pop. 41,621.

STAY, in ships, a large, strong rope, extending from the upper end of a mast down to another mast, or to some part of the vessel, with the object of lending support to the mast to whose top it is attached. Those leaning forward are called fore-and-aft stays, and those leading down to the vessel's sides and pulling a little backward are called back stays. A sail extended on a stay is a stay sail. In large vessels there are a number of these of a triangular shape. To stay is to tack or bring the ship's head up to the wind for going about; to miss stays is to fail in the attempt to go about. In stays or hove in stays is the situation of a vessel when she is in the act of going about.

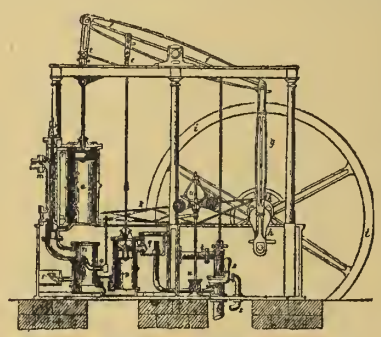
STEAD, William Thomas, English journalist, was born at Embleton, Northumberland in 1849. In 1880 he was assistant editor of the Pall Mall Gazette; editor from 1883 to 1889. In 1890 founded the Review of Reviews. By his exposure of legally permissible outrages upon women and children in his Maiden Tribute of Modern Babylon in 1885 he was sentenced to a three months' term in Holloway gaol, but it was followed by the enactment of the Criminal Law Amendment Bill. His publications include: The Truth About Russia, The Pope and the New Era, If Christ Came to Chicago, The Labor War in the United States, Satan's Invisible World, A Study of Despairing Democracy, The Americanization of the World.

STEALING. See Larceny.

STEAM, is the vaporous substance into which water is converted under certain conditions of heat and pressure. It may be said, indeed, that water gives off vapor or steam at every temperature,

but the term is technically applied to the elastic aeriform fluid generated by heating water to the boiling point. Steam, in its perfect state, is transparent, colorless, and invisible; but when it has been deprived of part of its heat by coming into contact with cold air, it suddenly assumes a cloudy appearance, and is condensed into water. When water, in an open vessel, is heated to the boiling point (212° F.) globules of steam are formed at the bottom and rise to the surface, where they pass off in vapor. In this case all the heat which enters into the water is solely employed in converting it into steam of the temperature of boiling water, while the continued and increased application of heat will only cause a more rapid formation of steam until the whole of the water evaporates. When water, however, is confined in a strong close vessel, both it and the steam which it produces may be brought to any temperature; and as steam at boiling point occupies 1642 times the space of the water from which it is generated, it follows that when thus confined it must exercise an enormous expansive force. Steam, as used in the steam-engine, holds water in suspension mechanically, and is called saturated steam; while the steam which receives additional heat apart from water is called superheated steam, and approximates to the condition of a perfect gas. When the temperature of saturated steam is considerably above 212° F., the steam formed under such conditions is termed high-pressure steam while at 212° F it is called low-pressure steam, and its pressure is equal to that of one atmosphere, or 14.7 lbs. on the square inch. Another element in the constitution of steam is its density which is expressed by the weight of 1 cubic foot of the steam. This density is increased with an increase of the pressure under which the steam is generated, for the particles of steam become more closely packed together. Thus the density of steam produced at 212° has been found to be equal to .038 lb. or $\frac{5}{8}$ oz. per cubic foot, from which it follows that the volume of 1 lb. of such steam is equal to 26.36 cubic feet. Like the pressure or expansive force of steam, the density is invariably the same for a given temperature. From the possession of the properties thus briefly stated, steam constitutes an invaluable agent for the production of mechanical force, as shown in the various uses of the steam-engine. It is also employed in distributing the heat used for warming buildings, in heating baths, evaporating solutions, brewing, drying, dyeing, and even for cookery.

STEAM-ENGINE, a mechanical contrivance, in which the force arising from the elasticity and expansive action of steam, or from its property of rapid condensation, or from the combination of these qualities, is made available as a source of motive power in the arts and manufactures, and in locomotion. The expansive power of steam was known to the ancients, and its earliest use in connection with a mechanical contrivance is noted by Hero of Alexandria (about 130 B.C.) in his Pneumatica. In this treatise Hero describes an æolipile or hollow spherical vessel turning on an axis, supplied with steam, and driven by the reaction from the escaping jets of steam. The principle that a mechanical power is obtained by the pressure of steam acting on the surface of water placed in a closed vessel put to practical use by Captain Thomas Savery (1698) in a steam-engine which he constructed for the purpose of raising water out of mines; and with the elevation of water by pressure he also combined the principle of obtaining a vacuum by condensation. This principle, however, was made more practically effective by Denis Papin (1690), who constructed a steam-engine in which a piston was forced down through the vacuum made by condensation. This first conception of a piston working in a cylinder was further developed by Newcomen (1705) and his assistant Cawley. Various improvements in the steam-engine were made by Smeaton and others, but its greatest development was effected by James Watt (1769). His improvements consisted in condensing the steam, not in the cylinder, but in a separate condenser, thus preventing the waste occasioned previously by the chilling



Beam condensing steam-engine.

a, The steam-cylinder. *b*, The piston. *c*, The upper steam-port or passage. *d*, The lower steam-port, *ee*, The parallel motion. *ff*, The beam. *g*, The connecting-rod. *h*, The crank. *ii*, The fly-wheel. *kk*, The eccentric and its rod for working the steam-valve. *l*, The steam-valve and valve-casing. *m*, The throttle-valve. *n*, The condenser. *o*, The injection-cock. *p*, The air-pump. *q*, The hot-well. *r*, The snifting-valve for creating a vacuum in the condenser previous to starting the engine. *s*, The feed-pump for supplying the boilers. *t*, The cold-water pump for supplying the condenser cistern. *u*, The governor.

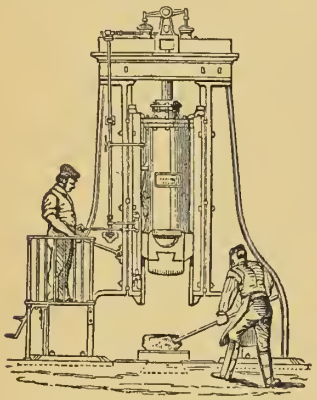
and heating of the cylinder. Besides this, he preserved the heat in the cylinder by surrounding it with a layer of hot steam inside of an external casing; and with the same object he employed steam, instead of air, to press down the piston from above. Thus he obtained the double-acting engine, which is so named because both the up-stroke and the down-stroke are produced by means of steam. Further, he devised a crank motion which converted the alternating motion of the oscillating beam into a continuous rotary motion; but as this invention was pirated he patented the "sun-and-planet" wheel as a substitute for the crank, returning afterward to the crank. To these improvements he subsequently added a fly-wheel, in order to equalize the motion so as to drive the crank past the dead-points; a governor, whose purpose was to regulate the quantity of steam passing into the cylinder; an indicator, to measure the pressure upon the piston; and a slide-valve, moved automatically by an eccentric, the object of which was to regulate the action of the steam in the cylinder. The steam-engine, as thus developed by Watt, was in nearly all essential points the same as the present-day engine. Probably the only improvement of primary importance which has been made in the steam-engine since the time of Watt, is the manner in which steam is now used expansively. In the compound engine the steam receives the greater part of its expansion in a second cylinder of much larger diameter than the first, and by this means greater steadiness of piston-stroke, economy of fuel, and increased driving power have been obtained. The use of expanded steam has been especially notable in the marine engine, where it is now expanded successively in three or even four cylinders. The accompanying illustration represents a sectional elevation of a beam condensing steam-engine, and shows the principles embodied in Watt's steam-engine. The pipe conveying the steam from the boiler opens into the part marked l, which incloses a movable valve by means of which the steam may be alternately admitted into the cylinder a by the upper port c and lower d; between these points the piston b works steam-tight. The valve l is so contrived that while it allows steam to pass into the cylinder through one of the ports, it shall at the same time open a communication between the opposite side of the piston and the condenser n, which is a hollow vessel kept constantly immersed in cold water, a portion of which is admitted into it by the injection-cock o; consequently, the steam thus admitted is instantly deprived of its heat, and reconverted into its original form of water, thereby forming a vacuum. Thus it will be seen that, on the communication being opened up between the boiler and either side of the piston, the latter will ascend or descend in the cylinder unimpeded by the resistance of the atmosphere against the other side, and with a force proportional to the pressure of the steam; and as the motions of the steam-valve l are regulated by the engine itself, the above action is kept up continuously. The alternating rectilinear motion thus generated within the cylinder is transmitted by means of a rod attached to the piston, to a strong beam f f, movable upon a central axis, a system of jointed rods e e, called the parallel motion, being interposed for the purpose of neutralizing the disturbing action which the circular path of the beam would otherwise exert upon the piston. The reciprocating motion of the beam is now, through the intervention of the connecting-rod g and crank h, converted into a circular or rotatory motion, which is rendered continuous and uniform by the fly-wheel i, to the axis of which the machinery to be impelled is connected. The air-pump p for withdrawing the vapor and water from the condenser, the feed-pump s for supplying the boilers, and cold-water pump t for supplying the condenser cistern, are all worked by rods from the beam; and the governor u, for maintaining uniformity of motion, is driven by a band from the crank-shaft. The above description

refers more immediately to that class of steam-engines called low-pressure engines. The various forms of the steam-engine have received a varied form of classification. There are the general divisions into condensing and non-condensing engines, compound and non-compound, and single, double, or direct acting. Again there is the classification connected with the position of the cylinder, as in the horizontal, vertical, and inclined cylinder engines. Another classification, and that which is adopted here, is to divide steam-engines into the uses to which they are applied. Stationary engines comprise all such engines as are permanently fixed for the purpose of driving the machinery in a factory, pumping water, etc. For a long time the favorite engine for these purposes was of the beam condensing type adopted and improved by Watt. But this has now, for the most part, been superseded by an engine the cylinders and connections of which are horizontal. In the most modern type the cylinder is fixed endwise to a base plate at one extremity, the crank-shaft has its bearings on the same base at the other extremity, and the piston-rod driven horizontally is guided by means of a crosshead, the ends of which slide between two parallel bars fixed on the frame. The Corliss engine is a well-known type of horizontal engine, its characteristic feature being the system of reciprocating valves by which the steam is passed to and from the cylinder. In some engines, especially such as are used as winding engines, a pair of coupled horizontal cylinders are now used; and in the larger form of horizontal engine two cylinders of high and low pressure are placed either side by side or one before the other. In cases where the cylinders are vertical the other general arrangements are much the same as in the horizontal engine. In portable engines the boiler and engine go together, the boiler being undermost; and the whole is supported upon four wheels, by means of which it is moved from place to place. The chimney is turned down over the boiler when not in use. A kind of engine known as semi-portable consists of a boiler and engine placed together, but without wheels. The road-locomotive was first suggested by William Symington in Scotland, and developed for practical purposes about 1800 by Oliver Evans in America and Trevethick in Wales. The chief characteristics of this traction engine, as it is called, is the great width of the wheels, which are now supplied by some makers with protected india-rubber tires to prevent slipping. It can be made to run backward and forward by means of reversing gear, while its course is guided by a steering wheel acting upon a vertical shaft. The railway-locomotive is a steam-engine and boiler placed upon wheels and employed to transport a train of cars upon a railway. It was not, however, until 1829 that the modern high-speed locomotive came into use. The "Rocket" built by George Stephenson, in 1829, ran on four wheels, weighed 4 tons 5 cwts., and the tender, consisting of a simple cask, 3 tons 4 cwts ; the steam cylinders were 8 inches in diameter with 16½ inches of stroke; the driving-wheels were 4 feet 8½ inches in diameter; the total gross weight drawn was about 17 tons; and the speed attained was an average of 14 miles per hour, with an occasional speed of 29 miles per hour. In this engine of the "Rocket" there were brought together the three primary elements which, having been developed, make the efficiency of the modern locomotive—viz., the internal water-surrounded fire-box and the multitubular flue in the boiler; the blast-pipe, from which the waste steam of the engine was exhausted up the chimney; and the direct connection of the two steam cylinders, one on each side of the engine, with the driving-wheels, on one axle. From this early locomotive the two modern types, differentiated by the position of the cylinder, have been developed. In the inside cylinder locomotive the cylinder is situated within the framing, under the boiler, with the main driving-axle cranked at two points to receive the power from the two cylinders; while in the outside cylinder locomotive the cylinder is external to the framing and connected, not to the axle, but to the crank-pins fixed between the spokes of the wheels in connection with the nave. Another point of advance on the early locomotive is in the number of the wheels. These now vary from six to twelve, and in some locomotives, where heavy loads are drawn on inclines, a greater tractive power is secured by coupling three or even four wheels together upon one side. The principle of the expansion of steam in high-pressure and low-pressure cylinders has also been adopted, in order to save fuel, in some recent locomotives. The express passenger engine of the modern type now forms a striking contrast to the engine of the "Rocket;" it weighs nearly 50 tons in working order, and with the loaded tender, about 80 tons gross; its cylinders are from 17 to 19 inches in diameter, with a stroke of about 26 inches; the driving-wheels are from 7 to 8 feet in diameter; and the speed attained, about 54 miles per hour. The modern freight engine is capable of drawing a train weighing 672 tons up an incline of 1 in 178, this being equivalent to a gross weight, including engine and tender, of 1816 tons on a level. The earliest form of marine engine seems to have been devised by Patrick Miller of Dalswinton, and constructed in Edinburgh (1788) by William Symington. Its cylinders were 4 inches in diameter, and it was able to drive a pleasure-boat 25 feet long, with two central paddle-wheels, at a speed of 5 miles an hour. Subsequently Symington constructed (1801) an engine on Watt's double-acting principle, and with a stern-wheel, which was used on a canal in Scotland, in a steamboat called the Charlotte Dundas. This engine was seen by Robert Fulton, who employed (1807) an English firm to build a similar engine for a steamer called the Clermont, which he afterward successfuly employed upon the Hudson river in America. In Great Britain the first passenger steam vessel was the Comet built (1812) at Port-Glasgow by John Wood to the order of Henry Bell, who employed it to ply between Glasgow and Greenock. The Comet, which had side paddle-wheels and was about 42 feet long and 11 feet wide, was driven by a kind of inverted beam-engine, with a single vertical cylinder, developing four or five horse-power. These early marine engines were constructed in a manner similar to Watt's land engine, but the position of the beam so high above the deck was soon recognized as a defect, especially in sea going steamers. Instead, therefore, of a beam placed above the cylinder and piston, two beams or levers were placed below, one on each side of the engine, and the connecting-rod conveyed the power to the crank upward instead of downward. This design, however, was soon afterward discarded in favor of an arrangement by which the cylinder was placed beneath and connected directly with the crank. A further improvement was secured by an oscillating cylinder, which moved right and left with the swing of the crank and enabled the piston-rods to be connected directly with the cranks. When the paddle-wheel was superseded by the screw-propeller a totally different type of marine engine was required. In this case the cylinder was inverted and placed above the shaft of the screw near the deck, and the connection with the crank was formed by means of an ordinary connecting-rod. In ships-of-war a horizontal direct-acting engine was adopted in order to keep the machinery below the water-line and out of danger from the enemy's guns. This took various forms, such as Penn's trunk-engine, where compactness was obtained by securing the connecting-rod directly to the piston and using the piston-rod as a hollow trunk within which the connecting-rod could oscillate freely; and the engine designed by Maudsley, in which two piston-rods proceed from each piston, and the connecting-rod is reversed so as to embrace the crank on the screw-shaft, near which the cylinder is placed. Recently, however, there is a tendency in war-ships to adopt the inverted vertical direct-acting engine as used in nearly all the large ocean steamers. These engines were commonly constructed with a two-cylinder compound arrangement, but this has been rapidly superseded by a three-crank triple-expansion engine first designed in 1874 by Mr. A. C. Kirk. This form of marine steam-engine has been found to effect a considerable saving in fuel, and the principle of expanding the steam has even been used in a four-cylinder quadruple-expansion engine with success.

STEAM-GAUGE. See Gauge.

STEAM-HAMMER, a machine employed in making large iron and steel forgings, and consisting usually of a steam-cylinder and piston with a metal striker placed vertically over an anvil. In the hammer invented by James Nasmyth about 1839, and patented in 1842, the first steam-hammer to come into practical use, the cylinder is fixed, and the hammer-head attached to the lower end of the piston-rod delivers its blows by the direct action of the steam in the cylinder. In operation the steam is introduced into the cylinder imme-

diately below the piston, and it raises the hammer between the guides to the required height. The steam being then cut off, and the exhaust-valve opened, the hammer descends with a velocity augmented by the compression of the air above the piston. As an improvement steam pressure is now also applied above the piston to increase the downward stroke of the hammer. By means of the valves and valve gearing the person in charge of the machine has complete control over the slightest movement of the hammer. In Condie's steam-hammer the piston-rod is attached to the top of the hammer frame,



Condie's steam-hammer.

and the cylinder is movable; the hammer head is attached to and falls with the cylinder, which thereby adds an additional weight to the blow. In the duplex steam-hammer patented by Ramsbottom the anvil is discarded, and two hammer-heads of equal weight deliver their blows upon the forging horizontally. From the increased size of gun forgings the steam-hammer has now attained enormous proportions, one erected by Krupp at Essen in 1888 being 150 tons. There is a probability, however, that steam will be superseded by hydraulic or pneumatic power in the largest hammers.

STEAM NAVIGATION, the navigation of ships in which steam is the sole or main propelling power. As early as 1736 Jonathan Hulls in England patented a method of propelling a vessel by steam by means of a stern wheel. In America James Rumsey and also John Fitch succeeded in 1786 in constructing each a vessel that was actually driven by steam; but the real precursor of the paddle-wheel steamer was constructed in 1788 by a Scottish landed proprietor, Patrick Miller of Dalswinton, on Dalswinton Loch, Dumfriesshire. This vessel, which was a double or twin boat, measured 25 feet in length by 7 feet in breadth, and was fitted with two paddle-wheels, one before and the other behind the engine. The mechanical part was constructed in Edinburgh under the superintendence of William Symington, and the speed attained was about 5 miles an hour. The following year a larger boat was built on the same principle and successfully tried on the Forth and Clyde canal. In 1801 Lord Dundas employed Symington to construct a steamboat for use upon the Forth and Clyde canal. This vessel, which was launched in 1802 and named the Charlotte Dundas, had one paddle-wheel near the stern, and was driven by a direct-acting horizontal engine with a connecting-rod and crank. It was seen by Robert Fulton, an American engineer, who employed (1807) the English firm of Boulton and Watt to construct an engine upon the same principle, and this he fitted into a steamer called the Clermont, 130 feet long, which plied successfully upon the Hudson river. A number of steam-vessels were soon after plying on American waters. In 1819 the Savannah made the voyage to Liverpool from America in twenty-six days, its capacity as a sailing vessel being partly aided by steam. It was not until 1838, however, that regular steamboat communication was established across the Atlantic. In that year the Sirius steamed from London to New York in seventeen days; and a few months afterward the Great Western made the voyage from Bristol to New York in fifteen days. These were all paddle-steamers, and that type of vessel culminated in the Scotia (1861) of the Cunard line, which made the passage to New York in nine days. The measurements of this vessel were: length 366 feet, breadth 47 feet 6 inches; cylinder diameter 100 inches with a stroke of 12 feet, and the engines were of the side-lever type. Meanwhile various experiments were made with the screw propeller (which see). The first steamer in Great Britain fitted with a screw was the Archimedes (1839), built on the Thames; the first screw-ship in the British navy was the Dwarf (1843) and the first iron screw-steamer was the Fire Queen (1845), built at Glasgow. The modern type of ocean steamer is built of steel, and is represented by such vessels as the Kaiser Wilhelm der Grosse and the Lusitania, which make the voyage to America in less than five days. These are twin-screw vessels over 750 feet long, 88 broad, and have a displacement of 45,000 tons. See Ship.

STEAM-PLOUGH. See Plough.

STEAM SHOVEL, the steam shovel was invented by an American named Otis, in 1840. It consists of a frame mounted on wheels to form a base to which the working parts are attached. The digging mechanism consists of a crane hinged to a mast at the front of the car and a dipper handle and dipper carried by the crane. The operating machinery consists of a main engine, which hoists the dipper and swings the crane, and of a thrusting mechanism for forcing the dipper into the earth. For digging blasted rock the front edge or lip of the dipper has steel teeth. The excavating capacity of steam shovels varies from 2400 cubic yards of sand to 600 cubic yards of loose rock per ten hours, with a 2½ cubic yard dipper.

STEAM-WHISTLE, an arrangement connected with the boiler of a steam-engine for the purpose of making a loud whistling sound. In the locomotive steam-whistle a tube, fixed to the head of the boiler and opening into its interior, is commanded by a stop-cock, the tube ends in a portion perforated with holes and surrounded by a thin brass cup; and the tube and cup are so adjusted as to leave a narrow opening all round. Above this opening a thin brass cup is fixed in an inverted position so as to present a sharp edge to the orifice. When the stop-cock is opened the steam rushes through this orifice with great violence, and in coming in contact with the sharp edge of the cup it produces a loud shrill sound. Steam-whistles can be made to give off musical tones by graduating the length of the pipe or cup.

STEAM-WINCH, a form of hoisting apparatus in which rotatory motion is imparted to the winding axle of the winch from the piston-rod of a steam-engine, either directly or indirectly.

STEARIC ACID is one of the most important and abundant of the fatty acids. As stearine it exists, in combination with glycerine, in beef and mutton fat, and in several vegetable fats. Stearic acid, which is inodorous, tasteless, insoluble in water but soluble in alcohol, forms white scaly crystals, and combines with alkalies, earths, and metallic oxides to form stearates. It burns like wax, and is used in making candles.

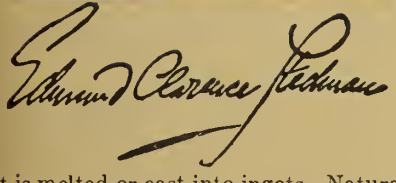
STEARINE, Stearin (stē'a-rin), the chief ingredient of suet and tallow, or the harder ingredient of animal fats, oleine being the softer one. It is obtained from mutton suet by repeated solution in ether and crystallization. It may also be obtained by pressing tallow between hot plates, and afterward dissolving in hot ether, which on cooling deposits the stearine. It has a pearly luster, is soft to the touch, but not greasy. It is insoluble in water, but soluble in hot alcohol and ether. When treated with superheated steam it is separated into stearic acid and glycerine, and when boiled with alkalies is saponified, that is, the stearic acid combines with the alkali, forming soap, and glycerine is separated. When melted it resembles wax.

STEDMAN, Edmund Clarence, American poet, was born in 1833 at Hartford, Conn. His chief volumes of verse are: Poems, Lyrical and Idyllic, Hawthorne and Other Poems, Lyrics and Idylls, and Poems Now First Collected. His prose works include The Victorian Poets and The Poets of America, and The Nature and Elements of Poetry. These volumes of critical writing he supplemented by A Victorian Anthology and an American Anthology. He was also editor, with Ellen M. Hutchinson, of A Library of American Literature, and, with George E. Woodberry of the Works of Edgar Allan Poe. He died in 1908.

STE'ATITE, or **SOAPSTONE,** a subspecies of rhomboidal mica. It is of two kinds, the common and the pagodite or lardstone. It is a compact stone, white, green of all shades, gray, brown or marbled, and is soapy or unctuous to the touch. It is used in the manufacture of porcelain, in polishing marble, in diminishing friction in machinery, and as the basis of rouge and other cosmetic powders.

STEEL, is the term applied to metallic iron when combined with carbon; but as

the proportion of carbon can be graded continuously from wrought-iron, which contains almost no carbon, up to cast-iron, which may contain as much as 10 per cent, the position of steel lying between these is necessarily indefinite. Besides the essential elements of iron and carbon steel may also contain small quantities of silicon, phosphorus, manganese, and sulphur. In steel used for ordinary purposes the carbon amounts from about 0.5 to 1.5 per cent; the toughness, tenacity, and hardness being increased with the increase of the carbon, while the elasticity decreases with the increase of hardness. In a red-hot condition steel can be welded almost as easily as bar-iron. It is a bright grayish white in color, the texture is granular, and in specific gravity it varies from 7.62 to 7.81. In commerce it takes various names: as when it is called blister-steel from its surface acquiring that character in the process of cementation, shear-steel when blister-steel is rolled or beaten into bars, and cast-steel when



it is melted or cast into ingots. Natural or German steel is an inferior steel procured from cast-iron or obtained at once from the ore. When it is produced from cast-iron in the refining-house it is called furnace steel, and when it has undergone the refining process only once it is known as rough steel. The value of steel depends greatly on the readiness with which it can be tempered. It is found that the higher the temperature to which steel is raised and the more sudden the cooling the greater is the hardness; hence any degree of hardness can be given to steel by applying the necessary conditions of heat and cold. The color of steel varies according to the degree of hardness to which it is tempered, and these colors at one time served to guide the workmen in tempering, but now a thermometer, with a bath of mercury or oil is used. In producing steel various methods have been employed in order to obtain (either by extraction or addition) a metal with the required amount of carbon. Among these may be mentioned (1) The direct reduction of iron ores. In this process the iron ore is mixed with charcoal and heated until metallic iron is produced, after which more charcoal is added and the material further heated until steel is produced. The disadvantage of this process is that it yields an irregular mixture of steel and iron. (2) The adding of carbon to malleable iron. In this process, which is usually called cementation, the bars of iron are placed in fire-brick chambers between layers of charcoal, and there subjected to heat from a furnace underneath. The fire is usually maintained for six or eight days, and the degree of heat to which it is raised depends upon the degree of carbonization required. When the bars, now become steel by the addition of carbon, are withdrawn they are brittle and covered with blisters. (3) The Bessemer process. In this method, which was adopted by Mr. Bessemer in 1856, the carbon is first removed from the pig-iron by blowing a stream of compressed air through the metal when in a molten condition. When this is accomplished the exact amount of carbon required is afterward added in the form of spiegeleisen, or some other variety of iron rich in carbon. Briefly, the process is conducted as follows:—The charge of molten pig-iron is run from the furnace into the converter. This latter is a vessel shaped like a bottle with the neck slightly bent sideways, formed of boiler-plate, and lined internally with a compact kind of sandstone called "ganister." The converter is then swung back into a vertical position, and in doing this the air-blast is automatically turned on. In a few minutes the carbon is all blown out of the metal, the blast is shut off, a quantity of molten spiegeleisen is run in, and then the whole contents of the converter is poured out into the casting ladle. (4) In the Heaton process the object desired is to oxidize the sulphur and phosphorus found in cast-iron and remove them in the slag. To produce this result nitrate of soda is placed at the bottom of an iron vessel and covered with a perforated iron plate. When the molten cast-iron is run in the iron plate becomes melted, and the chemical action set up by the nitrate of soda underneath destroys the silicon and removes a large part of the phosphorus. (5) In the Siemens-Martin process it is sought to decarbonize pig-iron by mixing it with malleable iron. Thus the pig-iron is run off into a furnace heated to a very high temperature by gas from a Siemens' regenerative gas furnace. Then molten wrought-iron in small quantities is added until the decarbonization of the pig-iron is complete. When this is accomplished a fresh quantity of pig-iron is added to supply the exact amount of carbon required. The whole mass is then heated for a short time until ready to be run off into ingot moulds. In the more modern "Siemens" process a much larger relative quantity of pig-iron is employed, and although scrap-iron is generally worked in the process can be completed without it. (6) In the "basic" process, known also as the Thomas-Gilchrist process, it is sought to remove the phosphorus from such highly phosphoretic ores as those found in the Cleveland district. To effect this the ordinary Bessemer converter is lined with a mixture of magnesian lime, silica, alumina, and oxide of iron, a quantity of the latter being also added to the charge when the blast is in progress. This lining supplies a base, in combination with which the phosphorus in the molten metal becomes oxidized and converted into phosphates. As a result of the many improved methods of manufacture the cost of steel has been considerably reduced, and it is now rapidly displacing wrought-iron in almost all the uses to which it was applied. Its employment in the making of various kinds of instruments, edge-tools, springs, etc., is well known, but it is now extensively used in the manufacture of plates and rails, and is rapidly superseding iron in the building of ships and in the tall buildings in the larger cities, called sky scrapers, it has entirely replaced all other materials.

STEEL ENGRAVING. See Engraving.

STEELTON, a town in Dauphin co., Pa., on the Susquehanna river, the Pennsylvania canal, and the Penn. and the Phila. and Reading railways; 3 miles e of Harrisburg, the state capital. It contains the great plant of the Pennsylvania Steel Company, comprising blast furnaces, rail and blooming mills, and bridge and construction works. Pop. 14,186.

STEERING APPARATUS, the contrivance by which a vessel is steered, usually composed of three parts, viz.: the rudder, the tiller, and the wheel, except in small vessels, where the wheel is unnecessary. The rudder or helm is a long and flat piece or frame suspended edgewise down the hind part of a ship's stern-post, where it turns upon a kind of hinge to the right or left, serving to direct the course of a vessel, as the tail of a fish guides the body. The tiller is a bar of timber or iron, fixed horizontally to the upper end of the rudder and projecting within the vessel. The movements of the tiller are effected in small vessels by hand, assisted by a sort of tackle called the tiller-rope. In larger vessels there are properly speaking two ropes, or more commonly chains, which being wound about the axis or barrel of a wheel, act upon the tiller with the powers of a windlass. In the enormous modern vessels a ponderous system of braces and tackle became necessary to assist the working of the wheel. This was remedied by the introduction of hydraulic or steam-steering apparatus, which is a device interposed between the tiller-wheel and the rudder-head. There are numerous forms of apparatus, and by many mechanical improvements in steering machinery, manual labor at the wheel is now reduced to a minimum.

STEIN (stīn), Heinrich Friedrich Karl, Baron von, German statesman, born at Nassau 1757, died 1831. He became president of the provincial chambers of Westphalia in 1796, and a minister of state in 1804. For the severity of his criticisms on the administration he was

dismissed (1807), but was recalled, with power to introduce his reforms. Accordingly he abolished serfage by edict, made military service obligatory on all classes, and rearranged the financial administrative affairs. By means of these reforms he laid the basis of Prussia' future greatness. He afterward visited St. Petersburg, and was instrumental in bringing about the coalition which crushed Napoleon.

STEINBOCK (stīn'bok), Steenbok (stān'bok), a small antelope found in South Africa. It is ashen gray on the sides, white underneath, stands about 2 feet in height, and its flesh is much esteemed. The male alone has short horns. The name is also applied in Europe to the ibex.

STEM, in botany, the axis of growth of a plant above ground. The stem may be either herbaceous or woody, solid or hollow, jointed or unjointed, branched or simple, upright or trailing, etc. In some plants the stem is so short as to scem to be wanting, the leaves and flower-stalks appearing to spring from the top of the root. There are also stems, such as the rhizome and tuber, which, being subterranean, have been mistaken for roots. See Botany.

STENOGRAPHY. See Shorthand.

STEPHEN, St., there are three saints of this name in the calendar, viz.: (1) The martyr whose death is recorded in the Acts of the Apostles, chapters vi. and vii., and whose festival is held on December 26; (2) Stephen, a pope from 253 to 257 (his day is the 2d of August); and (3) Stephen the king (Stephen I. of Hungary), a popular saint in Hungary and South Germany.

STEPHENS, Alexander H., American statesman, was born near Crawfordsville, Ga., in 1812. In 1834 he was admitted to the bar; was elected to the Georgia legislature in 1836 and to congress in 1843, where he at once assumed prominence, as a fearless advocate of the Union. In 1850 he opposed the secession movement. Mr. Stephens in 1860 made a great Union speech, and in 1861 became vice-president of the southern confederacy—both times on principle. In 1866 he delivered a strong reconstruction speech and plea for the new freedmen. From 1874 to 1882 he was a member of congress; in the latter year elected governor to Georgia. He died in 1883.

STEPHENSON (stē'vn-sun), George, engineer, was born at Wylam, near Newcastle, in 1781, and died in 1848. In his fourteenth year he became assistant to his father, who was fireman at a colliery, and in 1812 he was appointed to manage the engine at Killingworth colliery. Meanwhile he had been educating himself, chiefly in the science of mechanics, with the result that he obtained permission from Lord Ravensworth to construct a traveling engine for the colliery tramway. This he accomplished in 1814, and next year he introduced a great improvement in the shape of the steam-blast. In 1822 he succeeded in inducing the projectors of the Stockton and Darlington railway to adopt an improved locomotive. He was then employed to construct the Liverpool and Manchester railway, the directors of which accepted his locomotive called the Rocket, which at the trial trip in 1830 ran 29 miles in an hour. He was afterward identified with numerous railway undertakings, and he was also the inventor of a miner's safety-lamp.—Robert, his son, born in 1803, died 1859. He was educated at Newcastle; apprenticed to a coal-viewer at Killingworth, and attended the science

George Stephenson.

classes in Edinburgh university. Afterward he assisted his father in the survey of various railway lines; and was subsequently employed in railway undertakings both at home and abroad. His most notable engineering achievements were the construction of the high-level bridge at Newcastle-on-Tyne, the railway bridge at Berwick-on-Tweed, the tubular bridge over the Menai straits, and the Victoria tubular bridge over the St. Lawrence in Canada.

STEPPES, a Russian name applied to those extensive plains which, with the occasional occurrence of low ranges of hills, stretch from the Dnieper across the southeast of European Russia, round the shores of the Caspian and Aral seas, between the Altai and Ural chains, and occupy a considerable part of Siberia. In spring they are covered with verdure, but for most of the year they are dry and barren

STERCULIA'CEÆ, a natural order of polypetalous exogens, allied to Malvaceæ. The plants of this order are trees

Sterculia chicha.

or shrubs, with alternate, stipulate, simple, and often toothed leaves, with a variable inflorescence. They are natives of tropical and sub-tropical regions. The most important member of the order is the cacao-tree; others are the kola tree, the baobab, the durian, and the silk-cotton tree. The species here illustrated, a native of South and Central America, yields edible seeds as large as a pigeon's egg.

STEREOSCOPE, an optical apparatus which enables us to look at one and the same time upon two photographic pictures nearly the same, but taken under a small difference of angular view, each eye looking upon one picture only; and thus, as in ordinary vision, two images are conveyed to the brain which unite into one, the objects being thus represented under a high degree of relief. A reflecting form of stereoscope was invented by Wheatstone in 1838. Subsequently Brewster invented the refracting stereoscope, based on the refractive properties of the halves of double-convex lenses. This is the one now in general use. There are many forms of it, but it is generally a kind of small box furnished with two tubes containing each the half of a lens through which the eyes look upon the two pictures at the back of the box. When the tubes are adjusted to suit the eye the observer takes the one picture into the right eye and the other into the left eye, but the perceptive faculty apprehends only one image, and that in bold substantial relief and intensity.

STEREOTYPING, the art of reproducing a form of type in one solid plate. The first stereotyping printing in our country was done in 1775 by Benjamin Mecom, nephew of Dr. Franklin, of Philadelphia. He cast a number of pages of the New Testament. In 1829 a Frenchman, named Gerroux, made plates with the use of a long-fibered paper. This was called the papier-mâché process, and as it was much cheaper and more rapid it came into general use. It is to the invention of this process that we owe, indirectly, the rapid newspaper printing presses of today. After a form has been locked up, it is sent to the foundry, where it is brushed clean with a soft brush dipped in oil. Several sheets of damp paper pasted together are then placed on top of the type and beaten into it with a stiff brush. It is then covered with a blanket and placed in a steam-heated press, like a letter-copying press. Here under pressure, the paper is dried out until it becomes hard. It is then removed from the form, placed in a casting box and the metal poured onto the paper matrix. When the metal is cool it is taken out and finished. In a newspaper office, the casting box is circular in form and corresponds with the diameter of the cylinder of the press upon which the stereotype, when finished, is fastened. The work is done with such rapidity that it is not uncommon to place a plate upon the press in five minutes after the form has been locked up. If the paper matrix has not been torn it can be used a number of times. Stereotypes have been largely superseded by electrotypes, which see.

STERNE, Laurence, an English humorist, was born at Clonmel, Ireland, in 1713; died in London in 1768. In 1759 appeared the two first volumes of his longest work, The Life and Opinions

of Tristram Shandy, which, by their humor, whimsicality, and happy audacity of tone and treatment, gained instant popularity. His other writings are A Sentimental Journey through France and Italy (1768), and a number of sermons, besides letters published after his death. Though disfigured by indecency Sterne's Tristram Shandy and Sentimental Journey, especially the former, contain some of the finest humor in English literature.

STETH'OSCOPE, an instrument used by medical men for distinguishing sounds within the thorax and other cavities of the body. In its simplest form it consists of a hollow wooden cylinder with one extremity funnel-shaped, the other with a comparatively large circular ivory plate. In using it the funnel-shaped extremity is placed upon the body of the patient, and the ivory plate to the ear of the listener, this broad plate helping to exclude foreign sounds. Flexible instruments of rubber are also used, one of these having two tubes attached to the piece which receives the sounds, these being thus conveyed to both ears simultaneously.

STETTIN', capital of Pomerania and the chief seaport in Prussia, situated on the Oder 17 miles from its entrance into the Stettiner Haff, 30 miles from the Baltic sea, and about 90 miles by rail from Berlin. Pop. 210,680.

STEUBEN (stū'ben), Friedrich Wilhelm von, Baron, German-American soldier, was born at Madgeburg, Prussia in 1730. He fought in the Seven Years' war, at the close of which he was appointed grand marshal of the Prince of Hohenzollern-Hechingen. In 1777 he came to America and immediately offered his services as a volunteer to congress. In May, 1778, he was oppointed instructor-general of the Continental army. He reorganized the army introducing order and system, and enormously increased the general efficiency of the army In 1780 he prepared a manual for the army entitled Regulations for the Order and Discipline of the Troops of the United States, which came into general use. After the war he received grants of land from several states, and congress voted him a pension of $2,400. He died in 1794.

STEUBENVILLE, a city in Ohio, on the west bank of the Ohio river, 68 miles below Pittsburg. It has woolen factories, blast-furnaces, rolling-mills, machine-shops, breweries, and there are rich mines of bituminous coal in the neighborhood. Pop. 15,944

STEVENS, Edwin Augustus, American inventor, was born at Hoboken, N. J., in 1795. He invented the "air-tight fire room" and its application to vessels, and devoted years to the study of plans formulated with a view to perfect improvements in naval warfare. The Naugatuck, one of the first ships to attack the Merrimac, was presented to the government by Mr. Stevens; the Stevens battery he donated to New Jersey, and directed in his will that a fund of $1,000,000 should be set apart for its completion. He also founded the Stevens institute at Hoboken, and provided liberally for its support. His death occurred in Paris, France, August, 1868.

STE'VENS POINT, the county seat of Portage county, Wis., 150 miles northwest of Milwaukee, on the Wisconsin river, and on the Wisconsin Central railroad. Pop. 11,575.

STEVENS, Thaddeus, American statesman, was born at Danville, Vt., in 1792. In 1814 he removed to Pennsylvania. In 1833 he became a member of the state legislature. In 1836 he was a delegate to the state constitutional convention. In 1849 he was elected to the United States congress. In 1859 he was again elected to congress, and from then until his death was the recognized leader of the house of representatives. He died in 1868.

STEVENSON, Adlai E., American statesman, was born in 1835 in Christian co., Ky. In 1874 and 1878 he was elected member of congress from Illinois by the democratic party. In 1885 he was appointed first assistant postmaster general, and in 1892 was elected vice-president of the United States. He was nominated for vice-president in 1900 by the democrats, but was defeated.

STEVENSON, Robert Louis, was born at Edinburgh in 1845; educated in the university there; was called to the Scottish bar, but devoted himself to literature, and latterly took up his residence in Samoa, where he died in 1894. His works include: An Inland Voyage, Travels with a Donkey in the Cevennes, Virginibus Puerisque, New Arabian Knights, Treasure Island, Dr Jekyll and Mr. Hyde, Prince Otto, Kidnapped, The Black Arrow, The Master of Ballantrae, David Balfour, Catriona, Weir of Hermiston (left incomplete), St. Ives, The Merry Men and Other Tales, a Child's Garden of Verses, besides poems

STEWART, Alexander Turney, Irish-American merchant, was born at Lisburn, near Belfast, Ireland, in 1803. In 1823 he emigrated to America, settling in New York City, and in 1825 he established himself in the dry-goods business. In 1848 he built the largest dry-goods store in the world. At the time of his death the business of A. T. Stewart & Co. comprised branches and agencies in the principal cities of Europe, and several mills and factories in the United States. He died in 1876.

STICKING PLASTER. See Court-Plaster.

STIGMA, in botany, the upper extremity of the style, and the part which in impregnation receives the pollen.

Section of flower. *s*, Stigma.

It is composed of cellular tissue, has its surface destitute of true epidermis, and is usually moist. In many plants there is only one stigma, while in others there are two, three, five, or many, the number of stigmas being determined by that of the styles.

STILL. See Distillation.

STILL'WATER, the county seat of Washington co., Minn., 18 miles northeast of St. Paul; on the St. Croix river and lake, and on the Chicago, Milwaukee and St. Paul, the Chicago, St. Paul, Minneapolis and Omaha, and the Northern Pacific railroads. Pop. 14,715.

STILT-BIRD, Stilt-plover, a wading bird, having remarkably long slender legs, a feature from which it derives its common name. The stilt-bird of Great

Stilt-plover.

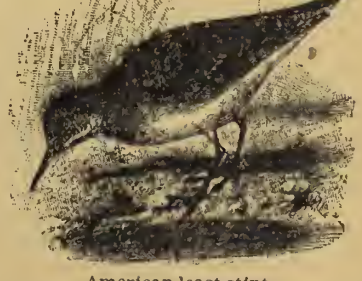
Britain has a long straight bill, very long wings for its size, and the legs, which are of a red color, measure from 18 to 20 inches.

STIMULANTS, in medicine, agents which produce a quickly diffused and transient increase of vital engery in the organism or some part of it. Stimulants are of two classes: the one comprises certain medicinal substances; the other warmth, cold, electricity, galvanism and mental agents such as music, joy, hope, etc. In the first class ammonia, alcohol, and sulphuric ether are commonly employed as stimulants. Stimulants have also been divided into general and topical, according as they affect the whole system or a particular part.

STING, a sharp-pointed weapon or instrument with which certain insects, bees and wasps in particular, are armed by nature for their defense. In most instances this instrument is a tube, through which a poisonous matter is discharged, which inflames the flesh, and in some instances proves fatal to life.

STING-RAY, a fish which is allied to that of the rays proper. It is remarkable for its long, flexible, whip-like tail, which is armed with a projecting bony spine, very sharp at the point, and furnished along both edges with sharp cutting teeth. One species is common on the eastern coasts of North America. These fishes sometimes inflict serious wounds with their tail.

STINT, a grallatorial bird, a species of



American least stint.

sandpiper. Temminck's stint is the smallest species of the British sand-

pipers, length 5½ inches. It inhabits the edges of lakes and inland rivers, and is said to breed in North Europe.

STIP'ULE, in botany, a small leaf-like appendage to a leaf, commonly situated at the base of the petiole in pairs, one on each side, and either adhering to it or standing separate. They are usually of a more delicate texture

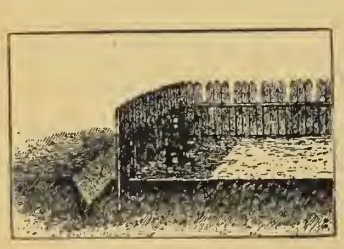
s s, Leaf with stipules.

than the leaf, but vary in this respect as well as in form and color They are not found in all plants, but where they occur they frequently characterize a whole family, as in Leguminosæ, Rosaceæ, Malvaceæ, etc.

STIRLING, a royal and parliamentary burgh of Scotland, capital of the county of the same name, situated on a height overlooking the winding course of the river Forth, and 36 miles n.w. from Edinburgh. Pop. 18,403.—The county of Stirling consists of a main portion and two detached areas included in Perthshire and Clackmannanshire; greatest length about 46 miles; greatest breadth about 20 miles; area, 286,338. acres. Pop. 142,291.

STOAT. See Ermine.

STOCKADE', in fortification, a fence or barrier constructed by planting upright in the ground trunks of trees or



Stockade.

rough piles of timber so as to inclose an area which is to be defended.

STOCKHOLM, the capital of Sweden, beautifully and picturesquely situated between Lake Mälar and the Baltic, 330 miles northeast of Copenhagen. The chief public building is the royal palace, a fine edifice in the Italian style, other noteworthy edifices are the National library, National museum, Academy of Arts and Sciences, parliament-house, etc. The educational institutions include a medical college, a technological institute, navigation school, school of design, etc. It is besides a place of considerable trade, and has manufactures of woolen, linen, cotton, silk, porcelain, glass, tobacco, iron castings, etc. Stockholm was founded about 1260. Pop. 302,462.

STOCK-JOBBING, the practice of dealing in stocks or shares, especially by persons who buy and sell on the stock exchange on their own account and not for clients, as do the stock-brokers properly so-called. The transactions carried out are often entirely of a gambling nature, and the jobber may neither have stock of his own to buy nor to sell. This business is now carried on to an amazing extent, and is of this character: A. agrees to sell B. $50,000 of bank stock, for instance, to be transferred in twenty days, for $60,500. Now if the price of bank stock on the day appointed for transfer should be only $118 per cent, he may then purchase as much as will enable him to fulfil his bargain for $59,000, and thereby gain $1500 by the transaction. Should the price of bank stock, however, advance to $125 per cent, he will have to pay $62,500 for the necessary amount of stock and will thus lose $2,000 by completing his agreement. In effect, the stock is usually never transferred; the difference between the price of the stock on the day of delivery and the price bargained for being simply paid to one or other of the parties to the bargain. See Bulls and Bears.

STOCKPORT, a parl., mun., and county borough of England, partly in Cheshire and party in Lancashire, 5 miles southeast of Manchester, on the Mersey. Pop. 92,832.

STOCKS, an apparatus formerly used for the punishment of petty offenders, as vagrants, trespassers, and the like.

Prisoners in the stocks.

It usually consisted of a frame of timber with holes in which the ankles, and sometimes both the ankles and wrists, of the offenders were confined.

STOCKTON, Frank Richard, American author, born at Philadelphia, 1834; attained much popularity by his short stories, which are very numerous, among the best known being the Rudder Grange stories, The Lady or the Tiger? The Ting-a-ling Stories, etc. He also wrote several novels, and stories for children. He died in 1902.

STODDARD, Richard Henry, American poet, critic, and journalist, was born at Hingham, Mass., in 1825. Among his numerous publications are: the juvenile Adventures in Fairyland, Songs of Summer, The King's Bell, a poem; Abraham Lincoln, a commemoration ode; The Lion's Cub and Other Poems, and Under the Evening Lamp. Stoddard also edited several anthologies, among them Melodies and Madrigals, Poets and Poetry of America, and Female Poets of America. He died in 1903.

STOICS, a sect of philosophers which flourished first in Greece and subsequently in Rome, so called from the porch or Stoa, at Athens, where Zeno, its founder, taught. It was about B.C. 308, fourteen years after the death of Aristotle and thirty-nine years after the death of Plato, that Zeno laid the foundation of the new school. The Stoics are proverbially known for the austerity of their ethical doctrines, which, indeed, quite overshadowed all the rest of their philosophy. With Zeno and his disciples the system appears to have been an attempt to reconcile a theological pantheism and a materialist psychology with a logic which seeks the foundations of knowledge in the representations or perceptions of the senses, and a morality which claims as its first principle the absolute freedom of the human will. Transferred to the Roman world, this philosophy became a practical rule of life. To Epictetus and the Stoics of the later empire the supreme end of life, or the highest good, is virtue, that is, a life conformed to nature, the agreement of human conduct with the all-controlling law of nature, or of the human with the divine will; not contemplation, but action, is the supreme problem for man; virtue is sufficient for happiness, but happiness or pleasure should never be made the end of human endeavor. The great struggle of Stoical morality is to subdue all emotion, which in itself is contrary to nature, entirely without utility, and productive only of evil. The wise man alone attains to the complete performance of his duty; he is without passion, although not without feeling; he is not indulgent, but just toward himself and others; he alone is free, having entirely subdued his passions, which are the great barrier to liberty; he is king and lord, and is inferior in inner worth to no other rational being, not even to Zeus himself.

STOKE-UPON-TRENT, a market town and parliamentary borough of England, in Staffordshire. Its extensive manufactures of china and earthenware make it the center of the "Potteries" district. Pop. 89,023.

STOLA, a garment worn by the Roman women over the tunic. It came as low as the ankles or feet, was fastened round the body by a girdle, leaving

Roman matron attired in the stola.

broad folds above the breast, and had a flounce sewed to the bottom. It was the characteristic dress of the Roman matrons, as the toga was of the men.

STOMACH, The, the principal organ of digestion in animals, may be regarded

simply as an expanded portion of the alimentary canal. The human stomach is of an irregularly conical or pear-shaped form; it is situated in the epigastric region, lying almost transversely across the upper and left portion of the abdominal cavity, below the liver and midriff and close to the front wall of the abdomen. Its largest extremity is directed to the left, its smaller to the right. Its upper opening, where the œsophagus terminates, is called the cardiac orifice, because of its closeness to the heart; and the lower opening, where the intestine begins, the pylōrus, the portion of the intestine which joins it here being the duodenum. At the entrance to the latter is a valve which prevents the contents of the intestine from regurgitating backward. The stomach is composed of four coats or layers, the outermost, or serous layer, forming part of the peritoneum or general lining membrane of the abdomen. Next is a muscular coat, then an intermediate or cellular, and lastly, an inner or mucous coat in which are the orifices of the glands for the secretion of the gastric juice. By its blood-vessels the stomach is intimately connected with the liver and spleen. Its nerves are very numerous, and come from the eighth pair and the sympathetic nerve. By these it is brought into close relationship with the heart, lungs, etc. The stomach owes its digestive powers chiefly to the gastric juice, an acid liquid containing a fermentive principle called pepsin that converts albuminous foods into peptones capable of absorption. Digestion is also aided by certain stomachic movements by which the gastric juice is mixed with the food. (See Digestion.) The stomach is subject to various diseases. Acute gastric catarrh, in which the mucous membrane becomes congested, may be constitutional; but more probably it arises from errors in diet, excess of alcohol, sudden changes of temperature, etc. In chronic gastric catarrh the congestion becomes permanent, and the symptoms are such as appear in an aggravated form of dyspepsia. Ulceration of the stomach is a disease of middle life, and seems to occur most commonly among women. The ulcer is at first limited to the inner coat of the stomach, but if not healed it will strike more deeply and probably penetrate the walls of the stomach. In a case where the stomach adheres, at the seat of the ulcer, to some other organ, actual perforation may be prevented; in which case peritonitis, which is speedily fatal, is not likely to arise. The symptoms of this disease are chiefly pain, vomiting, especially vomiting of blood, and general dyspeptic symptoms. Cancer of the stomach is not uncommon, though it seldom occurs before the age of forty. Its symptoms are not easily to be decided even by a skilful physician. In mammals there are three kinds of stomachs, simple, complex, and compound. In the simple it consists of a single cavity, as in man and the carnivora, etc. This is the most common form. The complex has two or more compartments communicating with each other, with no marked difference of structure, as in the kangaroo, squirrel, porcupine, etc. The cetacea have from five to seven such compartments. The compound stomach is peculiar to the ruminants (which see). In animals of the lowest type there is no distinct stomach cavity at all; and even in those more highly organized it is often extremely simple.

STOMACH-PUMP, a small pump or syringe used in medical practice, for the purpose of emptying the stomach and introducing cleansing or other liquids. It resembles the common syringe, except that it has two apertures near the end, instead of one, in which the valves open different ways, so as to constitute a sucking and a forcing passage When the object is to be extracted from the stomach, the pump is worked while its sucking orifice is in connection with a flexible tube passed into the stomach; and the extracted matter escapes by the forcing orifice. When it is desired, on the contrary, to throw cleansing water or other liquid into the stomach, the tube is connected with the forcing orifice, by which the action of the pump is reversed.

STONE, a hard concretion of some species of earth, as lime, silex, clay, and the like; also, the material obtained by quarrying rocks. The principal component parts of stones are silex, alumina, zirconia, glucina, lime, and magnesia; sometimes the oxides of iron, manganese, nickel, chromium, and copper are also found to enter into their composition. Stones are of various degrees of hardness and weight; they are brittle and fusible, but not malleable, ductile, or soluble in water. Stones are of extensive use for a great variety of purposes—for building, paving, grinding, ornamental purposes, etc. The stones of public buildings are liable to decay from chemical decomposition and mechanical disintegration. To prevent this decay oils and cements have been frequently used, but they have been found to discolor the stone and require frequent renewal. A siliceous coating applied to the stone seems to be the most effectual remedy. Frederick Ransome has patented a process in which a solution of silicate of soda is first put upon the stone and afterward a solution of chloride of calcium. This process has been received with considerable favor.

STONE, a common measure of weight. The English imperial standard stone is 14 lbs. avoirdupois, but other values are in regular use, varying with the article weighed; thus, the stone of butcher's meat or fish is 8 lbs., of cheese 16 lbs., of hemp 32 lbs., of glass 5 lbs.

STONE, or **CALCULUS.** See Calculus.

Stone-plover.

STONE-PLOVER, a large species of plover. It appears in England at the latter end of April, frequents open hilly situations; makes no nest, but lays two eggs on the bare ground, and emigrates in small flocks about the end of September.

STONES, Precious. See Gems.

STONEWARE. See Pottery.

STORK, a name given to tall and stately birds, the beak being moderately cleft and destitute of a nasal furrow. The common stork is pure white, with the exception of the black quill feathers of the wings, the scapularies, and greater wing-coverts, and the red beak, legs, and toes. It is about 3 feet 6 inches in length, and when erect its head is about 4 feet from the ground. It is remarkable for its affection toward its young.

STORM. See Meteorology, Cyclone, Wind.

STORM-GLASS, a weather-glass consisting of a tube containing a chemical solution sensible to atmospheric changes. In fine weather the substances in solution are said to settle at the bottom of the tube, leaving the liquid comparatively clear; previous to a storm the substances rise, and the liquid assumes a turbid and floeculent appearance.

STORM-SIGNAL, a cone and drum used at seaports and coast-guard stations to indicate the approach of a storm. The cone exhibited alone with its apex down portends a south gale; with its apex up a north gale. The cone with the apex down and the drum over it portends dangerous winds from the south; with the apex up and the drum under dangerous winds from the north. See Weather and Storm Signals.

STORY, Joseph, LL.D., American lawyer, born 1779, died 1845. In 1808 he entered congress, in 1810 became speaker of the Massachusetts state legislature, and soon after was appointed a judge of the United States supreme court. In 1829 he became professor of law at Harvard, a position which he held for the rest of his life. His law works include a number of special treatises, commentaries, and judgments, and a collection of his miscellaneous writings was published in 1852.

STORY, William Wetmore, American sculptor, was born at Salem, Mass., in 1819. In 1848 he went to Italy, where he made his home, residing principally at Rome, and died at Vallombrosa. The list of his works as a sculptor includes monuments, statues, ideal figures, and portrait busts. In the Metropolitan museum, New York City, are the statues of Cleopatra and Semiramis; other works by him include a statue of Edward Everett, a statue of George Peabody, erected in London, and the monument of Francis Scott Keys in the Golden Gate Park, San Francisco. His published works are The American Question, Roba di Roma, Proportions of the Human Figure, Graffiti d'Italia, five volumes of his poems, and the Life and Letters of Joseph Story. He was United States commissioner on fine arts to the World's Fair at Paris (1879), and received decorations from France and Italy. He died in 1895.—His son, Julian Story, a portrait painter, received a gold medal in Berlin in 1891, was elected a member of the Society of American Artists in 1892, and won a silver medal

at the Paris exposition of 1900, and was made a chevalier Lēgion d'Honneur. Among his sitters were King Edward VII. and Emma Eames, the singer whom he married.

STOVE, an apparatus of metal, brick, or earthenware, which is heated within by a fire, generally almost excluded from sight. The heating medium may be burning wood, coal, petroleum, or gas. The simplest of all forms is the familiar Dutch stove, a hollow cylinder of iron, standing on the floor, close at top, whence a small flue or chimney proceeds, with bottom bars on which the coals, etc., rest. But as this form was found objectionable from the metal becoming overheated and the air in the apartment becoming unwholesomely dry, many kinds of improved stoves have now taken its place.

STOWE (stō), Mrs. Harriet Elizabeth, (Beecher) was born at Litchfield, Connecticut, in 1812. She wrote several tales and sketches, and contributed to the National Era, a newspaper published at Washington, the serial story of Uncle Tom's Cabin; issued this tale in book-

form in 1852, when it achieved an enormous success both in the United States and Europe. Among her other numerous writings are: Sunny Memories of Foreign Lands, Dred, a Tale of the Dismal Swamp, The Minister's Wooing, and Lady Byron Vindicated. She died in 1896.

STRABISMUS. See Squinting.

STRABO, Greek geographer, a native of Amasia, in Pontus, was born about 54 B.C., and died about 21 A.D. His earliest writings were his Historical Memoirs and a Continuation of Polybius, both of whom are now lost. His great work, however, on geography, in seventeen books, has been preserved entire, with the exception of the seventh book, of which there is only an epitome. The first two books are introductory, the next ten treat of Europe, the four following of Asia, and the last of Africa.

STRADIVA'RI, Antonio (Stradivarius), a celebrated violin-maker, who was born in Cremona, Italy, about 1649; died 1737. He was a pupil of Nicolo Amati, in whose employment he remained until 1700, when he began making on his own account. It was he who settled the typical pattern of the Cremona violin, and his instruments, for tone and finish, have never yet been excelled.

STRAFFORD, Thomas Wentworth, Earl of, an English statesman, was born in London in 1593. He sat in parliament for Yorkshire for a number of years, and when Charles I. asserted that the Commons enjoyed no rights but by royal permission, he was strongly opposed by Sir Thomas Wentworth. Archbishop Laud sent him, in 1832, to Ireland as lord-deputy. Here he greatly improved the state of the country, both as regarded law, revenue, and trade; but to accomplish his ends he did not scruple to use the strongest and most arbitrary measures. For these services he was created Earl of Strafford. When the Long Parliament met the very first movement of the party opposed to arbitrary power was to impeach Strafford of high treason. The king endeavored to secure his safety, but yielded to the advice of his counsellors, backed by a letter from Strafford himself, who urged him, for his own safety, to ratify the bill. Stafford was accordingly beheaded on Tower Hill in May, 1641.

STRAITS SETTLEMENTS, a British crown colony, deriving its name from the straits which separate the Malay peninsula from Sumatra. It consists of the island of Singapore (the seat of government); the town and province of Malacca; the island of Penang and province of Wellesley; the islands and territory of the Dindings; the Cocos or Keeling Islands as a dependency; and it has an administrative control of the native states of Perak, Selangor, Sungei Ujong, Negri Sembalan, Johore, and Pahang; area, about 35,000 sq. miles. Pop. 572,249; Feudatory states, 676,138. See Singapore, Penang, Malacca, etc.

STRANGULATION, a sudden and violent compression of the windpipe, constriction being applied directly to the neck, either around it (as in hanging) or in the forepart, so as to prevent the passage of air, and thereby suspend respiration and life. If animation is only suspended by strangulation, the methods of restoring it are much the same as in drowning.

STRAS'BURG, or **STRASSBURG,** a town and fortress of Germany, in Alsace, capital of the territory of Alsace-Lorraine, on the Ill, about 2 miles west of the Rhine, to which its glacis extends 250 miles east by south of Paris, and about 370 miles southwest of Berlin. By means of canals which unite the Ill with the Rhine, Rhone, and Marne, it is brought into communication with the Atlantic and the Mediterranean. The chief building is the cathedral, a structure which presents the architectural styles of the centuries from the 11th to the 15th, in which it was built, but whose main element is Gothic. The other notable buildings are the church of St. Thomas, the Temple-Neuf or Neukirche, the old episcopal palace, the town-house, the new university building, opened in 1884, and the new imperial palace. The old episcopal palace contains the university and town library numbering 600,000 volumes. Pop. 150,268.

STRATEGY may be defined as the art of moving troops so as to be enabled either to dispense with a battle, or to deliver one with the greatest advantage and with the most decisive results. Tactics is the art of handling troops when in actual contact with the enemy.

STRATFORD-UPON-AVON, a municipal borough and market-town of England, in Warwickshire, 100 miles by rail from London, famous as the birthplace of Shakespeare. The chief objects of interest are the house in which Shakespeare was born, and the parish church in which he was buried. Shakespeare's remains were interred in the chancel, and against the north wall are his monument and bust. There are several other churches, a town-hall, guild-hall, Shakespeare memorial theater library, and picture-gallery. Pop. 8310.

STRATUM, in geology, a layer of any deposited substance, as sand, clay, limestone, etc., which has been originally spread out over a certain surface by the action of water, or in some cases by wind, especially such a layer when forming one of a number superposed and forming a mass of rock. When strata do not lie horizontally but are inclined, they are said to dip toward some point

Unconformable strata.

of the compass, and the angle they make with the horizon is called the angle of dip or inclination. When strata protrude above the surface, or appear uncovered, they are said to crop out. They are said to be conformable when their planes are parallel, whatever their dip may be; and unconformable when there is a want of parallelism between the strata. See Geology.

STRATUS. See Cloud.

STRAUS (strous), Oscar Solomon, American diplomat, was born at Atterberg, in Rhenish Bavaria in 1850. He came to the United States in 1854, and lived in Georgia until the close of the civil war. In 1887–89 he was minister to Turkey, and was reappointed by President McKinley, remaining there till 1900. On January, 14, 1902, he was named a member of the Permanent Court of Arbitration at The Hague to fill the place left vacant by the death of ex-President Harrison. In 1907 he entered the cabinet of President Roosevelt as secretary of commerce. His published works include: The Origin of the Republican Form of Government in the United States, Roger Williams, the Pioneer of Religious Liberty, The Development of Religious Liberty in the United States, and Reform in the Consular Service.

STRAUSS (strous), David Friedrich, was born at Ludwigsburg, Würtemberg, in 1808, and died 1874. He went to

Berlin in 1831 to study under Schleiermacher and Hegel; returned to Tübingen and lectured on logic and philosophy and published in 1835 his famous Life of Jesus, in which he attempted to prove that the gospel narratives had a mythical origin and growth. His subsequent writings were: Christliche Glaubenslehre, Life of Schubert, Life of Christian Märklin, Life of Ulrich von Hutten, Leben Jesu für das Deutsche Volk (Life of Jesus for the German People), Der Christus des Glaubens und der Jesus der Geschichte (The Christ of Faith and the Jesus of History), and De ralte und der neue Glaube (The Old and the New Faith), in which he defines his final attitude to Christianity, that being now entirely hostile. His more important works have been translated into English.

STRAUSS, Johann, German composer, born 1625. He has written over 400 waltzes, many of them world-famous, the best known being The Beautiful Blue Danube Waltz, and is the author of several successful operettas. He died in 1899.

STRAWBERRY, a well-known fruit and plant. It is remarkable for the manner in which the receptacle, commonly called the fruit, increases and becomes succulent; but the true fruit is the small seeds or achenes on the surface of the receptacle. The species are perennial plants throwing out runners which take root and produce new plants; they are natives of temperate and cold climates in Europe, America, and Asia. Strawberries are much valued for dessert, and for purposes of jam-making. The strawberry thrives in any good garden soil, and is propagated by seeds, by division of the plant, and by runners.

STRAWBERRY-PEAR, a plant of the cactus family, which grows in the West

Strawberry-pear.

India islands. Its fruit is sweetish, slightly acid, pleasant, and cooling.

STRAWBERRY-TOMATO, the name of a plant of the genus Physălis, nat. order Solanaceæ, known also as winter-cherry, cultivated for its fruit, which is of a bright red color, of the size of a small cherry, and makes a delicate sweetmeat.

STRAW PLAIT, straw plaited or braided into strips or tissues of some size for making hats, bags, ornaments, etc. In the manufacture of straw hats the straw must be of a certain length between the knots and must not be brittle; and these qualities are found most frequently in the wheat grown in Tuscany, where the well-known Leghorn hats are made. When the grain is still green the straw is pulled up by the roots, dried in the sun, bleached by means of sulphureous fumes, split by a machine, and then plaited into hats.

STREATOR, (strē'tor), a city in La Salle co., Ill., 94 miles southwest of Chicago; on the Vermilion river, and on the Chicago, Burlington and Quincy, the Chicago and Alton, the Wabash, the Indiana, Illinois, and Iowa, and the Atchison, Topeka and Santa Fe railroads. Pop. 16,800.

STREETS, Pavement of. See Pavement.

STRENGTH OF MATERIALS. The strength of any material is the resistance which it opposes to alteration of form or to fracture by an application of force. Materials are subject to many forms of strains, and some are better qualified to resist strains of a certain kind than others. Stone, for example, is admirably constituted for supporting immense weights, but it would not offer much resistance to a direct pull. Wrought-iron is superior to cast-iron in resisting a pull or tensile stress, but the latter excels the former in its resistance to a thrust or compressive stress. A material is exposed to five distinct strains; a tensile or stretching strain in the direction of its fibers, as in the case of ropes, tie-beams, etc.; a transverse strain acting perpendicularly or obliquely to its length, as in levers, joists, etc.; a crushing strain by pressure, as in the case of pillars, posts, etc.; a torsional or twisting strain acting in a perpendicular direction at the extremity of a lever or otherwise, as in axles, crank-shafts, etc.; and a shearing force applied laterally, as in the case of a shearing-machine for cutting through iron plates and bars. Wrought-iron and steel offer the greatest resistance to tensile strains; the strength of wood in this direction varies according to its seasoning and specific gravity. The heavier the wood is, in general, the stronger it is. The transverse strength of beams is determined largely by their elasticity. This property varies greatly in different materials. Wood has a greater elastic range of action than iron or steel bars, and consequently sinks or deflects to a greater degree under a given weight. Any strain beyond the elastic limit entails fracture. Increased stiffness or transverse resistance of beams is rapidly obtained with an increase of depth of the beam. With the exception of wood, materials offer a greater resistance to a crushing force than to a tensile strain. Cast-iron is superior to wrought-iron in this respect, and is consequently much employed in the construction of girders and other supports. Torsional stress tries the solidity and tenacity of metals more than any other kind of stress. But the torsional strength of shafts increases very rapidly as the diameter is enlarged. The distribution of material in hollow forms conduces to the greatest strength and stiffness in combination with the minimum consumption of material. A familiar instance of the hollow construction is the stem of grasses, and especially the bamboo, while another example is that of the hollow bones of animals.

STREPSIP'TERA, a small and very peculiar and anomalous order of insects. The females are wingless, and live as parasites in the abdomens of bees, wasps, and other insects. The males have the front pair of wings in the form of twisted filaments, the posterior pair are fan-shaped and membranous. The jaws are rudimentary. The heads of the

Strepsiptera.

a, *Stylops Dalii*, male insect. *b*, Do. magnified. *c*, Anterior wings. *d*, Double antennæ.

parasitic females protrude from between the abdominal joints of their host. The strepsiptera are viviparous, and the larvæ are little caterpillars which attach themselves to the bodies of wasps and bees. The female larvæ never leave their hosts; the male larvæ undergo their metamorphosis within the bodies of their hosts, from which in due time they emerge as perfect winged males.

STREPSIRHI'NA, one of the three chief divisions into which the order Quadrumana or monkeys is sometimes arranged, represented by such forms as the aye-aye or cheiromys of Madagascar, by the lemurs, loris, etc. See Lemur, etc.

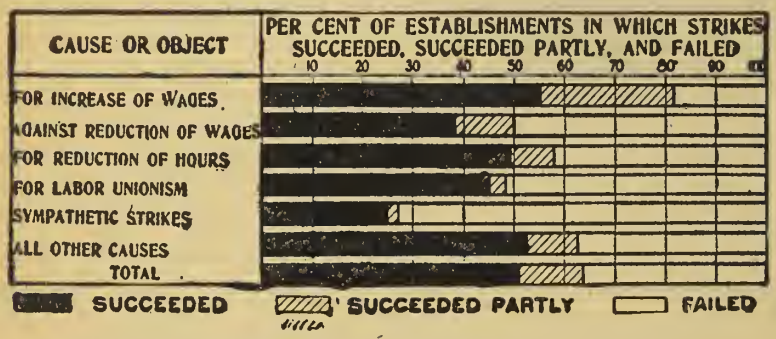
STRESS, in mechanics, a term sometimes used as equivalent to strain, at other times used as the force producing strain, the latter referring to the amount of change produced. See strain.

STRICKLAND, Agnes, an English authoress, born 1796 at Reydon Hall, near Southwold, Suffolk. She wrote, in conjunction with her sister Elizabeth, Lives of the Queens of England (twelve vols., 1840–48); Lives of the Queens of Scotland (eight vols., 1850–59). She also published Letters of Mary Queen of Scots, with an Historical Introduction and Notes; Lives of the Bachelor Kings of England; Lives of the Tudor Princesses; poems, stories, etc. She died in 1874.

STRICTURE, a contraction of a tube, duct, or orifice; for instance, of any part of the alimentary canal or of the urinary passages. This disease usually affects the urethra and is treated by dieting and dilatation of the passage by means of catheters

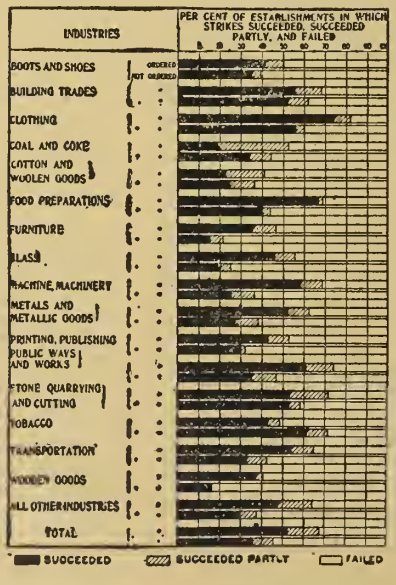
STRIKES AND LOCKOUTS, when employes cease to work to enforce a demand upon an employer it is called a strike. When the employer shuts down his establishment to compel his men to comply with a demand it is called a lockout. The first recorded strike in the United States is that of journeymen bakers of New York in 1741. The first of the great historic strikes occurred in 1877, when the employes of the Baltimore & Ohio railroad at Martinsburg refused to accept a reduction of 10 per cent in wages. In this strike not only

the state militia, but the United States troops, were called out to quell riots and disturbances. Another great strike was the one on the Pennsylvania railroad, which broke out at Pittsburg on June 27, 1877. Still another notable strike was that of the telegraphers, which occurred in 1883. This took place to secure the abolition of Sunday work without extra pay, and the "equalization of pay between the sexes for the same work." The strike lasted from July 19 to August 23, and was unsuccessful, the loss to employes being about $250,000, while they expended about $62,000 assisting destitute operators. The strikes on the Gould system in 1885 and 1886, and the Homestead strike in 1892 were important uprisings, the latter being considered the bitterest labor war ever waged in this country up to that time. It was the first labor disturbance in which Pinkerton detectives played an important part. These men were particularly objectionable to the strikers who stoned them, resisted their approach with firearms, and sprayed the boats in which they came with petroleum, intending to burn the detectives out. The Chicago strike of 1894 grew out of a demand of some Pullman employes for restoration of wages paid the previous year, but the company refused to pay the old wages on account of a reduction in the volume of business. Out of this little beginning grew a strike the cost of which amounted to about $700,000 in property destroyed and hire of United States marshals. The roads lost in earnings $5,000,000, and the employes lost more than $350,000. Workmen on railroads radiating from Chicago lost nearly $1,400,000 in wages and the loss to the country at large was estimated at many millions of dollars. Riots, intimidations, assaults, murder, arson, and burglary were some of the accompaniments of the great strike, and it took 14,186 men, police and military, to restore order. The largest strike in America was that of the anthracite coal miners, which began May 12, 1902, involving 147,500 men. It was due to the refusal of the presidents and directors of the coal operating railroads to comply with the employes' demands for an increase of 20 per cent in wages to miners paid by the ton, and a reduction of the hours of a days' labor from 10 to 8 without decrease in wages. The employers contended they could not afford the demands and also opposed any recognition of the miners' right to interfere with their business. When the price of coal became excessive because of its scarcity, President Roosevelt persuaded both sides to agree to arbitration by a board appointed by him. This commission increased the wages of the miners 10 per cent, denouncing boycotting and blacklisting. It estimated the loss due to the strike was: To mine owners, $46,100,000; to employes, $25,000,000; to transportation companies, $28,000,000; total, $99,100,000. Provision was made for arbitration. When the agreement expired March 31, 1906, the men again struck to enforce their original demands, but after being out six weeks agreed to continue the agreement until 1909. For the twenty years' period ending with the last census year, according to the United States labor bureau, the strikes of the country have cost the employe in loss of wages $257,863,478; the unions in contributions to their fellows, $16,174,793; the employers, $122,731,120. Each of the 6,105,693 employes lost $42 in wages, irrespective of the contributions of the sympathizing unions. In the lockouts instituted by the employers a still greater per capita loss came to the employes. The individual cost to the employe was $97, with $4,915 cost to each establishment imposing the lockout. The strike loss to each establishment under strike duress was only $2,194 in the twenty years. The greatest single year of loss to employes and employers was in 1894, when the sum totals were respectively $37,145,532 and $18,982,129. Considering the strike and the lockout as the force measures of the two sides to labor troubles, it is a toss up as to which is the more successfully carried to a finish. The percentage of success and failure is shown in the preceding tabulations:



Results of strikes undertaken for five leading causes in twenty years.

	Successful.	Partly Successful	Failed
Strikes	50.77	13.04	36.19
Lockouts	50.79	6.28	42.93



Results of strikes ordered by labor organizations and strikes not so ordered in twenty years.

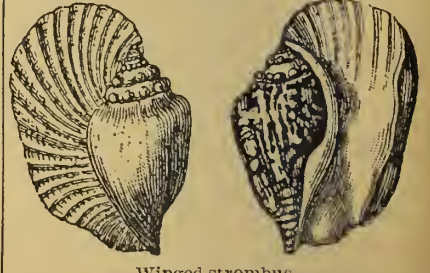
	Strikes	Lockouts
Building trades	4,440	95
Coal and coke workers	2,515	45
Metals and metal goods	2,080	130
Clothing	1,638	100
Tobacco	1,509	124
Transportation	1,265	23
Stone quarrying and cutting	856	43
Boots and Shoes	862	59
Printing and publishing	765	88
Machines and machinery	453	25

A tabulation of the causes for strikes in the order of their number is:

Increase of wages	33,731
Increased wages and reduced hours	13,201
Reduced hours	13,116
Against wage reduction	8,423
Sympathetic strikes	4,078
Against employment of non-union men	2,751
New rules and scales	2,742
Recognition of union	1,649
Increased wages and recognition of unions	1,111
Enforcing union rules	1,068
For reinstatement of discharged employes	868
Adoption of union scale	928
Against task system	917
Against reduction of wages and overtime	750
Increase of wages and Saturday half holiday	729

It requires twice as much time to prepare for a general strike as that general strike will last. A strike lasts 23.8 days; preparation for the strike of any magnitude will require sixty days before it is in effect.

STROMBUS, the name given by Linnæus to a genus of gasteropodous shells, now broken up into several genera. The aperture is much dilated, the lip expanding and produced into a groove.



Winged strombus.

In some of the shells of this genus there are spines of great length arranged round the circumference of the base, being at first tubular, and afterward solid, according to the period of growth.

STRO'PHE, the name of one of the divisions of a Greek choral ode, corresponding to the antistrŏphē. The

singing of the strophes on the stage was accompanied with a motion or turn from right to left; the singing of the antistrophe, with a contrary motion, from the left to the right.

STRYCHNINE (strik'nīn), an alkaloid existing in nux-vomica, St. Ignatius beans, and in various other plants of the genus of Strychnos. Strychnine may be prepared from nux-vomica by treating with rectified spirit, acetate of lead, etc., precipitating with ammonia, dissolving the precipitate with alcohol, and crystallizing. Strychnine forms colorless four-sided prisms, which are inodorous and intensely poisonous. One-eighth of a grain of strychnine is sufficient to kill a large dog: three-eights of a grain produces violent tetanic spasms in man, while half a grain has been known to prove fatal. When taken in small doses for a long period of time the drug produces increased excitability of the nerves. Strychnine resists putrefaction, and may therefore be detected in bodies which have been buried for a long time. This alkaloid combines with acids, forming a series of well-defined salts; a series of strychnine derivatives is also known, in which the hydrogen is partly replaced by such groups as ethyl, amyl, etc.

STRYCHNOS (strik'nos), a genus of plants, composed of trees or shrubs which do not yield a milky juice, and have opposite, usually nerved leaves and corymbose flowers; some of the species are possessed of tendrils, and are climbing plants. They are found principally in the tropical parts of Asia and America. Among the species are nux-vomica, poison-nut, or ratsbane, clearing-nut, St. Ignatius' bean, snakewood, woorali or poison-plant of Guiana.

STUART, Gilbert, American portrait painter, was born at Narragansett, R. I., in 1755. After several trips to England he established a studio in Philadelphia, where the first Washington portrait was painted in 1795. Stuart's portraits of Washington are the most famous of artist and sitter. Nearly forty replicas of his various Washington portraits have been traced. The list of his sitters includes the first five presidents of the United States, Edward Everett, John Jay, Jacob Astor, Judge Story, W. E. Channing, Josiah and Edmund Quincy, O. H. Perry, Jerome and Mme. Bonaparte. During his residence in England he painted King George III., also George IV. while Prince of Wales, Louis XVI. of France (at Paris), Mrs. Siddons, Sir Joshua Reynolds, Benjamin West, and a notable picture of "W. Grant Skating in Saint James Park," which made his reputation in England. He died in 1828.

STUART, James Ewell Brown, confederate officer, born in Patrick co., Va., in 1833. With the commission of second lieutenant he entered the army and fought Indians for three years. In 1861 he joined the confederate army with the rank of colonel, and served throughout the war, greatly distinguished himself. He fought with Jackson and Lee, and won some very important battles, gaining the rank of general. With the exception of Sheridan, General Stuart was without doubt the foremost cavalry leader in either army. The boldness and rapidity of his movements were remarkable. His death in 1864 resulted from a wound received in the battle of Yellow Tavern, Hanover co., Va.

STUCCO (stuk'kō), a fine plaster, used as a coating for walls; and to give them a finished surface. Stucco for internal decorative purposes is a composition of very fine sand, pulverized marble, and gypsum, mixed with water till it is of a proper consistency. The stucco employed for external purposes is of a coarser kind, and variously prepared, the different sorts being generally distinguished by the name of cements. Some of these take a surface and polish almost equal to that of the finest marble. The third coat of three-coat plaster is termed stucco, consisting of fine lime and sand. There is a species called bastard stucco, in which a small portion of hair is used.

STUDDING-SAILS, formerly called scudding-sails, fine-weather sails set outside the square sails. The top-mast and top-gallant studding-sails are those which are set outside the top-sails and top-gallant-sails; they have yards at the head, and are spread at the foot by booms which slide out on the extremities of the lower and top-sail yards, and their heads or yards are hoisted up to the top-sail and top-gallant-sail yard-arms. See Sail.

STURGEON, the general form of the sturgeon is elongated and rather slender, the snout long and pointed; the body is covered with numerous bony plates in longitudinal rows; the exterior portion of the head is also well mailed; the mouth placed under the snout is small and funnel-shaped, without teeth, and provided with tentacle-like filaments or barbules. The eyes and nostrils are on the side of the head. On the back is a single dorsal fin, and the tail is forked, but is heterocercal or unequally lobed, and is provided with a row of spines along its upper margin. The sturgeons are sea-fish, but ascend the larger rivers of Europe in great abundance, and are

Sturgeon.

the objects of important fisheries. The flesh of most of the species is wholesome and agreeable food; their roe is converted into caviare, and their air-bladder affords the finest isinglass. The common sturgeon is found off the British coasts, in the North sea, in the Mediterranean and in most of the large rivers of Europe. Its flesh is firm and well-flavored, somewhat resembling veal. The general body color is yellow; its length is usually 5 or 6 to 8 feet, but it may reach 12 feet. The food consists of molluscs, small crustaceans and small fishes. The great or white sturgeon, or beluga is found in the Danube, the Volga, and other rivers running into the Black and Caspian seas. It frequently exceeds 12 and 15 feet in length, and weighs above 1200 pounds. The flesh is not much esteemed, but the finest isinglass is made from its air-bladder. There are several species peculiar to North America. One of these, the fresh-water sturgeon inhabits the great lakes and connected streams.

STUTTERING. See Stammering.

STUTTGART, capital of the Kingdom of Würtemberg, S. Germany, beautifully situated near the left bank of the Neckar, and closely surrounded by vineyard slopes, 816 feet above the sea. Stuttgart is the chief center in South Germany for the book trade, connected with which are paper-mills, type-foundries, printing-presses, and lithographic establishments. Pop. 176,318.

STUYVESANT (stī've-sant), Peter, born in Holland in 1602; in 1647 was made director-general of the Dutch colony of the New Netherlands, a position he held until 1664, when the colony fell into the hands of the English and became known as New York. Stuyvesant went to Holland the next year, but soon returned, and passed the rest of his life at his farm called the Bouwerij, from which the present Bowery in the city of New York has its name. He died in 1682.

STYLE, in botany the prolongation of the summit of the ovary which supports the stigma. Sometimes it is entirely wanting, and then the stigma is sessile, as in the poppy and tulip. When the ovary is composed of a single

a, Style; *b*, Stigma.

carpel, the style is also single, and the number of styles varies according to the number of carpels, though when the carpels are numerous the styles may be united.

STYLE, Old and New. See Calendar.

STYR'IA, a duchy of Austria, bounded by Upper and Lower Austria, Hungary, Croatia, Carniola, Carinthia, and Salzburg; area, 8670 sq. miles. The whole duchy, with the exception of the southern part, is mountainous. The chief sources of wealth are the forests and minerals, dairy-farming, mining, and manufactures. Gratz is the capital. Pop. 1,356,058.

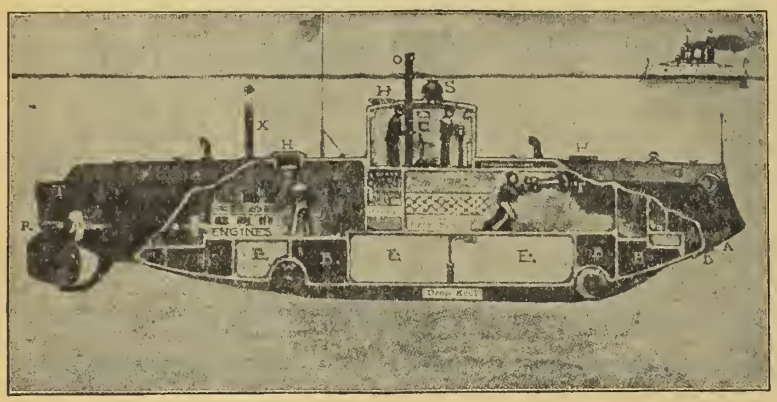
STYX, in Greek and Roman mythology, the name of a river of the infernal regions. Styx was also a rivulet in Arcadia, whose water was considered poisonous.

SUABIA, or **SWABIA,** an ancient German duchy. On the division of the kingdom of the Franks in 843, Suabia, along with Bavaria, became as it were the nucleus of Germany, and its rulers continued for many centuries to hold a prominent place in its history. The name of Suabia is given to a division of Bavaria; area, 3730 sq. miles; pop. 650,166. Augsburg is its capital.

SUBJECT. See Object.

SUBLIMATE, Corrosive. See Corrosive Sublimate.

SUBLIMATION, a process by which solid substances are, by the aid of heat, converted into vapor, which is again condensed into the solid state by the application of cold. Sublimation bears the same relation to a solid that distillation does to a liquid. Both processes purify the substances to which they are severally applied, by separating them from the fixed and grosser matters with which they are connected. The vapor of some substances which undergo the process of sublimation condenses in the form of a fine powder called flowers such are the flowers of sulphur, flowers; of benzoin, and others of the same kind.



Submarine torpedo boat.

Other sublimates require to be in a solid and compact form, as camphor, hydrochlorate of ammonia, and all the sublimates of mercury. The substance formed by the process of sublimation is called a sublimate.

SUBLIME, The. This term is applied both to that quality of objects which produce a mingled feeling of pleasure and awe and to the emotion itself. The invariable condition of the sublime in objects, either material or moral, is vastness, power, or intensity. The invariable condition of the emotion of sublimity—that which distinguishes this emotion from every other emotion—is a comprehension of this vastness or power, with a simultaneous feeling of our own comparative insignificance. The antithesis to the emotion of sublimity is the emotion of contempt. In every case of sublimity in material objects, whatever feelings may simultaneously concur, vastness will be found to be an invariable condition—vastness either of form or of power, as in the violent dashing of a cataract, in the roar of the ocean, in the violence of the storm, in the majestic quiet of Mont Blanc, preserving its calm amid all the storms that play around it. In the moral world the invariable condition of sublimity is intensity. Mere intensity is sufficient to produce the sublime. Lear, who appeals to the heavens, "for they are old like him," is sublime from the very intensity of his sufferings and his passions. Lady Macbeth is sublime from the intensity of her will, which crushes every feminine feeling for the attainment of her object. In all the cases above mentioned we are moved by a vivid feeling of some greater power than our own, or some will more capable of suffering, more vast in its strength, than our feeble vacillating will.

SUBLIME PORTE. See Porte.

SUBMARINE BOAT, a boat that travels completely or partly under the surface of the water. There are two types—the submerged and the submergible. Submerged boats are nearly cylindrical with pointed ends, the shape being like a Whitehead torpedo. To effect submergence water is admitted to the ballast tanks or it is effected by means of inclined rudders. Submergible boats have two hulls, one inside the other. To effect submergence water is first admitted to the space between the hulls, and this brings the boat to the "awash" condition. Further submergence is effected by permitting the ballast tanks to fill. The record of attempts to perfect submarine vessels begins with the seventeenth century, since which time the problem has well nigh constantly enlisted inventive skill. Almost every year since 1850 has witnessed some new design or practical experiment. The first real success was made by the American Engineer, David Bushnell, in 1775. Robert Fulton built a boat (1795–1812) in which on one occasion he was submerged for five hours. In recent times many national governments have experimented with various types of the submarine. The United States has had them under consideration for many years. In 1892 an appropriation of $200,000 was made to permit the navy department to build and test a submarine. The plans of I. P. Holland were selected. The first Holland boat, the beginning of the really successful submarine was built in 1875. After severe test the tenth type of the Holland boat was ordered in 1900. This boat can dive like a duck, and on the surface it makes about 10 miles an hour. It carries three torpedo tubes and uses the largest size of Whitehead torpedoes. In 1903 eight submarines were put in commission. The results arrived at during the Russian-Japanese war will greatly influence the views held as to the military value of submarine craft and the methods of their construction.

SUBMARINE CABLE, a rope of wires and insulating materials laid along the bed of a sea or ocean through which telegraphic messages are transmitted. The conducting portion of such cables consists of a number of pure copper wires twisted into a strand which is covered with alternate coatings of a pitchy mixture and gutta-percha. This core is then covered with Manila yarn and twisted iron wires. The first attempt to lay a submarine cable was made in 1850 between Dover and Calais, but the cable only lasted a few hours owing to friction against the rocks However, electric communication across the channel was re-established not long after. The first Atlantic cable, from Ireland to Newfoundland, was successfully laid by the Great Eastern in 1866, after unsuccessful attempts in 1857, 1858 and 1865. The work of laying the first Pacific cable began in 1902. Signals through the cables are generally recorded by Thomson's mirror galvanometer and also by his siphon recorder, which enables the transmission of messages to be carried on with great rapidity. See Telegraph, Electric.

SUBORNATION OF PERJURY, the crime of inducing a person to commit perjury; punishable similarly to perjury. See Perjury.

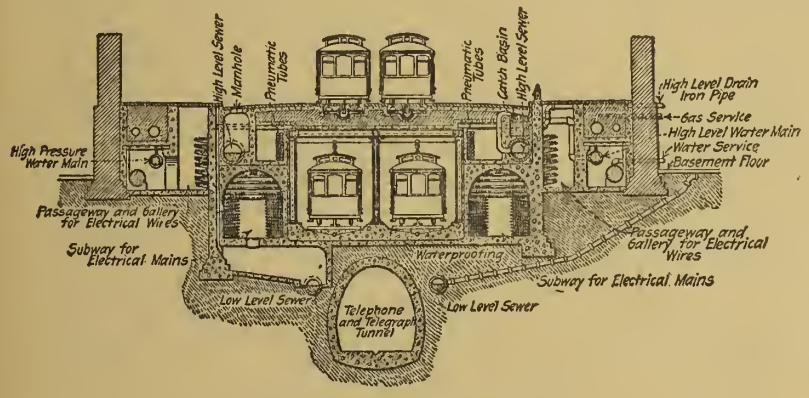
SUBPŒ'NA, in law, is a writ commanding a witness to appear in court. When he is required to bring books or papers in his possession, a clause is inserted to that effect, and the writ is then called a subpœna duces tecum ("bring with you under penalty"). A witness is allowed his traveling expenses.

SUB'SIDY, a term now used to denote the pecuniary assistance afforded, according to treaty, by one government to another, sometimes to secure its neutrality, but more frequently in consideration of its furnishing a certain number of troops. Subsidy was formerly an aid or tax granted to the crown for the urgent occasions of the kingdom, and was levied on every subject according to the value of his lands or goods.

SUBSTANCE, in a philosophical sense, is contradistinguished from accident, and signifies that which exists independently and unchangeably; while accident denotes the changeable phenomena in substance, whether these phenomena are necessary or casual, in which latter case they are called accidents in a narrower sense. Substance is, with respect to the mind, a merely logical distinction from its attributes. We can never imagine it, but we are compelled to assume it. We cannot conceive substance shorn of its attributes, because those attributes are the sole staple of our conceptions; but we must assume that substance is something different from its attributes. Substance is the unknown, unknowable substratum on which rests all that we experience of the external world.

SUBWAYS, tunnels cut or built for various purposes beneath the streets of large cities. Tunnels for sewer, gas and water pipes, telegraph and telephone wires increase the life and general serviceability of pavements, prevent interruption to traffic, facilitate inspection and repair, and lessen the number of troublesome and dangerous leaks from

water and gas mains. The concentration of population in cities has made it necessary to solve suitable and economic means of transportation, etc. The first city to feel the need of subways was London. In 1853 a two track underground road was begun. From the beginning two lines, the Metropolitan railway and the Metropolitan District railway, were produced. The routes, however, were not properly selected, and they were not successful. In 1886 the first practical tubular railroad was started. It was designed to be operated with cables but before its completion electricity was substituted. The most approved form of subway was introduced at Budapest in 1893. It is constructed with a flat roof, consisting of steel beams with arches turned between them, permitting the whole structure to be brought close to the surface of the street, obviating the use of mechanical means of taking the passengers from platform to street level. In the meanwhile lines had been projected in New York and Boston, the first work



Cross-section of the Chicago subway.

on subways being begun in the latter city. The subway planned in Boston was partly a two track and partly a four track structure. The subway has been connected with both the surface and elevated systems. The work of building the subway in New York did not begin until 1900. The general type of this subway is of the flat roof shallow form, bringing the rail and platform level as close to the surface of the street as possible. The topography of the city, however, has compelled a departure from this type in several instances so that a portion of the road is deep tunnel and the portion beneath the East river and the approaches thereto of the tubular type. The cost of constructing subways is very great. The New York subway being the largest and most complete as yet constructed, has cost $47,000,000, being an average exclusive of equipment of more than $2,000,000 per mile.

SUCCESSION WARS, wars which have arisen from claims for the possession of the crown on the occasion of a sovereign dying without undisputed legal heirs. In modern European history the most important of these struggles were those of the Spanish succession (1700–13), and of the Austrian succession (1740–48). See Spain and Austria.

SUCKER, or **SUCKING-FISH,** a name applied popularly to the Remora (which see).

SUCKLING, Sir John, a wit, courtier, and dramatist, born in 1609, at Whitton, in Middlesex. Being implicated in a plot to rescue the Earl of Strafford from the Tower he was obliged to flee to France, where he is said to have committed suicide about 1641. His writings consist of letters, miscellaneous poems, including ballads and songs, and several plays, which were probably the first plays produced with stage scenery on an elaborate scale.

SUDERMANN (zōō'der-män), Hermann, German dramatist and novelist, born at Matzicken, East Prussia, in 1857. He won European fame and assured literary position by a drama Die Ehre, and the novel Dame Care. He followed these up with the novel Regina; the stories Im Zwielicht, the humorous novel Iolanthes Hochzeit, and his greatest drama, Magda, a fine novel of moral psychology, Es war, Das Glück im Winkel and Johannes, a realistic dramatic presentation of the story of John the Baptist; The Joy of Living, etc.

SUE (sü), Marie - Joseph - Eugène, French novelist, born at Paris in 1804. On his father's death in 1829 he inherited an immense fortune, and devoted himself to literary composition. His first work was a sea novel entitled Kernock le Pirate, which was quickly followed by Plick et Plock, Atar-Gull, La Salamandre, and La Vigie de Koatven. But his most famous works are The Mysteries of Paris and The Wandering Jew. His later novels are L'Enfant Trouvé, Les Sept Péchés Capitaux, and Les Mystères du Peuple. In 1850 he was elected to the Constituent assembly, and sat as an advanced radical. After the coup de'état by Napoleon III. in 1851, he left France and retired to Annecy, where he died in 1857.

SUEABORG. See Sweaborg.

SUET, the fatty tissue situated about the loins and kidneys of certain domestic animals, especially the ox and sheep and which is harder and less fusible than the fat from other parts of the same animals. Beef-suet is much used for culinary purposes, and purified mutton-suet forms an ingredient in ointments, cerates, and plasters.

SU'EZ, a town of Egypt, situated at the Red sea, terminus of the Suez canal, 76 miles e. of Cairo, with which it is connected by rail. Pop. 10,919.

SUEZ CANAL, the great ship-canal without locks connecting the Mediterranean with the Red sea; running from Port Said on the former to Suez on the latter, a distance of nearly 100 miles. According to Herodotus a large canal from the Red sea to the Nile was constructed about 6000 B.C. This canal, which seems never to have been of much use, was finally blocked up about 767 A.D. Napoleon I. had conceived the idea of making a ship-canal across the isthmus of Suez. In 1854 the French engineer M. Ferdinand de Lesseps obtained a concession for that purpose, and in 1858 was able to form a company for carrying on the work. Operations were begun on the 25th April, 1859, and on the 17th November, 1869, the canal was opened; the total cost of construction was nearly $80,000,000. There were 75 miles of

actual excavation, the remaining 25 miles being through shallow lakes which had to be deepened. A canal was also constructed for bringing fresh water from the Nile at a point near Cairo. This canal reaches the salt-water canal at Ismailia, and then runs almost parallel to the ship-canal to Suez. It is almost 40 feet wide and 9 deep, and is used for navigation as well as for domestic purposes and irrigation. The land on both sides of the ship-canal is to be retained by the company for ninety-nine years. In November 1875 the British government bought from the Viceroy of Egypt his interest in the canal, consisting of 176,602 shares, for the sum of $20,000,000. The distance between London and Bombay by the old route round the Cape is about 11,220 miles; by the canal route, 6332. Steam-ships are allowed to sail at a speed of five to six knots an hour along the canal.

SUFFOLK (suf'ok; literally south-folk), a maritime county of England, bounded by the German ocean, Essex, Norfolk, and Cambridgeshire. It has a coast-line of about 50 miles, and an area of 1500 sq. miles, or 944,060 acres. Pop. 384,198.

SUFFRAGAN. See Bishop.

SUFFRAGE, the right to vote for any purpose, but more especially the right of a person to vote in the election of his political representative. Many writers advocate the universal extension of this right, but in most countries it is limited by a household or other qualification. It is generally held by leading politicians that the extension of the suffrage should proceed gradually with the advance of education.

SUGAR, a name applied to various compounds of carbon, hydrogen, and oxygen, all of which have a more or less sweet taste, a neutral reaction to vegetable colors, and are soluble in water. The sugars are generally of vegetable origin; they are mostly crystallizable, and when in solution they rotate the plane of a ray of polarized light. Among all these compounds the sugar of the sugar-cane and beet is distinguished par excellence by the name sugar. It is supposed that sugar was first cultivated in India, but a knowledge of the sugar-cane and its method of cultivation was brought from Persia by the Arabs, and given by them to Europe. The Spaniards were the first to plant it in Maderia (1490), from whence it spread to their possessions in the West Indies and South America; while during the middle ages Venice was the emporium of the trade in sugar. There is a record that so early as 1319 it was shipped from the latter port to London. It was, however, chiefly used as medicine until the beginning of the 19th century, when it became a food staple in connection with tea and coffee. Sugar is principally prepared from the sugar-cane and from beet. (See Sugar-cane and Beet.) The first operation in the manufacture of sugar from sugar-cane consists in pressing the juice from the canes. For this purpose the canes are passed under large rollers, which extract about 70 to 90 per cent of the juice. The cane-juice is now boiled in copper vessels; milk of lime, sulphurous acid, or phosphoric acid is added to neutralize the vegetable acids (malic, etc.), and at length the sugar crystallizes. The liquid portion remaining is drained off and sold as molasses. In obtaining the juice from beet-root two methods have been adopted. In one of these the roots are placed in a cylinder, where they are mashed to a pulp by rows of saw-toothed blades driven with great rapidity, after which the juice is pressed out by means of a hydraulic press; in the other process the roots are placed in a series of cylinders through which water is forced until the saccharine matter in the roots has all been obtained. By this process as much as 90 per cent of the juice is extracted. When this is accomplished the expressed juice is heated to about 70° C., milk of lime is added, and the temperature increased; the lime separates the impurities in the form of phosphates and albuminates of calcium, etc., which cover the surface with a white crust. When the boiling juice breaks through the crust the liquid is run off and cleared of the lime by carbonic acid. The syrup is then twice filtered, and allowed to crystallize. The sugar-cane contains about 18 per cent, and the beet 11.2 per cent of sugar. The first process of refinement is to dissolve the raw sugar in water to which a little lime is added; this solution is heated by steam and passed through filters, generally consisting of deep vats, the bottoms of which are perforated and covered with a thick layer of animal charcoal. The syrup is then collected underneath and boiled down to induce crystallization. The latter operation is conducted in vacuum-pans connected with an air-pipe, a condenser, and a pipe to admit steam. The juice being in the pan, a partial vacuum is produced by means of the air-pump, and steam circulates through a coiled pipe in the pan until the liquid boils, while the vapor thereby produced is removed and condensed. The sugar-syrup is then run out and allowed to crystalize in conical-shaped vessels of clay or sheet-iron; papier-mâché is also used. In these vessels the crystaline mass assumes its marketable form, from which it derives the name of loaf-sugar. After draining the sugar in the moulds the juice is completely removed by a centrifugal machine; the sugar-loaf is then dried. From the syrup which drains off an inferior sugar is obtained, and the remaining uncrystalized syrup is sold as molasses. Sugar-candy is prepared by boiling sugar-syrup with a little animal charcoal, clearing with white of egg, boiling down over an open fire, and crystalizing. Sugar-candy is known in commerce as refined-white, which forms large colorless crystals, and is prepared from refined cane-sugar; yellow-candy, forming straw-colored crystals, prepared from boiled sugar; and brown-candy, similar in color to ordinary moist sugar, and prepared from inferior cane-sugar. Sugar candy is largely used for making liquors, sweetening champagne, etc. Sugar is also produced extensively in North America from the rock or sugar maple, in Asia from various species of palms, and in various countries from species of Guinea-corn or sorghum. The common sugars have the general name of cane-sugar. Another form of sugar, called grape-sugar is the type of sugars called glucoses, and is manufactured chiefly for the use of brewers and wine-makers; it is also known as honey-sugar, fruit-sugar, starch-sugar, etc. It occurs in many natural fruits, such as the peach, plum, current, apple, and grape, in quantities varying from 1.5 per cent. in the peach to 15 per cent in the grape. It also forms the solid crystaline portion of honey. Grape-sugar may be obtained from grape-juice by heating it with marble, filtering, clearing with ox-blood, evaporating, and crystalizing. It is, however, generally prepared by boiling starch with dilute sulphuric acid; the clear liquid is then run off from the precipitate, evaporated by steam, filtered through animal charcoal, and run into the crystalizing vessels. Dextrose or grape-sugar as well as cane-sugar belongs to the class of fermentable sugars. A certain number of other sugars, as mannite or manna-sugar, quercite or oak-sugar, etc., are non-fermentable. Cane-sugar crystalizes in large monoclinic prisms, which when broken exhibit phosphorescence. At 160° it melts to a clear liquid, which when cool and solidified is commonly known as barley-sugar. The quantity of cane-sugar in a solution which contains no other substance may be estimated by simply estimating the specific gravity of the solution, but when other bodies are present it must be ascertained by other chemical processes or by means of the saccharometer, which is an instrument for determining the rotatory power exercised by a solution of sugar upon a ray of polarized light. Large quantities of sugar from the cane are produced in India, China, the United States, Java, Cuba, Demerara, Jamaica, and other parts of the West Indies, Brazil, etc.

SUGAR BEET, a vegetable botanically of the same species as the garden beet, and important commercially as the source of a very large part of the world's supply of sugar. The sugar beet thrives upon a rich, loamy soil in a climate having a temperature of about 70°. The sugar content and yield are influenced by many factors, and field experts are employed to instruct the farmers how to grow beets in the proper way. The average cost of growing an acre of sugar beets is about $30. The average yield is about 12 tons, with an average sugar content of 14.5 per cent., which represents a yield of about 3900 pounds of sugar per acre.

SUGAR, BEET, the manufacture of sugar from beet roots is a modern industry. Margraff in 1747 announced to the Berlin Academy of Sciences the analyses of several sugar-containing plants and predicted that the sugar beet, being the most saccharine of the plants examined, would become the basis of a great industry. The United States department of agriculture and various experiment stations have assisted greatly in the development of the beet-sugar industry, the capital invested in 1907 being more than $30,000,000.

SUGAR-CANE, a plant from which great part of the sugar of commerce is obtained. It is nowhere found in a wild state, but is probably a native of tropical Asia. It grows to the height of 7 or 8 feet or more, and has broad ribbed

Sugar-cane.

leaves, and smooth shining stems. It is now cultivated in all the warm parts of the globe, such as the West Indies, Brazil, Java, etc., but varies in rapidity of growth according to the situation, the season, or the weather. The sugar-

cane flowers only after the lapse of an entire year, and a plantation lasts from six to ten years. The juice of the cane is so palatable and nutritive that during the sugar harvest every creature which partakes freely of it appears to derive health and vigor from its use. For the process of making sugar, as well as for other information regarding this product, see the preceding article.

SUGAR, MAPLE, the manufacture of maple sugar is carried on more or less wherever sugar-maple trees are abundant, especially in the Northern Atlantic and Northern Central states, the leading producers being Vermont and New York. The busy period depends upon the locality and upon the season, sometimes commencing in February and sometimes lasting until the middle of May, the best flow of sap being when there is a diurnal alternation of thawing and slight freezing.

SUGAR-MITE, a species of mite frequently to be observed in raw sugar, very similar in appearance to the itch-mite.

SUGAR-OF-LEAD, the common name for acetate of lead. See Lead.

SU'IDÆ, the family of mammals of which the hog is the type. This family is characterized by having on each foot two large principal toes, shod with stout hoofs, and two short lateral toes which

Characters of suidæ.
a, Skull of wild boar. *b*, Teeth of upper jaw. *c*, Teeth of lower jaw. *d*, Foot. *e*, Bones of foot.

hardly touch the earth. The canine teeth project from the mouth and curve upward. The muzzle is terminated by a truncated snout, fitted for turning up the ground. The family includes the wild boar, the wart-hog, and the peccary.

SULLA, Lucius Cornelius, Roman dictator, was born in 138 B.C. He served with distinction under Marius in the Jugurthine (107 B.C.) and Cimbrian (104–102) wars, and in 93 was chosen prætor. For his services in the Social war (90–88) he was appointed consul (B.C. 88), and the province of Asia, with the conduct of the war against Mithridates, fell to his lot. Sulla at the head of his army drove Marius to Africa, and then sailed for Greece at the beginning of 87 B.C. He expelled the armies of Mithridates from Europe (86), crossed into Asia (84), and was everywhere victorious, gaining plenty of wealth for himself and his soldiers, and forcing Mithridates to conclude a peace. Sulla now hastened to Italy, and landed at Brundusium with 40,000 men, B.C. 83. He gained four battles over the Roman forces in person, and defeated a Samnite army under Telesinus. He entered the city victorious in 82, and immediately put to death between 6000 and 7000 prisoners of war in the circus. Rome and all the provinces of Italy were filled with the most revolting scenes of cruelty. After satisfying his vengeance by the murder or proscription of thousands he caused himself to be named dictator for an indefinite period (B.C. 81). He now ruled without restraint, repealed and made laws, abolished the tribuneship, and settled his veterans in various parts of Italy. In 79 B.C. he laid down his dictatorship, and retiring to Puteoli abandoned himself to all sorts of debauchery. He died in 78 B.C. See Rome.

SULLIVAN, Sir Arthur Seymour, born in London 1842. He has written oratorios (Prodigal Son, Light of the World), anthems, songs, etc.; but his most popular compositions are the burlesque operettas which he has produced in conjunction with W. S. Gilbert. Among the most popular of these are H. M. S. Pinafore, Pirates of Penzance, Patience, Mikado, and the Gondoliers. In 1886 he set to music an arrangement of Longfellow's Golden Legend, which is one of his finest compositions. He was knighted in 1833. He died on Nov. 22, 1900.

SULLY, Maximilien de Béthune, Duc de, Marshal of France and first minister of Henry IV., was born in 1560. In 1597 he was appointed controller of finance, and by his excellent administration largely reduced taxation, and eventually paid off a state debt of 300,000,000 livres. In 1606 the territory of Sully-sur-Loire was elected into a duchy in his favor. After the murder of Henry IV. (1611) he retired from court and resigned most of his charges. He was created a marshal by Richelieu in 1634, and died in 1641.

SULPHATES, salts of sulphuric acid. Sulphuric acid is dibasic, forming two classes of sulphates, viz. neutral sulphates, in which the two hydrogen atoms of the acid are replaced by metal, and acid sulphates, in which one hydrogen atom only is so replaced. Of the sulphates, some are found native; some are very soluble, some sparingly soluble, and some insoluble. The most important sulphates are—sulphate of aluminium and potassium, or alum; sulphate of ammonium, employed for making carbonate of ammonia; sulphate of copper, or blue vitriol, much used as an escharotic in surgery, and also used in dyeing and for preparing certain green pigments; sulphate of iron, or green vitrol, used in making ink, and very extensively in dyeing and calico-printing; it is also much used in medicine; sulphate of calcium, or gypsum; sulphate of magnesium, or Epsom salts; sulphate of manganese, used in calico-printing; sulphate of mercury, used in the preparation of corrosive sublimate and of calomel; bisulphate of potash, much used as a flux in mineral analysis; sulphate of sodium, or Glauber's salts; sulphate of quinine, much used in medicine; sulphate of zinc, or white vitriol, used in surgery, also in the preparation of drying oils for varnishes, and in the reserve or resist pastes of the calico-printer. Many double sulphates are known.

SULPHUR, an elementary, non-metallic, combustible substance which has been known from the earliest ages; chemical symbol, S. It frequently occurs in a pure state in beds of gypsum or clay, but is generally associated with sulphate of strontium. It also occurs in chemical combination with oxygen and various metals, forming sulphates and sulphides. It is found in greatest abundance and purity in the neighborhood of volcanoes, modern or extinct, as in Sicily; and as an article of commerce is chiefly imported from the Mediterranean. It is also found in Iceland, California, and Mexico. That which is manuafctured in Britain is obtained by the roasting of iron pyrites; the condensed mass of sulphur thus obtained is broken into lumps and distilled. Native sulphur is usually separated from the earthy matter by a process of distillation, the sulphur vapors being liquefied by a condenser. The product obtained from native sulphur, or from iron pyrites, is afterward refined by a further process of distillation. Pure sulphur is commonly met with in two forms, that of a compact, brittle solid, and a fine powder. It is nearly tasteless, of a greenish-yellow color, and when rubbed or melted emits a peculiar odor. Its atomic weight is 32, and its specific gravity 1.99. It is insoluble in water, and not very readily soluble in alcohol, but is taken up by spirits of turpentine, by many oils, and by carbon disulphide. It is a non-conductor of electricity. It is readily melted and volatilized. It fuses at 232° Fahr., and between 232° and 280° it possesses the greatest degree of fluidity, and, when cast into cylindrical moulds, forms the common roll-sulphur of commerce. It possesses the peculiar property of solidifying at a higher degree, or when raised to 320°. From 480° to its boiling point (790°) it again becomes fluid, and at 792° it rises in vapor, which condenses in close vessels in the form of a fine yellow powder, called flowers of sulphur. Sulphur exists in two distinct crystalline forms, and also as an amorphous variety; these modifications are characterized by differences in specific gravity, in solubility in various liquids, and in many other points. Sulphur combines with oxygen, hydrogen, chlorine, etc., forming various important compounds; it also unites with the metals, forming sulphides. It is employed in the manufacture of gunpowder, matches, vulcanite, and sulphurous and sulphuric acids. It is also employed in medicine, and for various other purposes. Sulphur chloride is produced by passing chlorine gas into a retort containing melted sulphur. It is used for vulcanizing caoutchouc. Sulphur forms two combinations with oxygen, the dioxide and the trioxide. The former is the sole product of the combustion of sulphur; it is a colorless gas, which may be liquefied and solidified by cold and pressure. This gas is used in the arts for bleaching silk, wool, straw, parchment, and generally such substances as are destroyed by the action of chlorine. Sulphur trioxide is a white

crystalline solid, produced by the oxidation of the dioxide. Sodium thiosulphate is produced by boiling sulphur with soda lye, and passing sulphur dioxide into the solution until it is completely decolorized. It is largely used in the arts as an antichlor, and for fixing photographs. Carbon disulphide is a volatile liquid, with a poisonous vapor, produced by the action of sulphur upon carbon at high temperatures. It is used for dissolving caoutchouc and gutta-percha, for extracting essential oils, spices, etc., from plants and seeds, and bitumen from minerals, etc.

SULPHURIC ACID, or **OIL OF VITRIOL,** a most important acid discovered by Basil Valentine toward the close of the 15th century. It was formerly procured by the distillation of dried sulphate of iron, called green vitriol, whence the corrosive liquid which came over in the distillation, having an oily consistence, was called oil of vitriol. The principal upon which it is now manufactured was laid down by Roebuck in 1746, and consists in burning sulphur, or more frequently iron pyrites, in closed furnaces, and leading the fumes, mixed with oxides of nitrogen, into large leaden chambers, into which jets of steam are continuously sent. The oxides of nitrogen are produced by the action of sulphuric acid upon nitre contained in pots, which are placed between the sulphur ovens and the chambers. The sulphur dioxide takes away part of the oxygen from the oxides of nitrogen, which are again oxidized by the air in the chambers. The sulphur trioxide produced unites with the steam to form sulphuric acid. The acid produced in the chamber is condensed in leaden vessels until it reaches a certain gravity (about 1.72), when it is run into glass, or sometimes platinum vessels, where the condensation is continued until the specific gravity has increased to 1.84. The acid of gravity 1.72 constitutes the brown acid of commerce; it is largely used in the manufacture of superphosphate of lime and for other purposes. Pure sulphuric acid is a dense, oily, colorless fluid, exceedingly acid and corrosive, decomposing all animal and vegetable substances by the aid of heat. It unites with alkaline substances, and separates most of the other acids from their combinations with the alkalies. It has a very great affinity for water, and unites with it in every proportion, producing great heat; it attracts moisture strongly from the atmosphere, becoming rapidly weaker if exposed. The sulphuric acid of commerce is never pure, but it may be purified by distillation. With bases sulphuric acid forms salts called sulphates, some of which are neutral and others acid. By concentrating sulphuric acid as far as is possible without decomposition, and cooling the liquid so obtained, crystals of the true acid are formed. The ordinary acid is a hydrate of varying composition. A very strong form of sulphuric acid, known as Nordhausen acid, is prepared by heating green vitriol in closed vessels; it is a solution of sulphur trioxide in sulphuric acid, or it may be regarded as pyro-sulphuric acid. It has a specific gravity varying from 1.86 to 1.92, and is chiefly used in the arts for dissolving indigo. Of all the acids the sulphuric is the most extensively used in the arts, and is in fact the primary agent for obtaining almost all the others by disengaging them from their saline combinations. Its uses to the scientific chemist are innumerable. In medicine it is used in a diluted state as a refrigerant.

SULPHURIC ETHER (ethylic, vinic, or ordinary ether) is a colorless transparent liquid, of a pleasant smell and a pungent taste, extremely exhilarating, and producing a degree of intoxication when its vapor is inhaled by the nostrils. It is produced by distilling a mixture of equal weights of sulphuric acid and alcohol, and by various other means. Its specific gravity is 0.720. It is extremely volatile and highly inflammable; and its vapor, mixed with oxygen or atmospheric air, forms a very dangerous explosive mixture. It disssolves in 10 parts of water, and is miscible with alcohol and the fatty and volatile oils in all proportions. It is employed in medicine as a stimulant, and antispasmodic. Ether, by its spontaneous evaporation, produces a great degree of cold, and is used in the form of spray in minor surgical operations for freezing the part, and thus rendering it insensible to pain. True sulphuric ether, known also as sulphate of ethyl is an oily liquid of burning taste and ethereal odor, resembling that of peppermint. It is almost incapable of being distilled without decomposition, as at a temperature of about 280° it resolves itself into alcohol, sulphurous acid, and olefiant gas.

SULPHUROUS ACID. See Sulphurous Oxide.

SULPHUROUS OXIDE, a gas formed by the combustion of sulphur in air or dry oxygen. It is transparent and colorless, of a disagreeable taste, a pungent and suffocating odor, is fatal to life, and very injurious to vegetation. At 45°, under the pressure of two atmospheres, it becomes liquid, and also at 0° under the pressure of one atmosphere. It extinguishes flame, but is not itself inflammable. It has considerable bleaching properties, so that the fumes of burning sulphur are often used to whiten straw, and silk and cotton goods. The gas is also called sulphur dioxide; when led into water it forms sulphurous acid. This acid readily takes up oxygen, passing into sulphuric acid; it is dibasic, forming salts called sulphites.

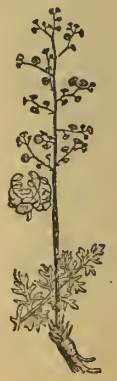
SULTAN, in Arabic, signifies "mighty one, lord." It is the ordinary title of Mohammedan rulers. The ruler of Turkey assumes the title of Sultan-es-selatin, "Sultan of sultans." The title sultan is also applied to the sultan's daughters, and his mother, if living, is styled Sultan Valide.

SULTANPUR', a district of India, in Oudh; area, 1707 sq. miles. Chief river, the Gumti. Pop. 957,912.—The town Sultanpur, administrative head-quarters of the district, contains the usual public buildings, and has a population of 9374.

SULU', or **SOOLOO ISLANDS,** a group in the Indian archipelago, consisting of more than 150 islands, which stretch from the n.e. point of Borneo to the Philippine Islands; total estimated area, 1600 sq. miles. Sulu, the chief island, is lofty, and lies near the center of the group. The islands are of volcanic origin, and produce all kinds of tropical plants and trees. They are well watered, and enjoy an immunity from the hurricanes which ravage the neighboring islands. The inhabitants are of Malay descent, and nearly all profess the Mohammedan religion. There is a considerable trade between Sulu and Singapore in bêche-de-mer, pearl shells, birds'-nests, etc. The Sulu islands, with the Philippines, now belong to the United States of America. Pop. estimated at 200,000.

SUMACH (sū'mak), a genus of shrubs with pinnate leaves and small flowers. They all have a lactescent acrid juice, and most of them possess valuable tanning properties. More than seventy species are known.

SUMA'TRA, a great island in the Indian seas immediately under the equator, separated from the peninsula of Malacca by the Straits of Malacca and from Java by the Straits of Sunda. Greatest length, about 1000 miles; breadth, about 240 miles; area, about 150,000 sq. miles. Banca and other islands adjoin the coast. There are several volcanoes in the island. Copper, tin, and iron are found in abundance, and deposits of coal exist. Mangroves grow near the coast, and at higher elevations myrtles, palms, figs, and oaks of various species are met with. The camphor-tree prevails in the north, and among vegetable curiosities are the upas-tree and the gigantic Rafflesia. Pepper, rice, sugar, tobacco, indigo, cotton, coffee, are cultivated for export, and camphor, benzoin, catechu, gutta-percha and caoutchouc, teak, ebony, and sandal-wood are also exported. The island is all nominally under the authority of the Dutch, who have divided it into eight administrative divisions. Sumatra has a very mixed population, consisting of Malays, Chinese, Arabs, and many native tribes. The tidal wave accompanying the volcanic eruption of Krakatoa in 1883 caused great destruction on the south coast of Sumatra. The chief towns are Palembang and Padang. The total population is estimated at between 3,000,000 and 4,000,000.



Sumbul.

SUMBAL, or **SUMBUL,** an Eastern name for the root of an umbeliferous plant. It contains a strongly odorous

principle, like that of musk, and is regarded as an antispasmodic and stimulating tonic.

SUMBA'WA, an island of the Indian archipelago, lying south by west of Celebes, between Lombok and Flores, about 160 miles long from east to west, with a breadth varying from 13 to 31 miles. The inhabitants are of Malay race and Mohammedans. Pop. about 150,000.

SUMMER, the season of the year which in the northern hemisphere generally may be said to comprise the months of June, July, and August. The astronomical summer lasts in the northern hemisphere from the June solstice to the September equinox, during which time the sun being north of the equator, shines more directly upon this part of the earth and rises much sooner and sets later, which renders this the hottest period of the year. The period of greatest heat generally takes place in August, since the influence of the sun's rays has then been felt for a long time on the earth, and the wind blowing from the north becomes milder owing to a moderation of the temperature in the polar circle caused by the thawing of the ice. In the southern hemisphere the summer lasts from the December solstice to the March equinox. See Seasons.

SUMMONS, in law, a writ addressed to the defendant in a personal action, admonishing him to appear in court. It must contain the names of all the defendants, the name and address of the person taking it out, and the date of issue; but it need not state the form or cause of action.

SUMNER, Charles, an American jurist and statesman, born at Boston, Massachusetts, in 1811. In 1836 he published three volumes of Judge Story's decisions, subsequently known as Sumner's Reports, and edited a periodical called the American Jurist. In 1851 he was elected to the senate of the United States, and distinguished himself by his strong antipathy to slavery. In May, 1856, after delivering a speech vigorously attacking the slaveholders, he was violently assaulted by P. S. Brooks, a member representing a slaveholding state (South Carolina). His injuries compelled him to absent himself from public duties for nearly four years. He was a supporter of Lincoln and Hamlin, and in 1861 he became chairman of the senate committee on foreign relations. He was an enemy to the policy of President Johnson, and opposed the home and foreign policy of President Grant. After the latter's re-election in 1872 Sumner seldom appeared in debate. He died at Washington, March 11, 1874.

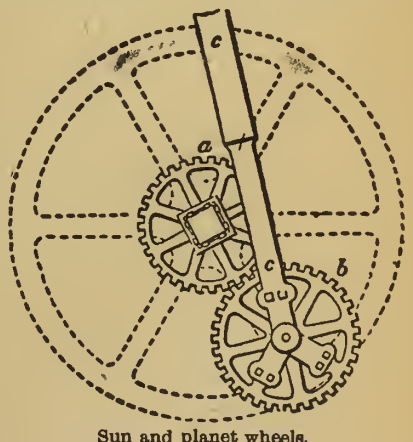
SUN, the central orb of the solar system, that around which revolve the earth and the other planets. The sun appears to be a perfect sphere, with a diameter of 866,900 miles; its mean density is about ¼, taking that of the earth as 1; its mean distance from the earth is taken as 93,000,000 miles. It rotates on its own axis; this axis of rotation being inclined to the ecliptic at an angle of 82° 40′; and its rotation period is variously estimated at from twenty-five to twenty-eight days. The mass of the sun is about 750 times that of all the other members of the solar system combined, and the center of gravity of the solar system lies somewhere in the sun, whatever may be the relative positions of the planets in their orbits. The sun is now generally believed to be of gaseous constitution, covered with a sort of luminous shell of cloud formed by the precipitation of the vapors which are cooled by external radiation. This

Group of sun-spots of June 5, 1864.

dazzling shell is termed the photosphere. The spots are supposed to be cavities in this cloud-layer, caused by the unequal velocities of neighboring portions of the solar atmosphere. Zöllner, who considers the body of the sun to be liquid, sees in them slags or scoriæ floating on a molten surface, and surrounded by clouds. It is estimated that the sun's radiation would melt a shell of ice covering its own surface to a depth of between 39 and 40 feet in one minute, but the temperature of the surface has not yet been ascertained. It is evident, however, that the temperature and radiation have remained constant for a long period. The photosphere is overlaid by an atmosphere which is shown by the spectroscope to contain nearly all the materials which enter into the composition of the sun. And in the lines of the spectrum of sunlight is found proof of the existence in the solar atmosphere of the following substances: Iron, titanium, calcium, manganese, nickel, cobalt, chromium, barium, sodium, magnesium, copper, hydrogen, zinc, sulphur, cerium, strontium, and potassium. In 1706 Captain Stannyan observed a blood-red streak just before the limb of the sun appeared after a total eclipse, and such appearances were subsequently observed, being first scientifically described in 1842 under the names of flames, protuberances, or prominences. In 1868 the spectroscope showed that these appearances were due to enormous masses of glowing hydrogen gas floating above the sun, similarly to clouds in our atmosphere. The region outside the photosphere in which these colored prominences are observed has been called the chromosphere, which has an average depth of from 3000 to 8000 miles. The incandescent h drogen clouds stretch out beyond this to altitudes of 20,000 to 100,000 miles, and jets of chromospheric hydrogen have been observed to reach a height of 200,000 miles in twenty minutes, and disappear altogether within half an hour. Outside the chromosphere, extending very far out from the sun, is the corona, an aurora of light observed during total eclipses, and which is now the chief object to be observed by eclipse expeditions. This phenomenon has been shown to be connected with the existence of what is called the "coronal atmosphere," but the nature of this atmosphere is as yet undetermined. The amount of light sent forth by the sun is not exactly measurable, but the amount of heat has been pretty accurately computed, and it is equivalent in mechanical effect to the action of 7000 horse-power on every square foot of the solar surface, or to the combustion on every square foot of upward of 13½ cwts. of coal per hour.

SUN, Worship of the. Sun worship probably prevailed in the earliest times among all nations, and the chief deities of the polytheisms of ancient India, Egypt, Greece, Rome, Germany (Indra, Amoun Ra, Zeus, Jupiter, Odin, etc.), are, according to a popular theory, all identified as sun gods. But by some people the sun itself was worshiped as a physical object associated with fire, as among the followers of Zoroaster, the ancient Celts, etc. Peru seems to have had the most complete system of sun worship.

SUN AND PLANET WHEELS, an ingenious contrivance adopted by Watt, in the early history of the steam-engine, for converting the reciprocating motion of the beam into a rotatory motion. In the annexed figure the sun wheel *a* is a



Sun and planet wheels.

toothed wheel fixed fast to the axis of the fly-wheel, and the planet wheel *b* is a similar wheel bolted to the lower end of the connecting-rod *c*; it is retained in its orbit by a link at the back of both wheels. By the reciprocating motion of the connecting-rod the wheel *b* is com-

pelled to circulate round the wheel *a*, and in so doing carries the latter along with it, communicating to the fly-wheel a velocity double its own.

SUNDAY (that is, day of the sun, like Monday, day of the moon), the first day of the week, the Lord's day. See Sabbath.

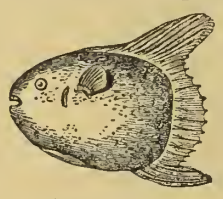
SUNDAY-SCHOOLS, schools held on Sunday for the purpose of imparting religious instruction to the young by means of reading and repetition in the Bible, catechism, hymns, etc. In 1527 Martin Luther established several Sunday-schools in Germany for the instruction of children and youths in reading the Holy Scriptures, and in the latter half of the same century Cardinal Borromeo organized similar schools throughout Milan. The modern Sunday-schools, however, as an institution, were founded in England by Robert Raikes, editor of the Gloucester Journal, in 1781, who, in order to prevent the profanation of the Sabbath by the children of the poorer classes, engaged several women to instruct such children as he should send to them on Sundays in reading and the catechism, paying each of them a shilling for her day's work. His example was soon followed by other charitable persons, and in 1785 a society was formed for the encouragement of Sunday-schools by pecuniary aid, etc. Gratuitous instruction became general about 1800, and in 1803 the first Sunday-school union was formed in London. Similar unions were quickly established in many large towns and in some of the counties. The Scottish Sabbath-schools (first established in Edinburgh in 1787) arose from the English Sunday-schools, and so universal has the establishment of Sunday-schools now become in the British Isles that one exists in connection with nearly every church. In America the first Sunday-schools were opened at New York in 1816, and have since multiplied rapidly and overspread the whole county. By 1815 such schools had been introduced into most European countries, but do not appear to flourish so well among foreign nations as in English-speaking countries. The total number of school teachers and scholars in the world according to the report of the Eleventh International Sunday School convention, held at Toronto, Canada, in 1905, was exclusive of Roman Catholics and non-Evangelical Protestant churches 262,131 schools, 2,426,888 teachers, 22,739,323 scholars. The number of scholars in Roman Catholic schools in the United States is estimated at 1,000,000. The Twelfth International Sunday School convention will be held at Louisville, Ky., in June, 1908.

SUNDERLAND, a seaport, mun., county, and parliamentary borough of England, at the mouth of the Wear, county of Durham, 13 miles n.e. of Durham, and 12 miles s.e. of Newcastle. The staple trade interests of the place are shipping, the coal trade, and shipbuilding, and there are also large factories for the making of marine engines, iron work, bottles, glass, earthenware, rope, etc. Pop. 146,565.

SUN-DEW, plants growing in bogs and marshes, having leaves clothed with reddish hairs bearing glands which exude drops of clear glutinous fluid, glittering like dew-drops, whence the name. A characteristic of these plants is their habit of capturing insects by their viscid secretion. Mr. Darwin, in his Insectivorous Plants (1875), says that the sun-dew derives its nitrogenous food by absorption from the tissues of insects entangled in the inflected tentacles of its viscid leaves; while like other plants it obtains and assimilates carbonic acid from the air. He further shows that these leaves have the power of digestion, and that they act on albuminous compounds in the same manner as does the gastric juice of higher animals, the digested matter being afterward absorbed. The digestive faculty has also been traced in Venus' fly-trap, butterwort, the pitcher-plant, etc.

SUN-DIAL. See Dial.

SUN-FISH, a genus of fishes. These fishes are short and almost circular in form, their jaws are undivided, and they have no swimming-bladder. The sun-fish appears like the head of a large fish separated from its body, and when swimming it turns upon itself like a wheel. It grows to a large size, often



Short sun-fish.

attaining a diameter of 4 feet, and sometimes even that of 12 feet. The skin is hard and leathery, but the flesh is soft, white, and palatable. The liver is large, and yields an oil highly valued among sailors as a cure for rheumatism. The sun-fish is found in all seas from the antarctic to the arctic circle.

SUN-FLOWER, natural order of plants, so called from the ideal resemblance of the yellow flowers to the sun with his golden rays. The root is mostly perennial; the stem herbaceous, upright, and often tall; the leaves opposite or alternate, undivided, often rigid and scabrous; the flowers large and terminal, usually disposed in a corymb. The species are numerous, and mostly inhabit North America. The gigantic sun-flower common in gardens is a native of Peru. The stem is from 6 to 15 feet in height; the flowers, sometimes 1 foot in diameter, are usually turned toward the south. The seeds form an excellent nourishment for poultry and for cage birds; and an edible oil has also been expressed from them.

SUN-SPOT, a dark patch on the sun, varying in size from a minute telescopic object to vast areas visible to the naked eye and thousands of miles in diameter. Sun-spots have an interesting history. Galileo was charged with blasphemy because he called attention to them, and Stanley Jevons, the British economist, advanced the theory that sun-spots and money-panics had some relation to each other. Certain it is that the well-known "cycle" of sun-spots and "cycle" of panics have been, in the past at least, coincident. The regular period of sun-spots is about eleven years, that is, every eleven years the spots on the sun are abundant and in the intermediate time they decrease in number and even vanish. The same has been true of panics. The great sun-spot of March 5, 1873, was 100,000 miles across. In this terrific cavern four planets each as large as our earth could have been swallowed up. The year 1906 was a maximum year for sun-spots, but Jevons's law seemed to have failed, except in England, where, during that year, the most painful industrial depression was experienced.

The causes of these remarkable appearances on the sun's surface are not known, although it is pretty certain that they are really comparatively shallow depressions on the photosphere, the darkness being due to the absorption of light occasioned by the lower temperature within the depression. Numerous spots appear to grow and disappear, lasting from only a few hours to many months. A great group of smaller spots often coalesce and form a great spot. That they have some connection with the sun's rotation on its axis is shown by the relation of the spot zone to the equator, being most numerous in latitudes from 15 degrees to 20 degrees. It has been held that the aurora borealis, or northern lights, are caused by sun spots, and on several occasions unusual disturbances of this kind in the sun have been accompanied by startling magnetic and electric storms on the earth.

SUN-STROKE, any sudden and severe injury to the health resulting from the exposure of the head to a hot sun. The most usual symptoms of sun-stroke are the following:—Pains in the head, accompanied by fever; lethargy, or suffering which prevents sleep; congestion of the brain or other nerve-centers, or an inflammation of the brain sometimes ensues, and often terminates fatally. Sometimes the effects of the stroke can be discerned only in impaired bodily health or mental vigor dating from some occasion on which the patient was exposed to a violent sun.

SUPERFŒTATION, a second conception after a prior one, and before the birth of the first child, by which two fœtuses are growing at once in the same womb. Several certified cases have occurred in which women have given birth to two children, the second child being born at periods varying from 90 to 140 days later than the first. These certainly appear to be cases of superfœtation. The possibility of superfœtation in the hmuan female has been vigorously opposed by some eminent physicians, and as vigorously defended by others. Some believe that up to the third month of gestation a second conception may follow the first, and that this will satisfactorily account for all the cases of superfœtation on record. It has also been argued that the human uterus may be double in some cases, and that in each of its cavities a fœtus may be contained.

SUPERIOR, a city, port of entry, and capital of Douglas co., Wis., at the head

of Lake Superior, on St. Louis, Superior, and Allouez bays, and the Gt. North., N. Pac., Chi., St. P., Minn. and Om., St. P. and Duluth, Dul. and Winnipeg, and the Dul., S. Shore and Atl. railways; opposite Duluth, Minn. It has three perfect landlocked harbors, all connected, with total length of 13 miles and width of from 1 to 3 miles. The manufactures are chiefly flour, lumber, lath, shingles, iron, chairs, barrels, bags, coke, and woolen goods. Superior was a station of the Hudson Bay company, over 200 years ago Pop. 35,415.

SUPERIOR, Lake, the largest expanse of fresh water in the world, and the most westerly and most elevated of the North American chain of lakes. It washes the shores of the state of Minnesota on the west, those of Wisconsin and the northern peninsula of Michigan on the south, and those of Canada in all other directions. Its greatest length is 420 miles, greatest breadth 160 miles; circuit about 1750 miles; area about 32,000 sq. miles (or the same as that of Ireland). It is 630 feet above sea-level, and varies in depth from 80 to 200 fathoms. In shape it forms an irregular crescent, dotted with numerous islands toward its northern and southern sides. The northern shore consists of cliffs varying in height from 300 to 1500 feet, but the southern shore is low and sandy, although occasionally interrupted by cliffs, among which are the fantastic Pictured Rocks, 300 feet high, one of the greatest natural curiosities of the United States. The waters of the lake are remarkable for their transparency, and are well stocked with fish, principally trout, white-fish, and sturgeon. The lake receives more than 200 streams, and about thirty are of considerable size. The outlet is at the southeast by St. Mary's river. Fish and copper are the chief exports, the latter existing in valuable veins both on the shores and islands of the lake.

SUPERIOR PLANETS. See Planets.

SUPERNATURALISM, a term used chiefly in theology, in contradistinction to rationalism. In its widest extent supernaturalism is the doctrine that religion and the knowledge of God require a revelation from God. It considers the Christian religion an extraordinary phenomenon, out of the circle of natural events, and as communicating truths above the comprehension of human reason. Rationalism maintains that the Christian religion must be judged of, like other phenomena, by the only means which we have to judge with, namely reason. See Rationalism.

SUPPURATION. See Inflammation.

SURAT', a town of India, Bombay presidency, capital of a district of same name, on the left bank of the Tapti, about 20 miles above its mouth in the Gulf of Cambay. Pop. 119,306.

SUPREME COURT OF THE UNITED STATES, The, is the head of the national judiciary. The supreme court is authorized by the constitution. Section 1 of Article III. provides that "the judicial power of the United States shall be vested in one supreme court, and in such inferior courts as the congress may from time to time ordain and establish." The supreme court is a constitutional court, while the other courts are statutory. The first act in organizing the supreme court was passed at the first session of the United States congress, approved by Washington on September 24, 1789, and directed that the court should consist of a chief justice and five associate justices, any four of whom should make a quorum. It now consists of nine members. They hold office for life. The act of September 24th not only made provision for the supreme court, but created the inferior courts of the United States and organized its entire judicial system.

SURETY. See Guarantee.

SURF-DUCK, or **SURF-SCOTER,** a species of duck, about the size of a mallard frequently seen on the coasts of Labrador, Hudson's bay, and other parts of North America.

SURGEON-FISH. See Sea-surgeon.

SURGERY, the operative branch of medicine, or that part of the medical art which is concerned with the removal of injured parts or organs, or with the healing of lesions by means of operations on the parts affected, either by the hand or with instruments. Surgery early became separated, for practical ends, from medicine, and by a natural expansion came to embrace two parts, the science pertaining to surgical operations, and the art required for conducting them. From this arose a mischievous distinction between medical and surgical cases. We have thus surgical and medical anatomy, surgical and medical pathology, and surgical and medical clinics. But the progress of science has both extended the domain of surgery, and made the relation between it and medicine more intimate. The origin of surgery may almost be held to be coeval with the human race. Herodotus says that the medical art in Egypt was divided into numerous branches representing each member of the body. The Greeks made considerable progress in surgery, and the Hippocratic collection contains six surgical treatises in which important operations are described as conducted in a mode little behind the modern practice. Medicine was first cultivated at Rome by Greek slaves. It afterward became a special science, and among its professors who advanced the art of surgery were Archagathus (200 B.C.), surnamed the executioner, from his frequent use of the knife; Asclepiades, to whom is attributed the origin of laryngotomy; and Themison, the first to use leeches. A greater name than these is that of Celsus, called the Latin Hippocrates, who flourished about the beginning of the Christian era. He mentions autoplastic operations and the treatment of hernias, and his method of amputation is still occasionally employed. Galen (died 200 A.D.) did much for medicine but little for surgery. Paul of Ægina, a practitioner of the 7th century, may be looked upon as the last representative of the Græco-Roman school. The Arabs were initiated into medicine and surgery by the translation of the works of the Greeks. Among the Asiatic Arabs the only devoted student of surgery who has left any record of his art is Abulcasis, who flourished at the beginning of the 12th century. On the decline of the Roman empire, the medical art in Europe fell entirely into the hands of the monks, and when, in 1163, the Council of Tours prohibited the clergy from performing any operation, surgery became incorporated with the trade of barber, and was reduced to the simplest operations, chiefly that of letting blood. The earliest revival of science arose from the contact of Europeans with the Eastern nations, particularly the Arabs, and before the close of the 11th century Salerno, in Italy, acquired celebrity for a school of medicine in which all the teachers were laymen. This school acquired the right to confer the degrees of master and doctor. Among surgeons of reputation of the Salernian school, may be mentioned Roger of Parma, and his disciple Roland, who made great use of cataplasms and other emollients. Guy de Chauliac, the first great surgeon of France, belongs to the latter half of the 14th century. Berengarios de Carpi held a chair at Bologna from 1502 to 1507. He boasted of having dissected more than 100 dead bodies, and made important discoveries. Vesalius, a Belgian physician, born 1514, died 1564, is regarded as the father of modern anatomy. He prepared the way for Ambrose Paré, who did for surgery what Vesalius had done for anatomy. Paré was surgeon in ordinary to Henry II., Charles IX., and Henry III. His works were translated into English, and include a general treatise on surgery, and a special treatise on wounds. Among the great surgeons of the 16th century were Paracelsus, who advocated a thorough reform in surgery; Guillemeau, whose special study was ophthalmia; Pineau, a skilful surgeon and lithotomist; Jacques Démarque, one of the first authors who wrote on bandages; and Fabricius of Hilden in Germany, the author of a complete course of clinical surgery, and the inventor of surgical instruments for the extraction of foreign bodies from the ear, urethra, etc., which are still in use. In England Harvey, the discoverer of the circulation of the blood, lectured on surgery; but a genuine school of surgery was first founded by Richard Wiseman, who has been called the Paré of England. His works were published in two vols. in 1676. In England the Company of Barber Surgeons, incorporated by Edward IV. in 1461, gave place to a separate corporation of surgeons in 1745. In 1731 the Royal Academy of Surgery was founded in Paris, and soon produced a school of surgeons so eminent as to take the lead of their profession in Europe. The rapid advance of scientific knowledge in the 19th century has not been without its influence on the art of surgery. The 19th century will ever be conspicuous in the annals of surgery as that in which the inestimable boon of anæsthetics was conferred upon mankind, by which not only has pain in surgery been abolished, but the extent of its operative department immensely enlarged. Of no less importance has been the discovery of the relation of microorganisms to putrefaction and to infectious diseases, and the consequent introduction of the antiseptic method of treating wounds. A scarcely less noticeable feature of this epoch has been the

application of the rules of hygiene to the construction and management of hospitals, by which the general health of the patients has been much benefited, and the mortality reduced. The operative skill of the surgeon has kept pace with the increased precision in physiological knowledge, and surgical operations are now performed on many parts of the body which not long ago would have been deemed certain death to the patient. Diseased conditions in the cranium, the thoracic cavity, the abdomen, the joints, are all successfully treated. Cancerous affections are boldly treated by excision, while diseases of the uterus are now treated with a boldness and success which a few years ago seemed impossible.

SUR'MULLET, a name of fishes allied to the perches, and often called red mullets. They have two dorsal fins with a wide interval between them, the first being spinous, and two long barbels hanging from the lower jaw. The common red mullet of the Mediterranean is about 12 inches long, esteemed very delicious food, and was much prized by the Romans.

SURNAMES. See Names, Personal.

SURPLICE, a white garment worn by priests, deacons, and choristers in the Church of England and the Roman Catholic church over their other dress during the performance of religious services. It is a loose, flowing vestment

Surplice, brass of Prior Nelond, Cowfold, Sussex.

of linen, reaching almost to the feet, having sleeves broad and full, and differs from the alb only in being fuller and having no girdle nor embroidery at the foot.

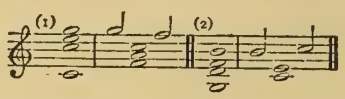
SURREY, a county of England, bounded by the Thames, separating it from Buckinghamshire and Middlesex; by Kent, Sussex, Hampshire, and Berkshire; area, 485,129 acres, of which more than half is under crops. Pop. 2,008,923.

SURVEYING, the art of measuring the angular and linear distances of objects on the surface of the earth, so as to be able to delineate their several positions on paper, to ascertain the superficial area, or space between them, and to draw an accurate plan of any piece of ground in more or less detail. It is a branch of applied mathematics, and is of two kinds, land surveying and marine surveying, the former having generally in view the measurement and delineation on paper of certain tracts of land, and the latter the laying down of the position of beacons, shoals, coasts, etc. Those extensive operations of surveying which have for their object the determination of the latitude and longtiude of places, and the length of terrestrial arcs in different latitudes, are frequently called trigonometrical surveys, or geodetic operations, and the science itself geodesy. In land-surveying various instruments are used, the most indispensable of which are Gunter's chain, for taking the linear dimensions when the area of the land is required; the theodolite, for measuring angles; and the surveyor's cross, or cross-staff, for raising perpendiculars. See Geodesy, Trigonometrical Survey, and Ordnance Survey.

SURVIVAL OF THE FITTEST. See Natural Selection.

SUSA, an ancient city of Persia. It was a very extensive city, with a strongly fortified citadel, containing the palace and treasury of the Persian kings, whose chief residence it was from the time of Darius I. It is the Shushan of the book of Daniel, where it is mentioned as situated on the banks of the river Ulai or Eulæus. The plain of Susa is covered with extensive mounds, in which fragments of brick and pottery with cuneiform inscriptions are found, and important discoveries have been made.

SUSPENSION, in music, the prolongation of a note in a chord, having the effect of suspending for a moment cer-



Suspension (1) from above; (2) from below.

tain notes in the following chord; or the delay of a dissonance in reaching the chord into which it is to be resolved.

SUSPENSION-BRIDGE. See Bridge.

SUSQUEHAN'NA, a river of the United States, formed by two branches an eastern or northern branch, 250 miles long from Lake Otsego in New York, and a western branch, 200 miles from the western slope of the Alleghanies, which unite at Northumberland in Pennsylvania. The united stream flows south and southeast, and after a course of 150 miles reaches the head of Chesapeake bay at Port Deposit, Maryland. It is a wide but shallow stream, nowhere navigable to any extent, save in the spring.

SUSSEX, a southern maritime county of England, bounded north by Surrey, north and northeast by Kent, southeast and south by the English Channel, and west and northwest by Hants; area, 933,269 acres, of which more than two-thirds is under crops. Pop. 605,052.

SUTHERLAND, a maritime county in the north of Scotland, bounded north and west by the Atlantic, south by Ross and Cromarty, east by the North sea and Caithness; area, 1,297,846 acres, of which about one-thirtieth part is under crops. Pop. 21,550.

SU'TRAS, in Sanskrit literature, the name given to the numerous series of religious aphorisms and rules, including all the ritual, grammatical, metrical, and philosophical works, and consisting of brief sentences to be committed to memory. These were usually written on dried palm-leaves tied together by a string.

SUTTEE' (Sanskrit, satī, an excellent wife), a term applied by the English to the self-immolation of Indian widows on the funeral pile of their deceased husbands. The origin of this practice is of considerable antiquity, but it is not enjoined by the laws of Manu, nor is it based on the Vedas. It was abolished by Lord Bentinck, governor-general of India, in December, 1829, but cases are still occasionally heard of.

SU'TURE, in anatomy, is the line of union of two bones between which there is no motion, as the bones of the skull.

SUZERAIN, in feudalism, a lord paramount; the king, for instance, in relation to his immediate vassals, or these as grantors in turn to sub-vassals.

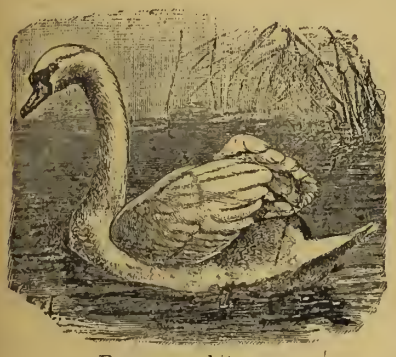
SWALLOW, the general name for all the insessorial birds distinguished by their long and powerful wings, their short broad beak, their wide gape, their comparatively small and weak legs and feet, and their habit of hawking on the wing for insects, which constitute their food. They are found all over the world except in the coldest regions, and there are a number of species. The common swallow has the nostrils concealed by a membrane in front, and the outer feathers of the tail much elongated. It is about 8½ inches in length. The top of the head is colored of a reddish-chestnut hue, the back and wings being steel-blue. The tail and secondary feathers are black, a dark-blue patch existing at the upper part of the chest, while the throat is a chestnut-brown. The beak, legs, and toes are black, and the under parts

Chimney swallow.

are white or grayish. The females possess the chest-patch, and also the forehead patch of red, of smaller size than the males. The song is weak, and is at best a mere twitter. The nest consists of a cup-shaped structure of mud or clay, sometimes built a few feet down an unused chimney, often close under the roof of some outhouse to which ready access is obtained, and is lined inside with soft grasses, feathers, and other materials. Swallows bear a considerable resemblance to swifts, and among the swifts are several forms which are popularly named "swallows." Thus the bird known in North America as the chimney swallow is not a true swallow, but a swift. The swallow that produces the edible nest is also a swift. Of true

swallows, however, several are American, and among them the barn swallow, very similar to the European chimney swallow, the purple martin, and the cliff swallow. The name of "sea swallow" is given to the tern. See also Martin, Sand-martin.

SWAN, a genus of swimming birds, distinguished as a group by the bill being of equal length with the head, and broad throughout its length; by the cere being soft; by the front toes being strongly webbed, while the hinder toe is not webbed, and has no lobe or under-skin. The nest is constructed of reeds and grasses, and is generally situated near the edge of the water on some islet. The young when hatched are of a light bluish-gray color. The food con-



European white swan.

sists of vegetable matters, smaller fishes, worms, etc., and fish-spawn. They have their representatives in North America in the trumpeter swan, and the americanus. South America produces one very distinct species, the beautiful black-necked swan. The black swan of Australia, like the white swan, is frequently kept as an ornament in parks or pleasure grounds. Its large size, and the gracefulness of its form and motions, render the swan one of the most ornamental of all the water-birds.

SWANSDOWN, a name for a fine, soft, thick woolen cloth; or more commonly for a thick cotton cloth with a soft nap on one side.

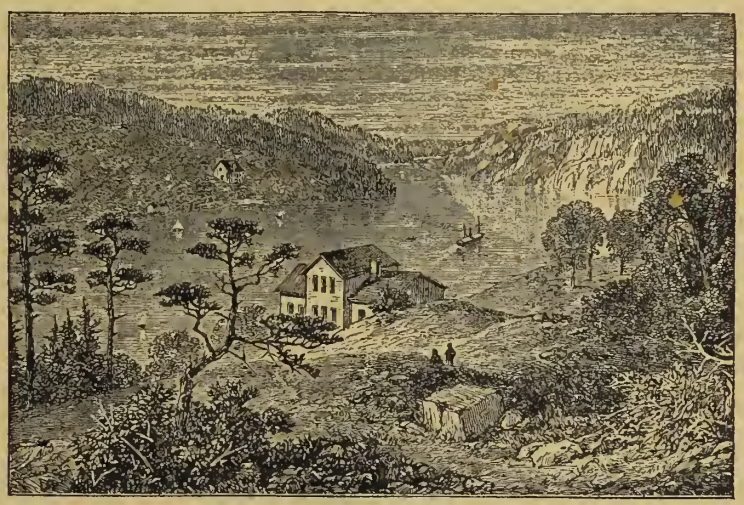
SWANSEA, a seaport town, and municipal, parl., and county borough of Wales. Copper-works were first established in 1719, and Swansea has now the principal copper-works in Great Britain. Copper ore is imported from Cornwall, Spain, Africa, America, and all parts of the world, and in the immediate neighborhood is an abundant supply of coal for smelting. There are also important tin-works, iron-works, steel-works, zinc-works, alkali-works, etc. Pop. of county bor. 94,514 of parl. bor. 128,052.

SWAZILAND, a small native state in South Africa, forming a dependency of the Transvaal, on the southeast of which it lies; area 8000 sq. miles. Pop. 64,000.

SWEAT. See Perspiration.

SWEATING SYSTEM, the system by which sub-contractors undertake to do work in their own houses or small workshops, and employ others to do it, making a profit for themselves by the difference between the contract prices and the wages they pay their assistants. The object of the sub-contractor or sweater being to secure as large a margin of profit as possible, the tendency of the system is to grind the workers down to the lowest possible limit.

SWEDEN, a kingdom in the north of Europe, bounded north and west by Norway; southwest by the Skager-Rack, Kattegat, and Sound; south by the Baltic; east by the Baltic and the Gulf of Bothnia; and northeast by the Torneå and its affluent Muonio, separating it from Finland. It consists of the three great divisions of Swealand or Sweden Proper in the middle, Götland or Gottland in the south, and Norrland in the north. For administrative purposes it is divided into twenty-five läns or governments. The total area is 170,979 sq. miles; pop. 5,260,811. The population of Sweden is mainly rural. There are five towns with a population of 30,000 upward, namely, Stockholm (capital), Göteborg or Gottenburg, Malmö, Norrköping, and Gefle. Nearly 2,500,000 of the population are agricultural; about a quarter of a million are cultivators of their own land. The coast-line, above 1400 miles in length, is serrated rather than deeply indented. The west coast is very rocky, but seldom rises so high as 30 feet. A great number of islets are scattered near the shores. There are also two islands of some size: Oeland near the southeast coast, and Gothland further out in the Baltic. The rivers and lakes are very numerous and all belong to the basins of the Baltic sea and the German ocean. Almost the whole of the country is composed of gneiss, partially penetrated by granite. The chief mineral is iron, which is produced in large quantities, of excellent quality, admirably adapted for steel. Zinc, copper, and silver, are also raised. Coal is worked in the south, but is poor in quality. Mining, and especially iron-mining, is one of the most important of Swedish industries. Roughly speaking the mining region occupies the central part of the country, with the forest region to the north and the agricultural region to the south. There is hardly any spring or autumn intervening between the heat of summer and the cold of winter, which in the north lasts for nine, and in the south for seven months. But on the whole the climate is eminently favorable to health, and no country furnishes more numerous instances of longevity. Among the larger wild animals are the wolf, the bear, the elk, the red and roe deer, the lynx, glutton, fox, and even the beaver. Of the smaller animals the most destructive is the lemming. Among birds the most remarkable are eagles, the eagle-owl, and the capercailzie. The rivers and lakes are well stocked with salmon and trout. Timber is the chief export. Of the cereal crops oats, barley, rye, and wheat are cultivated. The potato is grown everywhere. The principal domestic animals are cattle, sheep, horses, swine, and rein-deer. The last, necessarily confined to the north, are kept in large herds by the Laplanders, and supply them at once with food and clothing. The manufacturing industries include those connected with iron, steel, wooden goods, woolens, cottons, silks, refined sugar, leather, paper, spirits, etc. The mercantile marine has a burden of 550,350 tons. There are now over 6000 miles of railway, and 5400 miles of telegraph lines. The chief denomination of money is the krona—27c. The inhabitants of Sweden, with the exception of the Laplanders and Finns, found only in the north belong to the Scandinavian branch of the Teutonic family, and are characterized by a tall, robust stature, light hair, blue eyes, and light complexions.



Scene in Sweden—The Skurusund near Stockholm.

The Lutheran faith is recognized as the state religion, but recently there have been extensive secessions from the Established church. Other religions are tolerated; but appointments in the public service can be held by Lutherans only. Elementary education is gratuitous and compulsory, and almost every person can read and write. There are two universities, at Upsala and Lund respectively. The crown is hereditary in the male line. The king must be a member of the Lutheran church, and

has to swear fidelity to the laws of the land. His prerogatives consist of the right to preside in the high court of justice, to grant pardons, to conclude treaties with foreign powers, to declare war and peace, to nominate to all appointments civil and military, and to veto absolutely any decree of the diet. He also possesses legislative power in matters of political administration, but in all other matters that power is exercised, in concert with the sovereign, by the diet, in which is invested the right of imposing taxes. About a third of the revenue is derived from direct taxes and from national property, including railways; the remainder from customs, excise, and other indirect taxes. The army comprises a grand total of 340,000 men, the majority raised by conscription, by annual levy from among men between the ages of 21 and 40. The navy is intended for coast defense, and numbers 13 armored turret ships, 3 torpedo boat destroyers, 5 torpedo gunboats, 34 torpedo boats; unarmored and training vessels. The early history of Sweden is obscure. Christianity was introduced about the beginning of the 11th century. Sweden was more or

A Swedish interior.

less an appanage of the Danish crown until the time of Gustavus Vasa, who raised the peasants of Dalecarlia, defeated the Danes, was elected to the throne in 1523, and received authority to reorganize the church on the basis of Lutheranism in 1527. His son, Erik XIV., reigned only eight years, when, having lost his reason, he was deposed. He was succeeded by his brother, John III., who endeavored to restore the Catholic religion in Sweden; in which, however, he failed. He died in 1592, and was succeeded by his son, Sigismund, who in 1587 had been elected king of Poland. He was succeeded by his uncle Charles IX., who died in 1611 and was succeeded by his son, the celebrated Gustavus Adolphus. Sweden, which, notwithstanding internal troubles, had been advancing in political importance since the time of Gustavus Vasa, now became the leading power of the North; and under Gustavus Adolphus, who espoused the cause of Protestantism in the Thirty Years' war, took for the first time a leading part in the affairs of Europe. Gustavus Adolphus met his death at the battle of Lützen in 1632, and was succeeded by his daughter Christina, who renounced the crown in 1654 in favor of her cousin, Charles Gustavus, son of the count palatine. The short reign of Charles X. was distinguished by some brilliant military enterprises, which extended to Poland, Prussia, Russia, and Denmark. He died suddenly in 1660, leaving a son, Charles XI., only four years of age. The country was then for long under a council of regency, and carried on a protracted war with Denmark. Charles assumed the government in 1680. He died in 1697, and was succeeded by his son, the celebrated Charles XII. Of the warlike monarchs of Sweden he is the one who has attained the highest reputation for military genius. His career of conquest ended in the disastrous battle of Poltava, 8th July, 1709, which compelled Sweden to yield the presidency among the northern states to Russia, and he was killed at the siege of Frederickshall, 30th November, 1718, while pushing the conquest of Norway. He was succeeded by his second sister, Ulrica Eleonora, who in 1720 associated with her in the government her husband Frederick I. Sweden was now under the hands of an oligarchy, the chief power in the state being held by a secret council of 100 members: 50 of the order of nobles, 25 of the clergy, and 25 of the burghers. This council was divided into two factions, called (after 1738) the Hats and Caps, the former of which preferred to sell themselves to France, the latter to Russia. On the death of Frederick in 1751 Adolphus Frederick of Holstein-Gottorp, by the influences of Russia, was elected king. During his reign the country was distracted by the rivalries of the Hats and Caps, and the royal power sank to a shadow. Adolphus died in 1771, and was succeeded by his son Gustavus III., whose reign was distinguished by a monarchical revolution. He was assassinated in 1792. His son Gustavus IV. was deposed, and his family declared forever incapable of succeeding to the crown, in 1809. His uncle, the Duke of Sudermania, was declared king with the title of Charles XIII. In 1810 the states elected Jean Baptiste Bernadotte, crown-prince. (See Bernadotte.) In the final struggle with Napoleon previous to 1814 Sweden joined the allies, while Denmark took the part of France. The Danes were driven out of Holstein by Bernadotte, and the Treaty of Kiel was concluded between Sweden, Denmark, and Great Britain, January 14, 1814. Sweden by this treaty ceded to Denmark her last German possessions in Pomerania, and the Isle of Rügen, while Denmark was compelled to cede Norway to Sweden as a compensation for the loss of Finland, gained by Rusisa. Sweden now held the whole Scandinavian peninsula, and had lost all her other European possessions. Bernadotte succeeded to the crown in 1818, under the title of Charles XIV. He died in 1844, and was succeeded by his son Oscar I., whose reign was singularly peaceful and uneventful. He died 8th July, 1859, and was succeeded by his son Charles Louis Eugene, under the title of Charles XV., whose reign was marked by constitutional reforms. In 1866 the states, which from time immemorial had met in four chambers, representing the nobility, clergy, citizens, and peasantry, were reduced to the modern composition of two chambers, an upper and a lower, and the suffrage was extended in 1869. Charles XV. died 18th September, 1872, and was succeeded by his brother Oscar II., who proved a wise and prudent ruler, and under whom the country prospered greatly in industry, commerce and otherwise. The dissolution of the Union of Norway and Sweden took place in 1906. Oscar II. died in 1907 and was succeeded by his son Gustaf V.

SWEDENBORG, Emanuel, the founder of the New Jerusalem church, or sect of Swedenborgians, was born at Stockholm in 1688. The period 1710 to 1714 he spent in scientific travels through England, Holland, France, and Germany. In 1716 he was appointed assessor extraordinary in the Royal College of Mines by Charles XII. In 1719 Queen Ulrica raised the Swedberg family to the rank of nobility, upon which occasion the name was changed to Swedenborg. He increased his stock of knowledge by new travels in 1736–40 in Germany, Holland, France, Italy, and England. He was first introduced to an intercourse with the spiritual world in detail, according to his own statement, in 1743 at London. The eyes of his inward man, he says, were opened to see heaven, hell, and the world of spirits, in which he conversed, not only with his deceased acquaintances, but with the most distinguished men of antiquity. His theological works, written in Latin between the years 1747 and 1771, found but a limited number of readers; and while he was an object of the deepest veneration and wonder to his few followers, his statements were the more mysterious to the rest of the world because he could not be suspected of dishonesty, and exhibited profound learning, keenness of intellect, and unfeigned piety. His works are very numerous, among the more important of them being the Arcana Cœlestia, the New Jerusalem, Angelic Wisdom, the Apocalypse Explained, Heaven and Hell, etc. With uninterrupted health he attained the age of eighty-four, and died of apoplexy in London, March 29, 1772.

SWEDENBORGIANS, the followers of Swedenborg, and particularly the members of what is called the New Jerusalem church, or New church. This body adopts the doctrinal tenets and method of Biblical interpretation laid down in the writings of Emanual Swedenborg. The belief of the Swedenborgians is: that Jesus Christ is God, in whom is a trinity not of persons but essentials, answering to the soul, body, and the operation of these in a man; that the Scriptures contain an internal or spiritual meaning, which is the Word existing in heaven; that the key to this is the correspondence between natural and spiritual things, as between effects and their causes; that man is saved by shunning evils as sins and leading a life according to the ten commandments; that man is a spirit clothed with a

natural body for life on earth, and then when he puts it off at death he continues to live as before but in the spiritual world, first in an intermediate state between heaven and hell, but afterward, when his character, whether good or evil becomes harmonious throughout, among his like either in heaven or hell; that the Lord's second coming and the last judgment are spiritual events which have already taken place.

SWEET-BREAD. See Pancreas.

SWEET-BRIAR, or SWEET-BRIER, a species of rose, which grows wild, but is often planted in hedges and gardens on account of the sweet balsamic smell of its small leaves and flowers. It is also called the eglantine.

SWEET-FLAG, a plant, also called Sweet-rush, found in marshy places throughout the northern hemisphere. The leaves are all radical, long, and sword-shaped; the stem bears a lateral, dense, greenish spike of flowers; the root is long, cylindrical, and knotted. The root has a strong aromatic odor, and a warm, pungent, bitterish taste, and has been employed in medicine since the time of Hippocrates. It is also used by confectioners as a candy, and by perfumers in the preparation of aromatic vinegar, hair-powder, etc.

SWEET-PEA, a garden plant cultivated on account of the beauty of its flowers, which are sweet-scented, and in color purple, rose, white, or variegated.

SWEET-POTATO, a plant now cultivated in all the warmer parts of the globe. It is the potato of Shakespeare and contemporary writers, the common potato being then scarcely known in

Sweet-potato.

Europe. The consumption of the sweet-potato is very large in many parts, including the United States and the warmer parts of America, the East Indies, etc.

SWEET-WILLIAM, a species of pink. It grows wild in dry and sterile places in middle and southern Europe.

SWELL, in music, a gradual increase and decrease of sound; the cresendo and diminuendo combined. Also an arrangement in an organ (and in some harmoniums) whereby the player can increase or diminish the intensity of the sound at will. In the organ it consists of a series of pipes with a separate keyboard, and forming a separate department (called the swell-organ). The loudness or softness of the tone is regulated by opening or shutting, by means of a pedal, a set of slats like a Venetian blind, which forms part of the frame in which the pipes are inclosed.

SWIFT, though swifts are like swallows in many respects, their structure is almost entirely different, and some naturalists rather class them with the humming birds, or the goat-suckers. The swift has all four toes directed forward; it is larger than the swallow; its flight is more rapid and steady; and its scream is very different from the twittering of the swallow. It has the greatest powers of flight of any bird that visits Britain. Its weight is most disproportionately small to its extent of wing, the former being scarcely an ounce, the latter 18 inches, the length of the body being about 8 inches. Its color is a

Common swift.

somber or sooty black, a whitish patch appearing beneath the chin. It builds in holes in the roofs of houses, in towers, or in hollow trees. It leaves Britain in August, having arrived from Africa early in May. A larger species, with the lower parts dusky white, has its home in the mountainous parts of Central and Southern Europe. A common North American swift is the so-called chimney swallow, which builds its nest in chimneys. The swifts or swiftlets which inhabit chiefly the islands of the Indian ocean from the north of Madagascar eastward, construct the edible birds'-nests which are used by Chinese epicures in the making of soup.

SWIFT, Gustavus Franklin, an American merchant, born at Cape Cod, Mass., in 1839. He engaged in meat-packing in Chicago, and was the first to ship meat long distances successfully. He founded and was president of the corporation of Swift and company, one of the largest packing firms in the United States, and was a prominent member of many other similar concerns. He died in 1903.

SWIFT, Jonathan, the greatest of English satirists, was born in Dublin, November 30, 1667. In 1701 he took his doctor's degree, and in 1704 he published anonymously his famous Tale of a Tub, to which was appended the Battle of the Books. In 1708 appeared, among other things, an attack upon astrology under the title of Predictions for the Year 1708, by Isaac Bickerstaff, Esq., and in 1709 a Project for the Advancement of Religion, dedicated to Lady Berkeley, the only work to which he ever put his name. A bishopric in England was the object of his ambition; but the only preferment he obtained from his ministerial friends was the Irish deanery of St. Patrick's, to which he was presented in 1713. His famous Gulliver's Travels appeared in 1726. He died in 1745, bequeathing the greatest part of his fortune to an hospital for lunatics and idiots. As a writer he has, perhaps, never been exceeded in grave irony. He abounds in ludicrous ideas, which often deviate, both in his poetry and prose, into very unpardonable grossness.

SWIMMING, the act or art of sustaining and propelling the body in water. A large proportion of the animal tribes are furnished with a greater or less capacity for swimming either in water or on its surface, but man is unqualified for swimming without learning to do so as an art. The art of swimming chiefly consists in keeping the head, or at least the mouth, above water, and using the hands and feet as oars and helm. Want of confidence is the greatest obstacle in the way of most who begin to learn swimming. The beginner cannot persuade himself that the water will support him, and with the feeling that some muscular effort is necessary for the purpose stiffens his back in such a way that the water cannot buoy him up with the head above water. If, instead of doing this, he would give up the endeavor to support himself by a muscular strain, and trust to the water to support him like a cushion, the art of swimming would come to him almost as naturally as the art of walking does to a child. When the ability to swim in the ordinary way, chest downward, is acquired, everything is acquired. It is as unnecessary to give special instructions for swimming on the back, on the side, etc., as it is to direct people who are able to walk how to turn themselves or walk up or down hill. In saving a person from drowning, which can be done most effectually if he has already lost consciousness, pull him by the hair, or push him before you, if far from shore; otherwise take him by the arm. An excellent method of supporting another in the water is to allow the person supported to rest his hands on your hips. This method can scarcely be practiced in cases where persons unable to swim are drowning; but it may be of much avail in supporting a brother swimmer who is attacked with weakness or cramp, and who has presence of mind to take advantage of the support.

SWIMMING-BLADDER, AIR-BLADDER, or SOUND (of fishes), the names applied to a sac or bladder-like structure found in most, but not in all fishes, the chief office of which appears to consist in altering the specific gravity of the fish, and thus enabling it to rise or sink at will in the surrounding water. It has a homology or structural correspondence with the lungs of higher forms than fishes; but it has no analogy or functional correspondence with the lungs or breathing organs, save in the peculiar Lepidosirens or mud-fishes, in which the air-bladder becomes cellular in structure, and otherwise assumes a lung-like structure and function In its simplest condition it exists as a closed sac lying beneath the spine, and containing air or gases of different kinds. By the muscular compression of its walls the density of the contained gas is altered, and the specific gravity of the fish affected accordingly, so as to change its position in the water. In most sea-fishes the gas which the swimming-bladder contains is oxygen,

that in the air-sac of fresh-water fishes being mostly nitrogen. Such fishes as the flat-fishes, represented by the flounders, soles, etc., have no swimming-bladder developed, and it may be absent in other forms, such as sharks, rays, lampreys, etc.

SWINBURNE, Algernon Charles, poet and essayist, was born in London 1837. His first productions, Queen Mother and Rosamond, published in 1861, attracted but little attention. They were followed by two tragedies, Atalanta in Calydon and Chastelard, and by Poems and Ballads which excited considerable criticism. Since that time Swinburne has been prominently before the public. Among his numerous later works may be mentioned: A Song of Italy, William Blake, a critical essay; Songs before Sunrise, Bothwell, a tragedy; Poems and Ballads (2d series), Mary Stuart, a tragedy; Tristram of Lyonesse, etc. A Century of Roundels, Marino Faliero, a tragedy; Poems and Ballads (3rd series), Astrophel and other Poems; etc. He died in 1909.

SWINE. See Hog.

SWINE FEVER, or **SWINE PLAGUE,** is known as hog cholera in America, where it has caused enormous losses. It is a specific contagious fever, generally very rapid in its course, death ensuing in a very few days. To suppress the disease, all affected pigs must be killed, and if necessary those which have been in contact with them, and the carcasses and litter burned or deeply buried.

SWING, David, American preacher, born in 1830 in Cincinnati. In 1866 he was called to the Fourth Presbyterian church in Chicago. In 1874 he was tried for heresy and acquitted, but, resigned his pastorate and withdrew from the Presbyterian ministry. He organized a new church, meeting at first in a theater and later in the Central Music Hall, where Dr. Swing continued to preach to one of the largest congregations in Chicago until his death. He died in 1894.

SWING-BRIDGE, called also swivel-bridge and pivot-bridge, a bridge that may be moved by swinging, so as to afford a passage for ships on a river, canal, at the mouth of docks, etc. In one form the whole bridge is swung to one side; in another it rotates from its center on a pier in the middle of the water-way, so as to make a passage on each side of it; while in a third it consists of two sections, each of which, when opened, is landed on its own side.

SWISS GUARDS, bodies of mercenary Swiss troops which, since Switzerland gained her independence in the 15th century, have been employed in many European countries as body-guards, and for duty about courts. The most famous are the French Swiss guards organized in 1616, and annihilated in the defense of the Tuileries, August 10, 1792, whose heroism is commemorated in Thorwaldsen's colossal Lion, carved in the face of a rock at Lucerne. The French Swiss guards were reorganized by Louis XVIII. in 1815, and defeated and dispersed in the revolution of 1830.

SWITCHES. See Railways.

SWITHIN, St., bishop of Winchester from 852 to 862, and patron saint of Winchester cathedral from the 10th to the 16th century. The popular knowledge of this saint's name is due to the belief that if rain falls on the 15th of July (which is popularly known as St. Swithin's Day) it will rain for six weeks after Similar superstitions are connected in various continental countries with other saints' days which occur in summer.

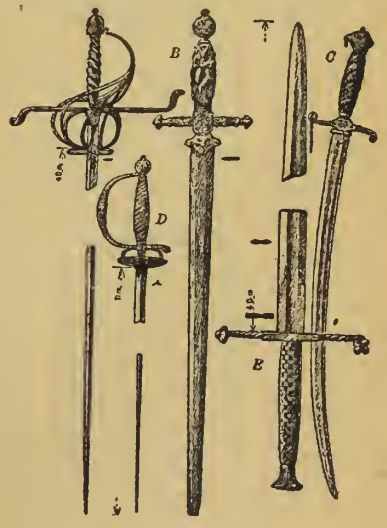
SWITZERLAND, a federal republic of Central Europe, bounded north by Baden, from which it is separated for the most part by the Rhine; northeast by Würtemberg and Bavaria, from which it is separated by the Lake of Constance; east by the principality of Lichtenstein and the Tyrol, from which it is separated by the Rhine and the Grisons Alps; south by Italy, from which it is separated by the Alps and the Lake of Geneva; and west and northwest by France, from which it is separated in part by the Jura mountains and the River Doubs. Greatest length, 210 miles; greatest breadth, 126 miles. Pop. 3,292,551. The largest towns are Zürich, Basel, Geneva, and Bern, the last being the federal capital. The characteristic physical features of Switzerland are its lofty mountain ranges, enormous glaciers, magnificent lakes, and wild romantic valleys. The loftiest mountain-chains belong to the Alps, and are situated chiefly in the south. The central nucleus is Mount St. Gothard, which unites the principal watersheds of Europe. In like manner it forms a kind of starting point for the loftiest ranges of the Alps. Besides the Alps, properly so called, the only range deserving of notice is that of the Jura, which is linked to the Alps by the small range of the Jorat. The principal rivers are the Rhine, the Rhone, the Aar, and the Inn. The largest lakes, that of Geneva in the southwest and of Constance in the northeast, as well as that of Maggiore on the south side of the Alps, belong partly to other countries; but within the limits of Switzerland, and not far from its center, are Lake Neuchâtel, with Morat and Bienne in its vicinity, Thun with its feeder Brienz, Lucerne, or Vierwaldstätter-see, Sempach, Baldegg, Zug, Zürich, and Wallenstatter-see. All these internal lakes belong to the basin of the Rhine. All the loftiest alpine ranges have a nucleus of granite, on which gneiss and mica-slate recline generally at a high angle. Coal-bearing strata are found in the cantons of Valais, Vaud, Freiburg, Bern, and Thurgau, and brown coal is obtained in St. Gall and Zürich. Iron is worked to advantage in several quarters, particularly among the strata connected with the Jura limestone. Rock and common salt are produced to some extent in the cantons of Vaud, Basel, and Aargau. The only other minerals deserving of notice are alabaster and marble, widely diffused; and asphalte, in the Val-de-Travers in the canton of Valais. Mineral springs occur in many quarters. Owing to differences of elevation the climate is extremely variable even in the same localities. Owing to the same cause, few countries in Europe even of larger extent can boast of a more varied vegetation than Switzerland. In regard to vegetation it has been divided into seven regions. The characteristic product of the first is the vine, which grows up to 1700 or 1800 feet above the sea-level. The next is the hilly or lower mountain region, rising to the height of 2800 feet, and characterized by the luxuriance of its walnut trees, with good crops of spelt and excellent meadows. The third or upper mountain region, which has its limit at 4000 feet, produces forest timber, more especially beech, and has good crops of barley and oats, and excellent pastures. Above this, and up to the height of 5500 feet, is the fourth or subalpine region, distinguished by its pine forests and maples; here no regular crops are grown; The fifth or lower alpine region, terminating at 6500 feet, is the proper region of alpine pastures. In the sixth or upper alpine region the vegatation becomes more and more stunted, and the variation of the seasons is lost. The seventh or last region is that of perpetual snow. The chief crops are wheat, spelt, rye, oats, and potatoes. The wine produced is mostly of inferior quality. Considerable quantities of fruit are grown. Among domestic animals the

Group of Swiss, District of Appenzell.

first place belongs to the horned cattle, and the dairy products of Switzerland are of special commercial importance, great quantities of cheese and condensed milk being exported. On the higher grounds goats are very numerous. Among wild animals are bears, wolves, chamois, wild boars, stags, badgers, foxes, hares, otters, birds of prey of large dimensions, and many varieties of winged game. The lakes and rivers are well supplied with fish. Of the population about 40 per cent are dependent on agriculture, and about 34 per cent on manufacturing industry. Switzerland is thus mainly an agricultural and manufacturing country The system of peasant proprietorship prevails largely, it being estimated that there are nearly 300,000 peasant proprietors. The principal manufactures are cotton, silk, embroidery, watches and jewelry, machinery and iron, tobacco and wool. Geneva is the chief seat of the watch industry, Basel of the silk industry, and St. Gallen of embroidery. Switzerland being an inland country, has direct commercial intercourse only with the surrounding states; but the trade with other countries, especially Great Britain and the United States, is very important. There are now fully 2300 miles of railway. There is a very complete

system of telegraphs. The French metric system of money, weights, and measures has been generally adopted in Switzerland. Both the Evangelical-reformed church and the Roman Catholic are national churches in Switzerland, about 59 per cent of the inhabitants belonging to the former, and 41 per cent to the latter. There is complete liberty of conscience and creed, but the order of the Jesuits and the societies affiliated to it are not allowed within the confederation. In terms of the constitution of 1874 primary education is secular and compulsory throughout the confederation. For the higher education there are five universities, Basel, Zürich, Geneva, Berne, Lausanne, the first founded in 1460, and the others since 1832. There are also academies or incomplete universities at Fribourg and Neuchâtel; a polytechnic school at Zürich; and a military academy at Thun. The cantons of Switzerland are united together as a federal republic for mutual defense, but retain their individual independence in regard to all matters of internal administration. The legislative power of the confederation belongs to a federal assembly, and the executive power to a federal council. The federal assembly is composed of two divisions—the national council, and the state council or senate. The national council is elected every three years by the cantons—one member to each 20,000. Every lay Swiss citizen is eligible. The senate consists of forty-four members—two for each canton. In addition to its legislative functions the federal assembly possesses the exclusive right of concluding treaties of alliance with other countries, declaring war and singing peace, sanctioning the cantonal constitutions, and taking measures regarding neutrality and intervention. The army consists of the Bundesauszug, or federal army, comprising all men able to bear arms from the age of twenty to thirty-two; and the Landwehr, or militia, comprising all men from the age of thirty-two to forty-four. In 1907 the Bundesauszug had a strength of 153,649, and the Landwehr of 88,813, making a total of 242,642. There is also, by a law of 1887, a Landsturm (of 283,643 men), in which every citizen between the ages of seventeen and fifty, not otherwise serving, is liable to be called to serve. The Landsturm is called out only in time of war. The Swiss are a mixed people as to race and language. German, French, Italian, and a corrupt kind of Latin called Rhætian or Roumansch, are spoken in different parts. The Swiss, however, have lived so long in a state of confederation that, apart from these peculiarities of origin and language, they have acquired a decided national character, and may now be viewed as forming a single people. The oldest inhabitants mentioned in written history are the Helvetians, who, between 58 B.C. and 10 A.D., were subjugated by the Romans. Before the fall of the Roman empire in the West, Switzerland was occupied by the German confederation of the Alemanni; by the Burgundians and the Lombards; and by the year 534, under the successors of Clovis, it had become a portion of the Frankish empire. Under the successors of Charlemagne it was divided between the Kingdom of France and the German empire, but ultimately the whole country fell to Germany. For the most part, however, the dependence of Switzerland on Germany was merely nominal. The counts (originally local governors) conducted themselves as princes, assumed the name of their castles, and compelled the free inhabitants of their Gaus (districts) to acknowledge them as their lords. At the beginning of the 13th century the three forest cantons of Uri, Schwyz, and Unterwalden were subject to the counts of Hapsburg, who, although they were properly only imperial bailiffs (Vögte), yet regarded themselves as sovereign rulers. This claim the three cantons constantly refused to admit, and eventually (1291) leagued themselves together to oppose the usurpations of the house of Hapsburg. On January 1, 1308, the Austrian governors were deposed and expelled. A few years later the three cantons were invaded by the Hapsburgs; but the signal victory at the pass of Morgarten on the 15th of November, 1315, secured the independence of the cantons. The three united cantons were joined by the cities of Lucerne (1332) and Zürich (1351), the cantons of Glarus and Zug (1352), and the city of Bern (1353). Austria, which claimed jurisdiction over three of the newly-added members, namely, the city of Lucerne and the cantons of Glarus and Zug, again invaded the territory of the confederation, but was completely defeated at Sempach in 1386, and in 1388 at Näfels. The canton of Appenzell joined the confederation in 1411, and Aargau was wrested from the Austrians in 1415. The third war with Austria terminated in 1460, in favor of the confederation, which obtained Thurgau, Austria being thus deprived of all its possessions in the regions over which Switzerland now extends. They admitted Freiburg and Solothurn into the confederation in 1481, and about the same time they concluded defensive alliances with several of the neighboring states. The last war with Austria broke out in 1498. The Swiss had to undergo a severe struggle, but, victors in six sanguinary battles, they were, by the Peace of Basel in 1499, practically separated from the empire, a separation to which formal and international sanction was given in 1648. After this war they had no longer any enemy to fear, and their future wars were waged on behalf of foreign powers. In 1501 Basel and Schaffhausen, and in 1513 Appenzell were admitted into full federation. The number of the cantons was thus brought up to thirteen, at which it remained till 1798. The town and the abbot of St. Gall and the town of Bienne had seats and votes in the diet without being in full federation; and there were besides six allies of the confederation not enjoying these privileges—the Grisons, Valais, Geneva, Neufchâtel, Mühlhausen, and the bishopric of Basel. In 1516 France gave up to Switzerland the whole of the present canton of Ticino. In 1518 the Reformation began to make its way into Switzerland, chiefly through the efforts of Zuinglius at Zürich. Zuinglius fell at Kappel (1531), but his work was carried on by Calvin at Geneva. The effect of the Reformation for long was to divide Switzerland into separate camps. The last time the two great parties met in arms was at Willmergen in 1712, when victory declared itself for the Protestants. In almost every department of human knowledge the Swiss of the 18th century, both at home and abroad, acquired distinguished reputation. In the last years of the century the ferment of the French revolution spread to Switzerland; and in 1798 the ancient confederation was replaced by the Helvetic Republic, which lasted four years. In 1803 Napoleon I. organized a new confederation, composed of nineteen cantons, by the addition of Aargau, Grisons, St. Gall, Ticino, Thurgau, and Pays de Vaud. In 1815, by the compact of Zürich, Neufchâtel, Geneva, and Valais were admitted into the confederacy, and the number of the cantons was thus brought up to twenty-two. This confederacy was acknowledged by the congress of Vienna, which proclaimed the perpetual neutrality of Switzerland, and the inviolability of its soil. Again, in 1830 and in 1848, Switzerland was affected by the revolutionary movement in France, and a new federal constitution was introduced in the latter year. During the commotions of 1848 Neufchâtel set aside its monarchial form of government and adopted a republican one, and in 1857 it was put upon the same footing with the other cantons. Since that time the annals of Switzerland have little to record beyond the fact of constant moral and material progress. A revision of the federal constitution was adopted after a protracted agitation on the 19th of April, 1874, giving to the federal authorities more power in matters relating to law, the army, the church, and education.

SWORD, a weapon used in hand-to-



Swords.
a, Rapier, 16th century; *b*, Italian sword, wrought-bronze hilt; *c*, French hunting-sword, 18th century; *d*, Small sword, 18th century; *e*, Knights' sword, 15th century.

hand encounters consisting of a steel blade and a hilt or handle for wielding

it. The blade may be either straight or curved, one-edged, or two-edged, sharp at the end for thrusting, or blunt. The ancient Greek swords were of bronze, and later of iron. The Romans in the time of Polybius (B.C. 150) had short, straight swords of finely-tempered steel. The straight, long sword was used by the Christians of the West in the middle ages, while the Poles and all the tribes of Slavonic origin employed, and still prefer, the crooked sword or scimitar, which was also used by the Saracens, and is still the common one in the East. The double-handed sword of the middle ages was an unwieldly weapon, and probably originated from the wearing of plate armor. The sword is of much less importance in warfare than formerly, but European cavalry are still armed with it. From the former importance of the sword it came to be connected with various matters of ceremonial. The sword of state is one of the regalia, and the "offering of the sword" one of the ceremonies of coronation. Damascus, Toledo, and Milan were anciently famous for their sword-blades. In England, at the present day, the government seat of the sword manufacture is Birmingham. See Broadsword, Cutlass, Rapier, and Scimitar; also Cutlery and Fencing.

SWORD-FISH, a fish allied to the mackerel and represented by the common sword-fish, the single known species. It occurs in the Mediterranean sea and Atlantic ocean, but may also be occasionally found round the coasts of Britain. It attains a length of from 12 to 15, or even 20 feet, the elongated upper jaw, or sword, forming three-tenths of its length. Its body is covered

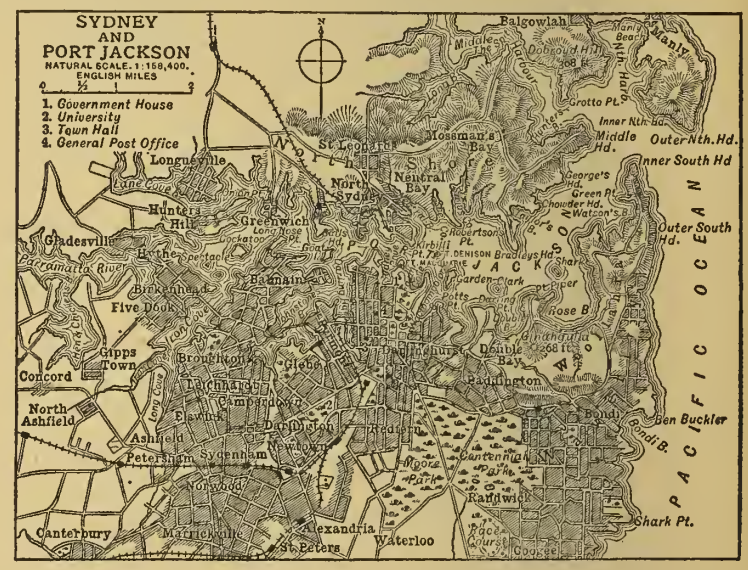
Sword-fish.

with minute scales. Its color is a bluish-black above, and silvery white on the under parts. The ventral fins are wanting. It is fished for by the Neapolitan and Sicilian fishermen with the harpoon. Its flesh is very palatable and nutritious. It attacks other fishes, and often inflicts fatal wounds with its powerful weapon; and there are frequent instances in which the timbers of ships have been found to be perforated through and through by the sword-like jaw, which has been left sticking in the wood.

SYCAMORE, a large and well-known timber tree in the western parts of the United States, a name for the occidental plane or buttonwood. For the Sycamore of Scripture see Sycomore.

SYCOMORE, a kind of fig-tree. It is very common in Palestine, Arabia, and Egypt, growing thick and to a great height, and though the grain is coarse, much used in building, and very durable. Its wide-spreading branches afford a grateful shade in those hot climates, and its fruit, which is produced in clusters upon the trunk and the old limbs, is sweet and delicate.

SYDNEY, the capital of New South Wales and the parent city of Australia, is situated on the southern shore of Port Jackson, the shore line being deeply indented by capacious bays or inlets which form harbors in themselves, and are lined with wharves, quays, and warehouses. Among the most important public buildings are the new government offices, the town-hall, with a tower 200 feet high, and a very capacious great hall; the post-office, an Italian building with a tower 250 feet high; the government house; the university, a Gothic building with a frontage of nearly 400 feet, situated in a fine park;



the free public library; school of art; public museum; grammar-school; St. Andrew's (Episcopal) cathedral; St. Mary's (R.C.) cathedral; the Jewish synagogue; exchange; custom-house; mint; parliament houses; hospitals, asylums, and numerous other ecclesiastical, scholastic, and business buildings. The principal exports are wool, tallow, hides, preserved meat, tin, copper, etc.; the imports, grain, tea, coffee, sugar, wine and spirits, ironware and machinery, cotton and woolen goods, wearing apparel, furniture, etc. The discovery of gold in the colony in 1851 gave an immense impetus to its progress. Pop. 618,462.

SYLVESTER, Joshua, English poet, born in 1563, was a member of the company of merchant adventurers at Stade, Holland. He is known chiefly as the translator into English of the Divine Weeks and Works of the French poet Du Bartas. He died in 1618.

SYMBOL, a sign by which one knows or infers a thing; an emblem. It is generally a definite visible figure intended to represent or stand for something else, as in the case of the common astronomical symbols, which are signs conveniently representing astronomical objects, phases of the moon, etc., and astronomical terms. Some of these symbols are so ancient that we can find no satisfactory account of their origin. The symbols for the chief heavenly bodies are as follows:

Sun ☉, Mercury ☿, Venus ♀, Earth ♁ and ⊕, Moon ☾, Mars ♂, Ceres ⚳, Pallas ⚴, Juno ⚵, Vesta ⚶, Jupiter ♃, Saturn ♄, Uranus ♅, Neptune ♆, Comet ☄, Star ✳. The asteroids, except the four given above, are represented by a circle with a number, thus, (64). *Lunar Phases.* ● Moon in conjunction, or *new;* ☽ Moon in eastern quadrature, or *first quarter;* ○ Moon in opposition, or *full;* ☾ Moon in western quadrature, or *last quarter.* See *Ecliptic.*—Chemical symbols are merely the first letters of the names of the chemical elements; or, when the names of two or more elements begin with the same letter, two letters are used as the symbol, one of which is always the first letter of the name of the element. Generally speaking the letters comprising the symbol are taken from the English name of the element; but in some instances, specially in the case of metals which have been long known, the symbols are derived from the Latin names, as Fe (Lat. ferrum) for iron. See Chemistry.—Mathematical symbols are letters and characters which represent quantities or magnitudes, and point out their relations, as, a'', $a_{,,}$; a^2, a_2; a^m, a; the signs, $+$, $-$, $\times$, $\div$, $:$, $\surd$, f, $=$, $<$, $>$, etc.

SYMPATHETIC INKS, inks which remain invisible until acted upon by heat or by some other reagent. See Ink.

SYMPATHETIC NERVOUS SYSTEM, the name applied to a set of nerves in vertebrate animals, forming a nervous system distinct from, and yet connected with, the chief nerve-centers, or cerebro-spinal nervous system. They are specially connected with the processes of organic life, the movements of the heart and of respiration, the work of the stomach, etc., in digestion, the process of secretion in glands, etc. See Nerve.

SYM'PATHY, in physiology, is that quality of the animal organization by which, through the increased or diminished activity of one organ, that of

others is also increased or diminished. The idea of an organized system—the union of many parts in one whole, in which all these parts correspond to each other—includes the idea of a mutual operation, of which sympathy is a part. The sympathetic medium has been sometimes supposed to be the nervous system, sometimes the vascular or cellular system; but sympathy takes place between such organs as have no discoverable connection by nerves or vessels. The phenomenon of sympathy appears even in the healthy body; but its effect is much more often observed in diseases. Sympathy is further used to express the influence of the pathological state of one individual upon another, as in the contagion of hysteria or of yawning.

SYM'PHONY, an elaborate musical composition for a full orchestra, consisting usually, like the sonata, of three or four contrasted, yet inwardly related movements. Haydn, Mozart, Mendelsshon, and Beethoven are the most successful composers of this class of compositions.

SYMPTOMS, in medicine, the phenomena of diseases, from which we infer the existence and the nature of the disease. Symptoms have their seat in the functions which are affected by the disease, and may be perceptible by the patient alone (for example, pain and all change of sensations), or by the physician also (for example, all diseased movements). The nervous, the vascular, and the cutaneous systems are affected in most diseases, and thus afford symptoms. If the symptoms are perceptible only to the patient they are called subjective; if to the physician without necessary reference to the patient, they are objective.

SYNAGOGUE, the recognized place of public worship among the Jews. Its origin, it is supposed, belongs most probably to the date of the Babylonish captivity in the abeyance of temple worship. The synagogues were so constructed that the worshippers, as they entered and as they prayed, looked toward Jerusalem. At the extreme east end was the holy ark, containing copies of the Pentateuch; in front of this was the raised platform for the reader or preacher. The men sat on one side of the synagogue and the women on the other, a partition 5 or 6 feet high dividing them. The chief seats, after which the scribes and Pharisees strove, were situated near the east end. The constitution of the synagogue was congregational, not priestly, and the office-bearers were not hereditary, but were chosen by the congregation. A college of elders, presided over by one who was the ruler of the synagogue, managed the affairs of the synagogue, and possessed the power of excommunication. The officiating minister was the chief reader of the prayers, the law, the prophets, etc. The servant of the synagogue, who had the general charge of the building, generally acted on week-days as schoolmaster to the young of the congregation. The right of instruction was not strictly confined to the regularly-appointed teachers, but the ruler of the synagogue might call upon anyone present to address the people, or even a stranger might volunteer to speak. The modern synagogue differs little from the ancient. Instead of elders there is a committee of management; and the women are now provided with seats in a low latticed gallery.—The Great Synagogue was an assembly or council of 120 members, said to have been founded and presided over by Ezra after the return from the captivity. Their duties are supposed to have been the remodelling of the religious life of the people, and the collecting and redacting of the sacred books of former times.

SYNCOPE (sin'ko-pē), the name given to that form of death characterized by failure and cessation of the heart's action as its primary feature. The term is also applied to the state of fainting produced by a diminution or interruption of the action of the heart, and of respiration, accompanied with a suspension of the action of the brain and a temporary loss of sensation, volition, and other faculties. Fatal syncope is usually the result of some nervous "shock," resulting from some severe lesion of organs, or from a want of blood or an altered and abnormal state of blood pressure. Ordinarily syncope is caused chiefly by weakness, mental emotion, etc. The fainting patient should be laid on a couch and the head kept low; while great caution must be observed in stimulating the action of the heart.

SYNDIC, an officer intrusted with the affairs of a city or other community; also, a person appointed to act in some particular affair in which he has a common interest with his constituents, as when he is one among several creditors of the same debtor.

SYN'DICATES, originally, councils or bodies of syndics; afterward, associations of persons formed with the view of promoting some particular enterprise, discharging some trust, or the like; now, combinations of capitalists for the purpose of controlling production and raising prices. Formerly, combinations of capitalists simply aimed at an agreement as to how much each should produce, and what common price should be charged to the public, each producer still retaining control over his own business; but modern syndicates have absolute control over the operations of all the consenting parties, and aim at obtaining entire control of the industries with which they deal, so that both producer and consumer shall be at their mercy. Syndicates, in their modern form, originated in the United States, where they have been introduced into all the leading branches of trade, and are now in operation on a very extensive scale. From the United States they were transplanted to the continent of Europe, where they found a congenial soil, especially in Germany. Their introduction into Britain is of more recent date, but they promise to become as general there as elsewhere.

SYNOD, an ecclesiastical assembly convened to consult on church affairs. A synod may be diocesan, composed of a bishop and the clergy of his diocese; or provincial, of an archbishop and the bishops and clergy of his province; or national, of the whole clergy of a state under a papal legate. The convocations of the English clergy are provincial synods. Synods in the Presbyterian church are courts of review standing between the presbyteries and the general assembly, and embracing a certain number of associated presbyteries, the clergy and elders of which constitute the respective synods.

SYNOPTIC GOSPELS, a term applied to the gospels of St. Matthew, St. Mark, and St. Luke, which present a synopsis or general view of the same series of events. In St John's gospel the events narrated are different. See Gospel.

SYNTAX, that part of grammar which treats of the manner of connecting words into regular sentences, constructing sentences by the due arrangement of words or members in their mutual relations according to established usage. In every language there is some fundamental principle which pervades and regulates its whole construction, although it may occasionallly admit of particular variations. In some languages the principle of juxtaposition prevails, and little diversity of arrangement is possible, as is the case in English, in which inflections are so few. The relations of the subject, the action, and the object are indicated by their respective position. In other langauges—inflected languages like Latin or Greek—these relations are indicated by the changes in the forms of the words, and the modes of arrangement are various. Still, in the structure and disposition of sentences and parts of sentences the logical relations of the thoughts must regulate the construction, even where it appears to be most arbitrary.

SYN'THESIS. See Analysis.

SYPH'ILIS, a disease usually communicated by impure sexual connection. It is a contagious and hereditary veneral disease, characterized in its primary or local stage by chancres or ulcers on the genitals, succeeded by inguinal buboes. The indications of a secondary or constitutional affection are ulcers in the throat, copper-colored eruptions on the skin, pains in the bones, nerves, etc. During the latter part of the 15th century it assumed an epidemic form, and spread throughout the whole of Europe. Like other diseases, it gradually diminished in virulence, particularly after Paracelsus had found in mercury a useful remedy against it.

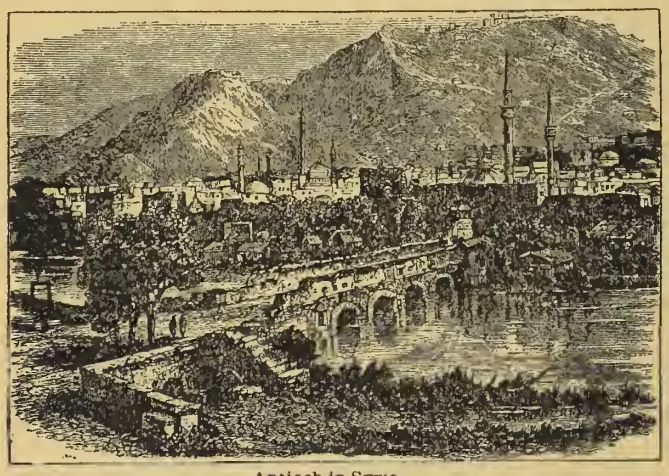
SYPHON. See Siphon.

SYR'ACUSE (now Siracusa), anciently the chief city of Sicily, on the east coast of the island, one of the most magnificent cities in the world, with 500,000 inhabitants, is now greatly reduced, but still has an excellent harbor, capable of receiving vessels of the greatest burden. The cathedral is the ancient temple of Minerva, and there are remains of ampitheaters and other Roman works. Syracuse was founded by a colony of Corinthians under Archias, B.C. 734, and, according to Thucydides, possessed a greater population than Athens or any other Grecian city. Syracuse is the seat of an archbishop, and since 1865 has been the capital of a province of the same name. It has some manufactures of drugs, chemicals, and earthenware,

and a considerable commerce, principally in wine. Pop. 21,157.

SYR'ACUSE, a city in Onondaga co., New York, 148 miles west of Albany. It has spacious and well-built streets, handsome churches, splendid hotels, large and lofty warehouses, university, and complete system of public schools, etc. The salt industry, to which it owed its early prosperity, is still the staple, the springs yielding on an average from seven to eight million bushels of salt a year; but the other industries are numerous and important (including rolling-mills, furnaces, steel works, etc.), and there is an extensive traffic by rail and canal. Pop. 1909, about 130,000.

SYRACUSE UNIVERSITY, a coeducational institution at Syracuse, N. Y.; founded in the year 1848, but located at Lima, N. Y., and known as Genesee college until 1871, when it was removed to Syracuse. The campus comprises 50 acres; the principal buildings are the Hall of Languages, the Holden observatory, the John Crouse Memorial college, containing the college of fine arts,



Antioch in Syria.

the library building, and the Y. M. C. A. hall and gymnasium. The medical college building is near the center of the city. The college was removed from Geneva in 1881. A college of law was opened in 1895.

SYR'IA, a country forming part of Asiatic Turkey, and bounded on the north by the Taurus range, on the northeast by the Euphrates, on the east by the Syrian desert, on the south and southeast by Arabia, on the southwest by Egypt, and on the west by the Mediterranean; area, estimated at about 70,000 square miles. The coast has some low sandy tracts, but is in general, though not deeply indented, lofty and precipitous, rising, particularly in Mount Carmel, to the height of 3000 feet. The only good harbors are those of Beyrout and Alexandretta (Scanderoon). In Lebanon the mountains reach a height of about 10,000 feet. Between the two parallel ranges of Libanus and Anti-Libanus is the valley of Cœle-Syria, whence the Orontes flows northward, turning westward at Antioch, and falling into the sea at the ancient Seleucia. The principal river of South Syria (Palestine, which see) is the Jordan. In the course of the Jordan are the lakes of Merom and Tiberias, and at its mouth is the far larger lake, the Dead Sea. Much of the soil, more especially in the valleys of Lebanon, is very fertile; but agriculture is not pursued with so much zeal as in ancient times. Nevertheless, the orchards of Damascus and the cornfields of Hauran are celebrated, and the olive-tree and the vine are found in all parts. The country is poor in minerals; the native manufactures in silk, cotton, and wool have been paralyzed by the import trade from Europe; and the caravan trade has almost entirely ceased. The inhabitants, roughly estimated at about 1,500,000, consist chiefly of two elements, the Aramaic and the Arabic the latter including Bedouins and town and peasant Arabs. Jews are found only in the large towns, and have immigrated back from Europe. The language generally spoken is Arabic, but with Aramaic elements. The Mohammedans comprise about four-fifths of the population, and the Christians one-fifth. Syria at an early period became part of the Assyrian empire, and afterward passed to the Persians, the Greeks and the Romans. It formed part of the Byzantine empire, but was taken by the Arabs in 636, by the Seljuk Turks in 1078, by the Crusaders, whose kingdom of Jerusalem lasted till 1295, by the Mamelukes, who united it with Egypt, and by the Ottoman Turks, who added it to their empire in 1517. The most important events in the modern history of Syria are its conquest by Mehemet Ali of Egypt in 1833, and its restoration to Turkey in 1840 by the intervention of the great European powers; and the war between the Druses and Maronites which broke out in 1860, peace being restored in 1861 only by the active efforts of a French force sent out under sanction of Turkey and the western powers. At present Syria comprises three vilayets—Syria proper, Aleppo, and Beyrout, and the mutessarifates of Zor (on the Euphrates) Lebanon, and Jerusalem. Lebanon has the special privilege of being under the rule of a Christian Mutessarif.

SYRINGA. See Lilac.

SYRINGE, an instrument consisting of a cylinder of metal or glass fitted with an air-tight piston, which is moved up and down by means of a handle. In its simplest form it is destitute of valves, one simple aperture at the extremity serving for the admission and ejection of fluid; those provided with valves, however, are available, on a small scale, for all the purposes of an air-pump.

SYRUP, in medicine, a saturated, or almost saturated solution of sugar in water, either simple, flavored, or medicated. In the sugar manufacture, a syrup is a strong saccharine solution which contains sugar in a condition capable of being crystalized out, the ultimate uncrystalizable fluid being called treacle or molasses.

SZE-CHUEN, a large province in the west of China; area, 166,800 sq. miles. The surface is generally rugged and full of defiles, especially in the west, where many peaks rise far above the snow-line, but there is a plain of some extent surrounding Ching-too-fo, the capital. The principal river is the Yang-tse-kiang. The soil is only moderately fertile, but there is some metallic wealth. Pop. 67,712,897.

SZEGEDIN (seg'e-din), a royal free city of Hungary. It is second only to Budapest, and is a great center of commerce and agriculture. Pop. 100,552

T

T, the twentieth letter in the English alphabet, a sharp mute consonant, representing the sound produced by a quick and strong emission of the breath after the end of the tongue has been placed against the roof of the mouth near the roots of the upper teeth. By Grimm's law t in English corresponds to d in Latin, Greek, and Sanskrit, and to ss or z in German.

TAB'ARD, a sort of tunic of the middle ages, worn over the armor, and generally embroidered with the arms of the wearer or if worn by a herald, with those of his lord or sovereign. It still forms a part of the official dress of heralds.

TABAS'CO, a state of Mexico, between Yucatan peninsula and Vera Cruz; area, 12,716 sq. miles. A large portion of the state is still covered with primeval forests. The inhabitants are chiefly Indians. The capital is San-Juan-Bautista. Pop., 158,107.

TABERNACLE, in Jewish antiquities, the tent or sanctuary in which the sacred utensils were kept during the wanderings of the Israelites in the desert. It was in the shape of a parallelogram, 45 feet by 15, and 15 feet in height, with its smaller ends placed east and west, and

having its entrance in the east. Its framework consisted of forty-eight gilded boards of shittim-wood, bound together by golden rings and set into silver sockets; and this framework was covered with four carpets. The interior was divided by a curtain into two compartments, the outer the "sanctuary" proper, and the innermost the holy of holies. In the sanctuary was placed on the north the table of show-bread, on the south the golden candle-stick, and in the middle, near the inner curtain, the altar of incense. In the center of the holy of holies stood the ark of the covenant. The tabernacle was situated in a court 150 feet by 75, surrounded by costly screens 7½ feet high, and supported by pillars of brass 7½ feet apart, to which the curtains were attached by hooks and fillets of silver. In the outer or eastern half of the court stood the altar of burnt-offering, and between it and the tabernacle itself the laver, at which the priests washed their hands and feet before entering the sanctuary. It was superseded by the temple at Jerusalem.

Tabard, Sir John Cornwall, Ampthill church, Beds.

TABERNACLES, Feast of, the last of the three great festivals of the Jews which required the presence of all the males in Jerusalem. Its object was to commemorate the dwelling of the Israelites in tents during their sojourn in the wilderness, and it was also a feast of thanksgiving for the harvest and vintage. The time of the festival fell in the autumn, when all the chief fruits were gathered in, and hence it is often called the feast of the ingathering. Its duration was strictly only seven days, but it was followed by a day of holy convocation of peculiar solemnity. During the seven days the people lived in booths erected in the courts of houses, on the roofs, and in the court of the temple. It was the most joyous festival of the year.

TABLE-LAND, or PLATEAU, a flat or comparatively level tract of land considerably elevated above the general surface of a country. Being in effect broad mountain masses, many of these plateaux form the gathering-grounds and sources of some of the noblest rivers, while their elevation confers on them a climate and a vegetable and animal life distinct from that of the surrounding lowlands. In Europe the chief table-lands are that of Central Spain, the less-defined upland in Switzerland, and the lower plateaux of Bavaria and Bohemia. In Asia are the most extensive table-lands in the world; the sandy rainless Desert of Gobi, nearly 400,000 sq. miles; and the loftiest inhabited table-land in the world, that of Tibet, with an elevation of from 11,000 to 15,000 feet. In Africa are the plateaux of Abyssinia, and the karoos or terrace plains of South Africa. In America the great table-lands are those of Mexico and the Andes.

TABOO′, or TABU, a peculiar institution formerly prevalent among the South Sea islanders, and used in both a good and bad sense—as something sacred or consecrated, and as something accursed or unholy—both senses forbidding the touching or use of the thing taboo. The idea of prohibition was always prominent. The whole religious, political, and social system of the primitive Polynesians was enforced by the taboo, the infringement of which in serious cases was death.

TABREEZ′, or TABRIZ′, a city of Persia, capital of the province of Azerbijan, on the Aigi, 36 miles above its entrance into Lake Urumia. Tabreez has manufactures of silks, cottons, carpets, leather and leather goods, etc. It is the great emporium for the trade of Persia on the west, and has an extensive commerce. It has frequently suffered from earthquakes. Pop. 170,000.

TACAHOUT (tak′a-hut), the small gall formed on the tamarisk-tree. It is imported for the sake of its gallic acid, and is used as a mordant in dyeing and in tanning.

TACAMAHAC′, the name given to a bitter balsamic resin, the produce of several kinds of trees belonging to Mexico and the West Indies, the East Indies, South America, and North America. The balsam-poplar or tacamahac is one of these.

TACITUS, Caius Cornelius, a Roman historian, born probably about 54 A.D. Under Titus he became quæstor or ædile; was prætor under Domitian (A.D. 88), and consul under Nerva (A.D. 97). He was several years absent from Rome on provincial business, and probably then made the acquaintance of the German peoples. The time of his death is uncertain; but it probably took place after A.D. 117. We have four historical works from his pen; his Annals, in sixteen books (of which books seventh to tenth inclusive are lost), which contain an account of the principal events in Roman history from the death of Augustus (A.D. 14) to that of Nero (A.D. 68); his History (of which only four books and a part of the fifth are extant), which begins with the year 69 A.D., when Galba wore the purple, and ends with the accession of Vespasian (70); his Germany, an account of the geography, manners, etc., of the country; and his Life of Agricola. The works of Tacitus have been pronounced, by the unanimous voice of his contemporaries and of posterity, to be masterpieces in their way.

TACK, in navigation, the course of a ship in regard to the position of her sails and the angle at which the wind strikes them. Tacking is an operation by which a ship is enabled to beat up against a wind by a series of zigzags, the sails being turned obliquely to the wind first on one side and then on the other.

TACO′MA, a town in the state of Washington, on Commencement bay, Puget sound, the western terminus of the North Pacific railroad, with railway works, salmon-canning, lumber trade, etc. Pop. 1909, about 110,000.

TACONIC MOUNTAINS, a range of mountains in the United States, connecting the Green mountains of Western Massachusetts with the highlands of the Hudson. The "Taconic System," in geology, was named from the characteristic strata of this range, a metamorphic rock, believed to be older than the Silurian system.

TAD′EMA. See Alma-Tadema.

TADPOLE, the name given to the larval or young state of frogs and other amphibians.

TAFF′ETA, or TAFFETY, was originally the name applied to all kinds of plain silks, but which has now become a kind of generic name for plain silk, gros de Naples, gros des Indes, shot silk, glacé, and others. The term has also been applied to mixed fabrics of silk and wool.

TAFFRAIL, or TAFFEREL, a curved wooden rail running from one quarter-stanchion to the other of a ship's stern, and usually ornamented with some device in sculpture.

TAFT, William Howard, an American jurist and administrator, was born in Cincinnati in 1857. He was a judge of the superior court of Ohio, 1887–1890, solicitor-general of the United States, 1890–92, and judge of the United States circuit court 1892–1900, when he resigned to become chairman of the commission appointed to establish civil government in the Philippines. He was appointed in 1901 the first civil governor of the islands. In 1903 he became secretary of war. In 1908 he was nominated for the presidency and was elected by an overwhelming majority.

TAGANROG, a seaport of Russia, in the government of Ekaterinoslav, on a low cape on the northern shore of the Sea of Azof. The chief article of export is corn. Pop. 56,047.

TAGLIONI (tăl-yō′nē), Marie, ballet dancer, born 1809, was trained by her father, an Italian master of the ballet; appeared at Vienna in 1822, at Paris in 1827, and at London, where she created a great sensation, in 1838. She visited all the capitals of Europe, and was acknowledged the first ballet dancer of her time. She died at Marseilles in 1884.

TAGUS, the largest river of Spain and Portugal. It has a total length of 540 miles, and is navigable for 115 miles.

TAHITI (tȧ-hē′ti), the largest of the Society islands, consisting of two peninsulas, connected by an isthmus 3 miles broad, and submerged at high-water; area, 412 sq. miles. It is hilly, volcanic, beautiful, and highly fertile; and produces sugar, cocoa-nut, arrow-root, dye-woods, etc. The chief town is Papeete, which has an excellent harbor. Pop. of the island, 10,639. See Society islands.

TAILOR-BIRD, a bird so named from its curious habits of weaving or sewing together leaves in order to form a nest. It belongs to the sub-family of true

warblers, and inhabits India and the Eastern archipelago.

A Tahitian family.

TAINE (tān), Hippolyte Adolphe, French writer, born at Vouziers (Ardennes) in 1828. In 1854 his first work, an Essay on Livy, was crowned by the academy; in 1864 he was appointed professor in the School of Fine Arts in Paris; and in 1878 he was elected to a seat in the academy. His History of English Literature, one of the best and most philosophical works on the subject, appeared in 1864; his Philosophy of Art in 1865; his Notes on England in 1872; and his Origins of Contemporary France in 1875–94, a work of great research and value, in three sections, dealing respectively with the Ancient Régime the Revolution, and the Modern Régime. He died in 1893.

TAIWAN (ti-wän'), capital of the Japanese island Formosa, one of the treaty ports, with considerable trade in sugar and opium. Pop., including Takow, which almost forms one city with it, 235,000.

TALC, a magnesian mineral, consisting of broad, flat, smooth laminæ or plates, unctuous to the touch, of a shining luster, translucent, and often transparent when in very thin plates. There are three pincipal varieties of talc, common, earthy, and indurated. Talc is a silicate of magnesium, with small quantities of potash, alumina, oxide of iron, and water. It is used in many parts of India and China, as a substitute for window-glass. A variety of talc called French chalk (or steatite) is used for tracing lines on wood, cloth, etc., instead of chalk. See Potstone, Soap stone, Steatite.

TALCA, a town of Chile, capital of the province of Talca, on the Claro, is connected by rail with Santiago, and has manufactures of ponchos. Pop. 42,625. The province has an area of 3664 sq. miles, and pop. 128,961.

TALENT, the name of a weight and denomination of money among the ancient Greeks, and also applied by Greek writers to various standard weights and denominations of money of different nations; the weight and value differing in the various nations and at various times. The Attic talent as a weight contained 60 Attic minæ or 6000 Attic drachmæ, equal to 56 lbs. 11 oz. troy-weight. As a denomination of silver money it was equal to $1,215. The great talent of the Romans is computed to be equal to $500, and the little talent to $375. A Hebrew weight and denomination of money, equivalent to 3000 shekels, also receives this name. As a weight it was equal to about 93¾ lbs. avoirdupois; as a denomination of silver it has been variously estimated at from $1700 to $2000.

TALIPOT PALM, the great fan-palm, a native of Ceylon. The cylindrical trunk reaches a height of 60, 70, or 100 feet, and is covered with a tuft of fan-like leaves, usually about 18 feet in length and 14 in breadth. The leaves are used for covering houses, for making umbrellas and fans, and as a substitute for paper. When the tree has attained

Talipot palm.

its full growth, the flower spike bursts from its envelope or spathe with a loud report. The flower spike is then as white as ivory, and occasionally 30 feet long. When its fruit is matured, the tree generally dies.

TALISMAN, a figure cast or cut in metal or stone, and made, with certain superstitious ceremonies, at some particular moment of time, as when a certain star is at its culminating point, or when certain planets are in conjunction. The talisman thus prepared is supposed to exercise extraordinary influences over the bearer, particularly in averting disease. In a more extensive sense the word is used, like amulet, to denote any object of nature or art, the presence of which checks the power of spirits or demons, and defends the wearer from their malice. Relics, consecrated candles, rosaries, images of saints, etc., were employed as talismans in the middle ages; and at that time the knowledge of the virtues of talismans and amulets formed an important part of medical science.

TALLEGALLA, or **BRUSH TURKEY,** a remarkable genus of rasorial birds, usually designated by the distinctive name of "brush turkey." It inhabits Australia, where it is also known by the names "wattled tallegalla" and "New Holland vulture"—this latter name having reference to the naked vulturine head and neck. The male when full grown is colored of a blackish-brown above and below, with grayish tints on the back. The head and neck are covered with very small feathers of blackish hue, while a large wattle, colored bright or orange yellow, depends from the front of the neck. These birds are remarkable on account of the huge, conical "egg-mound" which they form, several of them jointly, for the purpose of therein depositing their eggs, which are hatched by the heat of the decomposing mass of vegetable matter piled up. The eggs are greatly sought after on account of their delicious flavor.

TALLEYRAND-PERIGORD (tál-ā-rän-pā-rē-gōr), Charles Maurice de, Prince of Benevento, French diplomatist, was born at Paris in 1754, died there in 1838. His high birth and great ability procured him rapid advancement, and in 1788 he was consecrated bishop of Autun. In 1790 he was elected president of the national assembly. In 1792 he was sent to London charged with diplomatic functions, and during his stay there was proscribed for alleged royalist intrigues. Forced to leave England by the provisions of the Alien Act, in 1794 he sailed for the United States, but returned to France in 1796. The following year he was appointed minister of foreign affairs; but being suspected of keeping up an understanding with the agents of Louis XVIII. he was obliged to resign in July, 1799. He now devoted himself entirely to Bonaparte, whom he had early recognized as the master spirit of the time, and after Bonaparte's return

Talleyrand.

from Egypt contributed greatly to the events of the 18th Brumaire (10th November, 1799), when the directory fell and the consulate began. He was then reappointed minister of foreign affairs. After the establishment of the empire in 1804 he was appointed to the office of grand-chamberlain, and in 1806 was created Prince of Benevento. After the Peace of Tilsit in 1807 a coolness took place between him and Napoleon, and became more and more marked. In 1808 he secretly joined a royalist committee. In 1814 he procured Napoleon's abdication. He took part in the congress of Vienna, and in 1815, when the allies

again entered Paris, he became president of the council with the portfolio of foreign affairs; but as he objected to sign the second Peace of Paris he gave in his resignation. When the revolution of July, 1830, broke out, he advised Louis Philippe to place himself at its head and to accept the throne. He crowned his career by the formation of the Quadruple Alliance.

TALLIEN (tâl-i-an), Jean Lambert, French revolutionist, was born at Paris in 1769, and first made himself known by publishing a revolutionary journal called Ami du Citoyen. He soon became one of the most popular men of the revolutionary party, and took part in most of the sanguinary proceedings which occurred during the ascendency of Robespierre. After the fall of Danton and his party he perceived that he should become one of the next victims of Robespierre if he did not strike the first blow, and it was mainly by his influence that the latter with his friends was brought to the guillotine. He subsequently became a member of the Council of Five Hundred, but his influence gradually declined. In after years he was glad to accept the office of French consul at Alicante. He died at Paris, in poverty and obscurity, in 1820.

TALLOW, the harder and less fusible fat of animals, especially cattle and sheep, melted and separated from the fibrous matter mixed with them. Tallow is firm, brittle, and has a peculiar heavy odor. When pure it is white and nearly insipid; but the tallow of commerce has usually a yellowish tinge, which may be removed by exposure to light and air. Tallow is manufactured into candles and soap, and is extensively used in the dressing of leather, and in various processes of the arts. The British imports of tallow are chiefly from Australia and the United States. Vegetable tallow is contained in the seeds of various plants, one of the best known of which is the candle-berry. See also China Wax, and next article.

TALLOW-TREE, one of the largest, the most beautiful, and the most widely diffused of the plants found in China. From a remote period it has furnished the Chinese with the material out of which they make candles. The capsules and seeds are crushed together and boiled; the fatty matter is skimmed as it rises, and condenses on cooling. The tallow-tree has been introduced into the United States, and is almost naturalized in the maritime parts of Carolina. It has also been acclimatized by the French in Algeria.

TALLY, a piece of wood on which notches or scores are cut, as the marks of number. In purchasing and selling it was once customary for traders to have two sticks, or one stick cleft into two parts, and to mark with scores or notches on each the number or quantity of goods delivered, or what was due between debtor and creditor, the seller or creditor keeping one stick, and the purchaser or debtor the other. Before the use of writing, or before writing became general, this or something like it was the usual method of keeping accounts. In the exchequer of England tallies were used till late in the 18th century.

TALMAGE, Thomas DeWitt, clergyman, born in Bound Brook, N. J., in 1832. His first pastorate was at Belleville, N. J., in the Presbyterian church. In 1859 he went to Syracuse, N. Y., and in 1862 became located in Philadelphia, Penn. There he remained seven years, when he was called to the pastorate of the Central Presbyterian church in Brooklyn, N. Y. He acquired a national reputation for effective but rather sensational pulpit oratory. His congregation built him a church in 1870, having a seating capacity of 3,400, which was called the Brooklyn tabernacle. It was destroyed by fire in 1872 and in 1874 a new tabernacle was dedicated with a seating capacity of 5,000. This edifice was also burned in the early spring of 1890, when the church organization ceased to exist. His wide influence was largely increased by frequent lecturing tours, both in America and England. He was editor of The Christian at Work, The Advance, Frank Leslie's Sunday Magazine, and The Christian Herald. He died in 1902.

TALMUD, a Chaldaic word signifying "doctrine," and sometimes used to designate the whole teaching of the Jewish law, comprising all the writings included in what we call the Old Testament, as well as the oral law or Mishna, with its supplement or commentary the Gemara, but more frequently applied only to the Mishna and Gemara. The Gemara was originally an oral commentary of the Mishna, as the Mishna itself was originally an oral commentary of the Mikra, or written law. It consisted of the explanations and illustrations which the teachers of the Mishna were in the habit of giving in the course of their lessons. These oral comments, were handed down from age to age, differing of course in different localities and gradually increasing in quantity; and they were at last committed to writing in two forms, the one called the Jerusalem and the other the Babylonian Gemara, or, with the addition of the Mishna, which is common to both, the Jerusalem and the Babylonian Talmud. The Jerusalem Talmud is the earlier and by much the smaller of the two. The language of both the Gemaras is a mixed Hebrew, but that of the Babylonian Gemara is much less pure than the other; in the narrative portions, designed as popular illustrations of the other parts, it comes near the Aramaic or vernacular dialect of the Eastern Jews. The style is in both cases extremely condensed and difficult. The Mishna, with its corresponding Gemara, is divided into six orders or principal divisions. The subjects of these orders are agriculture, festivals, women, damages, holy things, and purifications. These orders are subdivided into sixty-three tracts, to which the Babylonian Gemara adds five others, thus containing sixty-eight tracts in all. Other divisions of the Talmud are the Halaka, the doctrinal and logical portion; Haggada, the rhetorical or imaginative portion; and Cabala, the mystical portion, including theosophy and magic. Many translations of parts of the Talmud have appeared.

TAM'ARACK. See Larch.

TAM'ARIN, the name of certain South American monkeys. The tamarins are active, restless, and irritable little creatures, two of the smallest being the silky tamarin and the little lion monkey the latter of which, though only a few inches in length, presents a wonderful resemblance to the lion.

TAM'ARIND, a large and beautiful tree of the East and West Indies. It is cultivated chiefly for the sake of its pods (tamarinds). The West Indian tamarinds are put into casks, with

Tamarind.

layers of sugar between them, or with boiling syrup poured over them, and are called prepared tamarinds. The East Indian tamarinds, which are most esteemed, are preserved without sugar. They are dried in the sun, or artificially with salt added.

TAMAULIPAS (tä-mou-lē'päs), a state of Mexico, on the Gulf of Mexico, north of Vera Cruz; area, 28,659 sq. miles. The capital is Ciudad Victoria. Pop. 218,948.

TAMBOURINE (tam-bu-rēn'), a musical instrument of the drum species, much used among the Spanish and Italian peasants as well as elsewhere. It consists of a piece of parchment stretched

Spanish tambourine.

over the top of a broad hoop, which is furnished with little bells. It is sounded by sliding the fingers along the parchment, or by striking it with the back of the hand or with the fist or the elbow.

TAMBOV, a government of Russia, south of Nijni-Novgorod and Vladimir, between the basins of the Oka and the Don; area, 25,676 sq. miles. It is one of the largest, most fertile, and most densely peopled provinces of Central Russia. Pop. 2,607,881.—Tambov, the capital, 263 miles southeast of Moscow,

has great trade in corn and cattle. Pop. 35,688.

TAMERLANE. See Timour.

TAMMANY RING, a political combination of New York, which, about 1870, under William M. Tweed, secured the control of the elections in that city and the management of the municipal revenues, which were extensively plundered. The frauds, amounting to many millions of dollars, were discovered in 1876. The name Tammany was given from the meeting-place, Tammany hall, New York, being originally the name of a celebrated Indian chief. See Tweed, W. M.

TAMPA, a port of Florida, Hillsboro co., on the Gulf coast; a rising business center, the terminus of two railways, and the point of departure of steamers for Key West, Havana, and the ports along the coast of Florida. Pop. 18,160.

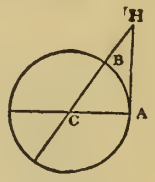
TAMSUI, a seaport of the island of Formosa, one of the treaty ports, with a trade in tea. Pop. 95,000.

TAN'AGERS, passerine birds, or finches, distinguished by the bill being of triangular shape at its base and arched toward its tip, and remarkable for their bright colors. They are chiefly found in the tropical parts of America.

TANEY (ta'nĭ), Roger Brooke, eminent American jurist, chief justice of the United States supreme court, was born in Calvert co., Md., in 1777. In 1823 he removed to Baltimore. In 1827 he was elected attorney-general of the state and was appointed attorney-general of the United States in 1831. In 1836 he succeeded John Marshall as chief justice of the United States supreme court. He wrote the opinion of the court in many important cases, the most notable being that of Dred Scott. A memoir of Taney's life, in part an autobiography, was published in 1872 by Samuel Tyler. He died in 1864.

TANCRED, son of the Marquis Odo the Good and Emma the sister of Robert Guiscard, born in 1078, was one of the most famous heroes of the first Crusade. He distinguished himself at the siege of Nicæa (1097), at the battle of Dorylæum (July, 1097), at the capture of Jerusalem (July, 1099), and at Ascalon (August 12), and was appointed by Godfrey de Bouillon Prince of Galilee. He died in 1112, in his thirty-fifth year, of a wound received at Antioch. He is represented by Tasso in the Jerusalem Delivered as the flower and pattern of chivalry.

TANGENT, in geometry, a straight line which touches or meets a circle or curve in one point, and which being produced does not cut it; a straight line drawn at right angles to the diameter of a circle, from the extremity of it, as h a in figure, which being continued at a, would merely touch and not cut the circle. In trigonometry the tangent of an arc is a straight line touching the circle of which the arc is a part, at one extremity of the arc, and meeting the diameter passing through the other extremity. Thus a h is the tangent of the arc a b, and it is also said to be the tangent of the angle a c b, of which a b is the measure. The arc and its tangent have always a certain relation to each other; and when the one is given in parts of the radius, the other can always be computed. For trigonometrical purposes tangents for every arc from 0 degrees to 90 degrees, as well as sines, cosines, etc., have been calculated with reference to a radius of a certain length,



Tangent.

and these or their logarithms formed into tables. In the higher geometry the word tangent is not limited to straight lines, but is also applied to curves in contact with other curves, and also to surfaces.

TANGIER (tan'jēr), a seaport of Morocco, on the Strait of Gibraltar. In 1662 Tangier was annexed to the English crown as part of the dowry of the Infanta of Portugal, the wife of King Charles II., but in 1864 it was abandoned, on account of the expense necessary to keep it up. Pop. estimated at 20,000.

TANGLE, the common name of two species of sea-weed found on the shores of Britain, Laminaria digitāta and Laminaria saccharīna.

TANJORE, a city in Hindustan, in the presidency of Madras, capital of the district of the same name. Manufactures of silk, muslin, and cotton are carried on to a considerable extent. Pop. 57,605.—The district of Tanjore has an area of 3654 sq. miles, and a population of 2,130,383.

TANNHAUSER (tän'hoi-zĕr), or **TANHAUSER,** in old German legend, a knight who gains admission into a hill called the Veunsberg, in the interior of which Venus holds her court, and who for a long time remains buried in sensual pleasures, but at last listens to the voice of the Virgin Mary, whom he hears calling upon him to return. The goddess allows him to depart, when he hastens to Rome to seek from the pope (Pope Urban) absolution for his sins. The pope, however, when he knows the extent of the knight's guilt, declares to him that it is as impossible for him to obtain pardon as it is for the wand which he holds in his hand to bud and bring forth green leaves. Despairing, the knight retires from the presence of the pontiff, and enters the Venusberg once more. Meanwhile the pope's wand actually begins to sprout, and the pope, taking this as a sign from God that there was still an opportunity of salvation for the knight, hastily sends messengers into all lands to seek for him. But Tannhäuser is never again seen. The Tannhäuser legend has been treated poetically by Tieck, and Richard Wagner has adopted it (with modifications) as the subject of one of his operas.

TANNIC ACID, or **TANNIN,** a peculiar acid which exists in every part of all species of oaks, especially in the bark, but is found in greatest quantity in gall-nuts. Tannic acid, when pure, is nearly white, and not at all crystaline. It is very soluble in water, and has a most astringent taste, without bitterness. It derives its name from its property of combining with the skins of animals and converting them into leather, or tanning them. It is the active principle in almost all astringent vegetables, and is used in medicine in preference to mineral astringents, because free from irritant and poisonous action. The name is generally applied to a mixture of several substances.

TANNING, the operation of converting the raw hides and skins of animals into leather by effecting a chemical combination between the gelatine of which they principally consist and the astringent vegetable principle called tannic acid or tannin. The object of the tanning process is to produce such a chemical change in skins as may render them unalterable by those agents which tend to decompose them in their natural state, and in connection with the subsequent operations of currying or dressing to bring them into a state of pliability and impermeability to water which may adapt them for the many useful purposes to which leather is applied. The larger and heavier skins subjected to the tanning process, as those of buffaloes, bulls, oxen, and cows, are technically called hides; while those of smaller animals, as calves, sheep, and goats, are called skins. In preparing the hides and skins for tanning they are subjected to certain operations already described under Leather, after which the tanning proper begins. The various substances used for tanning are oak, fir, mimosa, and hemlock bark, sumach, myrobalans, divi-divi, valonia-nuts, cutch, kino, gambir, and oak-galls—all of which contain tannin. The impregnation of the hides with this tannin may be effected either by placing them between layers of bark (oak bark being the best) in a vat filled with water, or steeping them in a liquor containing a small at first, but steadily increasing proportion of tannin throughout a series of pits. This liquor usually consists of water in which the ground or crushed tanning material has been steeped. The raw hide takes about a year to prepare it for the best quality of leather. There is also a process called tawing, which is employed chiefly in the preparation of the skins of sheep, lambs, goats, and kids. In this process the skins are steeped in a bath of alum, salt, and other substances, and they are also sometimes soaked in fish-oil. The more delicate leathers are treated in this manner, those especially which are used for wash leathers, kid gloves, etc. After the leather is tanned it is finished for use by the process of currying. Various improvements have been attempted to be made in the art of tanning, such as the preparation of the skins by means of metallic solutions instead of by vegetable tan-liquor; the forced absorption of the tan by applying pressure between cylinders; and the preparation of the skins by a chemical agent, so as to induce a quicker absorption of the tan. It has been found, however, that the slow process followed by the old tanners produces leather far superior to that produced by the new and more rapid

methods, though a fair leather for certain purposes may be produced in five to ten weeks.

TANSY is a well-known plant. It is a tall plant, with divided leaves and button-like heads of yellow flowers. Every part of the plant is bitter, and it is considered as tonic and anthelmintic, tansy-

Tansy.
a, A disk-flower; *b*, A ray-flower; *c*, An achene.

tea being an old popular medicine. It is now cultivated in gardens mainly for the young leaves, which are shredded down and employed to flavor puddings, cakes, etc.

TANTA, a town of Lower Egypt, situated on the railway about 50 miles n. of Cairo. Tanta has three great annual fairs, which are held in January, April, and August, and at the latter 500,000 persons are said to congregate from the surrounding countries. Pop. 60,000.

TAN'TALUS, in Greek mythology, a son of Zeus, and king of Phrygia, Lydia, Argos or Corinth, who was admitted to the table of the gods, but who had forfeited their favor either by betraying their secrets, stealing ambrosia from heaven, or presenting to them his murdered son Pelops as food. His punishment consisted in being placed in a lake whose waters receded from his lips when he attempted to drink, and of being tempted by delicious fruit overhead which withdrew when he attempted to eat. Moreover, a huge rock forever threatened to fall and crush him.

TAN'TALUS, a genus of wading birds of the heron family. It is the wood-ibis of America, which frequents extensive swamps, where it feeds on serpents, young alligators, frogs, and other reptiles. The African tantalus was long regarded as the ancient Egyptian ibis, but it is rare in Egypt, belonging chiefly to Senegal, and is much larger than the true ibis.

TA'PESTRY, a kind of woven hangings of wool and silk, often enriched with gold and silver, with worked designs, representing figures of men, animals, landscapes, etc., and formerly much used for lining or covering the walls and furniture of apartments, churches, etc. Tapestry is made by a process intermediate between weaving and embroidery, being worked in a web with needles instead of a shuttle. Short lengths of thread of the special colors required for the design are worked in at the necessary places and fastened at the back of the texture. In Flanders, particularly at Arras (whence the term arras, signifying the "tapestry"), during the 15th and 16th centuries, the art was practiced with uncommon skill. The art of weaving tapestry was introduced into England near the end of Henry VIII.'s reign. During the reign of James I. a manufactory was established at

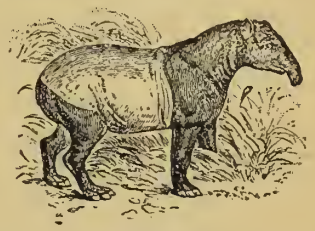
Fire-screen, covered with tapestry.

Mortlake, which continued till the beginning of the 18th century. The term tapestry is also applied to a variety of woven fabrics having a multiplicity of colors in their design, which, however, have no other characteristic of true tapestry. The name of tapestry carpet is given to a showy and cheap two-ply or ingrain-carpet, the warp or weft being printed before weaving so as to produce the figure in the cloth.

TAPE-WORMS, the name common to certain internal parasites (Entozoa), found in the mature state in the alimentary canal of warm-blooded vertebrates. Tape-worms are composed of a number of flattened joints or segments, the anterior of which, or head (which is the true animal), is furnished with a circlet of hooks or suckers, which enable it to maintain its hold on the mucous membrane of the intestines of its host. The other segments, called proglottides, are simply generative organs budded off by the head, the oldest being furthest removed from it, and each containing when mature male and female organs. The tape-worm has neither mouth nor digestive organs, nutrition being effected by absorption through the skin. The length of the animal varies from a few inches to several yards. The ova do not undergo development in the animal in which the adult exists. They require to be swallowed by some other warm-blooded vertebrate, the ripe proglottides being expelled from the bowel of the host with all their contained ova fertilized. The segments or proglottides decompose and liberate the ova, which are covered with a capsule. After being swallowed the capsule bursts and an embryo, called a proscolex, is liberated. This embryo, by means of spines, perforates the tissues of some contiguous organ, or of a blood-vessel, in the latter case being carried by the blood to some solid part of the body, as the liver or brain, where it surrounds itself with a cyst, and develops a vesicle containing a fluid. It is now called a scolex or hydatid, and formerly was known as the cystic worm. The scolex is incapable of further development till swallowed and received a second time into the alimentary canal of a warm-blooded vertebrate. Here it becomes the head of the true tape-worm, from which proglottides are developed posteriorly by gemmation, and we have the adult animal with which the cycle begins. In all cases the only conclusive sign of tape-worm is the passage of one or part of one in the fæces. One mode of treatment for this disorder is, for an adult, a tea-spoonful of the extract of male-fern. A few hours thereafter a strong dose of castor-oil should be taken.

TAPIO'CA, a farinaceous substance prepared from cassava meal, which, while moist or damp, has been heated for the purpose of drying it on hot plates. By this treatment the starch-grains swell, many of them bust, and the whole agglomerates in small irregular masses or lumps. In boiling-water it swells up and forms a viscous jelly-like mass. See Cassava.

TAPIR, the name of ungulate or hoofed animals. The nose resembles a short fleshy proboscis; there are four toes to the fore-feet, and three to the hind ones. The common South American tapir is the size of a small ass, with a brown skin, nearly naked. It inhabits forests, lives much in the water, conceals itself during the day, and feeds on vegetable substances. There are several other American species. The T. malayanus or indicus is found in the forests of Malacca and Sumatra. It is



Malay tapir.

larger than the American species, and is a most conspicuous animal from the white back, rump, and belly contrasting so strongly with the deep sooty black of the rest of the body as, at a little distance, to give it the aspect of being muffled up in a white sheet. Fossil tapirs are scattered throughout Europe, and among them is a gigantic species, T. giganteus, Cuvier, which in size must have nearly equalled the elephant.

TAR, a thick, dark-colored, viscid product obtained by the destructive distillation of organic substances and bituminous minerals, as wood, coal, peat, shale, etc. Wood-tar, such as the Archangel, Stockholm, and American tars of commerce, is obtained by burning billets of wood slowly in a conical cavity at the bottom of which is a cast-iron pan into which the tar exudes. In Britain wood-tar is chiefly obtained as a

by-product in the destructive distillation of wood for the manufacture of wood-vinegar (pyroligneous acid) and wood-spirit (methyl alcohol). It has an acid reaction, and contains various liquid matters, of which the principal are methyl-acetate, acetone, hydrocarbons of the benzene series, and a number of oxidized compounds, as carbolic acid. Paraffin, anthracene. naphthalene, chrysene, etc., are found among its solid products. It possesses valuable antiseptic properties, owing to the creasote it contains, and is used extensively for coating and preserving timber, iron, and cordage. Coal-tar, which is largely obtained in gas manufacture, is also valuable inasmuch as it is extensively employed in the production of dyes, etc. See Coal-tar and Aniline.

TARAI (ta-rī'; "moist land"), a moist and jungly tract of Northern India, running along the foot of the first range of the Himalayas for several hundred miles, with a breadth of from 2 to 15, infested by wild beasts, and generally unhealthy. Area, 938 sq. miles; pop. 206,993.

TARAN'TO (anciently Tarentum), a fortified seaport of S. Italy, in the province of Lecce, on a rocky peninsula at the northern extremity of the gulf of same name. The manufactures include linen, cotton, velvet, muslin, and gloves. Taranto is now a station of the Italian

navy, with a naval arsenal, etc. The ancient Tarentum was founded by the Greeks in B.C. 708, and became a powerful city. It was captured by the Romans B.C. 272, and remained a notable Roman town until the downfall of the empire. Pop. 26,670.

TARAN'TULA, a kind of spider, found in some of the warmer parts of the south-

Tarantula.

western states, Mexico, and in Italy. When full grown it is about the size of a chestnut, and is of a brown color. Its bite was at one time supposed to be dangerous, and to cause a kind of dancing disease; it is now known not to be worse than the sting of a common wasp.

TARAPACA, a coast province of Northern Chile, containing deposits of niter and borax and silver mines; area, 19,300 sq. miles. Capital, Iquique. Pop. 89,751.

TARBELL, Ida Minerva, American author, born in 1857 in Erie co., Pa. In 1894 she became an associate editor of McClure's Magazine. Her publications include: Short Life of Napoleon Bonaparte, Life of Madame Roland, Early Life of Abraham Lincoln (in collaboration with J. McDavis), Life of Abraham Lincoln, and History of the Standard Oil Company.

TARE, the common name of different species of leguminous plants, known also by the name of vetch. There are numerous species and varieties of tares or vetches, but that which is found best adapted for agricultural purposes is the common tare, of which there are two principal varieties, the summer and winter tare. They afford excellent food for horses and cattle, and hence are extensively cultivated throughout Europe.

TARGET, (1) a shield or buckler of a small kind, such as those formerly in use among the Highlanders, which were circular in form, cut out of ox-hide, mounted on strong wood, strengthened by bosses, spikes, etc., and often covered externally with a considerable amount of ornametnal work. (2) The mark set up to be aimed at in archery, musketry, or artillery practice and the like. The targets used in rifle practice are generally square or oblong metal plates, and are

Target.

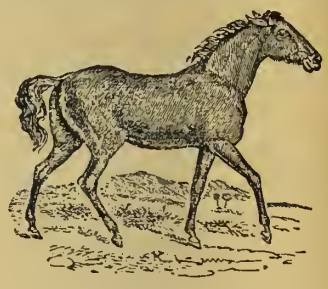
divided into three or more sections, called bulls' eye, inner (or center), and outer, counting from the center of the target to its edges; some targets have an additional division (called a magpie), situated between the outer and the inner. It is the marksman's aim to put his shots as near the central point as possible, as if he hits the bull's eye there are counted in his favor 5 points, the center 4 points, the magpie 3 points, and the outer 2 points, or some similar proportions.

TARLATAN, a thin and fine fabric of cotton, mostly used for ladies' ball dresses. It is cheap, but does not stand washing.

TARN, a department of Southern France, named from the river of same name; area, 2218 sq. miles. The minerals include iron and coal, both of which are partially worked. Woolens, linens, hosiery, etc., are manufactured. The capital is Alby. Pop. 358,757.

TARN-ET-GARONNE, a department of France, named after its two chief rivers; area, 1436 sq. miles. This department belongs to the basin of the Garonne, which traverses it south to northwest, and receives within it the accumulated waters of the Tarn and Aveyron. The most important manufactures consist of common woolen cloth and serge, linen goods, silk hosiery, cutlery, leather, etc. Montauban is the capital. Pop. 214,046.

TARPAN, the wild horse of Tartary, belonging to one of those races which are by some authorities regarded as original. They are not larger than an ordinary mule. The color is invariably tan or mouse, with black mane and tail.



Tarpan.

During the cold season their hair is long and soft, but in summer it falls much away. They are sometimes captured by the Tartars, but are reduced with great difficulty to subjection.

TARPON, or **TARPUM,** a herring-shaped fish found on the southern coasts of the United States and in the West Indies. It reaches a length of 5 or 6 feet, and from a hundred to several hundred pounds weight, and is of giant strength. Though too coarse ordinarily for food, it is a great attraction to anglers. Its scales, which are of great size, are now largely used in ornamental work.

TARSIUS, a genus of quadrumanous mammals of the lemur family inhabiting the Eastern archipelago. In this genus

Tarsier.

the bones of the tarsus are very much elongated, which give the feet and hands a disproportionate length. Tarsius spectrum, the tarsier, seems to be the only species known. It is about the size

of a squirrel, fawn-brown in color, with large ears, large eyes, and a long tufted tail. It is nocturnal in its habits, lives among trees, and feeds upon lizards.

TARSUS, in anatomy, that part of the foot which in man is popularly known as the ankle, the front of which is called the instep. It corresponds with the wrist of the upper limb or arm, and is composed of seven bones In insects the tarsus is the last segment of the leg. It is divided into several joints, the last being generally terminated by a claw, which is sometimes single and sometimes double In birds the tarsus is that part of the leg (or properly the foot) which extends from the toes to the first joint above; the shank.

TARSUS, an ancient city of Asia Minor, the capital of Cilicia, now in the province of Adana, in Asiatic Turkey. The Apostle Paul was born, and Julian the Apostate was buried there. Pop. 8500.

TARTAN, a well-known species of cloth, checkered or cross-barred with threads of various colors. It was originally made of wool or silk, and constituted the distinguishing badge of the Scottish Highland clans, each clan having its own peculiar pattern. An endless variety of fancy tartans are now manufactured, some of wool, others of silk, others of wool and cotton, or of silk and cotton.

TARTAR, the substance called also argal or argol, deposited from wines incompletely fermented, and adhering to the sides of the casks in the form of a hard crust. When purified it forms cream of tartar. What is called tartar emetic is a double tartrate of potassium and antimony, an important compound used in medicine as an emetic, purgative, diaphoretic, sedative, fubrifuge, and counter-irritant. Tartar of the teeth is an earthy-like substance which occasionally concretes upon the teeth, and is deposited from the saliva. It consists of salivary mucus, animal matter, and phosphate of lime.

TARTARIC ACID, the acid of tartar. It exists in grape juice, in tamarinds, and several other fruits; but principally in bitartrate of potassium, or cream of tartar, from which it is usually obtained. It crystalizes in large rhombic prisms, transparent and colorless, and very soluble in water. It is inodorous and very sour to the taste. A high temperature decomposes it, giving rise to several new products. The solution of tartaric acid acts with facility upon those metals which decompose water, as iron and zinc. There are five modifications of tartaric acid, characterized chiefly by the differences in the action exerted by them upon a ray of polarized light; such as dextro- or ordinary tartaric acid, lævo-tartaric acid, para-tartaric or racemic acid, meso-tartaric acid, and meta-tartaric acid. Tartaric acid is largely employed as a discharge in calico-printing, and for making soda-water powders and baking powders. In medicine it is used in small doses as a refrigerant.

TARTARS. See Tatars.

TARTARY, a name formerly applied to the wide band of country extending through Central Asia from the seas of Japan and Okhotsk in the east to the Caspian on the west, and including Manchooria, Mongolia, Turkestan, and all the south part of Russian Asia. It was used sometimes even to include a large portion of Southeastern Russia. In a restricted sense it is identical with Turkestan. It received its name from the Tartars or Tatars. See Tatars.

TASHKENT', or **TASHKEND',** a town of Asiatic Russia, in the government of Turkestan. The manufactures are silks, cottons, iron goods, etc. The trade, carried on chiefly by caravans, partly by railway, is very extensive. Tashkent was occupied by Russia in 1865, and a Russian quarter has grown up. Pop. about 156,414.

TASMA'NIA, formerly Van Diemen's Land, an island in the Southern ocean, fully 100 miles south of Australia, from which it is separated by Bass's strait; greatest length, 186 miles; mean breadth 165 miles; area, 24,330 sq. miles, or including islands, 26,215. Wheat, oats, barley, potatoes, pease, beans, and hops are largely cultivated, and the fruit includes grapes, cherries, plums, quinces, mulberries, peaches, apricots, walnuts, filberts, almonds, etc. Kangaroos and other animals of the pouched kind are numerous. There are two marsupial carnivorous animals called the Tasmanian wolf and the Tasmanian devil, both of

which are destructive to sheep. Another marsupial carnivore is the dasyure or native cat. The natural forests are chiefly of the eucalyptus or gumtree, pine, and acacia tribe. Among the minerals are gold, silver, copper, iron, tin, coal, freestone, limestone, and roofing slate. Mount Bischoff tin mine is a notably rich one. Tasmanian coal is now used on the railways. The staple export from Tasmania is copper, and the other articles include gold, silver, tin, wool, timber, fruit, hops, hides, and bark. Pop. 172,475.

TASMANNIA, a genus of plants, consisting of one Tasmanian and two Australian shrubs. The Tasmanian species possesses aromatic qualities, particularly in its bark. Its fruit is used by the colonists for pepper.

TASSO, Torquato, an Italian epic poet, was born at Sorrento 1544. At the age of sixteen he produced the Rinaldo, an epic poem in twelve cantos. The reputation of this poem procured for Torquato an invitation to the University of Bologna, which he accepted. Here he displayed an aptitude for philosophy, and began to write his great poem of Gierusalemme Liberata (Jerusalem Delivered). In 1573 Tasso brought out the Aminta, a pastoral, which was represented at the court. In 1575 he completed his epic of Gierusalemme Liberata. In 1595, he proceeded to Rome at the request of the pope, who desired him to be crowned with laurel in the capitol, but the poet died while the preparations for the ceremony were being made. Tasso wrote numerous poems, but his fame rests chiefly on his Rime, or lyrical poems, his Aminta, and his Gierusalemme Liberata.

TASTE, the sense by which we percieve the relish or savor of a thing. The organs of this special sense are the papillæ, or processes on the surface of the tongue, and also certain parts within the cavity of the mouth and the throat, as the soft plate, the tonsils, and the upper part of the pharynx. See Tongue.

TATARS, or **TARTARS,** a vague term with no ethnological significance usually applied to certain roving tribes which inhabited the steppes of Central Asia. More specifically, however, Tatar or Ta-ta appears to have been the name of a tribe of Mongols who occupied about the 9th century a district of Chinese Tartary on the Upper Amur. The true Tatars formed part of the horde of Genghis Khan, when that conqueror carried his arms from the country known as Chinese Tartary to Europe, as well as to the successive hordes of similar origin who followed in their footsteps, and to the districts from which they came, or in which they settled; hence the names of Chinese Tartary, Independent Tartary, and European or Little Tartary, which comprised most of the Russian governments of Orenburg, Astrakhan, Ekaterinoslav, the Cossack provinces, and the Crimea.

TATTOOING, a practice common to several uncivilized nations, ancient and modern, and to some extent employed among civilized peoples. It consists in pricking the skin in a design, and introducing into the wounds colored liquids, gun-powder, or the like, so as to make it indelible. This practice is very prevalent among the South Sea islanders, among whom are used instruments edged with small teeth, somewhat resembling those of a fine comb. Degrees of rank are sometimes indicated by the greater or less surface of tattooed skin.

TAUNTON, a town, capital of Bristol co., Massachusetts, about 33 miles south of Boston. It is well built and contains a great number of handsome edifices. The manufactures consist of locomotives, cotton machinery, Britannia ware, nails, etc., and it has iron-works, cotton and paper mills, print-works, foundries, etc. Pop. 37,160.

TAU'RIDA, a government in the south of Russia; area, 24,539 sq. miles. It is watered by the Dnieper; the northern peninsula consists almost entirely of an extensive steppe, and the chief occupation of the inhabitants, who consist of Russians, is cattle-breeding and agriculture. Pop. 1,443,566. The capital is Simferopol.

TAURUS, the Bull, one of the twelve signs of the zodiac, which the sun enters about the 20th April. Taurus is also the second zodiacal constellation, containing 141 stars. Several of these are remarkable, as Aldebaran, of the first magnitude, in the eye; the Hyades, in the face; and the Pleiades in the neck.

TAUTOG, a fish found on the coast of New England, and valued for food. See Blackfish.

TAVOY, a district in the Tenasserim division of Lower Burmah; area, 7150 sq. miles. Pop. 84,988. The chief town is Tavoy, situated about 30 miles from the mouth of the river of the same name. Pop. 15,000. There is also an island of Tavoy about 18 miles long and 2 broad, and on the eastern side there is a well-sheltered harbor called Port Owen.

TAX, a contribution levied by authority from people to defray the expenses of government or other public services. A tax may be a charge made by the national or state rulers on the incomes or property of individuals, or on the products consumed by them. A tax is said to be direct when it is demanded from the very persons who it is intended or desired should pay it, as, for example, a poll-tax, a land or property-tax, an income-tax, taxes for keeping man-servants, carriages, dogs, and the like. It is said to be indirect when it is demanded from one person in the expectation and intention that he shall indemnify himself at the expense of another; as, for example, the taxes called customs, which are imposed on certain classes of imported goods, and those called excise duties, which are imposed on home manufactures or inland production. Taxes are also rates or sums imposed on individuals or their property for municipal, county, or other local purposes, such as police taxes, taxes for the support of the poor (poor-rates), taxes for the repair of the roads and bridges, etc. In Great Britain and elsewhere house taxes or taxes on rental form the largest part of the local revenues, municipal revenues being, indeed, entirely raised from this source. Adam Smith has laid down four principles of taxation, which have been generally accepted by political economists. These are: (1) The subjects of every state ought to contribute to the support of the government as nearly as possible in proportion to their respective abilities. (2) The tax ought to be certain, not arbitrary. (3) Every tax ought to be levied at the time or in the manner most convenient for the contributor. (4) Every tax ought to be so contrived as both to take out and keep out of the pockets of the people as little as possible over and above what it brings into the public treasury of the state. See also Income-tax, Customs, Excise, etc.

TAXIDERMY, the art of preparing and preserving the skins of animals, and also of stuffing and mounting.

TAXO'DIUM, a genus of deciduous cypress, a common ornamental tree, is a native of North America. The bark exudes a resin which is used by the negroes for dressing wounds, and the roots, which are hollow inside, are used for bee-hives.

TAY, the longest river in Scotland, and the one that carries to the sea a greater volume of water than any other in the British islands. Its length is about 120 miles, its greatest breadth in the estuary 3½ miles, and the area drained 2400 sq. miles. It is navigable as far as Perth, but Dundee is the chief port. The salmon fisheries are important.

Taxodium.

TAYLOR, Bayard, American poet, born at Kennett Square, Pennsylvania, in 1825, died in 1878. He traveled extensively, giving his experiences in Views Afoot in Europe, The Lands of the Saracens, Visit to India, China, and Japan, Crete and Russia, Byways of Europe. He also published several novels; various volumes of verse, such

Bayard Taylor

as Rhymes of Travel, A Book of Romances, Lyrics, and Songs, Poems and Ballads, Poems of the Orient, The Masque of the Gods, and a translation of Goethe's Faust in the original meters. He was for some time United States secretary of legation at St. Petersburg, and latterly he was United States ambassador at Berlin, where he died.

TAYLOR, Jeremy, one of the greatest names in the Church of England, was born in 1613 at Cambridge; died at Lisburne, Ireland, in 1667. He was entered, in 1626, as a sizar in Caius college, where he graduated Master of Arts; and in 1636 obtained by the patronage of Archbishop Laud a fellowship of All Souls college, Oxford. In 1638 he was presented by Bishop Juxon to the rectory of Uppingham, in Rutlandshire, and in 1642 he was appointed chaplain in ordinary to Charles I. Afterward he removed to London, but in 1658 he accepted an invitation from Lord Conway to reside at his seat in Ireland. Here he remained until the Restoration,

Jeremy Taylor.

when he was elevated to the Irish see of Down and Connor, with the administration of that of Dromore. He was also in the same year, made a privy-councillor for Ireland, and chosen vice-chancellor of the University of Dublin. The greater part of his writings consist of sermons and devotional pieces, and upon the former rests his fame as a master of varied English prose.

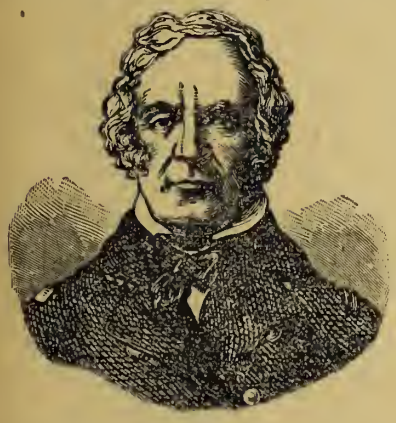
TAYLOR, John, The successor of Brigham Young as president of the Church of Jesus Christ of Latter-Day Saints, was born in England in 1808. In 1836 he joined the Mormon church and was elected one of the twelve apostles. In 1849 he was appointed to the European mission; he published a Mormon monthly in Paris and translated the Book of Mormon into French and German. In 1854, he was stationed in New York as superintendent over the Eastern churches and there published the Mormon. In 1858 he was indicted for treason against the United States government. On October 6, 1880, he was elected president of the church. He died in 1887.

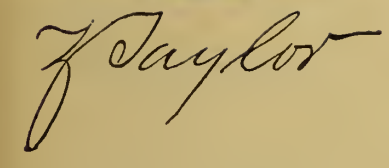
TAYLOR, Richard, a confederate soldier, familarly known as "Dick" Taylor, was born at New Orleans in 1826. He fought under Stonewall Jackson in the Shenandoah valley campaign, and in the Seven Days' battle before Richmond. On April 8, 1864, he defeated General Banks at Sabine Cross roads. On May 4, 1865, he surrendered to General Canby. He published Destruction and Reconstruction (1879). He died in 1879.

TAYLOR, Tom, born at Sunderland in 1817, died 1880. The most popular of his plays are: New Men and Old Acres, Masks and Faces (in collaboration with Charles Reade), Still Waters Run Deep, The Overland Route, and The Ticket of Leave Man. His historic dramas include: The Fool's Revenge, Joan of Arc, 'Twixt Axe and Crown, Lady Clancarty, Anne Boleyn, etc. He also published biographies of B. R.

Haydon (1853), C. R. Leslie (1859), and Sir Joshua Reynolds (1865).

TAYLOR, Zachary, twelfth president of the United States, born in Orange county, Virginia, 1784; died 1850. He entered the army in 1808, and rose to the rank of major; took command of the United States forces at the outbreak of the Mexican war. His victory over the Mexicans at Buena Vista, with only 5,500 men against an army of 21,000,





commanded by President Santa Anna, created great enthusiasm, and "Old Rough-and-Ready," as he was called in the army, was nominated in 1848 for president of the United States, and though opposed by General Cass, Martin Van Buren and C. F. Adams, he was triumphantly elected, and entered upon the presidency in 1850. He only occupied the post four months, and died on July 9th, in that year.

TCHAD, CHAD, or **TSAD,** a large fresh-water lake of Central Africa, in the Soudan, having the territories of Bornou, Kanem, and Bagirmi surrounding it; length, about 150 miles; breadth, about 100 miles; area, about 20,000 sq. miles, with a variable expanse according as it is the wet or dry season.

TCHERNIGOV, TCHERNIGOFF, or **TCHERNIGOW,** a government of Little Russia, situated on the left bank of the Dnieper; area, 20,232 sq. miles. Agriculture and cattle-breeding are the chief employments; corn, linseed, timber, tobacco, and sugar are exported. Pop. 2,075,867.—Tchernigov, the capital, is situated on the Desna, about 80 miles n.n.e. of Kieff. Pop. 27,028.

TEA, a genus of plants comprising the species which yields most of the tea of commerce. By different modes of culture this species has diverged into two distinct varieties, entitled Thea viridis and Thea bohea. The former is a large hardy evergreen plant with spreading branches and thin leaves from 3 to 5 inches long; the latter is a smaller plant, and differs from the other in several particulars. From both, according to the process of manufacture, black and green teas are procured. The tea plant is not only cultivated over a great part of China, but also in Japan, Tonquin, Cochin-China, Assam and other parts of India, and Ceylon. It has also been experimentally introduced into Carolina, Brazil, and Australia. Its growth is chiefly confined to hilly tracts; it is raised from seed, and the rearing of it requires great skill and attention. In seven years the plant attains the height of 6 feet, and the leaves are plucked off carefully one by one four times a year. In their green condition they are placed in a hot pan over a small furnace, and then rubbed lightly between the palms of the hands, or on a table. This process is repeated until the leaves become small, crisp, and curled. The black teas thus prepared include bohea, congou, souchong, and pekoe; the green teas, twankay, hyson-skin, young hyson, hyson, imperial, and gunpowder. Green tea gets less of the fire than black tea. The broken leaves, stalks, and refuse of the tea are compressed into solid bricks, and in this form it is imported by the Russians into the greater part of Central Asia, where (besides being used as a sort of coinage) it is sometimes stewed with milk, salt, and butter. There is considerable adulteration in the teas sent from China to the European market, and they are often artificially colored with a mixture of Prussian blue, or of gypsum and indigo carefully mixed. The infusion of tea-leaves in hot water yields a beverage which has little nutritive value, but it increases respiratory action, and seems to have a stimulative and restorative action on the nervous system. This is chiefly due to the essential oil and the theine (an alkaloid in its nature identical with the caffeine in coffee) which it contains, while the tannin, which is also present, acts as an astringent. If the water is boiling an infusion of ten minutes is sufficient to extract all the theine, and a longer period only adds to the tannin in the beverage, a result which is very hurtful to digestion. From historical sources we learn that tea was used in China as a beverage in the 6th century, and two centuries after its use had become common. In England we first find it mentioned about 1615 by an agent of the East India company; in 1660 Pepys says in his diary, "I did send for a cup of tea, a China drink, of which I never had drunk before." China until recent years, held almost a monopoly in the production of tea, but now India and Ceylon have entered the market as important competitors. Britain is the principal tea-consuming country in the world, coffee being less in favor there than in many other countries, the United States and Canada for example. The import of tea to the United States is less than half that of Britain.

TEAK, a tree of the natural order Verbenaceæ, a native of different parts of India, as well as of Burmah and of the islands from Ceylon to the Moluccas. It grows to an immense size, and is remarkable for its large leaves, which are from 12 to 24 inches long, and from 6 to 18 broad The wood, though porous, is strong and durable; it is easily seasoned and shrinks but little, and from containing a resinous oil it resists the action of water, and repels the attacks of insects of all kinds. It is extensively used in ship-building and for many other purposes.

Teak.

TEAL, the common name of the smallest and most beautiful of the duck family. Its length is about 14 inches. The green-winged teal is very like the

Blue-winged teal.

common teal. The blue-winged teal is somewhat larger than the common teal, and is easily domesticated. Both are North American.

TECHNICAL EDUCATION is the form of education received in specially equipped schools, where manual skill, and the practical application of science and art to manufactures, are taught. The recent demand for such instruction has arisen chiefly because, by the modern use of machinery and a highly-developed division of labor, the old apprentice system has broken down, and workmen in recent years have ceased to learn the complete practical details of their crafts.

TECHNOLOGY, that branch of knowledge which deals with the various industrial arts; the science or systematic knowledge of the industrial arts, as spinning, weaving, dyeing, metallurgy, brewing, and the like.

TE DEUM, a name (from the opening phrase Te Deum Laudamus) of the well-known Latin hymn usually ascribed to St. Ambrose and St. Augustine, although it cannot be traced farther back than the end of the 5th century. It is used in the ritual of the Roman Catholic and Anglican churches, being part of the morning service in the latter ("We praise thee, O God," etc.)

TEETH, the name given to certain hard structures growing out of the jaws of vertebrate animals, and serving as the instruments of mastication. The teeth of animals differ in shape, being destined for different offices. In man and the higher mammals two sets of teeth are developed, the early, milk or deciduous teeth, and the permanent set. In fishes the teeth fall off and are renewed repeatedly in the course of their lives. Teeth do not belong to the skeleton, but to the skin or exoskcletal parts of the body, and are homologous with hairs. In man the teeth are imbedded in sockets in the upper and lower jawbones. There are thirty-two in all, sixteen in each jaw, and each consists of the crown or visible part, and the fangs or buried part. The four central teeth of each jaw having chiseled-shaped crowns with sharp edges are called incisors; on each side of these four is the pointed canine tooth (which in the upper jaw are called the eye-tooth); on each side of these are two bicuspid teeth (præmolars); and behind these again are the molar teeth, three on each side. (See Dental Formula.) The last of the permanent teeth to appear are the farthest back grinding teeth, which, owing to their arrival between the seventeenth and twenty-fifth years, are called the wisdom teeth. Each tooth has a central cavity filled with a soft pulp containing blood-vessels and nerves; this cavity is surrounded by dentine, a hard substance composed of phosphate and carbonate of lime; outside the fang is a cement-like substance resembling bone; while outside the crown is a hard enamel. In young teeth the enamel is covered by a delicate membrane called "the skin of the teeth," which in adult teeth is worn off. Toothache is due to decay of the substance of a tooth, dental caries as it is called. When the enamel which covers the tooth becomes flawed the underlying dentine is exposed and soon breaks down. When the decay, passing inward, reaches the pulp which contains the blood-vessels and nerves it causes inflammation, aching, and suppuration. Any treatment of toothache, short of extraction, is seldom satisfactory if the pulp has been actually attacked; but neuralgia is often mistaken for toothache. See Dentistry.

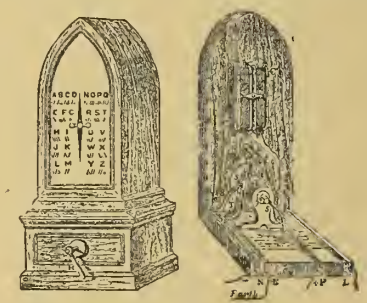
TEETOTALISM. See Temperance.

TEHERAN', capital of Persia, in Irak Ajemi, toward the northeast of the province, 66 miles south of the Caspian sea, at the southern base of Mount Elburz. Pop. (in winter), 210,000.

TEHUANTEPEC (tā-wän-te-pek'), a town of Mexico, in the state of Oaxaca, 14 miles above the mouth of a river of the same name, falling into the Pacific ocean. On account of a dangerous bar the river is little used for navigation. Pop., mostly Indians, 24,438. The town is near the south side of the Isthmus of Tehuantepec, the narrowest part of North America, having the Gulf of Tehuantepec on the Pacific side, the Bay of Campeachy on the Atlantic side; width, about 115 miles. There have been various schemes for constructing a canal or a ship railway across the isthmus, the most recent of the latter sort being that of an American engineer named Eads. The idea was received with great favor in the United States, and in 1887 a bill passed the senate authorizing the incorporation of a company to carry out the project. The total length of the line, from the Atlantic to the port of Salina Cruz on the Pacific, was estimated at 135 miles, and the cost of construction at sixty million dollars. Capt. Eads, the projector, died in 1887. See Ship Railway.

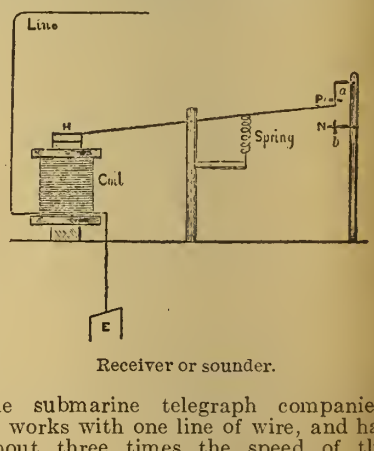
TELAU'TOGRAPH, a new writing telegraph, invented by Professor Elisha Gray, based on a novel system of transmission, whereby a facsimile reproduction of the handwriting of the sender of a message is effected.

TELEGRAPH, a general name for any instrument or apparatus for conveying intelligence beyond the limits of distance at which the voice is audible, the idea of speed being also implied. Thus the name used to be given to a semaphore or other signalling apparatus. The word, however, is now usually restricted in its application to the electric telegraph, which from its power of rapidly conveying elaborate communications to the greatest distances has thrown all others into the shade. The electric telegraph, as comprising the entire system of apparatus for transmitting intelligence by elec-



Single-needle instrument.

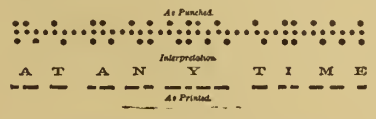
tricity, consists essentially (1) of a battery or other source of electric power; (2) of a line-wire or conductor for conveying the electric current from one station to another; (3) of the apparatus for transmitting, interrupting, and if necessary reversing the current at pleasure; and (4) of the indicator or signalling instrument. The line-wires for overhead lines are usually of iron, protected from atmospheric influence by galvanizing or by being varnished with boiled linseed-oil, a coating of tar, or other means, and are supported upon posts, to which they are attached by insulators. (See Insulator.) In underground lines the wires are insulated by a gutta-percha or other non-conducting covering, and inclosed in iron or lead pipes. The battery and line-wire are common to all telegraphic systems; it is in the method of producing the signals that the great variation exists; but in all of them advantage has been taken of one or other of the three following properties of the current: (1) its power of producing the deflection of a magnetic needle, as in the galvanometer (which see); (2) its power of temporarily magnetizing soft iron; and (3) its power of producing chemical decomposition. The electro-magnetic instrument of Professor Morse, which, however, in its perfected form owed much to the genius of Morse's associates Joseph Henry and Alfred Vail, is an application of the second of the above properties. By means of an electro-magnet an armature which is attracted when the magnet is temporarily magnetized, a lever moved by the armature, and a style which moves with the lever, this instrument impresses a message in dots and dashes on a ribbon of moving paper, and by it forty words may be sent in a minute. This "dot and dash" system which was invented by Morse is now in extensive use. A modification of this instrument, called a sounder, in which the lever makes audible sounds by coming in contact with a brass rod, indicates the message by the length of the strokes produced. This is shown in the illustration, which shows the arrangement, by which the hammer-head h is attracted, and the arm h p is brought into contact with the pin a. Upon the cessation of the current the spring brings down the arm upon the pin b. Frequently the Morse is simultaneously a recorder and sounder. It being necessary that this instrument should produce sharp and distinct impressions, and the current being weak for stages over 50 miles, a relay, or subsidiary electro-magnetic circuit, is added to it in the case of longer distances. The transmitting instrument is a lever, which, on being pressed, permits the current from the battery to flow into the line-wire during the time the contact is made. Both on account of its intrinsic merits and for the sake of uniformity the Morse is the most extensively used system, being that in use in America, and on the continent of Europe, and being also largely employed in Britain. Hughes' telegraph appears to be the best printing telegraph and is the instrument chiefly used by



Receiver or sounder.

the submarine telegraph companies. It works with one line of wire, and has about three times the speed of the Morse system, with the advantage that the message is printed in the ordinary Roman type. The machine is rather complicated, but its principle can be easily understood. A wheel having type engraved on its rim is made to revolve at a known rate; a strip of paper, as in the case of the Morse, is drawn off in a drum over a roller which lies under the rim of the revolving type-wheel; by means of the current the roller with the paper is raised against the type-wheel as the proper letter passes, and in this

way the despatch is printed. The operator works on a key-board much like that of a piano. Chemical telegraphs work on the principle that an iron wire pressing against a paper prepared with cyanide of potassium or other substance will, while a current is passing between the wire and the paper, produce a dark streak of Prussian blue or other mark, and when the current is interrupted the streak of pigment is interrupted. Bonelli's telegraph is worked by means of five wires. The message is set up in brass types in one line; the letters are common block letters; five styles, like the teeth of a comb, press against the raised portions of the type, and as the line of type is drawn through each style sends a current along its wire to a corresponding style pressing against prepared paper at the distant station, making a mark on the paper there corresponding to the raised portion of type which sends the current. The chief objection to Bonelli's telegraph is the five wires necessary between the stations. Autographic telegraphs are chemical telegraphs, and consist of a message written with a pen dipped in some non-conducting substance on a surface of tin-foil or other conducting material pasted on a cylinder which is made to revolve at a certain rate; a style presses against the surface, and is moved up or down the cylinder at a certain rate so as to describe a helical line; a current passes between the cylinder and style except when the non-conducting writing comes between them; at the distant station a similar cylinder covered with paper prepared with cyanide of potassium revolves at the same rate as the first cylinder; and its style being connected with the first style by means of the telegraph wire makes a mark of Prussian blue, which is a continuous helix, except when the current is interrupted at the first style. In this way a copy of the message in the handwriting of the sender is produced at a distant station. This is Bakewell's telegraph. Caselli's telegraph is similar in principle. Bain's automatic telegraph is Bonelli's telegraph, wherein by adopting the Morse alphabet one wire is sufficient; and the type is simply a strip of paper with dots and dashes punched in it. As early as 1747 Bishop Watson showed that signals might be sent through a wire stretched across the Thames by discharging a Leyden-jar through it. Volta's discovery of the galvanic pile, and Oersted's discovery of electro-magnetism, by supplying electricity of a kind more easily retained on the conducting wires, afforded much greater facilities for transmitting signals to a distance. Ampère, in 1820, proposed to utilize Oersted's discovery by employing twenty-four needles to be deflected by currents sent through the same number of wires; and Baron Schilling exhibited in Russia, in 1832, a telegraph model in which the signals appear to have been given by the deflections of a single needle. Weber and Gauss carried out this plan in 1833 by leading two wires from the observatory of Göttingen to the Physical Cabinet, a distance of about 9000 feet. The signal consisted in small deflections of a bar-magnet suspended horizontally with a mirror attached, on the plan since adopted in Thomson's mirror galvanometer. At their request the subject was earnestly taken up by Professor Steinheil of Munich, whose inventions contributed more perhaps than those of any other single individual to render electric telegraphs commercially practicable. He was the first to ascertain that earth connections might be made to supersede the use of a return wire. He also invented a convenient telegraphic alphabet, in which, as in



Wheatstone's automatic system.

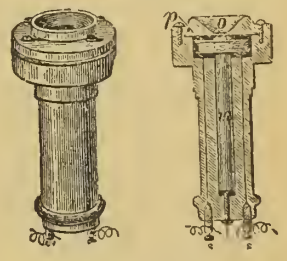
most of the codes since employed, the different letters of the alphabet are represented by different combinations of two elementary signals. His currents were magneto-electric, like those of Weber and Gauss. The attraction of an electro-magnet on a movable armature furnishes the means of signalling which is the foundation of Morse's telegraphic system, and which has been employed by Wheatstone to ring a bell calling attention before transmitting a message. About the year 1837 electric telegraphs were first established as commercial speculations in three different countries. Steinheil's system was carried out at Munich, Morse's in America, and Wheatstone and Cooke's in England. Among recent improvements in electric telegraphy are those by which a wire can be used for more than one message at a time. In 1872 a method of sending simultaneously two messages in opposite directions on the same wire was introduced, and it was also discovered that two messages could be sent in the same direction (duplex telegraphy). The two plans being combined formed quadruplex telegraphy. In wireless telegraphy electric waves transmitted through space are utilized by means of delicate instruments. See Wireless Telegraphy.

TELEGRAPH CABLE. See Submarine Cable.

TELEMACHUS (te-lem'a-kus), a son of Ulysses and Penelope, who is reputed to have gone through many adventures in search of his father after the close of the Trojan war. He is the hero of a French prose epic by Fénelon. (1699).

TELEOL'OGY, the science or doctrine of final causes; the doctrine which asserts that all things which exist were produced by an intelligent being for the end which they fulfil.

TEL'EPHONE, an instrument for transmitting the human voice or other sounds by means of electricity and telegraph wires. About the year 1860 the idea that sound-producing vibrations could be transmitted through a wire by means of electricity began to be recognized by several men of science. Reis of Frankfort invented an apparatus which could reproduce at a distant station the piteh of a musical sound by means of a discontinuous current along a telegraph wire. A great step in advance was made in 1876, when Prof. Graham Bell discovered an articulating telephone which depends upon the principle of the undulating current, and by means of which the very quality of a note, and therefore conversation itself, could be reproduced at a distant station. Several varieties of telephonic apparatus are now in use for inter-communication between distant places. The Bell telephone in its common form is shown in the accompanying cut. A strong ordinary bar-magnet m has round one of its ends a coil of fine silk-covered wire in metalic communication with the two terminals s s. One of the terminals communicates through a telegraph wire with one of the terminals of the coil of a precisely similar instrument at the other station, the remaining pair of terminals being connected through the earth, or through a return wire. Just in front of the extremity of the magnet there is a thin plate of iron p, and in front of this again there is the mouthpiece of a speaking-tube o. By this last the sounds to be transmitted are collected and concentrated, and falling on the metal plate cause it to vibrate. These vibrations in their turn excite undulating elcctric currents which correspond exactly with the vibrations; that is, with the original sounds. The



Bell telephone.

electric currents being transmitted to the receiving telephone cause corresponding vibrations in the plate or disc in it, and these reproduce to the ear the original sounds. The telephone is now an established institution throughout Europe and America. Telephone exchanges exist in all the principal towns, subscribers to which have their houses or places of business in direct communication with each other. Long distance lines are also rapidly joining city to city, the longest as yet in existence being the lines between New York and Chicago (1000 miles), and between Boston and Milwaukee (1300 miles, and New York and Denver (1954 miles). In 1907 extremely interesting tests were made by Count Arco, the Berlin electrical expert, who demonstrated the possibility of talking by wireless telegraphy. All the newest ships in the German, English, and American navies are now being fitted out with wireless telephone instruments. Experiments conducted by Capt. A. C. Knowles, U. S. A., have made it possible, by using a one wire circuit, the current passing through the horse to the ground, for officers to give commands while separated from their troops, and also to converse with one another without dismounting. See Wireless Telegraphy.

TELESCOPE, an optical instrument essentially consisting of a set of lenses fixed in a tube or a number of sliding tubes, by which distant objects are brought within the range of distinct, or more distinct vision. The law of action by which the telescope assists human vision is twofold, and that under all the varieties of its construction. A distant object viewed by the unaided eye is placed in the circumference of a large circle, having the eye for its center, and consequently the angle under which it is seen is measured by the minute portion of the circumference which it occupies. Now, when the distance is great, it is found that this angle is too small to convey to the retina any sensible impression—all the light proceeding from the object is too weak to affect the optic nerve. This limit to distinct vision results from the small aperture or pupil of the eye. The telescope substitutes its large object lens or reflector for the human eye, and consequently receives a quantity of light proportioned to its area or surface; hence a distant point, inappreciable by the eye alone, is rendered visible by the aid of the telescope. The rays of light, after transmission or reflection, converge to a point as they at first proceeded from a point, and thus an image of the object is formed which, when viewed by the eye-piece or lens, is more or less magnified. The telescope therefore assists the eye in these two ways: it gathers up additional light and it magnifies the object; that is to say, its image. The refracting telescope is constructed of lenses alone, which, by successive refractions, produce the desired effect. This instrument was formerly very cumbersome and inconvenient, inasmuch as its length had to be increased considerably with every accession of power; but the substitution of achromatic for ordinary lenses has rendered it more portable and convenient. The reflecting telescope is composed of specula or concave reflectors (see Speculum) aided by a refracting eye-piece. To this instrument we owe some of the most wondrous discoveries in astronomical science. The names of Newton, Gregory, Herschel, and Lord Rosse are connected with its history. The following diagrams exhibit the principles of construction and action in both sorts of telescopes. In Fig. 1, which

Fig. 1.

illustrates the refracting telescope in its simplest form, a and b are two lenses of different focal lengths. Rays of light from a distant object falling upon the object-glass a are converged to a focus at c. The eye-glass b, placed at its focal distance from the point of convergence, gathers up the diverging rays and carries them parallel to the eye magnifying the image formed at c. (See Optics.) The magnifying power of the instrument is as ac : cb, or as the focal length of one lens to that of the other. In this construction the object is seen inverted or turned upside down, and hence it is unsuitable for terrestrial purposes. To render the image erect, and thus show it in its natural position, a more complicated eye-piece, consisting of two additional lenses, is necessary. Another refracting telescope, consisting of two lenses in its simplest form, is called the Galilean telescope. It differs from the former in having a concave lens for its eye-glass, which lens is placed nearer the object-glass than the focus of this lens, producing an image which is not inverted. This kind of telescope is the

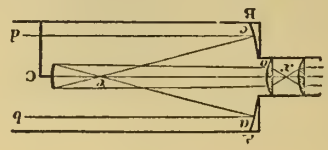
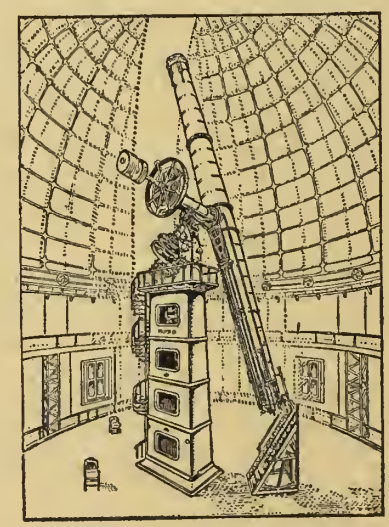


Fig. 2.

one used in opera-glasses and field-glasses. Fig. 2 shows the structure of the reflecting telescope as constructed by Dr. Gregory. a b is a large speculum perforated in the center; upon this fall the rays b, a and d, c, which are reflected to convergence at e. A smaller speculum, c, takes up the diverging rays and reflects them, slightly converging, through the aperture o, where they are received by a lens, and, after transmission, they intersect at x, and proceed to the eye-glass, whence they emerge parallel. The magnifying power of this instrument is great for its length, being as $\frac{o\ e}{e\ C} \times \frac{x\ C}{x\ o}$. In the telescope invented by Sir Wm. Herschel there is no second speculum, and no perforation in the center of the larger one placed at the bottom of the tube. The latter is fixed



The Lick telescope, Lick observatory, California.

in an inclined position so that the image formed by reflection falls near the lower side of the tube at its open end or mouth, where it is viewed directly by an eye-piece, without greatly interfering with the light. This arrangement in the case of large reflectors, is imposed by their great weight and difficult management. Were it otherwise the ordinary construction would be preferred, the inclination of the speculum being a disadvantage. Chromatic aberration, which arises from the different refrangibilities of the different colored rays, and leads to the formation, by a lens, of a separate image of a bright object for each colored ray, is remedied by achromatizing the lens, that is, by constructing it of two or more lenses of different kinds of glass, so that the colors, separated by one, shall be reunited by the others. (See Achromatic.) The most powerful refracting telescope yet made is that in the Yerkes Observatory, Wisconsin, which has an object-glass 40 in. in diameter. The telescope in the Lick observatory, California, has an object glass three feet in diameter. A large number of refracting telescopes of 13 inches diameter have recently been constructed with which to conduct the photographic survey of the heavens, a camera being attached to the eye-piece end of each.

TELFORD, Thomas, engineer, born in 1757 in Eskdale, Dumfriesshire, which in 1782 he left for London. The greatest monument of his engineering skill, was the Menai Suspension-bridge, connecting Caernarvonshire with the Island of Anglesea, opened in 1826. The Conway bridge was also his, as well as the Dean bridge, Edinburgh, and the Broomielaw bridge, Glasgow. He died in 1834, and was interred in Westminster Abbey.

TELL, William, a famous peasant hero of Switzerland, reputed to have done some daring and wonderful feats in his resistance to the tyranny of the Austrian governor Gessler, but now proved to have been a mythical personage. In particular, having refused to do homage to Gessler's hat, set upon a pole, he was seized and condemned to death, but granted his life on condition of shooting with an arrow an apple placed on the head of his own son. This he did successfully, admitting at the same time that a second arrow he had was intended for Gessler in case of failure. He was therefore still kept a prisoner; but while being conveyed over the Lake of Lucerne he managed to leap ashore, and soon after, having lain in wait for Gessler, he shot the tyrant dead. These stories professedly belong to the end of the 14th or early part of the 15th century, but contemporary historians know nothing of them; and similar stories belong to the legends and ballads of various peoples.

TEL'LER, Henry Moore, American politician, was born at Granger. N. Y., in 1830. In 1858 he removed to Illinois, and in 1861 to Colorado. He was a member of the United States senate from 1876 until he entered the cabinet of President Arthur as secretary of the interior in 1882. He left the republican national convention in 1896 after it had adopted a gold standard plank and supported W. J. Bryan for the presidency. In the same year he was returned to the senate as an independent silver republican, and in 1903 was re-elected as the regular democratic nominee.

TELLURIUM, a metal discovered in 1782, combined with gold and silver in

certain ores found in Hungary. The ores are denominated native, graphic, yellow, and black. The native tellurium is of a color between tin and silver, and sometimes inclines to a steel-gray. The graphic tellurium (or graphic gold) is steel-gray; but sometimes white, yellow, or lead-gray. These ores are found massive or crystalized.

TEM'BULAND, a district or dependency of the Cape Colony. The minerals include coal and copper. Pop. 180,415 (5179 Europeans).

TEMESVÁR (tem'esh-vâr), a town of Hungary, in the Temes Banat, in an extensive marshy plain on the Bega canal, 75 miles n.n.e. of Belgrade. The manufactures consist of woolens, silks, paper, tobacco, etc. Pop. 49,977.

TEMPERANCE SOCIETIES, the first association for the purpose of influencing public opinion in order to check the evil of intemperance appears to have been formed in Massachusetts in 1813. In 1826 a new impulse was given to the movement by the establishment in Boston on a more extensive plan of the American Society for the Promotion of Temperance. By 1831 more than 2200 societies, embracing 170,000 members, were in correspondence with the parent society. Reports of the movement in America soon began to have an effect on the other side of the Atlantic. In 1829 societies were formed in Scotland and Ireland. In 1830 the first temperance society in England was founded at Bradford, and by the close of the year there were in existence some thirty associations, numbering about 10,000 members. Since then many advocates of total abstinence have sought to enforce their views by legislative measures, as long ago exemplified in the celebrated Maine Liquor Law, for the suppression of the manufacture and sale of intoxicating beverages in the state of Maine. See Prohibition Party.

TEMPERATURE may be expressed as the state of a body with regard to heat, or the state of a body considered with reference to its power of communicating heat to other bodies. It often refers to the atmospheric heat of a locality at a particular time. When we speak of a body having a "high" or a "low temperature" it is implied that the condition of heat in the body may be compared with some standard. The means of such comparison is the thermometer. See Thermometer.

TEMPERATURE OF ANIMALS. See Animals.

TEMPERING, in metallurgy, the process of giving to metals, principally iron and steel, the requisite degree of hardness or softness, especially the process of giving to steel the necessary hardness for cutting, stamping, and other purposes. If heated and suddenly cooled below a certain degree it becomes as soft as iron; if heated beyond that degree, it becomes very hard and brittle. The process essentially consists in plunging the steel when red-hot into cold water or other liquid to give an excess of hardness, and then gradually reheating it until the hardness is reduced or brought down to the required degree. The excellence of all cutting steel instruments depends on the degree of temper given to them. Different degrees of temper are indicated by different colors which the steel assumes. Thus steel heated to 450°, and suddenly cooled, assumes a pale straw color, and is employed for making razors and surgical instruments. See Steel.

TEMPLARS, an order of knights which had its origin in the Crusades. Subsequently its object became the defense of the Christian faith, and of the holy sepulchre against the Saracens. The knights took the vows of chastity, of obedience, and of poverty, like regular canons. The knights wore a white cloak adorned with an eight-pointed red cross (Maltese) on the left shoulder. The grand-master, the chief of the order, had the rank of a prince, and the order acknowledged the pope alone as its protector. The Templars established themselves in England about 1185, taking up their head-quarters in Fleet street, London, at the place still known as the

Templar.
Monument in Temple church, London.

Temple. Being compelled, in 1291, to leave the Holy Land, they transferred their chief seat to the island of Cyprus. By this time the wealth and power of the order had increased to such an extent, and their arrogance and luxury in proportion, that it was deemed necessary to suppress it. The Templars were put an end to on the charge that they had ambitious designs on European thrones, and that they held heretical views. Philip IV. of France and Pope Clement V. played into each other's hands in the work of suppression and spoliation. The pope, at the Council of Vienne, in Dauphiny, solemnly abolished the order by a bull of March 2, 1312. See Freemasonry.

TEMPLE, in architecture, an edifice designed for the performance of public worship. Magnificent temples were erected in ancient Greece and Rome, the Romans taking the Greek structures for models. The Egyptian temples were also remarkable structures. The most remarkable temple in the world, however, was that built by Solomon on Mount Moriah in Jerusalem. It was an oblong stone building, 60 cubits in length, 20 in width, and 30 in height. On three sides were corridors, rising above each other to the height of three stories. The fourth or front side was open, and was ornamented with a portico, 10 cubits in width, supported by two brazen pillars. The interior was divided into the most holy place, which contained the ark of the covenant, and was separated by a curtain from the sanctuary, in which were the golden candlesticks, the table of the shew-bread and the altar of incense. The temple was surrounded by an inner court, which contained the altar of burnt-offering. Colonnades, with brazen gates, separated this court of the priests from the outer court, which was likewise surrounded by a wall. This temple was destroyed by the Assyrians, and after the return from the Babylonish captivity a second temple, but much inferior in splendor, was erected. Herod the Great rebuilt it of a larger size, surrounding it with four courts, rising above each other like terraces, the lowest of which was 500 cubits square, and was surrounded on three sides by a double, and on the fourth by a triple row of columns. In the middle of this inclosure stood the temple, of white marble richly gilt, 100 cubits long and wide, and 60 cubits high, with a porch 100 cubits wide. This magnificent edifice was destroyed by the Romans in A.D. 70.

TEMPLET, a pattern or mould used by masons, machinists, smiths, shipwrights, etc. It usually consists of a flat thin board, a piece of sheet-iron, or the like, whose edge is dressed and

Templet for a Baluster.

shaped to the required conformation, and is laid against the object being moulded, built, or turned so as to test the conformity of the object thereto.

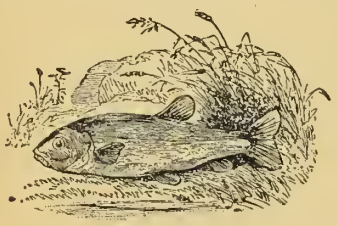
TEMPO (Italian for "time"), in music, a word used to express the rate of movement or degree of quickness with which a piece of music is to be executed. The degrees of time are indicated by certain words such as lento (slow), adagio or largo (leisurely), andante (walking pace), allegro (gay or quick), presto (rapid), prestissimo (very rapid), etc.

TENACITY, the measure of the resistance of bodies to tearing or crushing. Tenacity results from the attraction of cohesion which exists between the particles of bodies, and the stronger this attraction is in any body the greater is the tenacity of the body. Tenacity is consequently different in different materials, and in the same material it varies with the state of the body in regard to temperature and other circumstances. The resistance offered to tearing is called absolute tenacity, that offered to crushing, retroactive tenacity. The tenacity of wood is much greater in the direction of the length of its fibers than in the transverse direction. With regard to metals the processes of forging and wire-drawing increase their tenacity in the longitudinal direction; and mixed metals

have, in general, greater tenacity than those which are simple.

TENAS'SERIM, a maritime division of Burmah, about 500 miles in length, and from 40 to 80 in breadth, with an area of 46,730 sq. miles. Pop. 978,073.

TENCH, a fish belonging to the carp family. It inhabits most of the lakes of the European continent, and in Britain it is frequent in ornamental waters and ponds. It attains a length of from 10 to 12 inches. The color is generally a greenish-olive above, a light tint pre-



Tench.

dominating below. It is very sluggish, apparently inhabiting bottom-waters, and feeding on refuse vegetable matter. It is very tenacious of life, and may be conveyed alive in damp weeds for long distances. The flesh is somewhat coarse and insipid.

TENDON, the name given to the "sinews" by means of which muscles are inserted upon bones. They consist of bundles of white fibrous inelastic and very strong tissue disposed in bands, and separated by areolar or connective tissue.

TENERIFFE', TENERIFFA, the largest of the Canary islands, is of an irregularly triangular form, and has an area of about 780 sq. miles. It is of volcanic formation, composed principally of enormous masses and cones of trachyte, lava, and basalt, which culminate in the Peak of Teneriffe, 12,182 feet high. The principal productions are corn, wheat, potatoes, pulse, almonds, oranges, guavas, apples, honey, wax, silk, cochineal, and wine. Cochineal, tobacco, and wine are the chief exports. Pop. 105,062.

TENRIERS (ten-ērs'), David, the name of two celebrated artists of the Flemish school, father and son, both natives of Antwerp, in which city the elder was born in 1582. He may be considered the founder of a style of painting which his son afterward brought to perfection. His pictures are mostly small. He died in 1649.—His son was born in 1610. He specially excelled in outdoor scenes, though many of his interiors are masterpieces of color and composition. His general subjects were fairs, markets, merry-makings, guard-rooms, taverns, etc., and his pictures, which number over 700, are found in all the important public and private galleries of Europe. His etchings are also highly esteemed. He died at Brussels in 1690.

TENNESSEE', one of the United States of North America (admitted into the Union in 1796), is bounded on the north by Kentucky and Virginia, east by North Carolina, south by Georgia, Alabama, and Mississippi, and west by Arkansas and Missouri; area, 42,050 sq. miles. Tennessee is popularly divided into three sections. East Tennessee, an extensive valley, and agriculturally one of the most important sections of the state, stretches from the eastern boundary to the middle of the Cumberland table-land, which has an average elevation of 2000 feet above the sea, and abounds in coal, iron, and other minerals. Middle Tennessee extends from the dividing line on the table-land to the lower Tennessee river; and West Tennessee, from the Tennessee river to the Mississippi. The Unaka mountains, a part of the Appalachian chain, run along the eastern frontier, and have an average elevation of 5000 feet above the sea. The Mississippi, with the Tennessee and and Cumberland, drains three-fourths of the state. The two latter are navigable for a considerable distance, and other rivers with numerous tributaries supply valuable water power. The climate is very healthy, the mean temperature of winter being 37.8°, and of summer 74.4°. The largest and most valuable crop is corn. Wheat and oats are the only other important cereals. Cotton is one of the leading crops. Hay and forage, peas and sorghum cane are noteworthy products, as are also Irish and sweet potatoes. Peanuts are grown in large quantities in the Tennessee valley. The climate is favorable to fruit culture, and there are over 14,000,000 fruit trees, more than half of which, 7,700,000 are apple trees. Watermelons and various vegetables are extensively raised. Tennessee stood first among Southern states in 1900 in the value of its lumber products. It is estimated that the state contains 27,300 sq. miles of wooded area. The rearing and fattening of live stock are carried on under pecu-

Seal of Tennessee.

liar advantages, and immense numbers of hogs grow up on the mast of the forests, which cover a very large area. The most valuable minerals found are coal, iron (both worked to a considerable extent), copper, marble, limestone, sandstone, granite, roofing slate, potters' clay, and kaolin. Also among the other minerals are gold (not found in paying quantities), lead, zinc, baryta, copperas, asbestos, etc. Petroleum, sulphur, chalybeate and salt springs are plentiful. The leading manufactures are iron and steel, cotton and woolen goods, furniture, cars, leather, oils, wines, spirits, etc. The state has the advantage of water transportation afforded by the Mississippi and Tennessee rivers. A number of railroads cross the state, most of them centering in Memphis. The mileage increased from 1253 in 1860 to 1843 in 1880, 2767 in 1890, and 3712 miles in 1907. At the head of the educational establishments stand the University of Tennessee, Nashville university, the Cumberland, Vanderbilt, and Fisk universities, the last for colored students. De Soto reached the Mississippi at the present site of Memphis about 1541. La Salle, about 1682, built a fort at this point, and called it Port Prud'homme. The grant by Charles II. to the Lords Proprietors of Carolina of the territory between latitudes 29° and 36° 30′ in 1665 included this territory. The most important effort of transmontane colonization by the British prior to 1760 was the establishment of Fort Loudon on the Little Tennessee river in 1756 or 1757. But in 1760 this post was captured by the Cherokees and its garrison massacred; and the same fate befell a number of colonists who had settled between Fort Chissel (on New River, Virginia) and Fort Loudon. Early in 1761 Colonel Grant completely routed the Cherokees and compelled their French and Spanish allies to withdraw to Louisiana and Georgia.

Eight years later the stream of emigration began to set westward, mainly by two routes, of which one led through Cumberland Gap to the valley of the Cumberland river, while the other followed the course of the Tennessee round the southern border of the Cumberland plateau into the western Tennessee valley. A body of emigrants from Virginia settled on the banks of the river Holston, in what is now Hawkins county and formed the nucleus of a rapidly increasing colony, which was mainly recruited from Virginia and North Carolina. The act of government for the "Territory South of the Ohio" was passed in April, 1790, and the seat of government was moved from Rogersville to Knoxville. In the same year the first territorial assembly met. In 1795 a constitutional convention was called, which met in January, 1796. A constitution for the "State of Tennessee" was adopted without submission to popular vote; the first general assembly met March 28th, and the state was admitted June 1, 1796. The progress of the state was rapid, almost entirely along agricultural lines. Turnpike roads were built in 1804, and after 1823 roads and canals were pushed forward. The first railroad was chartered in 1831, but the Memphis and Charleston road was not built until 1857. There was a strong Union party in the state at the outbreak of the civil war, and in February, 1861, the people refused to hold a convention to consider cecession, but with President Lincoln's call for troops sentiment changed, and through the influence of Governor Harris the state declared itself by popular vote out of the Union, June 8th. The position of Tennessee during the civil war was the same as that of the other middle and southern states. While secession was in agitation, it refused to secede, but when actual hostilities commenced it joined the southern confederacy. Even then, however, west and middle Tennessee sympathized with the south,

while eastern Tennessee sided with the north. Each division sent very large contingents to the army which it favored. A large portion of the state was, during the later years of the war, in the occupation of the northern army, and many great battles were fought on its soil, notably those of Fort Donelson, Murfreesborough (Stone river), Franklin, and Nashville. Tennessee suffered more from the exhaustion attendant on the close of the war, and from the rigorous government which accompanied the period of reconstruction, than any other state except Virginia.

In the Presidential elections, with the exception of 1868 when it voted for Grant the state has been Democratic by large majorities. From the state have come many men of national reputation, including three presidents, Jackson, Polk and Johnson. The chief towns are Nashville (the capital), Memphis, Chattanooga, and Knoxville. Pop. 2,220,000.

TENNESSEE, a river of the United States, formed by the union of two streams in the eastern part of the state of Tennessee, flows southwest, passes through the northern part of Alabama, then flows north through the western part of Tennessee and Kentucky, and enters the Ohio, of which it is the largest tributary, about 10 miles below the confluence of the Cumberland. Length, about 1200 miles. It is navigable 259 miles for steamers to Florence, at the foot of the Mussel-shoal rapids, which are passed by a canal 36 miles long; and above these there is navigation for boats for 250 miles.

TENNESSEE, The. A formidable confederate ram crippled by the Hartford of Admiral Faragut's fleet, and taken in Mobile harbor on August 5, 1864.

TENNESSEE, UNIVERSITY OF. A coeducational state institution at Knoxville, Tenn., founded in 1794. The institution comprises the college of Agriculture and Mechanic Arts and the university proper. The college has an agricultural department, an engineering department, a literary department, and an industrial department for colored students (Knoxville college). The university consists of an acedemic department with courses for the graduate degrees of M.A. and M.S. and professional courses in engineering, law, medicine, and dentistry, the medical and dental departments being situated in Nashville. The university has a liberal system of accredited scholars whose certificates are accepted in place of the entrance examinations.

TENNESSEE CENTENNIAL EXPOSITION, an exposition held in Nashville, Tenn., May 1 to October 30, 1897, to celebrate the one hundredth anniversary of the admission of the state into the Union. The site covered about 20 acres.

TENNIS, a game in which a ball is driven continually against a wall in a specially constructed court, and caused to rebound beyond a line at a certain distance by several persons striking it alternately with a racket, the object being to keep the ball in motion as long as possible without allowing it to fall to the ground. The game was introduced into England in the 13th century, and continued to be very popular with the nobility to the reign of Charles II. The modern game of rackets is a descendant of tennis. Lawn Tennis is a recent modification of the game. See Lawn Tennis.

TENNYSON, Alfred, Lord, was born on 6th August, 1809. As early as 1827 he had published, in conjunction with his brother Charles, Poems by Two Brothers, but his literary career may be said to date from 1830, when he published a volume entitled Poems, chiefly Lyrical. Its success was sufficient to encourage the poet to prepare a second collection, which appeared in 1833, and contained such poems as A Dream of Fair Women, The Palace of Art, Œnone, The Lady of Shalott, and others.

Lord Alfred Tennyson.

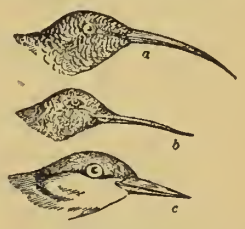
It was not till 1842 that he again appealed to the public with a selection of his poems in two volumes, and it is from this time that we find his work beginning to receive wide recognition. The collection then issued included Morte d'Arthur, Locksley Hall, The May Queen, and The Two Voices, all of which, it was almost at once acknowledged, entitled him to rank very high. His reputation was more than sustained by the works that immediately followed. These were: The Princess, a Medley; In Memoriam, written in memory of his friend Arthur, Hallam; and the Ode on the Death of the Duke of Wellington. The latter was his first great poem after receiving the laureateship upon the death of Wordsworth. From that time hardly a year passed without his adding some gem to our language. In 1855 Oxford university conferred on him the degree of D.C.L., and in 1869 the fellows of Trinity college, Cambridge, elected him an honorary fellow. From 1875 onward he gave various dramas to the public: Queen Mary, Harold, The Cup, The Falcon, The Promise of May, Beckett, and the Foresters. Several of these were put upon the stage. Tennyson was raised to the peerage as Baron Tennyson in 1884. He died 6th Oct., 1892. Few writers have developed so rare a mastery of English as a poetic instrument, and his works are assured of a high rank in the ultimate judgment of the literature of the 19th century.

TENOR, in music, is the more delicate of the two adult male voices, and its compass generally extends from C in the bass to G or A in the treble. The qualities of the tenor render it suitable to the expression of tender and delicate sentiments. In a vocal composition of four parts the tenor forms the second middle part, deeper than the alto, but higher than the bass; but in the song of four male voices the tenor, as the first voice, leads the chief melody, and as the second is the higher middle voice. The clef of this voice is the C clef, placed upon the fourth line of the staff.

TENT, a portable dwelling-house, formed usually in the simplest manner, of canvas, for instance, stretched with cords upon poles. The tent of private soldiers in the British service are of a conical form with circular basis, supported by a vertical pole in the center 10 feet high. The outside diameter of the tent, which accommodates fifteen infantry or twelve cavalry soldiers, is 17 feet 3 inches. The officers' marquees as well as the hospital and laboratory tents, are oblong, and are supported by two standards connected by a ridge pole 6 or 7 feet long. The soldiers' tent in the United States army are of the ridged variety.

TENTACLE, in zoology, an elongated appendage proceeding from the head or cephalic extremity of many of the lower animals, and used as an instrument of exploration and prehension. Thus the arms of the sea-anemone, the prehensile processes of the cirripeds and annelids, the cephalic feet of the cephalopods, the barbs of fishes, are termed tentacles.

TENUIROS'TRES, one of the four sections into which the order Insessores of birds is divided. This group, represented by the humming-birds, creepers,



Heads of tenuirostres.
a, Sun-bird. *b*, Humming-bird. *c*, European nuthatch.

sun-birds, hoopoes, etc., is characterized by the generally elongated bill, which usually tapers to a point.

TERCEIRA (ter-sā'i-rå), an island of the Atlantic, one of the Azores; greatest length, 20 miles; average breadth, 13 miles; area, 223 sq. miles. The soil possesses great natural fertility, and heavy crops of grain, pulse, etc., and abundance of oranges, lemons, and other fruits are produced. The capital is Angra. Pop. 46,528.

TER'EBINTH, the common name for various resinous exudations, both of a fluid and solid nature, such as turpentine, frankincense and Burgundy pitch, Canada balsam, etc. The volatile oil of various of these resins is called oil of terebinth, or oil of turpentine. Terebinth is also a name for the turpentine-tree.

TERE'SA, St. See Theresa.

TERMITES (ter'mits), a family of insects, also known by the name of white ants. They have little affinity with the true ants, although they resemble them

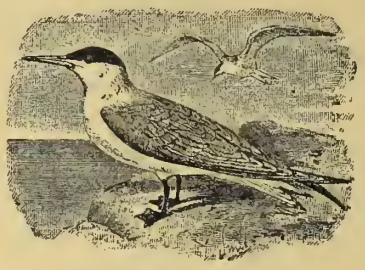
in their mode of life. They are chiefly confined to the tropics, and are found very plentifully in Western Africa. They unite in societies, building their dwellings in the form of pyramids or cones, 10 or 12 feet high. These dwellings, which are so firmly cemented as to be capable of bearing the weight of three or four men, are divided off into several apartments as magazines, chambers, galleries, etc. Every colony of termites consists of a king and queen both of which are much larger than the other members of the colony, and of workers and soldiers without wings. The king and queen are the parents of the colony, and are constantly kept together, attended by a detachment of workers, in a large chamber in the heart of the hive, surrounded by stronger walls than the other cells. The queen is always gravid, the abdomen being enormously distended with eggs, which, as they are dropped, relays of workers receive and convey in their mouths to the minor cells throughout the hive. At the beginning of the rainy season a

Dwellings of termites.

number of winged insects, both male and female, are produced. These, when mature, leave the hive and fly abroad, afterward shedding their wings, and becoming the kings and queens of future colonies. The soldiers and workers, both neuter, or of no fully developed sex, and differing merely in the armature of the head, are distinct animals from the moment they leave the egg, the young differing from the adult of the same class only in size. The duties of the workers are to build the habitations, make covered roads, nurse the young, attend on the king and queen, and secure the exit of the mature winged insects, while to the soldiers, whose mandibles are powerfully developed for that purpose, is committed the defense of the community which duty they perform systematically and with desperate courage. There are many species of termites, all of which are fearfully destructive to wood.

TERN, or **SEA-SWALLOW,** a genus of birds, included in the gull family. The terns are distinguished by the long, slender, and straight bill, long and pointed wings, and forked tail. The legs are relativcly shorter than in the gulls. It is a very active bird, seeming to have a ceaseless flight, and feeding upon small fishes. Its average length is 15 inches. The color is black on the head and neck, and ashy gray on the upper parts generally. The under parts are white, the legs, feet, and bill being red.

TERNSTRŒMIA'CEÆ, a natural order of plants, consisting of trees or shrubs; with alternate simple usually coriaceous leaves without stipules. The flowers are generally white, arranged in axillary or terminal peduncles, articulated at the base. This order is one of great economical importance, as it includes the genus Thea, from which the teas of commerce are obtained. The favorite garden camellia also belongs to it. The plants belonging to the order are principally inhabitants of Asia and America



Sandwich tern.

TERRA COTTA (Italian, "baked earth"), baked clay or burned earth, a similar material to that from which pottery is made, much used both in ancient and modern times for architectural decorations, statues, figures, vases, and the like. As now made it usually consists of potters' clay and fine powdered silica. It is produced of many different colors, the most pleasing being a rich red and a warm cream color. Large numbers of ancient statues, and especially statuettes, of terra cotta have been found in recent times, the most charming being the production of the city of Tanagra in Northern Greece (Bœotia).

TERRA DEL FUEGO. See Tierra del Fuego.

TERRA DI SIENNA, a brown ferruginous ochre employed in painting, and obtained from Italy. It is calcined before being used as a pigment, and is thus known as burned sienna.

TER'RAPIN, the popular name of several species of fresh water or tide water tortoises distinguished by a horny beak, a shield covered with epidermic plates, and feet partly webbed. They are active in their habits, swimming well and moving with greater agility on land than the land-tortoises. They are natives of tropical and warmer temperate countries, many being natives of North America. They feed on vegetables, fish, reptiles, and other aquatic animals. Their flesh is much esteemed. One species, called the salt-water terrapin, is abundant in the salt-water marshes around Charlestown. The chicken tortoise, so named from its flavor, is also an esteemed American species.

TERRE-HAUTE (târ-ōt; usually pronounced ter-e-hōt'), a town and important railway center in Vigo co., Indiana, on the Wabash. and Wabash and Erie canal. It is well built, and has numerous churches and schools (the state normal school, Rose Polytechnic institute, etc.), fine courts of justice, and an opera-house; extensive manufactures, and a considerable trade. There are rich beds of coal and iron in the vicinity. Pop. 43,175.

TERRY, Alfred Howe, American soldier, was born at Hartford, Conn., in 1827. In 1862 he was made a brigadier-general of volunteers. He was in a number of engagements but he is chiefly remembered in connection with the capture of Fort Fisher, which he accomplished in conjunction with Admiral Porter. For his services he was commissioned major-general of volunteers, and brigadier-general and brevet major-general in the regular army. In 1876 he commanded the main column which drove Sitting Bull and his followers into Canada after the massacre on the Little Big Horn. He died in 1890.

TERRY, Ellen Alicia, English actress, war born at Coventry, in 1848. She first appeared as the boy Manilius in the Winters Tale in 1856. In 1863 she appeared at the Haymarket theater in London, England. In 1878 she began her long association with Henry Irving, playing Ophelia to his Hamlet. Her principal roles are, Portia in the Merchant of Venice, Ruth Meadows in Eugene Aram, Juliet, Viola, in Twelfth Night, Marguerite in Faust, Madame Sans Gene, and Clerise in Robespierre. Her first visit to America with Irving was made in 1883, when she made a great success, repeated many times since.

TERRITORY, a term applied in the United States to an area similar to a state of the Union, but not having the independent position of a state, being directly under congress and having a governor and other chief officials appointed by the president, with a legislature of certain limited powers. Territories are usually admitted as states on attaining a sufficient population. In 1907 the territories were Arizona, New Mexico, District of Columbia and Alaska on the continent and Hawaii in the Pacific. The new possessions are Porto Rico in the West Indies and the Samoan islands, Guam and the Philippine islands in the Pacific. A government for Porto Rico was established by the Fifty-sixth Congress. The Philippines are under a provisional civil government, Guam and Tutuila under governors, and the Isthmian canal zone under a commission, all appointed by the president.

TERROR, Reign of, the term usually applied to the period of the French revolutionary government from the appointment of the revolutionary tribunal and the committee of public safety (6th April, 1793) to the fall of Robespierre (27th July, 1794). See France (History).

TERTIAN FEVER. See Ague.

TERTIARY FORMATION. See Geology.

TERTULLIAN, in full Quintus Septimius Florens Tertullianus, the earliest Latin father of the church whose works are extant. His most celebrated work is the Apologia, a formal defense of Christianity addressed to the Roman magistrates. The works of Tertullian display great learning, much imagination, and a keen wit, but their style is bad They are chiefly valuable for the light they throw on the doctrine and discipline of the church in the age in which he lived.

TERUEL', a town of Spain, in the province of the same name, on a hill near the Guadalaviar, 72 miles n.w. of Valencia, with which it carries on an active trade. It is inclosed by walls, has a Gothic cathedral, a bishop's palace, and a seminary. Pop. 8869.—The province has an area of 5491 sq. miles, and a pop. of 241,865.

TESLA, Nikola, electrician and inventor, was born in 1858, in Herzegovina. He studied engineering in Paris, and was engineer of the Edison station located there. For a time he was employed at Edison's laboratory, near Orange, N. J., but left to open a laboratory of his own. He has shown that electric lamps and motors can be operated on one wire without a circuit, and invented the rotary field motor, the multiphase system of which is used in the 50,000-horse-power plant built to transmit the water power of Niagara Falls to Buffalo and other places. He is considered one of the greatest living geniuses in the field of electric research.

TESTAMENT. See Will.

TESTAMENT, Old and New. See Bible.

TESTING, the process of examining various substances by means of chemical reagents, with the view of discovering their composition. The term testing is usually confined to such examinations as seek to determine what chemical elements or groups of elements are contained in any substance, without enquiring as to the quantity of these elements. Testing is carried out either by the application of chemical reactions to solid substances, or by the application of reagents in solution to a solution of the substance under examination.

Roman testudo, from Trajan's pillar.

TESTUDO, among the ancient Romans a cover or screen which a body of troops formed with their oblong shield or targets, by holding them over their heads when standing close to each other. This cover somewhat resembled the back of a tortoise, and served to shelter the men from missiles thrown from above. The name was also given to a structure movable on wheels or rollers for protecting sappers.

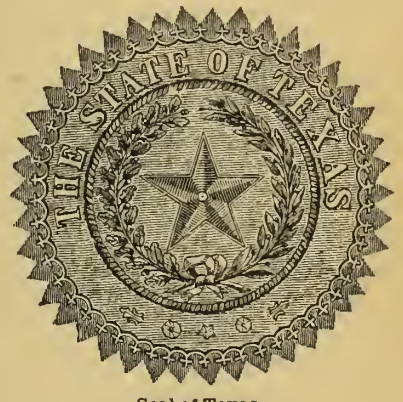
TET'ANUS, a spasmodic rigidity of the whole body, such as frequently results from wounds, especially in warm climates. If the lower jaw is drawn to the upper with such force that they cannot be separated the disorder is called lock-jaw. Tetanus frequently terminates fatally.

TE'TRARCH, a title which originally signified the governor of the fourth part of a country. By the Romans the title was used to designate a tributary ruler inferior in dignity to a king.

TEUTONIC PEOPLES, a term now applied (1) to the High Germans, including the German inhabitants of Upper and Middle Germany and those of Switzerland and Austria. (2) The Low Germans, including the Frisians, the Plattdeutsch, the Dutch, the Flemings, and the English descended from the Saxons, Angles etc., who settled in Britain. (3) The Scandinavians, including the Norwegians, Swedes, Danes, and Icelanders. See Philology, Indo-European Languages.

TEWFIK PASHA, Mahommed, Khedive of Egypt, eldest son of Khedive Ismail, was born in 1852, and succeeded to the vice-royalty by decree of the sultan, August 8, 1879, upon the forced abdication of his father. He was the sixth ruler of Egypt in the dynasty of Mohammed Ali Pasha. He died in 1892.

TEXAS, one of the United States, bounded by Mexico, New Mexico, Oklahoma, Arkansas, Louisiana, and the Gulf of Mexico; length, east to west, 825 miles; breadth, 740 miles; coast-line, 400 miles; it is the largest state in the Union, having an area of 265,780 miles. Its area is larger than the combined area of the Atlantic states from Maine to Virginia, inclusive, and nearly one-third greater than that of the whole German empire. The surface in the northwest is covered with mountains, which, in proceeding southwest, subside into hills and undulating plateaus, succeeded, on approaching the Gulf of Mexico, by low alluvial plains. These extend inland from 20 to 80 miles, are furrowed with deep ravines, and consist for the most part of rich prairie or forest land. The hilly region behind this is formed chiefly of sandstone and limestone ridges, separated by valleys of considerable fertility. In the mountainous region many of the summits are lofty, and covered with snow most of the year. The general slope of the country gives all the rivers a more or less southerly direction. The Rio-Grande, rising in New Mexico, forms the west and southwest boundary of the state. The Red river, which has its source in Mexico forms the greater part of the northern boundary. The other important rivers are the Colorado, the Brazos, the San Jacinto and Trinity, and the Sabine, which, during the greater part of its course, is the boundary between Texas and Louisiana. A long chain of lagoons stretches along the Gulf of Mexico. Texas has a warm climate, but the great range in latitude produces a considerable range in climatic conditions. Although warm, the climate is drier and less enervating than that of the other Gulf states. The alluvial bottom lands around the lower river courses are the most fertile portions of the state. The soil of the coastal plain is generally sandy. In the northwest there are heavy deposits of red clay containing much potash, but little nitrogenous matter. The soil on the southern plateau is thin, but the Llano Estacado is covered with a red sandy loam. The principal forest area is in the extreme eastern portion. The pine is the prevailing tree in the coastal plain, long-leaf pine in the lower and short-leaf pine in the higher pine barrens. The deciduous species predominate toward the middle of the state, including oaks, elm, maple, hickory, sycamore, mulberry, sweet gum, ash, and walnut. The Osage orange and the palmetto are plentiful in the eastern part, giving a tropical aspect to the vegetation. In the river-bottoms the characteristic species are cottonwood, pecan, live oak, and cypress. Along the western border of the Black prairie two parallel belts of hardwood forest, chiefly oak, and known as the Cross Timbers, extend southward as far as the Brazos river. Mining bids fair to acquire large proportions. The value of coal increased from $412,300 in 1891 to over $2,000,000 in 1907. The production of petroleum practically began in 1897. The yield has increased very rapidly. Gypsum is mined in the northwestern part. Cinnabar and salt are mined and some granite, sandstone, and limestone are quarried. There are a number of valuable mineral springs. The two staple products are cotton and corn, both of which are largely cultivated in the lower or coast region, where the sugar-cane and tobacco also grow luxuriantly. Wheat, rye, oats, and barley thrive best in the hilly regions; and both there and at lower levels fruits in almost endless variety are abundant. The pastures are often covered with the richest natural grasses, and the rearing of cattle is carried on to the greatest advantage. Manufacture is still in its infancy; but the coasting trade is of some importance, and the railway system very extensive. The Baptists are numerically the strongest church, followed closely by the Methodist. These two bodies together contain considerably over two-thirds of the church membership. The Disciples of Christ (Christian), Presbyterians, and Episcopalians are the only other Protestant sects numerically important. At the head of the educational establishments stand the State university, located at Austin, with a medical branch at Galveston, and the Agricultural and Mechanical college at Bryan. There are a large number of denominational institu-



Seal of Texas.

tions. There are also a number of colleges for colored students. The first settlement in Texas was made at Matagorda by the French, who in 1690 were expelled by the Spaniards. It afterward became one of the states of the Mexican confederation. Several colonies of American citizens, invited by the Mexicans, settled in the eastern section, and gradually increased in numbers. Texas then revolted from the Mexican government, and in 1836 declared itself independent. Santa Anna attempted to reduce it, but failed, being himself beaten and taken prisoner at the battle of San Jacinto by General Houston. Texas now managed its own affairs as an independent republic till in 1845 it became one of the United States, and thus gave rise to a war which proved disastrous to Mexico. Texas seceded from the Union (February 1, 1861). Sam Houston was governor and threw all his weight in opposition to secession, but there was no staying the resolve of the people. The state was fortunate in that it was not the scene of much active fighting. The Reconstruction Acts of 1867 placed the state under the military authority, with General Sheridan in command. The carpetbaggers followed and the new reconstruction occupied the next three years. Texas was readmitted to the Union March 30, 1870. In national elections the state has been democratic by overwhelming majoritics. Austin is the capital, and other chief towns are Galveston, San Antonio, Houston, Dallas, Waco, etc. Pop. 4,000,000, including about half a million colored and some Indians.

TEXAS, UNIVERSITY OF, a coeducational institution at Austin, Texas, founded upon a grant of 1,000,000 acres of land by the legislature in 1876. It embraces the department of literature, sciences, medicine and arts, offering the degrees of B.A., B. Lit., B.S., M.A., and M.S.; the department of engineering, conferring the degrees of civil engineer and engineer of mines; and the department of law, conferring the degrees of LL.B. and LL.M. New departments in electricity and mechanical engineering were established in 1903, when it was decided to give no degree for undergraudate work after 1906 except that of B.A.

TEX'ARKAN'A, the name of two adjoining cites situated on each side of the boundary between Arkansas and Texas, 145 miles southwest of Little Rock; on the Texas and Pacific, the St. Louis, Iron Mountain and Southern, the St. Louis Southwestern, the Kansas City, Pittsburg and Gulf, and other railroads. Pop. Texarkana in Texas, 6250; Texarkana in Arkansas, 5910.

TEZCU'CO, a town of Mexico, in the department of Mexico, on the eastern shore of the Lake of Tezcuco. In ancient times it was the second city in the kingdom. Here are the remains of three pyramids, each measuring 400 feet along the base of their fronts. Pop. 15,626.

THACKERAY, William Makepeace, English novelist and humorist, was born at Calcutta in 1811, died Dec. 24, 1863. Under the names of George Fitz-Boodle, Esq., or of Michael Angelo Titmarsh, he contributed to Frazer's Magazine tales, criticisms, verses, etc., which were marked by great knowledge of the world, keen irony, or playful humor. It was in this magazine that The Great Hoggarty Diamond, Yellowplush Papers, and Barry Lyndon appeared. In 1840 he published separately the Paris Sketchbook, in 1841 the Second Funeral of Napoleon and the Chronicle of the Drum and in 1843 the Irish Sketchbook. None of these writings, however, attained to any great popularity. In 1841 Punch was started, and his contributions to that periodical, among others Jeames's Diary and the Snob Papers, were very successful. In 1846–48 his novel of Vanity Fair was published in monthly parts, with illustrations by himself; and long before its completion its author was unanimously placed in the first rank of British novelists. His next novel was the History of Pendennis, completed in 1850. In 1851 he delivered a course of lectures in London on the English Humorists of the 18th century, which were repeated in Scotland and America, and published in 1853. Another novel, The History of Henry Esmond appeared in 1852, and was followlowed by the Newcomes (1855), The Virginians (1859), a sort of sequel to Esmond; Lovel the Widower, The Adventures of Philip, and Denis Duval, which was left unfinished at his death. In 1855–56 he delivered a series of lectures in the United States—The Four Georges, and afterward in England and Scotland. In 1859 he became editor of the Cornhill Magazine, in which his later novels and the remarkable Roundabout Papers appeared, but he retired from

William Makepeace Thackeray.

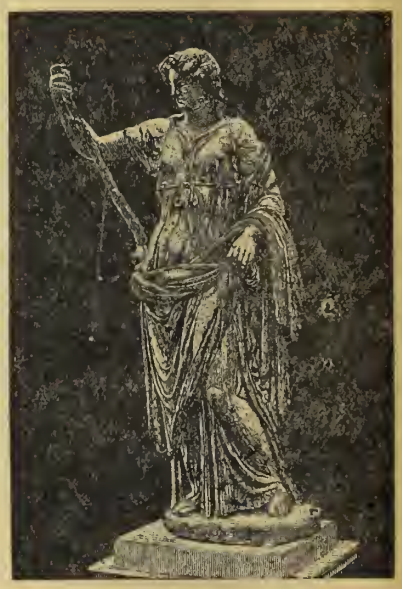
that post in 1862. He wrote a good deal of verse, half-humorous, half-pathetic, and often wholly extravagant, but all characterized by grace and spontaneity. He undoubtedly ranks as the classical English humorist and satirist of the Victorian reign, and one of the greatest novelists, essayists, and critics in the literature.

THALBERG (täl-berh), Sigismund, a celebrated pianist, was born in Geneva in 1812, He died April 28, 1871. He left a number of compositions, including sonatas, studies, a concerto, several nocturnes, and other small pieces.

THALER (tä'lêr), a silver coin formerly in use in Germany, of the value of about 75c.

THALES (thā'lēz), a native of Miletus in Ionia, or according to some, of Phœnicia, the earliest philosopher of Greece, and the founder of the Ionian school, was born about 640 B.C. His reputation for learning and wisdom became so great that he was reckoned among the seven wise men, and his sayings were held in the highest esteem by the ancients. He died about B.C. 548. His philosophical doctrines were taught orally, and preserved only by oral tradition, until some of the later Greek philosophers, particularly Aristotle, committed them to writing. He considered water, or rather fluidity, the elemental principle of all things. His philosophical doctrines, are, however, but imperfectly understood.

THALI'A, one of the nine Muses. She was the patron of comedy, and is usually represented with the comic mask and



Thalia.—From an antique in the British museum.

the shepherd's crook in her hand. One of the Graces was also called Thalia.

THALLIUM, a metal discovered by Crookes in 1861, in a deposit from a sulphuric acid manufactory in the Hartz. In its physical properties thallium resembles lead, but is slightly heavier, somewhat softer, and may be scratched by the finger-nail. It fuses under a red heat, and is soluble in the ordinary mineral acids. In color it resembles silver, but is less brilliantly white. Its specific gravity varies from 11.8 to 11.9 according to the mechanical treatment to which it has been subjected. The tenacity of the metal is less than that of lead; is it possessed of very considerable malleability. Thallium and its salts imparts an intense green color to a non-luminous flame; when a flame so colored is examined by the spectroscope one very brilliant green band is noticed, somewhat more refrangible than the sodium line D. (See Spectrum.) The salts of thallium are exceedingly poisonous. Small quantities of thallium appear to be widely distributed in nature, the metal frequently occurring in iron and copper pyrites, in native sulphur, etc.

THALLUS, in botany, a solid mass of cells, or cellular tissue without woody fiber, consisting of one or more layers, usually in the form of a flat stratum or

Lichen—*t*, Thallus.

expansion, or in the form of a lobe, leaf, or frond, and forming the substance of the thallogens.

THAMES (temz), the most important river of Great Britain. At London bridge the width of the river is 266 yards, at Woolwich 490 yards, at Gravesend 800 yards, and 3 miles below, 1290 yards. The basin of the Thames has an area of 5400 sq. miles, and belongs entirely to the upper part of the Secondary and to the Tertiary formations. The depth of the river in the fair way above Greenwich to London bridge is 12 to 13 feet, while its tides have a mean range of 17 feet and an extreme rise of 22 feet. By means of numerous canals immediate access is given from its basin to those of all the great rivers of England.

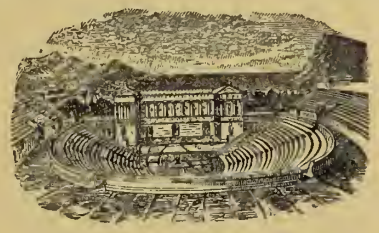
THANA, TANNA, chief town of a district of the same name, Bombay presidency, 21 miles n.e. of Bombay city. It is a favorite residence with the Bombay officials. Pop. 14,456.—The district has an area of 4243 sq. miles. Pop. 908,548, of which 12 per cent are urban.

THANKSGIVING DAY, a day specially set apart for the giving of thanks. Since 1864 the president has appointed a day of Thanksgiving (usually the last Thursday of November), and his proclamation has generally been followed by similar proclamations from the governors of several states.

THAR AND PARKAR, British district in the east of Sind, Bombay presidency. Area, 12,729 sq. miles; pop. 203,344. Scarcely a half of the area is under cultivation.

THEA, the tea genus of plants. See Tea.

THEATER, an edifice appropriated to the representation of dramatic spectacles. Among the Greeks and Romans theaters were the chief public edifices next to the temples, and in point of magnitude they surpassed the most spacious of the temples, having in some instances accommodation for as many as from 10,000 to 40,000 spectators. The Greek and Roman theaters very closely resembled each other in their general form and principal parts. The building was of a semicircular form, resembling the half of an ampitheater, and was not covered by a roof. In Greece the semi-circular area was often scooped out in the side of a hill, but Roman theaters were built on the level. The seats of the spectators were all concentric, being arranged in tiers up the semi-circular slope. The stage or place for the players was in front of the seats, being a narrow platform along the straight side of the theater. Behind this rose a high wall resembling the façade of a building, this being intended to represent any building in front of which the action was supposed to take place. This was called in Greek skēnē (L. scena), the stage being called proskēnion (L. proscenium). The semicircular space between the stage and the lowest seats of the spectators was called orchestra, and was appropriated by the Greeks to the chorus and musicians, and by the Romans to the senators. Scenery, in the modern sense of the word, was not employed except in a very rude form, but the stage machinery seems in many cases to have been elaborate; and in particular there was a well-known machine or contrivance of some sort from which deities made their entrance as if from the sky. A good example of an ancient theater is that of Segesta in Sicily.



Theater of Segesta, Sicily—restored.

Modern theaters are all very much alike in their internal construction. The house is divided into two distinct portions, the auditorium and the stage, the former for the spectators, the latter for the actors and scenery, which is often of the most elaborate and realistic kind. The floor of the auditorium is always sloped down from the back of the house to the stage; several tiers of galleries or balconies run in a semicircular or horseshoe form round the house. On the ground floor the front rows of seats are generally reserved as dress or orchestral stalls, and the back part is called the pit. The seats in the galleries rise terracewise from the front, so as to allow the persons in the back rows to see on to the stage over the heads of those before them. Immediately in front of the stage is a space occupied by the orchestra. Part of the stage flooring is movable, either as traps through which actors or furniture ascend or descend, or in long narrow pieces which are drawn off at each side of the stage to allow the passage of the rising scenes. Adjoining the stage are the dressing-rooms for the performers, the green-room where they wait when dressed, etc.

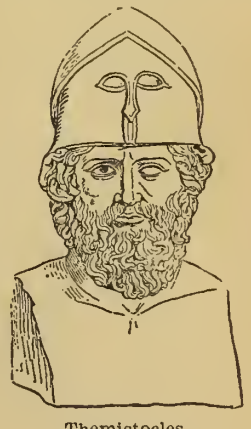
THEBES (thēbz), an ancient capital of Egypt, in Upper Egypt, on both sides of the Nile, about 300 miles s.s.e. of Cairo, now represented by the four villages of Luxor, Karnak, Medinet Habu, and Kurneh, as well as by magnificent ruins, which extend about 9 miles along the river. When Thebes was founded is not known; the period of its greatest prosperity reaches from 1500 to 1000 B.C. The ruins comprise magnificent temples, rock-cut tombs, obelisks decorated with beautiful sculptures, long avenues of sphinxes, and colossal statues. The largest of the temples is that at Karnak, which is about 1½ mile in circumference. The great hall of the temple (or "hall of columns;") the most magnificent in Egypt, measures 329 feet by 170, and the roof was originally supported by 134 gigantic columns, of which 12 forming the central avenue are 62 feet high and 11 feet 6 inches in diameter, the others, which are in rows on either side, being fully 42 feet in height and 28 in circumference. Within the temple courts are several obelisks of red granite; one—the largest obelisk known—is 108 feet 10 inches high and 8 feet square. Above Karnak are the village and temple of Luxor, the latter at one time connected with Karnak by an avenue of sphinxes (some of which still remain) about a mile long. The Memnonium or temple of Rameses II., and the temple and palace of Rameses III., on the other or left bank of the river, are objects of great interest, both for the grandeur of their architecture and the richness and variety of their sculptures. Here are also the colossal statues of Amenoph III., one of them known as the vocal statue of Memnon. In the interior of the mountains which rise behind are found the tombs of the kings of Thebes, excavated in the rock, the most remarkable being that of Sethi I., discovered by Belzoni, and containing fine sculptures and paintings.

THEBES, a city of ancient Greece, the principal city of Bœotia, the birthplace of Pindar, Epaminondas, and Pelopidas, was situated about midway between the Corinthian Gulf and the Eubœan sea. Cadmus is said to have founded it in 1500 B.C. The modern Thebes or Thiva is an unimportant town of some 4000 inhabitants.

THEISM, the belief or acknowledgment of the existence of God, as opposed to Atheism. See Deism.

THEMIS, goddess of law and justice among the Greeks, was the daughter of Urănus and Gē (Heaven and Earth); according to some, of Helios, or the Sun.

THEMIS'TOCLES (-klēz), an Athenian commander, born 514 B.C. On the second invasion of Greece by Xerxes, Themistocles succeeded by bribery in obtaining the command of the Athenian



Themistocles.

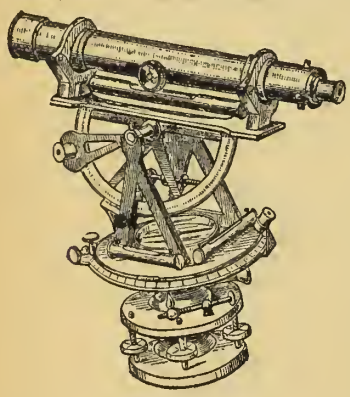
fleet, and in the battle of Salamis which followed (B.C. 480), the Persian fleet was almost totally destroyed, and Greece was saved. The chief glory of the victory is due to Themistocles. Subsequently he was accused of having enriched himself by unjust means, and of being privy to designs for the betrayal

of Greece to the Persians. Fearing the vengeance of his countrymen, he, after many vicissitudes, took refuge at the Persian court. The Persian throne was now (465 B.C.) occupied by Artaxerxes Longimăus, to whom Themistocles procured access, and whose favor he gained by his address and talents, so that he was treated with the greatest distinction. He died in 449, according to some accounts by his own hand.

THEOC'RACY, is that government of which the chief is, or is believed to be, God himself, the priests being the promulgators and expounders of the divine commands. The most notable theocratic government of all times is that established by Moses among the Israelites.

THEOC'RITUS, a Greek poet, born at Syracuse, who flourished about B.C. 280. We have under his name thirty idyls, or pastoral poems, of which, however, several are probably by other authors. Most of his idyls have a dramatic form, and consist of the alternate responses of musical shepherds. His language is strong and harmonious.

THEOD'OLITE, a surveying instrument for measuring horizontal and vertical angles by means of a telescope, the movements of which can be accurately marked. This instrument is variously constructed, but its main characteristics continue unaltered in all forms. Its chief features are the telescope, a graduated vertical circle to which it is attached, two concentric horizontal cir-



Theodolite.

cular plates which turn freely on each other, and two spirit-levels on the upper plate to secure exact horizontality, the whole being on a tripod stand. The lower plate contains the divisions of the circle round its edge, and the upper or vernier plate has two vernier divisions diametrically opposite. The plates turn on a double vertical axis. To measure the angular distance horizontally between any two objects, the telescope is turned round along with the vernier circle until it is brought to bear exactly upon one of the objects; it is then turned round until it is brought to bear on the other object, and the arc which the vernier has described on the graduated circle measures the angle required. By means of the double vertical axis the observation may be repeated any number of times in order to ensure accuracy. The graduated vertical circle is for taking altitudes or vertical angles in a similar way. The theodolite is a most essential instrument in surveying and in geodetical operations.

THEOLOGY is the science which treats of the existence of God, his attributes, and the Divine will regarding our actions, present condition, and ultimate destiny. In reference to the sources whence it is derived theology is distinguished into natural or philosophical theology, which relates to the knowledge of God from his works by the light of nature and reason; and supernatural positive, or revealed theology, which sets forth and systematizes the doctrines of the Scriptures. With regard to the contents of theology it is classified into theoretical theology or dogmatics, and practical theology or ethics. As comprehending the whole extent of religious science, theology is divided into four principal classes, historical, exegetical, systematic, and practical theology. Historical theology treats of the history of Christian doctrines. Exegetical theology embraces the interpretation of the Scriptures and Biblical criticism. Systematic theology arranges methodically the great truths of religion. Practical theology consists of an exhibition, first, of precepts and directions; and secondly, of the motives from which we should be expected to comply with these. Apologetic and polemic theology belong to several of the above-mentioned four classes at once. The Scholastic theology attempted to clear and discuss all questions by the aid of human reason alone laying aside the study of the Scriptures, adopting instead the arts of the dialectician.

THEOPHRAS'TUS, a celebrated Peripatetic philosopher, was born at Lesbos early in the 4th century, B.C., and studied at Athens, in the school of Plato, and afterward under Aristotle, of whom he was the favorite pupil and successor. On the departure of Aristotle from Athens after the judicial murder of Socrates he became the head of the Peripatetic school of philosophy, and composed a multitude of books—dialectic, moral, metaphysical, and physical. We possess two entire works of his on botany, but only fragments of his other works, such as those on Stones, on the Winds, etc.; and his Characters or sketches of types of character, by far the most celebrated of all his productions. He died in 287 B.C. To his care we are indebted for the preservation of the writings of Aristotle, who, when dying, intrusted them to his keeping.

THEOS'OPHY, according to its etymology the science of divine things. But the name of theosophists has generally been appplied to persons who in their inquiries respecting God have run into mysticism, as Jacob Böhme, Swedenborg, St. Martin, and others. At the present day the term is applied to the tenets of the Theosophical society, founded in New York in 1875 by a Col. Olcott, the objects of which are: to form the nucleus of a universal brotherhood of humanity, to promote the study of Eastern literature and science, and chiefly to investigate unexplained laws of nature, and the psychical powers of man, and generally the search after divine knowledge—divine applying to the divine nature of the abstract principle, not to the quality of a personal God. The theosophists assert that humanity is possessed of certain powers over nature, which the narrower study of nature from the merely materialistic stand-point has failed to develop. Leading names are Olcott, A. P. Sinnett, Madame Blavatsky, and Mrs. Annie Besant. Their so-called occult manifestations are akin to those attributed to spiritualism or telepathy, that is, communication between minds at a distance from each other.

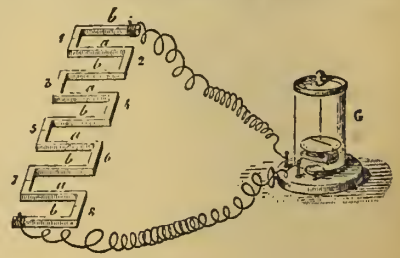
THERAPEUTICS, that department of medicine which treats of remedies in the widest sense.

THERE'SA, St., a religious enthusiast, born at Avila, in Spain, in 1515, who took the veil among the Carmelites at the age of twenty-four. Being dissatisfied at the relaxation of discipline in the order to which she belonged she undertook to restore the original severity of the institute. The first convent of reformed Carmelite nuns was founded at Avila in 1562, and was speedily followed by a number of others. She died in 1582, and was canonized by Pope Gregory XV. in 1621. She was the author of several works, and all of a devotional nature, among them a very curious life of herself.

THERESIO'PEL, a royal free town in Hungary, in the county of Bács, is more properly a district than a town, as it covers, with its numerous suburbs, an area of more than 600 sq. miles. It has manufactures of linen and woolen cloth, dye-works, tanneries, soap-boiling works, etc., and a trade in cattle, horses, hides, and wool. Pop. 81,302.

THERMIDOR, the eleventh month of the year in the calendar of the first French republic. It commenced on the 19th of July, and ended on the 17th of August. See Calendar.

THERMO-ELECTRICITY, electricity produced at the junction of two metals, or at a point where a molecular change occurs in a bar of the same metal, when the junction or point is heated above or cooled below the general temperature of the conductor. Thus when wires or bars of metal of different kinds, as bismuth and antimony, are placed in close contact, end to end, and disposed so as to form a periphery or continuous cir-

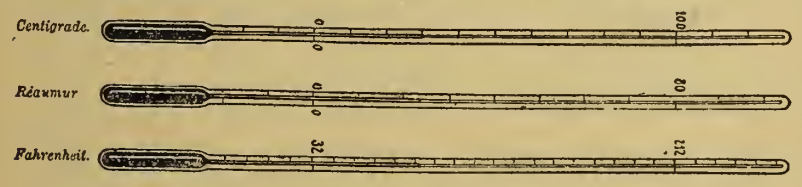


Thermo-pile.

cuit, and heat then applied to the ends or junctions of the bars, electric currents are produced. The principle of the arrangement is shown in the accompanying figure, in which the bars marked a are antimony, those marked b bismuth. The junctions 1, 3, 5, 7 are to be at one temperature, the junctions 2, 4, 6, 8 at another. g is a delicate galvanometer

which measures the force of the current produced. The thermo-electric battery, or pile, an apparatus much used in delicate experiments with radiant heat, consists of a series of little bars of antimony and bismuth (or any other two metals of different heat-conducting power), having their ends soldered together and arranged in a compact form; the opposite ends of the pile being connected with a galvanometer, which is very sensibly affected by the electric current induced in the system of bars when exposed to the slightest variations of temperature. To the combined arrangement of pile and galvanometer the name of thermo-multiplier is given. Two metal bars of different heat-conducting power having their ends soldered together, and the combined bar then usually bent into a more or less horse-shoe or magnet form for the purpose of bringing their free ends within a conveniently short distance, designated a thermo-electric pair, are much used in thermo-electric experiments. But as the electric current developed in a single pair is very weak, a considerable number are usually combined to form a thermo-electric pile or battery. Bismuth and antimony are the metals usually employed, the difference in electro-motive force being greater between them than between any other two metals conveniently obtainable.

THERMOM'ETER, an instrument by which the temperatures of bodies are ascertained; founded on the property which heat possesses of expanding all bodies, the rate or quantity of expansion being supposed proportional to the degree of heat applied, and hence indicating that degree. The thermometer consists of a slender glass tube, with a small bore, containing in general mercury or alcohol, which expanding or contracting by variations in the temperature of the atmosphere, or on the instrument being brought into contact with any other body, or immersed in a liquid or gas which is to be examined, the state of the atmosphere, the body, liquid, or gas, with regard to heat, is indicated by a scale either applied to the tube or engraved on its exterior surface. The ordinary thermometer consists of a small tube, terminating in a ball containing mercury, the air having been expelled and the tube hermetically sealed. A scale of temperatures is attached, in which there are two points corresponding to fixed and determinate temperatures, one, namely, to the temperature of freezing water, and the other to that of boiling water. In the thermometer commonly used in Britain and her colonies, the United States, etc., known as Fahrenheit's thermometer, the former point is marked 32° and the latter 212°; hence the zero of the scale, or that part marked 0°, is 32° below the freezing-point, and the interval or space between the freezing and boiling points consists of 180°. The zero point is supposed to have been fixed by Fahrenheit at the point of greatest cold that he had observed, probably by means of a freezing mixture such as snow and salt. In France and other parts of Europe, and nowadays in all scientific investigations, the Centigrade or Celsius scale is used. In this the space between the freezing and boiling points of water is divided into 100 equal parts or degrees, the zero being at freezing and the boiling-point marked 100°. Réaumur's thermometer, in use in Germany, has the space between the freezing and boiling points divided into 80 equal parts, the zero being at freezing. For extreme degrees of cold, thermometers filled with spirit of wine must be employed, as no degree of cold known is capable of freezing that liquid, whereas mercury freezes at about 39° below zero on the Fahrenheit scale. On the other hand, spirit of wine is not adapted to high temperatures, as it is soon converted into vapor, whereas mercury does not boil till its temperature is raised to 660° F. As the ordinary thermometer gives the temperature only at the time of observation, the necessity for having an instrument which would show the maximum and minimum temperatures within a given period is easily apparent in all cases connected with meteorology, and various forms of instruments for this purpose have been invented. A common form of maximum thermometer consists of the ordinary thermometer fitted with a piston which moves easily in the tube. The instrument is placed horizontally, and the piston is pushed along the bore as the mercury advances, and is left at the highest point by the retiring fluid. This point is noted by the observer, who then erects the thermometer, causing the piston to sink to the mercury, the instrument thus being in condition for a fresh experiment. A similar action takes place in the spirit of wine minimum thermometer, the small movable piston being, however, immersed in the fluid and drawn back by the convex surface of the contracting fluid, being left at the point of greatest contraction. The maximum and minimum instruments combined form the self-registering thermometer.



Thermometer scales.

THERMO-PILE. See Thermo-electricity.

THERMOP'YLÆ, a narrow defile in Northern Greece, leading from Thessaly southward, between Mount Œta and the sea (the Maliac gulf, now the Gulf of Zeitouni), 25 miles north of Delphi, celebrated for its defense by 300 Spartans together with allies, under Leonidas, against the Persian host under Xerxes, in 480 B.C.

THESEUS (thē'sūs), a mythical king of Athens and famous hero of antiquity, son of Ægeus by Æthra, the daughter of Pittheus of Troezen, in Peloponnesus, of whom many notable deeds are related, as the slaying of the Minotaur and the freeing of Athens from the tribute of seven youths and seven maids annually sent to Crete to be devoured by that monster. As king of Athens he is reputed to have governed with mildness, instituted new laws, and made the government more democratic.

THESSALONIANS, Epistles to the, two New Testament epistles written by St. Paul to the church at Thessalonica, in all probability during his long stay at Corinth, and therefore not very long after the foundation of the Thessalonian church on St. Paul's second missionary journey. A note at the end of each of the epistles in our Authorized Version states that they were written from Athens, but there can be little doubt that this is erroneous, and that they were really written at Corinth. They are the earliest of Paul's writings, and are characterized by great simplicity of style as compared with his other epistles. The genuineness of the first epistle has hardly ever been questioned, but according to the newer criticism, that of the second epistle is more than doubtful.

THES'SALY, the northeastern division of Greece, mainly consisting of a rich plain inclosed between mountains and belonging almost entirely to one river basin, that of the Peneios (Salambria), which traverses it from west to east, and finds an outlet into the Ægean through the vale of Tempe. In the earliest times Thessaly proper is said to have been inhabited by Æolic and other tribes. Subsequently it was broken up into separate confederacies, and seldom exerted any important influence on the affairs of Greece generally. Thessaly was conquered by Philip of Macedon in the 4th century B.C., became dependent on Macedonia, and was finally incorporated with the Roman empire. After the fall of the Byzantine empire it came, with the rest of the imperial dominions, into the hands of the Turks, and till recently formed a part of the Ottoman empire, although the majority of the inhabitants are Greeks. The greater portion of it was in 1881 incorporated with the kingdom of Greece. Capital Larissa. Pop. 294,093.

THETIS, a Greek divinity, a daughter of Nereus and Doris, therefore one of the Nereids. By Peleus, to whom she was married, she became the mother of Achilles.

THIBET (ti-bet'). See Tibet.

THIERRY (ti-er-ri), Jacques Nicolas Augustin, French historian, born at Blois in 1795, died in 1856. His celebrated work on the Norman conquest of England was published at Paris in 1825, and attained great success both in France and in England. Lettres sur l'Histoire de la France appeared in 1827. In 1834 he published, under the title of Dix Ans d'Études, a series of admirable essays, and about the same time he was summoned by Guizot, then minister of

public instruction, to Paris, and intrusted with the editing of the Recueil des Monuments Inédits de l'Histoire du Tiers Etat, for the collection of documents relative to the history of France. In 1840 he published Récits des Temps Mérovingiens.

THIERS (ti-ār), Louis Adolphe, president of the French republic, statesman and historian, was born at Marseilles 1797, died 1877. During the terrible crisis of 1870–71 Thiers came to the front as the one supreme man in France. After the fall of Paris he was returned to the national assembly, and on February 17, 1871, he was declared chief of the executive power. The first duty imposed upon him as such was to assist in drawing up the treaty of peace, whereby France lost Alsace and Lorraine and agreed to pay an enormous indemnity; his second was to suppress the communist insurrection, which broke out within three weeks of the signing of the treaty. This done, his next task was to free the soil as quickly as possible from

Louis Adolphe Thiers.

the invaders by the payment of the ransom, which also was effected in an incredibly short space of time. The assembly in August, 1871, prolonged his tenure of office and changed his title to that of president. In November, 1872, Thiers declared himself in favor of the republic as a definite form of government for France, and thus to some extent brought about the crisis which resulted in his being deprived of the presidency. He accepted his deposition with dignity, and went quietly into retirement. M. Thiers' chief works are: Histoire de la Revolution Française (6 vols., 1823–27), and Histoire du Consulat et de l'Empire (20 vols., 1845–62). The latter obtained for him the academic prize of twenty thousand francs.

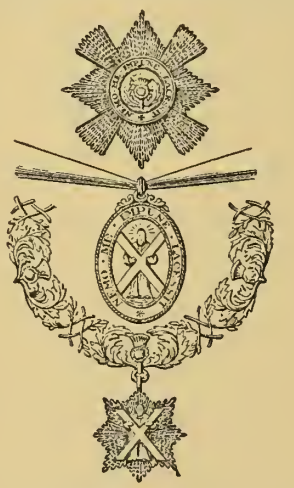
THIRST, the sensations experienced in animals from the want of fluid nutriment. The sensations of thirst are chiefly referred to the thorax and fauces, but the condition is really one affecting the entire body. The excessive pains of thirst compared with those of hunger are due to the fact that the deprivation of liquids is a condition with which all the tissues sympathize. Every solid and every fluid of the body contains water, and hence abstraction or diminution of the watery constituents is followed by a general depression of the whole system. Thirst is a common symptom of febrile and other diseases.

THIRTY YEARS' WAR, a war in Germany (1618–48), at first a religious war between the Catholics and the Protestants, and latterly (after 1635), a political struggle between Austria on the one side and France and Sweden on the other. The great commanders in the religious war were Wallenstein and Tilly on the side of the Catholics, and Gustavus Adolphus of Sweden on the side of the Protestants. The war was ended by the Peace of Westphalia. See Germany.

THISBE. See Pyramus and Thisbe.

THISTLE, the common name of a prickly plant. There are numerous species. The common cotton-thistle attains a height of from 4 to 6 feet. It is often regarded as the Scotch thistle, but it is doubtful whether the thistle which constitutes the Scottish national badge has any existing type, though the stemless thistle is in many districts of Scotland looked on as the true Scotch thistle. Some species are cultivated in gardens from the beauty of their flowers. Thistles sow themselves readily by their winged seeds.

THISTLE, Order of the, a Scottish order of knighthood, sometimes called the order of St. Andrew. It was instituted by James VII. (James II. of England) in 1687, when eight knights were nominated. It fell into abeyance during the reign of William and Mary, but was revived by Queen Anne in 1703. The insignia of the order consist of a gold collar composed of thistles interlaced with sprigs of rue; the jewel, a figure of St. Andrew in the middle of a star of eight pointed rays, suspended from the



Order of the Thistle—Star, jewel, badge, and collar.

collar; the star, of silver and eight-rayed, four of the rays being pointed, while the alternate rays are shaped like the tail-feathers of a bird, with a thistle in the center surrounded by the Latin motto Nemo me impune lacessit; and the badge, oval, with the motto surrounding the figure of St. Andrew. The order consists of the sovereign and sixteen knights besides extra knights (princes), and a dean, a secretary, the lyon-king-at-arms, and the gentleman usher of the green rod.

THOMAS, St., also called Didymus, one of the twelve apostles, said to have been a native of Antioch. The particulars of his life are unknown, the chief fact known regarding him being his doubts as to the living reality of Christ after the resurrection. He figures largely in the apocryphal gospels, and tradition has it that he acted as a Christian missionary in Ethiopia, Egypt, India, and even America.

THOMAS, George Henry, American general, was born in Virginia in 1816, and at the age of twenty entered the military academy at West Point, passing into the artillery as sub-lieutenant at the age of twenty-four. He took part in the Mexican war (1846–47); was appointed professor at West Point in 1850; recalled to active service in 1855, and employed in Texas against the Indians. When the war of secession broke out Thomas had attained the rank of colonel and being appointed brigadier-general of volunteers in August, 1861, was some months later sent into Kentucky, where, in the following year, he defeated Zollikofer. As major-general of volunteers he took part in the battle of Murfreesborough, where he greatly distinguished himself; while at the bloody battle of Chickamauga, in September, 1863, he saved the federal army from destruction by his stubborn resistance after the defeat of the federal right. In the campaign of 1865 he defeated Hood, and compelled the confederates to raise the siege of Nashville, for which he received the thanks of congress, and was raised to the rank of major-general in the regular army. He died in 1870.

THOMAS A KEMPIS, that is, Thomas of Kempen, his birthplace, in the archbishopric of Cologne, was born about 1380. At the age of twenty he retired to an Augustine convent near Zwolle, in Holland, where he took the vows, and where, in 1471, he died superior of the convent. He was a voluminous writer. His works (the printed ones all in Latin) consist of sermons, exhortations, ascetic treatises, hymns, prayers, etc. His name however, would hardly be remembered were it not for its connection with the celebrated devotional work called The Imitation of Christ (De Imitatione Christi), a work which has passed through thousands of editions in the original Latin and in translations. The authorship of this book has long been a disputed point. It is generally ascribed to à Kempis, but often to Gerson, chancellor of the University of Paris at the end of the 14th and beginning of the 16th century.

THOMAS AQUINAS. See Aquinas.

THOMAS, Theodore, German-American orchestral conductor, was born in Esens, East Friesland in 1835. He came with his parents to America in 1845, and played first violin in the first American concert tour of Jenny Lind. In 1861 he began the formation of his famous orchestra, and in 1864 gave his first symphony concerts in New York. In 1866 he instituted his summer-night festivals. From 1878 to 1890 he was the conductor of the Brooklyn Philharmonic society, and in 1890 he went to Chicago. The orchestra which he built up in Chicago became one of the recognized great orchestras of the world. Orchestra hall, Chicago, was erected by its citizens in honor of his memory. He died in 1905.

THOMSON, Sir Charles Wyville, naturalist, born in 1830 in Linlithgowshire; died 1882 In the dredging expeditions of the Lightning and Porcupine he took part, afterward publishing in The Depths of the Sea, the substance of his discoveries in regard to the fauna of the Atlantic. In 1872 he was appointed scientific chief of the Challenger expedition, which was absent from England 3½ years, during which time 68,890 miles were surveyed. On his return he was knighted, and intrusted by the government with the task of drawing up a report on the natural history specimens collected during the expedition. But he only lived to publish a preliminary account of the expedition.

THOMSON, James, poet, was born in 1700, at Ednam, near Kelso, in Scotland. He went in 1725 to London, where Winter, the first of his poems on the seasons, was published in 1726. In 1727 he published his Summer, his Poem to the Memory of Sir Isaac Newton, and his Britannia, in 1728 his Spring, and in 1730 his Autumn. He brought on the stage his tragedy of Sophonisba (1729). He now (1738) produced his tragedy of Agamemnon, and a third entitled Edward and Eleanora. In 1740 he composed the masque of Alfred in conjunction with Mallet; but which of them wrote the famous song, Rule, Britannia, is not known. In 1745 his most successful tragedy, Tancred and Sigismunda, was brought out and warmly applauded. The following year he produced his Castle of Indolence, a work in the Spenserian stanza. For a few years he held by deputy the comfortable post of surveyor-general of the Leeward islands, and he died in 1748.

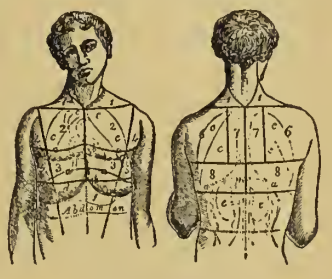
THOMSON, James, poet, was born at Port-Glasgow, Scotland, in 1834. In 1860 he became a contributor to the National Reformer, in which was published, under the signature "B. V.," The Dead Year, To our Ladies of Death, and the poem by which he is best known, The City of Dreadful Night. He died in 1882.

THOMSON, Sir W., Lord Kelvin, one of the greatest mathematicians and physicists of the present day, was born at Belfast in 1824. In 1846 he was appointed professor of natural philosophy in the University of Glasgow, a post which he held till 1899. The same year he became editor of the Cambridge and Dublin Mathematical Journal, to which he contributed valuable papers on the mathematical theory of electricity, being also a distinguished contributor to Liouville's Journal de Mathématiques. Among the most important of his contributions to electrical science are the construction of several delicate instruments for the measurement and study of electricity. It was in connection with submarine telegraphy that his name became most generally known, his services being rewarded, on the completion of the Atlantic cable of 1866, with knighthood and other honors. In 1892 he was created a baron. He has greatly increased our knowledge of magnetism and heat, and has invented an improved form of mariner's compass now in extensive use. His work in thermo-dynamics is of the greatest value. He was the first to recognize the importance of the doctrine of the conservation of energy. Lord Kelvin's many scientific papers have been published in book form, as follows: Electrostatics and Magnetism, Mathematical and Physical Papers, Popular Lectures and addresses. He is the author, in conjunction with Professor P. T. Tait, of a Treatise on Natural Philosophy. He was president of the British association at Edinburgh in 1871, and of the Royal society in 1890–95. Lord Kelvin visited America in 1884, 1897, and 1902. He died in 1907.

THOR, son of Odin by Jörd (the earth), the Jupiter of the Teutons, the God of thunder. Thursday has its name from him. See Northern Mythology.

THORACIC DUCT. See Lymph.

THORAX, the chest, or that cavity of the human body formed by the spine, ribs, and breast-bone, situated between the neck and the abdomen, and which contains the pleura, lungs, heart, etc. The name is also applied to the corresponding portions of other mammals, to the less sharply defined cavity in the lower vertebrates, as birds, fishes, etc., and to the segments intervening between



Thorax in man.

Thoracic regions denoted by thick black lines. 11, Right and left humeral. 22, do. subclavian. 33, do. mammary. 44, do. axillary. 55, do. subaxillary. 66, do. scapular. 77, do. interscapular. 88, do. superior dorsal or subscapular.—Viscera or contents of thorax, the position of which is indicated by dotted lines. *aa*, Diaphragm; *b*, heart; *c*, lungs; *d*, liver; *e*, kidneys; *f*, stomach.

the head and abdomen in insects and other Arthropoda. In serpents and fishes the thorax is not completed below by a breastbone. In insects three sections form the thorax, the pro-thorax bearing the first pair of legs; the meso-thorax, bearing the second pair of legs and the first pair of wings; and the meta-thorax, bearing the third pair of legs and the second pair of wings.

THOREAU, (thō'rō), Henry David, American writer, born at Boston in 1817. Besides contributing to the Dial and other periodicals, he published A Week on the Concord and Merrimac Rivers (1849), and Walden, or Life in the Woods (1854). After his death appeared Excursions in Field and Forest, The Maine Woods, Cape Cod, and A Yankee in Canada. Thoreau was a friend of Emerson, and imbibed much of his spirit and method of thought. He died in 1862.

THORIUM, the metal of which thoria is the oxide, discovered by Berzelius. It is in the form of a heavy metallic powder, has an iron-gray tint, burns in air or oxygen, when heated, with great splendor, and is converted into thorina or oxide of thorinum. It unites energetically with chlorine, sulphur, and phosphorus. Hydrochloric acid readily dissolves it, with the evolution of hydrogen gas. The symbol of Thorium is Th, and the atomic weight 116.

Henry D. Thoreau.

THORN. See Hawthorn.

THORWALDSEN (tor'vâld-sèn), Albert Bartholomew, a celebrated sculptor, born at Copenhagen, November 19, 1770. It was not until 1803, that he became at all widely known. Then he received a commission from Sir Thomas Hope to execute in marble a statue of Jason, which the sculptor had modeled. His fortune was now made. Commissions flowed in upon him, new creations from his hand followed in quick succession, and his unsurpassed abilities as a sculptor became everywhere recognized. In 1819 he returned to Denmark, and his journey through Germany and his reception at Copenhagen resembled a triumph. He died March 24, 1844. The Thorwaldsen museum, opened in 1846, contains about 300 of the works of the sculptor. Thorwaldsen was eminently successful in his subjects chosen from Greek mythology, such as his Mars, Mercury, Venus, etc. His religious works, among which are a colossal group of Christ and the Twelve Apostles, St. John Preaching in the Wilderness, and statues of the four great prophets, display almost superior grandeur of conception. Chief among his other works are his statues of Galileo and Copernicus, and the colossal lion near Lucerne, in memory of the Swiss guards who fell in defense of the Tuileries.

THOU (tō), Jacques Auguste de, a French statesman and historian, born in 1553, died in 1617. Henry IV. employed him in several important negotiations, and in 1593 made him his principal librarian. In 1595 he succeeded his uncle as chief-justice, and during the regency of Mary de' Medici he was one of the directors-general of finance. His greatest literary labor was the composition in Latin of a voluminous History of his own Times (Historia sui Temporis),

comprising the events from 1545 to 1607, of which the first part was made public in 1604. To this work, which is remarkable for its impartiality, he subjoined interesting Memoirs of his own Life.

THOUSAND AND ONE NIGHTS. See Arabian Nights.

THOUSAND ISLANDS, a group of small islands numbering about 1800 in the St. Lawrence immediately below Lake Ontario. They partly belong to Canada and partly to the state of New York, and have become a popular summer resort.

THRACE, or **THRACIA,** a name applied at an early period among the Greeks to a region lying north of Macedonia. By the Romans this country was regarded as divided into two parts by the Hæmus (or Balkan), the northern of which was called Mœsia and the southern Thrace. Abdera, the birthplace of Democritus and Protagoras; Sestos, on the Hellespont, celebrated in the story of Hero and Leander; and Byzantium, on the peninsula on which Constantinople now stands, were the places the most worthy of note.

THRESHING-MACHINE, a machine for separating grain from the straw, and in which the moving power is that of horses, oxen, wind, water, or steam. The threshing-machine was invented in Scotland in 1758 by Michael Stirling, a farmer in Perthshire; it was afterward improved by Andrew Meikle, a millwright in East Lothian, about the year 1776. Since that time it has undergone various improvements. The principal feature of the threshing-machine as at present constructed, is the three rotary drums or cylinders, which receive motion from a water-wheel, or from horse or steam power. The first drum which comes into operation has projecting ribs called beaters on its outer surface, parallel to its axis. This drum receives a very rapid motion on its axis. The sheaves of corn are first spread out on a slanting table, and are then drawn in with the ears foremost between two feeding rollers with parallel grooves. The beaters of the drum act on the straw as it passes through the rollers, and beat out the grain. The threshed straw is then carried forward to two successive drums or shakers, which, being armed with numerous spikes, lift up and shake the straw so as to free it entirely from the loose grain lodged in it. The grain is made to pass through a grated floor, and is generally conducted to a winnowing-machine connected by gearing with the threshing-machine itself, by which means the grain is separated from the chaff. Improved machines on the same principle, many of them portable, are extensively used in England and America, those of the latter country being in particular very light and effective. The portable steam threshing-machine now common in England and in many parts of Scotland has no feeding-rollers, the corn being fed direct to the first drum, which revolves at a very high speed and separates the grain by rubbing against a grating fitted around the drum rather than by direct beating. It gets through far more work than the ordinary stationary mill. With a portable engine the machine can be moved from field to field, and also from farm to farm, thus being capable of performing the threshing-work of a wide district for the whole season.

THREAD, a slender cord consisting of two or more yarns, or simple spun strands, firmly united together by twisting. The twisting together of the different strands or yarns to form a thread is effected by a thread-frame or doubling and twisting machine, which accomplishes the purpose by the action of bobbins and flyers. Thread is used in some species of weaving, but its principal use is for sewing. The manufacture of sewing thread in the United Kingdom both for home use and export is very extensive. As a general rule the thread manufactured for home use, and for export to the United States, is much superior to that made for other markets, which is of an inferior quality. The thread made for home use is commonly known as six-cord, and that for export as three-cord thread. The chief seat of the cotton thread manufacture in Scotland is Paisley, in England Manchester. Linen thread is manufactured largely in Ireland.

THREAD-WORMS, the name for thread-like intestinal worms which occur in great numbers in the rectum of children particularly.

THREE-COLOR PROCESS, a photo-mechanical process of reproducing in color. The process consists in making three photograph negatives of the same subject through three different color screens representing the three primary colors, red, yellow, and blue. The accuracy of the finished picture depends, to a great extent, upon the exactness of the register. The process is largely mechanical and the result is only approximately correct, though increased care is being taken in the manipulation and better results are constantly obtained.

THRESHER-SHARK, also called the Fox-shark, a genus of sharks containing but one known species, with a short conical snout, and less formidable jaws than the white shark. The upper lobe of the tail fin is very elongated, being nearly equal in length to the rest of the body, and is used as a weapon to strike with. Tail included, the thresher attains a length of 13 feet. It inhabits the Atlantic and the Mediterranean, and is sometimes met with on the coasts of Britain. See Shark.

THROAT, the anterior part of the neck of an animal, in which are the œsophagus and windpipe, or the passages for the food and breath. See Larynx, Œsophagus, Trachea, Diphtheria, Croup, etc.

THRUSH, the name applied popularly to several insessorial birds. The true thrushes form a family of dentirostral passerine birds, including the song-thrush or throstle, the missel-thrush, the redwing, etc. They feed upon berries, small molluscs, worms, etc. Their habits are mostly solitary, but several species are gregarious in winter. They are celebrated on account of their powers of song; and are widely diffused, being found in all the quarters of the globe. The song-thrush is especially distinguished by its sweet song. The color is a brown of different shades on the upper parts, the chin being white, and the belly and under tail-coverts a grayish-white. Its average length is 9 inches. The eggs, numbering five, are blue, spotted with black. The nest is

Red-winged thrush.

large and basin-shaped, composed of roots, mosses, etc., smoothly plastered inside with clay. The thrush family also includes the fieldfare, redwing, and ring-ouzel.

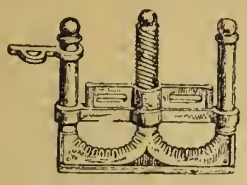
THRUSH, a disease common in infants who are ill fed: The name is also applied to an abscess in the feet of horses and some other animals.

THUCYDIDES (thō-sid'i-dēz), the greatest of all the Greek historians, was born in Attica about 471 B.C. He was for a time a prominent commander during the Peloponnesian war, which forms the subject of his great work. For many years he suffered exile (being accused of remissness in duty); but appears to have returned to Athens the year following the termination of the war, namely, in B.C. 403. He is said to have met a violent death, probably a year or two later, but at what exact time and whether in Thrace or Athens, is not known. His history consists of eight books, the last of which differs from the others in containing none of the political speeches which form so striking a feature of the rest, and is also generally supposed to be inferior to them in style. As a historian Thucydides was painstaking and indefatigable in collecting and sifting facts, brief and terse in narrating them. His style is full of dignity and replete with condensed meaning. He is unsurpassed in the power of analysing character and action, of tracing events to their causes, of appreciating the motives of individual agents and of combining in their just relations all the threads of the tangled web of history.

THUGS, the name applied to a secret and once widely-spread society among the Hindus, whose occupation was to waylay, assassinate, and rob all who did not belong to their own caste. This they did, not so much from cupidity as from religious motive, such actions being deemed acceptable to their goddess Kâlî.

THULE (thō'le), the name given by the ancients to the most northern country with which they were acquainted. According to Pytheas it was an island six days' voyage to the north of Britannia, and accordingly it has often been identified with Iceland. Some have imagined it to be one of the Scotch islands, others the coast of Norway

THUMB-SCREW, a former instrument of torture for compressing the thumbs. It was employed in various



Scotch thumb-screw, time of Charles I.

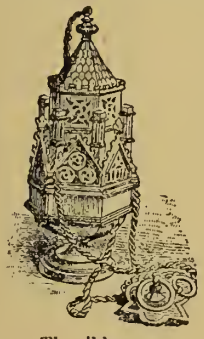
countries, Scotland in particular. Called also Thumbkins.

THUNDER. See Lightning.

THUNDER-FISH, a species of fish of the family Siluridæ, found in the Nile, which, like the torpedo, can give an electric shock.

THURGAU (tur'gou), a canton in the northeast of Switzerland, bounded mainly by the Lake of Constance and the cantons of Zürich and St. Gall; area, 381 sq. miles; capital, Frauenfeld. The whole canton belongs to the basin of the Rhine, to which its waters are conveyed chiefly by the Thur and its affluents, and partly also by the Lake of Constance, including the Untersee. Pop. 113,110.

THURIBLE, a kind of censer of metal, sometimes of gold or silver, but more commonly of brass or latten, in the shape of a covered vase or cup, per-



Thuribie.

forated so as to allow the fumes of burning incense to escape. It has chains attached, by which it is held and swung at high mass, vespers, and other solemn offices of the Roman Catholic church.

THURINGERWALD (tü'ring-ėr-vâlt), or **FOREST OF THURINGIA,** a mountain chain in the center of Germany, stretching southeast to northwest for about 60 miles. Its culminating points are the Beerberg and the Schneekopf, which have each a height of about 3220 feet. The mountains are well covered with wood, chiefly pine. The minerals include iron, copper, lead, cobalt, etc.

THURINGIA (thö-rin'ji-a), a region of Central Germany situated between the Harz mountains, the Saale, the Thüringerwald, and the Werra, and comprising great part of Saxe-Weimar, Saxe-Coburg-Gotha, and other small adjoining states.

THUR'MAN, Allen Granbery, American political leader, was born in Lynchburg, Va., in 1813, and in 1819 was taken by his parents to Chillicothe, Ohio. In 1845–47 he was a democratic member of congress, then resumed his law practice, and from 1851 to 1856 was on the bench of the Ohio supreme court, after December, 1854, as chief justice. In 1867 he was the democratic candidate for governor of Ohio, but was defeated by Rutherford B. Hayes. From 1869 to 1881 he was a member of the United States senate. In the forty-sixth congress he was elected president pro tempore of the senate. In 1881 he was appointed by President Garfield a member of the International monetary conference at Paris. In 1888 he was nominated by acclamation for Vice-president on the Cleveland ticket, which was defeated by Harrison and Morton. He died in 1895.

THURSDAY (that is, "Thor's day"), the fifth day of the week, so called from the old Teutonic god of thunder, Thor. See Thor.

THWAITES, Reuben Gold, American historical writer, was born in Dorchester, Mass., in 1853. In 1866 he removed to Wisconsin. From 1876 to 1886 he was managing editor of The Wisconsin State Journal, at Madison. In 1886 he was elected secretary of the State Historical Society of Wisconsin, and editor of the society's Collections. He edited the Wisconsin Historical Collections, Chronicles of Border Warfare, and The Jesuit Relations (73 vols.), his work on the last being one of the most careful and scholarly pieces of historical editing ever done in America. He also published: Historic Waterways, The Story of Wisconsin, The Colonies, 1492–1750; Stories of the Badger State, Daniel Boone and Père Marquette, and George Rogers Clark.

THYESTES (thī-es'tēz), in Greek mythology, son of Pelops and Hippodamia, and grandson of Tantalus. Having seduced the wife of his brother Atreus, the latter, in revenge, served up to him the body of his own son at a feast.

THYME (tīm), a small plant, a native of the south of Europe. It has a strong aromatic odor, and yields an essential oil which is used for flavoring purposes.

THYMUS GLAND, a ductless temporary organ situated in the middle line of the body. After the end of the second year of life it decreases in size, and almost or wholly disappears at puberty. It is covered in front by the breast-bone, lies on the front and sides of the windpipe. Its functions are still undetermined.

THYROID CARTILAGE. See Larynx.

THYROID GLAND, a ductless structure in man which covers the anterior and inferior part of the larynx and the first rings of the windpipe. It is of a reddish color, and is more developed in women than in men. It may become abnormally enlarged, as in goitre. Its use is not at all clear, but it probably exerts some influence on the blood and circulation, especially in childhood.

THYRSUS, among the Greeks, a wand or spear wreathed with ivy leaves, and with a pine-cone at the top, carried by the followers of Bacchus as a symbol of devotion. In ancient representations it appears in various forms.

TIA'RA, originally the cap of the Persian kings. The tiara of the pope is a high cap, encircled by three coronets with an orb and cross of gold at the top, and on two sides of it a chain of precious stones. The mitre alone was first adopted by Damasus II. in 1048. It afterward had a plain circlet of gold put around it. It was surmounted by a coronet by Boniface VIII. The second coronet was added by Benedict XII., the third coronet by Urban V.

Various forms of thyrsus, from ancient vases.

TI'BER, a celebrated river of Italy, which rises in the Apennines, in Tuscany, and, after a general southerly course of about 240 miles, falls into the Mediterranean by two mouths. It traverses the city of Rome, here forming the island anciently called Insula Tiberina. About ninety miles of its course are navigable for small vessels; those of about 140 tons burden reach Rome.

TIBE'RIAS. See Galilee, Sea of.

TIBERIUS, in full, Tiberius Claudius Nero Cæsar, a Roman emperor, born B.C. 42, was the son of Tiberius Claudius, of the ancient Claudian family, and of Livia Drusilla, afterward the wife of the emperor Augustus. Tiberius became consul in his twenty-eighth year, and was subsequently adopted by Augustus as his heir. In A.D. 14 he succeeded to the throne without opposition. Tacitus records the events of the reign, including the suspicious death of Germanicus, the detestable administration of Sejanus, the poisoning by that minister of Drusus, the emperor's son, and the infamous and dissolute retirement of Tiberius (A.D. 27) to the Isle of Capreæ, in the Bay of Naples, never to return to Rome. The death of Livia in A.D. 29 removed the only restraint upon his actions, and the destruction of the widow and family of Germanicus followed. Sejanus, aspiring to the throne, fell a victim to his ambition in the year 31; and many innocent persons were destroyed owing to the suspicion and cruelty of Tiberius, which now exceeded all limits. He died in March, 37.

TIBET', or **THIBET',** a country occupying the south portion of the great plateau of Central Asia, lying between lon. 73° and 101° e., and lat. 27° and 36° n., and extending east and west from Cashmere and the Karakorum range to the frontiers of China; area about 700,000 sq. miles. Its plains average above 10,000 feet in height, and many of its mountains have twice that altitude. In Tibet nearly all the great rivers of South and East Asia take their rise (Indus, Brahmaputra, Hoang-ho, Yang-

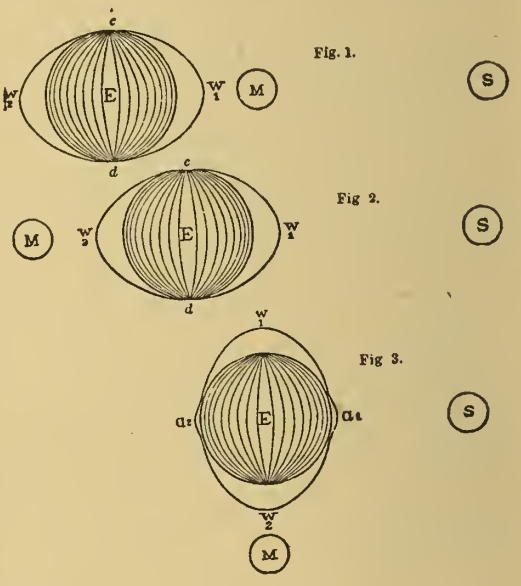
tse-kiang, etc.), and there are numerous salt and fresh-water lakes, situated from 13,800 to 15,000 feet above the sea-level. The climate is characterized by the excessive dryness of the atmosphere, and the severity of the winter. Tibet does a large trade with China, exchanging gold-dust, incense, idols, and European and Indian goods, for tea, silks, and other Chinese produce. The capital is Lhassa. The form of government is a hierarchy. The religion is Buddhism in a form known as Lamaism, of which Tibet is the principal seat. The lamas or priests form a large proportion of the population, and live in monasteries; the two grandlamas being regarded as the religious and political heads of the state. Remains of an earlier creed exist in the Boupo, a religion evolved from Shamanism, but much influenced by Buddhism, and frequently confounded with the old school of the Buddhists. The inhabitants are of an amiable disposition, but much averse to intercourse with foreigners, few of whom have been able to gain admittance to the country. Their manners and mode of life are rude. Polyandry is a common custom. The language is allied to Chinese, and has been written and used in literature for 1200 years. Tibet was governed by its own princes till the commencement of the 18th century, but since 1720 it has been a dependency of China. A Chinese functionary is always stationed at the residence of the grand lama, and a Chinese governor with a military force is stationed in each of the principal towns. Pop. about 5,000,000.

TICINO, a canton in the south of Switzerland; area, 1088 sq. miles. The northern and greater part of this canton is an elevated and mountainous region, the Splügen, St. Bernardin, and Mount St. Gothard forming its northern boundary. Pop. 142,719.

TICKNOR, George, American historian, born at Boston in 1791, died there in 1871. In 1849 he published a History of Spanish Literature (three vols 8vo., New York), corrected and enlarged editions being subsequently published. It was at once recognized by scholars as a work of value, and has been translated into Spanish and German. After some works of minor interest he produced in 1863 a Memoir of Prescott, the historian, with whom he had maintained a close friendship.

TICKS, a family of parasitic animals, possessing oval or rounded bodies, and mouths, in the form of suckers, by which they attach themselves to dogs, sheep, oxen, and other mammals. Birds and reptiles are also annoyed by the attacks of certain species.

TIDES, the rising and falling of the water of the sea, which occurs periodically, as observed at places on the coasts. The tide appears as a general wave of water, which gradually elevates itself to a certain height, then as gradually sinks till its surface is about as much below the medium level as it was before above it. From that time the wave again begins to rise; and this reciprocating motion of the waters continues constantly, with certain variations in the height and in the times of attaining the greatest degree of height and of depression. The alternate rising and falling of the tide-wave are observed to take place generally twice in the course of a lunar day, or of 24 hours 49 minutes of mean solar time, on most of the shores of the ocean, and in the greater part of the bays, firths, and rivers which communicate freely with it. The tides form what are called a flood and an ebb, a high and low water. The whole interval between high and low water is often called a tide; the water is said to flow and to ebb; and the rising is called the flood-tide and the falling the ebb-tide. The rise or fall of the waters, in regard to elevation or depression, is exceedingly different at different places, and is also variable everywhere. The interval between two succeeding high-waters is also variable. It is shortest about new and full moon, being then about 12 hours 19 minutes; and about the time of the moon's quadratures it is 12 hours 30 minutes. But these intervals are somewhat different at different places. Tides are caused by the attraction which the sun and moon exert over the water of the earth. The moon is the nearest of the heavenly bodies to the earth, and the mobile nature of water leads it to yield readily to the attractive influence. Those parts of the waters directly under the moon's vertical path in the heavens are drawn out toward the moon. At the same time the moon attracts the bulk of the earth, and, as it were, pulls the earth away from the water on the surface furthest from it, so that here also the water is raised, although not quite so much as on the nearer side. The waters being thus heaped up at the same time on these two opposite parts of the earth, and the waters situated half-way between them being thus necessarily depressed, two high and two low tides occur in the period of a little more than one revolution of the earth on its axis. The sun's influence upon the tides is evidenced in its either increasing or diminishing the lunar tide, according as the sun's place in the heavens coincides with the line of the moon's attraction, or the reverse. It is this difference which produces what are known as spring tides and neap tides. Spring tides occur at new and full moon, and are the result of the gravitating influence of both sun and moon; neap tides occur when the moon is in her quarters, and are not so high as the spring tides, the lunar influence being lessened by the sun's force acting in a direction at right angles to it. The accompanying figures illustrate the theory of the tides, e being the earth, m the moon, s the sun, w_1 w_2 the water raised up by attraction on the opposite sides of the earth. Fig. 1 shows spring tide at new moon, Fig. 2 spring tide at full moon, the low tides being at c and d. Fig. 3 illustrates the neap tides,



Tides.

a_1 a_2 being small tides caused by the sun alone. The interference of coasts and irregularities in the ocean beds cause the great variations as to time and range in the actual tides observed at different places. In some places, as in the German ocean at a point north of the Straits of Dover, a high tide meets low water, and thus maintains perpetual mean tide. In the case cited high water transmitted through the Straits of Dover encounters low water transmitted round the north of Scotland, and vice versa. The interval of time at any place between noon and the time of high water on the day of full or new moon is called the establishment of the port.

TIECK (tēk), Ludwig, German writer, born at Berlin in 1773. At Jena in 1799–1800 he entered on friendly relations with the Schlegels, Novalis, Brentano, and others, and through this association arose what has been dominated as "the Romantic School of Germany." In 1817 he visited England, where he collected material for his Shakespeare; and on his return resided at Ziebingen till 1819, when he removed to Dresden. From this period his writings, as exemplified

in his Tales, bear the true stamp of genius. These tales were ultimately published complete in twelve volumes (Berlin, 1853), the principal being Dichterleben (A Poet's Life—Shakespeare); Der Tod des Poeten (The Poet's Death—Camoens); the Witches' Sabbath, and Aufruhr in den Cevennen (Revolt in the Cevennes), an incomplete work. In 1826 he published his Dramaturgische Blätter (two vols., Breslau). His study of Shakespeare resulted in Shakespeare's Vorschule (two vols., Leipzig, 1823–29); and the continuation of the German translation of Shakespeare commenced by Schlegel. His last story of importance was Vittoria Accorombona (1840). He died at Berlin on the 28th April, 1853.

TIENTSIN', a town in the north of China, and the river-port of Pekin, with which it communicates by the Pei-ho river. This river is only navigable by native craft, and large vessels have their cargoes transhipped outside the mouth of the Taku roadstead. From October to February the river is frozen, but in the open season a large import trade is carried on, chiefly in European goods (Tientsin being one of the treaty ports). The principal imports are cotton, sugar, opium, paper, and tea; exports, dates, cotton, camel's wool, and coal. The Taku forts were taken by the British and French in 1860, and the capture of Pekin followed. During the Boxer uprising in 1900 the foreign settlement suffered from the besieging Boxers and the city from the relieving forces of the allies. Pop. 950,000.

TIER'RA (or Terra) **DEL FUE'GO** ("Land of Fire"), a large group of islands at the southern extremity of South America, separated from the mainland by the Strait of Magellan. It consists of one large island and numerous smaller islands, with a total area of about 32,000 sq. miles. The eastern part of the group belongs to the Argentine Republic, the western part to Chile. These islands consist chiefly of mountains covered with perpetual ice and snow, or clothed with stunted forests, mainly of evergreen-beech. Tierra del Fuego was discovered by Magalhaens in 1520, and named "Land of Fire" from the numerous fires he saw on its coasts during the night. Pop. about 2,100.

TIERS-ETAT (ti-ār-zā-tā; "third estate"), the name given in the ancient French monarchy to the third order of the nation, which, together with the nobility and clergy, formed the états généraux (states-general). It consisted of the deputies of the bourgeoisie, that is, the free inhabitants of the towns and communes who did not belong to either of the other two estates. In 1789 the states-general, or rather the tiers-état by itself, assumed the name of the National assembly.

TIFLIS, capital of a government of the same name and of Russian Caucasia, is situated on the river Kur, 500 feet above the level of the Black sea. Pop. 160,645.—The government has an area of 15,000 sq. miles; is very mountainous; produces cereals, fruits, etc., in the valleys, and has immense forests of excellent timber. Pop. 1,040,943.

TIFFANY, Charles Louis, American merchant, was born at Killingly, Conn., in 1812, and removed to New York City in 1837, and embarked in the jewelry business. In 1850 he made a large fortune in buying diamonds when they had fallen 50 per cent in value owing to the general revolutionary movement throughout Europe. During the civil war Mr. Tiffany placed his store and resources at the disposal of the government and it became for a time one of the principal depots of military supplies. Mr. Tiffany was made a member of the French Legion of Honor in 1878 and received at various times decorations from other foreign rulers. He was a liberal patron of the fine arts, and did much to encourage and promote the study and knowledge of art in America. He died in 1902.

TIF'FIN, the county-seat of Seneca co., Ohio, 40 miles southeast of Toledo; on the Sandusky river, here spanned by several bridges, and on the Baltimore and Ohio, the Pennsylvania, and the Cleveland, Cincinnati, Chicago and St. Louis railroads. Pop. 13,400.

TIGER, a well-known carnivorous animal, possessing in common with the lion, leopard, etc., five toes on the front feet and four on the hinder feet, all the toes being furnished with strong retractile claws. The tiger is about the height of the lion, but the body is longer and the head rounder. It is of a bright fawn-color above, a pure white below, irregularly crossed with black stripes. The tiger attains its full development in India, the name of "Bengal tiger" being generally used as synonymous with those

Royal tiger.

specimens which appear as the typical and most powerful representatives of the species. The tiger also occurs in Java and Sumatra. In habits it is far more active and agile than the lion, and exhibits a large amount of fierce cunning. It generally selects the neighborhood of water-courses as its habitat, and springs upon the animals that approach to drink. "Man-eaters" are tigers which have acquired a special liking for human prey. The natives destroy tigers by traps, pits, poisoned arrows, and other means. Tiger-hunting is a favorite Indian sport.

TIGER-BEETLE, a species of coleopterous insects which are swift and active in their movements, and prey upon other insects.

TIGER-FLOWER, a Mexican bulbous plant frequently cultivated in gardens on account of the magnificence of its flowers. The stem is about 1 foot in height, with sword-shaped leaves. The flowers are large, of a singular form, and very evanescent. The petals are of a fine orange-red toward the extremity; whitish or yellowish and beautifully spotted at the base.

TIGER-LILY, a native of China, common in gardens, having scarlet flowers turned downward, the perianth being

Tiger-lily.

reflexed. It is remarkable for having axillary buds on the stem. The bulbs are eaten in China and Japan.

TIGER-MOTH, a genus of insects, the caterpillars of which are well known under the popular name of "woolly bears." The moth is colored red and brown. The larvæ feed on dead-nettles.

TIGRIS, a river in Western Asia, having its principal source in the Turkish province of Diarbekir, on the southern slope of the Anti-Taurus, a few miles to the east of the Euphrates. It flows generally southeast, passes Diarbekir, Mosul, and Bagdad, and joins the Euphrates somewhat more than 100 miles from its embouchure in the Persian gulf, after a course of 1100 miles, the united stream being known as the Shatt-el-Arab. Large rafts, supported by inflated skins, are much in use for the transport of goods. Between the Tigris and the Euphrates lies the celebrated region Mesopotamia.

TILDEN, Samuel Jones, American statesman, was born at New Lebanon, N. Y., in 1814. He became chairman of the democratic state committee in 1866. The Tweed "ring" in New York City dreaded him, and in 1869 attempted to remove him from his chairmanship. Tilden then became the soul of the legal attacks upon the ring and worked for the removal of the corrupt judges who were their tools. In 1874 he was elected governor of the state by the democrats. In 1876 the national democratic convention nominated him for the presidency, the republicans nominating governor Hayes of Ohio. The result was the disputed election of 1876–77, when each party secured about the same number of electors outside of the three southern states of Florida, South Carolina, and Louisiana. In this emergency Tilden consented to the appointment of an extra-constitutional body, an "electoral commission" to decide disputed cases, the decisions of which were to hold good unless reversed by concurrent vote of the two houses. The commission decided all the cases in

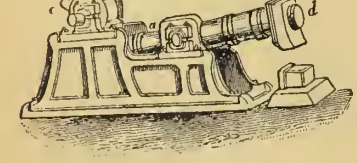
favor of the republican candidates, and Tilden was defeated. He continued in retirement until his death, which took place at Greystone, N. Y., on August 4, 1886.

TILES, a term applied to a variety of articles made either for ornament, such as inlaid paving tiles (see Encaustic Tiles and Mosaic), or for use, as in tile-draining (see Draining) and roofing, which last are made similarly to bricks, and of similar clay.

TILLY, Johann Tserklaes, Count of, one of the most celebrated generals of the 17th century, born about 1559, in Walloon Brabant. On the outbreak of the Thirty Years' war he led the army destined to crush the Protestants in Bohemia. He defeated them on the White mountains (November, 1620), and in 1622 conquered the Palatinate, defeating several Protestant commanders. On the 27th August, 1626, he defeated Christian IV. of Denmark in Brunswick, and compelled him to return to his own country. In 1630 Tilly succeeded Wallenstein as generalissimo of the imperial troops. His most celebrated exploit is the bloody sack of Magdeburg, May 10, 1631. Gustavus Adolphus met him at Breitenfeld, near Leipzig, September 7, and Tilly was entirely beaten, and was himself wounded. In a subsequent engagement with the Swedes on the Lech a cannon-ball shattered his thigh, and caused his death in 1632.

TILL'MAN, Benjamin Ryan, American politician, was born in Edgefield co., S. C., in 1847. He became the leader of the farming element in the democratic party, received the support of the Farmers' Alliance, and in 1890, was elected governor of the state. He was reëlected in 1892, and in 1895 was elected United States senator being reëlected to that office for a second time in 1901. He was active in both "free-silver" campaigns, in 1896 and 1900, as one of the most radical supporters of the candidacy of W. J. Bryan.

TILT-HAMMER, a large and heavy hammer worked by steam or water power, and used in forgings. It has been largely superseded by the steam-hammer, but is still advantageously used with light work. Cogs (as at c c in cut)



Tilt-hammer.

being brought to bear on the tail of the hammer (a), its depression causes the head (d) to be elevated, which, when the tail is liberated, falls with considerable force by its own weight.

TIMBER, a general term applied to wood used for constructive purposes, as that of the different kinds of fir and pine, the oak, ash, elm, beech, sycamore, chestnut, walnut, mahogany, teak, etc. The sap in timber is the great cause of its decay; hence, at whatever period timber is felled, it requires to be thoroughly seasoned before being used in building. The object of seasoning is partly to evaporate the sap, and partly to reduce the dimensions of the wood so that it may be used without further shrinking. Timber seasons best when placed in dry situations, where the air has a free circulation round it. Wood for building becomes compact and durable after two or three years' seasoning. But this mode of seasoning only removes a portion of the aqueous and volatile matter from the wood, the extractive and soluble portion still remains, and is liable to ferment on the reabsorption of moisture. It is often extremely difficult to preserve wood which is to be exposed to the weather, or is to remain in a warm and moist atmosphere. No entirely satisfactory process has yet been discovered for the preservation of timber and the prevention of dry-rot. The most successful method consists in extracting the sap, in excluding moisture, and in impregnating the vessels of the wood with antiseptic substances such as creosote. The sap may be extracted by water seasoning, in which the green timber is immersed in clear water for about two weeks, being then seasoned in the usual manner. It has also been proposed to extract the sap by means of an air-pump. The charring of timber on the outside is commonly supposed to increase its durability, but experiments on this subject do not agree. The exclusion of moisture by covering the surface with a coating of paint, varnish, tar, etc., is a well-known preservative of wood exposed to the weather. But painting is no preservative against the internal or dry rot. Only wood thoroughly seasoned should be painted. Resinous woods are more durable than others, and the impregnation of wood with tar, bitumen, and other resinous substances undoubtedly promotes its preservation. Wood impregnated with drying oils becomes harder and more capable of resisting moisture. Common salt (chloride of sodium) is a well-known preservative. The immersion of seasoned timber in sea-water is generally admitted to promote its durability. Chloride of zinc and creosote are extensively used for the preservation of wood.

TIMBREL, a kind of drum, tabor, or tabret, which has been in use from the highest antiquity, and is much the same as the tambourine.

TIME, in music. See Music.

TIME, the general idea of successive existence, or that in which events take place, space being that in which things are contained. Relative time is the sensible measure of any portion of duration, often marked by some phenomenon, as the apparent revolution of the celestial bodies, more especially of the sun, or the rotation of the earth on its axis. Time is divided into years, months, weeks, days, hours, minutes, and seconds; but of these portions the year and days only are marked by celestial phenomena. (See Day, Year.) The instruments employed for measuring time are clocks, watches, chronometers, hour-glasses, and dials; but the three first are those chiefly used.

TIME STANDARD, primarily for the convenience of the railroads, a standard of time was established by mutual agreement in 1883, by which trains are run and local time regulated. According to this system, the United States, extending from 65° to 125° west longitude, is divided into four time sections, each of 15° of longitude, exactly equivalent to one hour, commencing with the 75th meridian. The first (eastern) section includes all territory between the Atlantic coast and an irregular line drawn from Detroit to Charleston, S. C., the latter being its most southern point. The second (central) section includes all the territory between the last-named line and an irregular line from Bismarck, N. D., to the mouth of the Rio Grande. The third (mountain) section includes all territory between the last-named line and nearly the western borders of Idaho, Utah, and Arziona. The fourth (Pacific) section covers the rest of the country to the Pacific coast. Standard time is uniform inside each of these sections, and the time of each section differs from that next to it by exactly one hour. Thus at 12 noon in New York City (eastern time), the time at Chicago (central time) is 11 o'clock a.m.; at Denver (mountain time), 10 o'clock a.m. and at San Francisco (Pacific time), 9 o'clock a.m. Standard time is 16 minutes slower at Boston than true local time, 4 minutes slower at New York, 8 minutes faster at Washington, 19 minutes faster at Charleston, 28 minutes slower at Detroit, 18 minutes faster at Kansas City, 10 minutes slower at Chicago, 1 minute faster at St. Louis, 28 minutes faster at Salt Lake City, and 10 minutes faster at San Francisco.

TIMOR, the largest and most eastern of the Lesser Sunda islands, in the Asiatic archipelago, southeast of Celebes is politically divided between Holland and Portugal; area, 11,000 sq. miles. The natives are partly Papuans, partly Malays. The trade, chiefly in the hands of Chinese, is carried on mostly through Koepang. The exports are sandal-wood, trepang, wax, horses, tortoise-shell, birds'-nests, etc. Pop. about 500,000.

TIMOTHY, a disciple of St. Paul, was born in Lycaonia, Asia Minor, probably at Lystra, of a Gentile father and Jewish mother. When St. Paul visited Lystra on his second missionary journey, Timothy became an active fellow-worker with the apostle, and he accompanied him and Silas in the further course of their mission. He went with Paul to Philippi and Berœa, and remained alone in the latter city, afterward rejoining the apostle at Athens, from which city he was sent to Thessalonica. After remaining there some time he again joined Paul at Corinth. Five years later, he is found with his master at Ephesus, whence he was sent with Erastus into Macedonia and Achaia to prepare the churches for Paul's meditated visit. Timothy met the apostle again in Macedonia, and preceded him on his journey to Jerusalem. He again appears at Rome with Paul at the time when the epistles to the Colossians, Philippians, and Philemon were written. Timothy was on one occasion left at Ephesus when Paul went into Macedonia (1 Tim. i. 3). Tradition

makes him the first bishop of Ephesus. He is said to have been martyred in the reign of Domitian or Nerva.

TIMOTHY, Epistles to, two books of the New Testament attributed to St. Paul. These epistles, along with that to Titus, are called the pastoral epistles, as to the genuineness of which there has been considerable controversy. By the early Christian fathers they were almost universally accepted as genuine, and their genuineness is also supported by external testimony. They were, however, rejected by Marcion, Basilides, and other Gnostic heretics. In modern times both views have been ably advocated. Their genuineness is chiefly attacked on the grounds that their style differs from that of the acknowledged epistles of St. Paul, that the heresies alluded to in the epistles betray a later age, that the ecclesiastical polity of the epistles is too complete to belong to the time of the apostles, and that it is difficult to find any part of the apostle's life to which they can be assigned. Biblical critics generally meet the last difficulty by assigning them to a period after the close of the narrative in the Acts, the second epistle to Timothy being written while St. Paul was undergoing a second imprisonment in Rome.

TIMOTHY-GRASS, a hard coarse grass with cylindrical spikes from 2 to 6 inches long. It is used mixed with other grasses for permanent pasture, and grows best in tenacious soils. It is extensively cultivated throughout Great Britain and also in North America. Swine refuse it.

TIMUR, called also Timur Beg and Timur Lenk (that is, Timur the Lame), and, by corruption, Tamerlane, a celebrated oriental conqueror of Mongol or Tartar race, born in the territory of Kesh, near Samarcand, in 1336. By degrees he conquered Persia, and the whole of Central Asia, and extended his power from the great wall of China to Moscow. He invaded India (1398), which he conquered from the Indus to the mouths of the Ganges, massacring, it is said, on one occasion 100,000 prisoners. On his way from India to meet the forces of Bajazet, the Turkish sultan, he subjugated Bagdad, plundered Aleppo, burned down the greater part of Damascus, and wrested Syria from the Mamelukes, after which he overran Asia Minor with an immense army. Bajazet's army was completely defeated on the plain of Ancyra (Angora) in 1402, and the sultan was taken prisoner The conquests of the Tartar now extended from the Irtish and Volga to the Persian Gulf, and from the Ganges to the Grecian archipelago. He was making mighty preparations for an invasion of China when death arrested his progress at his camp at Otrar, beyond the Sir-Daria, in 1405, and his empire immediately fell to pieces

TIN, a hard, white, ductile metal; atomic weight 118. Tin appears to have been known in the time of Moses; and the Phœnicians traded largely in the tin ores of Cornwall. The mountains between Galicia and Portugal, and those separating Saxony and Bohemia, were also productive of tin centuries ago, and still continue unexhausted. Tin occurs in the Malay peninsula, the island of Banca, India, Mexico, Chile, Peru, the United States, Australia, etc. There are only two ores of tin; the native binoxide, called tin-stone, and the double sulphide of tin and copper, called tin-pyrites. The former is the only ore used for obtaining metallic tin. It occurs in various crystalized forms, in deep lodes blended with several other metals, as arsenic, copper, zinc, and tungsten, when it is known as mine-tin; or, in disseminated masses in alluvial soil, in which state it is called stream-tin. Mine-tin, when reduced to the metallic state, yields block-tin while stream-tin yields a purer sort called grain-tin. The ore is first ground and washed, and then roasted in a reverberatory furnace to expel the sulphur and arsenic. Mixed with limestone and fuel, it is again fused in a furnace for about eight hours, the earthy matters flowing off with the lime, while the oxide of tin, reduced to a metallic state, falls by its own weight to the bottom, and is drawn off. The tin, still impure, is again moderately heated, when it melts and flows off into the refining basins, leaving the greater part of the foreign metals in a solid state. The molten tin is stirred in order to disperse the gases, and, when partially cool, it separates in zones, the upper consisting of nearly pure tin, while the under is so impure that it must be melted again. The upper layer is removed, cast into blocks, and sold as block-tin, the purest specimens being called refined-tin. Tin-pyrites, the other ore of tin, contains from 14 to 30 per cent of tin, and is found at St. Agnes in Cornwall, in Saxony, and in Bolivia. Pure tin has a fine white color like silver. It has a slightly disagreeable taste, and emits a peculiar sound when rubbed. Its hardness is between that of gold and lead, and it is very malleable. Specific gravity 7.28. Melting point about 230° C. Tin is very flexible, and when bent emits a crackling sound, sometimes called the cry of tin. It loses its luster when exposed to the air, but undergoes no further alteration. Tin will unite with arsenic and with antimony, but does not readily combine with iron. Combined with copper it forms bronze, bell-metal, and several other useful alloys. With lead it forms pewter and solder of various kinds. Tin-plate is formed by dipping thin plates of iron into melted tin; they are afterward cleaned with sand and steeped for twenty-four hours in water acidulated by bran or sulphuric acid. Tin is principally employed in the formation of alloys. Its oxides are used in enamelling, and for polishing the metals, and its solution in nitro-muriatic acid is an important mordant in the art of dyeing, rendering several colors, particularly scarlet, more brilliant and permanent

TIN'AMOU, the name given to a genus and family of birds occuring in South America, and allied in some respects to the ostrich and emeu. They somewhat resemble a partridge, and vary in size from that of a pheasant down to that of a quail. The great tinamou is about 18 inches long, and inhabits the forests of Guiana.

TIN'DALL, or TYNDALE, William, a martyr to the Reformation, born about 1484 in Gloucestershire, and educated at Oxford. He removed to London, where he began his English version of the New Testament, and subsequently proceeded to Germany, visiting Luther at Wittenberg. Having completed his translation he got it partly printed in quarto at Bologne; but he had to flee from this town, and the complete work was printed in octavo at Worms. The greater part was sent to England, and the prelates Warham and Tunstall collected all copies they could seize or purchase, and committed them to the flames. The only fragment of the quarto edition known to exist is preserved in the British museum. Tindall also translated the Pentateuch, and subsequently Jonah. In 1530 he took up his residence at Antwerp. In 1535 he was thrown into prison at Vilvorde near Brussels, and being found guilty of heresy he was strangled in 1536 and his body burned at the stake.

Great tinamou.

TINDER, any substance artificially rendered readily ignitible but not inflammable. Before the invention of chemical matches it was the chief means of procuring fire. The tinder, ignited by a spark from a flint, was brought into contact with matches dipped in sulphur. Tinder may be made of half-burnt linen, and of various other substances, such as amadou, touchwood, or German tinder.

TIN-FOIL, pure tin, or an alloy of tin and lead, beaten into leaves about $\frac{1}{100}$th part of an inch thick. It is often used to cover up articles that are not to be exposed to atmospheric moisture.

TINNEVELLI, a town in the southeast of India, in the presidency of Madras, the largest town of the district of the same name. Pop. 40,469.—The district, which occupies the extreme southeastern corner of the Indian peninsula, has an area of 5381 sq. miles, and pop. 1,916,095.

TIN-PLATE. See Tin.

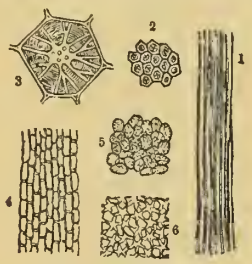
TINTORETTO, the surname of a Venetian historical painter, Giacomo or Jacopo Robusti, born at Venice in 1518, died there in 1594. He painted many works for his native city, among which are a Last Judgment, the Israelites Worshipping the Golden Calf, the Miracle of St. Mark (his masterpiece), etc. His portrait, by himself, is in the Louvre; and there are many of his paintings in Germany, Spain, France, and England. Equal in several respects to Titian or Paul Veronese, he wants the

dignity of the former, and the grace and richness of composition of the latter. His manner of painting was bold, with strong lights, opposed by deep shadows. His execution was very unequal.

TIP'PERAH, a district of British India, in the Chattagong division of Bengal; area, 2491 sq. miles. Pop. 1,782,935.

TIPPERA'RY, an inland county in Ireland, in the province of Munster, bounded by King's county, Queen's county, Kilkenny, Waterford, Cork, Limerick, Clare, and Galway; area, 1659 sq. miles, or 1,061,731 acres, of which a fourth is under tillage. The soil is extremely fertile; the chief crops are oats, potatoes, and wheat. Pop 159,754.—Tipperary, the county town, situated on the river Arra, 98 miles s.w. of Dublin. Pop. 6281.

TISSUES, (1) in animal anatomy, the texture or grouping of anatomical elements of which the systems of organs are composed. Thus in special histology we speak of muscular tissue, or flesh; osseous tissue, or bone; adipose tissue, or fat; cartilaginous tissue, or gristle; pigmentary tissue, or coloring matter seen in the skin, etc.; areolar, cellular, or connective tissue, widely distributed



Vegetable tissue.

1, Prosenchyma or woody tissue. 2, Horizontal section of prosenchymatous tissue. 3, Do. do. of a single cell, showing the successive layers of deposit in the interior which give hardness and firmness to the wood of plants. 4, Cylindrical parenchyma. 5, Round or elliptical parenchymatous tissue. 6, Spongiform or stellate tissue.

in every part of the body, and serving to bind together and consolidate other parts and tissues. (2) In vegetable anatomy, the minute elementary structures of which the organs of plants are composed. Plant tissues are composed of elementary membrane and elementary fibre, and the principal forms under which they exhibit themselves constitute cellular tissue, fibrous tissue, and vascular tissue.

TITANIUM, a metal discovered in 1791. It is found combined with oxygen in several minerals, and occurs especially in iron ores, which hence receive the name of titaniferous iron ores. Titanium is a dark green, heavy, amorphous powder, and some authorities doubt its metallic character. The ores of this metal include menachanite, from Menachan in Cornwall, where it was originally found; iserine, from the river Iser in Silesia; sphene, rutile, brookite, etc.

TITANS, in Greek mythology, the sons and daughters of Urănus (Heaven) and Gē (Earth). They were twelve in number, six sons and six daughters. They rose against Urănus and deposed him, raising Cronus, one of their number, to the throne. They were afterward overcome by Zeus, and thrown into Tartarus,

TITHES, the tenth part of the increase yearly arising from the profits of lands, the stock upon lands, and the industry of the occupants, allotted to the clergy for their maintenance. The custom of giving and paying tithes is very ancient, and was legally enjoined by Moses (Lev. xxvii., Deut. xiv., and elsewhere). In 578 Charlemagne established the payment of tithes in those parts of the Roman empire under his sway, dividing them into four parts; one to maintain the edifice of the church, the second to support the poor, the third the bishop, and the fourth the parochial clergy. Similar laws were afterward enacted in various states of Western Europe. Their payment was first enjoined in England by a constitutional decree of a synod held in 786. Offa, king of Mercia, in 794 made a law giving the tithes of all his kingdom to the church, and similar laws were enacted by Athelstan and Canute. The first mention of tithes in statute law is in 1285.

TITIAN (tish'-i-an), or **TIZIANO VECELLIO** (tit-si-ä'no ve-chel'li-ō), one of the most distinguished of the great Italian painters, and head of the Venetian school, was born at Pieve de Cadore, in the Carnic Alps, in 1477. In 1512 he completed the unfinished pictures of Giovanni Bellini in the Sala del Gran Consiglio at Venice, and the senate were so pleased that they gave him an important office. To this period are attributed his pictures of the Tribute Money and Sacred and Profane Love. In 1514 he painted a portrait of Aristo at Ferrara, and after his return to Venice, he painted an Assumption of the Virgin (1516), considered one of the finest pictures in the world; it is now in the Academy of the Fine Arts in Venice. About 1528 he produced his magnificent picture, The Death of St. Peter the Martyr. Many of his master-pieces, such as The Sleeping Venus, Christ in the Garden, St. Margaret and the Dragon,

Titian

are to be found in Spain where they were painted during his sojourn there. In 1537 he painted an Annunciation, and in 1541 he produced The Descent of the Holy Ghost on the Apostles, The Sacrifice of Abraham, and David and Goliath. In 1543 he painted his picture of The Virgin and San Tiziano. He died of the plague in 1576, aged ninety-nine. Titian excelled as much in landscape as in figure-painting, was equally great in sacred and profane subjects, in ideal heads and in portraits, in frescoes and in oils; and though others may have surpassed him in single points, none equalled him in general mastery. As a colorist he is almost unrivaled, and his pictures often reach the perfection of sensuous beauty.

TITLE-DEEDS, in law, are the documentary evidences of ownership of real property.

TITMOUSE, TIT, or **TOMTIT,** the name given to a number of dentirostral insessorial birds inhabiting most parts of the world. They are very active little birds, continually flitting from branch to branch, devouring seeds and insects and not sparing even small birds when they happen to find them sick and are able to put an end to them. Their notes are shrill and wild. They build in the hollows of trees, in walls, etc. The great

Blue titmouse, male and female.

titmouse is between five and six inches long, and inhabits Britain and Europe generally. Other British species are the blue titmouse, the long-tailed tit, the coal-tit, and the marsh-tit. The crested titmouse and the bearded titmouse are comparatively rare in England, but common on the continent. Several species are North American, some of them known as chickadee.

TITUS, or in full, **TITUS FLAVIUS SABINUS VESPASIANUS,** a Roman emperor, born A.D. 40, was the eldest son of the Emperor Vespasian. He became sole emperor in 79, and showed himself as an enlightened and munificent ruler, distinguished by benevolence and philanthropy. He died on the 13th September, 81, after a reign of a little over two years and two months. His brother Domitian was strongly suspected of having poisoned him.

TITUS, a disciple and assistant of the apostle Paul, and the person to whom one of the canonical epistles of the New Testament is addressed. He was a gentile by origin, and probably a native of Antioch. He labored with Paul in Asia Minor, Macedonia, and Crete, and is said to have been the first Christian bishop of Crete.

TITUS, Epistle to, one of the three pastoral epistles of the New Testament (the remaining two being those addressed to Timothy), believed to have been written by St. Paul after his first imprisonment at Rome. The topics handled are the same which we find in the other two kindred epistles. See Timothy, Epistles to

TOAD, the name applied to various genera of tailless amphibians. Toads have a thick bulky body, covered with warts or papillæ. They have no teeth, and the tongue is fixed to the front of the

mouth, but the posterior extremity is free and protrusible. The hind feet are but slightly webbed. They leap badly, and generally avoid the water, except in the breeding season. Their food consists of insects and worms. Toads have a most unprepossessing aspect and outward appearance. The toad is easily tamed, and exhibits a considerable amount of intelligence as a pet. It lies torpid in some hole during winter. Insects are caught by a sudden protrusion of the tongue, which is provided with a

Common American toad.

viscous secretion. There are some ten species of toads in North America. The toad is extremely tenacious of life, but experiments have conclusively shown that there is no truth in the oft-repeated stories of the creature being able to support life when inclosed in solid rock for immense periods of time. Dr. Buckland has shown that when excluded from air and food, frogs and toads, in virtue of their slow circulation and cold-blooded habits, might survive about a year or eighteen months at most.

TOBACCO, a very important plant, belonging to the natural order Atropaceæ, or nightshade order. The introduction of the use of tobacco forms a singular chapter in the history of mankind. According to some authorities smoking was practiced by the Chinese at a very early date. At the time of the discovery of America, tobacco was in frequent use among the Indians, and the practice of smoking, which had with them a religious character, was common to almost all the tribes. The name tobacco was either derived from the term used in Hayti to designate the pipe, or from Tabaca in St. Domingo, whence it was introduced into Spain and Portugal in 1559 by a Spaniard. It soon found its way to Paris and Rome, and was first used in the shape of snuff. Smoking is generally supposed to have been introduced into England by Sir Walter Raleigh, but Camden says the practice was introduced by Drake and his companions on their return from Virginia in 1585. It was strongly opposed by both priests and rulers. Pope Urban VIII. and Innocent IX. issued bulls excommunicating such as used snuff in church, and in Turkey smoking was made a capital offense. In the canton of Bern the prohibition of the use of tobacco was put among the ten commandments, immediately after that forbidding adultery. The Counterblast or denunciation written by James I. of England is a matter of history. All prohibitions, however, regal or priestly, were of no avail, and tobacco is now the most extensively used luxury on the face of the earth. The most commonly cultivated tobacco plant is glutinous, and covered with a very short down; the stem upright, 4 or 5 feet high, and branching; the leaves are lanceolate, from 6 to 18 inches long; the flowers are terminal and rose-colored. A less esteemed species is distinguished by a short yellowish-green corolla. All the tobacco plants are natives of America, and this continent has continued the principal producer, the chief tobacco-growing country being the United States, and the chief localities being Virginia and Kentucky. It was first cultivated in Holland early in the 17th century, and soon extended to other countries, including Austria, Germany, Russia, the Balkan peninsula, Asiatic Turkey, France, British India, Cuba, Brazil, the Philippine Islands, Japan, and Australia. Tobacco owes its principal properties to the presence of a most poisonous alkaloid named nicotine. In the cultivation of tobacco the object is to render the leaves as large and as numerous as possible. When the leaves become brittle the plants are cut close to the ground, and afterward carried to the drying-shed, where they are

Virginian tobacco.

hung up in lines to sweat and dry. When perfectly dry the leaves are stripped from the stalks and made into small bundles, which are subsequently stowed in casks for exportation. In the manufacture of tobacco the leaves are first thoroughly cleansed with salt and water. The midrib of the leaf is then removed; the leaves are again sorted, and the large ones set apart for making cigars. The leaves may either be cut finely for use in pipes, as in the case with shag tobacco, or they are moistened and pressed into cakes, which are designated cavendish; or they are pressed into sticks, as negrohead; or again the leaves may be spun in the form of a rope of greater or less thickness; the smallest twist is called pigtail. The midribs, separated in the first process of manufacture, are preserved to be converted into snuff. Cigars and cheroots are favorite forms of manufactured tobacco. As the best leaf is grown in Cuba, so also are the best cigars made there. The leaf used for the manufacture of Manilla cheroots is grown chiefly on the island of Luzon. The United States exports tobacco annually to the value of more than $30,000,000. The total crop in the United States is estimated at about 660,000,000 lbs. annually, the value of which is about $55,000,000.

TOBACCO-PIPE. See Pipe (Tobacco).

TOBIT, Book of, one of the Old Testament apocryphal books, rejected by the Jews and Protestants, but included in the Roman Catholic canon. It contains an account of some remarkable events in the life of Tobit, a Jew of the tribe of Naphtali, carried captive to Nineveh, and his son Tobias.

TOBOL, a river of Siberia, which rises in the west slope of the Ural mountains, in the government of Orenburg, and joins the Irtish at the town of Tobolsk, after a course of about 550 miles.

TOBOLSK', capital of the government of Tobolsk, Western Siberia, on the Tobol where it joins the Irtish. It has a cathedral, arsenal, barracks, prison for Siberian exiles, a theater, etc. Pop. 20,130.—The government comprises the northwestern part of Siberia, and has an area of 564,825 sq. miles, and a pop. of 1,283,000.

TOCQUEVILLE (tok-vēl), Alexis Charles Henri Clerel de, French writer, born in 1805, died 1859. Being commissioned by the government to proceed to the United States to report upon the penitentiary system, the results of his inquiry were published in 1833 under the title Du Système Pénitentiaire aux Etats-Unis et de son Application en France. His most celebrated work, however, was La Démocratie en Amérique (Democracy in America, two vols. Paris, 1834), which was translated into the principal European languages. In 1849 he accepted the portfolio of foreign affairs, but soon resigned it. After the coup d'état of 1851 he lived retired from public affairs. He wrote also L'Ancien Régime et la Révolution; Histoire Philosophique du Règne de Louis XV., etc.

TODDY, the name given by the English to the sweet juices which are extracted from the different species of the palm tribe, including the cocoa-nut tree. When newly drawn from the tree it is a sweet, cool, refreshing beverage, but when it has been allowed about ten or twelve hours to ferment it becomes highly intoxicating. The name toddy is also given to a mixture of whisky, hot water, and sugar.

Roman senator wearing the toga.

TOGA, the principal outer garment of wool worn by Roman citizens. It covered the whole of the body except the right arm, and it was originally worn by both

sexes until the matrons adopted the stola. The toga virilis, or manly gown, was assumed by Roman youths when they attained the age of fourteen. The variety in the color, the fineness of the wool, and the ornaments attached to it indicated the rank of the citizen; generally it was white. Under the emperors the toga went out of fashion.

TOGOLAND, a German protectorate on the Slave coast, Guinea, acquired in 1885. It has a coast-line of 32 miles, and stretches about 200 miles inland. Pop. 300,000.

TOKENS, pieces of money current by sufferance, and not coined by authority; or coins only nominally of their professed value. In England tokens first came into use in the reign of Henry VIII. owing to the want of authorized coins of lower value than a penny. Stamped tokens of lead, tin, and even leather were issued by vintners, grocers, and other tradesmen during the time of Elizabeth, and were extensively circulated, being readily exchanged for authorized money at the shops where they were issued. A currency of this kind (mostly of copper) was much used in Britain during the close of the 18th century.

TOKIO, formerly called Yeddo, the capital of Japan, and chief residence of the mikado, is situated on a bay of the same name, on the s.e. coast of Hondo, the largest of the Japanese islands, and is connected by rail with Yokohama and Kanagawa. The bulk of the houses are of wood, but there are many new buildings of brick and stone, and an imperial palace has recently been erected near the center, as also public offices, etc. The greater part of the town is flat, and

intersected by numerous canals crossed by bridges. The streets are generally narrow and irregular. Gas has been introduced, and the sanitary arrangements have been improved. Education is well organized, and there are nearly 700 private and elementary schools. Tokio contains the imperial university, and it may be considered the center of the political, commercial, and literary activity of Japan. Pop. 1,440,121.

TOLE'DO, a city of Spain, in New Castile, capital of a province of the same name, on a rocky eminence washed by the Tagus, and 1820 feet above the sea, 55 miles southwest of Madrid. It is the see of an archbishop, who is primate of Spain. Toledo contains a ruined alcazar, or palace and fortress, dating from 1551, and a Gothic cathedral, one of the grandest in the world, completed in 1492 in the style of the 13th century; also other interesting buildings. The Toledo sword-blades, renowned for many centuries, are manufactured in a large building (a government establishment) on the Tagus, about a mile from the town. Pop. 20,251. Province; area, 5620 sq. miles. Pop. 370,012.

TOLEDO, a flourishing city of Lucas co., Ohio, at the western extremity of Lake Erie, 65 miles s.s.w. of Detroit. Toledo is the terminus of the Miami and Erie, and the Wabash and Erie canals, and the center of several extensive railway lines. Exports include flour, grain, cattle, beef, pork, hides, wool, tobacco, and timber. There are large wagon-works, machine-shops, foundries, flour-mills, and manufactories of tobacco, flax, cotton, and chandlery. Pop. 1909, estimated at 193,000.

TOLERATION. See Religious Liberty.

TOL'IMA, a state of the Republic of Colombia, intersected by the upper course of the Magdalena, and embraced between the two chief chains of the Cordillera; area, 18,000 sq. miles. It produces cacao, sugar, corn, and tobacco, and is rich in gold and silver. The volcano of Tolima has a height of 17,660 feet. Pop. 306,000. Capital, Ibague.

TOLL, a tax paid, or duty imposed, for some liberty or privilege or other reasonable consideration; such as (a) the payment claimed by the owners of a port for goods landed or shipped there; (b) the sum charged by the owners of a market or fair for goods brought to be sold there; (c) a fixed charge made by those intrusted with the maintenance of roads, streets, bridges, etc., for the passage of persons, goods, and cattle. See Roads.

TOLSTOI, Count Leo Nikolaievitch, celebrated Russian novelist, born in 1828. In 1851 he accompanied his brother to the Caucasus and entered the army, and during the Crimean war took part in the defense of Sebastopol. At the close of the war he retired to his estates and devoted himself to literary composition and schemes for the education and social improvement of the peasantry. Latterly he has entirely given himself up to working out the higher problems of life experimentally—working along with the peasantry in a sort of communistic life. Among his earliest writings of moment are his vivid sketches from Sebastopol. His three great novels are the Cossacks, War and Peace, and Anna Karenina. His later writings are all mostly directed toward an explanation of his peculiar social and mystic religious ideas. Among them are Confessions, My Religion, The Search for Happiness, Two Generations, Infancy and Youth, Death, Great Problems of History, What is My Life? The Kreutzer Sonata, etc.

TOLTEKS. See Mexico.

TOMAHAWK, the light battle-axe of the North American Indians. The head was originally of stone attached to the shaft by thongs, etc., but steel heads were latterly supplied by American and

Tomahawks of the North American Indians.

European traders. The Indians can throw the tomahawk to a considerable distance, unerringly striking the object aimed at with the edge of the hatchet.

TOMA'TO, or **LOVE-APPLE,** a plant belonging to the natural order Solanaceæ. It is a native of South America, but has been introduced into most other warm or temperate countries. It is cultivated

Tomato.

for the sake of its fruit, which is fleshy, usually scarlet or orange, irregularly shaped, and is largely used in sauces, stews, and soups, as well as eaten by itself. The plant is a tender, herbaceous annual, with yellow flowers.

TOMB, any sepulchral structure, usually a chamber or vault formed wholly or partly in the earth, with walls and a roof, for the reception of the dead. See Sarcophagus, Burial, and Funeral Rites.

TOMSK, a town of Western Siberia, capital of the government of Tomsk, on the right bank of the Tom, on the great road to China. Pop. 52,430.—The government of Tomsk has an area of 329,040 sq. miles, and a pop. of 1,929,092. It is watered by the Obi and its tributaries, and is wild and desolate in the north, but furnishes excellent pasture in the south.

TON, a denomination of weight equivalent to 20 hundredweights (contracted cwt.), or 2240 lbs. In America goods are sometimes weighed by the short ton, of 2000 lbs., the hundredweight being reckoned at 100 lbs.; but it is decided by act of congress that, unless otherwise specified, a ton weight is to be understood as 2240 lbs. avoirdupois.

TONE, in music, the sound produced by the vibration of a string or other sonorous body; a musical sound. Nearly every musical sound is composite, that is consists of several simultaneous tones having different rates of vibration according to fixed laws, which depend on the nature of the sonorous body and the mode of producing its vibrations. The simultaneously sounding components are called partial tones; that one having

the lowest rate of vibration and the loudest sound is termed the prime, principal, or fundamental tone; the other partial tones are called harmonics or overtones. See Music, Gregorian Tones, Harmonics, Acoustics.

TONGUE, the organ found in the mouth of most vertebrate animals, which exercises the sense of taste, and also assists in speech and in taking food. The name tongue is also given to very different structures in Invertebrata. In man the tongue is attached by its base or root to the hyoid bone; its other extremity being free. The upper surface is convex with a fibrous middle septum, called the raphé. The front two-thirds of the tongue are rough, and bear the papillæ, in which the sense of taste resides. The posterior third is smooth, and exhibits the openings of numerous mucous glands. The substance of the tongue consists of numerous muscles. The papillæ, which cause the characteristic roughness of the tongue, are of three kinds, circumvallate, fungiform, and filiform. The largest or circumvallate papillæ number from eight to ten, and occupy the posterior part of the upper surface. They vary from $\frac{1}{20}$th to $\frac{1}{12}$th inch in diameter. The fungiform papillæ are scattered irregularly, the filiform over the front. In structure the papillæ are like those of the skin (which see), and contain capillary vessels and nervous filaments. Numerous follicles and mucous or lingual glands exist on the tongue, the functions of these latter being the secretion of mucus. The nervous supply is distributed in the form of three main nerves to each half of the organ. The gustatory nerves and the glossopharyngeal branches are the nerves providing the tongue with common sensation, and also with the sense of taste; while the hypoglossal nerve invests the muscles of the tongue with the necessary stimulus. The conditions necessary for the exercise of the sense of taste are, firstly, the solution of the matters to be tasted; secondly, the presence of a special gustatory nerve; and thirdly, that the surface of the tongue itself be moist. The top and edges of the tongue are more sensitive to taste than the middle portion. The sense of touch is very acute in the tongue.

TONIC, or **KEY-NOTE,** in music, the first or fundamental note of any scale, the principal sound on which all regular melodies depend, and in which they or their accompanying basses naturally terminate.

TONIC, in medicine, any remedy which improves the tone or vigor of the fibers of the stomach and bowels, or of the muscular fibers generally. Tonics may be said to be of two kinds, medical and non-medical. Medical tonics act chiefly in two ways: (1) indirectly, by first influencing the stomach and increasing its digestive powers; such being the effect of the vegetable bitters, the most important of which are calumba, chamomile, cinchona bark, gentian, taraxacum, etc. (2) Directly, by passing into and exerting their influence through the blood; such being the case with the various preparations of iron, certain mineral acids, and salts. The non-medical tonics are open-air exercise, friction, cold in its various forms and applications, as the shower-bath, sea-bathing, etc.

TONKA (or Tonga) **BEAN,** the fruit of a shrubby plant of Guiana. The fruit is an oblong dry fibrous drupe, containing a single seed. The odor of the kernel is extremely agreeable. It is used in perfumery. Called also Tonkin-bean, Tonquin-bean.

Tonka-bean plant.

TONNAGE, a word originally signifying the number of tons weight which a ship might carry with safety, but now used to denote the gauge of the vessel's dimensions, and the standard for tolls, dues, etc. It is generally assumed that 40 cubic feet shall constitute a ton, and the tonnage of a ship is considered to be the multiple of this ton which most closely corresponds with the internal capacity of the vessel. Formerly the rule was to multiply the length of the ship by the breadth, assume the depth to be the same as the width, multiply by this assumed depth, and divide the product by 94, the quotient being the tons burden. But this mode was found to be both misleading and dangerous; for as harbor and light dues, towage, etc. were charged according to tonnage, shipowners had their vessels built so deep and narrow that they were often unseaworthy. An improved system was introduced in 1835 and made compulsory by the British Merchant Shipping Act of 1854. The elaborate instructions of this statute take into account not only the depth of the vessel, but also make allowance for the varying curvature of the hull. The depth from the deck to the bottom of the hold is taken at different places, and the breadth is measured at different elevations in the depth. If the vessel is a steamer an allowance is made for the space occupied by the engine-room, boilers, coal-bunks, etc. In vessels with a break or poop in the upper deck, the tonnage of this poop space must be ascertained and added to the ordinary tonnage. In the United States the measurement is similar.

TONQUIN (tong-king'), the most northern province of Anam in Asia; area, 35,000 sq. miles. The chief river is the Song-ka. The principal agricultural products are rice, cotton, spices, and sugar; and the province is rich in timber and minerals. The climate is unhealthy. By treaty dated June, 1884, Tonquin was ceded to France. Pop. 9,000,000.

TONSILLI'TIS, See Quinsy.

TONSILS, in anatomy, two oblong suboval bodies situated on each side of the throat or fauces. Their minute structure resembles that of the closed sacs or follicles of Peyer in the intestine, and their function is not yet understood. See Palate.

TONSURE, the name given to the bare place on the heads of the Roman Catholic and Greek priests, formed by shaving or cutting away the hair and keeping it so. The custom of cutting away the hair in token of the dedication of a person to the service of God is mentioned as early as the 4th century. Shaving the hair precedes consecration; it is performed by the bishop. The tonsure admits the subject into holy orders, and the extent of the tonsure increases with the rank held.

TONTINE, a kind of life annuity, so called from their inventor Tonti, an Italian of the 17th century. A tontine is an annuity shared by subscribers to a loan, with the benefit of survivorship, the annuity being increased as the subscribers die, until at last the whole goes to the last survivor, or to the last two or three, according to the terms on which the money is advanced. By means of tontines many government loans were formerly raised in England.

TOOMBS, Robert, American statesman, was born at Washington, Ga., in 1810. After several years in the Georgia legislature he was elected to congress in 1844 and held his seat for four terms until 1853, when he was elected to the United States senate, and in 1859 reëlected. It was chiefly his influence, in opposition to the more conservative views of his life-long friend, Alexander H. Stephens, that led Georgia to pass its ordinance of secession. On the election of Davis, Toombs accepted the office of secretary of state, but resigned after a short time and accepted a commission as brigadier-general. He served in the second battle of Bull Run and at Sharpsburg, and later was made brigadier-general of the Georgia militia. He was a bitter opponent of the "Reconstruction" measures, and never took the oath of allegiance. He is mainly remembered as one of the most typical and vigorous of the so-called Southern "fire-eaters." He died in 1885.

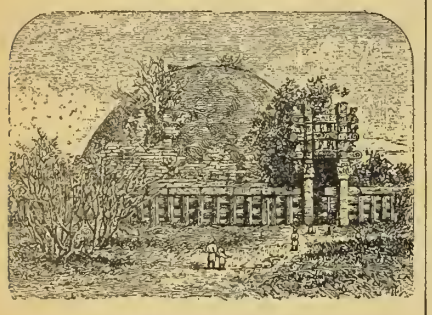
TOOTH. See Teeth.

TOOTHACHE, a well-known affection of the teeth, arising from various causes. Inflammation of the fangs of the teeth is a common cause. If the inflammation is not reduced matter forms, and the result is a gum-boil. Caries is a frequent cause of toothache, the outer part of the tooth rotting away and exposing the nerve. Neuralgia toothache is a purely nervous variety and may occur either in sound or carious teeth. As a preventive against toothache the teeth should be kept scrupulously clean, and when they show symptoms of decay the services of a skilful dentist should be had recourse to. The decay of a tooth is very often arrested by stopping or filling up the cavity.

TOPAZ, a mineral, ranked by mineralogists among gems, characterized by having the luster vitreous, transparent to translucent; the color yellow, white,

green, blue; fracture subconchoidal, uneven; specific gravity, 3.499. It is harder than quartz. It is a silicate of aluminium, in which the oxygen is partly replaced by fluorine. It occurs massive and in crystals. The primary form of its crystal is a right rhombic prism. Topazes occur generally in igenous and metamorphic rocks, and in many parts of the world, as Cornwall, Scotland, Saxony, Siberia, Brazil, etc. The finest varieties are obtained from Brazil and the Ural mountains. Those from Brazil have deep yellow tints; those from Siberia have a bluish tinge; the Saxon topazes are of a pale wine-yellow, and those found in the Scotch Highlands are of a sky-blue color. The purest from Brazil, when cut in facets, closely resemble the diamond in luster and brilliance.

TOPE, a popular name for a species of Buddhist monument intended usually to mark some important event. The oldest monuments of this kind are



Great tope at Sanchi, Central India.

spherical or elliptical cupolas, resting on a circular or rectilinear base, with an umbrella-shaped structure on the apex.

TOPE'KA, the capital of Shawnee county and of the state of Kansas, on the Kansas river, 68 miles west of Kansas City and on the Santa Fe, Rock Island, Union Pacific and Missouri Pacific railroads. It has wide well-built

State capitol, Topeka, Kan.

streets, and contains a handsome state-house, court-house, several high-class educational institutions, etc. There are flour-mills, iron-foundries, a rolling-mill, machine-shops, brick-kilns, breweries, etc. Bituminous coal is found in the neighborhood. Pop. 51,600.

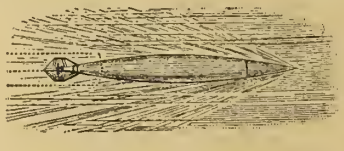
TOPHET. See Gehenna.

TORNA'DO, a violent cyclonic storm; more especially applied to those whirlwind hurricanes prevalent in the West Indies, and on the west coast of Africa about the time of the equinoxes, and in the Indian ocean about the changes of the monsoons. Tornadoes are usually accompanied with severe thunder, lightning, and torrents of rain; but they are of short duration and limited in area.

TORON'TO, one of the chief cities of the Dominion of Canada, capital of the province of Ontario, situated in the county of York, on a small bay on the northwest coast of Lake Ontario, 315 miles w.s.w. of Montreal. Toronto has iron-foundries and engineering works, agricultural implement works, breweries, carriage-works, tanneries, soap works, boot and shoe factories, piano and organ factories, stove foundries, etc. It was founded in 1794 and was originally named York. Pop. 325,400.

TORPE'DO, the name of fishes allied to the rays, noted for their power of giving electrical shocks by means of specially-developed electrical organs. The electrical organs consist of two masses placed on each side of the head, and composed of numerous vertical gelatinous columns separated by membraneous septa, and richly furnished with nervous filaments. The production of electricity by these fishes is readily enough explicable on the ground of the conversion of an equivalent of nerve force into electric force by the electric organ; just as, under other circumstances, nerve force is converted into motion through the muscles. The power of the discharge varies with the health and size of the fish. The torpedoes occur in typical perfection chiefly in the Mediterranean sea, and in the Indian and Pacific oceans. A large specimen may measure 4 feet long, and weigh from 60 to 70 pounds.

TORPEDO, a name for two distinct classes of submarine destructive agents, namely, torpedoes proper, which are movable, and are propelled against an enemy's ship; and submarine mines, which lie stationary in the water. Of the first class, called offensive torpedoes, there are three principal types: (a) the "locomotive," of which the Whitehead is the best-known form; (b) the "towing" torpedo of Captain Harvey; and (c) the "spar" or "outrigger" torpedo. The Whitehead, or fish torpedo, may be described as being a cigar-shaped vessel, varying from 14 to 19 feet in length, and from 14 to 16 inches in diameter. It is made of specially prepared steel, and is divided into three compartments; the head contains the gun-cotton which forms its charge and the fuse for exploding it when it comes in contact with a vessel. The central part contains the engines by which it is propelled, and which are



Whitehead torpedo.

worked by compressed air, a sufficient supply of which for driving the torpedo the required distance is stored in the third, or tail compartment. The propeller is a three-bladed screw, which can move the largest sized torpedoes at a speed of 24 knots for the distance of 220 yards, the distance of 1000 yards being reached at a slower rate of progress. By means of a horizontal balance rudder it can be made to sink and to remain during its run at any required distance below the surface of the water, so that it may be discharged from the deck of a ship or from a tube opening into the sea below the water-line. At close quarters this is a very destructive weapon against iron-clad vessels, striking them beneath their armor. The Harvey torpedo is constructed to be pulled through the water something in the fashion of a ship's log. It has been, however, superseded by the Brennan and other forms of manœuvred torpedo. The spar or outrigger torpedo consists simply of a metal case containing the explosive substance (gunpowder, gun-cotton, dynamite, etc.), and fitted with a fuse constructed so that it can be fired at pleasure, or exploded by contact with a ship's side. It is screwed on to a long spar, which is usually fixed in the bow of a swift boat or steam-launch, which endeavors to reach and push the torpedo against the hostile vessel. Stationary torpedoes or submarine mines, such as one placed in channels or coasts to prevent the approach of the enemy's vessels, usually consist of a strong metal case containing an effective explosive, such as gun-cotton, etc., and having a fuse or cap which will explode the charge on the slightest contact; or the explosion may be effected by means of electricity, the operator firing it at will from the shore.

TORPEDO-BOAT, a vessel specially intended to make use of torpedoes in warfare by exploding them against another vessel. The torpedo-boat is usually a small, swift steamer, lying low in the water, and meant to approach the enemy either by surprise or under cover of darkness. Such vessels are chiefly intended for the protection of coasts against hostile vessels. They vary greatly in size, the smaller being only of from 12 to 15 tons. Some of them have a speed of 27 knots or more. Another class of torpedo craft are the torpedo-boat destroyers, or "torpedo-catchers," very fast vessels, heavily armed with quick-firing guns, and with good sea-going qualities. See Submarine Boat.

TORRICELLI (tor-ri-chel'lē), Evangelista, Italian physicist, born in 1608, died in 1647. Torricelli's name is important in the history of science as the discoverer of the law on which the barometer depends. See Barometer.

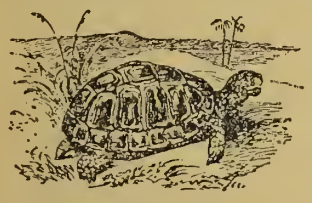
TORSION BALANCE, an instrument employed to measure the intensities of very small forces. It consists of a fine wire, silk thread, or the like, suspended from a fixed point, and having a horizontal needle attached, the force being measured by the resistance to twisting which the filament exhibits when the force (that of attraction, for instance) acts on the needle.

TORSO, an art term signifying the trunk of a statue of which the head and the extremities are wanting. The torso of Hercules, in the Belvidere at Rome,

is considered by connoisseurs one of the finest works of art remaining from antiquity.

TORT, in law, denotes injustice or injury. "Actions upon torts or wrongs are all personal actions for trespasses, nuisances, assaults, defamatory words, and the like.

TORTOISE (tor'tis), the name applied to various genera of reptiles included with the turtles and their allies. The distinctive features of the tortoises consist in the modification of the skeleton and of the skin-structure or scales to form the well-known bony box in which their bodies are inclosed, the upper portion of which is the carapace, the lower the plastron. The land-tortoises have short stunted limbs adapted for terrestrial progression; the short toes are bound together by the skin, and have well-developed nails. The carapace is strongly convex, and is covered by horny epidermic plates. The horny jaws are adapted for cutting, or may be divided into serrated processes. The head, limbs, and tail can be completely retracted within the carapace. Though capable of swimming, the tortoises proper are really terrestrial animals, and are strictly vegetable feeders. The most familiar example is the common Greek or European tortoise which occurs chiefly on the eastern borders of the Mediterranean. These animals sometimes live to a great age (over 100 years according to some), and hybernate through the colder season of



Common or Greek tortoise.

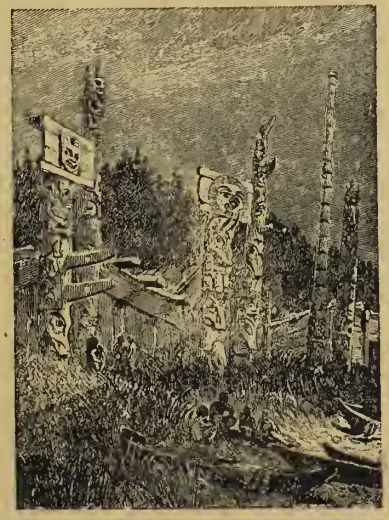
the year. They attain a length of 12 inches. A much larger species is the great Indian tortoise, which attains a length of over 3 feet and a weight of 200 lbs. Its flesh is reckoned food of excellent quality, as are also its eggs. The box tortoise of India and Madagascar is remarkable for the curious development of the front part of the plastron, which shuts over the anterior aperture of the shell like a lid when the animal retracts itself. In the box tortoise of North America the hinder part of the plastron forms a lid. It is included among the Emydæ or terrapins. Other genera include the alligator terrapin of America, also called the "snapping turtle." The mud of soft tortoises occur in Asia, Africa, and North America. They have soft fleshy lips, and no horny plates are developed in the skin. Very frequently also the ribs are not so modified as to form a hard carapace, as in other chelonia. See also Turtle.

TORTOISE-SHELL, a name popularly applied to the shell or rather the scutes or scales of the tortoise and other allied chelonians, especially to those of the hawk's-bill turtle, a species which inhabits tropical seas. The horny scales or plates which form the covering of this animal are extensively used in the manufacture of combs, snuff-boxes, etc., and in inlaying and other ornamental work. It becomes very plastic when heated, and when cold retains with sharpness any form it may be molded to in its heated state. Pieces can also be welded together under the pressure of hot irons. It is now largely imitated by horn and cheap artificial compounds.

TORTU'GAS, or DRY TORTUGAS, a group of ten small low barren islands belonging to Florida, United States, about 40 miles w. of the most western of the Florida Keys. On Loggerhead Key there is a lighthouse 150 feet high.

TORTURE, the arbitrary and especially excessive infliction of pain judicially, whether to extort confession or to aggravate punishment. Torture has been common in all the nations of modern Europe, and it was also practiced by the ancient Romans. The practice was first adopted by the church in the early middle ages, and when the old superstitious means of discovering guilt (as in ordeal by fire and water) lost their efficacy torture became general in Europe. Though never recognized by the common law of England, it was employed there as late as the reign of Charles I., and in Scotland torture was not wholly abandoned till very near the close of the 17th century. Every reader is familiar with the horrid tortures inflicted on those accused of witchcraft, and on many of the covenanters, by means of thumbkins, the boot, etc., in order to discover alleged hiding-places and the like. In the German states torture continued to be practiced under certain restrictions till the close of the 18th century. The chief instrument of torture was the rack (which see).

TOTEM, a rude picture of some natural object, as of a bird or beast, used by the American Indians as a symbol and designation of a family or tribe.



Totem posts.

A similar practice has been found to prevail among other savage peoples, and some theorists have given it a very wide extension on purely conjectural grounds.

TOUCAN, a genus of scansorial or climbing birds. These birds inhabit the tropical regions of South America and are distinguished by a large keeled bill. The bill is about 8 inches long, and its substance is hallowed out into air-cells, thus being comparatively light. The

Red-billed toucan.

toucans feed on fruits, seeds, insects, etc. The prevailing colors among the toucans are yellow, black, and red. The bill is frequently very brilliantly colored.

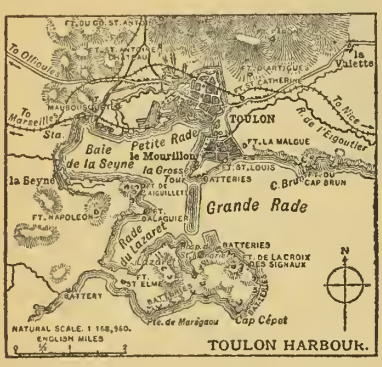
TOUCH, the sense of feeling and the most widely diffused of the senses. It resides in the skin (see Skin), and is exercised through certain structures situated in the papillæ of the true skin and connected with terminal filaments of sensory nerves. These structures have some variety of form, and are called tactile cells, tactile corpuscles, compound tactile corpuscles, Pacinian corpuscles, etc. All the kinds are to be regarded as terminal organs of the sensory nerves, acting as the media by which impressions made on the skin are communicated to the nerve fibers. Although the sense of touch is diffused over the whole body, it is much more exquisite in some parts than in others. Experiment shows the tip of the tongue to be the most sensitive surface, the points of the fingers come next, while the red part of the lips follows in order. The neck, middle of the back, and the middle of the arm and thigh are the least acute surfaces.

TOUCH-PAPER, paper steeped in saltpeter, which burns slowly, and is used as a match for firing gunpowder, etc.

TOUCHSTONE, a variety of extremely compact siliceous schist, used for ascertaining the purity of gold and silver. Known also as black jasper and basanite. It was called Lydian stone, or lapis Lydia, by the ancients, because found in Lydia in Asia Minor. A series of needles (called touch-needles) of which the composition is known are used for comparison with the article to be tested. When the color of the streak produced by both the needle and the trinket on the stone is the same the quantity of alloy they contain is supposed to be similar.

TOULON-SUR-MER (tö-lōn-sûr-mâr), a seaport, and after Brest the most important naval station of France, in the department of the Var, situated on a bay of the Mediterranean, 42 miles e.s.e. of Marseilles. It is defended by numerous forts and redoubts, and strong forts and outworks occupy all the heights surrounding the town. Toulon has a cathedral originally Romanesque of the 11th century, a good town-hall, theater, etc., besides the arsenal and other marine establishments, which are

on a most extensive scale. The chief harbors and docks are separated from the roadstead by moles, which are hollow and bomb-proof, and lined by bat-



teries, and the storehouses, ship-yards, workshops, etc., are most complete. Pop. 101,172.

TOULOUSE (tö-löz), a town of Southern France, capital of the department of Haute-Garonne, on the Garonne (which is navigable and crossed by three bridges), 160 miles s.e. of Bordeaux. Among remarkable public buildings are the cathedral, the church of St. Sernin, the Hotel de Ville, and the Palais de Justice. Toulouse has university faculties, a Roman Catholic university, a lyceum, and other educational institutions, public library of 60,000 vols., etc. It is the chief entrepôt of the district for agricultural produce and general trade, and is an important inudstrial center. Pop. 149,791

TOURAC'O, a name of insessorial birds, natives of Africa, and allied to the Scansores, or climbing birds. Their pre-

Touraco.

vailing color is green, varied in some species with purple on the wings and tail. They feed chiefly on soft fruits.

TOURAINE (tö-rān), an ancient province of France, bounded north by Maine, east by Orléanais and Berry, south by Berry and Poitou, and west by Anjou and Poitou. It now forms the department of Indre-et-Loire.

TOURCOING (tör-kwan), a town of France, department of Nord, 9 miles n.n.e. of Lille, a well-built thriving manufacturing town, the staple manufactures being woolen, cotton, linen, and silk stuffs, besides dye-works, soap-works, sugar-refineries, machine works, etc. Pop. 78,468.

TOURGUENIEFF (tör-gen'yef), Ivan Sergeyevitch, a celebrated Russian novelist, born at Orel 1818, died near Paris, 1883. His first important publication was translated into English under the title of Russian Life in the Interior, or the Experiences of a Sportsman. A powerful politico-social novel, Fathers and Sons, was published in 1861, and met with much adverse criticism in Russia. His other works include Smoke, Spring Floods, Virgin Soil, etc., all of which have been translated into English. Tourguenieff has been ranked with the greatest masters of fiction.

TOURMALINE (tör'ma-lin), a mineral occurring crystallized in three-sided or six-sided prisms, terminated by three-sided pyramids, the primary form being a rhomboid. It scratches glass easily, has a specific gravity of 3, and consists principally of a compound silicate and borate of alumina and magnesia. Tourmaline occurs most commonly in igneous and metamorphic rocks, especially in granite, gneiss, and mica-slate. Some varieties are transparent, some translucent, some opaque. Some are colorless, and others green, brown, red, blue, and black. Red tourmaline is known as rubellite, blue tourmaline as indicolite, and black tourmaline as schorl. The transparent varieties include various well-known jewelry stones, as the Brazilian sapphire, the Brazilian emerald, etc. Prisms of tourmaline are much used in polarizing apparatus, and it possesses powerful electric properties.

TOURNAMENT, or **TOURNEY,** a common sport of the middle ages, in which parties of mounted knights encountered each other with lances and swords in order to display their skill in arms. Tournaments reached their full perfection in France in the 9th and 10th centuries, where they first received the form under which they are known to us. They were introduced into England soon after the conquest of the Normans. Jousts were single combats between two knights, and at a tournament there would often be a number of jousts as well as combats between parties of knights. The place of combat was the lists, a large open place surrounded by ropes or a railing. Galleries were erected for the spectators, among whom were seated the ladies, the supreme judges of tournaments. A knight taking part in a tournament generally carried some device emblematic of a lady's favor. Tournaments gradually went out with the decline of chivalry, and were little practiced after the 16th century.

TOURNIQUET, an appliance employed in the practice of surgery to stop bleeding, its use being only intended to be temporary. Some kinds of ligature twisted tight with a stick forms a simple tourniquet.

TOURS (tör), a town of France, capital of the department of Indre-et-Loire, on the left bank of the Loire, 145 miles by rail southwest of Paris. The principal edifice is the cathedral (Tours being an archbishopric), flanked by two towers, 205 feet high, a fine building begun in the 12th, completed in the 16th century. It became famous for its silk manufactures, and had a population of 80,000, when the revocation of the edict of Nantes deprived it of nearly half its inhabitants, a blow from which it has never recovered. In 1870 Tours was the seat of the government of national defense. Pop. 64,448.

TOURVILLE, De, Anne Hilarion de Colentin, Count, a distinguished French admiral, born at Tourville, La Manche, 1642; died at Paris 1701. He defeated a Dutch and English fleet off Beachy Head in July, 1690. In 1692 he was ordered to attack a far superior Dutch-English fleet off La Hogue, and was defeated. He was created a marshal in 1693, and in 1694 destroyed a Dutch and English trading fleet off Cape St. Vincent.

TOUSSAINT-LOUVERTURE (tö-san-lö-ver-tür), a distinguished negro, born a slave in the Island of Hayti in 1743. After the insurrection of 1791 Toussaint served in the army of the blacks, and latterly rose to be their leader. After a severe struggle with insurrectionary movements he assumed supreme civil authority, and in 1801 was completely master of the island. Napoleon did not choose to see him independent, although professedly loyal to France, and sent a powerful expedition to subdue Toussaint, who was forced to surrender. After a vigorous resistance he was seized and sent to France, where he died in prison, 27th April, 1803.

TOWER OF LONDON, a celebrated ancient fortress in London, consisting of a collection of buildings of various ages on a somewhat elevated position on the north bank of the Thames, outside the old city walls. It covers about 13 acres, and is surrounded by a battlemented wall flanked with massive towers and encircled by a moat. There is also an inner line of circumvallation broken by towers, and interspersed with other buildings. In the center is the White Tower, the keep of the old fortress, around which are grouped the chapel, the jewel-house, barracks and

The Tower of London.

other buildings. The Tower was a first-class mediæval fortress, and served at once as a palace, a prison, and a place of defense The White Tower was built by Gundulf, bishop of Rochester, for William I. in 1078. It was successively strengthened by various English sovereigns. The regalia, consisting of the royal crowns, sceptres, etc., are now kept and exhibited in the jewel-house. The armory contains a fine collection of armor and weapons. In the part called the Bloody Tower the two young princes, sons of Edward IV., were murdered. The Tower is now chiefly used as an arsenal, and has a small military garrison of the yeomen of the guard. It is governed by a constable and deputy-constable. The governorship is still a post of distinction.

TOWN. See City.

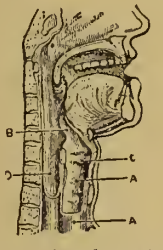
TOWNS'END, Edward Waterman, American novelist, was born in Cleveland, Ohio, in 1855. His novels of New York life with the picturesque slang of the streets have been very successful. Among them are: Chimmie Fadden and Major Max; Chimmie Fadden Explains, Major Max Expounds. A Daughter of the Tenements and Days Like These are novels, also of New York life. Later books are Chimmie Fadden and Mr. Pard, and Lees and Leaven.

TOWNSEND, George Alfred, American journalist, was born in Georgetown, Del., in 1841. He was successively connected with the Philadelphia Inquirer and Press, the New York Herald and World, and the Chicago Tribune. He first gained distinction as a war correspondent. Among his books the most noteworthy are: Campaigns of a Non-Combatant, Poems, Washington Outside and Inside, Tales of the Chesapeake, The Entailed Hat, and a drama, President Cromwell. Much of his newspaper correspondence was over the signature Gath.

TOWNSHIP, in England, a division of a parish which has a constable, and may have overseers of the poor belonging to itself. In the United States a township is a subdivision of a county, without reference to its population. They are generally squares of 36 sq. miles area.

TOXICOLOGY, the science of poisons and antidotes. See Poison.

TRACHEA (trā'kē-a), or **WINDPIPE,** in anatomy, the name given to the tube extending from the larynx (which see) down into the chest to a point opposite the third dorsal vertebra, where the tube divides into two chief divisions or bronchi (which see), one of which supplies each lung with the air necessary for respiration or breathing. The trachea in man is of cylindrical form, about 4½ inches long, and from ¾ to 1 inch in diameter, and is composed of from sixteen to twenty rings or



Trachea—Section through part of face and neck.

zones of gristly or cartilaginous nature, separated and connected by fibrous tissue. Each cartilage forms an imperfect ring, being unclosed behind, and having the gristly edges merely joined by fibrous membrane. The windpipe is lined by delicate mucous membrane which is covered by epithelial cells provided with delicate vibratile processes or cilia. All mammals, reptilia and birds possess a trachea, but some amphibia want this organ; the lungs in such cases springing directly from the larynx. The cut shows the trachea a a, the epiglottis b, the larynx c, and the œsophagus d.

TRACHEOTOMY, LARYNGOTOMY, or **BRONCHOTOMY,** an operation in which an opening is made into the trachea or larynx, as in cases of suffocation.

TRACING-PAPER, transparent paper which enables a drawing or print to be clearly seen through it when laid on the drawing, so that a pen or pencil may be used in tracing the outlines of the original. It is prepared from smooth unsized white paper rendered transparent by a varnish made of oil of turpentine with an equal part Canada balsam, nut-oil, or other oleo-resin.

TRACTION-ENGINE. See under Steam-engine.

TRADE, Boards of, are associations of merchants, bankers, brokers, and manufacturers, organized in the leading cities of the United States and Europe, to develop and promote the financial, commercial and productive interests of communities and nations; movements in behalf of associations of this character were started in America as early as 1768, when the Chamber of Commerce of New York City was established. The purpose of these local organizations is to consider questions of local importance connected with trade, commerce, transportation, etc., and to secure the establishment and promotion of undertakings of a local character. These local organizations may be divided into trading and deliberative bodies, the Merchants Exchange of St. Louis and Board of Trade of Chicago being of the former class, and the Chamber of Commerce of New York City of the latter. In 1868 a meeting of delegates from 30 of the largest cities met at Philadelphia, and perfected an organization "to promote the efficiency and extend the usefulness of the various Chambers of Commerce, Boards of Trade, and other chartered bodies, organized for commercial purposes in the United States, in order to secure unity and harmony of action in reference to commercial usages, customs, and laws; and especially in order to secure the proper consideration of questions pertaining to the financial commercial, and industrial interests of the country at large." Since that date conventions have been held annually, with steadily increasing benefits to the cause the association was created to fotser and encourage. Supplementary to boards of trade and chambers of commerce, organizations have been recently created for similar purposes in connection with some especial department of commercial endeavor, such as corn and produce exchanges, etc. These exert a substantial influence in their several fields of usefulness, and are steadily growing in number and importance.

TRADE-MARK, a peculiar mark used by a manufacturer to distinguish his own productions from those of other persons. Such marks can now be registered and protected in all the more important countries, and between these also there is a general reciprocity as to protection. Regarding trade-marks many nice questions may arise, and it is not easy to define what constitutes a valid trade-mark. A mere descriptive title or a geographical name will not constitute a proper trade-mark; what it is best to select is some invented word or words, or a word or words having no reference to the character or quality (though suggestive of excellence), some distinctive device, figure, emblem, or design, or a written signature or copy of such. Any mark or name calculated to mislead as to the real nature or origin of the goods will be vitiated.

TRADES-UNIONS, a trade society is defined in the report of the Social Science committee on the subject appointed at Bradford, in 1859, "as a combination of workmen to enable each to secure the conditions most favorable for labor;" and although trades-unions, as they are generally called, almost always have other objects in view in addition to that specified in the definition, that object is their distinguishing one. Combinations of this sort in Great Britain are considerably more than three centuries old, for there is a statute of the year 1548 expressly directed against them. Trades-unions generally endeavor to regulate the prices and the hours of labor, and in many cases the number of men engaged by an employer, the number of apprentices which may be bound in proportion to the journeymen employed by a master, and the like. As accessories these unions may collect funds for benefit societies, and undertake the insurance of tools, libraries, and reading-rooms; but their fund, to which every member must regularly contribute a stated sum, is principally reserved for enabling the men to resist, by strikes and otherwise, such action on the part of the employers as would tend to lower the rate of wages or lengthen the hours of labor. That trades-unions enable the men to benefit by the state of trade more than they otherwise would have done would appear from the fact that the worst-paid trades are those without unions. Trades-unions are also said to have furthered the safety of the laborer by producing beneficial modifications of the conditions in which he works. Some hostility against trades-unions has been produced by the outrages of a more or less serious nature of which some of the unions, or members of them, have been guilty, such outrages being directed against the property of employers, or against the persons and tools of non-union men. The intimidation of non-unionists who venture to take work where the men are out on strike is also a common practice. In Britain special legislation has been introduced to cope with these outrages. The trades-unions now represented at the annual congress number considerably over one million. In the United States the federal statute providing for the incorporation of trades-unions, says: "In the meaning of this act shall signify any association of working people having two or more branches in the states or territories of the United States for the purpose of aiding its members to become more skilful and efficient workers, the promotion of their general intelligence, the elevation of their character, the regulation of their wages and their hours and conditions of labor, the protection of their individual rights in the prosecution of their trade or trades, the raising

of funds for the benefit of the sick, disabled, or unemployed members, or the families of deceased members, or for such other object or objects for which working people may lawfully combine, having in view their mutual protection or benefit." There is no record of a trade union before 1803, the year in which the New York Society of Journeymen Shipwrights was incorporated. In 1806 a union of the House Carpenters of the City of New York and of the Journeymen Tailors was organized. The New York Typographical Society had been in active existence for some time prior to 1817. In 1822 the Charitable Society of Shipwrights and Calkers of Boston and Charlestown was formed. During this period trade unionism was making progress. By 1840 local unions had been organized among the masons, marble-cutters, shoemakers, saddlers, hatters, tailors, printers, bricklayers, roofers, painters, carpenters, and shipworkers. In 1850 the International Typographical union was organized. The National Association of Hat Finishers of the United States of America was founded in 1854, the National Protective Association (the Locomotive Engineers) in 1855, the Sons of Vulcan and the National Spinners' association in 1858. Among the larger organizations may be named the National Labor union (1866), the Knights of Labor (1869), the International Association of Workingmen (1864), the Industrial Brotherhood (1873), the American Federation of Labor (1881), the National Building Trades Council (1897), and the American Labor Union (1898). By far the most important of these is the American Federation of Labor with a membership in 1907 of about 2,000,000.

TRADE-WIND, one of those perpetual or constant winds which occur in all open seas on both sides of the equator, and to the distance of about 30° north and south of it. On the north of the equator their direction is from the northeast (varying at times a point or two of the compass either way); on the south of the equator they proceed from the southeast. The origin of the trade-winds is this:—The great heat of the torrid zone rarefies and makes lighter the air of that region, and in consequence of this rarefaction the air rises and ascends into the higher regions of the atmosphere. To supply its place colder air from the northern and southern regions rushes towards the equator, which, also becoming rarefied, ascends in its turn. The heated air which thus ascends into the upper regions of the atmosphere being there condensed flows northward and southward to supply the deficiency caused by the under-currents blowing toward the equator. These under-currents coming from the north and south are, in consequence of the earth's rotation on its axis, deflected from their course as they approach the equatorial region, and thus become northeast and southeast winds, constituting the trade-winds. The belt between the two trade-winds is characterized by calms, frequently interrupted, however, by violent storms. Trade-winds are constant only over the open ocean, and the larger the expanse of ocean over which they blow (as in the Pacific) the more steady they are. In some places the trade-winds become periodical, blowing one half of the year in one direction and the other half in the opposite direction. See Monsoon.

TRADITION, in its general application, is any knowledge handed down from one generation to another by oral communication. It plays a very important part in the Jewish and Roman Catholic churches. In theology, the term is specifically applied to that body of doctrine and discipline, or any article thereof, supposed to have been put forth by Christ or his apostles, and not committed to writing, but still held by many as an article of faith.

TRAG'ACANTH, a variety of gum familiarly termed gum-dragon or gum-tragacanth. It is the produce of several species of leguminous plants, natives of the mountainous regions of Western Asia. In commerce tragacanth occurs

Tragacanth.

in small twisted thread-like pieces, or in flattened cakes, in color whitish or yellowish, devoid of taste or smell. It is demulcent, and is used in coughs and catarrhs, and to make lozenges and pills. It is employed also in calico-printing.

TRAGEDY, a dramatic poem, representing an important event or a series of events in the life of some person or persons, in which the diction is elevated and the catastrophe melancholy. Tragedy originated among the Greeks in the worship of the god Dionysus or Bacchus.

TRAG'OPAN, a name of certain beautiful birds of the genus Ceriornis, and of the family Phasianidæ, closely allied to

Crimson tragopan.

the common fowl. The most common species, is a native of the Himalayas. The plumage is spotted, and two fleshy protuberances hang from behind the eyes. When the bird is excited it can erect these protuberances until they look like a pair of horns. A large wattle hangs at either side of the lower mandible.

TRAIN, George Francis, American author, was born in Boston, Mass., in 1829. His publications include: An American Merchant in Europe, Asia and Australia; Young America Abroad, Irish Independency, and Championship of Women. He also published an autobiography entitled My Life in Many States and in Foreign Lands. He died in 1904.

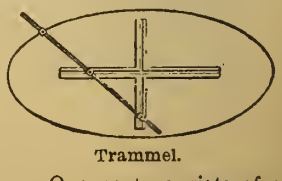
TRAINING COLLEGES. See Normal Schools.

TRAJAN, in full, Marcus Ulpius Trajanus, Roman emperor, born in Spain 52 A.D., was the son of Trajanus, a distinguished Roman commander under Vespasian. He served against the Parthians and on the Rhine, where he acquired so high a character that Nerva adopted him and created him Cæsar in 97. Nerva died in 98, and Trajan, who was then in Germany, peaceably succeeded to the throne. He made peace with the German tribes, and proceeded to introduce enlightened measures of reform into the public service. One of his greatest military achievements was his defeat of the Dacians, and the reduction of Dacia to a Roman province. It is supposed that it was in commemoration of this war that he erected at Rome the column which still remains under his name. In 103 he wrote the famous epistle to Pliny, governor of Pontus and

Trajan.

Bithynia, directing him not to search for Christians, but to punish them if brought before him; and on no account to listen to anonymous charges. For some years Trajan occupied himself with the work of administration, but in 114 he set out on an expedition against the Parthians which resulted in the reduction of Armenia to a Roman province. He died in Cilicia in 117 A.D., after having nominated Hadrian as his successor.

TRAMMEL, an instrument for drawing ovals, used by joiners and other



Trammel.

artificers. One part consists of a cross with two grooves at right angles; the

other is a beam-compass carrying two pins which slide in those grooves, and also the describing pencil.

TRAMWAYS, a kind of street railway introduced within recent times into many of the chief cities of the world. The commonest kind of street tramway is that in which grooved rails are used, the surface of which is nearly on a level with the street. Horse-power is one means used for propelling street cars, on other lines steam-engines are used for the purpose, while in some again the cars are drawn by underground cables. Latterly electricity has become exceedingly common as the means of propulsion, and has various advantages over other methods. Street tramways were first constructed at New York. The first in England were opened at Birkenhead in 1860, and they have since been introduced into nearly all the principal towns. The United States have over 20,000 miles of electric street railways, the most striking increase in recent years being in interurban railways, many of which have invaded the steam railroad field and are now operating sleeping, parlor and freight cars.

TRANCE, a condition resembling sleep, in which consciousness and many of the vital functions are suspended, and during which the action of the heart is diminished and the breathing reduced. The subjects of trance are usually hysterical, and in some cases it is induced by exhausting disease or emotional disturbance. In this condition the face is pale, the limbs relaxed, the mental functions are in abeyance, no effort at rousing will produce a return to consciousness, and this state may last from a period of several hours to many weeks or months. When the trance lasts for a lengthy period food is taken in a mechanical way at intervals by the sleeper. Most cases recover. The term is also applied to a sort of ecstatic state in which some persons are said to fall, and in which, while unconscious of what is passing around them, they have remarkable dreams or visions.

TRANSBAIKALIA, a Siberian province, e. of Lake Baikal; area, 240,780 sq. miles. It has an elevated, well-watered surface, and climate dry and extreme both in summer and winter. Agriculture and trade limited; gold found to some extent. Pop. 664,071.

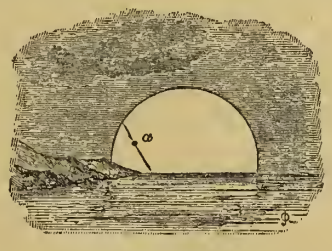
TRANSCASPIAN REGION, a territory to the e. of the Caspian recently annexed by Russia. It has an area of 220,000 sq. miles, mostly uninhabited desert, and is traversed by the Transcaspian railway, connecting Samarkand with the Caspian. Pop. 372,193.

TRANSCENDENTAL, a term applied in the system of philosophy founded by Kant to all those principles of knowledge which are original and primary, and which are determined à priori, such as space and time. They involve necessary and strictly universal truths, and so transcend all truth derived from experience, which must always be contingent and particular. The term transcendentalism is now generally used in a sense not very different from mysticism, or for that which is vague and illusive in philosophy. In mathematics the term is applied to quantities that cannot be expressed in ordinary algebraic terms.

TRANSEPT, in architecture, the transverse portion of a church which is built in the form of a cross; that part between the nave and choir which projects externally on each side, and forms the short arm of the cross in the general plan. See Cathedral.

TRANSFUSION, the transmission of blood from the veins of one living animal to those of another, or from those of a man or one of the lower animals into a man, with the view of restoring the vigor of exhausted subjects. This operation is a very old one, but seems to have generally ended in failure until about 1824, the chief cause of failure probably being the want of due precaution to exclude the air during the process. It is now occasionally resorted to as a last resource in cases of great loss of blood by hæmorrhage, especially in connection with labor.

TRANSIT, in astronomy, (a) the passage of a heavenly body across the meridian of any place, a phenomenon which is usually noted by a transit instrument. The determination of the exact times of the transits of the heavenly bodies across the meridian of the place of observation enables the astronomer to ascertain the differences of right ascensions, and the relative situations of the fixed stars, and the motions of the sun, planets, and comets, in respect of the celestial meridians. (b) The passage of one heavenly body



Transit of Mercury.
a, Mercury. The dotted line shows the path.

over the disc of a larger one; but the term is chiefly restricted to the passage of the inferior planets, Mercury and Venus, over the sun's disc. The transits of Venus are of great importance in astronomy, as they afford the best means of determining the sun's paralax, and consequently the dimensions of the planetary system. These transits are of rare occurrence, four taking place in 243 years, at intervals reckoning from the transit of 1874, in the order of 8, 122, 8, and 105 years, which gives the transit years 1882 (December 6), 2004, 2012, 2117. The transits of Mercury occur more frequently, but they are of far less astronomical interest, as they cannot be used for the same purpose, the planet being too distant from us.

TRANSIT INSTRUMENT, an important astronomical instrument adapted for observing the exact time of the passage of heavenly bodies across the meridian. (See Transit.) It consists essentially of a telescope fixed at right angles to a horizontal axis, which latter has its ends directed exactly to the east and west points of the horizon, so that the line of collimation or optical axis of the telescope may move in the plane of the meridian. The instrument is susceptible of certain nice adjustments, so that the axis can be made perfectly horizontal, and at right angles to the plane of the meridian, in which plane the telescope must move. It is generally used in connection with the mural circle.

TRANSKEI, a general name given to a region of Southeast Africa north of the Kei river and southwest of Natal, and comprising several territories annexed at various times to the Cape Colony. These are grouped into the four divisions of Griqualand East, Tembuland, Transkei, and Pondoland. Pop. 560,000 natives, 10,000 whites.

TRANSMIGRATION OF THE SOUL, or **METEMPSYCHOISIS,** the passage which, according to the belief of many races and tribes at all times, the soul after the death of the body makes through the bodies of the lower animals or other human bodies, or, it may be, through plants or inanimate objects. In the teaching of the Brahmanic Hindus it has its foundation in the belief of the connection of all living beings, and of the gradual purification of the spiritual part of man and its return to the common source and origin of all things—God. The Buddhists accept a similar doctrine, but with them the ultimate goal of the soul is not absorption by the Deity, but annihilation, Nirvana. Transmigration also formed part of the teaching of the Egyptian priests. The doctrine probably passed from Egypt into Greece, where it was never generally current, but was confined to the mysteries and some philosophic systems. It occupied an important place in the system of Pythagoras, and is supported by Plato and Plotinus. Among the Romans Cicero alludes to this doctrine, and Cæsar informs us that it was believed in by the Gauls, who, he says, in this faith were able to despise death. The doctrine is also found in the Talmud but only a minority of the Jewish rabbis appear to have adopted it. Various heretical Christian sects have held this doctrine, and it was also professed by the Arabs before Mohammed.

TRANSPORT, a ship employed by government for carrying soldiers, warlike stores, or provisions from one place to another.

TRANSUBSTANTIATION. See Lord's Supper.

TRANSVAAL, a British territory in South Africa, originally colonized by part of the Boers who left Cape Colony in 1836 for Natal, and quitted that colony on its annexation by Britain in 1845. It lies north of the Vaal river and south of the Limpopo, and is bounded by Rhodesia, Bechuanaland, Orange River Colony, Natal, Zululand, and Portuguese East Africa. Area, about 120,000 sq. miles; pop. 1,250,000. Pretoria is the seat of government; the largest town is Johannesburg. The country is elevated, forming high plateaux, and in some parts is quite rugged, mountains rising in the east to 8700 feet. In the south is the famous elevated tracks known as the Witwatersrand. The rivers are chiefly tributaries of the Limpopo. The climate is generally

salubrious. Minerals are abundant, especially gold, which is mined in many places, the chief being in the Witwatersrand, of which Johannesburg is the center. Coal is abundant, and is also worked. The country is more pastoral than agricultural. In 1877 the Transvaal was annexed by Britain, the country being far from flourishing, and a certain number of the people being in favor of this step. In 1880 the Boers took up arms against the British, defeated a body of troops at Majuba Hill, and as the result recovered their independence. By a convention made in 1884, the relation of the state to the British crown was modified, and from that date till 1900 it was known as the South African Republic. Latterly the area had been extended at the expense of the Zulus, and in 1894 Britain recognized Swaziland as a dependency of the Transvaal. A great increase of the population took place along with the extension of gold-mining, from about 1886, and various railways were constructed. For some years before 1895, much discontent prevailed among the "uitlanders" or aliens, whites not admitted to citizenship; and at the end of 1895 this led to an abortive revolution at Johannesburg. Simultaneously Dr. Jameson with an armed force belonging to the British South Africa Company, entered the Transvaal and rode toward Johannesburg, but was attacked and defeated by a body of Boers. In October, 1899, war broke out with Britain, the Transvaal being joined by the Orange Free State in commencing hostilities. After nearly eleven months' fighting and the occupation of the chief towns, the country was annexed by proclamation in 1900. Before the two Boer republics could be crushed Britain had placed some 200,000 men in the field under the supreme command of Lord Roberts. The president was then J. Paul Kruger, who had held the office continuously since 1883. The legislative power was exercised by two chambers, a first and a second Volksraad ("popular council"), each with twenty-four members. The former was in possession of all political power. The uitlanders had no voice in the government of the country though much of the taxation fell upon them. The annual output of gold is valued at about $135,000,000. See Boers, Natal.

TRANSYLVANIA, a grand-principality belonging to the crown of Hungary forming the southeastern portion of the Austrian empire; area, 21,213 sq. miles. The surface is mountainous, the Carpathian chain covering its southern and eastern frontier, and sending out numerous ramifications into the interior. The chief rivers are the Aluta or Alt, the Maros, and the Szamos, all flowing directly or indirectly into the Danube. The forests are extensive and valuable; the vine flourishes everywhere, and the crops include corn, wheat, rye, hemp, flax, tobacco. The minerals are important, and include gold, silver, copper, lead, coal, salt, and iron. The chief towns are Hermannstadt, Kronstadt, Bistritz, and Szamos-Ujvar. Education is in a very backward state. The population (2,084,048) is very mixed, including Roumanians, Magyars, Germans, Gypsies, Jews, Bulgarians, and others. The country now forms an integral portion of Hungary.

TRAP, a term rather loosely and vaguely applied by the earlier geologists to some or all of the multifarious igneous rocks that belong to the palæozoic and secondary epochs, as distinct from granite on the one hand, and the recent volcanic rocks on the other. Trap-rocks often assume a terraced appearance, whence their name from trappa, the Swedish for a stair. Their composition may be described as consisting chiefly of felspar and horneblende. Trap-rocks of crystalline structure are distinguished as greenstones, basalts, clinkstones, compact felspar, and felspar porphyries; while the softer and more earthy varieties are known as claystones, claystone porphyries, amygdaloids, trap-tuffs, and wackes. Basalt is the most compact, the hardest, and the heaviest of the trap-rocks. The hill scenery of trappean districts is often picturesque.

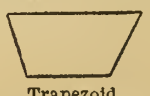
TRA'PANI, a fortified seaport town in Sicily, capital of the province of the same name, 47 miles w.s.w. of Palermo, on a peninsula shaped like a sickle, and hence its ancient name, from the Greek drepanē, a sickle. There is a good trade, and the fisheries are extensive. At a short distance e.n.e. of the town is Mount San Giuliano, the ancient Eryx. Pop. 60,257.

TRAP-DOOR SPIDER, a name given to certain spiders that have the habit of constructing tubular dwellings in the ground, sometimes a foot or more in depth, and an inch or so in diameter, closed by a sort of hinged door. They belong to several genera, and are found in Southern Europe, Western North America, and elsewhere. The dwelling

Trap-door spider and nest

is lined with the silky substance spun by the insect, and the hinge of the door is formed of the same, the door itself being constructed sometimes of earthy particles connected by threads, sometimes of leaves, etc. Some species construct nests that have a main tube and one or more branches, the latter having a door where they join the main tube.

TRAP'EZOID, or **TRAPE'ZIUM,** a quadrilateral figure of unequal sides,



Trapezoid.

and consequently unequal angles. A trapezoid is usually said to have two sides parallel, but some geometers define the trapezium as having this character.

TRAPPE, La, Trappists. See La Trappe.

TRAVANCORE, a native Indian state, subsidiary to the presidency of Madras, occupying the extreme southwest of the peninsula; area, 6730 sq. miles. The principal agricultural products are rice, pepper, areca-nuts, cocoa, coffee, tobacco, and oil plants. Some sugar and salt are manufactured. Pop. 2,557,736.

TRAVELER'S TREE, an arborescent plant, native of Madagascar, having the appearance of a palm, and forming the only species of the genus to which it belongs. Its trunk terminates in a bundle of leaves, each of which is borne by a petiole often 10 feet in length, and has a blade about 6 feet long and 2½ to 3 feet broad. The seeds yield a flour, which is eaten by the natives, and the petioles a limpid and wholesome water, which often renders the tree a great resource for travelers; hence its name.

TRAV'ERSE CITY, the county-seat of Grand Traverse co., Mich., 60 miles northeast of Manistee; at the mouth of the Boardman river, on Grand Traverse bay, an inlet of Lake Michigan; and on the Pere Marquette, the Grand Rapids and Indiana, and the Manistee and Northeastern railroads. Pop. 11,216.

TRAWLING, a mode of fishing in which a net in the form of a large bag, with a strong framework keeping the mouth properly distended, is dragged along the bottom of the sea. It is the mode chiefly adopted in deep-sea fishing, but it is not allowed within three miles of the shore. Cod, whiting, and other white-fish are taken by it in large

Trawl-net attached to fishing-boat.

numbers, and some kinds of flat-fish, as soles, can scarcely be taken in any other way. Trawling can be practiced only on a smooth bottom, as a rough bottom would destroy the net. Trawling is sometimes objected to as destroying fish-spawn and immature fish, and so injuring the fishing-grounds. See Net.

TRAZ-OS-MONTES ("Beyond the Mountains"), a northeast frontier province of Portugal; area, 4260 sq. miles. The province is fertile in parts, and the wine-growing district of Alto Douro is the native country of port. The chief towns are Villa Real and Braganza. Pop. 396,676.

TREACLE. See Sugar.

TREAD-MILL, an instrument of punishment of modern origin, consisting of a large wheel, about 20 or 25 feet

wide, with steps on its external surface, upon which criminals are placed. Their weight sets the wheel in motion, and they maintain themselves in an upright posture by means of a horizontal bar fixed above them, of which they keep hold. The power thus obtained may be applied to the same purpose as water-power, steam, etc. The tread-mill has recently been abandoned in most penitentiaries. It was introduced into the prisons of Great Britain about 1820.

TREASON, High, treason is that crime which is directly committed against the supreme authority of the state, and is considered to be the greatest crime that can be committed.

TREASURY, Department of the, the executive department controlling the national finances of the United States, was established by act of congress in September, 1789. It is presided over by a secretary appointed by the president, who is a member of the cabinet, and second among the cabinet officers in the line of succession to the presidency. The department employs some 5000 persons at Washington with numerous bureaus, branches, and offices throughout the country. The only qualification for the office of secretary of the treasury is the negative one that he shall not be interested in foreign commerce. He is required to prepare plans for the revenue and public credit; to superintend the collection of the revenues, etc., etc., and to perform all such duties relative to the finances as shall be required by law. The development of the department has been extended to the management of the national debt, the supervision of the national banks, the internal revenue system, the legal-tender currency, the merchant marine, the lighthouse system, the life-saving and marine hospital services, the coast survey, etc.

TREATY, an agreement, league, or contract between two or more nations or sovereigns formally signed by commissioners properly authorized, and ratified by the several sovereigns, or the supreme power of each state. Treaties are of various kinds, as treatises for regulating commercial intercourse, treaties of alliance, offensive and defensive, treaties of peace, etc. In most monarchies the power of making and ratifying treaties is vested in the sovereign; in republics it is vested in the chief magistrate, senate, or executive council; in the United States of America it is vested in the president by and with the consent of the senate. Treaties may be concluded and signed by diplomatic agents, but these, of course, must be furnished with full powers by the sovereign authority of their states

TREBIZOND', a seaport in Asiatic Turkey, capital of a pashalic of the same name, on the Black sea. Pop. estimated at 50,000.

TREBLE, in music, the highest vocal or instrumental part in a concerted piece, such as is sung by women or boys, or played by instruments of acute tone, as the violin, flute, oboe, clarinet, etc., or on the higher keys of the piano, organ, etc.; so called because it was originally a third part added to the ancient canto fermo and the counterpoint,

TREE, a perennial plant having a woody trunk of varying size, from which spring a number of branches, having a structure similar to the trunk. Trees are thus distinguished from shrubs, which have perennial stems but have no trunk properly so called; and from herbs, whose stems live only a single year. It is difficult, however, to fix the exact limit between trees and shrubs. Trees are both endogenous and exogenous, by far the greater number both of individuals and of varieties belonging to the latter class. Those of which the whole foliage falls off periodically, leaving them bare in winter, are called deciduous; those of which the foliage falls only partially, a fresh crop of leaves being always supplied before the mature leaves are exhausted, are called evergreen. Trees are the longest lived organisms of the vegetable kingdom, and attain a great and indefinite age, far exceeding that of animals. The maximum age of different trees is as follows:

	Years.
Palm	250
Elm	355
Cypress	388
Ivy	448
Maple	510
Larch	576
Lemon	646
Plane	720
Cedar	800
Chestnut	860
Walnut	900
Lime	1,070
Spruce	1,206
Oak	1,600
Olive	2,000
Yew	2,880
Baobab	5,100
Dragon	5,900

Eucalyptus, or Australian gum-tree, sometimes grows twenty-four feet in three months; bamboo, two feet in twenty-four hours. See Arboriculture, Botany, Timber, etc.

TREE-CRAB, a crab of the genus included among the land-crabs. It breaks open the shell of the cocoa-nut, etc., by repeated blows of its great claws, in order to feed upon the soft pulp of the nut. Tree-crabs can live for long periods out of water, but deposit their eggs in the sea.

TREE-FERNS, the name given to several species of ferns which attain to the size of trees. They are found in tropical countries. A handsome species contains in its trunk a mucilaginous pulp comparable to sago, which is used extensively for food in Polynesia and New Zealand.

TREE-FROG, a name of frogs differing from proper frogs in the extremities of their toes, each of which is expanded into a rounded viscous pellet that enables the animals to adhere to the surface of bodies and to climb trees, where they remain during the summer feeding upon insects.

TREE-TOAD. See Tree-Frog.

TREFOIL, a distinctive title applied to plants of various kinds on account of a peculiarity of the form of the leaf, which consists of three leaflets; examples, buck bean, clover and medick. The same term is also applied to an ornamental foliation in Gothic architecture, used in the heads of window lights, tracery, paneling, etc.

American tree-toad.

TREM'OLITE, a mineral, a variety of hornblende. It is a silicate of calcium and magnesiums, is white or colorless, and usually occurs in long, prismatic crystals.

TRENT, Council of, a celebrated œcumenical council of the Roman Catholic church, convened to settle various controversies that were agitating the church during the Reformation period, and for the reform of abuses. It met during the pontificate of Paul III. at Trent in 1545, but the wars in Germany caused its transference to Bologna in 1546, when it dispersed. Pope Julius III. again convoked it at Trent in 1551, but it dispersed a year later on the approach of the Lutherans. Eight years afterward it was again called together by Pius IV., and it finished its labors in 1563. This council definitely settled the doctrines of the Roman Catholic church. Its decrees are embodied in what is known as the Creed of Pius IV.

TRENTON, the capital of New Jersey, on the Delaware at the head of tide-water and steamboat navigation, 50 miles southwest of New York. It is laid out with great regularity, and has

State Capitol, Trenton, N. J.

a state-house, court-house, governor's house, state-prison, etc. There are numerous manufacturing establishments (earthenware, iron and steel, etc.), and the trade is extensive. Pop. 100,000.

TREPANG, the sea-slug, a marine animal popularly known as "sea-cucumbers," or bêches-de-mer. It is found chiefly about coral reefs in the Eastern seas, and is a rather repulsive looking animal, somewhat resembling the land slug in shape, and varying in length from 6 to 24 inches. Sun-dried

trepangs are in special request in China for making soups. The fishery is carried on in numerous localities in the Indian

Trepang,

ocean, the Eastern archipelago, and on the shores of Australia.

TREPANNING, the operation of cutting a circular opening into the skull by means of a surgical instrument called a trepan or trephine. This consists of a handle, to which is fixed a small hollow steel cylinder, of about ½ to 1 inch in diameter, having teeth cut on its lower edge so as to form a circular saw. Trepanning is especially resorted to for the purpose of relieving the brain from pressure, as in fracture of the skull or in cerebral abscess.

TRES'COT, William Henry, American diplomatist, was born at Charleston, S. C., in 1822. In 1852 he became secretary of the United States legation in London, and was assistant secretary of state from June, 1860, until the secession of South Carolina. Among his published works are: Diplomacy of the Revolution, An American View of the Eastern Question, and Diplomatic History of the Administrations of Washington and Adams. He died in 1898.

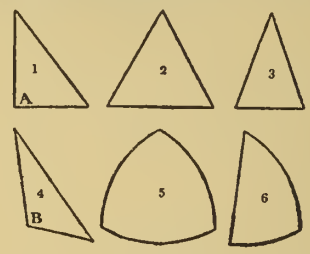
TRESPASS, in law, a term which is applied generally to any offense against the person or property of another, but is more especially applied to a peaceful but unlawful entry upon the property of another, the remedy for which is by an action of damages. Any injuries committed against land or buildings are in the most ordinary sense of the word trespasses, as entering another's house without permission, walking over the ground of another, or suffering any cattle to stray upon it, or any act or practice which damages the property, or interferes with the owner's or occupier's rights of possession. A creditor or customer can be ordered away by a householder or shopkeeper, and even the civil courts have no power to give a right of entry to officers intrusted with the execution of legal processes, though such officers may maintain possession if once they gain entrance.

TREVEL'YAN, Sir George Otto, Bart., the only son of Sir Charles E. Trevelyan, and nephew of Lord Macaulay, born in 1838. He is author of the Life and Letters of Lord Macaulay (2 vols. 1876), The Early History of Charles James Fox, etc.

TREVES, a town in the province of Rheinland, Prussia, on the right bank of the Moselle. It is considered the oldest city in Germany, and contains many Roman remains. The chief buildings are the cathedral, built at various times from the 6th century downward, and containing the Holy Coat (see Holy Coat of Treves); Church of our Lady, an elegant Gothic structure; and the old archiepiscopal palace, now used as a barracks. Pop. 39,993.

TRIAL. See Jury and Procedure, Civil.

TRIANGLE, in geometry, a figure bounded by three lines and containing three angles. The three angles of a plane triangle are equal to two right angles or 180°, and its area is equal to half that of a rectangle or parallelogram of the same base and altitude. The triangle is the most important figure in geometry, and may be considered the element of all other figures. If the three lines or sides of a triangle are all straight, it is a plane or rectilinear triangle, as in Figs. 1, 2, 3, 4. If all the three sides are equal, it is an equilateral triangle, as in Fig. 2. If two of the sides only are equal, it is an isosceles triangle, Fig. 3. If all the three sides are unequal, it is a scalene triangle, Fig. 4. If one of the angles is a right angle,



Triangles.

the triangle is right-angled, as Fig. 1, having the right angle at a. If one of the angles is obtuse, the triangle is called obtuse-angled, as Fig. 4, having the obtuse angle b. If all the angles are acute, the triangle is acute-angled, as Figs. 2, 3. If the three lines of a triangle are all curves, the triangle is said to be curvilinear, as Fig. 5. If one or two of the sides are straight and others are other curve, the triangle is said to be mixtilinear, Fig. 6. If the sides are all arcs of great circles of the sphere, or arcs of the same circle, the triangle is said to be spherical.

TRI'BUNE, in Roman antiquity, originally an officer connected with a tribe, or who represented a tribe for certain purposes; especially, an officer or magistrate chosen by the people to protect them from the oppression of the patricians or nobles, and to defend their liberties against any attempts that might be made upon them by the senate and consuls. These magistrates were at first two, but their number was increased to five and ultimately to ten. This last number appears to have remained unaltered down to the end of the empire. There were also military tribunes, officers of the army, each of whom commanded a division or legion, and also other officers called tribunes, as, tribunes of the treasury, of the horse, etc. See Rome (History).

TRICHINA (tri-kī'na), a minute nematoid worm, the larva of which was discovered in 1835 in the tissue of the voluntary muscles of man, giving rise to a disease since known as trichiniasis or trichinosis. The worm is common also to several other mammals, and especially to the pig, and it is generally from it that man receives the disease. When a portion of flesh, say of the pig, containing larvæ is taken into the stomach the larvæ in a few days becomes developed into procreative adult worms, having in the meantime passed into the intestines. The male worm is about $\frac{1}{10}$th of an inch long, the female about a half more. The female produces embryos in extraordinary numbers, which gain entrance into the muscles by penetrating the mucous coat of the intestine and entering the capillaries, whence they are carried to their habitat by the circulation. There they disorganize the surrounding tissue, setting up at the same time morbid action in the system, manifested by swelling of the face, body, and limbs, fever, pains, etc., and resulting sometimes in death. In the muscles they become quiescent, are encased in a cyst covered with calcareous matter, and may give no more trouble. Thorough cooking kills the trichinæ and thus prevents infection.

TRICHINOP'OLY, a town of British India, capital of district of same name, in the presidency of Madras, on the right bank of the Cavery. Pop. 104,721.

TRICOLOR, the French national flag, or one formed after the model of it. The French tricolor is blue, white, and red in equal vertical sections, the blue being next the flag-staff.

TRIDEN'TINE COUNCIL, the Council of Trent. See Trent.

TRIEST', a seaport town in Austria, 214 miles southwest of Vienna, on a gulf of same name, at the northeastern extremity of the Adriatic. The chief buildings are an ancient cathedral in the Byzantine style, and the exchange block of buildings, which is a handsome edifice. Triest is the chief Austrian port, and the most important trading place in the Adriatic, and has now very extensive harbor accommodation. Pop. 178,672.

TRIFORIUM, in Gothic churches, a gallery or open space between the arches of the nave and the roof of the aisles below the clere-story lighted by windows opening into the interior of the building.

TRI'GLYPHS, in architecture, are ornaments in the frieze of the Doric order, repeated at equal intervals. Each triglyph consists of a square block, on

Frieze of Roman Doric Order.
ttt, Triglyphs. *mm*, Metopes.

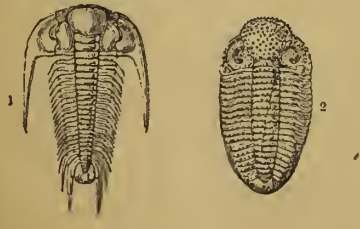
which are cut two perpendicular channels of triangular section, and one half channel on either side of these.

TRIGONOMETRICAL SURVEY, the survey of a country which is carried on from a single measured base-line, by trigonometrical computation made from observed angular distances. The most minute accuracy and the most perfect instruments are required in all the practical parts of such operations; and it becomes necessary to have regard to the curvature of the earth's surface, the effects of temperature, refraction, alti-

tude above the level of the sea, and a multitude of circumstances which are not taken into account in ordinary surveying. In conducting a trigonometrical survey of a country, signals, such as spires, towers, poles erected on elevated situations or other objects, are assumed at as great a distance as will admit of distinct and accurate observations by means of telescopes of considerable power attached to the instruments used in measuring the angles. In this way, starting from a measured baseline, the country will be divided into a series of connected triangles called primary triangles; and any side of any one of these being known the remaining sides of all of them may be computed by trigonometry. By means exactly similar, each of these triangles is resolved into a number of others called secondary triangles; and thus the positions of towns, villages, and other objects are determined. The length of the base or line measured, which is an arc of a great circle, must be determined with extreme accuracy, as an error in measuring it would affect the entire survey.

TRIGONOMETRY, the science of the measurement of triangles. Trigonometry is of two kinds, plane and spherical the former treating of triangles described on a plane, and the latter of those described on the surface of a sphere. In every triangle there are six things which may be considered, viz.: the three sides and the three angles, and the main object of the theoretical part of trigonometry is to deduce rules by which, when some of these are given, the others may be found by computation. In plane trigonometry any three of the six parts of a triangle being given (except the three angles), the other parts may be determined; but in spherical trigonometry, this exception has no place, for any three of the six parts being given, the rest may thence be determined, the sides being measured or estimated by degrees, minutes, etc., as well as the angles. Both plane and spherical trigonometry is divided into right-angled and oblique-angled. Solutions of triangles are worked by means of tables of the values of the trigonometrical functions, and the processes are much facilitated by the use of logarithms. See Logarithm.

TRI'LOBITES, an extinct and widely-distributed family of palæozoic crustacea, nearly allied to the Phyllopoda. Trilobites are especially characteristic



Trilobites.
1, Paradoxides bohemicus. 2, Phacops latifrons.

of the Cambrian and Silurian strata; a number of genera appear in the Devonian, a few in the Carboniferous, none higher. They are named from the fact that the body is divided into three lobes, which run parallel to its axis. They feed on small water animals, and vast numbers inhabited the shallow water near coasts. When attacked they could roll themselves into a ball. Up till recent times no antennæ or limbs belonging to these animals were known, but latterly a certain number have been found. The eye-lenses are frequently beautifully preserved so as to be perceptible by the naked eye. In one species each eye has 400 facets, and in another 6000. The species vary greatly in size, some being no larger than a pin's head.

TRI'LOGY, a series of three dramas, each of them in a certain sense complete in itself, yet bearing a mutual relation to each other, and forming but parts of one historical and poetical picture. The term belongs more particularly to the Greek drama, where three tragedies, connected in subject, together with a humorous piece, were performed in immediate succession.

TRINIDAD', one of the British West India islands, and, excepting Jamaica, largest and most valuable. It is the most southerly of the Windward group, lies immediately off the northeast coast of Venezuela, and is about 55 miles long by 40 miles broad; area, 1755 sq. miles. The chief products are sugar, cocoa, molasses, rum, cocoa-nuts, pitch, timber, and fruits. The climate is healthy, and though hot is well suited to Americans. The chief exports are sugar, rum, cocoa, molasses, and pitch. The capital, Port of Spain, on the northwest side of the island, is one of the finest towns in the West Indies. Pop. 260,815.

TRINITY, a theological name given to the Deity as expressive of the Christian doctrine of the Triune nature of God, the union of the Father, the Son, and the Holy Spirit as Three Persons and One God. The doctrine of the Trinity is nowhere expressly taught in the Old Testament, but in the New Testament it is clearly taught, though the word Trinity does not occur. The definition of the Trinity adopted by the Catholic church, and generally accepted by orthodox Christians, is that there are in the Godhead three persons, one in substance, co-eternal, equal in power, the Father, Son, and Holy Ghost. The Eastern church holds that the Holy Ghost proceeds from the Father; the Western, throughout all its divisions, adopting the amended form of the Nicene Creed, holds that he proceeds from the Father and the Son. The three creeds commonly called the Apostles', the Athanasian, and the Nicene, all contain the points of agreement between the two divisions of the church, while on the point of difference the Athanasian and the commonly known form of the Nicene express the faith of the Western church. The term persons is not used in Scripture of the Trinity, but something analogous to the conception of personality seems to be implied in the apostolic arguments of the epistles.

TRINITY SUNDAY, the Sunday after Whitsunday. It was definitely established as a church festival by Pope John XXII. in 1334. All the principal feasts occur in the half-year between Advent Sunday and Trinity, and all the Sundays from Trinity to Advent are called Sundays after Trinity.

TRIPLE ALLIANCE. Four treatics in European politics are known by this name. The first was formed in 1668 by Great Britain, Sweden, and the Netherlands against Louis XIV.; the second in 1717 by Great Britain, France, and Holland against Spain, then governed by Cardinal Alberoni; the third by Great Britain, Russia, and Austria against France (1795); the fourth by Germany, Austria-Hungary, and Italy, in the interests of peace (1887).

TRIPLET, in music, a combination of three notes to be played in the time of two. They are joined by a slur and distinguished by having the figure 3 above them.

TRIPOD, anciently a bronze altar consisting of a caldron raised on a three-legged stand of bronze. Such was the altar of Apollo at Delphi. Tripods of

Antique tripod.

fine workmanship and of precious metals were placed in later times as votive gifts in the temples, especially that of Apollo.

TRIP'OLI, a country in the north of Africa, forming a portion of the Turkish empire since 1835, is bounded on the north by the Mediterranean, west by Tunis, south by Fezzan and the Libyan Desert, and east by the Libyan Desert and Barca; area, about 106,000 sq. miles, and with Fezzan and Barca, which are included in the Turkish vilayet, about 344,000 sq. miles. The population, which in the outlying districts consists of Berbers and Bedouins and in the town chiefly Moors, is estimated at 1,150,000.—Tripoli, the capital, stands on a tongue of land projecting into the sea. Pop. about 30,000.

TRIPTYCH (trip'tik), a picture, carving, or other representation in three compartments side by side; most frequently such as is used for an altar-piece. The central picture is usually complete in itself. The subsidiary

Triptych—Painting by Allegretto Nucci, 1465.

designs on either side are smaller, and frequently correspond in size and shape to one half of the principal picture.

TRI'REME, a galley or vessel with three benches or ranks of oars on a side, a common class of warship among the ancient Greeks, Romans, Carthaginians, etc. The trireme was also provided with a large square sail, which could be raised during a fair wind to relieve the rowers, but was never employed in action.

TRITONS, in Greek mythology, the name of certain sea-gods. They are variously described, but their body is always a compound of the human figure

Triton with Nereid—From an antique sculpture in the Vatican.

above with that of a fish below. They carry a trumpet composed of a shell, which they blow at the command of Poseidon to soothe the waves.

TRI'UMPH, in Roman antiquity, a magnificent procession in honor of a victorious general, and the highest military honor which he could obtain. It was granted by the senate only to one who had held the office of dictator, of consul, or of prætor, and after a decisive victory or the complete subjugation of a province. In a Roman triumph the general to whom this honor was awarded entered the city of Rome in a chariot drawn by four horses, crowned with laurel, and having a scepter in one hand and a branch of laurel in the other. He was preceded by the senate and the magistrates, musicians, the spoils, the captives in fetters, etc., and followed by his army on foot, in marching order. The procession advanced in this order along the Via Sacra to the capitol, where a bull was sacrificed to Jupiter, and the laurel wreath deposited in the lap of the god. Banquets and other entertainments concluded the solemnity. A naval triumph differed in no respect from an ordinary triumph, except that it was upon a smaller scale, and was characterized by the beaks of ships and other nautical trophies.

TRIUM'VIR, one of three men united in office. The triumvirs of Rome were either ordinary magistrates or officials, or else extraordinary commissioners who were frequently appointed to jointly execute any public office. But the men best known in Roman history as triumvirs were rather usurpers of power than properly constituted authorities. The term triumvirate is particularly applied in Roman history to two famous coalitions, the first in 59 B.C. between Cæsar, Pompey, and Crassus; the second in 43 B.C. between Antony, Octavian, and Lepidus. See Rome (History).

TROAD. See Troy.

TROCHEE, in prosody, a foot of two syllables, the first long and the second short, as Lat. fāma, or Eng. nation.

TROCHILIDÆ. See Humming-bird.

TROCHU (tro-shü), Louis Jules, French general, born in 1815, died in 1896; educated at St. Cyr; engaged in the Algerian, Crimean, and Italian campaigns; published a pamphlet entitled L'Armée Française en 1867, and showed the weakness of the French army, by which he forfeited the favor of Napoleon. At the outbreak of the Franco-German war (1870), however, he was made governor of Paris, and when the republic was proclaimed he was intrusted with the defense of the city, a position which he held until the capitulation.

TROG'LODYTE, a cave-dweller; one dwelling in a cave or underground habitation. The ancient Greeks gave the name to various races of savages inhabiting caves, especially to the cave-dwellers on the coast of the Red sea and along the banks of the Upper Nile in Nubia and Abyssinia, the whole of this district being known by the name Troglodytikē. Archæological investigations show that cave-dwellers everywhere probably preceded house-builders.

TROLLOPE, Anthony, English novelist, was born in London 1815, died 1882. His first success was The Warden, followed by Barchester Towers, Dr. Thorne, The Bertrams, Framley Parsonage, The Last Chronicles of Barset, Phineas Finn, The Way We Live Now, etc. He also published accounts of his travels, besides a Life of Cicero, a sketch of Thackeray's Life, and his own Autobiography.

TROLLS, in Northern mythology, a name of certain supernatural beings, in old Icelandic literature represented as a kind of giants, but in modern Scandinavia regarded as of dimunitive size, and represented as a kind of mischievous imps or goblins.

TROMBONE, a deep-toned brass instrument of the trumpet kind, consisting of three tubes; the first, to which the mouthpiece is attached, and the third, which terminates in a bell-shaped orifice, are placed side by side; the middle tube is doubled, and slides into

1, Valve trombone. 2, Slide trombone.

the other two like the tube of a telescope. By the manipulation of the slide the tube of air is altered in length, and the pitch accordingly varied. The trombone is of three kinds, the alto, the tenor, and the bass; and some instruments are fitted with pistons when they are known as valve trombones.

TROMP, Martin Harpertzoon, the son of a Dutch naval officer, was born at Briel in 1597. He went to sea with his father in 1607; received the appointment of lieutenant-admiral; gained a decisive victory over the Spanish and Portuguese fleet near Dunkirk in 1639; encountered Blake and Monk in 1653, and in the same year he again encountered Monk and was killed in the battle.

TROOPIAL, the name common to a group of passerine birds, akin to the orioles and starlings. They mostly inhabit the southern United States, but several of them appear as birds of passage in the northern states in early spring. The cow-troopial, cow-bird, or cow-bunting, the blue-bird, and the bobolink or rice-bunting, belong to this group. See these articles.

TROPIC-BIRD, the common name of the natatorial or swimming birds belonging to the pelican family, peculiar to tropical regions. They are distinguished

Tropic-bird.

by two very long, slender tail-feathers. They are wonderfully powerful on the wing, being able to pass whole days in the air without needing to settle.

TROPICS, in astronomy, two circles on the celestial sphere, whose distances from the equator are each equal to the obliquity of the ecliptic, or 23½° nearly. The northern one touches the ecliptic at the sign Cancer, and is thence called the tropic of Cancer, the southern one being for a similar reason called the tropic of Capricorn. The sun's annual path in the heavens is bounded by these two circles, and they are called tropics, because when the sun, in his journey northward or southward, reaches either of them, he, as it were, turns back, and travels in an opposite direction in regard to north and south. Geographically the tropics are two parallels of latitude, each at the same distance from the terrestrial equator as the celestial tropics are from the celestial equator. The one north of the equator is called the tropic of Cancer, and that south of the equator the tropic of Capricorn. Over these circles the sun is vertical when farthest north or farthest south, that is, at the solstices, and they include between them that portion of the globe called the torrid zone, a zone 47° wide, having the equator for its central line.

TROU'BADOUR, a name given to a class of early poets who first appeared in Provence, in France. They flourished from the 11th to the latter part of the 13th century, their principal residence being the south of France, but they also lived in Catalonia, Arragon, and North Italy. The most renowned among the troubadours were knights who cultivated music and poetry as an honorable accomplishment; but their art declined in its later days, when it was chiefly cultivated by minstrels of a lower class.

TROUS-DE-LOUP (trö-dė-lö), a military term for trap-holes or pits dug in the ground in the form of inverted cones

Trous-de-loup.

or pyramids, in order to serve as obstacles to the advance of an enemy each pit having a pointed stake in the middle.

TROUT, the common name of various species of salmon, as the bull-trout, the salmon-trout, the common trout, and the great gray or lake trout. The common trout abounds in all the rivers and lakes of Northern Europe, and is found even in the smallest streams. The brook-trout of America and the common American lake-trout are among several species of lake-trout in America, among the finest and largest of which is the Mackinaw trout. The great gray or lake trout of Britain weighs sometimes 30 lbs., while the North American lake-trout may reach 60 lbs.

TROY, or **ILIUM,** an ancient city in the Troad, a territory in the northwest of Asia Minor, south of the western extremity of the Hellespont rendered famous by Homer's epic of the Iliad. The ancient and legendary city, according to the Homeric story, reached its highest splendor when Priam was king; but the abduction of Helen, wife of Menelaus, king of Sparta, by Paris, one of Priam's sons, brought about its destruction. To revenge this outrage all the Greek chiefs afterward famous in history banded themselves against the Trojans and their allies, and went against Troy with a great fleet. The first nine years of the war were spent by the Greeks in driving the Trojans and their allies within the walls of the capital. The tenth year brought about a quarrel between Achilles, the bravest of the Greeks, and Agamemnon, the Greek commander-in-chief, which proved for a time disastrous to their party, and which forms the subject of the Iliad. In the end the city was taken by means of a large hollow wooden horse, in which a number of the bravest of the Greek heroes concealed themselves, while the rest retired to their ships. Thinking that the Greeks had given up the siege, the Trojans incautiously drew the horse within the city, and gave themselves up to revelry. The Greeks within the horse issued from their concealment, and being joined by their companions without the walls, Troy was taken and utterly destroyed. This is said to have occurred about 1184 B.C.

TROY, the capital of Rensselaer co., New York, on the left bank of the Hudson river. It has a fine court-house, a lyceum, a celebrated female institute, a public library, a government arsenal, etc. It has paper, saw, cotton, and flour mills; manufactures of leather, woolen cloth, cordage, earthenware; and ships large quantities of lumber, flour, grain, beef, pork, wool, etc. Pop. 1909, 76,000.

TROY WEIGHT, a weight chiefly used in weighing gold, silver, and articles of jewelry. The pound troy contains 12 ounces; each ounce is divided into 20 pennyweights, and each pennyweight into 24 grains. Hence the pound contains 5760 grains, and the ounce 480 grains. As the avoirdupois pound (the weight in general commercial use) contains 7000 grains, and the ounce 437½ grains, the troy pound is to the avoirdupois as 144 to 175, and the troy ounce to the avoirdupois as 192 to 175.

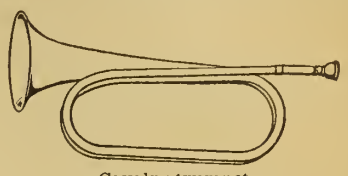
TRUFFLE, a genus of fungi growing underground. The common truffle is of a fleshy fungous structure and roundish figure, without any visible root; of a dark color, approaching to black, and studded over with tubercles, and varies in size from that of a large plum to that of a large potato. It is much sought after as an ingredient in certain high-seasoned dishes. There being no appearance above-ground to indicate the existence of the truffle, dogs are trained to find this fungus by the scent and scratch it up.

TRUMBULL, John, American historical and portrait painter, was born at Lebanon, Conn., in 1756. In 1784 he went to Paris, where he painted his first historical picture, "The Signing of the Declaration of Independence," which, with the "Surrender of Burgoyne," "Surrender of Cornwallis," "Resignation of Washington at Annapolis," hang in the capitol at Washington. Among his principal works are the "Battle of Bunker Hill," "Death of Montgomery," "Battle of Princeton," "Battle of Trenton," and portraits of Washington, Hamilton, the Duke of Wellington, and others. In 1794 he was secretary of legation in England; and from 1816 to 1825 was president of the Academy of Fine Arts, New York, in which city he died November 10, 1843.

TRUMBULL, Jonathan, an American patriot and political leader, was born at Lebanon, Conn., in 1710. From 1769 to 1783 he was governor of Connecticut, was the only one of the colonial governors who gave his unqualified support of the patriot party. According to a long accepted tradition he was called by Washington "Brother Jonathan," a phrase which later came into general use to personify the United States. He died in 1785.

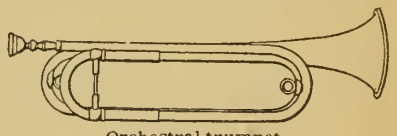
TRUMBULL, Lyman, American jurist, was born at Colchester, Conn., in 1813. He moved to Illinois in 1837. In 1841 he became secretary of state, and in 1848 was elevated to the supreme bench of the state. He was elected to congress as a Democrat in 1854, and while serving as representative was chosen United states senator for the term commencing March 4, 1855. In 1861 he was reëlected to the senate, where he took an active part in securing the passage of the constitutional amendment providing for the abolition of slavery, and was one of the republicans who voted against the impeachment of Andrew Johnson. Since that occurrence he had acted with the democratic party, having been the democratic nominee for governor of Illinois in 1880. He died in 1896.

TRUMPET, a wind-instrument of music of the highest antiquity, having a clear ringing and penetrating tone. In its modern form it consists of a metal tube (usually brass, sometimes silver), about 8 feet long, doubled up in the form of a parabola, becoming conoid



Cavalry trumpet.

in the last fold, and expanding into a bell-shaped end, the other end being fitted with a mouthpiece by which the instrument is sounded. By means of crooks and slides the length of the tube



Orchestral trumpet.

can be increased, and the pitch correspondingly lowered. Trumpets are also sometimes fitted with pistons, valves, or keys, by which the intermediate tones and semitones can be produced.

TRUMPETER, a genus of grallatorial or wading birds, found in South America, and so named from their hollow cry. The most familiar species is the golden-breasted trumpeter, a bird of the size of a pheasant, which is readily tamed, and becomes a favorite inmate of the house.

TRUMPETS, Feast of, a feast among the Jews, held on the first and second days of the month Tisri, which was the commencement of the Jewish civil year. It derived its name from the blowing of trumpets in the temple with more than usual solemnity.

TRUNK-HOSE, a kind of short wide breeches gathered in above the knees, or immediately under them, and distinguished according to their peculiar

Trunk-hose.

1. Charles IX. of France, 1550-1574.
2. Robert Carr, Earl of Somerset, died 1645.

cut as French, Gallic, or Venetian. This garment prevailed during the time of Henry VIII., Elizabeth, and James I.

TRUSTEE', in law, a person to whom property is legally committed in trust for the benefit of some other party or

parties, or for some special purpose. The person for whom or in whose favor the trustee holds the estate, or any interest therein, is called the cestui que trust. No one is compelled to undertake a trust, but if he once accepts he cannot renounce it unless the trust-deed contains a provision enabling him to do so, or a competent court grants him a discharge, or by the consent of all those beneficially interested in the estate. Trustees are liable for the consequences of any breach of trust however innocent, and the estate of a trustee deceased, who has misapplied the trust fund, is liable for the deficiency; but generally speaking, the law only requires of a trustee the same amount of care and prudence he would be expected to display in managing his own affairs. Where there are several trustees, each is liable for his own acts and receipts only, unless where there has been common agreement and organization. As their office is considered purely honorary, trustees are not entitled to any allowance for their trouble in connection with the trust. They may not invest the trust-funds on personal security, or in stock of a private company, unless specially authorized to do so by the trust-deed; but they are permitted to invest in government stocks, debenture, preference, or guaranteed stock of railways, stock of municipal corporations, and generally on satisfactory real security.

TSETSE-FLY, a South African two-winged insect akin to the gad-fly, whose bite is often fatal to horses, dogs, and cows, but is innoxious to man and wild beasts. It is a little larger than the common house-fly, and the symptoms of its bite are that the eyes and the nose begin to run, the coat stares as if the

Tsetse, four times natural size.

animal were cold, a swelling appears under the jaw and sometimes at the navel, and if the animal does not die at once, emaciation commences, accompanied with a peculiar flaccidity of the muscles, and this continues unchecked until, perhaps months afterward, purging comes on, and the animal perishes in a state of extreme exhaustion.

TUBER, in botany, an underground fleshy stem or appendage to the root, being usually an oblong or roundish body, of annual duration, composed chiefly of cellular tissue with a great quantity of amylaceous matter, intended for the development of the stems or branches which are to spring from it, and of which the rudiments, in the form

Tuberous roots.

of buds, are irregularly distributed over its surface. Examples are seen in the potato, the Jerusalem artichoke, and arrow-root.

TUBERCULOS'IS, the term applied to a general disease due to the formation of tubercles in various organs of the body. The prevalence of tuberculosis in cattle, and the possibility of tuberculosis cattle communicating the disease to human beings through the medium of the meat of slaughtered animals sold for food, have recently occasioned profound anxiety and much discussion. See Consumption.

TUBEROSE, a plant originally brought from the East, cultivated both for its perfume and for its beautiful white flowers. It has a bulbous root, and an upright branchless stem growing to the height of 3 or 4 feet.

TUBULAR BRIDGE. See Bridge.

TUCKAHOE', a singular vegetable found in the southern seaboard states of the United States, growing underground, like the European truffle. It is also called Indian bread and Indian loaf. It is referred to a genus of spurious fungi, but in all probability it is a peculiar condition of some root, though of what plant has not been properly ascertained.

TUCUMAN', or San Miguel de Tucuman, a town of the Argentine republic, capital of the province of same name. Pop. about 34,300. The province is fertile, and has a fine climate; area, 13,500. Pop. 249,433.

TUDOR, the family name of an English royal line founded by Owen Tudor of Wales, who married the widowed queen of Henry V. The first of the Tudor sovereigns was Henry VII.; the last, Elizabeth.

TUDOR STYLE, in architecture, a name frequently applied to the latest Gothic style in England, being the last phase of the perpendicular, and sometimes known as Florid Gothic. The period of this style is from 1400 to 1537; but the term is sometimes extended so as to include the Elizabethan period also, which brings it down to 1603. It is the result of a combination of the Italian style with the Gothic. It is characterized by a flat arch, shallow mouldings, and a profusion of panelling on the walls.

TUESDAY, the third day of our week, so called from the Anglo-Saxon god of war, Tiu.

TUILERIES (twēl-rēz'; from Fr. tuile, a tile, because the spot on which it was built was formerly used for the manufacture of tiles), the residence of the French monarchs, on the right bank of the Seine, in Paris. Catharine de' Medici, wife of Henry II., began the building (1564); Henry IV. extended it, and founded the old gallery (1600); and Louis XIV. enlarged it (1654), and completed that gallery. The side toward the Louvre consisted of five pavilions and four ranges of buildings; the other side had only three pavilions. During the revolution of 1830 the palace was sacked. It was restored by Louis Philippe to its former splendor, but in 1848 it was again pillaged. The Tuileries then became a hospital for wounded, a picture-gallery, and the home of Louis Napoleon in 1851. On the 23d May, 1871, it was almost totally destroyed by fire (the work of the communists), and the remaining portions were removed in the year 1883.

Tudor architecture; Hengrave hall, Suffolk, 1538.

TULA, a government of Central Russia; area, 11,954 sq. miles. Pop. 1,409,432.—Tula, the capital, is situated on the Upa, 107 miles south of Moscow. It is the residence both of a civil and a military governor, the see of a bishop, and has extensive manufactures of fire-arms, as also cutlery, ornamental steel-work, platina snuff-boxes, silks, hats, soap, candles, cordage, and leather. Pop. 111,048.

TULIP, a genus of plants. The species are bulbous herbaceous plants, and are extensively cultivated in gardens. About forty species have been described, of which the most noted is the common garden tulip, a native of the Levant. Upward of 1000 varieties of this plant have been enumerated. The sweet-scented tulip is much prized for its fragrance. About the middle of the 17th century an extraordinary tulip mania prevailed in Holland. Enormous sums were given for bulbs, the ownership of a bulb being often divided into shares, in which men speculated as they do in ordinary stocks or shares.

TULIP-TREE, an American tree bearing flowers resembling the tulip. It is one of the most magnificent of the forest trees in the temperate parts of North America. Throughout the states it is generally known by the name of poplar, white wood, or canoe-wood. The wood is light, compact, and fine-grained, and is employed for various useful purposes The bark, especially of the roots, has an aromatic smell and bitter taste, and has been used in medicine as a tonic and febrifuge.

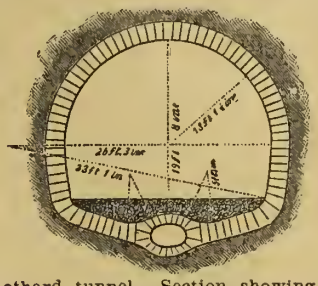
TUMOR, in surgery, in its widest sense, a morbid enlargement or swelling of any part of the body or of any kind; more strictly, however, it implies a permanent swelling occasioned by a new growth, and not a mere enlargement of a natural part, which is called hypertrophy. Tumors may be divided into two well-defined classes: (a) Simple, benign, or innocent tumors, the substance of which has anatomical resemblance to some tissues of the body; they gradually increase in size, and generally only produce inconvenience from the great bulk they sometimes attain; a complete cure may be effected by simple excision. (b) Malignant tumors, which bear no resemblance in substance to normal tissue; they are exceedingly liable to ulceration, they invade all the textures of the part in which they occur, affecting the mass of the blood, and terminate fatally; when excised they are apt to recur not only in the immediate neighborhood of the previous site, but also in remote parts of the body. This recurrence in remote parts is due to transference of some of the elements of the tumor by means of lymphatic or blood vessels. Hence if a malignant tumor is to be excised it must be done early to avoid such secondary infection if possible. Innocent tumors are often named from the tissues in which they occur, as adipose, or fatty tumors, fibrous tumors, cartilaginous tumors, bony tumors, and the like. Of the malignant class cancer is a well-known example. See Cancer.

TUNGSTEN, a metal discovered in 1781; atomic weight 184. It has a grayish white color and considerable luster. It is brittle, nearly as hard as steel, and less fusible than manganese. The ores of this metal are the native tungstate of lime and the tungstate of iron and manganese, which latter is also known by the name of wolfram.

TUNIC, an ancient form of garment in constant use among the Greeks. Among the Romans the tunic was an under garment worn by both sexes (under the toga and the palla), and was fastened by a girdle or belt about the waist. The term is also used ecclesiastically to denote a dress worn by the sub-deacon, made originally of linen, reaching to the feet, and then of an inferior silk, and narrower than the dalmatic of the deacon, with shorter and tighter sleeves.

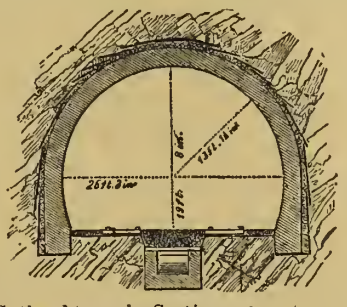
TUNIS, a country of North Africa, now a French protectorate, is bounded on the north and northeast by the Mediterranean, on the southeast by Tripoli, and on the west and southwest by Algeria; area, estimated at 42,000 sq. miles. The manufactures consist chiefly of woolen fabrics, soap, dyed skins, and ordinary and morocco leather. The inhabitants consist of a mixture of Moors and Arabs, along with Berbers, here called Kroumirs, occupying the elevated tract north of the valley of Mejerdah. Almost the only building of importance is the palace of the bey in the Moorish style; the bazaars are also interesting, and under French direction a cathedral and other buildings, have been erected, and schools, etc., established. Tunis has been recently connected directly with the Mediterranean by a deep channel cut through the lagoon. Pop. about 170,000.

TUNNEL, a subterranean passage cut through a hill, a rock, or any eminence, or under a river, a town, etc., to carry a canal, a road, or a railway in an advantageous course. In the construction of canals and railways tunnels are frequently had recourse to in order to preserve the desired level and for various



St. Gothard tunnel. Section showing construction in soft strata.

other local causes. Tunnels when not pierced through solid rock have usually an arched roof and are lined with brickwork or masonry. The sectional form of the passage is various. Among the greatest works of this kind are the tunnels of St. Gothard, Mont Cenis, the Arlberg, and the Simplon. In Britain the Severn and Mersey tunnels are noteworthy, while in America the Hoo-



St. Gothard tunnel. Section near entrance on Italian side.

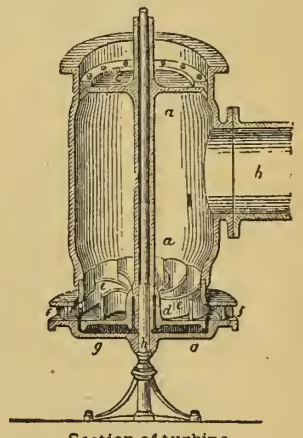
sac tunnel; that through the Cascade range in Washington and that under the St. Clair river connecting Detroit, Mich., and Windsor, Ont., are the most important. In recent years tunnels have been constructed to carry rapid transit railways under city streets and under rivers to connect cities such as those opened in 1908 between New York and Brooklyn and New York and Jersey City. See Subways.

TUNNY, a fish closely allied to the mackerel. These fish live in shoals in almost all the seas of the warmer and temperate parts of the earth. They are taken in immense quantities on the Mediterranean coasts, where the fishing is chiefly carried on. The flesh is delicate and somewhat resembles veal. The common tunny attains a length of from 4 feet to even 20 feet, and sometimes exceeds half a ton in weight. Its color is a dark blue on the upper parts, and silvery white below. The American tunny is found on the American coast from New York to Nova Scotia.

TUPPER, Martin Farquhar, born in London 1810, died 1889. He published a number of novels and plays, but his fame rests upon his Proverbial Philosophy, a work in a kind of blank verse which has gone through numerous editions.

TURBAN, a form of head-dress worn by the Orientals. It varies in form in different nations, and different classes of the same nation. It consists of two parts; a cap without a brim, fitted to the head; and a sash, scarf, or shawl, usually of cotton or linen, wound about the cap, and sometimes hanging down the neck.

TURBINE, a kind of horizontal water-wheel, made to revolve by the escape of water through orifices, under the influence of pressure derived from a fall. Turbines are now made after a vast variety of patterns. The oldest and simplest is the Scotch turbine, or Barker's mill. In another common form

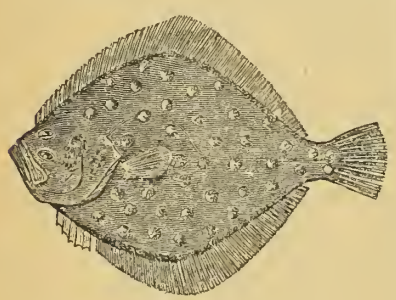


Section of turbine.

the water passes vertically down through the wheel between the fixed screw blades which give it a spiral motion, and then strike similar blades attached to a movable spindle, but placed in the opposite direction, so that the impact of the water communicates a rotary motion to the blades and spindles. Or the water may be passed from the center horizontally outward through fixed curved blades, so as to give it a tangential motion, and thereby cause it to act on the blades of the wheel which revolves outside. In the annexed cut the water is introduced into a close cast-iron vessel a by the pipe b, connecting it with the reservoir. Here, by virtue of its pressure, it tends to escape by any aperture which may be presented; but the only apertures consist of those between a series of curved float-boards ff, fixed to a horizontal plate g, mounted upon a central axis h, which passes upward through a tube connecting the upper and lower covers, c and d, of the vessel a. Another series of curved plates ee, is fixed to the upper surface of the disc d, to give a determinate direction to the water below before flowing out at the float-boards, and the curves of these various parts are so adjusted as to render the reactive force of the water available to the utmost extent in producing a circular motion, and thus carrying round the disc and the axis h with which the machinery to be impelled is connected. The steam turbine is a form of motor in which the moving force of expanding steam acts upon a wheel

provided with vanes so as to cause rotation. In the ordinary method of using steam it is admitted into a closed cylinder where it acts upon a movable piston; in the steam turbine the power is developed by particles of steam expanding from one pressure to another.

TURBOT, a well-known and highly esteemed fish. Next to the halibut, the turbot is the largest found on the British coast, and is the most highly esteemed for the table. It is of a short and broad form, brown on the upper side, which is



Turbot.

usually the left side, and attains a large size, sometimes weighing from 70 to 90 lbs. The American or spotted turbot, common on the coasts of New England and New York, attains a weight of 20 lbs.

TURENNE, Henri de la Tour d' Auvergne, Vicomte de, Marshal of France, born in 1611 at Sedan. He entered the service of France in 1630, served with distinction in Germany and North Italy, and in 1643 received the command of the army of the Rhine in the Thirty Years' war, and was made a marshal. His successes in this post, as in the battle of Nördlingen (1645), greatly contributed to the close of the war. During the disturbances of the Fronde the victories of Turenne led to the termination of the civil war. In the war against Spain he also distinguished himself, and after its close in 1659 he was named marshal-general of France. When war was renewed with Spain in 1667 he conquered Flanders in three months. In the Dutch war of 1672 Turenne had the chief command. He first marched against the elector of Brandenburg, and having driven him back as far as the Elbe forced him to sign the Treaty of Vossem in 1673; while in the brilliant campaign of 1674–75 he destroyed two Austrian armies by the battles of Mühlhausen and Türkheim, and conquered and devastated the Palatinate. In 1675 he was killed while making preparations to engage Montecuculi.

TURGOT (tur-gō), Anne Robert Jacques, was born at Paris in 1727, and died 1781. Shortly after the accession of Louis XVI. in 1774 Turgot was appointed comptroller-general of France, and in order to reform the political and financial condition of the country, he moderated the dutics on articles of the first necessity, freed commerce from many fetters, and encouraged industry by enlarging the rights of individuals, and abolishing the exclusive privileges of companies and corporations. Such, however, was the opposition of the clergy and nobility to his reforms that he was dismissed from office in 1776, and retired into private life.

TURGUENEFF. See Tourguenieff.

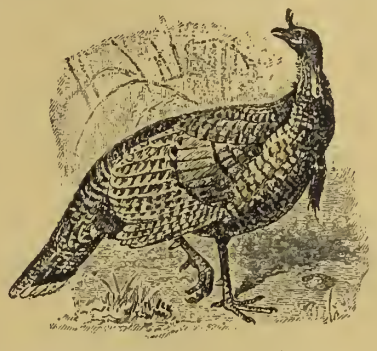
TURIN', a city of North Italy, capital of province of same name, at the confluence of the Dora Riparia with the Po, and between those two rivers. The manufactures consist, besides the staple of silk, chiefly of woolens, cottons, linen paper, irommongery, earthenware, and porcelain. Turin was anciently the capital of a tribe called the Taurini, and under the Roman empire was called Augusta Taurinorum. It was long the capital of Savoy, then of the Sardinian kingdom, and from 1861 to 1865 of United Italy. Pop. 335,639.

TURKESTAN, a wide region of Central Asia, roughly divided into two portions, Eastern Turkestan and Western Turkestan. Eastern or Chinese Turkestan is inclosed on three sides by lofty mountain ranges (Thian-Shan, Karakorum, Kuen-Lun), and on the east has the desert of Gobi. The products include cereals, root-crops, and cotton in large quantities, partly manufactured in the country. Carpets and felt cloths, along with silk, which the country produces abundantly, are exported to India, Kashmere, and Tibet; while opium, tea, linens and woolens are imported. The chief towns are Kashgar and Yarkand, and the population is estimated at 580,000 —Western Turkestan comprises the southern portion of Russian Central Asia, from Eastern Turkestan to the Caspian, and includes the khanates of Khiva and Bokhara. Corn, millet, rice, and cotton are cultivated in many places, and trade has greatly increased since the Russian occupation. The population may amount to 6,000,000. A portion of this territory forms the Russian general-government of Turkestan; area, 410,000 sq. miles; pop. 3,700,000.

TURKEY, a Mohammedan state of Southeastern Europe and Western Asia, under the rule of a sultan. In Europe it occupies a considerable portion of the Balkan peninsula, and in this portion is situated the capital, Constantinople, but the larger part of Turkey is in Asia. The immediate possessions of Turkey in Europe, or those directly under the sultan's rule, extend from Montenegro, Bosnia, Servia, and Eastern Roumelia on the north to the Ægean Sea and Greece on the south, and from the Black sea to the Adriatic, the Straits of Otranto and the Ionic sea. The Treaty of Berlin in 1878 greatly reduced the area under direct Turkish rule, besides confirming the independence and extending the limits of several of the formerly tributary states. There are still nominally under Turkey the tributary principality of Bulgaria, to which has been united Eastern Roumelia; and the semi-detached provinces of Bosnia, Herzegovina, and Novibazar, administered by Austria-Hungary. The immediate possessions in Europe have an area of 63,850 sq miles, pop. 5,711,000; in Asia, 729,170 sq. miles, pop. 16,823,500; in Africa (Tripoli), 398,873 sq. miles, pop. 1,000,000. Total, 1,191,893 sq. miles; pop. 23,534,500. A number of islands in the Ægean, the largest being Crete or Candia, belong to Turkey. Egypt also is nominally part of the Turkish dominions. European Turkey is traversed in different directions by numerous mountain chains, but the main systems are the Balkan range, stretching from west to east between Bulgaria and Eastern Roumelia to Cape Emineh on the Black sea; Rhodope, south of the Balkans; the Shardagh and Grammos on the west, continued northwestward under various names into Bosnia and Herzegovina. The most important river basin is that which drains into the Archipelago or Ægean sea, which receives the Vardar, the Struma, the Mista or Karasu, and the Maritza. The Adriatic and Ionian seas receive from Turkey no rivers worthy of notice, and the Sea of Marmora receives only a few mountain torrents. There are several plains remarkable for their fertility and beauty. The climate is not so mild as its latitude might seem to indicate, the winter being severe; but the summer heat is excessive. For the production of the ordinary cereals no part of the world is more admirably adapted. The principal grains are corn, wheat, and barley, while rice, millet, and buckwheat are produced, as also flax, hemp, sesame, and madder. The cultivation of tobacco and cotton is very general. Among fruits the figs are highly esteemed; the cultivation of the olive is carried on along the coasts of the Archipelago and the Adriatic; wine is an important product in many districts; and much attention is paid in some parts to the growing of roses (for otto or attar) There are few manufactures except in Constantinople, Adrianople, and Salonica, and these are of little importance. Turkey in Asia comprises the peninsula of Asia Minor, the country intersected by the Euphrates and the Tigris, the mountainous region of Armenia between their upper courses and the Black sea, the ancient lands of Syria and Palestine, and the coast strips of Arabia along the Red sea and Persian gulf. Omitting Arabia, the country consists mainly of (1) a high plateau traversed by the mountains of Taurus and Anti-Taurus, and stretching from the Archipelago to the borders of Persia; (2) a plateau of less elevation and extent (Syria and Palestine) traversed by the double range of Lebanon; and (3) the extensive plain of Mesopotamia on the Lower Tigris and Euphrates. (See Asia Minor, Armenia, Kurdistan, Mesopotamia, Syria, and Palestine.) The islands Chios, Lesbos, Rhodes, etc., belong to Turkey in Asia, while the island of Samos is a tributary principality, and Cyprus is held by Britain. The chief towns in Asiatic Turkey are Smyrna, Damascus, Bagdad, Aleppo, and Beyrout. The chief exports are raisins, figs, and dates, silk, cotton, wool, and mohair, opium, coffee, wheat, wine, valonia, olive-oil, and tobacco; while the imports are cotton, woolen, and silk goods, metals, iron, steel, glass wares, etc. The inhabitants of the Ottoman empire are of very diverse races. First in order are the Osmanli Turks, who, as the dominant race, are diffused over the country. They are proprietors of the greater part of the soil, fill all the civil and military

offices, live generally in towns employed in various trades, and are seldom agriculturists. The Greeks form the bulk of the population over great part of the Ægean coasts and islands, and constitute to a very considerable extent the mercantile and trading community of Turkey. Arnauts, or Albanians, are found in the west throughout Albania; the northwest is occupied by Servians; and Bulgarians inhabit the district south of the Danube and east of Servia and Albania. In Asiatic Turkey the Turks are an important element, but there are also numbers of Armenians, Arabs, Kurds, Jews, Greeks, Circassians, etc. The Turkish language belongs to the Turanian family of languages, and is allied to the Hungarian and the Finnish. The goverment of Turkey was despotic until 1908 when the movement known as Young Turkey extorted a Constitution and a Parliament from Abdul Hamid. The Cabinet now rules. The Monarch, usually designated the Sultan, is regarded by the Turks as the caliph or head of Islam. His edicts bear the name of Hatti-sherif, and his government is often designated as the Sublime Porte. The public officers who conduct the administration under the sultan are divided into three classes. The first class is that of law and religion, and at their head is the Sheik-ul-Islam, who governs a judicial and ecclesiastical body called the Ulemas. The second class consists of the "officials of the pen." or the members of administration, and at their head is the grand vizier or Sadrazam. The third class includes the "officials of the Sword," at their head being the Seraskier or minister of war, and the Capudan Pasha or minister of marine. The army on a war footing is said to number about 700,000, and it is believed that when the new system recently begun is complete, Turkey will have an army and reserve of 1,000,000 men. The navy numbers only a very few vessels of much fighting power, others being old and small. The financial condition of Turkey is thoroughly unsound. From 1854 the state had contracted a series of foreign loans, the total nominal capital of which amounted to about $1,140,000,000 in 1877. In 1875 the government announced that they would pay half the interest on the debt, but in 1876 they declared themselves unable to pay anything. In 1881 an arrangement was effected by delegates of the bondholders who met at Constantinople. The Turkish government then agreed to hand over the excise and other revenue to a commission representing the bondholders, so that interest to the extent of 1 per cent has been paid since 1882. Other debts have since been incurred, and the total is now $900,000,000, besides internal and floating debt. The established religion is Mohammedanism, but Christianity under the Greek form is professed by a large majority of the Greeks and Bulgarians, while part of the Albanians are Roman Catholics. The educational system in accordance with the law of 1869, provides for the erection of elementary schools in every commune, and of secondary schools in the larger towns, while at Constantinople in 1870 a university was opened. There are besides law, military, and medical schools in that city. History.—See Ottoman Empire.

TURKEY, a large gallinaceous bird, well known as an inmate of our poultry-yards. It is a native of North America, and was introduced into Europe in the 16th century. Wild turkeys abound in some of the forests of America, where they feed on berries, fruits, insects, reptiles, etc., their plumage being a golden bronze, shot with violet and green, and banded with black. On account of its size and the excellence of its flesh and eggs, the turkey is one of the most valued kinds of poultry. There is another species, the Honduras or West Indian turkey, which derives its specific name from the presence of bright eye-like spots on the tail-coverts. It is not so large as the common turkey, but its plumage is more brilliant.



Wild turkey of the United States.

TURKEY-BUZZARD, or **TURKEY-VULTURE,** a rapacious bird belonging to the vulture family, so named from its bearing a distant resemblance to a turkey. It is about 2½ feet long, and with wings extended about 6 feet in breadth, general color black or brownish. It inhabits a vast range of territory in the warmer parts of America.

TURKOMANS, a nomadic Tartar people occupying a territory stretching between the Caspian sea and the Sea of Aral, the khanates of Khiva and Bokhara, Afghanistan, and Persia. They do not form a single nation, but are divided into numerous tribes or clans.

TURKS, a widely spread race, supposed to have had its original seat in Turkestan, but now extending from European Turkey through Asia to the shores of the Northern ocean. Besides the Ottoman Turks or Osmanli of Turkey, the Turkomans, Kirghiz, Usbecks, Yakuts, etc., all belong to the Turkish race.

TURMERIC, the dried tubers or rhizomes of ginger. It is largely employed in India and China as an important ingredient in curry powder. Unsized white paper, steeped in an alcoholic solution of turmeric, when dried, is employed as a test to detect alkalies, which change its color from yellow to reddish-brown. Turmeric yields a yellow color, which has great brightness but little durability. It is also used medicinally in the East as a carminative.

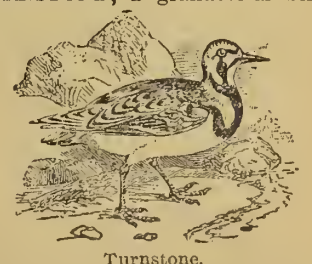
TURNER, Joseph Mallord William, R. A., great English landscape-painter, was born in London 1775, died 1851. He was elected in 1799 an associate of the Royal Academy. In the two following years he exhibited fourteen pictures, and in 1802 was elected an academician. In 1807 he was elected professor of perspective in the Royal academy, and the following year appeared his Liber Studiorum or Book of Studies, which Charles Turner, Mr. Lupton, and others engraved. Other works by him which were engraved are his illustrations of Lord Byron's and Sir Walter Scott's poems; Roger's Italy and Poems; The Rivers of England; the Rivers of France, and Scenery of the Southern Coast. The reputation of Turner, among landscape painters stands alone, solitary, colossal; no man has displayed at the same time such great powers of generalizing and concentrating the beauties of nature. For half a century Turner produced a succession of great works, from 1790 to 1840. By his will he bequeathed all his pictures and sketches to the nation, on condition of a suitable building being erected within ten years for their reception. They have been placed in the Turner gallery, occupying two rooms in the National gallery.

TURNIP, the common name of a cruciferous, biennial plant, much cultivated on account of its esculent root, and of the same genus as the cabbage cauliflower, and broccoli. The root is generally used as a culinary vegetable in all temperate climates, and is cultivated on a large scale for feeding stock, the root being invaluable for this purpose. In the field culture of the larger-rooted varieties the most advantageous mode is by drills. The roots of the turnip have often a tendency to divide and become hard and worthless—a condition known as finger-and-toe, or dactylorhiza. The plant thrives best on a rich and free soil and in moist cloudy weather. There are several varieties, all apparently the result of cultivation.

TURNIP-FLY, Turnip-flea, a small insect, very destructive to young turnips. It may be recognized by two yellow stripes on its wing-cases. The larvæ of this fly, popularly known as niggers, are very destructive to the leaves of the turnip.

Striped turnip-fly. *aa*, Natural size. *bb*, Magnified. *c*, Larva, natural size.

TURNSTONE, a grallatorial bird of the plover family. The length of the bird is about 9 inches. It takes its name



Turnstone.

from its practice of turning up small stones in search of the marine worms, minute crustaceans, etc., on which it feeds. It appears in most parts of the globe.

TURN-TABLE, in railways, a circular platform of iron and wood, supported on rollers, and turning upon a center without much friction, even when loaded with a considerable weight. It is used for removing single carriages from one line of rails to another, and also for reversing engines on the same line of rails.

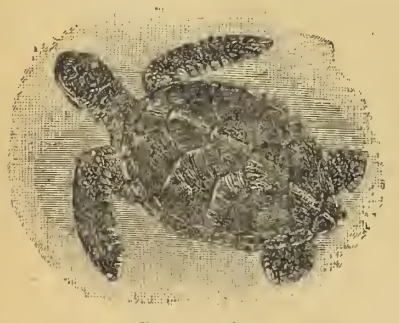
TUR'PENTINE, an oleo-resinous substance flowing naturally or by incision from several species of trees, as from the pine, larch, fir, pistacia, etc. Common turpentine is obtained from the the Scotch fir, and some other species of pines. Venice turpentine is yielded by the larch, Strasburg turpentine by the silver fir; Bordeaux turpentine by the maritime pine; Canadian turpentine, or Canada balsam by the balm of Gilead fir. All the turpentines dissolve in pure alcohol, and by distillation yield oils, which are termed spirits of turpentine. Oil or spirits of turpentine is used in medicine externally as an excellent rubefacient and counter-irritant, and internally as a vermifuge, stimulant, and diuretic. It is also much used in the arts for dissolving resins and oils in making varnishes, and is familiarly called turps.

TURQUOISE (tur'kis), a greenish-blue opaque precious stone, consisting essentially of a phosphate of alumina, containing a little oxide of iron and oxide of copper. The true or oriental turquoise, a favorite ornamental stone in rings and other articles of jewelry, is only found in a mountain region of Persia.

TURRET, in architecture, a kind of small tower. Turrets are chiefly of two kinds, such as rise immediately from the ground, as staircase turrets, and such as are formed on the upper part of a building by being carried up higher than the rest .

TURRET-SHIP. See Ironclad Vessels.

TURTLE, the name given to the marine members of the order Chelonia, being reptiles which differ but little from tortoises, the name turtle or tortoise being in some cases applied indifferently.



Green turtle.

They are found in all the seas of warm climates, and feed mostly on marine plants. The most important species is the green turtle which is from 6 to 7 feet long, and weighs from 700 to 800 pounds. Its flesh is highly esteemed as a table luxury. It is a native of the tropical parts of the Atlantic as well as of the Indian ocean, being especially abundant near Ascension island. The logger-head turtle yields an oil, which is used for

Hawk's-bill or tortoise-shell turtle.

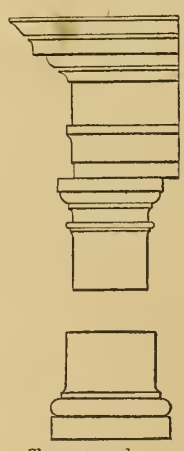
lamps and for dressing leather. The hawk's-bill turtle is remarkable for the beautiful imbricated horny plates covering the carapace, and constituting the tortoise-shell of commerce.

TURTLE-DOVE, a small variety of pigeon, about 11 inches in length, color pale brown marked with a darker hue above. a purple tinge pervading the

Turtle-dove.

feathers of the breast. They are in general smaller and more slender than the domesticated pigeons, and their cooing is plaintive and tender.

TUSCAN ORDER OF ARCHITECTURE, one of the five orders of archi-



Tuscan order.

tecture. It admits of no ornaments, and the columns are never fluted. Otherwise it differs so little, however, from the Doric, that it is generally regarded as being only a variety of the latter.

TUS'CANY, formerly a grand-duchy, now a department of Italy; area, 9289 sq. miles; pop. 2,548,154. The chain of the Northern Apennines forms a considerable portion of its northern boundary, the sea being its boundary on the west. The principal river is the Arno. Cereals cover a large area, and vineyards, olive-yards, and orchards are numerous. The manufacture of silk is considerable. The marble of Tuscany, especially that of Siena is well known.

TVER, a town, Russia, capital of the government of the same name, situated in a plain on the Volga, 96 miles northwest of Moscow. It consists of the Kremlin or fortress, surrounded by an earthen wall, and the town proper. The manufactures are numerous and varied. Pop. 53,477.—The government of Tver has an area of 25,225 sq. miles, and a population of 1,681,790. Rye, barley, hemp, and flax are largely cultivated, and the forests are extensive.

TWAIN, Mark. See Clemens.

TWEED, a river of Scotland, which rises in the south part of Peeblesshire; it forms the boundary line between England and Scotland for 16 miles, runs through England for a short distance, and then enters the North sea at Berwick; total length, 97 miles.

TWEED, William Marcy, American politician, was born in New York City in 1823. He entered politics early becoming an alderman of New York City, and taking a seat in congress in 1853. Subsequently he was a school commissioner; became a member of the board of supervisors of New York county, and was president of the board for four successive terms. From 1867 to 1871 he was a state senator. A member of the Tammany society for many years, he was grand sachem in 1869–71. When commissioner of public works he organized the combination known as the "Tammany Ring," or the "Tweed Ring." The "ring," elected its candidate for mayor in 1865, and its candidate for governor in 1868. Legislators and judges were bribed, and bills were passed and decisions rendered in favor of the members of the "ring." Fraudulent bills were audited, and their sum divided among the thieves, etc. A vigorous investigation and prosecution was undertaken under the lead of Samuel J. Tilden. In 1873 Tweed was convicted, and sentenced to twelve years' confinement in the penitentiary, and to pay a fine of $12,300.18. He was released in 1875 by a decision of the court of appeals, on a legal technicality. He was immediately rearrested but being permitted to go out to drive with an officer, he made his escape, and fled to Spain. He was returned in November, 1876, and again incarcerated in Ludlow Street jail until April 12, 1878, when he died.

TWELFTH-DAY, the twelfth day after Christmas, upon which is held the festival of Epiphany. On the evening of this day, called Twelfth-night, various social rites and ceremonies are observed in different countries. One of these is the baking of a twelfth-cake, into which a bean is introduced. When the cake is

divided at the feast the person who receives the piece containing the bean is made king for the occasion.

TWILIGHT, daylight which continues after sunset, occasioned by the reflection of sunlight from the higher parts of the atmosphere which are still illuminated after the sun has become invisible from ordinary heights. It is supposed to last till the sun is about 18° below the horizon, but is much influenced by the state of the atmosphere as to clouds, etc. In low latitudes (that is, near the equator), there is little twilight.

TWILL, a textile fabric, in which the weft threads do not pass over and under the warp-threads in regular succession, as in common plain weaving, but pass over one and under two, over one and under three, or over one and under eight or ten, according to the kind of twill.

TYLER, John, tenth president of the United States, born 1790, died 1862. He entered congress as a republican in 1816, and in 1840 was vice-president under the presidency of General Harrison. On Harrison's death in 1841 he became president, and came into collision with his party on the National Bank bill and other questions. The annexation of Texas was the chief event of his term of office, at the end of which he retired into private life. On the outbreak of the secession war he espoused the cause of the south, and was a member of the confederate congress.

TYM'PANUM, (1) a cavity of an irregular shape situated in the ear. (See Ear.) (2) In architecture, the triangular space in a pediment included between the cornices of the inclined sides and the

Tympanum of the south portal of the Abbey Church of St. Denis, France.

horizontal cornice; also, any similar space, as above a window, or the space included between the lintel of a door and the arch above it. The tympanum is often ornamented with carving or sculpture

TYNDALL, John, physicist, born in 1820 at Leighlin Bridge, Carlow, Ireland; was elected to the chair of natural philosophy in the Royal institution in 1853; visited Switzerland in 1856 along with Huxley, and made repeated investigations in that country subsequently; lectured throughout the United States in 1872; presided over the British association in 1874 at Belfast. He died in 1893. His chief works are: The Glaciers of the Alps, Mountaineering in 1861, Heat Considered as a Mode of Motion, On Radiation, Sound, Faraday as a Discoverer, Light, The Forms of Water in Clouds, Rivers, Ice, and Glaciers, Fragments of Science, Floating Matter in the Air in Relation to Putrefaction and Infection.

TYPE. Types from which books and newspapers are printed are cast by machinery from an alloy of lead, tin, and antimony, the lead being the chief constituent of the type-metal. Antimony is added to supply the necessary hardness, while the tin serves to fuse the lead and antimony, to toughen the alloy, and to prevent oxidization. Some founders add a small proportion

Sizes of type made on the point system (reduced one-third).

of copper to give still greater tenacity, while others add a copper face to the letter.

To produce a font or series of type, six mechanical operations are necessary—i.e., (1) punch cutting, or the designing and engraving the model characters from which the types are made; (2) fitting up, or adjusting the matrices; (3) making the matrices; (4) making the molds in which the types are cast; (5) casting the types; (6) finishing. Formerly all types were cast by hand, a slow and laborious process. A skilled workman at best could produce from 2000 to 3000 types a day. Since 1838 types have been cast by machinery.

The "face" of a type is the letter or character from which the printed impression is made. The word "face" also is used to distinguish one style of type from another. The "beard" or "neck" is the slope between the outer edge of the face and the shoulder. The "shoulder" is the flat top of the body which upholds the neck and face of the type. The "counter" is the depression between the lines of the face. The "stem" is the thick line of the letter. The "serif" is the short cross-line put as a finish at the ends of unconnected lines. The "hair line" is the thin line of the face.

Types necessarily are of varied sizes and designs. Up to within recent years there was little attempt to secure uniformity in sizes. The types of some founders would not "justify" or "line" with the types of others. But the system of classification of sizes had been reduced to a general scheme, the sizes being designated as follows: Brilliant, diamond, pearl, agate, nonpareil, minion, brevier, bourgeois, long primer, small pica, pica, English, great primer, double small pica, double pica, double English, double great primer, double paragon, canon.

Since 1886 practically all type cast by American foundries has been cast on the "point" system, and eventually the system will be adopted by foreign makers of type. Before that year the standard of size varied, and there was endless confusion and loss of time and money. To obviate this confusion the American type-foundries in 1886 adopted the "pica" as the basis of a new system of measurements. The pica was divided into twelve equal parts, and, accepting one of these twelve parts as its unit, a base was made for the determination of the size of every body of type. This twelfth part of a pica was called a "point." All type bodies were cast on multiples of this point, and called by numerical names. Thus pica became "12-point"; double pica, "24-point," etc. Nonpareil, or half of pica, became "6-point"; agate, "5-point"; brevier, "8-point," etc. The point system was also adopted to all leads, rules, and spaces used in the printing of books.

Under the American system of points the bodies of type are clearly described by numerical names. The faces and styles have to be described by names, many of them fanciful and few of them actually descriptive. There are, however, a number of recognized standard styles of type, as follows:

Scripts are imitations of different styles of handwriting.

Italic is a simplified style of script, the letters being disconnected.

Black letter is a degenerate form of roman, in which angles are substituted for curves.

Gothics, the simplest and rudest of all styles, are cast without serifs.

Italian is a roman in which the position of hair line and thick stroke have been transposed.

Antique is a roman in which the lines of all the characters are nearly uniform as to thickness.

Roman is the type universally used in books and newspapers.

Old style is the roman type of earlier decades. The hair lines are firmer, although shorter than in the modern cut faces; the serifs at the font are shorter, and it is not angled. Old style is used in book work, seldom in newspapers.

TYPECASTING MACHINES. Types from which books and newspapers are printed are cast by machines, of which a number are in general use. Up to 1838, however, all type was cast by hand, a slow and laborious process. A skilled workman could turn out from 2000 to 3000 types a day, many of them so imperfect that they had to be rejected. In 1838 David Bruce, Jr., of New York, invented a practical typecasting machine which was used for forty years almost without a rival. Yet it never was regarded as a perfect ma-

chine. It did not cast a finished type. Exact type had to be finished and dressed by hand. In 1888 Henry Barth produced a machine which practically superseded the Bruce machine, for it cast and finished type at the rate of 1000 an hour. The Barth machine was adopted by the leading type-foundries of the United States and England. In 1905 the Sennett Automatic Caster was invented and placed on the market by Sylvester Sennett, of Chicago. It is a marvelous machine, simple in its parts, and casts 7500 types an hour, ready for the printer's use. A machine known as a "sort caster," adapted for supplying smaller offices with "sorts" as needed, was invented in 1899 by Frank Brown, G. A. Boyden, and John E. Hanrahan, of Boston.

TYPESETTING MACHINES, the perfection of the typesetting machine has revolutionized the printing of newspapers and books. Since 1885 American inventors have supplied the world with typesetting machinery. Every style of machine in commercial operation in any part of the world is of American invention. The Linotype, Monotype, Monoline, Typograph and Simplex machines are in general use in all quarters of the globe. Machines of European invention are in limited use only in their own countries. The typesetting machines in general use in the United States are the Linotype and the Monotype—the former being the favorite in newspaper offices and the latter being better adapted for book and tabular work. The Linotype, as its name implies, casts an entire line while the Monotype casts each letter separately. The Monoline, another slug casting machine, conflicts with the Linotype patents and therefore is barred from the United States. It is in daily use in Canada and Germany. The Graphotype, invented by George A. Goodson of Minneapolis, Minn., is a type caster worked by electrically controlled devices, its product being similar to that of the Monotype. The Linotype is the product of the genius of Ottmar Mergenthaler. After working for seven years in trying to make a practical machine for setting up individual type Mergenthaler in 1884 conceived the idea of assembling a line of dies or female matrices and casting them into molten metal to form a slug which would itself be a complete line of type. He succeeded and in 1885 built the first Linotype. The first Linotype, however, would not be recognized in the Linotype of to-day. The matrix channels were upright tubes, an air blast was required to blow the matrices into an assembler and electricity was employed in its operation. These objectionable features were eliminated in a new Linotype put on the market in 1890, known as the square base Linotype. Mergenthaler did not live to reap the fruits of his genius, dying in 1899. The latest Linotype permits any size of type from 5 to 14 point to be composed in any length of line from 5 to 30 ems pica. Fifteen different languages are now set on the Linotype in as many different countries. The Lanston Monotype Machine casts separately each letter, point, and sign, including the spaces. The machine comprises a keyboard and a type-casting machine. The keyboard punches a series of holes made by the operator striking the keys on the keyboard in a moving strip of paper, which is unwound from one spool to another, passing under a series of punches in its journey. The result of the keyboard operation is, therefore, a roll of perforated paper. This paper when fed to the casting machine, initiates and controls all the operations which produce the cast type set in column width ready to take printed proofs from.

TYPEWRITER, a machine intended to be used as a substitute for the pen, and by which the letters are produced by the impression of inked types. The essential elements in such machines are a movement to bring the type into position, an inking device, an impression movement, and means for letter and line spacing. A successful form of the machine has a series of letter keys arranged in rows, to be worked by the fingers of both hands, a letter being imprinted on the paper (which moves automatically) each time a key is struck. In recent years several typewriters have been brought before the public, such as the Remington, Hammond, Smith-Premier, Bar-Lock, Oliver, etc., and improvements are made from time to time. Typewriters for printing in books have also proved very successful. The growth of the use of the typewriter has been rapid. It was placed on the market in the early seventies and was soon appreciated. The twelfth census contains an account of the comparative speed of typesetting and hand labor. "In this instance the unit required was the copying of 1000 words of statute law; this was accomplished by the typewriter in 19.5 minutes, or at the rate of 51 words per minute while a copyist with a pen required 1 hour and 14.8 minutes, or about four times as long. Typewriters are now an essential part of the equipment of business offices and are used extensively in railroad, telegraph and newspaper offices. The enormous growth of the industry is shown by the fact that the number of factories engaged in making them has increased 60 per cent, the capital invested 500 per cent, and the value of the product over 100 per cent since 1890.

TYPHOID FEVER, called also enteric fever and gastric fever, a disease somewhat resembling typhus, but essentially different. It is characterized by serious disorder of the bowels, and is not infectious in the sense that it can be communicated from one person to another by breath or by the skin, as in scarlet fever and small-pox. The poison seems to consist of living organisms or disease germs which exist in the discharges from typhoid fever patients, may gain admission to the water of wells, and hence to the human stomach, perhaps by the water being used to wash milk dishes. When these germs gain access to the alimentary canal of a person whose general health is impaired, the disease is usually set up. It is uncertain what time may elapse between the introduction of the poison and the appearance of the disease, but the period is usually about three weeks. The symptoms of the disease are languor, chills, violent headache, thirst, and pains in the limbs. Soon diarrhœa sets in, accompanied by a distended and tender state of the abdomen. The temperature rises, the skin loses its moisture, the kidneys cease to act freely, and the tongue becomes dry and brown. Then a rose-colored rash appears over the chest and abdomen, which may soon disappear, only, however, to be followed by a new crop of spots. At this stage delirium and other serious symptoms arise, and as the disease advances ulceration or perforation of the bowels may take place. While the symptoms here described are those of a typical case, there are numerous instances where the patient may have no marked looseness of the bowels, no spots on the skin, and no delirium. In the treatment of the disease the most important thing is the dieting. Only soft liquid foods are allowable, such as milk, in abundance, boiled milk and bread, corn-flour, etc. Looseness of the bowels, if excessive, should be checked by catechu and chalk mixture, with the addition of laudanum, if necessary, to a grown-up person. The disease, even in a mild form, is sufficiently serious, and it often proves fatal.

TYPHOON', a violent hurricane, especially one of those which rage on the coasts of China and Japan and the neighboring archipelago, occurring from May to November, being most frequent and disastrous in July, August, and September.

TYPHUS FEVER, known also as hospital fever, jail fever, etc., is essentially a fever of the poor, ill-fed, and badly-housed inhabitants of large cities. It is infectious, and the infection seems to be carried in the breath of the patient. For this reason free ventilation is the least favorable condition for the spread of typhus. Before the symptoms show themselves a period of from five to twelve days may pass after the person is infected. Then there is generally a shivering, followed by a hot, dry skin, a suffused condition of the eyes, a small pupil, thirst, a dull, stupid expression, great prostration, and costive bowels. About the seventh day a rash of irregular spots and of a dusky hue appears over the chest and back, but sometimes this is entirely absent As the disease advances the patient's strength becomes exhausted, the urinary secretion is scanty, if not entirely suppressed, delirium sets in, and the disease is often complicated by bronchitis, pneumonia, or pleurisy. About the fourteenth day, in favorable cases, the turn of the fever is shown by the patient falling into a sound sleep, from which he wakes with the fever gone. In unfavorable cases the prostration increases, the feverishness is heightened, convulsions may occur, and at length the patient sinks into unconsciousness. The treatment consists in keeping the patient in a well-ventilated room, and preventing exhaustion by a light and wholesome diet. Milk, beef-tea, nourishing soups without vegetables, should be given to the patient in small quantities at short intervals.

TYPOGRAPHY. See Printing.

TYRE, one of the most celebrated

cities of ancient Phœnicia, and with its elder sister, Sidon, long a great trading mart. It was built partly on an island and partly on the mainland; and the insular fortifications formed its chief strength when besieged and taken by Alexander the Great in B.C. 332. A mole or causeway then constructed to the island was the origin of the isthmus which now connects it with the mainland. Tyre was famous in the 10th century B.C. under Hiram the friend of Solomon, was besieged in vain by the Assyrians in 725–720 B.C., and by Nebuchadnezzar 585–572 B.C., and remained an important place till it came into the hands of the Turks. The modern Tyre or Sur is an insignificant place of 5000 inhabitants.

TYROL' or **TIROL'**, a province of Austria (including Tyrol proper and Vorarlberg), is bounded north by Bavaria and Lake Constance, west by Switzerland, east by Salzburg and Illyria, south, east, and west by Venetia and Lombardy; area, 11,325 sq. miles. In magnificence of scenery Tyrol is only inferior to Switzerland, of which it is a continuation. The capital is Innsbruck. Pop. 850,062.

TYRONE, a county of Ireland, in the province of Ulster; bounded by Londonderry, Donegal, Armagh, Monaghan, and Fermanagh; area, 778,943 acres. Pop. 150,468.

U

U, the twenty-first letter and the fifth vowel in the English alphabet. Its true primary sound was that which it still retains, that of oo in cool, tool, good, wood, etc., answering to the French ou in tour, the sound being sometimes short, sometimes long.

UDAIPUR, or **OODEYPORE,** a town in the northwest of India, capital of a native state of the same name in Rajputana, Pop. 45,976.—The state (called also Meywar), area 12,670 sq. miles, came under the protection of Britain in 1817, and the rajah ranks highest in dignity among the Rajput chiefs. Pop. 1,728,049.

UDINE (ö'di-nā), a walled town of North Italy, capital of a province of same name and see of an archbishop, 60 miles northeast of Venice. Pop. 37,933; of prov. 594,334.

UFA, a government of Russia, separated in 1865 from Orenburg; area, 47,112 sq. miles. Pop. 2,220,497.—Ufa, the capital, stands on the Bielaya, at the confluence of the Ufa, 735 miles east by north of Moscow. It is the see of a bishop, and has considerable manufactures and trade. Pop. 49,961.

UGAN'DA, a country of British East Africa, to the n. w. of the Victoria Nyanza. It is a rich agricultural country with a mild and uniform climate, and the inhabitants are of a comparatively high type. It was first visited by Speke and Grant in 1860, and is the seat of several mission stations. The population is estimated at 5,000,000.

UHLANS (ö'lānz), a species of light cavalry in the armies of the Austrians, Russians, and Germans.

UINTAH (or Uinta) **MOUNTAINS,** a range of lofty mountains in Utah, United States, which extend e. from the Wahsatch range, and occupy a large area. Some of the peaks reach an altitude of over 13,000 feet.

U'KASE, a Russian edict or order, legislative or administrative, emanating from the government. Ukases have the force of laws till they are annulled by subsequent decisions.

UKRAINE, an extensive country formerly on the frontier between Poland and Russia, now forming the Russian governments of Kief, Chernigof, Podolsk, Kharkof and Poltava.

ULCER, a sore in any of the soft parts of the body, either open to the surface or to some natural cavity, and attended with a secretion of pus or some kind of discharge. Ulcers are of various kinds, as scorbutic, cancerous, scrofulous, etc.

ULSTER, the most northerly of the four provinces of Ireland, comprehending the counties of Antrim, Armagh, Cavan, Donegal, Down, Fermanagh, Londonderry, Monaghan, and Tyrone. Area, 5,483,201 acres, or 8568 sq. miles. Pop. 1,581,351.

ULTRAMARINE', a beautiful and durable sky-blue pigment, a color formed of the mineral called lapis lazuli. This substance is much valued by painters, on account of the beauty and permanence of its color, both for oil and water painting. Artificial ultramarine is prepared by heating sulphide of sodium with a mixture of silicic acid and alumina.

UTRAMON'TANISM, the views of that party in the Church of Rome, who place an absolute authority in matters of faith and discipline in the hands of the pope, in opposition to the views of the party who would place the national churches, such as the Gallican, in partial independence of the Roman curia, and make the pope subordinate to the statutes of an œcumenical council. According to ultramontanism the pope is superior to general councils, independent of their decrees, and considered to be the source of all jurisdiction in the church. The Vatican council of 1870 virtually established the views of ultramontanism as dogmas of the church.

ULYSSES (ū-lis'sēz), king of the island of Ithaca, was one of the Greek heroes who engaged in the war against Troy. In returning to his own country after the siege he visited the country of the Lotophagi in North Africa, the Cyclopes in Sicily (see Polyphemus), the island of Æolus king of the winds, reached the island Ææa, where Circe changed (temporarily) his companions into pigs, visited the infernal regions, where he consulted the soothsayer Tiresias how to return to his country; passed in safety the coast of the Sirens, and the dangers of Scylla and Charybdis; remained for seven years with the nymph Calypso after losing all his men; and at last, after an absence of twenty years returned to Ithaca. Here he found his palace occupied and his substance wasted by suitors for the hand of his wife Penelope, but with the aid of his son Telemachus he put them to death. He lived about sixteen years after his return. These adventures of Ulysses are the subject of Homer's Odyssey.

UMBEL, in botany, a variety of inflorescence which consists of a number of pedicels or flower-stalks, nearly equal in length, springing from a common center, with the blossoms on their summits forming a level or rounded surface. When a number of such umbels are aggregated together in the same way

Umbels of hemlock.

we have a compound umbel, the smaller umbels being called partial umbels.

UMBELLIF'ERÆ, an extensive and important natural order of plants, the flowers of which are almost always in regular compound umbels. The plants of this order are natives chiefly of the northern parts of the northern hemisphere, and nearly all herbs with fistular furrowed stems and divided leaves; the fruit consists of two indehiscent ridged carpels united by a commissure. Some are very poisonous, as hemlock, and certain others; others are esculent, as celery, carrots, and parsnips; many yield aromatics, as caraway, coriander, dill, anise; a few secrete a fœtid gum-resin, much used in medicine, as asafetida, galbanum, opopanax, and sagapenum.

UMBER, a well-known mineral pigment, of an olive-brown color in its raw state, but much redder when burnt. It occurs either naturally in veins and beds, or is prepared artificially from various admixtures. The commercial varieties are known as Turkey umber, raw and burnt, and English umber, the latter being an artificial ochrey admixture.

UMBRA, in astronomy, a term applied to the total shadow of the earth or moon in an eclipse, or to the dark cone projected from a planet or satellite on the side opposite to the sun. See Penumbra, Eclipse.

UMBRELLA, a portable shade, screen, or canopy which opens and folds, carried in the hand for sheltering the person. The umbrella had its origin in the East in very remote times, where it was (and still is) regarded as an emblem of royalty or a mark of distinction; but as a de-

fense from rain it was not used in England till early in the 18th century.

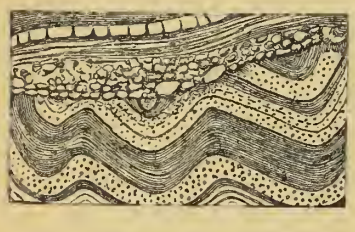
UMBRELLA-BIRD, a South American bird allied to the crows, remarkable for the crest of blue-black feathers rising from the head and curving toward the

Umbrella-bird.

end of the beak, which it nearly reaches. Another long tuft of feathers hang down from the breast.

UMBRIA, a division of Italy, on the Adriatic, which derives its appellation from the Umbrians, by whom it was inhabited in ancient times. It now forms the province of Perugia. The Umbrians were an ancient Italic people speaking a language akin to the Latin.

UNCONFORMABLE, in geology, a term applied to strata whose planes do



Unconformable strata.

not lie parallel with those of the subjacent or superjacent strata but have a different line of direction or inclination.

UNCTION, Extreme. See Extreme Unction.

UNDERSHOT-WHEEL, a form of water-wheel having a number of floatboards disposed on its circumference, and turned round by the moving force of a stream of water acting on the floatboards at its lowest part. In this wheel the water acts entirely by its momentum.

UN'DINE, a water-spirit of the female sex, resembling in character the sylphs or spirits of the air, and corresponding somewhat to the naiads of classical mythology. According to Paracelsus, when an undine married a mortal and bore a child she received a soul. One of these spirits is the heroine of a celebrated romance by De la Motte Fouqué.

UN'DULATORY THEORY, in physics, the theory which regards light as a mode of motion generated by molecular vibrations in the luminous source, and propagated by undulations in the subtle medium known as the ether, presumed to pervade all space and to occupy the intervals which separate the molecules or atoms of bodies. When these undulations reach and act on the nerves of our retina they produce in us the sensation of light. The only other theory of light which can be opposed to this, and which is variously called the corpuscular, emission, or material theory, supposes light to consist of material particles, emitted from the source, and projected in straight lines in all directions with a velocity which continues uniform at all distances, and is the same for all intensities. The undulatory theory, is however, now generally adopted by physicists.

UNGULA'TA, the ungulate or hoofed quadrupeds, forming the largest and most important order of the mammalia. This order is subdivided into (a) the section Perissodactyla, or odd-toed ungulates, which includes the rhinoceros, the tapirs, the horse and all its allies; and (b) the Artiodactyla, or even-toed, which comprises the hippopotamus, the pigs, and the whole group of ruminants, including oxen, sheep, goats, antelopes, camels, deer, etc., In the former section the hind feet are odd-toed (one or three toes) in all the members, and the forefeet in all except the tapirs; in the latter section the toes are always even in number, either two or four.

UNICORN, a fabulous animal represented as with one horn growing from its forehead. Such an animal is frequently mentioned by Greek and Roman writers, who generally described it as a native of India, of the size and form of a horse, the body being white, and a straight horn growing from its forehead. The reem of the Hebrews, of which unicorn is a mistranslation (Deut. xxxiii. 17, and elsewhere), was probably a urus. It was a two-horned animal. The unicorn is one of the supporters of the royal arms of Great Britain, in that posture termed salient. It was taken from the arms of Scotland, which had two unicorns as supporters.

UNICORN-ROOT, a popular name of the plant a native of North America, which furnishes one of the most intense bitters known, used as a tonic and stomachic.

UNIT, in arithmetic, the least whole number, or one, represented by the figure 1. Every other number is an assemblage of units. This definition is applicable to fractions as well as to whole numbers. In mathematics and physics a unit is any known determinate quantity by the constant repetition of which any other quality of the same kind is measured. It is not itself one, but is a length, or a surface, or a solid, or a weight, or a time, as the case may be, while 1 is only a numerical symbol.—Specific gravity unit: for solids or liquids, 1 cubic foot of distilled water at 62° Fahr. = 1; of air and gases, 1 cubic foot of atmospheric air at 62° Fahr. = 1. The unit of heat, or thermal unit, the quantity of heat corresponding to a rise of 1° Fahr. in the temperature of 1 lb. of pure water at about 39° Fahr.; in France, the heat required to raise a gramme of pure water at about 3.94° C., 1° C.—In electricity the unit of quantity is that quantity of electricity which, with an electro-motive force of one volt, will flow through a resistance of 1,000,000 ohms in one second, called a farad; unit of current, a current of one farad per second. Unit of work, that which will produce a velocity of one meter (39.37) inches per second in a mass weighing one gramme (15.432 grains) after acting upon it a second of time. A dynamic unit is one expressing the quantity of a force or the amount of work done. One such unit is the foot-pound (which see). The system of units recommended by a committee of the British association for scientific calculations, and known as the C. G. S. system, adopts the centimeter as the unit of length, the gramme as the unit of mass, and the second as the unit of time, these words being represented respectively by the above letters. (See Dynamics.) In this system the unit of area is the square centimeter, the unit of volume is the cubic centimeter, and the unit of velocity is a velocity of a centimeter per second. The unit of momentum is the momentum of a gramme moving with a velocity of a centimeter per second.

UNITARIANS, a religious sect or congeries of sects, distinguished by the denial of the received doctrine of the Trinity. The Unitarians may be divided into classes: (1) The conservative or orthodox Unitarians, who accept the general articles of the Christian creed (with the exception of the Trinity), such as miracles, the resurrection of Christ, and the plenary inspiration of Scripture. (2) The liberal or progressive Unitarians, whose creed is purely rationalistic. They consider Christ as a mere man, inspired as other great men are, though in a greater degree; they reject the doctrines of original sin, eternal punishments, the belief in miracles, and generally the whole supernatural element in Christianity. They deny the necessity of an atonement, considering Christ's death but as a martyrdom in defense of truth. This latter class forms the majority. Unitarian views have been held more or less in all ages of the church, but they came more prominently forward during the Reformation period, especially in connection with the teaching of the elder and younger Socinus, Lælius and Faustus, uncle and nephew. At this time Unitarian doctrines led to persecution. The sect was first tolerated in Poland and Transylvania. In the former country it flourished under the leadership of the younger Socinus, in the latter under that of his friend Blandatra. The Polish toleration was finally withdrawn in 1658, when the Unitarians were banished under pain of death. They dispersed in Germany and England. Unitarianism in the meantime made secret progress among various Protestant bodies professing orthodox creeds. In England, where Unitarians were burned as well as on the continent, full toleration was not granted till 1813. On the continent of Europe Unitarianism progressed in proportion to the progress of Rationalism. In America Unitarianism first sprung up in New England, from which it spread rapidly. The Universalist sect is also of non-Trinitarian

belief. There are about 300 Unitarian congregations in Britain and 459 in America, and Unitarian theology has tinged more or less almost every section of the reformed Christian church.

UNITED BRETHREN. See Moravian Brethren.

UNITED KINGDOM. See Britain.

UNITED PRESBYTERIAN CHURCH, the name adopted by that Scottish church which was formed by the union of the Secession church and the Relief church in May, 1847. This church adhered to the theological doctrines taught in the Westminster Confession of Faith and the Larger and Shorter Catechisms. The system of church government differed from that of the Established and Free churches only in having no intermediate court between the presbyteries and the supreme court, the latter of which was called a General Synod, and sat once a year. The distinguishing feature of the United Presbyterian church was that it was a voluntary church, which set itself against all state establishment of religion and all public and national endowments for the maintenance of Christianity. In October, 1900, it joined with the Free church to form the United Free church of Scotland.

UNITED PROVINCES. See Netherlands.

UNITED STATES OF NORTH AMERICA, a federal republic, occupying the whole of the central portion of that continent between lat. 24° and 49° n., and lon. 67° and 125° w.; stretching from east to west between the Atlantic and North Pacific oceans, and from north

Obverse.

Reverse.

Great seal of the U. S.

to south between Canada and the Gulf and Republic of Mexico; greatest length, east to west, 2800 miles; greatest breadth, 1600 miles; area, 3,024,880 sq. miles. The territory of Alaska also belongs to the United States, and Hawaii, the Philippines, Porto Rico, etc., have been recently acquired. The republic is composed of 46 states, 4 territories, and 1 district, besides the reserved Indian territory and Alaska. The first census was taken of the thirteen original states in 1790, when the population numbered 3,929,214. The various areas and populations are given in the following table:

States and Territories	Area in Sq. Miles	Population 1890	Estimated Pop. 1908 by the Governor of each State
States			
Alabama	52,250	1,513,017	2,250,000
Arkansas	53,850	1,128,179	1,750,000
California	158,360	1,208,130	2,000,000
Colorado	103,925	412,198	800,000
Connecticut	4,990	746,258	1,010,000
Delaware	2,050	168,493	190,000
Florida	58,680	391,422	650,000
Georgia	59,475	1,837,353	2,600,000
Idaho	84,800	84,385	300,000
Illinois	56,650	3,826,351	5,590,000
Indiana	36,350	2,192,404	2,678,492
Iowa	56,025	1,911,896	2,216,068
Kansas	82,080	1,427,096	1,680,000
Kentucky	40,400	1,858,635	2,435,000
Louisiana	48,720	1,118,517	1,700,000
Maine	33,040	661,086	731,760
Maryland	12,210	1,042,390	1,441,602
Massachusetts	8,315	2,238,943	3,173,487
Michigan	58,915	2,093,889	2,655,463
Minnesota	83,365	1,301,826	2,200,000
Mississippi	46,810	1,289,600	1,750,000
Missouri	69,415	2,679,184	3,885,989
Montana	146,080	132,159	275,000
Nebraska	76,855	1,058,910	1,225,000
Nevada	110,700	45,761	65,000
New Hampshire	9,305	376,530	443,700
New Jersey	7,815	1,444,933	2,294,413
New York	49,170	5,997,853	8,476,427
North Carolina	52,250	1,617,947	2,100,000
North Dakota	70,195	182,719	475,000
Ohio	41,060	3,672,316	4,557,000
Oklahoma	39,030	61,834	1,408,732
Oregon	96,030	313,767	550,000
Pennsylvania	45,215	5,258,014	6,900,000
Rhode Island	1,250	345,506	502,302
South Carolina	30,570	1,151,149	1,474,735
South Dakota	77,650	328,808	490,000
Tennessee	42,050	1,767,518	2,220,000
Texas	265,780	2,235,523	3,600,000
Utah	84,970	207,905	350,000
Vermont	9,565	332,422	340,000
Virginia	42,450	1,655,980	2,042,388
Virginia, West	24,780	762,794	1,200,000
Washington	69,180	349,390	900,000
Wisconsin	56,040	1,686,880	2,275,000
Wyoming	97,890	60,705	117,500
Territories			
Arizona	113,020	59,620	185,000
Hawaii	6,677	89,990	154,001
New Mexico	122,580	153,593	302,000
Dist. of Columbia	70	230,392	330,000
States and Territories	3,000,157	62,712,240	88,787,058
Indian Territory	31,400	186,490	450,000
Indians	.....	141,709	134,158
Territ. of Alaska	531,400	31,795	125,000
Total	3,562,957	63,072,234	89,496,216

Up to 1889 the Dakotas formed the territory of Dakota. In 1890 Oklahoma was constituted a territory, being detached from the Indian territory. The colored people in 1907 numbered 8,840,789. The Indians in all amount approximately to 250,000. The capital is Washington, the largest city is New York, the other large cities being Chicago, Philadelphia, Boston, St. Louis, Baltimore, Cleveland, Buffalo, San Francisco, Cincinnati, Pittsburg, etc. The following table shows the population of cities having over 100,000 inhabitants in 1900, for the census years 1860, 1890, 1900, and the estimated population in 1908 as furnished by the mayors of the different cities. The United States have a coast-line which measures 12,609 miles, of which 6861 are on the Atlantic, 2281 on the Pacific, and 3467 on the Mexican gulf. The most important indentations on the Atlantic are Massachusetts bay; Long Island sound, and in connection with it the Bay of New York; Delaware bay; Chesapeake bay; Albemarle and Pamlico sounds; and the Gulf of Mexico. The Pacific seaboard is deficient in bays, but possesses in that of San Francisco, on the coast of California, one of the largest natural harbors in the world. There are few islands either on the Atlantic or Pacific coasts, the only one of any importance being Long Island. The country is traversed by two great mountain-systems. The loftiest and largest of these is what as a whole may be called the Cordilleras, which enters from Mexico, stretches northward, and is continued into the Dominion of Canada. It has in its broadest parts a breadth of 1000 miles, and includes the ranges known as the Rocky mountains, Sierra Nevada, Cascade range, the Coast ranges, the Blue mountains, and various lofty plateaus. The great feature of this system is the Rocky mountains (which see). The other mountain-system is the Appalachian, which stretches parallel to the Atlantic coast almost from the Gulf of Mexico to the St. Lawrence. It consists of a long plateau with various groups and ranges of hills, among which are the White mountains in New Hampshire, the Green mountains of Vermont, the Adirondacks of northern New York, the Catskills of southeastern New York,

City	1908	1900	1890	1860
New York	4,285,435	3,437,202	1,515,301	813,669
Chicago	2,483,641	1,698,575	1,099,820	109,260
Philadelphia	1,491,161	1,293,697	1,046,964	565,529
Brooklyn	*	*	838,547	279,122
Saint Louis	750,000	575,238	451,770	160,773
Boston	607,340	560,892	448,477	177,840
Baltimore	567,000	508,957	434,439	212,418
Cleveland	525,000	381,768	261,353	43,417
Buffalo	400,000	352,387	255,664	81,129
San Francisco	475,000	342,782	298,997	56,802
Cincinnati	400,000	325,902	296,908	161,044
Pittsburg	350,000	321,616	238,617	49,221
New Orleans	400,000	287,104	242,039	168,675
Detroit	425,600	285,704	205,876	45,619
Milwaukee	355,000	285,315	204,468	45,246
Washington	332,000	278,718	230,392	61,122
Newark	300,000	246,070	181,830	71,941
Jersey City	245,000	206,433	163,003	29,226
Louisville	260,000	204,731	161,129	68,033
Minneapolis	300,000	202,718	164,738	2,564
Providence	208,000	175,597	132,146	50,666
Indianapolis	236,000	169,164	105,436	18,611
Kansas City	250,000	163,752	132,716	4,418
Saint Paul	225,000	163,065	133,156	10,401
Rochester	195,000	162,608	133,896	48,204
Denver	200,000	133,859	106,713	4,749
Toledo	189,000	131,822	81,434	13,768
Allegheny	138,000	129,896	105,287	28,702
Columbus	179,370	125,560	88,150	18,554
Worcester	138,000	118,421	84,655	24,960
Syracuse	125,000	108,374	88,143	28,119
New Haven	150,000	108,027	81,298	39,267
Paterson	130,000	105,171	78,347	19,586
Fall River	115,000	104,863	74,398	14,026
Saint Joseph	120,000	102,979	52,324	8,932
Omaha	142,500	102,555	140,452	1,883
Los Angeles	280,000	102,479	50,395	4,385
Memphis	175,000	102,320	64,495	22,623
Scranton	130,000	102,026	75,215	9,223
Portland	161,205	90,426	45,585	.....
Reading	110,000	78,961	56,661	.....
Richmond	112,000	85,050	81,388	.....
Seattle	250,000	80,671	42,839	.....
St. Joseph, Mo.	120,000	102,979	52,324	.....
Albany	100,000	91,104	94,923	.....
Atlanta	150,000	89,872	65,533	.....
Dallas	280,000	42,638	38,067	.....
Dayton	115,000	85,333	61,220	.....
Grand Rapids	117,000	87,563	60,278	.....
Hartford	106,000	79,850	53,230	.....
Lowell	100,000	94,969	77,696	.....
Nashville	125,000	80,865	76,168	.....

*The City of Brooklyn was consolidated with New York City in 1898.

UNITED STATES

the Alleghanies of Pennsylvania, etc. The great plain lying between these two mountain-systems belongs almost entirely to the basin of the Mississippi-Missouri, which enters the Gulf of Mexico. This, the chief river of the country and the longest in the world, is of immense importance as a highway of internal trade. Its principal tributaries are the Ohio, Arkansas, Red river, and Illinois. Various other rivers enter the Mexican gulf, including the Rio Grande del Norte, which separates the States from Mexico. The country west of the Rocky mountains, belonging to the basin of the Pacific, is drained by the Columbia, which falls into the Pacific between Oregon and Washington; the Sacramento, which discharges into the Bay of San Francisco; and the Colorado, which falls into the Gulf of California. Between the Alleghanies and the Atlantic the principal rivers are the Connecticut, which falls into Long Island sound; the Hudson, which contributes to form the harbor of New York; the Delaware, which falls into the bay of that name, and is navigable to Philadelphia; the Potomac; which falls into Chesapeake bay, and is navigable to Washington; and the Savannah, which enters Savannah bay. Besides Lake Champlain, which divides the states of Vermont and New York, and the Great Salt Lake in Utah, there are the great lakes Superior, Michigan, Huron, Erie, and Ontario lying between the United States and Canada, and belonging partly to both. The geology of the United States divides itself roughly into two large geographical areas. One of these areas extends from the Atlantic to the base of the Rocky mountains, and this is occupied to a large extent by a great basin of Palæozoic formations, including the Cambrian, Silurian, Devonian, and Carboniferous divisions. In the other great geological area, which extends from the base of the Rocky mountains to the Pacific, the Eozoic and Palæzoic formations which predominate are overlaid by rocks of the Secondary and Tertiary periods. As many of the deposits are carboniferous, coal is found in a large proportion of the states, but is chiefly worked in Pennsylvania; the total yield for the states being 413,838,679 tons in 1906. (See table). About one-fifth belongs to the anthracite variety. Iron ore, like coal, is widely distributed, being at present mined in no fewer than twenty-seven states. The total amount of pig-iron produced in 1906 was 25,712,106 tons, and of steel 23,738,587. The United States is the chief gold and silver producing country in the world, its mines being chiefly situated in Colorado, California, and Nevada. During 1906 the total production of gold was valued at $94,373,800, and the value of the silver obtained amounted to $38,256,400. Among the other chief metals are copper, the output of which in 1906 was 416,226 tons, lead, zinc, and mercury. Petroleum forms an important mineral resource of the states of Pennsylvania, New York and Illinois.

(See page opposite for table giving the production of ores, minerals, secondary minerals and chemicals for the year 1906.)

The following table gives the coal production by states for the year 1906:

States	Tons	Value at Mine	
		Total	Per Ton
Bituminous			
Alabama	12,851,775	$17,349,896	$1.35
Arkansas	1,875,569	2,438,240	1.30
California	80,000	232,000	2.90
Colorado	10,308,421	13,916,368	1.35
Georgia, N. Carol.	363,463	407,247	1.12
Illinois	38,317,581	39,467,108	1.03
Indiana	11,422,000	11,878,880	1.04
Indian Territory	2,980,600	5,663,140	1.90
Iowa	7,017,485	10,877,102	1.55
Kansas	6,010,858	8,935,195	1.49
Kentucky	9,740,420	10,714,462	1.10
Maryland	5,014,995	6,772,243	1.35
Michigan	1,370,860	2,193,376	1.60
Missouri	3,860,000	6,176,000	1.60
Montana	1,787,934	3,186,620	1.78
New Mexico	1,973,658	2,960,487	1.50
North Dakota	300,998	937,894	1.45
Ohio	27,213,495	29,934,845	1.10
Oregon	79,731	212,338	2.66
Pennsylvania	129,532,991	145,076,950	1.12
Tennessee	6,210,000	7,141,500	1.15
Texas	1,290,600	2,064,960	1.60
Utah	1,839,219	2,942,750	1.60
Virginia	4,546,040	8,501,095	1.87
Washington	3,293,098	6,421,541	1.95
West Virginia	46,452,000	44,129,400	.95
Wyoming	5,805,322	10,159,314	1.75
Alaska, Nevada	90,000	360,000	4.00
Total bituminous	341,629,113	$400,550,951	$1.17
Anthracite			
Colorado	50,000	$155,000	$3.10
New Mexico	20,000	70,000	3.50
Pennsylvania	72,139,566	166,082,002	2.30
Total anthracite	72,209,566	$166,307,002	$2.30
Total Sh. Tons	413,838,679	$566,857,953	$1.37
Coal Met. Tons	375,397,204	.....	1.51

Salt springs abound in various localities, and salt is produced in great quantities in New York, Virginia, Pennsylvania, Ohio, and Kentucky. Extensive beds of gypsum are found in New York, Maine, Virginia, and other states, and marble, fine granite, sandstone, porphyry, etc., are abundant. A country like the United States, stretching over such a vast latitude and having such wide areas of mountain and plain, must necessarily present a great variety of climate. Thus the annual rainfall ranges from 123 inches in Washington state to 6 inches in Colorado; while the mean annual temperature, which is 69° in Florida, is 41° in Wyoming. Along the Atlantic seaboard westerly winds prevail, while on the Californian coast the winds are almost steadily southwest or northwest. The climate, taken as a whole, is favorable to the growth of forest vegetation, and thickly-wooded regions extend along the Atlantic coast from Maine to Florida; on the Pacific coast, and the Cordilleran ranges; and in the Mississippi basin. In these areas the more important hardwood trees are the sugar-maple and soft-maple, oak (in several varieties), white ash, chestnut, birch, hickory, walnut, elm, beech, tulip-tree, fir, yellow pine, redwood, and cedar. There is also great variety and abundance of fruits, both of the temperate and tropical climates. Among wild animals are the bison or buffalo, now almost extinct in a wild state, the moose or American elk, the prong-horned antelope, the big-horned or Rocky mountain sheep, the wapiti or American stag, the peccary, the cougar or puma, the black and the grizzly bear, the jaguar, the prairie wolf, the racoon, the oppossum, and beaver. Among the birds are swans, wild turkeys, wild geese, wild ducks, eagles, vultures, the mocking-bird, humming-birds, etc. Among reptiles are the rattlesnake and other snakes, turtles, and tortoises, alligators, etc. It is estimated that the arable land of the United States exceeds a million and a quarter sq. miles. The total acreage of farms is nearly 900,000,000 acres. The total value of the agricultural and horticultural crops in 1907 was $3,500,000,000 not including live stock, the toal value of which was over $3,000,000,000.

(See pages 1272 and 1273 for tables giving the production of cereal crops by states and farm products of the United States for the year 1906.)

Immigration into the United States for the period 1900–1907:

1900	448,572
1901	487,918
1902	648,743
1903	857,046
1904	812,870
1905	1,027,421
1906	1,100,735
1907	1,285,349
Total	6,668,634
1820 to 1899	19,316,593
1789 to 1820 est	250,000
	26,234,227

The reported occupations of immigrants arriving during the fiscal year 1907 were as follows: Laborers, 291,141; servants, 121,587; farm laborers, 323,854; tailors, 30,644; merchants and dealers, 14,470; carpenters, 20,656;

IMMIGRATION BY COUNTRIES IN FISCAL YEARS 1906 AND 1907.

Countries	1906	1907
Austria-Hungary	265,138	338,452
Belgium	5,099	6,396
Bulgaria, Servia and Montenegro	4,666	11,359
Denmark	7,741	7,243
France, including Corsica	9,386	9,731
German Empire	37,564	37,807
Greece	19,489	36,580
Italy, including Sicily and Sardinia	273,120	285,731
Netherlands	4,946	6,637
Norway	21,730	22,133
Portugal, inc. Cape Verde and Azore Islands	8,517	9,608
Roumania	4,476	4,384
Russian Empire, and Finland	215,665	258,943
Spain including Canary and Balearic Islands	1,921	5,784
Sweden	23,310	20,589
Switzerland	3,846	3,748
Turkey in Europe	9,510	20,767
England	49,491	56,637
Ireland	34,995	34,530
Scotland	15,866	19,740
Wales	1,841	2,660
Other Europe	48	107
Total Europe	1,018,365	1,199,566
China	1,544	961
Japan	13,835	30,226
India	216	898
Turkey in Asia	6,354	8,053
Other Asia	351	386
Total Asia	22,300	40,524
Africa	712	1,486
Australia, Tasmania, and New Zealand	1,682	1,941
Pacific Isls., not specified	51	42
British North America	5,063	19,918
Central America	1,140	935
Mexico	1,997	1,406
South America	2,757	2,779
West Indies	13,656	16,689
Other Countries	33,012	22
Grand Total	1,100,735	1,285,349

shoemakers, 13,059; clerks, 11,980; mariners, 7270; miners, 11,452. The number of professional immigrants (including 822 actors, 2433 engineers, 1114 musicians, and 1673 teachers) was 12,600; of skilled laborers, 190,315; miscellaneous (including unskilled), 777,725, no occupation (including children), 304,709.

Owing to the great difficulty in obtaining accurate statements of the immigrants from the contiguous countries of Canada and Mexico, no statistics of immigration into the United States of citizens of those countries are gathered by the Bureau of Immigration. The constant ebb and flow of persons entering and leaving the United States from and to Mexico and Canada, at the numerous points where such movements can be conveniently made, renders accurate statements on this subject extremely difficult, and the Bureau of Immigration in its annual report for 1902 states that "the immigrants do not include arrivals from the neighboring countries of Mexico and Canada except such as come from abroad through ports in these countries for the avowed purpose of entering the United States." The facts, however, that the census of 1900 shows the presence of 1,183,225 persons in the United States born in Canada and 103,445 persons born in Mexico proves that the number of arrivals from those countries, proper to be considered as immigrants, must be large.

The average farm is 146 acres. Among cultivated crops the most important are wheat, the great staple of the western and middle states; corn, most productive in the middle states; tobacco, a staple in Virginia, Kentucky, Maryland, and Tennessee; cotton, a staple in Texas, Alabama, Mississippi, Georgia, and the Carolinas; barley, oats, rye, sugar, hemp, flax, potatoes, and hay.

The following table shows the tobacco production by states for the year 1905:

States	Product, Pounds	Acreage, Acres	Farm Value
Kentucky	28,975,420	275,874	$16,028,279
North Carolina	83,156,160	136,770	7,317,742
Virginia	79,951,725	118,447	6,076,331
Wisconsin	53,832,780	39,294	5,383,278
Ohio	50,344,650	59,229	4,228,951
Tennessee	31,873,536	41,502	2,390,515
Connecticut	23,011,500	13,340	3,911,955
Pennsylvania	20,993,880	15,324	2,267,339
Maryland	19,592,950	30,143	1,175,577
South Carolina	9,254,464	12,574	805,138
Massachusetts	8,302,800	4,488	1,403,173
New York	7,061,348	6,151	741,442
Indiana	5,113,836	6,244	306,830
Florida	3,192,600	5,321	574,668
West Virginia	3,163,950	4,005	268,936
Other States	5,211,920	7,406	638,714
Total U. S.	633,033,719	776,112	$53,519,068

In the same year the production of other states than those above reported was, in pounds: New Hampshire, 212,500; Vermont, 315,150; Georgia, 1,068,900; Missouri, 1,295,370; Alabama, 234,450; Mississippi, 66,650; Louisiana, 31,500; Texas, 234,500; Arkansas, 734,300; Illinois, 1,018,800.

The most remarkable development of any phase of American agriculture is in fruit culture. This industry has almost doubled in magnitude. The number of orchard trees has increased from 193,-

THE FOLLOWING TABLE GIVES THE PRODUCTION OF ORES, MINERALS, SECONDARY MINERALS AND CHEMICALS FOR THE YEAR 1906.

Products	Measures	1906	
		Quantity	Value
Antimony ore	Sh. T.	295	$44,250
Asbestos	Sh. T.	1,695	20,565
Asphaltum (u)	Sh. T.	116,653	1,066,019
Barytes	Sh. T.	63,486	252,719
Bauxite	L. T.	78,331	352,490
Chrome ore	L. T.	180	1,800
Coal, anthracite	Sh. T.	72,209,566	166,307,002
Coal, bituminous	Sh. T.	341,629,113	400,550,951
Diatomaceous earth	Sh. T.	....	.....
Emery	Sh. T.	2,147	22,780
Feldspar (u)	Sh. T.	72,656	401,531
Flint (u)	Sh. T.	66,697	243,012
Fluorspar	Sh. T.	34,683	201,481
Fuller's earth	Sh. T.	28,000	237,950
Garnet	Sh. T.	5,404	179,548
Graphite, amorphous	Sh. T.	16,853	102,175
Graphite, crystalline	Lb.	4,894,483	170,866
Gypsum (u)	Sh. T.	1,540,585	3,837,975
Iron ore	L. T.	49,237,129	107,091,574
Limestone flux	L. T.	15,486,139	7,339,125
Magnetite (u)	Sh. T.	7,805	23,415
Manganese ore	L. T.	(u) 141,681	306,993
Mica, sheet (u)	Lb.	1,423,100	252,248
Mica, scrap (u)	Sh. T.	1,489	22,742
Monazite (u)	Lb.	486,175	152,312
Petroleum, crude	Bbl. (i)	131,771,505	80,277,279
Phosphate rock	L. T.	2,052,742	12,342,741
Pumice	Sh. T.	12,200	16,750
Pyrites	L. T.	225,045	767,866
Quartz, crystalline	Sh. T.	....	.....
Salt (u)	Bbl. (k)	28,172,380	6,658,350
Sand, glass	Sh. T.	1,089,430	1,208,788
Slate, roofing	Squares (f)	1,214,742	5,668,346
Soda, natural	Sh. T.	.....	.....
Sulphur	L. T.	285,000	6,056,250
Talc, common	Sh. T.	58,972	874,356
Talc, fibrous	Sh. T.	64,200	541,600
Tungsten ore	Sh. T.	1,096	442,784
Whetstones and Oilstones (u)	.....	.....	268,070
Zinc ore	Sh. T.	905,175	17,250,420
Total enumerated	.....	.....	$821,555,123
SECONDARY MINERALS AND CHEMICALS.			
Alundum	Lb.	4,331,233	$303,186
Ammonium sulphate	Sh. T.	75,000	4,674,750
Arsenic	Lb.	1,663,000	83,150
Borax	Sh. T	58,173	1,182,410
Bromine	Lb.	1,229,000	184,350
Carborundum	Lb.	6,225,280	622,528
Cement, nat. hyd. (u)	Bbl. (g)	3,935,151	2,362,140
Cement, Portland (u)	Bbl. (h)	46,610,822	51,240,652
Cement, slag (u)	Bbl. (h)	481,224	412,912
Coke	Sh. T.	32,690,362	86,887,392
Copper sulphate (c)	Lb.	50,925,932	3,157,408
Copperas	Sh. T.	22,839	228,390
Crushed steel	Lb.	837,000	58,590
Graphite, artificial	Lb.	4,868,000	312,764
Lead, white	Sh. T.	123,640	15,234,297
Lead, sublimed white	Sd. T.	7,988	798,880
Lead, red	Sh. T.	13,693	1,874,448
Lead, orange mineral	Sh. T.	2,927	421,488
Litharge	Sh. T.	13,816	1,890,050
Mineral wool	Sh. T.	6,357	55,550
Zinc oxide (m)	Sh. T.	77,800	6,257,361
Total	.....	.....	$178,242,696
Aluminum	Lb.	14,350,000	$5,166,000
Antimony	Lb.	5,856,000	1,272,509
Copper	Lb.	917,620,000	180,000,339
Ferromanganese (q)	L. T.	300,500	24,040,000
Gold (fine)	Troy oz.	4,648,385	96,101,400
Iron (pig)	L. T.	25,006,691	453,871,441
Lead	Sh. T.	345,529	39,093,151
Nickel (s)	Sh. T.	7,150	6,360,640
Platinum	Troy oz.	1,439	45,189
Quicksilver	Flasks. (o)	28,293	1,157,184
Silver (fine)	Troy oz.	56,183,500	37,525,521
Zinc	Sh. T.	225,494	27,961,256
Total metals	.....	.....	$872,514,630
Total ores and minerals	.....	.....	821,555,123
Secondary products	.....	.....	178,242,696
Grand total enumerated	.....	.....	$1,872,312,449

(c) Includes sulphate made from metallic copper. (d) includes manganiferous iron ore. (e) Estimated. (f) One "square" covers 100 square feet. (g) Barrels of 265 lbs. (h) Barrels of 380 lbs. (i) Barrels of 42 gallons. (k) Includes salt used in manufacture of alkali; the barrel of salt weighs 280 lbs. (m) Includes a small quantity made from spelter. (o) Flasks of 75 lbs. (q) Includes spiegeleisen, though the value is given as for ferromanganese. (s) Includes nickel from Canadian ores smelted in the United States. (t) Barrels of 330 lbs. (u) Figures reported by the United States Geographical survey. (w) Excludes Lake Superior manganiferous iron ore which is included in iron ore proper.

452,588 to 387,164,694 (not including sub-tropical varieties). Most varieties of temperate zone fruits are grown in every state. The use of refrigerator cars has made it possible to transport fruits long distances, and thus all parts of the country have the advantage of the general market. However, climatic differences tend to localize. From the following table it will be seen that the apple has a decided primacy among American fruits:

Fruits	Trees
Apples	211,794,764
Peaches and nectarines	104,919,428
Pears	19,716,184
Plums and prunes	32,780,892
Cherries	12,943,287
Apricots	5,010,139
Total	387,164,694

The cotton crop of the United States in 1906–7 was as follows:

States	1906–07 Bales
North Carolina	644,000
South Carolina	941,000
Georgia	1,728,000
Florida	66,000
Alabama	1,332,000
Mississippi	1,548,000
Louisiana	980,000
Texas	4,073,000
Arkansas	915,000
Tennessee	317,000
All Others	1,007,000
Total Crop	13,551,000

The culture of the vine has made great progress, chiefly in Ohio, Pennsylvania, Indiana, North Carolina, Missouri, and especially California. The forest area (exclusive of Alaska) is estimated at about 500,000,000 acres, about seven-tenths being on the Atlantic side, one-tenth on the Pacific, one-tenth on the Rocky Mountains and one-tenth in the interior of the Western States. Three-fourths of the timber cut annually is pine, and the remainder oak and other hard woods. Horses are largely bred, and mules and asses in the southern states. The total number and value of the domestic animals in the United States is as follows:

THE FOLLOWING TABLE GIVES THE PRODUCTION OF THE PRINCIPAL CEREAL CROPS BY STATES FOR THE YEAR 1906.

States and Territories	Oats Bushels	Corn Bushels	Wheat Bushels
Maine	4,038,849	456,950	199,342
New Hampshire	424,212	983,775	.....
Vermont	2,862,726	2,005,430	30,952
Massachusetts	214,472	1,778,520	.....
Rhode Island	46,997	331,364	.....
Connecticut	341,179	2,223,800	.....
New York	40,233,784	22,685,000	9,350,180
New Jersey	1,662,819	10,082,289	2,033,002
Pennsylvania	31,816,496	57,960,239	29,073,188
Delaware	95,991	5,894,160	1,947,920
Maryland	808,584	22,007,825	12,902,416
Virginia	2,858,634	45,188,523	9,306,825
West Virginia	2,101,200	22,725,000	4,879,861
North Carolina	3,169,724	41,796,846	5,297,028
South Carolina	3,538,292	23,611,233	2,960,041
Georgia	3,362,291	52,066,596	3,161,070
Florida	394,240	6,875,000	.....
Ohio	48,280,000	141,645,000	43,202,100
Indiana	50,196,000	183,893,767	48,080,925
Illinois	107,763,500	347,169,585	38,535,900
Michigan	43,747,500	54,575,000	13,644,960
Wisconsin	91,630,000	60,105,732	4,690,816
Minnesota	72,011,160	50,149,277	55,801,591
Iowa	140,777,000	373,275,000	9,212,218
Missouri	14,685,503	228,522,500	31,734,900
North Dokota	40,485,608	4,170,000	77,896,000
South Dokata	46,410,000	62,812,500	41,955,400
Nebraska	72,275,000	249,782,500	52,288,692
Kansas	24,780,000	195,075,000	81,830,611
Kentucky	4,430,354	105,437,376	11,542,598
Tennessee	3,151,320	86,428,912	10,892,725
Alabama	3,167,879	47,849,392	1,085,029
Mississippi	1,626,732	40,789,207	17,610
Louisiana	486,227	26,217,633	.....
Texas	31,822,512	155,804,782	14,126,186
Indian Territory	7,446,571	68,493,264	2,890,188
Oklahoma	12,040,000	65,737,326	18,663,862
Arkansas	3,783,706	52,802,569	1,915,250
Montana	8,501,846	93,132	3,297,336
Wyoming	1,979,068	68,256	871,102
Colorado	5,962,394	3,157,136	8,266,538
New Mexico	424,507	1,182,203	1,120,650
Arizona	31,442	220,129	391,658
Utah	2,053,900	356,032	4,888,626
Nevada	252,898	.....	869,526
Idaho	4,390,065	148,037	8,231,631
Washington	7,463,534	288,389	25,075,258
Oregon	9,621,508	499,091	14,215,597
California	5,156,298	1,994,814	26,883,662
Total bushels	964,904,522	2,927,416,091	735,260,970
Total acres	30,958,768	96,737,581	47,305,829
Value	$306,292,978	$1,166,626,479	$490,332,760
Yield per acre	31.2	30.3	15.5
Farm price	31.7	39.9	66.7

Domestic Animals	Total		On Farms and Ranges		Not on Farms or Ranges	
	Number	Value	Number	Value	Number	Est. Value
All Domestic Animals	.....	$3,193,856,459	.....	$2,979,197,586	.....	$214,658,873
Neat cattle, cows, bulls, &c.	69,335,832	$1,516,307,270	67,719,410	$1,475,204,633	1,616,422	$41,102,637
Horses and colts	21,203,901	1,050,526,967	18,267,020	896,513,217	2,936,881	154,013,750
Mules	3,438,523	207,274,557	3,264,615	196,222,053	173,908	11,052,504
Asses and burros	110,012	6,776,583	94,165	5,811,184	15,847	965,399
Sheep and lambs	61,735,014	170,881,743	61,503,713	170,203,119	231,301	678,624
Swine	64,686,155	238,686,872	62,868,041	231,978,031	1,818,114	6,708,841
Goats	1,948,952	3,402,467	1,870,599	3,265,349	78,353	137,118

Horned cattle and sheep are raised in great numbers, hog-rearing forms an important industry, and immense quantities of cheese and butter are made. The staple manufactures are cottons, woolens, iron and steel and articles in iron and steel, other important occupations being those connected with clothing and boots and shoes, furniture, lumbering, flour-milling, meat-packing, etc. The cotton manufacture is carried on chiefly in Massachusetts, Pennsylvania, Rhode Island, Connecticut, and New York; the woolen manufacture chiefly in Massachusetts, New York, Connecticut, Pennsylvania, New Hampshire, Rhode Island Vermont and Ohio; and the most important centers of the iron industry are Philadelphia, Pittsburg, Cincinnati, New York, Baltimore, and St. Louis. Besides these, all ordinary manufactures are making very rapid progress. The foreign trade is very large, the imports in 1907 being valued at $1,591,878,298, the exports at $1,988,989,337. The most important single export is raw cotton, the value annually being about $500,000,000. The other chief exports consist principally of agricultural and dairy products, including wheat, flour, corn, butter, cheese; and animal food, in the form of pickled pork, bacon, hams, beef, canned fish, and live cattle. Other important exports are mineral oil, tobacco, sugar, fruits, tar, pitch, rosin, and turpentine; tallow and hides, lard, hops, oil-cake, clover seed, copper and copper ore, skins and furs. The more important manufactured exports are cotton goods, cotton twist, iron and articles in iron, articles in wood, leather, boots, and shoes, agricultural implements, cutlery, etc. The value of bread-stuffs exported in 1907 was $168,222,482; raw cotton, $481,277,797; provisions, $202,392,508; manufactured and unmanufactured iron and steel, $181,530,871; tobacco, leaf and manufactured, $39,113,011; petroleum, $78,228,819; wood and wooden manufactures, $83,349,575. The total exports to Great Britain in 1907 amounted to $607,783,255. The fisheries, in addition to dried fish and oysters, furnish exports of whale and other fish oil, spermaceti, whalebone, etc. There is also a large export of gold in the forms both of coin and bullion. Among the principal articles of import are sugar, valued at $92,806,253; coffee, $78,231,902; wool and woolen manufactures, $63,855,265; raw silk and silk manufactures, $110,045,150; cotton goods, $73,704,636; chemicals, dyes, etc., $82,997,914; hides and skins, $83,206,545; fruit, including nuts, $35,807,527. The value of the

THE FOLLOWING TABLE GIVES THE FARM PRODUCTIONS OF THE UNITED STATES FOR THE YEAR 1906.

Crop	Year	Unit of Measure	Quantity	Value
Animals	1907	Number	204,131,992	$4,423,697,853
Apples	Census	Bush	175,397,600	(a)
Apricots	Census	Bush	2,642,128	(a)
Beans, Castor	Census	Bush	143,388	134,084
Beans, Dry	Census	Bush	5,064,490	7,633,636
Bees	Census	Swarms	4,109,626	10,186,513
Broom Corn	Census	Pounds	90,947,370	3,588,414
Butter	1905	Pounds	531,478,141	113,189,452
Cereals (b) (l)	1906	Bush	4,854,514,837	(h) 2,065,886,900
Cheese	1905	Pounds	317,144,872	28,611,760
Chicory	Census	Pounds	21,495,870	73,627
Cider	Census	Barrels	1,754,927	(a)
Cotton	1906	Pounds	6,351,107,861	640,311,538
Cotton Seed	1905	Tons	5,060,205	(c) 75,564,041
Flaxseed	1906	Bush	25,576,146	(h) 25,899,165
Flowers, Plants	Census	.....	.....	18,758,864
Forest Products	Census	.....	.....	109,864,774
Fruits, small	Census	.....	.....	25,029,757
Fruits, sub-tropical	Census	.....	.....	8,227,838
Grapes	Census	Central	13,009,841	(d) 14,090,234
Hay	1906	Tons	57,145,950	(h) 592,539,671
Hemp	Census	Pounds	11,750,630	546,338
Honey (e)	Census	Pounds	62,862,885	6,656,611
Hops	Census	Pounds	49,200,704	4,081,929
Milk (i)	Census	Gallons	7,265,804,304	.....
Molasses	Census	Gallons	6,312,809	788,990
Nursery products	Census	.....	.....	10,123,873
Nuts (f)	Census	.....	.....	1,949,931
Onions	Census	Bush	11,790,974	6,637,413
Orchard products	Census	Bush	212,365,600	(g) 83,750,961
Peaches and Nect	Census	Bush	15,432,603	(a)
Peanuts	Census	Bush	11,964,109	7,270,515
Pears	Census	Bush	6,625,417	(a)
Peas, dry	Census	Bush	9,440,210	7,908,966
Plums and Prunes	Census	Bush	8,764,032	(a)
Potatoes, Irish	1906	Bush	308,038,382	(h) 157,547,392
Potatoes, sweet	Census	Bush	42,517,412	19,869,840
Rice [cleaned]	1906	Pounds	495,965,800	(j) 12,955,748
Seeds, Clover	Census	Bush	1,349,209	5,395,578
Seeds, Flax	Census	Bush	19,979,492	19,624,901
Seeds, Grass	Census	Bush	3,515,869	2,808,839
Sugar, Beet	1906	Pounds	967,223,040	(k) 23,895,781
Sugar, Cane	1906	Pounds	514,320,000	(k) 28,804,608
Sugar, Maple	Census	Pounds	11,928,770	1,074,260
Syrup, Cane	Census	Gallons	12,293,032	4,293,475
Syrup, Maple	Census	Gallons	2,056,611	1,562,451
Syrup, Sorghum	Census	Gallons	16,972,783	5,288,083
Tobacco	1906	Pounds	862,428,530	(h) 68,232,647
Vegetables, Mis	Census	.....	.....	113,644,398
Wool	1906	Pounds	298,915,130	129,410,942

(a) Included in orchard products. (b) Not including rice. (c) Based on average price paid by crushers. (d) Including value of raisins, wine, etc. (e) Including wax. (f) Not including peanuts. (g) Including value of cider, vinegar, etc. (h) December 1, 1906. (i) $472,276,783, was the aggregate value of milk, butter and cheese by the census of 1900. (j) Value of product in 1905. (k) Value of product in 1905, based on the export value of refined. (l) Estimated 1907 corn crop 2,553,732,000 bushels.

The census of 1900 gave the following farm statistics for the United States: Farms, total number, 5,739,657; value of farm property, $20,514,001,838; land and improvements, $13,114,492,056; buildings, $3,660,198,191; implements and machinery, $761,261,550; live stock, $3,078,050,041; expenditures in 1899 for labor, $365,305,921; for fertilizers, $54,783,757; number of farms operated by owners, 3,713,371; by cash tenants, 752,920; by share tenants, 1,273,366; by white persons, 4,970,129; by negroes, 746,717. Value of farm products in 1907, estimated by commissioner of agriculture, $7,412,000,000.

total imports from Great Britain in 1907 was $246,112,047. The international commerce of the United States is at present mainly carried in foreign bottoms, while previous to the year 1860 from 75 to 80 per cent was carried by vessels belonging to the United States. Of American vessels engaged in the foreign trade the aggregate tonnage in 1907 was 861,466; in the coasting trade, 6,010,601 tons. Including lake boats, etc., the total burden of American shipping is 6,938,794 tons. The internal commerce is largely facilitated by rivers, lakes, and canals. In 1907, 225,000 miles of railway, 265,000 miles of telegraph line, and 4,778,282 miles of telephone wire were in operation. The weights and measures are the same as those of Great Britain; but the old Winchester wine gallon, equal to .833 of an imperial gallon, the ale gallon equal to 1.01695 imperial gallon, and the Winchester bushel, equal to .9692 of an imperial bushel, are used instead of the imperial standards, and a cental of 100 lbs. is used instead of the cwt. Accounts are kept in dollars, cents or hundredths and mills or thousandths of a dollar. The currency is partly in paper and partly in specie. Gold is coined in double eagles = 20 dollars, eagles = 10 dollars, half-eagles, quarter-eagles, and dollars. Silver is coined in dollars, half-dollars, quarters, dimes, or 10 cents, half-dimes. The only copper coins are cents. The government of the United States is a federal republic based on the constitution of 1787, drawn up by delegates from the thirteen original states, and subsequently amended. The constitution and modes of administration of the individual states bear a close resemblance to each other. Each state maintains its independence, and by means of a state legislature and executive (vested in a governor) has complete management of its own affairs. The combined states have one supreme legislature, which takes the name of congress, and consists of a senate and a house of representatives. The senate consists of two members from each state elected by its own legislature for six years, one-third of the whole body being renewable biennially. The house of representatives consists of members chosen for two years by the people of the several states, in numbers proportioned to their population as ascertained by the decennial census. At present it is composed of 386 members, or one member for 194,182 inhabitants. In addition to the representatives from the states, the house admits a "delegate" from each organized territory, who has the right to speak on subjects in which his territory is interested, but is not entitled to vote. The salary of a senator, representative, or delegate is $7,500 with traveling expenses. Congress meets at least once a year, on the first Monday of December, and its leading powers are to levy taxes, duties, imposts, excises; to pay the debts and provide for the common defense and general welfare of the Union, to regulate commerce with foreign nations and among the several states, to coin money, declare war, raise and maintain an army and navy, etc. It is forbidden to the federal government, among other things, to tax exports, to grant any title of nobility, or to give commercial preference to the ports of one state over those of another. The executive is vested in a president chosen for four years, but eligible for re-election. The electors who vote for the president are chosen by each state, in such manner as its legislature may provide, and are in this capacity known as the electoral college. The president and vice-president are chosen by the majority of this college, and in the case of an equality of votes the president is chosen by the house of representatives, and the vice-president by the sentate. The president, who must be a native-born citizen, and who receives a salary of $50,000 yearly, has the power, in concurrence with two-thirds of the senate, to make treaties, appoint civil and military officers, levy war, conclude peace, etc. He has even a veto on the laws passed by congress, at least until they have received the assent of two-thirds of both houses. The vice-president, who has a salary of $12,000 presides in the senate, and in case of death or permanent disability succeeds the president. The business of the executive is administered by the secretary of state, secretary of war, secretary of the navy, secretary of the treasury, postmaster-general, secretary of the interior, attorney-general, and secretary of agriculture, secretary of commerce and labor, each of whom has an annual salary of $12,000 and holds office during the pleasure of the president. The judicial powers of the Union are vested in a supreme court, presided over by a chief justice and eight associate judges, which each state appoints its own local judges. The powers to enact municipal laws, that is, all laws which concern each state directly and immediately, are among the reserved rights of the state; but they cannot make treaties, coin money, impose duties, emit bills of credit, make agreements, with each other or with a foreign power, nor pass any bill impairing the

obligation of contracts. The general government derives its revenues chiefly from duties on imports and taxes on spirits, tobacco, banks, etc. In 1860 the public debt was only $63,452,773.55; but during the civil war (1861–65) it increased to $2,773,263,173.69. In 1906 it was $2,429,370,043. The public revenue in 1906 amounted to $694,621,000, the expenditure to $460,323,000. The largest items of expenditure are pensions, the civil service, army and navy. It is enacted by congress that there shall be no more than 100,000 enlisted men at one time, the term of service being three years. The army in active service as now organized under the act of congress of February 2, 1901, comprises 15 regiments of cavalry, 750 officers and 13,020 enlisted men; an artillery corps, 30 batteries of field artillery and 126 companies of coast artillery, 651 officers and 18,166 enlisted men; 30 regiments of infantry, 1500 officers and 25,649 enlisted men; 3 battalions of engineers, 1294 enlisted men, commanded by officers detailed from the corps of engineers; staff corps, military, academy, Indian scouts, recruits, etc., 4387 enlisted men; also a provisional force consisting of one regiment in Porto Rico, 31 officers and 554 native enlisted men, and 50 companies of native scouts in the Philippines, 116 officers and about 5000 enlisted men. The total number of commissioned officers, staff and line, on the active list, is 3869, and the total enlisted strength staff and line is 62,516 , exclusive of the provisional force and the hospital corps. Each state has a militia, of which the aggregate nominal strength is about 6½ millions. The navy comprises 28 first-class battle-ships, 22 coast defense ships, 50 cruisers, 42 gunboats, 57 torpedo craft, etc. In 1907 the war department expenditure was set down at $101,671,881; that of the navy at $97,606,595. There is, throughout the country, no uniform system of education, the organization and management of the "common" or state-supported public schools being left to each state, while considerable control is also given to the local authority. These common schools, which in rural neighborhoods are called district schools, are usually public elementary schools, but in some states they include the higher grades. To maintain these common schools the government makes no direct appropriation of moneys, this being supplied by each state through the state legislature directly, from local taxation, or from the sale of public domains set apart as a permanent school fund. Attendance on elementary schools is compulsory in many states, but not in all. In 1904–05 there was an average daily attendance of 11,481,531 pupils (out of 16,468,300 enrolled) in common schools and 350,099 in high schools. The higher education is provided in numerous colleges and universities. In addition there are special colleges for theology, law, medicine, the higher education of women, etc. The constitution of the states grants perfect equality to all creeds, and nearly all the sects and religious denominations existing in Europe are represented. In 1906 there were in all 182,731 churches belonging to the various Protestant bodies, and 11,814 Roman Catholic churches; 140,215 Protestant ministers, and 14,104 Roman Catholic clergy. The Roman Catholics were returned at 12,651,944 in 1906, the numbers of other bodies being given as follows: Methodists, 6,429,815; Baptists, 4,974,047; Presbyterians, 1,723,871; Lutherans, 1,841,346; Protestant Episcopal, 827,127; Congregational, 687,042; Reformed church, 405,022; United Brethren, 274,012; total Protestants about 20,000,000 members or communicants. There are 300,000 Mormons and 143,000 Jews. The first English colonies within the limits of the Union were settled by two chartered companies, called the Plymouth company and the London company. By the latter an expedition was sent out in 1607, and a settlement was made at Jamestown, in the present state of Virginia, while the Plymouth company established a colony on Massachusetts bay. Other settlers continuing to arrive a colonial assembly was for the first time convened in 1619. At this time the foundation of the colonies of New England was laid by the "pilgrim fathers," a body of Puritans numbering 100 who sailed from England in the Mayflower, and landed in 1620 in Massachusetts bay, where they established themselves. Then another colony was founded in 1628 at Salem, and in 1630 still another was established in Boston. Rhode Island was first settled at Providence in 1636 by Roger Williams, who had been driven from Massachusetts for his religious and political opinions. The states of Maryland and Virginia were colonized chiefly by English Roman Catholics and royalist refugees, while the central states were, to a great extent, settled by Dutch and Swedes. But it is impossible to enter into details of the origin and progress of the different states now composing the Union. The most remarkable events of the colonial period were those connected with the wars which Great Britain and her colonies were obliged to wage with France, and which terminated in the cession of Canada, etc., to Great Britain in 1763 by the Peace of Paris at the close of the Seven Years' war. No sooner was this peace concluded than the British parliament resolved to increase the revenue by a general stamp-duty through all the American colonies. Accordingly, the Stamp Act of 1765 was passed; but this, after opposition, was repealed next year, Britain still claiming, however, its right to tax. In accordance with this claim a duty, in 1767, was imposed upon tea, paper, glass, etc.; but the colonial opposition was such that three years later the duties were all repealed except the one upon tea. To such a pass had the opposition now come that in 1773, when British ships loaded with tea attempted to effect a landing in the port of Boston, a number of the inhabitants, disguised as Indians, seized them and threw the cargoes into the sea. In punishment of this, parliament passed the Boston Port Bill, which declared that port closed to all commerce, and transferred the seat of colonial government to Salem. From this time it became evident that a conflict was inevitable, and in 1775 hostilities actually commenced when a small British force, sent from Boston to destroy the military stores at Concord, was attacked by the colonists near Lexington, and forced to retreat. Before the end of April the British governor and army were besieged in Boston by a revolutionary force of 20,000 men; the northern fortresses of Ticonderoga and Crown Point were seized; and a continental congress which assembled at Philadelphia took measures to equip an army and navy, with George Washington as commander-in-chief. On June 17 the British attacked the intrenched position of the colonists on Bunker Hill, which commanded Boston harbor, and captured it, but in the following year they retreated to Halifax. This action induced the colonists to continue their resistance, and it was declared by the thirteen states assembled in congress that "the united colonies are, and ought to be, free and independent states; that their political connection with Great Britain is, and ought to be, dissolved." This resolution was embodied in a declaration of independence, drawn up by Jefferson and adopted 4th July, 1776. The British government now sent an army against the colonists under the command of Sir William Howe, and in a battle on Long Island (August, 1776) Washington was defeated with heavy loss. He retreated beyond the Delaware, and in order to defend Philadelphia, then the capital, was obliged to give battle on the Brandywine, where he was again defeated. Fortune, however, favored the Americans in the north, where General Gates at Stillwater defeated General Burgoyne. This event induced the French to enter the struggle in the spring of 1778, and subsequently Spain and Holland aided the Americans. At last the surrender of Lord Cornwallis with his army at Yorktown (1781) to a combined French and American force under Rochambeau and Washington, virtually terminated the war. On September 3, 1783, Great Britain formally recognized the independence of the United States by a treaty of peace signed at Paris, and in order still further to establish their position the states met at Philadelphia in 1787, and after four months' deliberation framed a constitution. This constitution, which remains the basis of the government, came into operation in March, 1789, and George Washington was elected the first president. The congress oppointed by the thirteen states then proceeded to impose duties, establish a federal judiciary, organize the executive administration, fund the debt of the United States, and establish a national bank. In 1793 Washington was unanimously re-elected president, but in 1797 he refused to be elected for a third term. During his administration the states of Vermont, Kentucky, and Tennessee were admitted into the Union. John Adams was elected second president, and it was while he held office that France made war upon the republic, the fighting taking place chiefly at sea. In 1800 the seat of government was transferred from New York, which had at first been declared the capital, to Washington, while in 1802 Ohio and

Louisiana were added to the Union. Great Britain still claimed the allegiance of American naturalized subjects, and the right to search American vessels for British seamen. In 1807 the British frigate Leopard overhauled the United States frigate Chesapeake, near the entrance to Chesapeake bay, compelled her to surrender, and took off four of her men. Reparation was asked in vain; some time later all trade with France and England was prohibited by act of congress, and in June, 1812, war was declared against Britain. In the different engagements which took place by sea and land the success was varied, and in 1814 peace was arranged. After this the chief historical events were the wars against the southern Indian tribes and the acquisition of Florida from the Spanish in 1819; the annexation of Texas, which led to a war with Mexico in 1845 (see Mexican war); and the acquisition of New Mexico and Upper California, which were ceded to the United States on payment of the sum of $15,000,000 to Mexico. The period about 1857 was notable for the free-soil movement and the increasing difficulty of dealing with slavery. Texas had been introduced into the Union as a slave-holding state, and the endeavor to act similarly with regard to the territory of Kansas led to rioting. The question was still further complicated by disputes respecting the territory of Nebraska, and the insurrection (1859) at Harper's Ferry, led by John Brown, brought the question of the abolition of slavery to a crisis. The presidential election of 1860 turned to a great extent upon this question, and when, Abraham Lincoln, the republican candidate, was elected the slave-holding states considered themselves defeated, and South Carolina, Mississippi, Florida, Alabama, Georgia, Louisiana, and Texas formally seceded from the Union. These states formed themselves into a southern confederation (4th February, 1861), with Jefferson Davis as president, and they were subsequently joined, after hostilities had begun, by Virginia, North Carolina, Tennessee and Arkansas. The custom-houses, arsenals, and United States buildings generally were seized and occupied by the confederates in their own states, and every preparation made to organize a separate government. War was inevitable, and the first blow was struck on April 12, 1861, the confederates proceeding to bombard Fort Sumter, which was forced to surrender. President Lincoln then called out by proclamation 75,000 volunteers, and the first battle on a large scale took place at Bull Run, south of Washington, where the federal forces were completely defeated. During the remainder of 1861 frequent collision took place between the rival forces at different points, almost always to the disadvantage of the north. In the spring of 1862 General Grant captured Fort Donnelson, on the Cumberland river, and along with General Sherman obtained a victory over the confederates at Pittsburg Landing, in Tennessee. In April the federal fleet, under Admiral Farragut, ran past the forts at the entrance of the Mississippi, and seized New Orleans, which was occupied by the supporting land forces. An attempt was then made by General McClellan to invest Richmond, the capital of the confederacy, but this was prevented by the confederate generals Lee and "Stonewall" Jackson, who drove back the federals on the James river, where they established themselves. General Lee then assumed the offensive and moved with his whole army upon Washington, but he was intercepted on the banks of the Antietam by McClellan, and, after an obstinate fight, compelled to recross the Potomac. Soon afterward McClellan was superseded by Burnside, and in December another advance to Richmond was commenced. This General Lee had anticipated, and intrenched himself behind the town of Fredericksburg, a position from which the federals vainly endeavored to dislodge him. Thus the year 1862 closed with no great gain on either side. In the following April General Hooker, superseding Burnside in the command of the army of the Potomac, commenced another movement toward Richmond, but was defeated by "Stonewall" Jackson at Chancellorsville, where, by mischance, the latter was killed in the darkness by his own men. Following up this gain General Lee transferred his army to the valley of the Shenandoah, entered Maryland, and crossed into Pennsylvania. At Gettysburg he was obliged to turn upon the pursuing federal forces under Meade, and after three days' desperate fighting and the loss of 15,000 men Lee was forced to retreat into Virginia. On the Mississippi the fortune of war was also in favor of the federals. Aided by the fleet, which had dashed past Port Hudson and seized Natchez, General Grant had assumed the offensive and captured Vicksburg, while at the end of this year (1863) he inflicted severe defeat upon Bragg at Chattanooga. In 1864 General Grant, as the result of his successes, was appointed commander-in-chief of all the armies, and at once he set himself to reorganize the federal forces. He took command of the army of the Potomac himself, with which he proposed to meet Lee, while he dispatched Sherman to operate against J. E. Johnston. In May, Grant moved his main force across the Rapidan and immediately attacked Lee in The Wilderness, where severe fighting lasted for six consecutive days. Unable to rout the confederates, Grant endeavored by a flank movement to cut them off from Richmond, but Lee anticipated the attempt and foiled it. Thus baffled, Grant by a circuit crossed the James river, joined Butler, and attacked Petersburg, but was repelled, and obliged to begin a regular siege during the winter. Meantime Sherman with a large federal force, had defeated Hood (who superseded Johnston as commander in Georgia), had occupied Atlanta, crossed the country by forced marches, seized Savannah, and by February, 1865, was able to occupy Charleston and Wilmington. During this brilliant movement the forces under Lee and Grant had faced each other in the lines round Richmond, but in April, 1865, a general advance was made by the federals. Lee defended Petersburg and Richmond with great skill and obstinacy, but after three days' sanguinary conflict the confederate lines were broken, and Richmond lay at the mercy of the Northern armies. Lee retreated north of the Appomattox, but was closely followed by Grant, who captured the general and his whole army. The remaining confederate armies in the field soon afterward surrendered, and the four years' war ended in favor of the federal government. In the course of the war the abolition of slavery had been proclaimed by President Lincoln, and he had just entered (April 1865) upon his second term of the presidentship when he was assassinated in Ford's theater at Washington by J. Wilkes Booth.

As the states returned to their allegiance to the Union they were after a time readmitted to their state and national privileges. The election of General Grant to the presidency in 1869 served, in some measure, to consolidate matters. An amendment to the national constitution was proclaimed in March 1870, and provided that no difference of race, color, education, or religion shall debar any person from the rights of citizenship in any of the states. This question of equal rights gave rise in 1874 to considerable rioting in the southern states between the negro and the white population, and is still beset with dangers. During the Grant administration the Indians of the northwest frontier were successfully suppressed, and a bill for the resumption of cash payments on January 1, 1879, passed Congress (December, 1874). Among other events were the admission of Colorado (1876) to the Union; the great international exhibition at Philadelphia, to celebrate the centenary of American Independence (1876); the opening of the Pacific railway from Omaha to San Francisco (1869); a dispute with Spain respecting the imprisonment of an American citizen in Cuba (1870–72); the great labor strike at New York (June, 1872); the massacre of General Custer and troops by the Indians (June 25, 1876); the celebration of the foundation of the American republic (July 4, 1876); and the settlement of the dispute with Great Britain respecting extradition (December, 1876). The election for president at the close of 1876 resulted in the return of Rutherford B. Hayes (1877–81), republican, the principal events in his term of office being the dispute as to the validity of the presidential election; the great railway strike; riots and bloodshed in West Virginia (July, 1877), suppressed by General Sheridan; the progress of measures for the pacification of the south; the veto of the Bland "Silver Bill" by the president (February 16, 1878), after it had received the sanction of congress, and the resumption of cash payments (January 1, 1879), gold for the first time since the war being at par (December 18, 1878). General J. A. Garfield (1881), republican, succeeded as president, but held office but for a short period, dying from the effects of a bullet fired by Guiteau, a Chicago lawyer (July 2, 1881). General Chester A. Arthur (1881–85), the vice-president, became president, and was succeeded

by Grover Cleveland (1885–89), the democrats, for the first time since the presidency of Buchanan, being successful in placing their nominee in office. President Cleveland's term of office was characterized by the adoption of measures for the reorganization of the civil service, and other reforms. Among the events of this presidency were the rejection, by the republicans, of the Fisheries Treaty, arranged with the United States government by Mr. Joseph Chamberlain on behalf of Great Britain, after having received the sanction of the president; the passage by congress of a bill prohibiting Chinese immigration for twenty years; the great blizzard which devastated New York (March 12, 1888); the collapse of the great railway strike organized by the Knights of Labor; the defeat of the Mills Tariff bill, introduced to reduce import duties, and the withdrawal of Lord Sackville, the British ambassador, in consequence of the "Murchison" letter. General Sheridan, commander-in-chief of the United States army, died July, 1888. In the election (November, 1888), the republicans replaced Cleveland by their candidate, General Harrison (1889), who appointed Mr. J. G Blaine as secretary of state. North and South Dakota, Montana, and Washington territory were admitted to the Union. The same year the United States government accepted Prince Bismarck's proposal to join the Berlin conference on the Samoan question (the treaty was ratified February, 1890); the Oklahoma territory was thrown open for settlement; the centennial of the Union was celebrated on May Day; the agents of the Clan-na-Gael, who had assassinated Dr. Cronin of Chicago, were tried. Great floods at Johnstown, Pa., caused much destruction and distress (May), and later (November), New York state, Pennsylvania, and neighboring states were devastated by floods. A great Pan-American congress assembled (November) at Philadelphia, under the presidency of Mr. Blaine, and (December 6) Jefferson Davis, ex-president of the confederate states, died at New Orleans. 1890 was chiefly remarkable for the passage of the Silver bill, authorizing the secretary of the treasury to purchase for coining 4,500,000 oz. of silver monthly, and to issue certificates to be used as legal tender for all debts; the passage of the McKinley Tariff bill, which greatly augmented the import duties, the bill coming into operation October 6; the ratification of a new Extradition Treaty with Great Britain; the passage of a bill for increasing the United States navy, and the defeat of the republican party by large majorities at the general elections (November). The attitude of Mr. Reed, speaker of the house of representatives, toward the democratic members caused considerable friction in that party. Wyoming and Idaho were this year admitted to the Union. The principal events of 1891 were the continuation of the Fisheries dispute; the passage of the Copyright bill; the lynching of the Italian prisoners connected with the Mafia by the citizens of New Orleans (March), and the recall of the Italian ambassador; the refusal of the Chinese court to receive the United States representative, as a protest against the Chinese Immigration bill; the tour of the president through the south and west of the states; and the agreement between the United States and Great Britain, signed at Washington. In 1892 the Fisheries Dispute was agreed to be referred to arbitration; compensation to the families of the Italians lynched at New Orleans was granted by the United States government; more stringent measures adopted for the exclusion of the Chinese, and the presidential contest commenced. The political change in 1893 in the Washington administration by the inauguration of Mr. Cleveland as president on March 4 did not cause as much excitement as did Mr. Cleveland's first accession. President Cleveland called an extra session of congress to convene August 7, to consider the financial crisis June 30; when the extra session begun currency was selling at a premium in New York City. The house of representatives voted to repeal the silver-purchasing clause of the Sherman act, rejecting all free coinage amendments, August 28, and on September 20 the bill to repcal the Federal Election law was reported in the house. The senate passed the Silver Repeal bill October 30. During the year American eyes were turned frequently toward Hawaii, where Queen Liliuokalani was dethroned by revolutionists on January 16; Minister Stevens landed United States marines at Honolulu, raised the United States flag, and established a protectorate February 1; this protectorate ended April 13, when the United States forces were withdrawn by order of Commissioner Blount. Other noteworthy American incidents of 1893 were: The World's Fair at Chicago was opened by President Cleveland May 1 and continued until October 30; the New York Central railroad's engine "999" raised the speed limit to 112½ miles per hour; Princess Eulalie, representative of the Spanish government, was received with honors in New York May 18; the body of Jefferson Davis was reinterred at Richmond, Va.; Lieutenant Peary's expedition left New York for the Arctic regions July 2; 1,000 lives were lost by a cyclone in Savannah and Charleston August 28; President Cleveland opened the Pan-American congress in Washington September 5; the Parliament of Religions began its sessions at Chicago September 11; the Cherokee strip was opened for public settlement September 16; a disastrous cyclone raged on the Gulf coast of Louisiana, about 2,000 persons, mostly whites, being killed, and much property destroyed; the United States supreme court decided the Great Lakes to be high seas November 21. The principal events of interest in 1894 included the passing of the Wilson Tariff and Income Tax bills by the house of representatives; the passing of the Bland Coinage bill by the United States senate, 44 to 31; the Greater New York bill was signed by the governor, making it the second largest city on earth, February 28; President Cleveland signed the Enabling act, making Utah a state, July 17; the Hawaiian republic was officially recognized by the United States government August 9; the new tariff law became a law without President Cleveland's signature August 27; a new treaty between the United States and Japan was proclaimed December 9. President Cleveland, on January 28, 1895, sent a message to congress on the financial affairs of the government, and asked authority to issue gold bonds; on February 8 he informed congress of arrangements made with the bankers' syndicate to take an issue of $62,400,000 government bonds. On May 20, the supreme court of the United States, by a vote of 5 to 4, declared the whole Income tax law null and void. The Cotton States and International exposition at Atlanta was opened. The National park, on the site of the Chickamauga battle ground, Tennessee, was dedicated by a great gathering of Union and confederate veterans September 19. In 1896 McKinley won a signal victory, receiving 601,854 popular votes over Bryan and 286,452 over all. The final year of President Cleveland's administration was marked by his announcement of the members of the Venezuelan Boundary commission January 1; a call by Secretary Carlisle, January 6, for bids for $100,000,000 bonds as a popular loan; the president's proclamation of warning to Cuban filibusters July 30; the reception of Li Hung Chang, the Chinese statesman, by president Cleveland August 29. In 1897 McKinley was inaugurated. Previous to that, a treaty of arbitration between the United States and Great Britain was signed at Washington by Secretary Olney and Ambassador Pauncefote January 11. The Tennessee Centennial exposition was formally opened May 1. The Congress of the Universal Postal Union opened at Washington, D. C., May 2. The Venezuela Boundary treaty between Great Britain and Venezuela was ratified at Washington June 14. A treaty of annexation to the United States was unanimously ratified by the Hawaiian senate September 14. Secretary of State Sherman and Lord Salisbury, British Foreign Minister, held correspondence over the Bering sea seal question October 4–12. A treaty to protect the seals in Bering sea was signed at Washington by representatives of the United States, Russia and Japan. President McKinley signed the treaty adopted by the Universal Postal Congress November 16. The destruction of the battleship Maine, in the harbor of Havana, February 15, 1898, would have precipitated a crisis had it not been for the fact that the question was immediately raised as to whether the ship had been destroyed by an external or internal explosion. The disaster caused intense excitement, and it was decided to investigate the facts, and await material proof before forming a judgment as to the cause, the responsibility, and, if the facts warranted, the remedy due. A naval court of inquiry was organized. The court held its sittings on board the lighthouse tender Mangrove anchored near the wreck. Aided by a strong force of wreckers and divers, the court proceeded to make a thorough investigation. The finding of the court of

UNITED STATES

inquiry was reached, on the 21st of March, and, having been approved on the day following by the commander-in-chief of the United States naval force on the north Atlantic station, was transmitted to President McKinley. This report was submitted to congress by the president, with the statement that he did not doubt but that the sense of justice of the Spanish nation would dictate a course of action suggested by honor and the friendly relations of the two governments. On March 8 the house of representatives passed a bill appropriating $50,000,000 for national defense, after four hours of debate, by the unanimous vote of 311 members. The following day the senate passed the same bill by a unanimous vote and without debate. On March 9 the president signed the bill, and measures of preparation for war received a great stimulus. On April 15, the Twenty-fifth infantry, United States of America, went into camp at Chickamauga Park. The following day the army officials called for bids for the transportation of troops to southern points. United States troops from many garrisons, on April 19, moved to the point of mobilization on the Gulf and at Chickamauga Park. On April 20, the president sent an ultimatum to Spain demanding that her land and naval forces withdraw from Cuba, and also required an answer before noon of April 23. The Spanish minister at Washington requested and received his passports. Before Minister Woodford could deliver the ultimatum of the United States to Spain on the day following, he was notified by the Spanish government that diplomatic relations with the United States were at an end. On April 22, the Spanish merchantman Buenaventura was captured by the United States gunboat Nashville off Key West. Spain issued a declaration of war on April 24. On the day preceding, the blockading of Havana and neighboring ports actually began, and President McKinley issued his first call for 125,000 volunteers. The regular army was already moving from every post in the country to mobilization points. Commodore Dewey at Hongkong was ordered to capture or destroy the Spanish naval forces in the Philippine Islands. May 1, Commodore Dewey, steamed into Manila harbor, and after an incredibly short engagement sunk or destroyed the entire Spanish fleet. On the following day Commodore Dewey cut the cable connecting Manila with Hongkong, and destroyed the fortifications at the entrance of Manila Bay, taking possession of the naval station at Cavite. May 12, Admiral Sampson bombarded San Juan, Porto Rico. Cervera left the Cape Verde Islands, where he had congregated the best ships of the Spanish navy, and sailed westward. May 13, Schley's flying squadron went to sea to search for the Spanish fleet. It was located a few days later at Curacoa, Venezuela, where it touched for coal and repairs. On May 18, Cervera's fleet reached Santiago and entered the harbor. Investment of the harbor by the North Atlantic and the flying squadrons was immediately begun; also bombardment of the outer fortifications of the place, which were supposed to be very strong. On June 1, the fleets of Sampson and Schley were combined, Admiral Sampson commanding. While the navy was locating Cervera and penning him in, the army was landing supplies on Cuban soil. Next came preparations for hurrying forward into Cuba an army of invasion. May 25, President McKinley called for 75,000 more troops. The same day the war department sent 6,000 troops from San Francisco to Manila to reinforce Dewey. General Shafter and his men commenced fighting two days after touching Cuban soil. On June 24 they took Juragua. At the same time the United States "Rough Riders" (dismounted), under Colonel Wood and Lieutenant-Colonel Theodore Roosevelt, engaged a force of Spaniards near Siboney and suffered severely. The Tenth United States cavalry, under General Young, was also in this battle. On July 3, General Shafter notified the Spanish generals in Santiago that if surrender were not immediate he would bombard the city. While General Shafter was waiting for a reply to his notice of bombardment, Admiral Cervera, attempted on the morning of July 3 to escape from the harbor of Santiago. The American ships got under headway at once, and bore down upon the enemy, forcing the Spanish ships to hug the shore, and in an incredibly short time in a running fight the whole of Cervera's fleet was destroyed. Owing to advices from Washington, Shafter did not bombard Santiago as he had threatened, but besieged the city. July 10, Spanish batteries opened on his forces, but were soon silenced. General Toral, the Spanish general commanding at Santiago, decided, July 14, to surrender, and three days later he gave up the city and the entire eastern portion of Cuba, together with 25,000 soldiers. With the surrender of Santiago the war was thought by all to be practically at an end, but active preparations were continued to take possession of Porto Rico. General Miles was placed in command of an army of invasion, which landed July 20, at Port Guianca. The Spaniards there resisted, but were repulsed, and the army advanced. The port of Ponce was occupied without difficulty, and then the city of Ponce and Juana Diaz. The advance upon San Juan was gradual, the Spanish resistance was very light, while the inhabitants welcomed the invading army with enthusiasm. Porto Rico was evacuated by the Spanish soldiers in October, and Major-General John R. Brook was appointed military governor. The members of the old cabinet of the islands took the oath of allegiance to the Uniten States, and were continued in office. In December General Brook became military governor of Cuba, and General Guy V. Henry succeeded him in Porto Rico. Affairs in the Philippines assumed a serious nature soon after the capture of Manila, August 13, 1898. The Filipinos organized a provisional government with Emilio Aguinaldo at the head. This leader had been brought in an American ship from Hongkong to organize the native forces to assist the United States against the Spanish. In a few months' operations the native troops captured many Spanish outposts and took many prisoners. At the close of the war the existence of the Filipino republic was made known, and its officers demanded recognition by the United States government, and upon being refused, showed considerable animosity during the winter of 1898–99. In February, 1899, a battle occurred between the Filipinos about Manila and the American troops stationed between them and the city to prevent their entrance into Manila. Thus was begun a conflict which lasted throughout 1899, 1900, and until March, 1901, when Aguinaldo was captured by General Funston. (See Spanish-American War). The other events of interest were: the United States and Canadian Joint High commission met at Quebec August 23; a commercial treaty with France was signed at Washington May 30; the Trans-Mississippi and International exposition opened at Omaha, Neb., June 1; a joint resolution for the annexation of Hawaii passed the house of representatives June 15, and the senate June 17; President KcKinley and his cabinet attended the Peace Jubilee at Atlanta, and visited Montgomery, Savannah and other southern cities, receiving great ovations, December 13–19.

The calm of peace settled upon the United States, except in the Philippines, in 1899. The American flag was raised at Guam February 1. The president signed the peace treaty with Spain February 10. A reciprocity treaty with France was signed July 24. The National Export exposition opened at Philadelphia September 14. England and the United States agreed on a temporary arrangement of the Alaska boundary dispute October 12. The Samoan partition treaty was signed at Washington December 2, England having relinquished its territorial rights November 8, and hostilities between naval claimants for the throne having been pending since January 1. American and British naval forces were attacked at Apia, Samoa, by Mataafa's followers April 1, and one British and two American officers were killed. The Philippine war of 1899 began on February 4, when the Filipinos, under Aguinaldo, attacked the American defenses at Manila; the next day the Americans assumed the offensive, and in the several days' fighting which ensued lost 57 killed and 215 wounded, the Filipinos losing 500 killed, 1,000 wounded and 500 captured. The battle of Caloocan was fought February 10. In all the engagements, which followed to the end of the year in a warfare largely desultory, the Americans were almost uniformly successful, the enemy retreating after making a more or less determined stand. The Philippine commission, appointed by the president, and composed of President Schurman, of Cornell university; Prof. Dean Worcester, Charles Denby, late minister to China; Admiral Dewey and General Otis sat in Manila from March 20 until September. On April 4 the commission issued a proclamation to the people of the Philippines announcing a broad but firm American policy in the islands. On November 2 the commission submitted its preliminary report to the president at

Washington. The army of occupation having been reinforced by 30,000 men, military operations on a much larger scale than before were begun with the advance of the dry season. In 1900 Secretary Hay announced the success of the "open door" policy in China; the senate ratified the Samoan treaty January 16; the Hay-Pauncefote treaty, amending the Clayton-Bulwer treaty, was signed at Washington February 5; President McKinley signed the Gold Standard Currency bill March 14; a tornado at Galveston, Tex., destroyed 7000 lives and $30,000,000 in property September 8, and about $1,000,000 was subscribed throughout the states for relief; a great strike prevailed in the anthracite coal regions of Pennsylvania September 13-October 13, and was ended by mutual concessions; the republican national convention at Philadelphia, Pa., nominated William McKinley, of Ohio, for president, and Theodore Roosevelt, of New York, for vice-president, both by acclamation. The democratic national convention at Kansas City, Mo., nominated William J. Bryan for president by acclamation. On the first ballot Adlai E. Stevenson for vice-president, his leading opponent being David B. Hill, who received 200 votes out of 936 cast, Stevenson getting 559½ ballots. The silver republican national convention at Kansas City, Mo., July 6, the people's party (fusion) at Sioux Falls, S. Dak., May 10, and the anti-imperialist league at Indianapolis, Ind., August 16, indorsed Bryan, and the national democratic party (gold democracy) refused to indorse him, and voted in convention at Indianapolis to oppose him July 25. The money issue was paramount in the campaign, and on November 6, in the general election, McKinley and Roosevelt had a popular plurality of 849,435 over Bryan, a popular majority of 457,027 over all, and an electoral majority of 137. The total popular vote was 13,961,566. In 1901 President McKinley, while holding a reception, on September 6, at the Pan-American exposition, Buffalo, was shot by Leon Czolgosz. Vice-President Theodore Roosevelt took the oath of office as president immediately after McKinley's death. The Army Reorganization bill was signed by President McKinley February 2; territorial legislature of Hawaii began its session February 20; Aguinaldo, the Filipino insurrectionary chief, was captured by General Funston in the Province of Isabella, Luzon, March 23; on the same date the United States paid Spain for the islands of Cagayan and Sibutu; President McKinley received the Cuban commissioners April 26; the Pan-American exposition was formally opened at Buffalo, N. Y., May 1; it was closed November 4; civil government was established at Manila, in the Philippines, May 3; Jacksonville, Fla., suffered a $10,000,000 fire May 3; the Isthmian Canal Treaty between the United States and Great Britain was signed by Secretary Hay and Lord Pauncefote November 8; the South Carolina and West Indian Exposition at Charleston, S. C., was opened with religious ceremonies December 1. In 1902 President Roosevelt sent to congress the report of the Isthmian Canal commission, recommending the purchase of the Panama Canal company rights for $40,000,000. On July 4 he issued orders establishing civil government in the Philippines and granting amnesty for political prisoners. A great strike of anthracite coal workers in the Pennsylvania region begun May 12. Lieutenant Peary, American Arctic explorer, arrived at Sydney, C. B., having penetrated as far north as 84° 17′ northwest of Cape Hecla; the reciprocity treaty between the United States and Newfoundland was signed November 8. The Venezuelan government appealed, through the United States, for arbitration of European claims December 15. The Panama Canal treaty between the United States and Colombia was signed January 22, 1903; the United States and Great Britain signed a treaty providing for a mixed commission to settle the Alaskan boundary dispute January 24; Great Britain, Germany and Italy signed February 13, protocols providing for the settlement of the Venezuelan controversy at Washington, and protocols for the settlement of the French, Mexican and Dutch claims against Venezuela were signed at Washington February 26–28; the president signed the bill creating the department of commerce and labor February 14; the Cuban senate ratified the reciprocity treaty with the United States March 11, and it was ratified at Washington, with amendments March 19; President Roosevelt started on an extensive western trip April 1; the United States court of appeals decided the Northern Securities company merger illegal April 9; the United States supreme court sustained the clause in the Alabama constitution disfranchising the negroes April 27; the dedication of the Louisiana Purchase exposition buildings at St. Louis took place with imposing ceremonies April 30; the European Squadron of the United States arrived at Kiel and was received by the German Emperor June 23–26; Cuba ceded to the United States two naval stations, and government of the Isle of Pines was settled July 2; the Pacific cable was completed, and on July 4 President Roosevelt sent the first message over to Governor Taft, of the Philippines; the President sent another message around the world by cable in twelve minutes; Chicago celebrated the hundredth anniversary of the first settlement September 26-October 1; a commercial treaty between the United States and China was signed October 8; the Alaskan Boundry Tribunal in London decided in favor of the United States on all points except the Portland canal October 17; the republic of Panama was proclaimed November 3, and the United States recognized the independence of Panama November 6; congress met in extraordinary session to consider the Cuban reciprocity treaty November 9; the Cuban naval station at Guantanamo was transferred to the United States November 11; the House of representatives passed the Cuban Reciprocity bill November 19. The republican national convention met at Chicago, June 23, 1904, and nominated Theodore Roosevelt, of New York, for president, and Charles W. Fairbanks, of Indiana, for vice-president. The democratic national convention at St. Louis nominated Alton B. Parker, of New York, for president, and Henry G. Davis, of West Virginia, for vice-president. Roosevelt had a "walk over," receiving 2,541,635 popular votes to Parker's 1,729,809. The United States supreme court decided that Porto Ricans are not aliens, January 4; the commercial treaty between the United States and China was ratified at Washington, President Roosevelt issuing a proclamation to that effect January 13; William H. Taft became secretary of war, Elihu Root retiring, February 1; fire in Baltimore's business district destroyed $70,000,000 worth of property; senate ratified the Panama canal treaty by a vote of 66 to 14 February 23; one of the tunnels under the Hudson, between New Jersey and New York, was completed March 11; the United States supreme court decided that the Northern Securities company was a trust, and therefore, illegal, March 14; the United States senate, in executive session, ratified the treaty with Cuba, embodying the Platt amendment, March 22; the contract for the transfer of the Panama Canal property to the United States was signed at Paris April 22; the Louisiana Purchase exposition was opened at St. Louis April 30; the excursion steamer General Slocum, having on board a Sunday-school picnic, was burned in the East river and more than 1000 persons, mainly women and children, were lost June 15; the thirteenth International Peace conference opened at Boston October 3; the president directed Secretary Taft to go to Panama to reassure the people of the pacific intentions of the United States October 19: the president invited the signatory powers to a second peace conference at The Hague October 20; the New York subway was opened from city hall to 145th street October 27; Secretary of State Hay and the French ambassador signed an arbitration treaty at Washington, D. C., November 1; an arbitration treaty was signed at Washington between Germany and the United States November 15; all differences between the United States and Panama were settled by an agreement between Secretary Taft and President Amador December 2. In 1905 through the efforts of President Roosevelt, Russia and Japan agreed to a peace parley in June. On January 28 Santo Domingo agreed that the United States should preserve order and assume charge of finances in the Dominican republic, while guaranteeing territorial integrity. Theodore Roosevelt and Charles W. Fairbanks were inaugurated on March 4 as president and vice-president of the United States for the term 1905–1909; the United States supreme court declared the beef trust illegal January 30; the investigation into the affairs of life insurance companies in New York began, the Equitable being the first company investigated; the body of John Paul Jones was discovered in Paris by Gen. Horace Porter April 14; it was brought with honors to the United States and was interred in a temporary tomb at Annap-

olis, Md., July 24; the Lewis and Clarke Centennial exposition was opened at Portland, Ore., May 28; Charles J. Bonaparte succeeded Paul Morton as secretary of the navy July 1; Elihu Root was appointed to succeed the late John Hay as secretary of state July 6; Peary sailed from New York for the North Pole July 16; Prince Louis of Battenburg arrived at Annapolis with the British cruiser squadron on a visit to American waters November 1. In 1906 the United States supreme court decided that witnesses in anti-trust proceedings cannot be excused from testifying against their corporation March 12; earthquakes and fire destroyed a large part of San Francisco, Cal., causing a loss of $400,000,000, April 18–19; the remains of John Paul Jones were reinterred at Annapolis April 24; the Benjamin Franklin Bi-Centenary was celebrated at Philadelphia April 27; public schools, with half a million pupils, were opened in the Philippines June 11; the president signed the Oklahoma and Arizona statehood bills June 16; the United States senate approved of the lock canal for Panama June 21; an insurrectionary movement in Cuba was begun August 20, and President Palma appealed to the United States for intervention in the island September 8; on September 13 American marines were landed at Havana, but were withdrawn; on September 28 President Palma, of Cuba, resigned; on the following day Secretary Taft proclaimed United States intervention in Cuba and himself as provisional governor; on October 12 Mr. Taft was succeeded in this office by Charles E. Magoon; William J. Bryan arrived in New York city from a long trip abroad and was given a popular reception August 30; a great naval demonstration off Oyster Bay was reviewed by the president September 8; Gen. James F. Smith was installed as governor of the Philippine islands September 20; the sugar trust was indicted at New York for accepting railroad rebates October 2; contractors were invited to submit proposals for the completion of the Panama canal September 10; the Japanese were excluded from the regular public schools of San Francisco October 15; President Roosevelt departed on a visit to the Isthmus of Panama November 8, reaching the city of Panama November 15, this being the first time a president of the United States passed beyond the jurisdiction of its flag. The president landed in Porto Rico November 21, and returned thence to Washington, where he arrived November 26. In 1907 the pure food law went into effect January 1. Ambassador Bryce presented his credentials at the White House February 25. Major Gonthals was appointed chief engineer of the Panama canal February 26. The United States supreme court decided that the Isle of Pines is not American territory, April 8. The Jamestown Tercentenary exposition was formally opened by President Roosevelt April 26. President Roosevelt signed a treaty with San Domingo June 24. United States fiscal year closed with a surplus of $87,000,000 June 30. The north tube of the Belmont tunnel from 42d street, New York, to Long Island City was opened August 7. Oklahoma ratified the new constitution and elected a Democratic state ticket and legislature September 17. The Phillippine assembly was opened October 16. First wireless dispatch over the Atlantic ocean for commercial purposes October 17. Financial stringency all over the country. Wm. H. Taft and James Schoolcraft Sherman were elected as president and vice president. Opened the Central American Peace conference November 17. American battleship fleet departed for the Pacific coast Dec. 16, 1908 visiting Hawaii, Australia, the Phillipines, Japan, China and Gibraltar, arriving in Hampton Roads in February, 1909, without a mishap.

The first literary work of any consequence produced in the United States was a translation of Ovid's Metamorphoses by George Sandys, written in Virginia (1620) and published in London (1626), and the first published book was a Puritan edition of the Psalms (Cambridge, United States, 1640). The most notable of the earlier writers were the theologians, such as Increase and Cotton Mather, Roger Williams, and above all Jonathan Edwards. The succeeding or revolutionary era was chiefly remarkable for its political writers, among whom were John Adams, Thomas Jefferson, Alexander Hamilton, John Jay, James Madison, and Benjamin Franklin. Philology was represented at this time by Lindley Murray, and the compiler of the famous dictionary Noah Webster. The list of poets includes Philip Freneau, John Trumbell and Joel Barlow. The first well-known novelist was Chas. Brockden Brown.

It was not, however, till the nineteenth century that the United States produced the higher form of pure literature. The poets of this epoch were William Cullen Bryant, Rich. H. Dana, J. G. Percival, Fitz-Greene Halleck, and Mrs. Sigourney, the song-writers, F. S. Key, Sam. Woodworth, John H. Payne (author of Home, Sweet Home), and Stephen C. Foster. The later and in part more famous names are J. G. Whittier, H. W. Longfellow, E. A. Poe, James R. Lowell, R. W. Emerson, Walt Whitman, Eugene Field, and James Whitcomb Riley; less well known throughout the world with many strong followings in varied classes are R. H. Stoddard, E. C. Stedman, Joaquin Miller, Will Carleton, Ella Wheeler Wilcox, Bliss Carmen, Clinton Scollard and William Vaughn Moody. The famous novelists of the past are James Fenimore Cooper and Harriet Beecher Stowe, the works of these two having been translated into all the modern languages; Washington Irving, Nathaniel Hawthorne and Bret Harte; nearly as well known are Henry James, F. R. Stockton, Louisa M. Alcott, and G. W. Cable; among the better known names of the present generation are Margaret Deland, Edith Wharton, Robert Barr, and R. W. Chambers, while the works of Mary Hartwell Catherwood, Frances Hodgson Burnett, Winston Churchill, F. Marion Crawford, Booth Tarkington, Mary Johnston, Irving Bacheller, and Maurice Thompson won enormous popularity. Of the poets Edgar Allen Poe is as well known for his fiction; Holmes, Longfellow, and Whittier are also authors of novels. Of American humorists the best known are Charles F. Browne (Artemus Ward), Samuel L. Clemens (Mark Twain), C. H. Clark (Max Adeler), H. W. Shaw (Josh Billings), E. W. Nye (Bill Nye), F. P. Dunne (Mr. Dooley), and George Ade. Among leading American historians are George Bancroft, W. H. Prescott, J. L. Motley, J. B. Macmaster, and Woodrow Wilson, whose work represented much original research while a school of "popular" historical writing was developed by J. C. Ridpath and others. At the head of the essayists stand Ralph Waldo Emerson, with Henry D. Thoreau, O.W. Holmes, and G. W. Curtis; other essayists of note were N. P. Willis, T. B. Aldrich, J. T. Fields, and J. G. Holland, while Charles Dudley Warner, Brander Matthews, and Agnes Repplier in a later generation did much to maintain the high standard.

UNITED STATES, TERRITORIAL EXPANSION OF THE, There have been thirteen additions to the original territory of the Union, including Alaska, the Hawaiian, Philippine, and Samoan islands and Guam, in the Pacific, and Porto Rico and Pine islands, in the West Indies, and the Panama canal zone; and the total area of the United States, including the noncontiguous territory, is now fully five times that of the original thirteen colonies. The additions to the territory of the United States subsequent to the peace treaty with Great Britain of 1783 are shown by the following table, prepared by the United States general land office:

ADDITIONS TO THE TERRITORY OF THE UNITED STATES FROM 1800 TO 1901.

Territorial Division	Year	Area Added, S. Miles	Purch'se Price, Dollars
Louisiana purchase..	1803	875,025	15,000,000
Florida	1819	70,107	5,499,768
Texas	1845	389,795	.....
Oregon territory	1846	288,689	.....
Mexican cession	1848	523,802	*18,250,000
Purchase from Texas	1850	†	10,000,000
Gadsden purchase	1853	36,211	10,000,000
Alaska	1867	599,446	7,200,000
Hawaiian Islands	1897	6,740	.....
Porto Rico	1898	3,600	.....
Pine Islands (W. I.)	1898	882	.....
Guam	1898	175	.....
Philippine Islands	1899	143,000	20,000,000
Samoan Islands	1899	73	.....
Additional Phil'pines	1901	68	100,000
Total	....	2,937,613	87,069,768

*Of which $3,250,000 was in payment of claims of American citizens against Mexico. †Area purchased from Texas amounting to 123,784 square miles is not included in the column of area added, because it became a part of the area of the United States with the admission of Texas.

Article 2 of the treaty between the United States and the Republic of Panama, ratified by the United States senate February 23, 1904, treaty in effect February 26, 1904, provided for the cession, in perpetuity, by Panama, of a strip of territory adjacent to the canal, as follows: "The Republic of Panama grants to the United States in perpetuity the use, occupation, and control of the zone of land and land un-

der water for the construction, maintenance, operation, sanitation, and protection of said canal of the width of ten miles, extending to the distance of five miles on each side of the center line of the route of the canal to be constructed; the said zone beginning in the Caribbean sea, three marine miles from mean low-water mark, and extending to and across the Isthmus of Panama into the Pacific ocean to a distance of three marine miles from mean low-water mark, with the proviso that the cities of Panama and Colon and the harbors adjacent to said cities, which are included within the boundaries of the zone above described, shall not be included within this grant. The Republic of Panama further grants to the United States in perpetuity the use, occupation, and control of any other lands and waters outside of the zone above described, which may be necessary and convenient for the construction, maintenance, operation, sanitation, and protection of the said canal or of any auxiliary canals or other work necessary and convenient for the construction, maintenance, operation, sanitation, and protection of the said enterprise. The Republic of Panama further grants to the United States in perpetuity the use, occupation and control of all islands within the limits of the zone above described, and in addition thereto the group of small islands in the Bay of Panama named Perico, Naos, Culebra, and Flamingo."

UNIVALVE, a mollusc, with a shell composed of a single piece. The univalves include most of the Gasteropoda, as land-snails, sea-snails, whelks, limpets, etc. The majority of univalve

Univalve shell.

A, Apex. B, Base. C, Aperture. D, Anterior canal. E, Posterior canal. F, Inner lip, pillar lip, columellar lip or labium. G, Outer lip or labrum. D F E G, Peristome or margin of aperture. W, Whorls or volutions. S, Sutures, or lines of separation. V, Varix—The last whorl of the shell, usually much larger than the rest, is called the "body whorl," the rest of the volutions constitute the "spire."

shells are cone-shaped and spiral. In the simplest form the conical shape is retained without any alteration, as in the limpet. In most cases, however, the cone is elongated, sometimes forming a simple tube, as in Dentalium, but usually coiled up into a spiral.

UNIVERSALISTS, those who hold the doctrine that all men will be saved, in opposition to the doctrine of eternal punishment. A sect of this name was founded about 1750. They believe in the ultimate salvation of all men and created spirits, and direct their criticism against an eternal hell, and in some cases even against any suffering after death. The name Universalists is sometimes applied to the Arminians in consequence of the universality which they ascribe to the operation of divine grace and their opposition to the doctrine of particular election.

UNIVERSITY. See articles following that of the different states.

UNIVERSITY, a corporate body or corporation established for the purposes of instruction in all or some of the most important branches of literature and science, and having the power of conferring certain honorary dignities, as arts, medicine, law, and theology. In most cases the corporations constituting universities include a body of teachers or professors for giving instruction to students; but this is not absolutely essential to a university, and London university, for instance, was long merely an examining body. In the middle ages, when the term began to be used in reference to seminaries of learning, it denoted either the whole body of teachers and learners, or the whole body of learners, with corporate rights and under by-laws of their own, divided either according to the faculty to which they were attached, or according to the country to which they belonged (hence the "nations" into which the students were classed, and which still exist in some universities). At a later period the expression universitas literarum (the whole of literature or learning) was used to indicate that all the most important branches of knowledge were to be taught in these establishments. Some, forming their notion of a university from the universities of Oxford and Cambridge, suppose that it necessarily means a collection and union of colleges, that it is a great corporation embodying in one certain smaller and subordinate collegiate bodies; but this is not correct, for many universities exist in which there are no colleges. This is the case with most of the German universities, and in the Scottish universities there are no foundations which bear any resemblance to the English colleges. Oxford and Cambridge differ from most universities also in the fact that, though they possess a body of professors, little of the teaching falls to be done by these. The oldest of the European universities were those of Bologna and Paris, and these formed the models on which most of the other early universities were established, a papal bull being generally regarded as necessary to this. The United States possesses the largest number of institutions bearing the name of universities, but a large proportion are sectarian, and many represent only a single faculty. For the chief universities see under separate heads, and refer to the articles following the different states.

UNIVERSITY EXTENSION, a movement to extend the means of higher education to persons of all classes and of both sexes engaged in the regular occupations of life. Any community may avail itself of the privileges by forming a local committee, who provide the necessary funds and fix fees, etc. The mode of instruction consists of courses of lectures by specialist graduates of the universities, each lecture being preceded or followed by a class, in which the students are orally examined by the lecturer, who also corrects written papers done at home. An examination is held at the end of each course and certificates awarded. Home reading circles under the direction of leaders are one outcome of the movement.

UNIVERSITY OF NASHVILLE, THE, began its life in 1785, eleven years before Tennessee became one of the states of the Union, and only five years after the first settlement was made upon the site of Nashville, under a charter from the legislature of North Carolina to Davidson academy. In 1806 the legislature of Tennessee changed the name of the institution to Cumberland college, which it kept until 1825; it then became the University of Nashville. In 1874 the university offered most of its buildings and grounds for the establishment of Peabody Normal college, which has since become Peabody college for teachers, and which has about 12,000 alumni, men and women, a majority of whom have followed the teaching profession. The university has in addition an endowed primary department called the Montgomery Bell academy, with 3000 alumni. The university in all of its departments has on an average of 1300 or 1400 students.

UNIVERSITY OF THE SOUTH, THE, Sewanee, Tennessee; an institution of higher learning, including with its academic department the following professional schools; civil engineering, theology, law, medicine, pharmacy, a training school for nurses and a grammar school. Confers the following degrees in course: B.A., M.A., C.E., LL.B., B.D., G.D., M.D., Ph.G. The government of the university is vested in a board of trustees, consisting of eighteen bishops of the Episcopal church, one of whom is elected chancellor, a like number of clerical and twice that number of lay trustees, representing the following ecclesiastical divisions: Ashville; Alabama; North, East, and South Carolina; Georgia; Florida; Mississippi; Louisiana; Dallas, Texas and West Texas; Arkansas; Southern Florida; Kentucky; Lexington; Missouri, and Tennessee. The administration is vested in a vice-chancellor and a hebdomadal board. The university was organized and received its charter from the state of Tennessee in 1857. The civil war retarded its progress and it was finally opened in 1868. The graduate alumni number about 1000. The faculties number about fifty and the annual student attendance is between five and six hundred.

UNLEAVENED BREAD, was that form of bread used (Lev. ii. and iv.) in the Jewish temple service, and which, by the Mosaic law, the people were required to eat during the seven days of the Passover (Ex. xii. 15). It was the simplest form of bread, and was made without fermentation.

UPAS, a tree common in the forests of Java, and of some of the neighboring islands, and found also in tropical Africa. Many exaggerated stories were formerly current concerning the deadly properties of this plant, its exhalations being said to be fatal to both animal and vegetable life at several miles distance from the tree itself. The truth is, that

the upas is a tree which yields a poisonous secretion and nothing more.

Upas tree.

UP'UPA. See Hoopoe.

URÆ'MIA, a diseased condition of the body arising from the presence of urea in the blood, in consequence of the urine not being properly secreted, as in Bright's disease or other ailments, thus leaving in the blood elements that should be carried off.

URAL, a river of Russia, which rises in the Ural mountains, forms part of the boundary between Europe and Asia, and enters the Caspian after a course of about 1000 miles.

URAL MOUNTAINS, a series of mountains and plateaus stretching nearly north and south between Europe and Asia, from the shores of the Arctic ocean for a distance of about 1900 miles; highest summit, 5513 feet. The Ural mountains are celebrated for the mines of gold, platinum, copper, coal, and iron which they contain, and in the south are many broad valleys of remarkable fertility.

URANIA, in Greek mythology, the muse of astronomy. She is generally

Urania, antique statue in the Vatican.

represented holding in her left hand a celestial globe to which she points with a little staff.

URANIUM, a rare metal, whose chemical symbol is U, atomic weight 240, specific gravity 18.4. The chief source of uranium is pitchblende. Metallic uranium is obtained in the form of a black powder, or sometimes aggregated in small plates, having a silvery luster and a certain degree of malleability. It forms several oxides, which are used in painting on porcelain, yielding a fine orange color in the enamelling fire, and a black color in that in which the porcelain itself is baked.

U'RANUS, in Greek mythology, the son of Gæa, the earth, and by her the father of the Titans, Cyclopes, etc. He hated his children, and confined them in Tartarus, but on the instigation of Gæa, Kronos, the youngest of the Titans, overthrew and dethroned him.

U'RANUS, in astronomy, one of the primary planets, and the seventh from the sun, discovered by Sir William Herschel in 1781. It was first called Georgium Sidus in honor of George III., and afterward Herschel, in honor of the discoverer. To the naked eye it appears like a star of the sixth magnitude. Its mean distance from the sun is about 1754 millions of miles, and the length of the year 30,686.82 days, or about 84 of our years. Its mean diameter is estimated at about 33,000 miles. Its volume exceeds the earth's about 74 times, but as its mean density is only 0.17 (the earth's being 1) its mass is only about 12½ times more. The length of its day is supposed to be between 9 and 10 hours. It is now generally admitted that this planet has four satellites, which differ from the other planets, primary and secondary (with the exception of Neptune's satellite), in the direction of their motion, this being from east to west, and they move in planes nearly perpendicular to the ecliptic.

URE'TER, the excretory duct or tube which conveys the urine from each kidney to the bladder. In man it is about the size of a goose-quill; and its length is from 16 to 18 inches.

URETH'RA, in anatomy, the canal leading from the bladder to the external urinary opening, and serving for the excretion of the urine. In the male it is a complicated structure varying in length from 8 to 9 inches, and in the female it is a narrow membranous canal about 1½ inch in length.

URIC ACID, an acid which occurs in small quantity in the healthy urine of man and quadrupeds, and in much larger quantity in the urine of birds. Uric acid constitutes the principal proportion of the urinary calculi and the concretions causing the complaint known as the gravel.

URINE, an animal fluid or liquor secreted by the kidneys, whence it is conveyed into the bladder by the ureters and through the urethra discharged. In its natural state it is acid, transparent, of a pale amber or straw color, a brackish taste, a peculiar odor, and of a specific gravity varying from 1.012 to 1.030. The character of the urine, however, is apt to be altered by the state of health, the season of the year, age, food, and a variety of other causes. A knowledge of the urine in health, and of the variations to which it is subject in disease, is of the utmost importance to the medical practitioner. One of its morbid constituents is diabetic sugar. See Diabetes.

URSA MAJOR AND URSA MINOR. See Bear, Great and Little.

UR'SULA, St., a virgin martyr, according to the legend a daughter of a prince in Britain put to death at Cologne by a horde of Huns, some say in 384, others in 453, together with 11,000 virgins who accompanied her. According to another reading the number of her companions was only eleven.

UR'SULINES, or **NUNS OF ST. URSULA,** a sisterhood founded by St. Angela Merici at Brescia, in 1537. They devote themselves to the succor of poverty and sickness and the education of female children. They had many houses in France during the 17th century. The Canadian Ursulines date from 1639; the Irish from 1771. There are now four houses in Ireland and four in England. In the United States there are twenty-four establishments with thousands of pupils.

URSUS. See Bear.

U'RUBU, the native name of an American vulture (black vulture or zopilote), very nearly allied to the turkey-buzzard, which it closely resembles. This voracious bird is common in the villages and towns of the southern states acting as a scavenger.

URUGUAY (ụ-rụ-gwī), a river of South America, which rises in Brazil, in the province of Santa Catarina, flows first westward, then gradually turns south, and finally enters the estuary of La Plata opposite Buenos Ayres; length, about 800 miles.

URUGUAY, or **BANDA ORIENTAL DEL URUGUAY,** a republic of South America, bounded on the north and northeast by Brazil, on the east by the Atlantic, on the south by the Rio de la Plata, and on the west by the Uruguay, separating it from the Argentine republic; area estimated at 72,150 sq. miles. The surface forms a vast undulating plain, generally flat, but broken in the interior by several ridges of moderate elevation. The principal river is the Negro, which divides the state into two nearly equal portions, and on the southeast frontier is the large lake of Merim. The climate is mild and healthy, the general range of the thermometer being from 32° to 90° F. The extensive plains are admirably adapted for agriculture, which has made rapid progress in recent years, wheat, corn, etc., being cultivated; but the rearing of sheep and cattle is still the principal industry. The chief exports are hides, tallow, preserved meat, sheepskins, bones, wool and cereals, while the chief imports are cotton goods, woolens, coal, and iron. Montevideo is the capital and chief port. There is a small army and navy. Railways have a length of about 1000 miles. Primary education is by law compulsory; there are normal, secondary, and higher institutions, and a university at Montevideo. The Roman Catholic is the state religion, but all faiths are tolerated. The country is divided into nineteen provinces, and by the constitution of 1830 it is governed by a president, a senate, and a house of representatives. Uruguay at one time formed part of the Spanish viceroyalty of Buenos Ayres, and the language of the country is Spanish. Pop. 1,000,000.

USUFRUCT, in law, the temporary use and enjoyment of lands or tenements or the right of receiving the fruits and profits of lands or other things without having the right to alienate or change the property.

USURY. See Interest.

UTAH (ū'tä), one of the western United States, bounded by Idaho, Wyoming, Colorado, Arizona, and

Nevada. It ranks eighth in size among the states having an area, 84,970 sq. miles. The Wahsatch mountains divide Utah into two unequal portions; a hilly country on the east, drained by the Colorado, with its head streams the Green and Grand rivers, and numerous tributaries, and a high and generally sterile table-land on the west, the drainage of which falls into the different lakes. Of these the largest are the Great Salt Lake and Utah Lake, both in the northwest. Some peaks of the Wahsatch mountains are 10,000 to 13,000 feet above sea-level, while the average elevation of the valleys is 5000 feet. The climate is of the continental type, with sudden changes and great extremes in summer and winter, although the valleys being well sheltered, have generally a mild and pleasant climate. The rainfall throughout the state is insufficient for the needs of agriculture, and irrigation is everywhere necessary. The average precipitation for the state is 12 inches. The soil of the valleys, contains the elements of fertility, which render it very productive when irrigated. To the southwest of the Great Salt Lake lies the wide, arid plain known as the Great Salt Lake, or Great American, desert. Valuable deposits of gold, silver, copper, lead, iron,

coal, and other minerals exist, and the production of the mines is increasing. Agriculture is the chief occupation. It is dependent almost wholly upon irrigation, and Utah was the first state to demonstrate the possibilities of the irrigation system. The western half of the state belongs to the Great Basin, and nearly 90 per cent of the irrigated land is within this basin. Almost the entire water supply is drawn from streams. Wells afford a very small amount. Hay is the crop most extensively grown and also the most valuable crop, alfalfa being the principal variety. Wheat and oats are the most widely grown cereals. Much attention is given to vegetables, particularly potatoes and sugar-beets. Sufficient pasturage to support a considerable grazing industry is found in the eastern half and the valleys of the central region. A steady increase in the number of dairy cows and other cattle, horses and sheep has been maintained since 1850. The Union Pacific was the first railway to enter Utah, and since its advent in 1869 the development of the state has been very rapid. The total railway mileage in 1876 was 500; in 1894, 1347; and in 1907, 1835. The most important railway lines are the Rio Grande Western and the Oregan Short Line, extending north and south through the central part of the state, and the Union Pacific, passing through the northern portion. There are no navigable streams. Utah is the center of Mormonism. About three-fourths of its population is allied with the Mormon church. In recent years many other denominations have entered the state, of which the Catholics and Methodists are numerically the strongest. The leading educational institutions are the University of Utah, at Salt Lake City; Brigham Young College, at Logan; and the Agricultural College of Utah, also at Logan. A state normal college is maintained in connection with the State University, and there is a branch normal school at Cedar City. The first white explorers of Utah were Spaniards, sent by Coronado, who reached the Colorado river in 1540. The real history of Utah begins when the Mormons determined in 1846 to move west. The United States did not obtain possession of the territory until 1848, and did not immediately provide for its government. At first the Mormon church was the ruler, but with the coming of non-Mormons in 1849 the state of Deseret was organized, a constitution adopted, and a delegate sent to the United States congress asking admission. Congress refused to admit the state, but organized the Territory of Utah (September 9, 1850), and Brigham Young was appointed governor. The Edmunds bill in 1882 disfranchised all polygamists, and abolished most of the offices in the territory. Control was given to a commission of five men. A more stringent act was passed in 1887, the corporation of the Mormon church, and the Perpetual Emigration Fund were abolished, and their property escheated. In 1890, President Woodruff of the Mormon church issued a manifesto declaring that the church no longer countenanced polygamy. This was followed in 1891 by the formation of political parties, on national lines, and in 1893 amnesty was declared to all offenders who could show that they had not broken the law since 1890. Congress passed an enabling act for statehood in 1894, a constitution was formed on March 6, 1895, was adopted in November, and the state was admitted January 4, 1896. The constitution forbids polgyamy and allows woman's suffrage. The state has voted in but three presidential elections. The silver question was the sole issue in 1896, and the vote was cast for the democratic silver candidate. In 1900 Republican electors were chosen, and by an increased majority in 1904 and 1908.

The capital is Salt Lake City; other cities are Ogden, Provo, and Logan. Pop. 1909, 350,000.

UTAH, University of, a state institution of learning for both sexes at Salt Lake City, Utah, founded in 1850 as the university of the state of Deseret. A new charter was secured in 1894, when the present corporate title was assumed. The departments are the school of arts and sciences; the state school of mines, established by the state legislature in 1901; the state normal school; and a preparatory department. Students are admitted on examination or on certificate from accredited schools.

UTAH LAKE, a fresh-water lake in Utah territory, 30 miles s. of Salt Lake City. It is 25 miles in length n. to s., with an extreme width of 13 miles. Its waters are drained into Great Salt Lake by means of the river Jordan. Several Morman towns are on its eastern shores.

UTAHS, or **UTES**, a tribe of American Indians of the Shoshone family, living in New Mexico, Utah, Colorado, and Nevada. They practice hunting and fishing, but rarely engage in agriculture. They have now sold most of their lands to the United States government, retaining a large reservation in the southwest corner of Colorado.

U'TERUS, or **WOMB**, an organ of females, situated between the bladder and rectum, in which the embryo is contained until it arrives at maturity, when it is finally born or expelled. In the virgin female it is somewhat pear-shaped, and measures about 3 inches long, 2 inches broad, 1 inch thick, and weighs about 1½ oz. It is divided into a fundus or base, a body, and a cervix or neck. It opens into the vagina by a transverse aperture. The organ is retained in its place by certain ligaments derived from the peritoneum. Its internal cavity is small, and at each superior angle at the fundus a Fallopian tube or oviduct enters. These tubes convey the ova or eggs from the ovary to the uterus. In structure the uterus is composed of an outer serous coat, a middle muscular coat, and an inner mucous lining. The arteries of the uterus are derived from the internal iliac and the aorta; the veins are large, and are called sinuses in the impregnated state. The nerves spring from the inferior hypogastric and spermatic plexuses, and from the third and fourth sacral nerves. The womb is liable to many diseases, of which the most frequent and important are inflammatory affections and tumors. It is also liable to become displaced in various ways, from laxity of its ligaments and other causes.

U'TICA, an ancient city of North Africa, on the river Bagrada, near its entrance into the Mediterranean. After the destruction of Carthage, Utica became the capital of the Roman province. It was destroyed by the Arabs in the latter part of the 7th century.

U'TICA, a city in New York, situated on the right bank of the Mohawk, 95 miles west by north of Albany. It has cotton factories, boot and shoe factories, flour, grist, and saw mills, tanneries, foundries, machine-shops, etc.; and an extensive trade, greatly facilitated by the Erie and the Chenango canals, and by several railways. Pop. 1909, 72,000.

UTILITARIANISM, the general name given to those schools of morals which define virtue as consisting in utility. The name is more specially applied to the school founded by Jeremy Bentham, of which the most recent exponent is John Stuart Mill, but there are many other developments of the same principle both in ancient and modern schools of morals. See Ethics.

UTOPIA, a name invented by Sir

Thomas More, from the Greek ou topos (no place), and applied by him to an imaginary island, which he represents as discovered by a companion of Amerigo Vespucci. As described in his work called Utopia, written in Latin and published in 1516, the Utopians had attained great perfection in laws, politics, etc.

UTRECHT, (ö'treht), an important town of Holland, capital of a province of the same name, 23 miles southeast of Amsterdam. Utrecht is the central point of the Dutch railway system, and carries on an extensive trade in grain and cattle, and in the manufactures of the place, which include Utrecht velvet, carpets, floor-cloth, cottons, linens, chemicals, etc. Utrecht is the oldest town in Holland. Pop. 104,194.—The province of Utrecht has an area of 532 sq. miles, with a pop. of 215,958. It is generally flat, is well watered by the Rhine, Vecht, Amstel, etc., and is better suited for dairy-farming and stock-rearing than for corn-growing.

UTRECHT, Peace of, a series of separate treaties agreed upon at Utrecht by the powers which had been engaged in the war of the Spanish succession. On April 11, 1713, the States-general, Prussia, Portugal, and Savoy, signed separate treaties with France. The emperor refused to accede to the peace, and his differences with France were subsequently adjusted by the treaties of Rastadt and Baden in 1714. By the treaty with England, France, among other things, recognized the Hanoverian succession, engaged never to unite the crowns of France and Spain, and ceded to Britain Nova Scotia, Newfoundland, St. Kitt's, and Hudson's bay and straits. Gibraltar and Minorca were also ceded on behalf of Spain. Holland retained the Spanish Netherlands until a barrier treaty was arranged with Austria. Louis XIV. recognized the title of the King of Prussia, who received a part of Spanish Guelderland, and the sovereignty of Neufchâtel in Switzerland, while renouncing the principality of Orange. Savoy and Nice were restored to the Duke of Savoy, who was recognized as presumptive heir to the Spanish monarchy, and received the title of king. Philip V. was not recognized till the conclusion of these treaties, but France treated for Spain, and formal treaties corresponding with those with France were afterward signed with that power.

UZ, in the Old Testament, a region probably lying to the east or southeast of Palestine, known as the scene of the story of Job.

V

V, the twenty-second letter of the English alphabet, a labial, formed by the junction of the upper teeth with the lower lip, and a gentle expiration. It resembles the letter f, but is sonant and not like it surd or hard.

VAAL RIVER, a river of South Africa, rises in the Quathlamba mountains, separates the Transvaal and Orange River colony and enters the Orange river; length 500 miles.

VACCINATION, inoculation with the cowpox—a disease akin to, but much less severe than smallpox—in order to prevent a person from catching the latter, or at least to make the attack much less severe. The practice of vaccination was introduced by Jenner, and it soon came into common use instead of inoculation. (See Jenner and Inoculation.) The usual method in vaccination is to make a few scratches across one another, with a clean lancet point, upon the upper part of the arm. The matter from the cowpox, or from the vaccination pustule produced on another person, is then rubbed on the skin where the scratches have been made. If the vaccination proves successful a small inflamed pustule appears about the third day, and increases in size until the tenth day. On the eighth day the constitutional effects manifest themselves by slight pain in the part, headache, shivering, loss of appetite, etc. These subside spontaneously in one or two days. Afterward the fluid in the pustules dries up, and a scab forms which disappears about the twentieth day, leaving a slight scar in the skin. Repeated vaccination with intervals of several years have been recommended by medical authorities. In the United States the vaccination of all children, excepting those in an unhealthy or otherwise unfit condition, is compulsory. In England since 1898 any parent who satisfies two justices or a stipendiary magistrate that he really believes that vaccination would be injurious to his child may be exempted from penaltics.

VAC'UUM, empty space, or space devoid of all matter or body. Whether there is such a thing as an absolute vacuum in nature is a question which has been much controverted. The existence of a vacuum was maintained by the Pythagoreans, Epicureans, and Atomists; but it was denied by the Peripatetics, who asserted that "nature abhors a vacuum." The modern theory, which seems to be warranted by experience, is that an absolute vacuum cannot exist, the subtle medium known as ether being believed to be everywhere present. In a less strict sense a vacuum (more or less perfect) is said to be produced when air is more or less completely removed from an inclosed space, such as the receiver of an air-pump, a portion of a barometric tube, etc. In the receiver of the air-pump the vacuum can only be partial, as the exhaustion is limited by the remaining air not having sufficient elasticity to raise the valves. The Torricellian vacuum, that is, the space above the mercury in a carefully manipulated barometer tube, is more nearly perfect in this respect, but even this space is to some extent filled with the vapor of mercury. If, however, an air-pump receiver, filled with pure carbonic acid gas (so as to expel the air), be exhausted, a small vessel containing moist caustic potash, and another containing concentrated sulphuric acid, having been previously introduced, the remaining carbonic acid is taken up and a vacuum produced so nearly absolute that the electric spark fails to pass through it.

VACUUM-BRAKE. See Brake.

VALAIS (vâ-lā), a southern canton of Switzerland, abutting on France and Italy; area, 2026 sq. miles. It is surrounded on all sides by sections of the Alps, with ridges 13,000 to 15,000 feet high, and magnificent glaciers. Rich pastures support numerous cattle, the chief source of subsistence of the inhabitants; and in the lower valley of the Rhone there is much arable land, the finer fruits are grown, and silk-worms reared. Pop. 114,980.

VALENCIA, a city of Spain, capital of the province of the same name, on the Guadilaviar, 2 miles from the Mediterranean. The chief manufactures are silk, linen, hemp, glass, cigars, paper, and soap. Valencia was founded by Junius Brutus, 140 B.C. Pop. 204,768. The old province of Valencia is now broken up into the three provinces of Valencia, Alicante, and Castellon de la Plana. It is one of the most fertile and pleasant regions of Spain.

VALENS, Flavius, Roman emperor of the East, born in Pannonia in 328, and declared emperor of the East by his brother Valentinian I., who had already been elected emperor. The chief event of his reign was the war with the Goths under Athanaric, which lasted during the whole of Valens' reign. Irritated by the treatment they received at the hands of the imperial officials, they soon took up arms, and in 378 defeated Valens and destroyed the greater part of his army. Valens was never seen or heard of afterward.

VALENTIA, or **VALENCIA,** a small fertile island off the southwest coast of Ireland, belonging to county Kerry, about 5 miles long by 2 miles broad. It has slate and flag quarries, and productive fisheries. The British Atlantic telegraph cables to Newfoundland start from Valentia, and there is here a lighthouse.

VALENTINE, St., a saint of the Roman calendar, said to have been martyred in 306 A.D. The custom of choosing valentines on his day (14th February) has been accidentally associated with his name. On the eve of St. Valentine's day young people of both sexes used to meet, and each of them drew one by lot from a number of names of the opposite sex, which were put into a common receptacle. Each gentleman thus got a lady for his valentine, and became the valentine of a lady. The gentlemen remained bound to the service of their valentines for a year. A similar custom prevailed in the Roman Lupercalia, to which the modern custom has, with probability, been traced. The day is now celebrated by sending sentimental or ludicrous missives specially prepared for the purpose.

VALERIAN, a plant, a native of

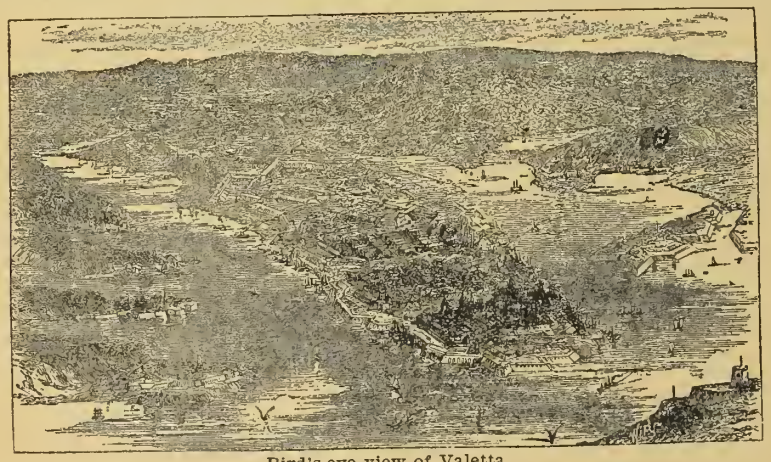
Europe, which grows abundantly by the sides of rivers, and in ditches and moist woods. The root has a very strong smell, which is dependent on a volatile oil. It is used in medicine, in the form of

Valerian.

infusion, decoction, or tincture, as a nervous stimulant and antispasmodic. Cats and rats are very fond of valerian. Red valerian, is occasionally found wild in Britain, and is cultivated in gardens, as well as many other species, on account of its elegant flowers. The valerian order consists of monopetalous exogens, annual or perennial herbs, rarely shrubs, inhabiting temperate climates.

VALERIA'NUS, Publius Licinius, Roman emperor from 253 to 260. He was taken prisoner by the Persians in 260, and his after fate is unknown.

VALET'TA, a strongly fortified seaport, capital of Malta, on the n.e. coast of the island, situated on an elevated neck of land, with a large and commodious harbor on each side. The cathedral, built in 1580, contains the



Bird's-eye view of Valetta.

tombs of the knights of Malta or of St. John, and in a chapel are the keys of Jerusalem, Acre, and Rhodes. Other notable buildings are the governor's residence, formerly the palace of the grand-masters; the library, museum, university, and the military hospital. The dockyard is capable of admitting the largest men-of-war. The mail steamers for Alexandria, Constantinople, etc., call here, and it is the chief station of the British fleet in the Mediterranean. Pop. 90,000. See Malta

VALHALLA, in Northern mythology, the palace of immortality, inhabited by the souls of heroes slain in battle, who here spent much of their time in drinking and feasting. The name is applied figuratively to any edifice which is the final resting-place of many of the heroes or great men of a nation, and specifically to an edifice built by Ludwig I. of Bavaria, a few miles from Ratisbon. See Walhalla.

VALKYR'IAS, in Northern mythology the "choosers of the slain," or fatal sisters of Odin, represented as awful and beautiful maidens, who, mounted on swift horses and holding drawn swords in their hands, presided over the field of battle, selecting those destined to death and conducting them to Valhalla, where they ministered at their feasts, serving them with mead and ale in skulls.

VALLADOLID (vål-yå-do-lid'), a city of Spain, capital of the provlnce of the same name, 98 miles northwest of Madrid. It has a cathedral, many churches and suppressed convents, three hospitals, and a university. The manufactures consist of silks, cotton and woolen goods, hats, jewelry, paper, etc. Pop. 68,746.—The province has an area of 3042 sq. miles, and a population of 276,366. It is well watered by the Douro and its tributaries, and is very fertile.

VALLANDIGHAM (văl-lăn'dĭ-gam), Clement Laird, American politician, was born at New Lisbon, Ohio, in 1820. He was elected to the Ohio legislature in 1845; edited the Dayton Western Empire in 1847–49; and from 1857 until 1863 was a member of the national house of representatives. He violently attacked the Lincoln administration both in and out of congress. After his term in congress expired, he continued to make incendiary speeches against the government. As a result he was arrested in May, 1863, by order of General Ambrose E. Burnside; was tried by court martial; and was sentenced to be imprisoned in Fort Warren. President Lincoln, however, changed the sentence to deportation into the confederate lines. Thence Vallandigham made his way to the Bermudas, and thence to Canada. In the same year he was nominated by his party for the governorship of Ohio, but was defeated by the overwhelming majority of 100,000 votes. He took an active part in the democratic convention of 1864. In 1871 while acting as counsel in a murder trial he attempted to illustrate how the shooting occurred and was killed by the accidental discharge of the pistol.

VALPARAISO (vål-på-rī'sō), the principal port of Chile, capital of the province of Valparaiso, situated on a large bay of the Pacific, 90 miles w.n.w. of Santiago. The bay is open to the north, but well sheltered from winds in other directions, and is capable of accommodating a very large number of vessels. The custom-house is the only public building worthy of note. Valparaiso is the great commercial emporium of Chile,

and is in railway communication with Santiago, the capital. The chief imports into Valparaiso are manufactured goods, sugar, wine, tobacco, and cigars. The exports consist mainly of wheat, barley, wool, etc., and of mining produce. The imports of Valparaiso constitute nearly the whole of the imports of Chile, while the exports form a large portion of the total exports. An earthquake and fire in 1906 caused great loss of life and property. Pop. 143,022.—The province has an area of 1637 sq. miles, and a pop. 220,756.

VALVE, a kind of movable lid or cover adapted to the orifice of some tube or passage, and so formed as to open communication in one direction and to close it in the other, used to regulate the admission or escape of a fluid, such as water, gas, or steam. Some valves are self-acting, that is, they are so contrived as to open in the required direction by the pressure of the fluid upon their surface, and immediately to shut and prevent the return of the fluid when the direction of its pressure changes. Others are actuated by independent external agency. Examples of the former kind are presented in the valves of pumps, and in the safety-valves of steam boilers, and of the latter in the slide-valves appended to the cylinder of a steam-engine for the purpose of regulating the admission and escape of the steam. The construction of valves admits of an almost endless variety. See Safety-valve, Pump, etc.

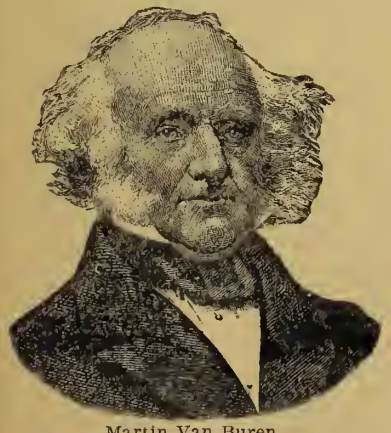
VAMPIRE, a superstition of Eastern origin existing among the Slavonic and other races on the Lower Danube. A vampire is a ghost still possessing a human body, which leaves the grave during the night and sucks the blood of living persons, particularly of the young and healthy. Dead wizards, heretics, and such like outcasts become vampires, as does also any one killed by a vampire. On the discovery of a vampire's grave the corpse must be disinterred, thrust through with a white-thorn stake, and burned.

VAMPIRE-BAT, a name for certain bats inhabiting South America. The name was given from the blood-sucking habits attributed to these bats, but how many of them really attack animals and suck blood from them is not quite clear. One species at least, known as the vampire-bat, of large size and having formidable teeth, seems to be conclusively acquitted of the charge, its regular food being fruits and insects. It has large leathery ears, an erect spear-like appendage on the tip of the nose, wings when extended measuring 28 inches.

False vampire, one of the *vampyri.*

Several bats, however, have been proved to be blood-suckers, the best-known being a species only about 4 inches long and 15 or 16 in expanse of wing. It has large prominent upper incisors of peculiar shape, and upper canines somewhat similar, and the stomach and intestines are evidently specially adapted for a diet of blood. This species of bat seems to be generally distributed throughout the warmer parts of South America from Chile to Guiana. The blood-sucking propensities of these bats are by no means so dangerous as formerly and popularly described; but there is little doubt that they do attack horses and cattle, and sometimes even man in his sleep.

VAN BUREN, Martin, eighth president of the United States, born at Kinderhook, New York, 1782; died 1862. He early studied law, and in 1812 was elected to the state senate. He was attorney-general from 1815 to 1819, and in 1821 was elected United States



Martin Van Buren.

senator. In 1828 he became governor of New York, and in the following year President Jackson appointed him secretary of state. In November, 1832, he was elected vice-president, and in 1836 became president of the United States. The difficulties which his administration had to face were chiefly connected with the deposit of state funds in private banks, and his method of dealing with these brought about his defeat at the next election in 1840. He was again nominated by the democrats in the elections of 1844 and 1848 but was unsuccessful on both occasions. He wrote a treatise entitled An Inquiry into the Origin and Course of Political Parties in the United States (1867).

VANCOUVER, George, English navigator, born about 1758, died 1798. He accompanied Cook on his second and third voyages (1772–74 and 1776–79); was made first lieutenant in 1780; and served in the West Indies until 1789. In 1790 he was put in command of a small squadron sent to take over Nootka from the Spaniards, and was also charged to ascertain if there was a northwest passage. He sailed in the Discovery, April 1, 1791, spent some time at the Cape, and afterward made for Australia and New Zealand, the coast of which he surveyed. He then went north and received formal surrender of Nootka, and spent the three summers of 1792–94 in surveying the coast as far north as Cook's Inlet, wintering at the Sandwich islands. On his return voyage he visited the chief Spanish settlements on the west coast of South America, and reached England in 1795, where a narrative of his voyage was published in 1798. Vancouver island was named after him.

VANCOUVER ISLAND, an island in the Pacific, off the west coast of British Columbia, of which province of Canada it forms part; length, from 250 to 300 miles; breadth, from 10 to 70 miles; area, about 15,000 sq. miles. It is generally mountainous, and heavily timbered. The climate is temperate, and the soil, in the south and east, fertile and favorable to agriculture and fruit-growing. Large quantities of salmon are exported, and there is an extensive

trade in fur, the skins exported being chiefly those of the minx, marten, sable, fox, bear, beaver, otter, seal, and deer. There are numerous good harbors along the coasts, the chief of which is Esquimault. As this island lies opposite the terminus of the Canadian Pacific railway it has recently acquired great importance. The chief town of the island, and the capital of British Columbia, is Victoria in the extreme southeast. Pop. of the island about 50,000.

VANDALS, a German nation or confederation, probably allied to the Goths, who occupied at an early period the country on the south of the Baltic, between the Oder and the Vistula. At a later period they appear to have descended into Silesia, and subsequently occupied Pannonia, Moravia, and Dacia. In 406, in conjunction with a German host, they ravaged Gaul, and thence found their way into Spain. After defeating an allied army of Goths and Romans, they seized Seville and Carthagena, and, led by Genseric, crossed to Africa. Here they vanquished the Roman governor (429), and founded a kingdom, which absorbed the greater part of the Roman possessions. Genseric immediately began to revive the maritime glories of Carthage, and extended his conquests to Sicily, Sardinia, and Corsica. He also invaded Italy and sacked Rome in 455. Genseric concluded a long reign in peace in 477. The kingdom of the Vandals was continued under his descendants—Hunneric, his son, who immediately succeeded him; Gundamund, 484; Thrasiimund, 496; Hilderic, 523; Gelimer, 530. It was overthrown in 534 by Belisarius, the general of the eastern Emperor Justinian.

VANDERBILT, Cornelius, American capitalist, born 1794, died 1877, amassed immense wealth in connection with shipping and railroads, a share of which he left to his eldest son William Henry, born 1821, died 1885, who was supposed at his death to be the wealthiest man in the world. The Vanderbilt university (Methodist Episcopal) at Nashville, Tennessee, was founded by Cornelius Vanderbilt, who presented it with $1,000,000.

VANDERBILT, Cornelius, American financier and capitalist, was born at New Dorp, Staten Island, in 1843. In 1865 he entered the service of the New York and Harlem railroad, of which he was treasurer from 1867 to 1877. In 1877 he became first vice-president of the New York Central railroad. In 1878 he became treasurer of the Michigan Central railroad and vice-president and treasurer of the Canadian Southern. Subsequently he was president of both roads, besides being president of the New York and Harlem, and after 1886 chairman of the board of directors of the New York Central railroad. He died in 1899.

VANDERBILT, William Henry, American capitalist and financier, was born in New Brunswick, N. J., in 1821. He became vice-president of the New York and Harlem railroad in 1864; vice-president of the New York Central and Hudson river in 1865. He succeeded his father in 1877 as president of the latter road, and under his management the control was completed of the Michigan Central, Lake Shore and Michigan Southern, Canada Southern, and Chicago and Northwestern systems. Subsequently the "Nickel Plate" and West Shore roads were acquired. He died in 1885.

VAN DIEMEN'S LAND. See Tasmania.

VANDYCK (van-dīk'), Sir Anthony, except perhaps Titian the greatest of all portrait-painters, was born at Antwerp on the 22d of March, 1599. Having acquired a great reputation as a portrait painter he was invited to England by Charles I., who bestowed upon him the

honor of knighthood. The painter by unceasing diligence, executed, besides a multitude of portraits, several myth-

Sir Anthony Vandyck.

ological and historical paintings. He died in 1641, and was buried at St. Paul's.

VANDYKE BROWN, a pigment obtained from a kind of peat or bog-earth, of a fine, deep, semi-transparent brown color; so called from its being supposed to be the brown used by Vandyck in his pictures.

VAN EYCK. See Eyck.

VANILLA, a flavoring agent used in confectionery, and in the preparation of liquors, procured from the fruit of orchidaceous plants of tropical America, remarkable on account of their climbing

Vanilla.

habit, and now cultivated in various tropical countries, including Ceylon and India. It has a fragrant odor, and is also used in medicine as a stimulant and promoter of digestion.

VAN RENSSELAER (văn rĕn'se-lēr), Stephen, American political leader known as the "Patroon," was born in New York in 1764. He was lieutenant-governor of New York from 1795 to 1801; presided over the state constitutional convention of 1801; and was again in the assembly in 1808–10. He took an active interest in the construction of the Erie canal and was one of its strongest promoters. In 1824 he established at Troy a scientific school which, two years later, was incorporated as the Rensselaer Polytechnic institute. From 1823 to 1829 he was a member of congress. He died in 1839.

VAPOR, in physics, a term applied to designate the gaseous form which a solid or liquid substance assumes when heated. Vapor is, therefore, essentially a gas, and seeing that all known gases have now been proved to be liquefiable, no physical difference can be said really to exist between an ordinary gas, such as oxygen, and a vapor, such as steam. In common language, however, a difference is usually recognized; a gas is a substance which at ordinary temperatures and pressures exists in a state of vapor, while a vapor is produced by the application of heat to a substance which normally exists in a solid or liquid form. The difference has been otherwise explained to be one not so much of kind as of degree; steam in the boiler of a steam-engine being said to be in a state of vapor, while superheated steam is said to be a gas. Aqueous vapor formed on the surface of the land and water is always present in suspension in the atmosphere, and when it meets with a reduction of temperature it condenses into water in the form of rain or dew.

VAR, a department in the southeast of France, bordering upon the Mediterranean, and covered in the interior with ramifications of the Alps; area, 2349 sq. miles. Pop. 325,490.

VARICOSE VEINS, veins in a diseased state, which become dilated and uneven, and form hard knotty swellings in the situation of their valves. The disease is a common affection of the lower limbs, where sometimes the varix bursts and hæmorrhage takes place. It also occurs in the veins of the scrotum and lower rectum, producing in the latter case bleeding piles. Varicose veins are caused by local obstruction of the circulation of the blood, and are common in pregnancy, while stout people, and those who stand most of the day at work, are apt to suffer from them. The treatment consists in the application of proper bandages, and rest to the limb supported in an elevated position.

VAR'UNA, in Hindu mythology, the god of water, the cause of rain, lord of rivers and the sea, the Hindu Neptune or Poseidon indeed. His name corre-

Varuna, the Indian God of Waters.

sponds with Greek Ourănus (Urănus), and meant originally the sky or heavens. He is represented as a white man, four-armed, riding on a sea animal, generally with a noose in one of his hands and a club in the other.

VASA, Gustavus. See Gustavus I.

VASCULAR TISSUE, in plants, consists of elongated ducts or cells, which may have closed extremities, so that fluids pass from one cell to another through the partition walls, or these partitions may be partly obliterated, thus forming a continuous tube. See Botany.

VASE, a name applied to certain vessels of an ornamental character. Vases were made in ancient times of all materials, but those which have come down to us in greatest numbers are the so-called Etruscan vases, made of terra cotta, and adorned with painted figures. Such vases have been found in most Greek cities as well as in Etruria, and all are really the productions of Greek art. The Greek vases of the oldest style mostly come from Corinth and the islands of Thera and Melos; and those of the late rich style have been almost exclusively discovered in Lower Italy (Apulia and Lucania), and were probably manufactured there, chiefly in the 4th and 3d centuries B.C. Vases were used for all purposes, but one peculiar and very common application of them

Grecian vases.

Chinese, Japanese and Indian Vases.

was to adorn sepulchers. Chased metal vases were in use in ancient times both among the Greeks and Romans, and many of the more valuable and beautiful kinds of stone were also used for making vases. Murrine vases were highly esteemed at Rome. Another favorite kind of vases at Rome was that called cameo vases, made of two layers of glass, the outer of which was opaque, and was cut down so as to leave figures standing out upon the lower layer as a ground. The celebrated Portland vase is an example of this kind. At a later period glass vases surrounded with delicate filagree work were introduced. Italy, France, and Germany in the 16th and 17th centuries produced many vases which are the perfection of artistic form and execution, and since the 15th century many master-pieces of the glass art in the form of vases have issued from the Venetian manufactories. From India, China, and Japan also have been obtained vases of various materials, especially of porcelain, vying in elegance of form and beauty of ornamentation with those produced in Europe.

VASSAL. See Feudal System.

VASSAR COLLEGE, a university at Poughkeepsie, New York, founded by Matthew Vassar in 1861 for the higher education of women. It is a fine brick edifice, 500 feet long by 200 wide, and was erected at a cost of about $200,000 being opened in September, 1865. It confers the degrees of B. A. and M. A.,

and the course of studies resembles those of other first-class colleges.

VAT'ICAN, the most extensive palace of modern Rome, the residence of the pope, built upon the Vatican Hill, from which it has received its name, on the opposite side of the river from the bulk of the city, immediately to the north of the cathedral of St. Peter's. It is a long rectangular edifice lying north and south, with an irregular cluster of buildings at either end. The present building was begun by Pope Eugenius III. (1145-53), and has been enlarged and embellished by many subsequent popes down to the last one (Leo XIII.). It now possesses twenty courts, and, it is said, 11,000 rooms of one sort or another Immense treasures are stored up in it. Here are celebrated collections of pictures of many of the great masters, and museums in which all periods of the arts are represented by many of their most perfect productions. Among its noblest art treasures are the frescoes on the ceiling of the Sistine chapel, painted by Michael Angelo, and consisting of scenes and figures connected with sacred history; and the frescoes painted by Raphael on the ceilings and walls of certain apartments known as Raphael's stanze, the subjects being biblical, allegorical, etc. Since the return of the popes from Avignon, the Vatican has been their principal residence, and here the conclaves always meet for the election of new popes. The Vatican library was first constituted by Pope Nicholas V. (1447–55), and was added to and enlarged by Leo X., Pius IV., Pius V., and other popes. The most important part of the library is the manuscript collection, which is said to contain about 25,600 MSS. The number of printed volumes has been estimated at from 150,000 to 220,000, including 2500 15th-century editions, and a great number of bibliographical rarities.

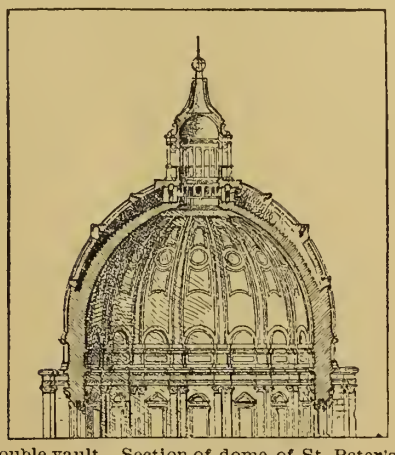
VATICAN COUNCIL, the Ecumenical Council of the Church of Rome, which met in the Vatican in 1870, and declared the personal infallibility of the pope when speaking ex cathedrâ to be a dogma of the church.

VAUCLUSE (vō-klüz), a department in the southeast of France; area, 1370 sq. miles. It is rugged and mountainous in the east, but more than one-half of the whole surface is arable, and vineyards occupy about one-sixth of this portion. The mulberry (for the rearing of silk-worms) and olive are extensively cultivated. Avignon is the capital. Pop. 235,457.

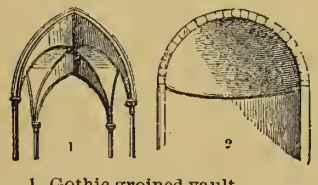
VAUD, or **PAYS-DE-VAUD,** a western canton of Switzerland; area, 1244 sq. miles. It has three mountain systems—the Alps in the southeast, the Jura in the west, and the Jorat in the south; and partly embraces the lakes of Geneva and Neufchâtel, belonging both to the basins of the Rhine and the Rhone. The capital is Lausanne. Pop. 279,152.

VAULT, in architecture, a continued arch, or an arched roof, so constructed that the stones, bricks, or other material of which it is composed, sustain and keep each other in their places. Vaults are of various kinds, cylindrical, elliptical, single, double, cross, diagonal, Gothic, etc.

VEDAS, the oldest of the Shastras or sacred writings of the Brahmans, and the oldest compositions in the Sanskrit language. Their date is unknown. Sir W. Jones fixes it at 1500 B.C., and Ritter at 1400 to 1600 B.C. They are four in number, called respectively the Rig, Yajur, Sāma, and Atharva Veda. All the Vedas are believed to be inspired, and are held by the Brahmans in the highest respect. The religious system of the Vedas is at bottom monotheistic. It derives a polytheistic appearance from the mention of the deity by various names according to the difference of his manifestations and attributes (Sūrya, Mitra, etc., the sun; Soma, the moon; Agni, fire; Indra, the firmament, etc.); but the unity of the supreme being is expressly asserted in more than one passage. Each of the Vedas is divided into three parts: the first called the Sanhitā, a collection of hymns and prayers called mantras or gānas; the second, Brāhmana, which relates chiefly to ritual; and the third, the Jnāna or Upanishads, which is the philosophical portion of the work. The Upanishads are sometimes called collectively the Vedānta. The Rig-veda is the oldest of the Vedas, and the Atharva-veda the latest. Some scholars question whether the latter should be regarded as a Veda. Varying greatly in age, the Vedas represent many stages of thought and worship, the earliest being the simplest, the later following and reflecting the development of the Brahmanical system, with all its superstitions and rites.



Double vault.—Section of dome of St. Peter's, Rome.



1, Gothic groined vault.
2, Spherical or domical vault.

VEGETABLE CHEMISTRY, the department of organic chemistry which investigates the chemical compounds found in vegetables. These compounds are chiefly made up of carbon, hydrogen, oxygen, and nitrogen, but potash, soda, lime, and other substances are occasionally present in small and variable quantities. Sugar, starch, gum, and other distinct compounds existing already formed in plants, and capable of separation without suffering decomposition, are called proximate or immediate principles of vegetables. Proximate analysis is the separation of a particular principle from others with which it is mixed. Ultimate analysis consists in the reduction of the proximate principles to their simplest parts. The more important classes of compounds to be obtained from vegetables are acids, alkalis or alkaloids, oils, and resins. Coloring matter, tannin, albumen, gluten, yeast, and other substances are also obtained. Of the acids the chief are acetic acid or vinegar, oxalic, tartaric, and benzoic acids. The alkaloids are organic bases which produce remarkable toxicological effects. During the germination of seeds there is a conversion of starchy matter in the sugar. The nutrition of plants may be regarded as depending upon solar energy organic and mineral constituents, and water. See Botany.

VEGETABLE IVORY, the name which is applied to the kernels of the nuts produced by a palm growing in South America. It is very hard and compact, has the appearance of ivory, and may be turned in the lathe, being used for buttons, umbrella handles, etc. The stem of the palm is extremely short, but the leaves rise to the height of 30 or 40 feet.

VEGETARIANISM, the theory and practice of living solely on vegetables. The doctrines and practice of vegetarianism are as old as the time of Pythagoras, and have for ages been strictly observed by many of the Hindus and of late years the practice of subsisting solely upon vegetable food—or at least of rejecting flesh food—has been brought prominently before the public.

VEIN, in mining, a crack or fissure in a rock, filled up by substances different from the rock, and which may either be metallic or non-metallic. Veins are sometimes many yards wide, having a length of many miles, and they ramify into innumerable smaller parts, often as slender as threads. Metallic veins are chiefly found in the primary, and lower and middle secondary rocks.

VEINS, a system of membranous canals or tubes distriubted throughout the bodies of animals for the purpose of returning the impure blood to the heart and lungs, after it has been conveyed to the various parts by the arteries. They are not elastic and have no pulsation (thus differing from the arteries), the motion of the blood in them being mainly secured by pressure of the moving parts between which they are embedded, the backward flow of the blood being prevented where necessary by a series of valves which permit a current only toward the heart. The veins at their farthest extremities form capillaries which collect from the tissues the blood brought by the arterial capillaries. These minute branches unite to form veins, which similarly unite in turn, forming gradually larger branches and trunks as they approach the heart. The venous blood from the head, neck, and upper limbs is all returned to the heart by one great vein, the vena cava superior, while that from the lower limbs

and belly is returned by the vena cava inferior. The portal vein (vena portæ) receives the venous blood from the intestines and conveys it through the liver to the vena cava inferior. From each lung to the heart come two pulmonary veins carrying back the blood that has been purified in the lungs, after being carried to them by the pulmonary artery. See Heart.

VELASQUEZ (ve-lâs'keth), or in full Don Diego Rodriguez de Silva y Velasquez (or Velazquez), an eminent Spanish historical and portrait painter, was born at Seville in 1599. He was appointed principal painter to Philip IV. in 1623. In 1629 he went to Italy, where he closely studied the works of Michael Angelo, Raphael, and Titian. On his return to Spain in 1631 he was received with great distinction, and in 1658 the king raised him to the dignity of a noble. He died in 1660. Among his best works are the Aguador, or Water-carrier; the Orlando Muerto; a Nativity, or Adoration of the Shepherds; the Brothers of Joseph; Moses taken from the Nile; portraits of Philip IV. and of Elizabeth his queen, Pope Innocent X., and other dignitaries; and many pictures from history and from common life.

VELLUM. See Parchment.

VELOCITY, the rate at which a body changes its position in space. Velocity is popularly expressed as so many miles per hour, or as so many feet per second. The velocity of a body is uniform when it passes through equal spaces in equal times, variable when the spaces passed through in equal times are unequal, accelerated when it passes through a greater space in equal successive portions of time, as is the case of falling bodies under the action of gravity, and retarded when a less space is passed through in each successive portion of time. Angular velocity is such a velocity as that of the spoke of a wheel, being measured as a number of angles of a specified extent (as right angles) divided by a measure of time in specified units. See Fall of Bodies, Dynamics, Projectiles, Motion, etc.

VELOCITY OF WIND. See Beaufort Scale.

VELVET, a rich silk stuff, covered on the outside with a close, short, fine, soft shag or nap. In this fabric the warp is passed over wires so as to make a row of loops which project from the backing, and are thus left, by withdrawing the wire, for an uncut or pile velvet, but are cut with a sharp tool to make a cut velvet. Florence and Genoa have been long noted for the manufacture of velvet, but Lyons, in France, is now its principal seat. Cotton and woolen fabrics woven in this manner are called velveteen and plush respectively.

VENDEE (vân-dā), a western maritime department of France; area, 2595 sq. miles. The surface is much diversified, and is watered in the north by tributaries of the Loire, and in the south by the Lay and tributaries of the Charente. The principal crops are grain, flax, and hemp; and a white wine is also produced. Capital, La Roche-sur-Yon. Pop. 439,637.

VENDEMIAIRE (vân-dā-mi-ār; that is, "vintage month"), the first month in the French revolutionary calendar, from 22d September to 21st October. See Calendar.

VENDET'TA, a blood-feud; the practice of the nearest of kin executing vengeance on the murder of a relative. In Corsica the vendetta is regarded as a duty incumbent on the relatives of the murdered man, and, failing to reach the real murderer, they take vengeance on his relatives. The practice exists, although to a more limited extent, in Sicily, Sardinia, and Calabria, as well as among the Druses, Circassians, Arabs, etc.

VENDOME, Louis, Duke of, the celebrated general of Louis XIV., was born in 1654. After having distinguished himself in Italy, Tyrol, and Belgium, the Duke of Burgundy was placed over him; and the disagreement of the two commanders caused the defeat of the French at Oudenarde (July 11, 1708). Vendôme was recalled. Soon after being placed in command in Spain he gained several distinguished successes, but died in 1712.

VENEER, a thin layer of choice hard wood, such as mahogany, rosewood, maple, etc., glued to the surface of wood of a commoner sort, such as fir or pine, so as to give the whole the appearance of being made of the more valuable material. It is mostly used for furniture, and owing to recent improvements in sawing machinery, layers as thin as paper can be obtained.

VENESECTION. See Phlebotomy.

VENETIAN ARCHITECTURE, Venetian Gothic, that style of Italian architecture employed by the Venetian architects from the 15th to the early part of the 17th century. The principal characteristics are: each story is provided with its own tier of columns or pilasters, with their entablature, and separated from the other stories by conspicuous friezes or belts, often in the form of balustrades broken by pedestals and ornamented by figures; arched windows ornamented with columns, the spandrils being filled with figures; ornamental parapets are common; and the whole has a rich and varied effect. This style of architecture is characterized by Fergusson as "Gothic treated with an Eastern feeling, and enriched with many details borrowed from Eastern styles."

Venetian architecture.
An angle of the Ducal Palace.

VENETIAN SCHOOL, in painting, that school which counts among its masters Titian, Paul Veronese, Giorgione, Tintoretto, and many other illustrious names.

VENEZUELA (ven-es-wā'lâ), a northern republic of South America, bounded by the Caribbean sea, the Atlantic, British Guiana, Brazil, and the United States of Colombia; area, 566,159 sq. miles. The Andes enter Venezuela from the west in two branches; the western branch has a moderate elevation, rarely exceeding 4000 feet, but the eastern branch, which is about 300 miles long by 60 miles broad, has an average altitude of 12,000 feet, culminating in Sierra-Nevada-de-Merida with summits attaining 15,000 feet. There are other branches running northeast and parallel to the north coast, and in the south, on the frontiers of Guiana, are the mountains of Parima. From these mountains to the coast chain at Carácas, and from the Andes to the mouth of the Orinoco, extend vast plains (or llanos) with an area of 300,000 sq. miles. The chief rivers are the Orinoco and its affluents; the principal lakes are Maracayko and Tacarigua. The climate is equatorial in character, and the seasons are distinguished into the wet and the dry. It is not unhealthy on the whole. The greater part of Venezuela is liable to earthquakes. The valleys and tablelands of the coast mountains are the chief seats of cultivation. The region of palms extends from the sea-level to the height of 3300 feet; mingled with the palms are cacti, mimosæ, the pine-apple, the milk-tree, mahogany, and trees yielding caoutchouc, sarsaparilla, copaiba, and other drugs. Above 2000 feet are the forests of cinchona or Peruvian-bark tree, the vanilla, plantain, etc. All the grains of temperate regions attain perfection at an elevation of 8000 feet. Cultivated plants include the cacao, cocoa-nut, tobacco, corn, (two crops yearly), cotton, coffee, sugar, and indigo. Among the minerals are gold, silver, tin, and copper; good coal is found in the coast districts; asphalt and petroleum abound round Lake Maracaybo. The gold mines are now being worked by English and other capital. The wild animals include the jaguar (now rare), puma, tapir, ounce, monkeys, serpents, alligators, the manatee, etc. The population is of Spanish, Indian, and Negro origin, either of pure or mixed blood. More than half of the population are mestizoes, mulattoes, and other mixed breeds. The chief exports are coffee, cocoa, hides, and skins. cattle, dye-woods, gold, and copper ores. The imports are chiefly manufactured goods, machinery, etc. Venezuela is divided into states and territories, each state having its own legislature and executive, its own budget, etc. The legislature for the whole republic consists in a congress of two houses, at the head of the executive being a president. The republic was formed in 1831 by secession from Colombia. It has suffered greatly from intestine dissensions, and has also had boundary disputes with its neighbors. The British Guiana frontier was determined by the award of a court of arbitration in 1899. The capital is

Carácas. The chief ports are La Guayra, Puerto-Cabello, Maracaybo, and Ciudad Bolivar. Pop. 2,323,527.

VEN'ICE, a city and seaport of Northern Italy, capital of the province of the same name, on a number of islets in a shallow lagoon in the northwest of the Adriatic, 23 miles east of Padua by rail. The islets are very low, and the houses are mostly supported on piles. A railway viaduct near 2½ miles long connects the town with the mainland. The city is divided into two parts by the Canalazzo or Grand canal, spanned by an elegant bridge, the Rialto, and several lesser bridges. The numerous branch canals are crossed by about 380 bridges, which rise rapidly toward the center to afford passage to the gondola and other boats. The city is also intersected by calli or narrow lanes for pedestrians; but the canals are really the streets of Venice, and it possesses neither horses nor wheeled carriages. Near the center of the city there is one street about 18 feet wide, the Merceria, but the great center of business and amusement is the Piazza, or Square of St. Mark,

and the piazetta adjoining it. The Piazza is about 570 feet long by 200 broad, contains some of the more remarkable public buildings, and is lined with handsome shops and cafés. The piazetta faces the sea. The Palace of the Doges, reconstructed by Marino Falieri in 1354, abuts on the piazetta. The Ponte-dei-Sospiri (Bridge of Sighs) connects the palace with the public prisons on the opposite side of a narrow canal. The church of St. Mark, now the cathedral (erected 976–1071), is surmounted by five domes. The principal front is adorned with 500 columns of precious marble. Above the doorway are the four celebrated bronze horses brought from Constantinople by the Doge Dandolo in 1204. The chief manufactures are woolen cloth, cloth of gold and silver, velvet, lace, ornamental, and colored glass, mosaic, jewelry, castings, etc. The trade is extensive; the imports include colonial goods, dye-woods, coal, iron, oil, etc.; exports timber, rice, linen, glass, coral, etc. Venice is supposed to have been founded in the 5th century by inhabitants of the surrounding districts, who took refuge from the cruelty of Attila on the islets at the mouth of the Brenta. In 1866 the city and province was ceded to Napoleon III., under whose auspices they were united by a plebiscite to the Kingdom of Italy. Pop. 151,841.

VENICE, Gulf of. See Adriatic Sea.

VENOMOUS ANIMALS, animals capable of inflicting poisonous wounds by means of special organs or contrivances. They include spiders, bees, wasps, hornets, scorpions, certain serpents, etc. In all cases the venomous matter must be introduced directly into the circulation to produce its effects.

VENTILATION. See Warming and Ventilation.

VENTRICLE. See Heart.

VENTRIL'OQUISM, the art of speaking in such a way as to cause a hearer to believe that the sound comes, not from the person speaking, but from a different source. The name originated from the erroneous supposition that the sounds uttered were formed in the belly, whereas practice alone is necessary to carry this act of illusion to a high degree of perfection. The sounds are formed by the ordinary vocal organs—the larynx, the palate, the tongue, the lips, etc. The art of the ventriloquist consists merely in this: After drawing a long breath he breathes it out slowly and gradually, dexterously modifying and diminishing the sound of the voice; besides this he moves his lips as little as possible, and by various contrivances diverts the attention of his auditors. This art was known to the ancient Greeks.

VE'NUS, the Roman name of the goddess of love, called by the Greeks Aphroditē. In the Iliad she is described as the daughter of Zeus and Diōnē; but Hesiod represents her as the offspring of Urănus, born among the foam of the sea. She surpassed all other goddesses in beauty, and hence received the apple

Venus, antique statue in the British Museum.

which was to be awarded to the most beautiful by Paris. She was the wife of Hephæstos (Vulcan), but also bestowed her love on the gods Arēs (Mars), Dionysos (Bacchus), Hermes (Mercury), and Poseidon (Neptune), and the mortals Anchises and Adonis. The myrtle, rose, poppy, apple, and other fruits were sacred to her, as were also the dove, sparrow, swan, swallow, ram, hare, and tortoise. The chief places of her worship in Greece were the islands of Cyprus and Cythera. In Rome several temples were erected to her under different names. In the best days of art this goddess was always represented draped, in later times nude. The scene of her arising from the sea was sculptured by Phidias on the base of the statue of Zeus at Olympia, and one of the most famous pictures of Apelles represented the same subject. The Venus of Capua and the Venus of Milo represent her as Venus Victrix, with one foot on a helmet and raising a shield. The Venus de' Medici is supposed to be a free copy of a statue of her by Praxiteles, which was celebrated above all her other statues in ancient times. Among modern statues of Venus, one of the most famous is that by Canova, which represents her as issuing from the bath.

VENUS, one of the inferior planets, having its orbit between Mercury and the earth, and the most brilliant of all the planetary bodies. From her alternate appearance in the morning and evening she was called by the ancients Lucifer and Hesperus, the morning and evening star. The mean distance of Venus from the sun is about 66,134,000 miles, her diameter 7510 miles, and her period of revolution round the sun about 224.7 mean solar days. Her volume is equal to about $\frac{1}{2}\frac{7}{0}\frac{1}{0}$ths of the earth, but her density being slightly greater her mass is actually equal to about $\frac{1}{2}\frac{7}{0}\frac{7}{0}$ths of the earth. The period of rotation round her axis is the same as that of revolution round the sun. The axis of rotation is inclined to the ecliptic at about 75°. According to her various positions relatively to the sun and earth she exhibits phases like the moon. Like Mercury, Venus transits the face of the sun, but at longer intervals. The transits of Venus are of much more importance than those of Mercury, because, being nearer to us when in transit, her position on the sun is measurably different for observers placed on different parts of the earth. See Transit.

VERA-CRUZ (vā'rà-krös), the chief seaport of Mexico, situated in the state of the same name. The harbor, though improved, is still unsatisfactory, but there is a large trade. The town has broad and regular streets, and some good buildings, and is defended by the fortress of San-Juan-de-Ulloa on an island in front of the harbor. The situation of the town is exceedingly unhealthy. It was founded by Cortez in 1520. Pop. 24,000.—The state stretches along the s.w. part of the Gulf of Mexico; area, 26,225 sq. miles. The products embrace all kinds of grain crops, tobacco, sugar, cotton, fruits, dye-woods, and timber. Cattle, horses, and sheep are numerous. Pop. 960,570.

VERB, in grammar, that part of speech whose essential function is to predicate or assert something in regard to something else (the subject or thing spoken of); as, the boy runs, the man lifts the stone, fishes swim, he suffers much. Verbs usually have the power of indicating time and mode by means of tenses and moods, these varying in the different languages, as does also the conjugation or system of verbal inflections and forms as a whole. They have been divided into active and neuter verbs, according as they predicate action or state. Active verbs are divided into

intransitive and transitive, according as the action is confined to the actor or passes from him to an object. Intransitive verbs often take an objective of their own nature; as, he runs a race; he sleeps the sleep of death. When a verb may be used either transitively or intransitively, as, he walks the horse, he walks to church, the verb in the former use is said to be causative. Many causative verbs are distinguished from their corresponding intransitives, by a change of form, as sit, set; lie, lay; fall, fell. Passive verbs affirm suffering or endurance of what another does. Hence, only verbs which take an object after them can have a passive voice, because it can be said of objects only that they suffer or endure the action directed on or toward them by the subject of the active verb. Passive verbs are thus the correlatives or complements of active verbs.

VERBE'NA, a genus of plants, the type of the natural order Verbenaceæ. Most of the species are American; about seventy are enumerated. Several species are cultivated for the great beauty of their flowers, being fine border plants. The verbena of the perfumers is the lemon-grass, from which the "oil of verbena" is extracted.

Verbenas—Garden varieties.

VERBENA'CEÆ, a natural order of plants, consisting of trees, shrubs, and herbaceous plants common in the tropics of both hemispheres. They have generally opposite or whorled simple or compound leaves without stipules; flowers in opposite corymbs, or spiked alternately, sometimes in dense heads, seldom axillary or solitary. The verbena and teak are examples.

VERDE, Cape. See Cape Verde.

VERDI, Giuseppe, an Italian operatic composer, born in 1813. His first production was Oberto, Conte di San Bonifazio (1839), and in 1842 he brought out with great success at the La Scala, Milan, his Nabuco, followed by I Lombardi (1843), Ernani (1844), Rigoletto (1851), Il Trovatore (1853), La Traviata (1853), Un Ballo in Maschera (1859), Aida (1871), Otello (1886), and Falstaff (1893). Verdi has a fine dramatic gift, and his melodies are showy and taking. He was an Italian senator. He died in 1901.

VERDICT. See Jury.

VER'DIGRIS, a poisonous substance, prepared by exposing copper to the air in contact with acetic acid, and used as a pigment, as a mordant, in medicine, etc.

VERESHTCHAGIN, Wasiliy, a Russian historical painter, born in 1842, and educated at the naval school in St. Petersburg. In 1864 he entered the Ecole des Beaux Arts at Paris, where Gerôme was his master. He joined the Caucasian expedition under General Kaufmann in 1867, and in 1869 went to Siberia. In 1874 he went to India with the Prince of Wales, and afterward settled in Paris. He took part in the Russo-Turkish war, and was wounded at Plevna. Since that time he has visited all the chief cities of Europe exhibiting his pictures. They are of immense size, extremely realistic, and treat chiefly of the horrors of war. He has lately taken up religious subjects, and his Family of Jesus and The Resurrection attracted some attention. He died in 1904.

VERGIL. See Virgil.

VERMICELLI, (-chel'lē). See Macaroni.

VERMIL'ION, the name given to a pigment of a beautifully scarlet color, obtained from crystallized mercuric sulphide. It is extensively employed in painting, in making red sealing-wax, and other purposes.

VERMONT, one of the United States, bounded by Canada, New York, Massachusetts, and by the Connecticut river; area, 9565 sq. miles. It ranks thirty-ninth in size among the states. The surface is traversed from south to north by the Green mountains, which culminate in Mansfield mountain in the n.w., 4280 feet high. The drainage is shared between Lake Champlain in the west, and the Connecticut and its affluents. The surface is generally fertile, grain growing in the valleys, while the higher lands furnish excellent pasture. The climate is healthy, and the temperature ranges from 20° below zero in winter up to 90° in summer. The soil is stony and of poor quality, though in the valleys, in the western lowlands, there is much land that is suitable for cultivation. There are large forests of pine and hemlock, with spruce and fir on the higher slopes. On the lower lands there are also forests of deciduous trees, the sugar maple being one of the most common trees. The principal mineral wealth of Vermont is in its rocks, which furnish a great variety of marble, from white to almost pure black. Granite, slate, and soap-stone are abundant. The quartz-mica-schists furnish excellent whetstones. Important veins of asbestos are bedded in the serpentine rocks in the north central part of the state. Among metallic ores iron and copper are abundant, lead, manganese, gold, and silver are also found in small quantities. Agriculture has always been the leading industry in the state. With the adoption of intensive methods of cultivation the soil is made to produce abundantly, the production of corn per acre being greater than that of any other state. Vermont produces more maple sugar than any other state in the Union, and two-fifths that of the entire country. Cattle-raising has become the predominant industry in Vermont agriculture. The horses of Vermont were among the first to win fame on the race-courses of the country, and include the Morgan, Messenger, and Black Hawk stocks. Sheep are also given considerable attention. The important industries are those which depend upon the forests for their raw materials. The increase in dairying has been accompanied by a rapid development of the factory production of butter and condensed milk. The stone resources of the state has afforded a basis for the manufacture of monuments and tombstones. The more important of the other industries are the manufacture of flour and grist-mill products, foundry and machine-shop products, woolen goods and hosiery, and knit goods. Burlington is the largest manufacturing center. The Central of Vermont, the Boston and Maine, and the Grand Trunk are the chief railroads

The seal of Vermont.

of the state. There is a considerable internal and transit trade, but the foreign trade is limited, being chiefly carried on through New York and Massachusetts. The early inhabitants were largely of the English "Non-Conformist" or "Independent" type, who became known as Congregationalists, and they have continued the strongest religious sect in the state. Later the Methodists became important. Still later the influx of foreigners brought a strong Catholic element. Of higher institutions the state supports normal schools at Randolph, Johnson, and Castleton, and a state university, including agricultural and medical departments, at Burlington. The Congregationalists maintain a college at Middlebury. Vermont, first became known to Europeans in 1609, when Champlain explored the lake since known by his name. During the next century the lake and its borders were a thoroughfare for various military expeditions in the Indian and colonial wars, and several points along the lake were occupied, mainly as military posts, by both French and English; but the first permanent settlement was made in 1724 at Fort Dummer in the limits of Brattleboro. Vermont was admitted as the fourteenth state in March, 1791. In May, 1775, the "Green Mountain boys" under Ethan Allan and Seth Warner had captured Ticonderoga and Crown Point. The battle of Bennington in August, 1777, was won by the combined forces of Vermont and New Hampshire. During the whole struggle the state, though unrecognized, contributed its full share of men and means. In the war of 1812–14 Vermont is credited with 5236 soldiers in regular service, exclusive of 2500 volunteers who were under arms at Plattsburgh in September,

1814. In the civil war of 1861–65 the state furnished more than its due quota of troops, 33,288 men from a total population (1860) of 315,098. The Fenian operations against Canada, in 1866 and 1870, had their base in St. Albans. The state adopted a prohibitory amendment to the constitution in 1852, but abandoned the policy of probihition in 1902, when the voters of the statc declared for high license. This measure, amounting to local option regulation, became law in 1903. In 1792, 1796, and 1800, the state was carried for federalist electors, but was democratic-republican thereafter to 1824. In that year, and again in 1828, the Adams republicans were successful. In 1832 the vote was cast for the anti-Masonic candidate. After that time it was steadfastly whig to 1852, and has been republican, by large majorities, ever since. Montpelier is the capital, but Burlington is the largest town. Pop. 350,000.

VERNE (vern), Jules, a popular French romancer, born at Nantes in 1828. He studied law for some time, but afterward began writing short pieces for the stage. In 1863 he published Five Weeks in a Balloon, and the vein of the marvelous, tinged with a quasi-scientific truthfulness, has since been worked by him with great success. His more popular works are: Twenty Thousand Leagues under the Sea, From the Earth to the Moon, Across Africa in a Balloon, A Journey to the Center of the Earth, Around the World in Eighty Days, Giant Raft, etc. Most of his works have been translated into English and German. He died in 1905.

VERO'NA, a city of Northern Italy, capital of the province of same name, beautifully situated on both sides of the rapid Adige, a fortress of the first class, walled, and entered by five beautiful gates. Verona has a Roman amphitheater, supposed to have been built about the 2d or 3d century of our era, the interior of which is nearly perfect; an imposing cathedral in the Gothic style dating from the 14th century, and many other magnificent churches rich in paintings and other art treasures. Other notable edifices are the Palazzo del Consiglio, adorned with statues of celebrated natives of the town; and the Gothic tombs of the Della Scala family (Scaligeri), who ruled Verona from 1262 to 1389. Modern public buildings include theaters, a museum, a library, hospitals, literary institutions, etc. The town has manufactures of silk, woolens, hats, etc., and a considerable trade. Pop. 74,261.

VERONESE (vā-ro-nā'ze), Paul, the popular name of Paolo Cagliari, an eminent Italian artist, born at Verona, in 1528. He was a contemporary of Titian and Tintoretto. He died at Venice April 19, 1588. Among his masterpieces are: The Calling of St. Andrew to the Apostleship, The Rape of Europa, The Family of Darius at the Feet of Alexander, Adoration of the Magi, Consecration of St. Nicholas and St. Helena, The Vision of the Invention of the Cross; the last five mentioned are in the National gallery.

VERSAILLES (ver-sālz'), a town of France, capital of the department of Seine-et-Oise, in a plain, 11 miles s.w. of Paris. It is regarded as one of the handsomest towns in Europe, having been built under the auspices of the sovereigns of France, particularly Louis XIV., who made it the seat of his court, and erected the palace. This is a large and imposing building with an extensive park and gardens, fine fountains, etc. Louis Philippe converted the palace into a national museum, and it contains an immense collection of statues and paintings representing personages and events connected with the French monarchy from Clovis downward. In October, 1870, the Germans established their headquarters at Versailles; and from March, 1871, till 1879, it was the seat of the French government. Pop. 54,081.

VERSE, a measured and cadenced form of speech or composition, usually adopted in poetry. It seems to be the natural language of passion, yet it has unquestionably been improved and developed by art. The use of rhymed cadences is a comparatively modern invention. (See Rhyme.) Grammarians have elaborately classified the varieties of verse, and analytically distinguished the possible divisions of words into bars of accented and unaccented syllables. (See Rhythm.) The term is also applied to a line of poetry consisting of a certain number of metrical feet disposed according to the rules of the species of poetry which the author intends to compose. Verses are of various kinds, as hexameter, pentameter, etc. Blank verse is verse in which the lines do not end in rhymes. (See Blank Verse.) Heroic verse is rhymed verse in which the lines consist of ten syllables, five of them being accented, and constituting five iambic feet.

VERST, a Russian measure of length, equal to 3500 English feet, or very nearly two-thirds of a mile.

VER'TEBRA. See Spine.

VERTEBRA'TA, the name given to the highest sub-kingdom of animals, consisting of those animals which in early life usually possess a backbone, but which invariably possess a notochord which have never more than four limbs disposed in pairs; which possess jaws as parts of the head; and which have the great nerve-centers contained within a special case formed by the skull and spinal column. In all Vertebrata save the lancelet a distinct heart is developed. The Vertebrata include the classes Pisces (fishes), Amphibia (frogs, etc.), Reptilia (reptiles), Aves (birds), and Mammalia (quadrupeds and man). They have also been classified into Ichthyopsida, including Pisces and Amphibia; Sauropsida, comprising Reptilia and Aves; and Mammalia.

VERTI'GO (or ver'ti-go), an attack of giddiness or swimming of the head in which objects appear to move in various directions though stationary, and the person affected finds it difficult to maintain an erect posture. It is a common symptom of an irregular (excessive or defective) supply of blood to the brain and of nervous and general debility; but it frequently arises from some disturbance of the digestive organs.

VESA'LIUS, Andreas, the father of modern anatomy, born at Brussels 1514, died at Zante 1564. He was physician to the Emperor Charles V. and to Philip II. His chief work, De Corporis Humani Fabrica, opened a new era in the science of medicine.

VESPA'SIAN, Titus Flavius, Emperor of Rome, was born near Reate, in the country of the Sabines, in A.D. 9. After serving with distinction in Germany and in Britain as commander of a legion, he was made consul. He afterward became proconsul of Africa, and on the rebellion of the Jews he was sent with an army into Judæa (A.D. 66). He reduced nearly all Galilee, and was preparing to attack Jerusalem, when he received news of Nero's death (A.D. 68). Then followed the emperors Galba, Otho, and Vitellius, and in A.D. 69 Vespasian was himself elected emperor by

Coin of Vespasian.

the army, and arrived in Rome about the middle of the year 70, leaving the siege of Jerusalem to his son Titus. He immediately reformed the discipline of the army, purified the senatorial and equestrian orders, and improved the administration of justice. He favored arts, letters, and learned men, particularly Quintilian, Pliny, and Josephus. He rebuilt a part of the city, restored the capital, and erected the gigantic amphitheatre, the ruins of which are still celebrated under the name of the Coliseum. Vespasian died in June, A.D. 79.

VESPERS, the evening service in Roman Catholic and other churches, or the time of evening service, being the last of the canonical hours except compline.

VESPUCCI, Amerigo. See Amerigo Vespucci.

VESTA, a Roman divinity, the goddess of the hearth. She was worshiped along with the Penates, at every family meal, when the household assembled round the hearth, which was in the center of the room. Her public sanctuary was in the Forum, and the sacred fire was kept constantly burning in it by the vestals, her priestesses. The vestals are said to have been established by Numa. There were at first four, and afterward six of them. They were taken from six to ten years of age. They were bound to virginity for thirty years, the term of their service, after which they were allowed to marry. Their persons were inviolable, and they were treated with great honor, and had important public privileges. The punishment of a vestal who was guilty of unchastity was burying alive.

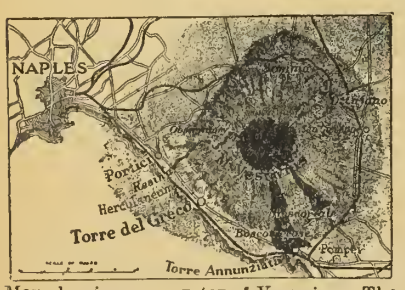
VESTA, in astronomy. See Asteroids.

VESTMENTS, Sacred, the official garments worn by ministers of religion.

The term is also applied to the altar-cloths. Among Catholics and High Churchmen, who believe that Christianity has retained a special priesthood and ritual, much importance is attached to vestments. See Ritualism; also Chasuble, Stole, etc.

VESTRY, a room adjoining a church where the vestments of the clergy are kept. Hence the place of meeting of those having the charge of parochial affairs, and collectively the persons themselves to whom these affairs are intrusted. In England the minister, churchwardens, and chief men of a parish generally constitute a vestry, and the minister, whether rector, vicar, or perpetual curate, is ex-officio chairman. The powers of the vestry include the expenditure of the church funds, the repairing or alteration of churches or chapels, and the appointment of certain parish officers. In certain large and populous parishes select vestries are annually chosen from the chief or most respectable parishioners to represent and transact the business of the parish. In London the vestries are highly important bodies. In the United States the vestry is a highly developed body with wide powers. The rector is *ex officio* a member of the vestry, and is entitled to preside, if present, at all its meetings. The function of the vestry is to represent the congregation in law, to have charge and care of its property and to collect and disburse its revenues.

VESUVIUS, a historic volcano, situated 10 miles east southeast of Naples, and chiefly noted for having buried with its ashes the ancient cities of Herculaneum and Pompeii. Previous to the eruption of 1906 it rose in the center of a plain 2300 feet above the sea, in a pyramidal cone of about 1900 feet; total height, over 4200 feet. Previous to an eruption about 1838 the top was an uneven plane, but was then converted into a hollow cup sloping to a depth of 500 feet. A precipitous rocky ridge, 1400 feet high, called Monte Somma, lies to the north of the cone, from which it is separated by a deep valley called the Atrio del Cavallo. At the western extremity of this valley an observatory



Map showing new crater of Vesuvius. The black shading is the pathway of the lava.

has been established. The lower belt of the sloping plain is about 2 miles broad; it is laid out in vineyards and well cultivated. Above this belt the plain is rugged and covered with scoriæ. Monte Somma is supposed to have formerly formed a complete cone of larger dimensions than the last one, being subsequently altered by volcanic forces in the same manner as 800 feet of the present cone was carried away by an eruption in 1822. The volcano began in March, 1906, to give evidence of an unusual disturbance, and during the next few weeks there followed a continuous eruption which threatened Naples, with its 500,000 population, and caused the death of nearly 1000 persons. An entirely new crater was established, changing the whole topography of the mountain and making this most recent eruption one of the most important in the history of the volcano.

After several days of earthquake the lava burst from the new crater and ran down the slope to Boscotrecase, which it completely destroyed. The streams were several hundred feet wide and covered the ground to the depth of 10 to 40 feet, fresh rivers of melted rock pouring over the earlier ones as they hardened by cooling. The ashes so filled the air as to cause partial darkness, and the people had to protect themselves by goggles and cloths from blindness and suffocation. The ground was covered with a gray mantle of fine ashes as far as Naples and the east coast. The weight of the cinders which fell upon the Monte Olivete market in Naples broke down the roof, crushing over 200 people. Vesuvius rises in the center of a plain 2300 feet above the sea. The old cone, previous to the recent eruption, was 1900 feet high, with a total height of 4200 feet, and 2000 feet in diameter. The first recorded symptoms of disturbance were those of A. D. 63. Desultory quakes followed until A.D. 79, when Herculaneum and Pompeii were buried. Another eruption took place in 1036. Since numerous outbreaks have been recorded, the most disastrous being that of 1631 when 18,000 lives were lost. Violent outbreaks also took place in 1759, 1767, 1794, 1822, 1855, 1858, 1861, 1865, 1867, 1872, 1878, 1879, and 1885.

VET'ERINARY ART, the art which deals with the nature, causes, and treatment of the disorders of domestic animals. The first veterinary school was instituted in 1762 at Lyons; in 1766 that at Alfort near Paris was opened. A similar institution was established at London in 1791, and in the year following one in Berlin. In Edinburgh instruction in veterinary medicine began to be given by Mr. Dick in 1819, and in veterinary surgery in 1823. In America veterinary chairs have been added to some of the universities, but most of the schools are private institutions.

VETO (Latin "I forbid"), the power which one branch of the legislature of a state has to negative the resolutions of another branch; or the right of the executive branch of government, such as king, president, or governor, to reject the bills, measures, or resolutions proposed by other branches. In Britain the power of the crown is confined to a veto, a right of rejecting and not resolving, and even this right is rarely exercised, the last occasion being in 1707. In the United States the president may veto all measures passed by congress, but after that right has been exercised the rejected bill may become law by being passed by two-thirds of each of the houses of congress.

VIADUCT, a structure of wood, iron, stone and brickwork for conveying a roadway across a valley or low level. In recent years, the term viaduct has come to mean more specifically a metal structure composed of a number of comparatively short spans carried by tower-like piers of steel framework. These piers usually consist of four column-like legs spread wide apart at the bottom and converging toward the top, which are braced togeter in all directions. See Bridge.

VIAT'KA, a town of Russia, capital of the government of same name, on the Viatka, 500 miles e.n.e. of Moscow. It has a cathedral, some manufactures, and a large trade. Pop. 24,258.—The government has an area of 59,172 sq. miles, and a pop. of 3,028,788.

VIBORG (vē'bŏrg), a government occupying the southeastern part of Finland, Russia. Area 13,525 square miles. The coast region along the Gulf of Finland and Lake Ladoga is low and exceedingly indented. The interior is rocky and mountainous and interspersed with marshes and lakes. The chief rivers are Kymenne and the Wuoxen. Viborg has extensive deposits of building stone, copper, lead, and iron. Rye, oats, and barley are grown. The forests occupy a large part of the area and are an important source of income. The manufacturing industries are highly developed. The commerce is mainly with Russia. Pop. 400,000, chiefly Finns. Viborg is the capital. Pop. 33,000.

VIBUR'NUM, a genus of plants, including the gelder-rose and laurustine, and the wayfaring tree, a native of Europe and the west of Asia. The young shoots are used in Germany for basket-making; the wood is sometimes employed in turning and cabinet-making; the berries are used for making ink, and the bark of the root for making bird-lime.

VICE-ADMIRAL. See Admiral.

VICE-CONSUL. See Consul.

VICENZA (vi-chen'tsá), a town of North Italy, capital of a province of the same name, 49 miles west of Venice. The most remarkable edifices are the Duomo or cathedral; the Palazzo della Ragione (town-hall), an ancient Gothic building, with fine connected buildings by Palladio; the museum, one of Palladio's finest buildings; the Palazzo-Prefetizzio, and the theater, both by Palladio; the lyceum, churches, and hospitals. The manufactures are silk, woolen, and linen tissues, leather earthenware, hats, etc. Pop. 44,261.—The province has an area of 940 sq. miles and a pop. of 446,521.

VICE-PRESIDENT, the second officer of the government of the United States in rank and chosen for the same term and in the same manner as the president. He performs no executive functions whatever, his only duty being to preside over the deliberations of the senate except when it is sitting as a court of impeachment for the trial of the president, when the chief justice presides. He has a casting vote in the senate in case of a tie, and he presides at the joint meeting of the two houses when the electoral votes are counted. The chief importance of the office consists in the fact that the vice-president is made by the constitution the successor of the

president in case of the latter's removal from office or of his death, resignation, or inability to discharge the powers and duties of the office. The qualifications required of the vice-president are the same as those of the president. His salary is $12,000 per year.

VICHY (vē-shē), a town of France, in the department of the Allier, in a valley of the river of that name, 32 miles s.s.e. of Moulins. The Vichy waters are in much request for disorders of the stomach and bowels, and of the urinary organs, in gout, rheumatism, etc. Much of the water is sent out in bottles. Pop. 8486.

VICKSBURG, a town in Warren co., Mississippi, on the Mississippi, 400 miles above New Orleans. It is a port of entry, and has an extensive trade in cotton. Vicksburg was strongly fortified by the confederates in the civil war, and the Unionist forces were repulsed here on several occasions, but after a long siege General Pemberton surrendered the place to General Grant, July 4, 1863. Pop. 15,373.

VICTOR EMMANUEL (Vittorio Emanuele) **II.,** the eldest son of Charles Albert, king of Sardinia, was born at Turin, March 14, 1820, and he married on April 12, 1842, Archduchess Adelaide of Austria. His aptitude for a military career became evident when he commanded the Savoy brigades against Austria (1848–49), and distinguished himself in the battle of Goito by his reckless valor. After the battle of Novara (March 23, 1849) his father abdicated, and Victor Emmanuel ascended the throne of Sardinia. He had then to negotiate with Austria under most unfavorable circumstances, but he steadily

Victor Emmanuel.

refused to give up the principle of representative government in the Sardinian constitution, and this gained for him the name of honest king and the goodwill of the Italian people. This latter was only gained, however, after much calumny and misunderstanding, but the young king pursued from the first a policy which led to the national unity of Italy. Under the advice of his celebrated minister Cavour, he regulated the finances, reorganized the army, and secularized the church property, for which he was excommunicated by the pope. He took part in the Crimean war, and in 1859, assisted by France, renewed the contest with Austria, taking part in the battles of Magenta (4th June) and Solferino (24th June). By the Treaty of Villafranca and the Peace of Zürich which followed these successes, Lombardy was added to his dominions, but he had to cede Savoy and Nice to France. Parma, Modena, and Tuscany, now became united to Sardinia, and Garibaldi's successes in Sicily and Naples brought the whole of Southern Italy over to Victor Emmanuel. On March 17, 1861, he assumed the title of King of Italy, and early in 1865 Florence became the royal residence. By the Peace of Vienna (1866) Austria ceded Venetia, and on the withdrawal of the French garrison from Rome in 1870 the city annexed itself to Italy. The king entered Rome on July 2, 1871, and took up his residence in the Quirinal. He died 9th June, 1878, and was succeeded by his son Humbert.

VICTORIA, a British colony in the southeast of Australia, bounded n. by New South Wales, s.e. by the Pacific, s. by Bass strait and the Southern ocean, and w. by South Australia; area, 87,884 sq. miles. It has about 600 geographical miles of sea-coast, with considerable bays and indentations, especially about the middle, where Port Phillip Bay, with an area of 875 sq. miles and an entrance barely 2 miles wide, affords shelter sufficient for the largest fleet. Victoria is the principal gold-producing colony of Australia. Tin, antimony, copper, and coal are also among the minerals worked. Agriculture has greatly extended of late years, wheat and oats being the two cereals chiefly cultivated. The great staple of the colony, however, is wool. The government is invested in a governor appointed by the crown, aided by an executive ministry consisting of twelve members, and a parliament consisting of a legislative council of forty-eight members elected for fourteen provinces, and a legislative assembly of ninety-five members for eighty-four districts. The colony possesses a small permanent military force, besides militia and volunteers, and there is a small fleet of war-vessels. Since 1901 Victoria has formed a state of the Australian commonwealth. There were in 1907, 3425 miles of railway open (all belonging to the government), and upward of 16,000 miles of telegraph wire with 843 telegraph stations. Education is compulsory between the ages of six and thirteen. Besides the Melbourne university there are several colleges connected with various religious denominations. Pop. 1,201,506.

VICTORIA, capital of British Columbia, in Vancouver island, on the north side of the Strait of Juan de Fuca. There are government buildings, town hall, cathedral, etc., and some good streets. The harbor for large vessels is at Esquimault, 3 miles distant, where there is a station of the British navy. Pop. 20,816.

VICTORIA CROSS, a British military decoration, instituted at the close of the Crimean war in 1856. It is granted to soldiers and sailors of any rank for a single act of valor in presence of the enemy. It was instituted in imitation of the French cross of the Legion of Honor. It is a bronze Maltese cross, with a royal crown in the center, surmounted by a lion, and the words "For Valour" indented on a scroll below the crown. The ribbon is red for the army,

Victoria cross.

and blue for the navy. A pension of $50 a year accompanies the decoration, when gained by anyone under the rank of commissioned officer, with an additional clasp and $25 if gained a second time.

VICTORIA I. (Alexandrina), Queen of Great Britain and Ireland and Empress of India, only child of Edward, duke of Kent, and of his wife Princess Victoria Mary Louisa, daughter of the Duke of Saxe-Coburg-Saalfeld, widow of the Prince of Leiningen, and sister of King Leopold of Belgium, was born at Kensington Palace, May 24, 1819. Her father died January 23, 1820, and she became heiress-presumptive to the crown on the accession of William IV. in 1830. The latter, dying without issue (June 20, 1837), she ascended the throne of Great Britain and Ireland, that of Hanover falling by the Salic law to her uncle, the

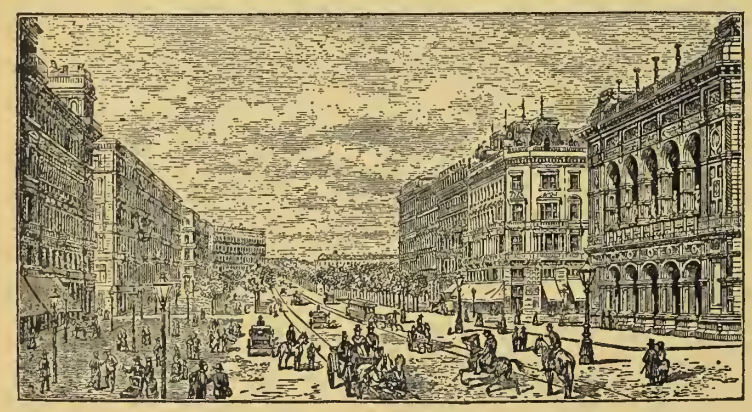
Queen Victoria.

Duke of Cumberland. She was crowned in Westminster Abbey, June 28, 1838, and on February 10, 1840, married her cousin, Prince Albert of Saxe-Coburg-Gotha. Prince Albert died on 14th December, 1861, a blow which so affected the queen that she made but few appearances in public for years. In 1876 she assumed the title of Empress of India. The jubilee of her reign was celebrated in 1887 and the "diamond jubilee" in 1897. She wrote Leaves from the Journal of Our Life in the Highlands (1868), and More Leaves (1884). She died at Osborne House, Isle of Wight, on 22nd January, 1901, and was succeeded by her eldest son Edward

VII. Her remains were placed beside those of Prince Albert in the mausoleum at Frogmore.

VICTORIA NYANZA, a lake of East Africa, about 400 miles inland from the Indian ocean, crossed near its north end by the equator, about 3800 feet above the sea; area, 29,000 sq. miles. It communicates with the Albert Nyanza by means of the Victoria Nile, and is the principal feeder of the White Nile. It contains many islands, some of them of considerable size. It was discovered by Captain Speke in 1858. Its northern shores belong to British East Africa and its southern to German East Africa.

VIENNA, capital of the Austro-Hungarian empire, is situated in a plain on the right bank of the Danube, and is intersected by a narrow arm of the river into which fall the Wein and other small streams. The old town is still the court and fashionable quarter of the city, and is encircled by the Ringstrasse, a handsome boulevard, 55 yards wide. Vienna is on the whole a handsome, well-built town, with fine squares and straight and spacious streets. Of the churches the most remarkable is the Domkirche, or cathedral, of St. Stephen, a cruciform Gothic structure, with a main tower 453 feet high. The interior is adorned with numerous statues and monuments, and the tower contains a bell of 18 tons weight. The modern palaces of the archdukes and others of the nobility, are



Street in Vienna.

many of them, handsome buildings. Deserving of special mention are the houses of parliament, the magnificent Gothic town-house (1872–83), the courts of justice, the museums of art and of natural history, and the exchange. The university was founded in 1237, and reorganized by Maria Theresa. The imperial library contains 440,000 volumes and 20,000 MSS. The imperial museum of natural history is one of the finest in Europe. The treasury, among other imperial treasures, contains the regalia of Charlemagne. Vienna is the first manufacturing town in the empire, and its manufactures include cotton and silk goods, leather, porcelain, arms, hardware, and many other articles. There is also a large inland trade. It is now the center of a great railway system, and the center of the shipping trade between eastern and western Europe. Pop. 1,662,269.

VIENNA, Congress of. This congress was assembled on November 1, 1814, to reorganize the political system of Europe after the first overthrow of Napoleon. The principal powers represented in it were Austria, Russia, Prussia, England, and France. Spain, Portugal, Sweden, and other minor powers were also consulted on matters more nearly concerning them. The leading territorial adjustments effected by the congress were the following: Austria recovered Lombardy and Venetia, while Tuscany and Modena were conferred on collateral branches of the imperial house. The king of Sardinia recovered Piedmont and Savoy, with the addition of Genoa. Murat retained Naples, but the Bourbons were soon reinstated. Holland and Belgium were erected into a kingdom for the Prince of Orange, William I. Hanover, with the title of king, returned to the king of England, and Great Britain retained Malta, Heligoland, and several conquered colonies. A federative constitution, with a diet at Frankfort, was established for Germany. Prussia received the duchy of Posen, the Rhine province, and a part of Saxony. Russia received the greater part of the grand-duchy of Warsaw, Cracow becoming a free state protected by Russia, Austria, and Prussia. Sweden retained Norway, and Denmark was indemnified with Lauenburg. The congress was suddenly broken up by Napoleon's escape from Elba (February, 1815); but its acts were signed by the powers interested on 9th June, 1815.

VIENNE (vē-enn), a western department of France; area, 2690 sq. miles. Iron is abundant, and there are excellent quarries of marble, granite, millstones, whetstones, lithographic stones, and limestone. The manufactures consist of woolens, lace, cutlery, paper, pig-iron, etc. The capital is Poitiers. Pop. 342,785.—Haute-Vienne is a hilly department adjoining Vienna on the southeast; area, 2130 sq. miles. The principal crops are buckwheat, rye, beans, and peas; and horses, mules, and swine of a superior breed are reared. Minerals include iron, copper, tin, lead, coal, antimony, and kaolin. Porcelain, woolen and other tissues, paper, and leather are the chief manufactures. Limoges is the capital. Pop. 363,182.

VIGIL, an ecclesiastical term applied at first to the evening, and afterward to the whole day, preceding a great festival. This name originated from the circumstance that the early Christians spent a part of the night preceding such festivals in prayers, to prepare themselves for the coming celebration.

VIK'ING (from the Icelandic vik, a bay or fiord, and the termination ing, implying one who belongs to or is descended from: literally one who lurked in bays and issued thence to plunder), a rover or sea-robber belonging to one of the bands of Northmen who scoured the European seas during the 8th, 9th, and 10th centuries. This word has been frequently confounded with sea-king, a term which is applied to a man of royal race, who took by right the title of king when he assumed the command of men, although only of a ship's crew; whereas the former term is applicable to any member of the rover bands. See Northmen.

VILLARD, Henry, American financier was born in Spire, Bavaria, in 1835. He came to the United States in 1853. He married a daughter of William Lloyd Garrison in 1866, and for two years afterward was European correspondent of the New York Tribune. In 1875 Mr. Villard became president of both the Oregon and California railroad, and the Oregon Steamship company. In 1879 he organized the Oregon railway and navigation company. He was elected president of the Northern Pacific railway in 1881, and from 1889 to 1893 was chairman of its board of directors. He died in 1900.

VILLARS (vil-är), Claude Louis Hector, Duc de, one of the greatest generals of the age of Louis XIV., was the son of the Marquis de Villars, and was born at Moulins in 1653. He early distinguished himself under Turenne, Condé, and Luxembourg, and was created maréchal de camp in 1690, and lieutenant-general in 1693. He defeated Prince Louis of Baden at Friedlingen, 14th October, 1702, for which he received the marshal's baton; and defeated the Prince of Baden at Höchstadt, 21st September, 1703. His success in dealing with the insurrection of the Camisards obtained for him the title of duke (1705). Having been sent to defend the frontier against Marlborough, he forced the formidable lines of Stollhofen, near Strasburg, and penetrated far into Germany (1705–1707). In 1709 he replaced Vendôme in Flanders, and fought the battle of Malplaquet against Marlborough and Eugene, in which he was seriously wounded. In 1712 he defeated the allies at Denain, took Marchiennes, and relieved Landrecy. After the Peace of Utrecht he opposed Eugene with uninterrupted success, and negotiated with him the Peace of Rastadt, 7th March, 1714. On the renewal of the war with Austria in 1733 he was sent to Italy at the head of an army, with the title of marshal-general of France. After a successful campaign, he died at Turin, 1734.

VILLEINS, a species of feudal serfs

who were allowed to hold portions of land at the will of their lord, on condition of performing menial and non-military services. It frequently happened that lands held in vilenage descended in uninterrupted succession from father to son, until at length the occupiers or villeins became entitled, by prescription or custom, to hold their lands so long as they performed the required services. And although the villeins themselves acquired freedom, or their land came into the possession of freemen, the villein services were still the condition of the tenure, according to the custom of the manor. These customs were preserved and evidenced by the rolls of the several courts-baron, in which they were entered, or kept on foot by the constant immemorial usage of the several manors in which the lands lay. And as such tenants had nothing to show for their estates but the entries into those rolls, or copies of them authenticated by the steward, they at last came to be called tenants by copy of court-roll, and their tenure a copy-hold.

VILLERS. See Buckingham

VILNA, or **WILNA,** a town of Russia, capital of the government of the same name, on the Villa. Pop. 154,532.—The government, which lies in the Baltic, has an area of 16,406 sq. miles and a population of 1,591,207. The surface is generally flat, and the government produces good crops of grain, hemp, and flax. Manufactures and trade are limited.

VINCENNES (vĭn-sĕnz′), the county-seat of Knox co., Ind., 117 miles southwest of Indianapolis; on the Wabash river, and on the Cleveland, Cincinnati, Chicago and St. Louis, the Baltimore and Ohio Southwestern, the Evansville and Terre Haute, and the Indianapolis and Vincennes railroad. Pop. 12,249.

VINCENT, St., one of the British West India islands. See St. Vincent.

VINCI (vin′chē), Leonardo da, one of the greatest Italian painters, also distinguished as a sculptor, architect, and civil and military engineer, a scientific inventor, and a man of universal genius, was born at the village of Vinci, near Florence, in 1452. Two of his earlier productions are still extant: The Adoration of the Magi, in the gallery of the

Leonardo da Vinci.

Uffizi at Florence, and The Virgin of the Rocks in the British National gallery. His great painting of the Lord's Supper was finished in 1499. The original has been wholly defaced, but judging from copies and engravings, this work is universally regarded as one of the greatest ever produced. One of the best copies is that in the Royal academy, London, by his pupil Marco d'Oggionno. After the occupation of Milan by Louis XII. (1499) he retired to Florence, where he painted his celebrated portrait of Mona Lisa del Giocondo, known as La Gioconda, in the Louvre. In 1502 he was appointed chief engineer and architect of the pope's army, and visited many of the fortified posts in the papal dominions. In 1507 he returned to Milan, and painted a Madonna and Child in the palace of the Melzi at Vaprio. In 1512 he painted two portraits of Duke Maximilian, son of Ludovico, and in 1516 accompanied Francis I. to France. He died at Cloux, near Amboise, 2d May, 1519.

VINE, a well-known climbing shrub with woody stems, simple or compound leaves, peduncles sometimes changed into tendrils, small green flowers, and round berries. The species are found in both the Old and New Worlds, especially in Asia. The best known and most useful of the order is the grapevine, cultivated from time immemorial, of which there are numerous varieties, distinguished by possessing lobed sinuately-toothed, naked or downy leaves. It is a native of Central Asia, and its cultivation extends from near 55° north latitude to the equator, but in south latitudes it only extends to about 40°. It is rarely grown at a greater altitude than 3000 feet. About 1771 a European vine was introduced on the Pacific slope, and the culture has increased to great dimensions, especially in California. In other parts of the United States, however, the native American varieties are chiefly cultivated. The vine grows in every sort of soil, but that which is light and gravelly is best suited for the production of fine wines. It is a long-lived plant, indeed, in suitable climates the period of its existence is not known. It is propagated from seeds, layers, cuttings, grafting, and by inoculation, the first method being used for obtaining new varieties. Some vines produce dark-colored berries (black or red so called), others white. The Burgundy may be considered the most general vineyard grape of France, and the best wines in Italy and Spain are also made from grapes of this description. The sweet wines are made from sweet-berried grapes allowed to remain on the plants till overripe. Most varieties of the vine bear only once in the season, some oftener, especially in warm climates. Grapes are extensively used in the dry state under the name of raisins, chiefly imported from Spain and the Levant. The dried currants of commerce are the produce of the small seedless Corinthian grape which is cultivated in Greece and in many of the Greek islands. The vine is mentioned in the most ancient historical records, and the grape has been in use for the making of wine for more than 4000 years. The Phœnicians introduced the vine into Europe. Vineyards are mentioned in Domesday book as existing in England, but in the reign of Henry II. the cultivation of the vine began to be neglected. Artificial heat was not applied to the production of grapes before the beginning of the 18th century. For the manufacture of wines see Wine.

VINEGAR, the name given to dilute and impure acetic acid, obtained by the vinous fermentation. In wine countries it is obtained from the acetous fermentation of inferior wines, but in Britain and elsewhere it is usually procured from an infusion of malt which has previously undergone the vinous fermentation. Vinegar may also be obtained from strong beer, by the fermentation of various fruits, or of a solution of sugar mixed with yeast; in short, all liquids which are capable of the vinous fermentation may be made to produce vinegar. Vinegars yield by distillation a purer and somewhat weaker acetic acid, called distilled vinegar. Wood vinegar is an impure acetic acid obtained by the distillation of wood. Common and distilled vinegar are used in pharmacy for preparing many remedies, and externally in medicine, in the form of lotions. The use of vinegar as a condiment is universal. It is likewise the antiseptic ingredient in pickles.

VIOL, a class of ancient musical instruments which may be regarded as the precursors of the modern violins. They were fretted instruments with three to six strings, and were played on with a bow. There were three instruments differing in pitch in a set, the treble, tenor, and bass viols, and in concerts they were commonly played in pairs: two treble, two tenor, and two bass. The bass viol, or viol de gamba, was the last to fall into disuse, which it did about the close of 18th century.

VIOLA. See Violin and Violet.

VIOLET (Viŏla), the popular name given to the species of the natural order Viloaceæ, which are favorite flowers in all northern and temperate climates and many of them among the first to make their appearance in the spring. The corolla is composed of five unequal petals; the roots are mostly perennial; the leaves are alternate and stipulated; and the flowers are pendunculate More than a hundred specimens are known. The greatest favorites are common sweet violet, heart's-ease; the former being especially esteemed for its fragrance. The well-known pansies so common as garden flowers are but varieties produced by cultivations.

VIOLET, one of the colors. See Color. Spectrum, etc.

VIOLET-WOOD. See King-wood.

VIOLIN, a musical instrument, consisting of four cat-gut strings, the lowest of which is covered with silvered copper wire, stretched by means of a bridge over a hollow wooden body, and played with a bow. It is considered the most perfect of musical instruments, on account of its capabilities of fine tone and expression, and of producing all the tones in any scale in perfect tune. It forms with its cognates, the viola, violoncello or bass violin, and double-bass, the main element of all orchestras. The principal parts of the violin are the scroll or head, in which are placed the pins for tuning the strings; the neck, which connects the scroll with the body, and to which is attached the finger-board, upon which the strings are

stopped by the fingers of the left hand as it holds the neck in playing; the belly, over which the strings are stretched, and which has two f-shaped sound holes, one on each side; the back or under side; the sides or ribs, uniting the back and belly; the tail-piece, to which the strings are fastened; and the bridge. The back, neck, and sides are generally of sycamore, the belly of deal, the finger-board and tail-piece of ebony. Almost all the different pieces are fastened together with glue. The four strings of the violin are tuned at intervals of fifths, G, on the upper space of the bass staff, D, A, E, reckoning upward. Every intermediate semitone in its ordinary compass of 3½ octaves may be produced by stopping the strings with the fingers, and the compass may be almost indefinitely extended upward by the harmonics produced by touching the strings lightly. The viola, or tenor violin, has four strings tuned C (in the second space of the bass staff), D, A, G, reckoning upward, and is an octave higher than the violoncello, and a fifth lower than the violin. The violin can, to a limited extent, be made to produce harmony by sounding two or three strings together. The finest violins are by old makers, which cannot be imitated, and the precise cause of their superiority has never been satisfactorily explained. The Cremona violins stand in the first rank, the celebrated makers being the Stradivari (Straduarius), Amati, and Guarneri (Guarnerius); of German makers the most celebrated are Stainer or Steiner and Klotz; Vuillaume of the French, and Forest of the English.

VIOLONCELLO, a powerful and expressive bow instrument of the violin kind, held by the performer between the knees, and filling a place between the violin and double-bass. It has four strings, the two lowest covered with silver wire. It is tuned in fifths, C (on the second ledger-line below the bass staff), G, D, A, reckoning upward, and is an octave lower than the viola or tenor violin. Its ordinary compass from C on the second ledger-line below extends to A on the second space of the treble, but soloists frequently play an octave higher.

VIPER, a name applied to various venomous serpents, characterized by having no teeth in the upper jaw save the two hollow poison-fangs. The common viper or adder is generally of a

Head and tail of common viper.

brownish-yellow color, with zig-zag markings and black triangular spots. Its bite is, as a rule, not fatal, but may induce pain, sickness, and fever. The food consists of frogs, mice, birds, eggs, etc. The viper is viviparous—retaining its eggs within the body till the young are hatched.

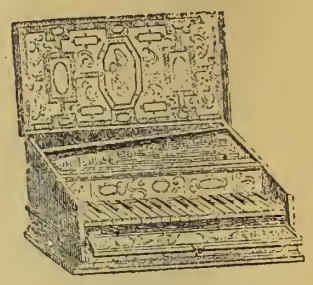
VIRCHOW (fēr'hō), Rudolf, German pathologist and anthropologist, born 1821, studied medicine at Berlin, and early became famous as a lecturer on pathological anatomy at Berlin university. In 1849 he accepted a chair at Würzburg, where he remained seven years, returning to Berlin in the autumn of 1856 as professor in the university and director of the pathological institute attached to it. He has rendered immense service to medical science by his discoveries in regard to inflammation, ulcerations, tuberculosis, and numerous other morbid processes of the human body, and has had great influence on the whole of modern medicine, including hospital reform and sanitary science.

Rudolf Virchow.

From 1862 he was one of Bismarck's most powerful opponents in the Prussian parliament and the Reichstag, and has been a member of important commissions, etc. In 1856 he was elected an honorary member of the Royal Society of Medicine, London. He was one of the founders of the German Anthropological society, and has been an enthusiastic worker in this field, accumulating facts (partly in company with Schliemann) in Asia Minor, the Caucasus, Egypt and Nubia, etc. He has been a voluminous writer, and among his important works are: Cellular Pathology, Handbuch der Speziellen Pathologie und Therapie, Uber den Hungertyphus, Die Aufgabe den Naturwissenschaften in dem neuen nationalen Leben Deutschlands, Die Freiheit der Wissenschaft im Modernen Staat, and many others. He died in September, 1902.

VIRGIL, full name, Publius Virgilius (or Vergilius) Maro, the most distinguished epic, didactic, and pastoral poet of ancient Rome, was born at Andes (probably Pietola), a little village near Mantua, 15th October, 70 B.C. His Eclogues, a series of bucolic or pastoral poems, were written about 41–39 B.C. His Georgics, a poem on agriculture, was completed in B.C. 31. The Æneid, an epic in twelve books on the fortunes of Æneas, was probably begun about B.C. 29. It occupied the author many years, and never received his finishing touches. In B.C. 20 Virgil appears to have engaged on a tour in Greece. But Augustus, having arrived at Athens on his return from the East, Virgil determined to accompany him home. At Megara, however, he fell sick, and he died at Brundusium, B.C. 19.

VIRGINAL, an obsolute keyed musical instrument with one string, jack and quill to each note. It differed from the spinet only in being square instead of triangular, and was the precursor of the harpsichord, now superseded by the pianoforte.



Virginal.

VIRGINIA. See Appius Claudius.

VIRGINIA, one of the original of the United States of North America, bounded by West Virginia, Maryland, the Atlantic, North Carolina, Tennessee, and Kentucky; area, 42,450 sq. miles. It ranks thirty-eight in size among the states. The western portion of the state is traversed from s.s.w. to n.n.e. by the great range of the Alleghanies, with ramifications known by various local names, and intersected by extensive and fertile valleys. The surface of the state may be divided into three sections; the seaboard or tide-water district, the soil of which is of excellent quality, yielding large crops; the district to the

Obverse.

Reverse.

The seal of Virginia.

eastern chain of the Alleghanies, which is less fertile; and the mountain district, which has many rich and fertile valleys. The Valley of Virginia in this district has been called the garden of America. The width of the mountainous district is from 80 to 100 miles. The highest point is White Top, about 6000 feet above sea-level. The sea-board or tide-water district is generally level, not exceeding 60 feet above the tide in its highest parts. Virginia is rich in minerals, including coal, iron, copper, lead, manganese, zinc, gold, gypsum, rock-salt, etc.; the most valuable of those worked being

coal and iron. The chief rivers are the Potomac, the Rappahannock, the York, and the James, which flow into Chesapeake bay. The Roanoke passes into North Carolina. East of the Blue Ridge the climate is mild or temperately warm, with a mean temperature of 37° for January and 77° for July. The rainfall is sufficient throughout the state, and favorably distributed for agriculture. It is greatest in the central portion near Richmond, where the average is 48 inches. The soils of Virginia are in general light and sandy, except in the bottom lands and in the marsh regions, where a deep layer of vegetable mold has accumulated. The forests are still of considerable extent, and consist of yellow pine and cedar, with cypress in the swamps and some oak, hickory, locust, and persimmon. In the western uplands there are large forests of deciduous trees, with white pine on the mountains, and with the general characters of the Appalachian floral region. Virginia ranks close to Massachusetts, New York, New Jersey, and Maryland in the importance of sea fisheries. Oysters constitute two-thirds of the total product. Among other varieties are shad, menhaden, clams, and alewives. The staple products of Virginia are tobacco, Indian corn, wheat, and oats. Cattle and sheep are numerous, and dairy produce is exported. The largest exports are tobacco and flour. Elementary and intermediate education is free to all; advanced instruction is free to a certain number; and the higher instruction of the University of Virginia is free to all male natives over eighteen years of age who possess a certain standard of culture. Among the other institutions are the college of William and Mary, Washington and Lee university, and Richmond college. The chief cities of the state are Richmond (the capital), Norfolk, Petersburg, Lynchburg, Alexandria, and Portsmouth. Virginia was first settled at Jamestown in 1607 and 1609 by chartered London companies. It was made a royal colony in 1624, and continued a loyal royal province till the revolution. Negro slavery was introduced in 1619, and for a considerable period after that date felons or convicts were sent over from England in large numbers, and sold for a term of years for work on the plantations. Virginia has perhaps, the most interesting history of any state in the Union. The first lasting settlement in America was made at Jamestown in 1607 by the English. At this place, also, was held the first representative assembly in America. In the early history of Virginia are found the names of Captain John Smith and Pocahontas. This state took the lead in the protest against the Stamp Act and the encroachments of Great Britain, and in the revolutionary period furnished such noted sons as Washington, Jefferson, Henry, the Lees, and Madison. The surrender of Cornwallis at Yorktown put an end to the war. In the war of 1812, Virginia bore a conspicuous part, as also in that of 1846–47 with Mexico. The civil war was more disastrous in its consequences to Virginia than to any other state of the Union, and on its soil the last battle was fought and the final surrender was made. Seven of the first twenty-one presidents of the United States were natives of Virginia. The popular name is the Old Dominion. From the beginning the state has been democratic in national politics. The hold was never broken until 1860, when the vote was cast for the Constitutional Union candidate, John Bell. Since its re-admission the vote has been steadily cast for the democratic national candidates, with the exception of 1872, when the republican candidate, Grant, was preferred to his opponent, Greeley, an old abolitionist. Pop. 2,100,000.

VIRGINIA, University of, an undenominational institution of higher learning at Charlottesville, Va., four miles from Monticello, the home of Thomas Jefferson, its founder. It was chartered in 1819 and opened in 1825. The courses of instruction are comprised in five departments: academic, engineering, law, medicine, and agriculture, comprising in all 22 schools, of which each affords an independent course under professors who are responsible only to the board of visitors, appointed by the governor. The courses are purely elective. The degrees of bachelor of arts, law, and science, master of arts, doctor of philosophy, medicine, and law, civil, mechanical, mining, and electrical engineer are conferred only upon examination after residence.

VIRGINIA AGRICULTURAL AND MECHANICAL COLLEGE AND POLYTECHNIC INSTITUTE, an institution founded in 1871 on the land grant of 1862. It offers courses in agriculture, horticulture, applied chemistry, general science, civil, mechanical, and electrical engineering, and shorter courses in practical agriculture and practical mechanics. The sciences hold the foremost place in the curriculum, but every course includes a certain element of general culture. The courses are so arranged as to give the student an approximately equal amount of class work and of laboratory, shop, or field practice. The degrees conferred are bachelor and master of science and civil, mechanical, and electrical engineer. Military drill is required of the students.

VIRGINIAN CREEPER, a climbing plant, native to North America, used as an ornamental covering for walls, etc., and sometimes called American Ivy. Its leaves turn a bright red in the autumn.

VIRGINIAN DEER. See Cariacou.

VIRGINIAN QUAIL. See Quail.

VIRGIN ISLANDS, a group of small islands in the West Indies, belonging to Denmark and Britain, and situated east of Porto Rico. The chief exports are sugar, molasses, rum, cotton, and salt. The chief British islands are Tortola, Anegada, and Virgin Gorda; the Danish are St. Thomas, Santa Cruz, St. John, Culebra, Crab Island, etc. The group was discovered by Columbus in 1494.

VIRGIN MARY. See Mary.

VIRGIN'S BOWER. See Clematis.

VIRUS, the term used in medicine to denote a palpable morbid product causative of a contagious disease. The term virus is used of any one of the infective agents which cause respectively typhus fever, relapsing fever, scarlet fever, smallpox or measles. Virus is also used as a synonym of lymph, in speaking of vaccine material. We also speak of the virus of syphilis, glanders, hydrophobia, etc., meaning the morbific fluid which contains the germs of these diseases and is capable of propagating them if inoculated into the human body. In this way a culture of any bacteria may loosely be called a virus. The active principle of a virus has the tendency to reproduce itself after a period of variable length, called the period of incubation, which elapses between the time of exposure and inoculation and the day when symptoms of the disease are first noted. In measles the period of incubation is about ten days, though it may be protracted to thirty days; the virus being carried in blood from an exanthematous patch or the secretion from the eyes or nostrils, and later from the scales that separate from the skin. In smallpox the period of incubation is about twelve days, though it varies from five days to three weeks.

VISCACHA (vis-kā'chā), a rodent animal of South America, allied to the chinchilla, about 2 feet long and stoutly built, with a short tail, inhabiting the pampas of the Argentine Republic, and living in burrows like the prairie-dog of North America.

VISCOUNT (vī'kount), a title of nobility next in rank to that of earl, and immediately above that of baron. It is the most recently established English title, having been first conferred by letters patent on John, Lord Beaumont, by Henry VI. in 1440. The title is frequently attached to an earldom as a second title, and is held by the eldest son during the lifetime of the father.

VISHNU, the second god of the Hindu triad (the others being Brahma and Siva), and by his special worshipers considered to be the greatest. In the early Vedas he appeared as a manifestation of the sun, and he was not regarded as the most exalted deity, this rank being accorded to him by the later writers of the Rāmāyana, the Mahābhārata, and

Vishnu on his man-bird garuda.

more especially of the Purānas. The Brahmanic myths relating to Vishnu are characterized by the idea that whenever a great physical or moral disorder affected the world, Vishnu descended in a small portion of his essence to set it right. Such descents are called avatars, or incarnations, and are generally given as ten, nine of which are already past,

the tenth being yet to come. He is generally represented as having four arms, each hand holding some particular object, and as riding on a being half man and half bird.

VISIBLE SPEECH, a term applied by Prof. A. Melville Bell, its inventor, to a system of alphabetical characters designed to represent every possible articulate utterance of the organs of speech. The system is based on an exhaustive classification of the possible actions of the speech organs, each organ and every mode of action having its appropriate symbol. It is said that this invention is of great utility in the teaching of the deaf and dumb to speak, and in enabling learners of foreign languages to acquire their pronunciation from books.

VISIGOTHS. See Goths.

VISION. See Eye, Optics, Sight.

VIS'TULA (vĭksĕl), a river which rises in the Carpathians, traverses Galicia, Poland, and Prussia, and after a course of about 650 miles empties by several mouths into the Gulf of Danzig. It flows past the towns of Cracow, Warsaw, Dromberg, and Danzig, and is navigable from the first-mentioned place.

VITACEÆ. See Vine.

VITEL'LINE, a substance consisting of casein and albumen, forming the nutritive part of the yolk of birds' eggs.

VITEPSK', or **VITEBSK,** a town in Russia, capital of the government of the same name on the Düna, 315 miles s. of St. Petersburg. Its manufactures are woolen and linen cloth, leather, and mead. Pop. 57,079.—The government has an area of 17,433 sq. miles. The surface is generally flat, and much occupied by woods and morasses. Pop. 1,201,224.

VITRIOL, BLUE. See Copper.

VITRIOL, Green, the same as copperas or sulphate of iron. See Copperas.

VITRIOL, Oil of, the common name for strong sulphuric acid.

VITTORIA. See Vitoria.

VITUS'S DANCE, St., a spasmodic or convulsive disease, allied to rheumatism, and due to an irritable condition of the spinal cord, in which the muscles of the extremities and other parts are thrown into various involuntary motions, and perform in an irregular manner those motions which are dictated by the will. The disease attacks both sexes, but chiefly the female, and is specially a disease of childhood, occurring in those who are of a weak constitution or improperly nourished. It generally appears from the eighth to the fourteenth year. In serious cases the spasmodic movements are violent and incessant, and speech and swallowing are interferred with.

VIVER'RIDÆ, a family of mammals containing the civits and allied tribes.

VIVIPAROUS ANIMALS, animals which bring forth their young alive. See Reproduction.

VIVISECTION, the practice of operating with the knife upon living animals for the purpose of ascertaining some fact in physiology or pathology which cannot be otherwise investigated. It is also practiced in order to illustrate previously known facts, and to enable students to acquire operative dexterity. Though the term vivisection strictly is applicable to cutting operations only, it is generally employed for all scientific experiments performed on living animals, whether they consist of cutting operations, the compression of parts by ligatures, the administration of poisons, the inoculation of disease, the subjection to special conditions of food, temperature, or respiration, or to the action of drugs and medicines.

VIZIER, a title given to high political officers in the Turkish empire and other Mohammedan states. In Turkey the title is given to the heads of the various ministerial departments into which the divan or ministerial council is divided. The president of the divan or prime minister is known as grand vizier.

VLADIMIR (vlåd-ē'mēr), one of the oldest towns in Russia, capital of a government of the same name, 105 miles n.e. of Moscow. It has a cathedral, a theological seminary, considerable manufactures, and a trade in fruit. During the 13th century it rivaled Moscow in importance, but began to decay in the following century. Pop. 16,422.—The government has an area of 18,794 sq. miles, and a population of 1,339,327.

VLADIVOSTOCK, a Russian seaport in Eastern Siberia, Sea of Japan, a terminus of the great Siberian railway. It was founded in 1861, and is a station of the Russian Pacific fleet. Vast sums have been spent on wharves, ship-yards, and arsenals, but the trade is small. Pop. 29,000.

VOCAL CORDS OR CHORDS. See Voice and Larynx.

VOICE, the name given to the result of the production of sound in nearly all the higher vertebrate animals. "Speech" (which see) is a modification of "voice." In man the voice is produced by the inferior laryngeal ligaments or true vocal cords (see Larynx) as they are termed. The vocal cords consist of two elastic folds of mucous membrane, so attached to the cartilages of the larynx and to muscles, that they may be stretched or relaxed and otherwise altered so as to modify the sounds produced by their vibration. The higher the note produced the greater is the tension of the cords; and the range of voice therefore depends upon the amount of tension which the cords can undergo. Regarding the compass and application of the voice in speaking and singing physiologists have noted three kinds of sequence. In ordinary speaking a monotonous sequence is observed, the notes having nearly all the same pitch, and the variety of the sounds being due rather to articulation in the mouth than to definite movements of the glottis and vocal cords. A passage from high to low notes, without intervals, forms the second kind of sequence; or the same sequence is observed in the passage from low to high notes. Such a sequence is exemplified in crying and howling both in man and in lower animals. The true musical sequence forms the third, in which the successive sounds have vibrations corresponding in relative proportions to the notes of the musical scale. The male voice admits of division into tenor and bass, and the female into soprano and contralto. The lowest female note is an octave or so higher than the lowest note of the male voice, and the female's highest note is about an octave above that of the male. The compass of both voices taken together is about four octaves, the chief difference residing in the pitch and also in the quality or timbre. The difference of pitch between the male and female voice is due to the length of the vocal cords, while the difference in timbre appears to result from differences in the nature and extent of the walls and cavity of the larynx, throat, and mouth. Chest notes differ from falsetto notes in that the former are natural notes produced by the natural voice, while the latter are produced by a stopping action on the cords. Finally it may be noted that the actual strength of the voice depends on the degree of vibration of the vocal cords, and also in a minor degree on the resonance of the larynx, lungs, and chest generally.

VOLAPUK (vō'la-pük), the name given to a universal language invented by Johann Martin Schleyer, of Constance, after twenty years labor. The name means "world-speech," being based on English world and speak, and a number of the vocables are modified English words. In structure the language is simple and extremely regular, and the orthography is entirely phonetic, the words being pronounced as they are written, and vice versa. The study of Volapük has made some progress; there are a number of periodicals written in it, and many associations devoted to its dissemination.

VOLATILE OILS. See Oils.

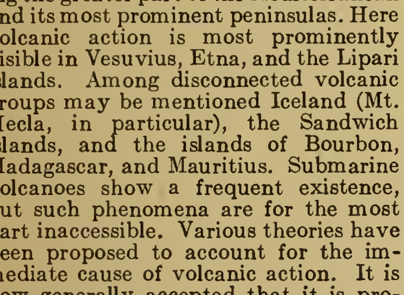
VOLCANOES, in a popular sense, conical hills or mountains composed of material (volcanic ashes and lava) brought up by igneous forces from the interior of the earth through a pipe or vent. At the top there is a cup-shaped hollow called the crater. A volcanic eruption generally commences with the discharge of immense quantities of gases. This is followed by the ejection of ashes and hot fragments of rock. Lastly there is a flood of molten rock or lava. Volcanoes which show such outbursts more or less frequently are called active volcanoes; those which are known

Section of an active volcano.

to have been active in historic times, but have long been quiescent, are called dormant or sleeping volcanoes; and those which present all the phenomena of volcanoes, but which have shown no activity in historic times, are called extinct or dead volcanoes. The mud volcanoes of the Crimea and elsewhere; the fissures from which steam issues; the holes from which sulphurous fumes proceed of Italy, etc.; the geysers and hot springs of Iceland, New Zealand, the Yellowstone park, etc., are signs of

weak or decreasing volcanic activity in the special districts in which they occur. Volcanoes may occur as isolated conical mountains, such as Vesuvius, Etna, or the Peak of Teneriffe. They also form various groups or systems of mountains. One remarkable fact in the distribution of volcanoes is their proximity to the sea, for out of 323 active volcanoes, all, excepting two or three in Central Asia and about the same number in America, are within a short distance of the ocean. An almost uninterrupted line of volcanoes stretches from the 46th degree of s. latitude in Chile to the north of Mexico, including Tunguragua, Cotopaxi, Antisana, Pichincha, Orizaba, Popocatepetl, Jorullo, etc. Another continuous line of volcanic action commences in the north of Alaska, passes through the Aleutian Isles over to Kamtchatka in northeast Asia, then proceeds southward without interruption through a space of between 60° and 70° of latitude to the Moluccas. It includes the Kurile, Japanese, and Philippine islands, traverses Java, Sumatra, Borneo, Celebes, New Guinea, and extends to various parts of the Polynesian archipelago and New Zealand. A volcano in the island of Krakatoa, in the Straits of Sunda, burst into most violent activity on the 26th August, 1883. In the Old World the volcanic region extends from the Caspian sea to the Azores, embracing the greater part of the Mediterranean and its most prominent peninsulas. Here volcanic action is most prominently visible in Vesuvius, Etna, and the Lipari islands. Among disconnected volcanic groups may be mentioned Iceland (Mt. Hecla, in particular), the Sandwich islands, and the islands of Bourbon, Madagascar, and Mauritius. Submarine volcanoes show a frequent existence, but such phenomena are for the most part inaccessible. Various theories have been proposed to account for the immediate cause of volcanic action. It is now generally accepted that it is produced by internal heat at a certain depth beneath the surface of the earth, and the evolution of a great body of elastic vapor, expanding and seeking to escape where the least amount of resistance is presented, and manifesting itself in the explosions that accompany an eruption, or in the upheaval of rocks and the production of earthquakes.

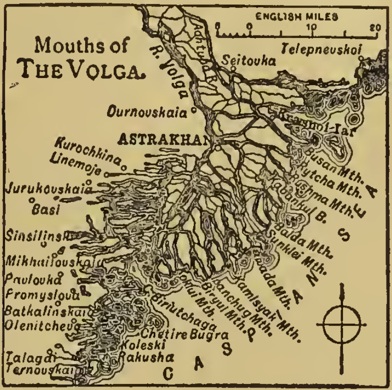
VOLE, a genus of rodents closely allied to the rats and mice, and included in that family. Some are terrestrial,



Common vole.

others aquatic. The common vole of Britain, the meadow-mouse, or short-tailed field-mouse, is injurious to young plantations and pastures, sometimes appearing in immense multitudes. It is reddish-brown above and gray below. The water-vole or water-rat is much larger, and swims well though its feet are not webbed. It is of a pale or chestnut brown, tinted with gray. There are many species of voles in the Old and New World.

VOLGA, a river in Russia, the longest in Europe; rising in a small lake in the east of the Valdai hills, and falling into the Caspian sea by about seventy mouths, near Astrakhan, after a total estimated course of 2400 miles. Its basin is estimated at from 500,000 to 700,000 sq. miles. It flows generally southeast past Tver, Yaroslav, Kostroma, and Nijni-Novgorod to Kasan, thence south



past Simbirsk and Saratov, and proceeds southeast from Sarepta to the Caspian. Its chief tributaries are the Kama on the left bank and the Oka on the right. It is navigable by barges from its source, and communicates with the Black, Baltic, and Polar seas by a series of canals. Its banks are fertile and well-wooded, and its waters abound in fish, particularly sturgeon, carp, and pike of extraordinary size.

VOLHYN'IA, a government in southwest Russia; area, 27,723 sq. miles. The soil is fertile, producing all kinds of grain, particularly wheat; and fine breeds of cattle and horses are reared. The hills in the south are rich in iron. There are also considerable manufactures. The capital is Jitomir. Pop. 2,997,902.

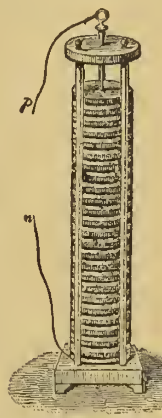
VOLITION. See Will.

VOLOG'DA, a government in northeast Russia; area, 155,033 sq. miles. Its forests furnish quantities of timber and charcoal. Pop. 1,172,253.—The capital is Vologda, on a river of same name, 35 miles e.s.e. of St. Petersburg. Pop. 17,391.

VOLTA, Alessandro, Italian natural philosopher, born at Como in 1745, and died there in 1827. Two treatises, published in 1769 and 1771, in which he gave a description of a new electrical machine, laid the foundation of his fame. He was successively professor of physics at the gymnasium in Como and in the University of Pavia, where he invented the electrophorus and electroscope. He also devised several other electrical appliances, and in 1800 the voltaic pile. In 1782 he made a tour through France, Germany, England, and Holland. In 1801 Napoleon invited him to France, where a medal was struck in his honor. In 1810 he was created a senator of Italy, with the title of count; and in 1815 was made director of the philosophical faculty of Padua.

VOLTAIC ELECTRICITY, galvanic electricity, galvanism. See Galvanic Battery and Galvanism.

VOLTAIC PILE, Volta's arrangement for producing a current of electricity, consisting of a pile of alternate discs of two dissimilar metals, as copper and



Voltaic pile. *p*, Positive. *n*, Negative end.

zinc, zinc and silver, zinc and platinum, separated by pieces of flannel or pasteboard moistened with salt water or with water acidulated with sulphuric acid.

VOLTAIRE, François Marie Arouet de, French writer, born at Paris, November 21, 1694; died there May 30, 1778. In 1718 a tragedy named Œdipe was brought out by him, and was a great success. It is said that this play was finished, and that two cantos of his epic the Henriade were written in the Bastille where he was confined from May, 1717, to April, 1718, for writing certain satirical verses on the regent. In 1726 he was again imprisoned in the Bastille for sending a challenge to the Chevalier Rohan, by whom he had been grossly insulted. He was liberated within a month, and went to England on the invitation of Lord Bolingbroke. Here he resided till 1729 in friendship with the leading deists, and acquired some knowledge of English literature. His Henriade was completed and published by subscription in England. From 1734 to 1749 he resided with the Marchioness de Châtelet at Cirey, in Lorraine. She died in 1749, and Voltaire then accepted the oft repeated invitations of Frederick the Great to come and live at his court at Potsdam. From 1754 he lived in Switzerland, or close to its borders. In 1760 or 1761 he fixed his residence with his niece, Madame Denis, at Ferney, where he received a constant succession of distinguished visitors, and maintained a correspondence which included in its range most of the crowned heads of Europe. In February, 1778, he went to Paris, where he was received with enthusiasm by all classes. But the excitement of the occasion hastened his death. His works embrace almost every branch of literature; poetry, the drama, romance, history, philosophy,

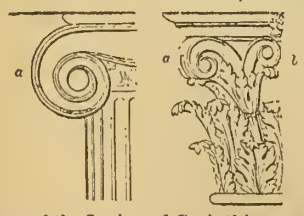
and even science. Hatred of fanaticism and superstition was his chief characteristic, and nearly all his works are strongly animated by a spirit of hostility to the priests and the religion they represented. He upheld theism, however, with as much zeal as he denounced Christianity and priestcraft. Voltaire's literary fame chiefly rests on his philosophical novels: Zadig, Candide, L'Ingénu, etc.; his histories: Siècle de Louis XIV., Histoire de Charles XII.; his correspondence; and more than all, perhaps, on his poetical epistles, satires, and occasional light poems, which all exhibit wit, gaiety, vivacity, and grace.

VOLTAM'ETER, an instrument in which a current of electricity is made to pass through slightly acidulated water, and as the water is thus decomposed, oxygen and hydrogen being liberated, the quantity of electric current passing through in a given time may be ascertained in terms of the quantity of water decomposed.

VOLUNTEERS, citizens who of their own accord offer the state their services in a military capacity without the stipulation of a substantial reward.

VOLUNTEERS OF AMERICA, The, this organization is a philanthropic, social, and religious movement. It was inaugurated in March, 1896, and incorporated November 6, 1896, by Gen. and Mrs. Ballington Booth, in response to a number of requests on the part of American citizens. It is organized in military style, having as its model the United States army, but in conjunction with military discipline and methods of work it possesses a thoroughly democratic form of government, having a constitution and its by-laws being framed by a grand field council that meets annually and is thoroughly representative. The volunteers have representatives and branches of their benevolent work in almost all the principal cities of the United States. Its field is divided into regiments or sections, which come under the control and oversight of thirty principal staff officers, its chief centers being New York, Philadelphia, Boston, Pittsburgh, Denver, Chicago, and San Francisco. In addition to the Volunteer reading rooms, thousands of copies of Christian literature are circulated in state prisons, jails, hospitals, soldiers' homes, and children's homes. In connection with the Volunteers, there are also sewing classes; hospital nurses; temporary financial relief departments; boys' fresh-air camps; Thanksgiving and Christmas dinners, and many other worthy undertakings.

VOLUTE', in architecture, a kind of spiral scroll used in the Ionic, Corinthian



Volutes of the Ionic and Corinthian capitals.
a a, Volutes. *b*, Helix.

and Composite capitals, of which it is a principal ornament. The number of volutes in the Ionic order is four. In the Corinthian and Composite orders they are more numerous, in the former being accompanied with smaller ones, called helices. See Composite Order, Corinthian Order, Ionic Order.

VOMER, in anatomy, one of the bones of the skull, forming in man part of the sepatum or division between the cavities of the nostrils. In fishes it is a feature of importance for classification purposes.

VOOR'HEES, Daniel Wolsey, American politician, was born in Butler co., Ohio, in 1827. He became early interested in politics, and gained a wide reputation as a democratic campaign speaker. He was United States district attorney for Indiana from 1858 to 1861, and was a member of congress from 1861 to 1867 and again from 1869 to 1875. In 1877 he was appointed United States senator to fill the unexpired term of Oliver P. Morton, and was regularly elected in 1879, 1885, and 1891. He died in 1897.

VORARLBERG, a western district of Austria-Hungary, officially included in the Tyrol. Area, 1005 sq. miles; pop. 107,373.

VORONEJ, a town of Russia, capital of the government of the same name, on the Voronej, 290 miles s.s.e. of Moscow. It has manufactures of woolen and linen cloth, soap, and vitriol, tanneries, and a considerable trade. Pop. 84,146. The government has an area of 25,440 sq. miles, and a pop. of 2,546,255. It is intersected by the Don, which receives the whole of the drainage, partly through its tributaries the Voronej and Khoper. The soil is generally fertile, and large crops of grain are raised.

VORTEX, the form produced when any portion of a fluid is set rotating round an axis. Familiar examples are seen in eddies, whirlpools, waterspouts, whirlwinds, and on a larger scale in cyclones and storms generally. Descartes supposed certain vortices to exist in the fluid or ether of space endowed with a rapid rotatory motion about an axis, and filling all space, and by these he accounted for the motions of the universe.

VORTEX RING, in physics, a vortical molecular filament or column returning into itself so as to form a ring composed of a number of small rotating circles placed side by side, like beads on a string, as the singular smoke-rings which are sometimes produced when a cannon is fired, or when a smoker skilfully emits a puff of tobacco smoke. Recent investigations of the motion of vortices have suggested the possibility of founding on them a new form of the atomic theory.

VORTICELLA, or **"BELL-ANIMALCULE,"** a genus of stalked infusoria, having a fixed stem capable of being coiled into a spiral form, and vibratile organs called cilia fringing the bell-shaped disc or head, which are constantly in rapid motion and attract particles of food. The species are very numerous in fresh water, and are generally microscopic.

VOSGES, an eastern frontier department of France; area, 2268 sq. miles. It is bounded on the east by the Vosges mountains, which send out ramifications over the greater part of its surface, while in the south it is traversed by the chain of the Faucilles. Grain, hemp, flax, and potatoes are extensively grown, and the department is famous for its kirsch-wasser. The principal rivers are the Meuse, Mouzon, Madon, Moselle, Saône, and Meurthe; all unnavigable within the department. The minerals are valuable. The manufactures are various. Epinal is the capital. Pop. 413,707.

Vorticellæ.

VOTER, the qualifications required of voters in political elections varies somewhat in the different states. Certain qualifications are required in all states, which may be summarized as follows: (1) Citizenship; (2) residence for a certain time in the state, county, and election district; (3) that the voter shall have attained his majority (21 years); (4) that the voter shall be of sound mind; (5) that he shall not be a convicted felon under sentence. Registration is also required in many states and some have established either property or educational qualifications. A few states permit women to vote.

VOTING MACHINE, a mechanical device which automatically records and counts votes. Besides preventing repeating and other fraud, an ideal voting machine has the additional advantages over the paper ballot system of greater secrecy, simplicity, rapidity, and cheapness. The Standard voting machine is about 4 feet square and 10 inches deep, and is supported by legs. The top is a little over 6 feet from the floor. A semicircular bar projects from the upper corners, on which is hung a curtain which forms a booth. An operating lever extends from the center of the top of the machine, the outer end of which is attached to the curtain. When the voter advances to vote he throws the lever by a dependent handle to the opposite side of the machine, thus carrying the curtain behind him and inclosing himself in a booth. The voter first selects his party ticket, and by pulling the straight ticket knob over the party emblem down to the right, moves all the pointers for that ticket. If he desires to split his ticket, he can move the pointer back from over the name that does not suit him, and in the same office line move the pointer over the name he wishes to vote for. He now registers his vote by throwing the curtain open by means of the operating lever with which he closed it, thus casting and counting his vote in perfect secrecy.

VOWEL, a simple articulated sound, which is produced merely by voice proceeding from the larynx, modified by a greater or less elevation or depression,

expansion or contraction of the tongue, and contraction or expansion of the lips. The vowel sounds of the English alphabet are imperfectly represented by five letters, a, e, i, o, u (and sometimes w and y). Vowels are distinguished from consonants in that they result from an open position of the vocal organs, while consonants are the result of an opening or shutting action of the organs; thus the former can be pronounced by themselves, while consonants require to be sounded with the aid of a vowel.

VULCAN, in Roman mythology, the god who presided over fire and the working of metals, and patronized handicraftsmen of every kind. By some

Vulcan, from an antique.

writers he is said to have been born lame, but by others his lameness is attributed to his having been thrown from Olympus. He was completely identified with the Greek Hephæstus.

VUL'CANITE, a kind of vulcanized caoutchouc, differing from ordinary vulcanized caoutchouc in containing a larger proportion of sulphur—from 30 to 60 per cent—and in being made at a higher temperature. It is of a brownish-black color, is hard and tough, cuts easily, and takes a good polish, on which account it is largely used for making into combs, brooches, bracelets, and many other ornaments. As it is especially distinguished by the large quantity of electricity which it evolves when rubbed, it is much used in the construction of electric machines. See Vulcanization.

VULCANIZATION, a method of treating caoutchouc or india-rubber with sulphur to effect certain changes in its properties, and yield a soft (vulcanized india-rubber) or a hard (vulcanite) product. Other ingredients, as litharge, white-lead, whiting, etc., are added to the sulphur to give color, softness, etc. The substance thus formed possesses the following properties: it remains elastic at all temperatures; it cannot be dissolved by the ordinary solvents, neither is it affected by heat within a considerable range of temperature; finally, it acquires extraordinary powers of resisting compression, with a great increase of strength and elasticity. See Vulcanite and India-rubber.

VULGAR FRACTIONS. See Fractions.

VULGATE, the Latin translation of the Bible, which has, in the Roman Catholic church, official authority, and which the Council of Trent, in their fourth session, in May 27, 1546, declared "shall be held as authentic in all public lectures, disputations, sermons, and expositions; and that no one shall presume to reject it, under any pretense whatsoever." In the early period of the church a Latin translation of the Scriptures existed, called Itala, the Old Testament made after the Septaugint. This translation was far from accurate, and about 383 St. Jerome produced a revised version of the New Testament, while between 385–405 A.D. he made a new translation of the Old Testament from the Hebrew. These translations were combined to form the Vulgate (versio vulgāta, common or usual version). The text of the Vulgate now in use is that published by Clement VIII. in 1592 (as improved in 1593 and again in 1598).

VULTURE, the common name for the raptorial birds belonging to the family Vulturidæ, characterized by having the head and part of the neck destitute of feathers, and a rather elongated beak, of which the upper mandible is curved at the end. The strength of their talons does not correspond with their size, and they make more use of their beak than of their claws. In general they are of a cowardly nature, living chiefly on dead carcasses and offal. Unlike other birds of prey the female is smaller than the male. Their geographical distribution is confined chiefly to warm countries, where they act as scavengers to purify the earth from the putrid carcasses with which it would otherwise be

Egyptian vulture.

encumbered. The griffon vulture inhabits the mountainous parts of the south of Europe, as does also the cinereous or brown vulture. The former measures nearly 4 feet from tip of beak to end of tail. The bearded vulture inhabits the Alps, Asia, and Africa. The Egyptian vulture visits south Europe. The American vultures differ from those of the Old World technically rather than in appearance or habits. They include the huge condor, king, and California vultures, and several other species, among them the smaller carrion-crow of the tropics, and the more familiar turkey-buzzard. This bird is about 30 inches in length, with an alar spread of about 75 inches; in color dingy brown; the tail is long, the wing is bent at a salient angle, and the tips of the longest quills spread apart and bend upward. No birds are better flyers or more expert and enduring in soaring. The eggs are one or two in number, roundish, about 2¾ inches in longest diameter, and yellowish white blotched with brown and purplish tints.

W

W, the twenty-third letter of the English alphabet, representing a consonantal sound formed by opening the mouth with a contraction of the lips, such as is performed in the rapid passage from the vowel sound u (oo) to that of i (ee). The character is formed, as its name indicates, by doubling the u or v. At the end of words or syllables it is either silent, as in low, or it modifies the preceding vowel, as in new, how, having then the power of a vowel.

WABASH (wa'bash), a river of the United States, which rises in the n.w. of Ohio, winds across Indiana, forms the boundary between Indiana and Illinois, and falls into the Ohio after a course of 550 miles. It is navigable for steamboats to Lafayette, and connects Lake Erie with the Ohio by the Wabash and Erie canal.

WACO, a town in M'Lennan co., Texas. It is situated on the Brazos river; and as the center of a large and fertile ranching and wheat growing district, it commands a large and increasing trade in cattle, wheat, and other agricultural products. Pop. 22,866.

WADA'I, or **WADAY',** an extensive and powerful negro state in the Central Soudan, between Kanem and Bagirmi in the w. and Darfur in the e., with a population estimated at about 5,000,000. It consists principally of an elevated plateau, very fertile in some parts, producing abundantly corn, millet, indigo, cotton, etc. Ivory and slaves are also largely dealt in. The inhabitants are warlike, and their sultan exercises tributary rights over several neighboring settlements.

WADE, Benjamin Franklin, American political leader, was born near West Springfield, Mass., in 1800. He removed to Ohio in 1821. He was elected prosecuting attorney of Ashtabula county in 1835, and state senator in 1837 and 1841; and was chosen presiding judge of the third judicial district of the state in 1847. From 1851 until 1869 he was a member of the United States senate. He was elected president of the senate in 1867, and was sent in 1871 as one of the commission to Santo Domingo to report in regard to its annexation to the United States. He died in 1878.

WAFER, a thin circular cake of unleavened bread, generally stamped with the Christian monogram, the cross, or other sacred symbol, used in the Roman church in the administration of the Eucharist.—Also a small disc of dried paste usually made of flour and water,

gum, and coloring matter, used for sealing letters, etc.

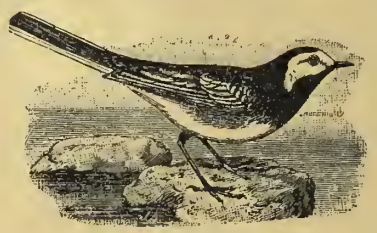
WAGNER (väh'nĕr), Wilhelm Richard, one of the most celebrated of modern composers, born at Leipzig 1813, died at Venice 1883. He received his education at Leipzig and Dresden. From 1834 he filled various musical engagements at Madgeburg, Riga, and Königsberg. In 1839–41 he went to Paris and London, and composed his operas Rienzi and the Flying Dutchman. The brilliant success of these operas secured him the conductorship at the Royal Opera of Dresden in 1843. He joined the insurrectionary movement of 1848–49, and was compelled to exile himself. Until his return to Germany in 1864 he spent most of his time in Switzerland, Italy, Paris, and London. His Tannhäuser and Lohengrin appeared in 1845 and 1850 respectively. The late King of

Wilhelm Richard Wagner.

Bavaria, Louis II., became an enthusiastic and liberal patron of Wagner, and the theater at Baireuth, especially built for Wagner, was chiefly supported from the king's purse. Here his famous tetralogy Der Ring des Nibelungen, consisting of Das Rheingold, Die Walküre, Siegfried, and Götterdämmerung, was first performed in 1876 before an unusually brilliant and appreciative audience. About a year before his death he produced his last creation, Parsifal. In 1870 he had married, as second wife, Cosima von Bülow, a daughter of the Abbé Liszt Wagner labored to reform dramatic music according to the ideas of Gluck and Weber, and gave his creations a national character by selecting his subjects from old German heroic legends. His theory (not in itself specially original) was that in a perfect musical drama the three arts, poetry, music, and dramatic representation should be welded together into one well-balanced whole. This theory he demonstrated with consummate ability and unsurpassed magnificence. His particular views on music are embodied in a well-known work entitled Oper und Drama.

WAGTAIL, a name of birds included in the family of the warblers, and so termed from their habit of jerking their long tails when running or perching. They inhabit meadow-lands and pastures, frequent water-pools and streams, are agile runners, and have a rapid flight. The food consists of insects. Their nests, built on the ground, contain from four to six eggs. These birds belong to both Old and New Worlds, and migrate southward in winter.

WAINWRIGHT, Richard, American naval officer, was born in Washington, D. C., in 1849, became a lieutenant in 1873, commanded the coast-survey vessel Arago for a time, and was promoted to the rank of lieutenant-commander in 1894. He was executive officer of the battleship Maine, when that vessel was destroyed in Havana harbor. In the Spanish-American war he commanded the converted yacht Gloucester, taking a distinguished part in the naval battle of Santiago. In March, 1899, he was promoted to the rank of commander, and in March, 1900, became superintendent of the United States Naval academy.



Quaketail, or pied wagtail.

WAITE, Morrison Remick, American jurist, was born at Lyme, Conn., in 1816. In 1849 he was elected to the Ohio legislature as a Whig. In 1871 he was appointed with Caleb Cushing and William M. Evarts to represent the United States before the tribunal for the arbitration of the Alabama and other claims at Geneva, Switzerland. In 1873 he was president of the Ohio Constitutional convention. In January, 1874, he was appointed by President Grant chief justice of the United States. This position he held until his death in 1888.

WAKE, a term corresponding originally to vigil, and applied to a festival held on the anniversary of the day on which the parish church was consecrated and dedicated to a saint. A lyke or lich wake (Anglo-Saxon, lîc, a corpse) is the watching of a dead body by night by the relatives and friends of the deceased. The practice, once general, is now confined to the lower Irish classes, and frequently accompanied by scenes much out of keeping with the sad occasion.

WALDECK AND PYRMONT, a small principality of west Germany, under Prussian administration, consisting of the two separate territories of Waldeck and Pyrmont; total area, 466 sq. miles; pop. 56,575.

WALDECK-ROUSSEAU (vål'dek' rōō'sō'), Pierre Marie Ernest, French statesman, born at Nantes in 1846. In 1879 he was elected deputy for Rennes; was minister of the interior in Gambetta's grand ministère of 1881, and in the cabinet of Jules Ferry of 1883–85. In 1894 he was elected to the senate for the department of the Loire, and in the following January he was supported by the right for the presidency of France against MM. Faure and Brisson. In the general election of 1902 he won a great victory for republican principles. Feeling his task completed, he resigned in June, 1902, with the prestige of having held office longer than other premier since the establishment of the third republic.

WALES, a principality in the southwest of the island of Great Britain, which since Edward I. gives the title of Prince of Wales to the heir-apparent of the British crown; area, 7363 sq. miles; pop. 1,720,609. It is rich in minerals, particularly coal, iron, copper, and even gold, and to these Wales owes its chief wealth. The coal trade is most extensive, and Cardiff is the largest coal port in the world. Iron, steel, and copper works are also on a large scale. Besides the mineral industries, there are considerable woolen manufactures, especially of flannel, coarse cloth, and hosiery. The inhabitants are almost purely Celtic in race, being the descendants of the early Britons, who were able to maintain themselves here when the rest of the country was overrun by the Germanic invaders.

WALHALLA, a magnificent Doric temple, on the Danube, near Ratisbon; built between 1830–42, as a national pantheon, consecrated to celebrated Germans of all walks of life. The idea of the erection is derived from the Walhalla, or Valhalla, the ancient paradise of Odin and the Scandinavian deities. See Valhalla.

WALKER, Robert James, American political leader, was born at Northumberland, Pa., in 1801. In 1826 he removed to Mississippi and in 1835 was elected United States senator as a democrat, and at once became known as one of the foremost anti-slavery advocates in his party. From 1845 to 1849 he was secretary of the treasury. The tariff bill of 1846 was adopted almost as it came from his hands. In 1853 he declined the post of commissioner to China, and in 1857, against his will, was appointed governor of Kansas territory. He died in 1869.

WALLABY, a name common to several rather small-sized kangaroos.

WALLACE, Alfred Russell, naturalist, born at Usk, Monmouthshire, in 1823. He spent many years in traveling, especially in South America and the Asiatic islands, and the valuable material collected in these scientific explorations he embodied in Travels on the Amazon and Rio Negro, The Malay Archipelago, Tropical Nature, The Geographical Distribution of Animals, etc. His observation of animal life early led him on to the track of natural selection, and before Darwin gave his famous work to the world he had published his Speculations on the Origin of Species. His share in establishing the theory has been acknowledged by Darwin. Dut while Darwin, in his later editions of the Origin of Species, somewhat modified his original conclusions, Wallace, in his recent work, Darwinism, an Exposition of the Theory of Natural Selection, with some of its Applications (1889), strongly insists upon the complete controlling power of these primary laws and conditions. He is a member of various scientific bodies, and the Royal Society of London awarded him the royal medal in 1868, and the Geographical Society of Paris the gold medal in 1870.

WALLACE, Lewis, American soldier and novelist, known as Lew Wallace, was born in Brookville, Ind., in 1827. He served in the Mexican war, and then

practiced law until the civil war. He served as colonel of a regiment of Indiana volunteers in West Virginia in

Lew Wallace

1861, and on September 3, 1861, was promoted to the rank of brigadier-general of volunteers. He was governor of New Mexico (1878–81) and United States minister to Turkey (1881–85). Among his novels are: The Fair God and The Prince of India. Ben Hur, a story of Palestine and Rome in the time of Christ, achieved an unprecedented success and was dramatized (1900) Wallace was also the author of The Boyhood of Christ. He died in 1905.

WALLACE, Sir William, the hero of Scottish independence, was probably born about 1270. For the most detailed particulars we possess about this famous Scottish character we are almost entirely dependent on Blind Harry (Harry the Minstrel); but the narratives cannot bear the scrutiny of the critical historian. Wallace is described as a man of herculean proportions and strength, and it is certain that he possessed in a high degree the qualifications of a commander. The turning-point in his career took place by the slaughter of Haselrig in revenge for the murder of his wife, and in pursuance of his vow of eternal vengeance against the invaders of his country. Henceforth he continued in open resistance to the English, and having collected a considerable force was besieging the castle of Dundee when he heard that Surrey and Cressingham were advancing upon Stirling with a large army. He met them in the vicinity of that town, and, thanks to his ingenious military tactics, gained a complete victory (1297). After this Wallace appears with the title of Guardian of the Kingdom, which was temporarily cleared of the English, and is found conducting a series of organized raids into England. In 1298 Edward I. entered Scotland with an army estimated at nearly 90,000 men. Wallace retired before him, wasting the country, but was at length overtaken at Falkirk, compelled to fight, and after a gallant resistance his army was routed. Wallace was conveyed to London, and after a mock trial found guilty of treason and rebellion, and executed on the 23d August, 1305.

WALLACE, William Vincent, musical composer, was born of Scotch parents, at Waterford 1814, died in France 1865. In 1845 he went to London, and devoted himself to composition. His first opera, Maritana, was produced at Drury Lane, 1846, and secured him at once a reputation.

WALLENSTEIN (vål'en-stīn), Albrecht Wenzel Eusebius, von, Duke of Friedland, a famous leader in the Thirty Years' war, was born on the paternal estate of Hermanic in Bohemia 1583, assassinated at Eger 1634. When the Thirty Years' war broke out in Bohemia (1618) he joined the imperial forces against his native country. His estates, valued at 30 million florins, he was allowed to form into the territory of Friedland, and in 1624 he was created Duke of Friedland. He raised a large army to assist the emperor against the Lower Saxon League; he defeated Count Mansfield at Dessau (April, 1626), and compelled Bethlen Gabor to conclude a truce; he conquered Silesia, and bought from the emperor, partly with military services, partly with plunder, the duchy of Sagan, and other extensive estates. He encountered the King of Sweden at Lützen, 16th November, 1632, and was defeated and Gustavus killed. Wallenstein had unsuccessfully treated on his own account with the Swedish king, and he now secretly reopened negotiations with France and the German princes, occasionally taking the field to display his military power. The court at Vienna was well aware of his crafty diplomacy, but the emperor was not strong enough to remove him, and he had recourse to assassination. This was accomplished for him at Eger, where Wallenstein had retreated for safety, by Colonel Gordon, commandant of the fortress, and his fellow officers Butler, Leslie, and Devereux. Wallenstein is the subject, and gives the title to one of Schiller's best dramatic poems.

WALLA WALLA, the capital of Walla Walla co., Wash.; on the Walla Walla river, and the Wash. and Col. River and the Oregon Railway and Nav. Co.'s railways; 75 miles w.s.w. of Lewiston, Id., and 160 miles e. by n. of The Dalles, Ore. It is in an agricultural, fruit-growing, and stock-raising region, and is the trade center of that part of the state of northern Idaho, and of northeastern Oregon. Among the public buildings are those comprising the United States military post, Port Walla Walla, the state penitentiary, and the United States penitentiary. Pop. 12,119.

WALLFLOWER. They are biennal or perennial herbs or undershrubs. Many of them exhale a delicious odor, and are great favorites in gardens. The best known is the common wallflower, which, in its wild state, grows on old walls and stony places. In the cultivated plant the flowers are of more varied and brilliant colors, and attain a much larger size than in the wild plant, the flowers of which are always yellow. A number of distinct varieties have been recorded, and double and semi-double varieties are common in gardens.

WALNUT, the common name of trees and their fruit of the genus Juglans, natural order Juglandaceæ. The best known species, the common walnut-tree, is a native of several Eastern countries. It is a large handsome tree with strong spreading branches. The timber of the walnut is of great value, is very durable, takes a fine polish, and is a beautiful furniture wood. It is also employed for turning and fancy articles, and especially for gun-stocks, being light and at the same time hard and fine grained. The ripe fruit is one of the best of nuts, and forms a favorite item of desert. They yield by expression a

Walnut.

bland fixed oil, which, under the names of walnut-oil and nut-oil, is much used by painters, and in the countries in which it is produced is a common article of diet. In copper-plate printing it is employed to produce a fine impression, either in black or colors. By boiling the husks when beginning to decay, and the bark of the roots, a substantial dark-brown color is obtained, which is used by dyers for woolens, and also by cabinet-makers to stain other species of wood in imitation of walnut. The fruit, in a green state, before the shell hardens, is much used for pickling. The black walnut is found in most parts of the United States of America, and in favorable situations the trunk often attains the diameter of 6 and 7 feet. It yields a wood preferable to the European walnut, but the nuts are inferior. The butternut is another noteworthy variety.

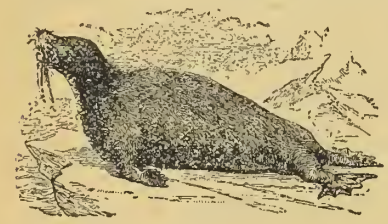
WALPOLE, Sir Robert, Earl of Orford, a great whig statesman, was born in 1676, and died in 1745. In 1702 he was elected for King's Lynn, became an active member of the Whig party, and soon distinguished himself by his business capacity, and by his easy, plausible, and dispassionate debates. He was secretary of war and leader in the commons in 1708, paymaster of the forces in 1714 and 1720, and first lord of the treasury and chancellor of the exchequer in 1715, and again in 1721. From the latter date until 1742 he held without interruption the highest office in the state. During his long administration the Hanoverian succession, to which he was zealously attached, became firmly established, a result to which his prudence and political sagacity

largely contributed. He promoted by an enlightened policy the commercial prosperity of the nation, and relieved

Sir Robert Walpole.

the weight of taxation by many improvements in the tariff. In 1724 he was made a Knight of the Bath, in 1726 a Knight of the Garter, and on 9th February, 1742, two days before his resignation, he was created Earl of Orford.

WALRUS, a marine carnivorous mammal, belonging, with its allies the seals, to the pinnigrade section of the order Carnivora. The walrus, which is also known as the morse, sea-horse, and sea-cow, has a general resemblance to the seals, but is especially remarkable from the upper canine teeth being enormously developed in the adults, constituting two large pointed tusks directed downward and slightly outward, and measuring usually 12 to 15 inches in width,



Walrus.

sometimes even 2 feet and more. There are no external ears. The animal exceeds the largest ox in size, attaining a length of 20 feet. It is monogamous, and seldom produces more than one young at a birth; gregarious but shy, and very fierce when attacked. It inhabits the high northern latitudes, where it is hunted by whalers for its blubber, which yields excellent oil; for its skin, which is made into a durable leather; and for its tusks. Their favorite food consists of crustaceans.

WALSALL', a parl., county, and municipal borough of England, in the county of Stafford, 8 miles n.n.w. of Birmingham. Pop. 86,440.

WALTHAM, a town in Massachusetts, 9 miles west of Boston. The Charles river supplies abundant waterpower to its factories of watches, watch-tools, and cottons. Pop. 27,576.

WALTHAMSTOW, a town and parl. div. of Essex, on the n.e. of London. Pop. of town, 95,125.

WALTON, Izaak, the author of the famous Complete Angler, was born at Stafford 1593, died at Winchester 1683. His first edition of the Complete Angler appeared in 1653. It is to his exquisite delineations of rural scenery, his genuine love for the Creator and his works, the ease and unaffected humor of the dialogue, and the delightful simplicity and purity of his style, that the Complete Angler owes its charm.

WALTZ, a dance of Bohemian origin, executed with a rapid wheeling motion, the gentleman having his arm round his partner's waist. The music is written in triple time in crotchets or quavers, and consists of eight or sixteen bar phrases. Several of these phrases are now usually united to prevent monotony. The valse à deux temps is a form of waltz in which two steps are made to each bar of three beats. Classical waltzes are compositions in waltz form not intended for dance tunes.

WANDERING JEW. See Jew, The Wandering.

WANDEROO, a monkey inhabiting Ceylon and the East Indies. The length is about 3 feet to the tip of the tail, which is tufted, and much resembles that of the lion; the color of the fur is

Wanderoo.

deep-black; the callosities on the hinder quarters are bright pink; a well-developed mass of black hair covers the head, and a great grayish beard rolls down the face and round the chin.

WAP'ITI, a species of deer, the North American stag, which more nearly re-

Wapiti, or American elk.

sembles the European red-deer in color, shape, and form than it does any other of the cervine race, though it is larger and of a stronger make, its antlers also being larger. It is found in Canada and the northern parts of the United States from the Atlantic to the Pacific. Its flesh is not much prized, being coarse and dry, but its hide is made into excellent leather.

WAR, a contest between nations or states (international war), or between parties in the same state (civil war), carried on by force of arms, usually arising in the first case from disputes about territorial possessions and frontiers, unjust dealings with the subjects of one state by another, questions of race and sentiment, jealousy or military prestige, or mere lust of conquest, rarely nowadays from the whim of a despot; in the second case, from the claims of rival contenders for supreme power in the state, or for the establishment of some important point connected with civil or religious liberty. In all cases the aim of each contending party is to overthrow or weaken the enemy by the defeat or dispersion of his army or navy, the occupation of important parts of his country, such as the capital or principal administrative and commercial centers, or the ruin of his commerce, thus cutting off his sources of recuperation in men, money, and material. International or public war is always understood to be authorized by the monarch or sovereign power of the nations; when it is carried into the territories of a hitherto friendly power it is called an aggressive or offensive war, and when carried on to resist such aggression it is called defensive. Previous to the outbreak of hostilities between states, the power taking the initiatory step issues a declaration of war, which now usually takes the form of an explanatory manifesto addressed to neutral governments. During the progress of the struggle certain laws, usages, or rights of war have come to be generally recognized; such laws permitting the destruction or capture of armed enemies, the destruction of property likely to be serviceable to them, the stoppage of all their channels of traffic, and the appropriation of everything in an enemy's country necessary for the support and subsistence of the invading army. On the other hand though an enemy may be starved into surrender, wounding, except in battle, mutilation, and all cruel and wanton devastation, are contrary to the usages of war, as are also bombarding an unprotected town, the use of poison in any way, and torture to extort information from an enemy; and generally the tendency in all laws and usages of war is becoming gradually more favorable to the cause of humanity at large. See also International Law.

WAR, Department of, an executive department of the United States government, created by act of congress of August 7, 1789. It has at its head a secretary appointed by the president. He ranks third among the cabinet members in the line of succession to the presidency and receives a salary of $12,000 per year. He has charge of all matters relating to military affairs, subject to the direction of the president, the distribution of stores, the signal

service, the survey and improvement of harbors, and the administration of the insular possessions. The business of the war department is distributed among a number of subdivisions or bureaus, each of which is under the supervision of a chief and under the general supervision of the chief of staff.

WARBLERS, the name applied to a family of dentirostral insessorial birds, generally small, sprightly, very shy, and

Yellow warbler or summer yellow-bird, male.

remarkable for the clearness, sweetness, and flexibility of their song. Insects form their food, and most of them are migratory.

WAR COLLEGE, United StatesArmy, an organization having for its object the direction and coördination of the instruction in the various service schools, the extension of the opportunities for investigation and study in the army and militia of the United States, and the collection and dissemination of military information. The college, which is located at Washington, is under the immediate direction of the secretary of war and the general staff of the army. The Naval War college is located at Newport, R. I. See Naval Schools of Instruction.

WARD, Artemus. See Browne, C. F.

WARD, Elizabeth Stuart. (Phelps), American author, was born in Andover, Mass., in 1844. Among her works the most popular are: The Gates Ajar, Beyond the Gates, The Gates Between, and Within the Gates.

WARD, Frederick Townsend, American military adventurer, was born at Salem, Mass., in 1831. He became a sailor, fought with the French in the Crimea, and was with Walker in Nicaragua, and went to China during the Taiping rebellion. Ward offered his services to the Chinese authorities, and for a reward of $200,000 recaptured Sungkiang and garrisoned it. He began drilling natives with foreign adventurers as officers, increased his following to nearly 4000, the nucleus of the force later known under Gordon as "the ever-victorious army." This force was of great assistance to the British and French admirals in protecting Shanghai, and maintaining a neutral belt of 30 miles around the city. During a skirmish near Ningpo Ward was killed; he was buried at Sungkiang, where a shrine was erected to his memory in 1875.

WARD, John Quincy Adams, American sculptor, was born at Urbana, Champaign co., Ohio, in 1830. In 1857-59 he resided in Washington, D. C., where he executed the busts of Alexander Stephens, Joshua R. Giddings, John P Hale, Hannibal Hamlin, and others. Among his memorial statues are the colossal George Washington on the steps of the treasury building, New York, General Thomas in Washington, Israel Putnam, Hartford, Conn., and the Beecher monument, city hall, Brooklyn. He was one of the founders and the first president of the National Sculpture society. He was also prominent in the affairs of the National Academy of Design, of which he was president in 1874.

WARD, Lester Frank, American geologist and paleontologist, well known as a sociologist and philosophical writer, was born at Joliet, Ill., in 1841. In 1883 he published Dynamic Sociology. As a contribution to sociology it was recognized as a powerful and original work. His other works are: The Psychic Factors of Civilization, Outlines of Sociology and Pure Sociology. In 1903 he was president of the Institut Internationale de Sociologie of Paris. Among his contributions to geology and paleontology are: The Flora of Washington, Sketch of Paleontological Botany, Synopsis of the Flora of the Laramie Group, Types of the Laramie Flora, and Geographical Distribution of Fossil Plants.

WARD, Mrs. Mary Augusta, novelist, granddaughter of Dr. Arnold of Rugby, born 1851, married 1872 Thomas Humphry Ward. Her chief works are Robert Elsmere (1888), a novel of religious doubts and perplexities; The History of David Grieve, Marcella, Sir George Tressady, Eleanor, Lady Rose's Daughter, etc.

WARM-BLOODED ANIMALS. See Animal.

WARMING AND VENTILATION. The condition of the atmosphere of our houses and apartments is of such importance to health and vigor of mind that warming and ventilation, two closely allied subjects, are receiving more and more attention as sanitary science advances. Their neglect has been the cause, and is still responsible, for an incalculable amount of human disease and suffering. The body, to remain in health, requires a certain degree of heat; so that, if the surrounding atmosphere is too low in temperature, artificial means must be employed to raise it. The temperature which is found the most agreeable for the air of apartments, in which the occupants are not engaged in bodily exercise, is from 63° to 65° F. The charcoal brazier is a very ancient method of warming an apartment. The Greeks and other nations commonly used it, and they sought to correct the deleterious nature of the fumes by burning costly odorous gums, spices, and woods; but the carbonic acid given off by the combustion of charcoal is very injurious to health. The ordinary open coal-fire is, if not the most economical, at least the most agreeable means of heating apartments, but the waste of heat is very considerable. This waste early led to the introduction of closed stoves, first in earthenware and then in metal. These closed stoves, of which there are innumerable varieties in form and construction are particularly favored in America and the European continent. For public buildings, warehouses, conservatories, etc., the most extensively employed system of heating is that of large hot-water pipes. The circulation of water is brought about on the principle of the expansion of water by heat, and its greater lightness in consequence. Whatever be the height of the water above, the water when heated in the lower part of a boiler will rise to the surface, making room for other and colder particles to be heated in their turn; hence if a pipe full of water rise from the top of a boiler to any required height, and then return by gentle bends to the boiler at the lower part, heated water will rise and occupy the upright pipe, and the colder water will descend into the boiler to take its place. Thus a continuous circulation may be maintained through pipes in a building, the heated water rising up, passing on, and returning cooled to the lower part of the boiler, causing a satisfactory temperature to be everywhere felt. The greater the elevation to which the heated water ascends, and the higher the initial temperature of the water, the greater is the motive power for circulation. There are also several systems of heating by passing steam or hot air through pipes. Ventilation is the means of renewing the atmosphere, and of maintaining its purity by expelling foul air and admitting fresh without draughts. Of the products which vitiate the air carbonic acid is the most important. Air which has been utilized by living beings is always charged with carbonic acid, and also with a varying amount of watery vapor, the quantity of which is increased as the air is warmed; and smaller quantities of ammonia, and organic matter especially bacteria, still further assist in rendering the atmosphere not only unfit but dangerous for respiration. Authorities on hygiene somewhat vary as to the amount of air necessary for healthy living rooms, but it is generally admitted that not less than 1000 cubic feet of fresh air per healthy person should be supplied every hour, and from 3000 to 4000 cubic feet to rooms occupied by invalids. Mechanical ventilation is generally effected by means of gratings in the ceilings or cornices in communication with flues leading into the open air, and a variety of arrangements have been invented to prevent down-draughts. Public and other large buildings are commonly ventilated in the roof, though sometimes by gratings in or near the floor, but this latter method is objectionable on account of draught. Automatic ventilation is, of course, irregular, owing to changes in wind and temperature, which increase or reduce, or even revert the motive power. In places where large numbers of people congregate and a uniform renewal of air is required, it is therefore necessary to resort to machinery. Many systems are in operation, varying with the nature of the building to be ventilated. Air flues, shafts, or pipes are usually the medium through which air passes in and out; and this passage is generally regulated by pumps or fans

moved by steam or gas engines. The proper ventilation of mines forms a problem for the mining engineer. See Mining, and Sanitary Science.

WARNER, Charles Dudley, American writer, born at Plainfield, Mass., in 1829, graduated at Hamilton college in 1851; studied law and practiced in Chicago; became connected with the newspaper press; traveled in Europe; and in 1884 became joint-editor of Harper's Magazine. His works include: My Summer in a Garden, Saunterings, Backlog Studies, My Winter on the Nile, In the Levant, Washington Irving, etc. He died in 1900.

WARNER, Susan, American writer, born 1819, died 1885. In 1851 she published under the pseudonym of Elizabeth Wetherell, a novel entitled The Wide, Wide World, which soon attained extraordinary popularity on both sides of the Atlantic. Queechy, which appeared in 1852, was almost equally popular.

WARP. See Weaving.

WARRANT, an instrument or document authorizing certain acts which without it would be illegal. Common forms of judicial warrants are: the warrant of arrest, usually issued by a justice of the peace for the apprehension of those accused or suspected of crimes; the warrant of commitment, a written authority committing a person to prison; the distress warrant, a warrant issued for raising a sum of money upon the goods of a party specified in the warrant; the search warrant, an authority, generally granted to police-officers, to search private premises.

WARRINGTON, a mun., parl., and county borough of England, in Lancashire, with a small portion in Cheshire. Pop. 64,241.

WAR'SAW, a city of Russia, capital of Russian Poland, or the Vistula province, as that country is now officially designated. Warsaw is famous for its huge churches, numerous and magnificent palaces and monuments, remnants of former Polish grandeur; for its educational institutions; and for its many and extensive gardens, parks, and suburban drives. It was formerly also exceptionally rich in literature and art treasures; most of these have been confiscated and transferred to St. Petersburg. Leather, boots and shoes, woolen and linen stuffs, plated ware, machinery, chemicals, spirits and beer, are some of the most important industrial products. It is the residence of the governor-general of the province, of the commander of the Warsaw military district, and of the Roman and Greek Catholic archbishops. Pop. 638,209, of which many are Jews and Germans.

WAR-SHIP. See Navy.

WART, a small, dry, hard tumor making its appearance most frequently on the hands, sometimes on the face, and rarely on other parts of the body, and occurring usually on children. Warts may be described as collections of abnormally lengthened papillæ of the skin, closely adherent and ensheathed in a thick covering of hard dry cuticle. In most cases they disappear of themselves, or they may be removed by nitric acid, glacial acetic acid, etc.

WART-HOG, a name common to certain members of the hog family, distinguished from the true swine by their dentition, which in some respects resembles that of the elephants. The head is very large; immense tusks project

Head of wart-hog.

from the mouth outward and upward, and the cheeks are furnished with flesh-like excrescences resembling warts. They feed on the roots of plants, which they dig up with their tusks. The African wart-hog or haruja of Abyssinia, and the vlacke-vark of the Dutch settlers of the Cape are familiar species.

WARWICK (wo'rik), a parliamentary borough of England, on a rocky hill on the right bank of the Avon, the county town of Warwickshire. The principal object of interest is Warwick castle, the most magnificent of the ancient feudal mansions of the English nobility. The town unites with Leamington in sending one member to parliament. Pop. 11,903.—The county has an area of 885 sq. miles, or 566,548 acres. Coal (output over a million tons per annum) and several kinds of building stone are abundant. Warwickshire is also famous for its manufactures, and includes the two great manufacturing towns of Birmingham and Coventry. Pop. 897,678.

WARWICK, Richard Neville, Earl of, "the kingmaker," a great English nobleman, born 1428, killed 1471. He was the son of an earl of Salisbury, and became Earl of Warwick by marrying the heiress of the title and estates. Taking the Yorkist side in the Wars of the Roses, he was the main instrument in placing Edward IV. on the throne in 1461 in place of Henry VI., and became the most powerful nobleman in the kingdom. Quarreling with Edward on account of the latter's marriage, he went over to Henry's side, and was able to place him again on the throne, but was defeated and slain at the battle of Barnet.

WASHBURN, Cadwallader Colden, American soldier and capitalist, was born at Livermore, Maine, in 1818. He made fortunate investments in timber lands and became one of the pioneers in the flour-milling industry. In 1854 he was elected to congress from Wisconsin by the anti-slavery element, and was twice reëlected, serving until 1861. He raised the second regiment of Wisconsin cavalry and was mustered into the federal service in February, 1862. In November, 1862, he was promoted to be major-general and was given a division in the Army of the Tennessee. He was again a member of congress from 1867 to 1871, and in 1872–74 was governor of Wisconsin. He gave largely to education, built an observatory at the University of Wisconsin, and founded an orphan asylum at Minneapolis. He died in 1882.

WASH'BURNE, Elihu Benjamin, American diplomat, was born at Livermore, Maine, in 1816. He removed in 1841 to Galena, Ill. He was a delegate to the whig national convention of 1844, and from 1853 until 1869 was a member of congress. When Grant became president, he made Washburne his secretary of state, but he resigned to become minister to France. During the Franco-Prussian war he was the only foreign representative who remained at his post. In 1877 he returned to the United States and settled at Chicago. He published Recollections of a Minister to France, 1869–77. He died in 1887.

WASHINGTON, the capital of the United States, in the District of Columbia, at the confluence of the Anacostia with the Potomac, here navigable by ships of the largest class; 200 miles southwest of New York. The site was selected in 1790 by Washington himself, and the plan of the city was drawn up on a most magnificent scale. The streets (70–120 feet wide) cross each other at right angles, and are intersected diagonally by avenues (120–180 feet wide), which bear the names of states in the Union. A large portion of these spacious thoroughfares are planted with elms and poplars, well paved, and well kept. Numerous open spaces, large and small, some of them beautifully laid out, are distributed throughout the vast area occupied by the town. First among the numerous public buildings ranks the capitol, the finest structure in the states, on a hill above the Potomac, in the midst of a highly ornamental park of 50 acres. It consists of a central building of freestone, two wings (each with a dome) of white marble, and a lofty central dome of iron, surmounted by a statue of Liberty (total height, 307½ feet). The Rotunda, in the center of the main building, is a magnificent hall, adorned with bas-reliefs and paintings, and a colossal statue of Washington. The entire structure covers 3½ acres, and cost over 12½ million dollars. It accommodates the two houses of congress, the United States supreme court, and until recently also held the extensive congress library (now transferred to a separate building). The edifices provided for the various state departments, such as the treasury, the state, war, and navy departments, the interior department, post-office, etc., are also on a splendid scale. In the midst of these palatial offices stands the more modest yet elegant White House, the residence of the United States president. In addition may be specially mentioned the Episcopal Trinity church, the patent-office, the city-hall, the observatory, the Smithsonian institution, the Columbian college, the arsenal, the navy-yard (42 acres), and the Washington obelisk, built of white marble and blue gneiss, 555½ feet high, with a base 104 feet square. The city is protected by numerous forts and batteries, the harbor defenses especially being of a formidable description. Pop. 1909, 340,000.

WASH'INGTON, occupies the northwestern corner of the United States, and is bounded on the north by British Columbia, on the east by Idaho, on the south by Oregon, and on the west by the Pacific ocean. It ranks sixteenth in

size among the states. The state is divided by the Cascade mountains into two unequal sections, which have very different climatic and physical characteristics and commercial and business interests. The Columbia river, which forms almost the entire boundary between Washington and Oregon, traverses the state from east to west, and with its tributaries drains almost the whole state. The tide-water basin at the mouth of the Columbia and Chehalis valley, farther north are the most important indentions of the coast south of the Strait of Juan de Fuca. This body of water, together with the extensive inland sea known as Puget sound, affords some of the best harbors in the world, and is of great commercial

Seal of Washington.

importance. The soils are fertile in most parts of the state. On the eastern spurs and slopes of the Cascades there are forests of pine. Western Washington has magnificent forests. They consist of gigantic coniferous trees such as the Douglas spruce, giant cedar, and Western hemlock. Washington is the most important coal-mining state on the Pacific coast. Gold and silver are mined in fluctuating quantities. Considerable quantities of limestone and some sandstone, granite, and marble are quarried. In 1850 fish were shipped from Washington, and since that date the growth in the industry has been rapid. The total amount invested in the industry is over $7,000,000. Salmon is the largest single product. The canning and packing of fish ranks third among the industries of the state. Alfalfa, clover, and other grasses and vegetables and fruit are the chief crops. Wheat constitutes over half of the total crop area of the state. The soil is exceedingly fertile and a high per acreage yield is obtained. Barley and oats are the only other cereals of importance. Hay and forage rank second in area and value. Potatoes are a favorite crop, and sugar-beet culture has developed in Spokane county. The southeastern counties lead in fruit-raising. The alluvium soil at the mouths of the tributary streams to the Walla Walla are peculiarly adapted to the cultivation of orchard fruits. Extensive areas are too arid for cultivation afford pasturing facilities. All kinds of domestic animals are rapidly increasing in numbers. Manufacturing has developed since 1885, when railroad connection was made with the older parts of the country. A great impetus was given to the industry through the discoveries of gold in Alaska in 1897. The most important branch of industry is the sawing of lumber. Next in importance is the manufacture of flour and grist mill products. An Oriental market is developing for the products of this industry. Seattle is the largest manufacturing center, followed by Tacoma and Spokane. Washington possesses the best commercial facilities of any of the Pacific states. The principal outlet to the sea is Puget sound, which, by reason of its position and the numerous bays and inlets with which its shores are indented, is especially well adapted to commercial purposes. Water communication with the interior is by the Columbia and Snake rivers and their branches. The Columbia is navigable for large steamers as far as Vancouver. The principal railroad lines are the Northern Pacific and the Great Northern. They both traverse the state from east to west as far a Seattle, where the Northern Pacific turns south, extending to Portland, Oregon, and the Great Northern turns north to the Canadian border. The Canadian Pacific operates trains over the Seattle and International railway, and thus brings the commercial centers of the state into touch with a third continental system. The population is confined mainly to the Puget sound region and the southeastern part of the state. The leading religious denominations in point of numbers are the Roman Catholics, Methodists, Disciples of Christ, Presbyterian, Baptists, and Congregationalists. The principal institutions of learning in the state are the University of Washington at Seattle; Gonzaga college, at Spokane; Whitman college, at Walla Walla; and the Washington Agricultural college and School of Science, at Pullman. The first event in history relating to Washington was the discovery, in 1592, of the Strait of Juan de Fuca by an old Greek pilot of that name in the service of Spain. In 1810 two expeditions were sent out by John Jacob Astor for the purpose of establishing a fur-trading empire on the Columbia and its tributary lands and streams. In 1813 the fortunes of war compelled the transfer of the Astor Fur company to the Northwest Fur company. Henceforward for many years the history of the state is the history of the operations of the great Northwest and Hudson Bay companies. Washington was first organized as a territory in 1853, with an area much greater than that of the present state. It was reduced to its present limits in 1863, and was admitted to the Union in 1889. In national politics the state voted for republican electors in 1892, and for a fusion ticket of democrats and populists in 1896, but returned to the republican column in 1900, 1904 and 1908. Within the last few years the development of the state has been phenomenal. Pop. 1,250,000.

WASHINGTON, University of, a coeducational, state institution at Seattle, Wash., founded in 1861. In 1906 the university had an attendance of 631 in the College of Liberal Arts, College of Engineering, the Schools of Mines, Pharmacy, and Law, and the Graduate School. In the same year it had a faculty of 37, a library of 20,000 volumes and 15,000 pamphlets. The university grounds cover 355 acres within the city limits.

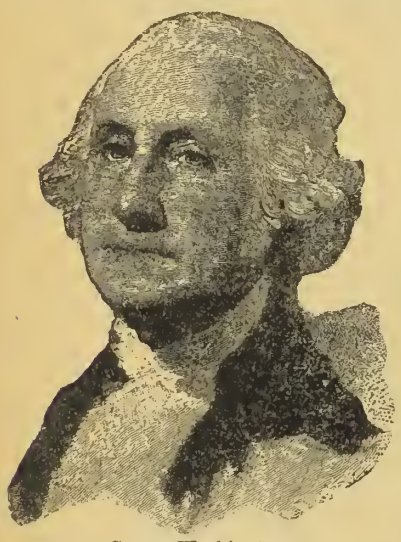
WASHINGTON, the county seat of Daviess co., Ind., 85 miles southwest of Indianapolis, on the Evansville and Terre Haute and the Baltimore and Ohio Southwestern railroads. It is the commercial center of a farming and stock-raising region, especially noted for its deposits of coal, kaolin, and fire clay. Pop. 10,219.

WASHINGTON AGRICULTURAL COLLEGE AND SCHOOL OF SCIENCE, a coeducational state institution at Pullman, Wash., established in 1890 on the national land grant act. It offers partially elective courses in the departments of mathematics and civil engineering, chemistry, botany and zoölogy, agriculture, horticulture, English, economic science and history, mechanical engineering, modern languages, mining engineering, and military science and tactics, with supplementary courses in physics, geology, and mineralogy, Latin, and education. In addition, special instruction is provided in the schools of agriculture, dairying, pharmacy, veterinary science, and business, the school for artisans, and the preparatory school. Provision is also made for graduate instruction.

WASHINGTON, Booker Taliaferro, an American negro educator, was born near Hale's Ford, Franklin co., Va., in 1858. In 1881 he was appointed to establish a colored normal school at Tuskegee, Ala., the state legislature having granted an annual appropriation of $2000 to be used for the salaries of instructors. He opened the school with 30 scholars, and himself as the only teacher. Subsequently he transferred the school to its present site on a plantation about one mile from Tuskegee. His efforts to better the condition of this institution led to his appearance at important public assemblages, and his addresses on these occasions soon made him known as a remarkably fluent and effective speaker. His most notable address was that given at the opening of the Atlanta (Ga.) Cotton States and International exposition in 1895. In 1900 he organzied the National Negro Business League at Boston, Mass. His publications include: The Future of the American Negro, Up from Slavery, and Character-Building.

WASHINGTON, George, the hero of American independence, and "the father of his country" as he is popularly called, was born in Westmoreland county, Virginia, on the 22d February, 1732; died at Mount Vernon, 14th December, 1799. He was the great-grandson of John Washington, an Englishman, who emigrated in 1657; and the son of Augustine Washington, a substantial farmer, being the eldest of a second family. His education was limited to the elementary subjects, but he acquired a fair knowledge of mathematics and surveying, chiefly by self-study, and when his widowed mother prevailed upon him to abandon the idea of entering the British navy, he adopted sur-

veying as a profession. His military career commenced at the age of nineteen, when he was appointed adjutant-general of Virginia militia; and before long he showed in operations against the French that he united in an eminent degree the qualities belonging to a successful commander, though in 1754, when in command of his regiment, he had to capitulate to a superior French force. In 1755 he accompanied General



George Washington.

Braddock as a volunteer, and was almost the only officer who returned safe from the disastrous expedition. In 1758 he took an important part in the expedition that captured Fort Du Quesne, where Pittsburg now stands. In the meantime extensive estates and plantations at Mount Vernon had come into his possession through the death of his half-brother. To these possessions he added largely by marrying in 1759 Mrs. Martha Custis, a wealthy young widow. He also sat for some years in the Virginia assembly. Shortly after the outbreak of the war of independence Washington was elected commander-in-chief of the American forces, 5th June, 1775, in which capacity his career belongs to the general history of his country. (See United States, History.) It is sufficient to say that the struggle was carried on by him under extraordinary disadvantages, including unfriendliness on the part of officers, and virulent attacks on the part of others. When peace was signed in 1783 Washington retired to Mount Vernon, and refused all recompense for his invaluable services beyond his personal expenses. In 1787 he was a member of and presided over the convention which met to revise the articles of union between the states, the result being the constitution which is still in force, and which was adopted in 1788. Washington was elected the first president of the republic, and inaugurated 30th April, 1789, and he was again elected in 1793. During both terms he performed the onerous duties of his office with marked ability, and the advances in prosperity made by the young republic were extraordinary. At the close of his second term of office he resigned (1797), but when a misunderstanding with France threatened further trouble congress appointed him lieutenant-general of the forces (1798). He died from an attack of acute laryngitis. Washington had a mind far above party strife, and was mourned by men of all parties. He had no family. Mount Vernon, on the Potomac about 15 miles from Washington, became national property in 1858. His remains are deposited in a vault in the grounds.

WASHINGTON MONUMENT, a huge obelisk erected in the city of Washington, having a total height of 555 feet 5⅛ inches. It is the highest masonry structure in the world. The cornerstone was laid in 1848 and work on the monument continued slowly until 1877, when it ceased, but was resumed in 1878, and finished in 1884. The Washington National Monument society originated the plan and controlled the work of construction until 1877, when its property was conveyed to the United States. Maryland marble is the material out of which the monument was constructed. The foundation covers an area of 16,000 feet, and weighs 36,912 gross tons. The shaft is 55 feet 1.5 inches square at the bottom, 34 feet 5.5 inches square at the top, weighs 43,633 gross tons, and is 500 feet 5⅛ inches high; the apex, weighing 300 tons, is 55 feet high, its summit being nearly 600 feet above the tide-water of the Potomac. The apex is capped by an aluminum point. It has 262 marble pieces, of seven-inch thickness. The original designs were by Robert Mills. An elevator and an iron stairway of 900 steps within the monument afford access to the base of the apex.

WASH'ITA, a river of the United States, in Arkansas and Louisiana, an affluent of the Red river; length, 600 miles; valuable for navigation.

WASP, the common name applied to insects of various genera. Those best known belong to the genus Vespa, and live in societies, composed of females, males, and neuters or workers. The females and neuters are armed with an extremely powerful and venomous sting. Their nests, some of them very ingenious both as regards material and construction, are made in holes underground, or attached to the branches of trees, to walls, etc. The cells are of a hexagonal form, arranged in tiers with the mouth downward, or opening sideways, in which the larvæ and pupæ are contained. Wasps are very voracious, eating other insects, sugar, meat, fruit, honey, etc.

WATCH, a well-known pocket instrument for measuring time, invented at Nürnberg in the end of the 15th century. The wheels in watches are urged on by the force of a spiral spring, generally of steel, contained in a cylindrical barrel or box, to which one end of a chain is fixed, the chain also making several turns round the barrel outside; the other end of the chain is fixed to the bottom of a cone with a spiral groove cut on it, known as the fusee. On the bottom of the fusee the first or great wheel is put. The barrel-arbor is so fixed in the frame that it cannot turn when the fusee is winding up. The inner end of the spring hooks on to the barrel-arbor, the outer to the inside of the barrel. If the fusee is turned round in the proper direction it will take on the chain, and consequently take it off from the barrel. This coils up the spring; and if the fusee and great wheel are left to themselves, the force exerted by the spring in the barrel to unroll itself will make the barrel turn in a contrary direction to that by which it was bent up. This force communicating itself to the wheels will set them in motion. Their time of continuing in motion will depend on the number of turns of the spiral groove on the fusee, the number of teeth in the first or great wheel, and on the number of leaves in the pinion upon which the great wheel acts, etc. The necessity of keeping the watch from "running down," and of making the wheels move with uniform motion, gave rise to the use of the balance-wheel and hair-spring (taking the place of the pendulum of a clock) and the variously and ingeniously designed mechanism, the escapement (which see). On the perfection of the escapement the time-keeping qualities of a watch largely depend. Of the many varieties invented and perfected, watches are now almost exclusively provided with either the horizontal, the lever, or the chronometer or detached escapement. (See Chronometer.) In all but the best class English watches the fusee has been abandoned in favor of the going-barrel. The latter offers better facilities for keyless work, and keyless watches are manufactured in increasing quantities. The going-barrel watch can also be produced at a cheaper rate, and for ordinary purposes is amply reliable. The mainspring in this class of watch is very long, but only a few coils are brought into action. The great wheel is attached to the going-barrel itself, thus the spring force is directly transmitted to the escapement. The invention of the spiral hair-spring by Dr. Hook (about 1658), the scientific application of its properties since, and the intelligent use of compensation (which see) in the balance, have combined to give to the best chronometers of to-day a uniformity of rate which it is probably inpossible to excel. A number of watches for special performances are also constructed. Such are the calendar watch, the repeater, the chronograph (which see), etc. Large quantities of the cheaper class of watches are now made by machinery in Switzerland, France, Germany, England, and the United States. They are generally produced on the interchangeable system, that is, if any part of a watch has become unfit for service, it can be cheaply replaced by an exact duplicate; the labor of the watch-repairer thus becoming easy and expeditious.

WATCH, a certain part of the officers and crew of a vessel who together work her for an allotted time, the time being also called a watch. The time called a watch is four hours, the reckoning beginning at noon or midnight. Between 4 and 8 p.m. the time is divided into two short or dog-watches, in order to prevent the constant recurrence of the same portion of the crew keeping the watch during the same hours.

WATER, a universally-diffused liquid,

It was classed among the elements until the close of the 18th century, when Lavoisier, profiting by the experiments of Cavendish, proved it to be a compound of hydrogen and oxygen, in the proportion of two volumes of the former gas to one volume of the latter; or by weight 2 parts of hydrogen to 16 parts of oxygen; Pure water is a colorless, tasteless, inodorous liquid; a powerful refractor of light; a bad conductor of heat and electricity; it is very slightly compressible, its absolute diminution for a pressure of one atmosphere being only about 51.3 millionths of its bulk. Although water is colorless in small quantities, it is blue like the atmosphere when viewed in mass. It takes a solid form, that of ice or snow, at 32° F. (0° C.), and all lower temperatures; and it takes the form of vapor or steam at 212° F. (100° C.) under a pressure of 29.9 ins. of mercury, and retains that form at all higher temperatures. Under ordinary conditions water possesses the liquid form only at temperatures lying between 32° and 212°. It is, however, possible to cool water very considerably below 32° F. and yet maintain it in the liquid form. Water may also be heated, under pressure, many degrees above 212° F. without passing into the state of steam. The specific gravity of water is 1 at 39°.2 F., being the unit to which the specific gravities of all solids and liquids are referred, as a convenient standard, on account of the facility with which it is obtained in a pure state; one cubic inch of water at 62° F. and 29.9 inches barometrical pressure, weighs 252.458 grains. Distilled water is 815 times heavier than atmospheric air. Water is at its greatest density at 39°.2 F. (= 4° C.), and in this respect it presents a singular exception to the general law of expansion by heat. If water at 39°.2 F. be cooled, it expands as it cools till reduced to 32°, when it solidifies; and if water at 39°.2 F. be heated, it expands as the temperature increases in accordance with the general law. In a chemical point of view water exhibits in itself neither acid nor basic properties; but it combines with both acids and bases forming hydrates; it also combines with neutral salts. Water also enters, as a liquid, into a peculiar kind of combination with the greater number of all known substances. Of all liquids water is the most powerful and general solvent, and on this important property its use depends. Without water not only the operations of the chemist but the processes of animal and vegetable life would come to a stand. In consequence of the great solvent power of water it is never found pure in nature. Even in rain-water, which is the purest, there are always traces of carbonic acid, ammonia, and sea-salt. Where the rain-water has filtered through rocks and soils, and reappears as spring or river water, it is always more or less charged with salts derived from the earth, such as sea-salt, gypsum, and chalk. When the proportion of these is small the water is called soft, when larger it is called hard water. The former dissolves soap better, and is therefore preferred for washing; the latter is often pleasanter to drink. Some springs contain a considerable quantity of foreign ingredients, which impart to the water particular properties. They are known under the general term mineral waters, and according to the predominating constituent held in solution are divided into carbonated waters (alkaline, magnesian, calcareous, and chalybeate), sulphatic waters (containing chiefly sulphates), chlorinated waters (containing chiefly chlorides), and sulphuretted waters (containing large quantities of sulphides or of sulphuretted hydrogen). The only way to obtain perfectly pure water is to distil it, but matter simply held in suspension may be got rid of by suitable filtration. The great reservoirs of water on the globe are the oceans, seas, and lakes, which cover more than three-fifths of its surface, and from which it is raised by evaporation, and, uniting with the air in the state of vapor, is wafted over the earth ready to be precipitated in the form of rain, snow, or hail. Water, like air, is absolutely necessary to life, and healthy human life requires that it should be free from contamination, hence an ample and pure water-supply is considered as one of the first laws of sanitation.

WATER-BED, a bed consisting of an india-rubber mattress filled with water, and generally used by persons confined to bed. Its pliability prevents pressure on the body of the patient, and thus avoids bed-sores. Water-beds have been largely superseded by the more convenient and healthier air-beds.

WATER-BEETLE, the name given to various species of beetles, having legs adapted for swimming, the two hinder pairs being flattened and fringed with hair.

WATERBURY, a city in New Haven co., Connecticut, in a valley on the Naugatuck river, 77 miles northeast of New York. It is an important railway junction and manufacturing town. Brass and brass goods are the staple products. Waterbury machine-made watches and clocks are known throughout the world. Electro-plate is also made. Pop. 49,859.

WATER-COLORS, in painting, colors carefully ground up with water and isinglass or other mucilage instead of oil. Water-colors are often prepared in the form of small cakes dried hard, which can be rubbed on a moistened palette when wanted. Moist water-colors in a semi-fluid state are also used; they are generally kept in metal tubes, which preserve them from drying up.

WATER-CRESS, a cruciferous plant distributed throughout Europe, Western Asia, North Africa, and choking some rivers of New Zealand, where the stem grows as thick as the wrist. It grows on the margin of clear streams, or even partly immersed in the water. It has antiscorbutic properties, and is cultivated near many large towns to be used as salad, or otherwise.

WATERFORD, a city, parliamentary borough, and seaport in the southeast of Ireland, capital of the county of same name, 97 miles s.s.w. of Dublin, on the right bank of the Suir, which soon after joins the Barrow, the combined stream reaching the sea by the fine estuary known as Waterford harbor. Pop. 26,743.—The county belongs to the province of Munster. The area is 461,552 acres, or 721 sq. miles, of which about a sixth is under tillage. Pop. 87,030.

WATER-GAS, a gas prepared by passing steam through incandescent carbon. It is used for heating and welding purposes in metallurgy, and also for illumination, especially in the United States. Numerous deaths from poisoning have resulted from its use, however, this being largely due to its want of smell. Burnt in the usual way it gives a blue flame, but by suspending a comb of thin magnesium rods in the flame the filaments are quickly heated to a white heat, producing a bright glow light of high illuminating power, but which is said to be neither unpleasant to the eye nor prejudicial to the sight.

WATER-GLASS, a substance which, when solid, resembles glass, but is slowly soluble in boiling water, although it remains unaffected by ordinary atmospheric changes. It consists of the soluble silicates of potash or soda, or a mixture of both. It is prepared either by breaking down and calcining flint nodules, the fragments or particles of which are then added to a solution of caustic potash or soda, whereupon the whole is exposed for a time to intense heat, or by fusing the constitutents together in a solid state, and afterward reducing them to a viscid condition. Among the purposes to which water-glass is applied are painting on glass, coating stone, wood, and other materials to render them waterproof, glazing scenery and paintings, fixing wall-paintings, etc.

WATER LILY, a small group of herbaceous and aquatic plants, natives of all temperate and warm climates. The sepals are three to five, petals three to many, stamens six to many, and ovaries three to many, free, or united into a compound pistil. The stems are creeping and submerged and the leaves mostly peltate, long-petioled, and floating. Fourteen species are North American. The white water lily is common in the Eastern United States. The lotus, water chinquapin, or yellow nelumbo occurs in the waters of the Mississippi valley. It is curious on account of its large top-shaped receptacle, in the cavities of whose upper surface the pistils are imbedded. The common yellow water lily, or spatter-dock has smaller, yellow flowers with fewer petals. It is

widely distributed in the United States. The Victoria lily, the largest of all, occurs in the waters of the Amazon region

White water-lily, one-half natural size.

of South America. Its peltate leaves are 6 to 10 feet in diameter with an upturned margin 2 inches in height. Its flowers

Lotus lily, one-fifth natural size.

are from 10 to 15 inches in diameter, pinkish and fragrant. The starchy seeds are eaten by the natives. It is now

Victoria water-lily, $\frac{1}{25}$th natural size.

grown in the parks and public gardens of many cities of the United States, and flowers in the open air as far north as Washington.

WATERLOO, the capital of Black Hawk co., Ia.; on the Cedar river, and the Burl., Ced. Rap. and N., the Chi. Gt. W., and the Ill. Cent. railways; 93 miles w. of Dubuque, 297 miles w. of Chicago. It is in an agricultural region, and contains flour-mills, foundries, carriage-factories, agricultural-implement works, and sash, door, and blind factories. Pop. 14,906.

WATERMELON, an annual vine, native of tropical Africa, and extensively cultivated in warm climates, particularly in Southern Russia and in the United States. The refreshing red, greenish, or yellow pulp of its ripe fruit contains about 93 per cent water and 2 per cent sugar. A very large number of varieties, especially red-fleshed ones, are in cultivation. The white-fleshed rather solid [illegible]n used largely in preserving is gen[illegible]lly known as a "citron" or "preserving melon." The watermelon is sensitive to frost and is easily stunted in growth by cold. It thrives best in a rich, warm, sandy loam well supplied with humus.

WATER-PITCHER, the popular name of plants, the leaves of which somewhat resemble pitchers or trumpets in general form.

WATERPROOF CLOTH, cloth rendered impervious to water. There are numerous processes for waterproof fabrics of all kinds. The earliest patent, that of Macintosh (1823), consisted in covering cloth with a paste obtained by dissolving caoutchouc in benzol or coal naphtha. In the treatment of cotton and linen cloth a small proportion of sulphur is generally added. A thin layer of this rubber solution is spread on the fabric by special machinery, after which the cloth is doubled, pressed, and finished in calenders, the waterproof layer being thus in the center of the finished material. Textiles thus manipulated become also impervious to air, and from a hygienic point of view unsuitable for prolonged personal wear. This led to the introduction of other solutions and methods of application intended to produce fabrics, which, while resisting rain, do not altogether obstruct ventilation. Consecutive dipping of cloths in soap and alum solutions, or in gelatine and gall solutions, or in a solution of acetate of lead and then in a solution of alumina, has been resorted to with more or less success. The new substance called algin, obtained from sea-weed, has been strongly recommended for the same purpose. Another recent patent process consists in treating the fibers in the solution instead of the manufactured textile, and the fabric thus produced, while rain-resisting, offers the same ventilation as ordinary materials.

WATER-RAT. See Vole.

WATER-SPOUT, a remarkable meteorological phenomenon frequently observed at sea, and exactly analogous to the whirlwinds experienced on land. It occurs when opposite winds of different temperatures meet in the upper atmosphere, whereby a great amount of vapor is condensed into a thick black cloud, to which a vortical motion is given. This vortical motion causes it to take the form of a vast funnel, which, descending near the surface of the sea, draws up the water in its vortex, which joins in its whirling motion. The whole column, which after the junction extends from the sea to the clouds, assumes a magnificent appearance, being of a light color near its axis, but dark along the sides. When acted on by the wind the column assumes a position oblique to the horizon, but in calm weather it maintains its vertical position, while at the

Water-spout.

same time it is carried along the surface of the sea. Sometimes the upper and lower parts move with different velocities, causing the parts to separate from each other, often with a loud report. The whole of the vapor is at length absorbed in the air, or it descends to the sea in a heavy shower of rain. Sudden gusts of wind, from all points of the compass, are very common in the vicinity of water-spouts. What are sometimes called water-spouts on land, or cloud-bursts, are merely heavy falls of rain of a very local character that occur generally during thunder-storms.

WATERTOWN, the capital of Jefferson co., New York, on Black river, about 10 miles above its entrance into Lake Ontario. The river is crossed by several bridges, and its rapids afford abundant water-power. Pop. 25,696.

WATERTOWN, a city in Jefferson co., Wisconsin, on the Rock river and on the Chicago, Milwaukee & St. Paul and Chicago & Northwestern Railroads. It is a busy manufacturing and commercial town, Pop. 10,100.

WATER-VOLE. See Vole.

WATER-WHEEL, a wheel moved by water, as the overshot wheel, the undershot wheel, the breast-wheel, and the turbine. See these terms.

WATSON, John Crittenden, American naval officer, was born in Frankfort, Ky., in 1842. He became a master in the navy in 1861, and served throughout the civil war. In 1887 he became a captain and a commodore ten years later, and in the Spanish-American war commanded the blockading squadron on the North Cuban coast from May to June, 1898, when he was made commander-in-chief of the Eastern squadron. He was commandant of the Mare Island navy yard from October, 1898, to May, 1899, was promoted to the rank of rear-admiral in March, 1899, was commander-in-chief of the naval forces on the Asiatic station from June, 1899, to April, 1900, and in October, 1900, became president of the naval examining board and in 1902, president of the naval examining and retiring boards.

WATT, James, the celebrated improver of the steam-engine, was born at Greenock, January 19, 1736; and died at his seat of Heathfield, Staffordshire, August 25, 1819. In 1774 he acted as a civil engineer—made several surveys for canals and harbors, and some of his plans were afterward carried into

execution. It was during this period that he conceived and gave shape to his improvements on the steam-engine, which have rendered his name famous.

James Watt.

To give his inventions practical form he associated himself in 1774 with Mathew Boulton, the firm of Boulton and Watt having their works at Soho, Birmingham. He retired from business in 1800.

WATTEAU (vät-ō), Jean Antoine, a French painter, born at Valenciennes, 1684; died at Nogent-sur-Marne, 1721. For many years he struggled in obscurity, but his talent once recognized, he rapidly became popular and prosperous. In 1717 he was received at the academy, and enrolled as a painter of pleasure parties, balls, masquerades, etc., subjects in which he excelled. Lightness, elegance, and brilliancy form the chief attractions of his style.

WAT'TERSON, Henry, American journalist, was born in Washington, D. C., in 1840. He entered journalism in Washington as editorial writer for the States, served in the confederate army in 1861–62, and in 1862–63 edited in Chattanooga the Rebel, the official newspaper of the state of Tennessee. In 1867 he became editor-in-chief of the Louisville Journal and later he established the Courier-Journal, of which he became the editor. In 1876–77 he represented the Louisville district in congress. Delegate-at-large from Kentucky to six democratic national conventions, presiding over that of 1876 and chairman of platform committee in the others. In 1896 he declared himself a gold democrat. Among his works are History of the Spanish-American War, Abraham Lincoln, etc.

WATERVILLE, a city in Kennebec county, Me.; on the Kennebec river, and the Maine Cent. railroad; 18 miles n. by e. of Augusta, 80 miles n.e. of Portland Pop. 11,115.

WATERTOWN (wa'tēr-toun), a town including several villages, in Middlesex co., Mass., seven miles west of Boston, on the Charles river, and on the Boston and Maine railroad. Pop. 11,500.

WATTLE-BIRD, an Australian bird belonging to the honey-eaters, and so named from the large reddish wattles on its neck. It is about the size of a magpie, and is of bold, active habits.

WATTS, George Frederick, R.A., English artist, born 1817. He first exhibited at the Royal academy in 1837. Among his more important pictures are: Life's Illusion (1849), The Window Seat and Sir Galahad (1862), Ariadne (1863), Esau (1865), Love and Death (1877), Time, Death, and Judgment (1878), Happy Warrior (1884), Hope (1886), Judgment of Paris (1887), The Angel of Death (1888), and Fata Morgana (1889). He is one of the most subtle and powerful of portrait-painters, among his successful work in this line being Tennyson, Millais, Sir F. Leighton, Cardinal Manning, Browning, etc. He is perhaps the greatest idealist in contemporary British art. He became R.A. in 1868, and retired in 1896. He has presented some of his pictures to the nation. He died in 1903.

Wattle-bird.

WAUKEGAN (wa-kē'gan), the county seat of Lake co., Ill., 35 miles north of Chicago, on Lake Michigan, and on the Chicago and Northwestern railroad. Pop. 11,226.

WAUKESHA (wa'kē-shà), the county seat of Waukesha co., Wis. 17 miles west of Milwaukee, on the Little Fox river, and on the Chicago, Milwaukee and St. Paul, the Chicago and Northwestern, and the Wisconsin Central railroads. Pop. 10,100.

WAUSAU (wa'sa), the county seat of Marathon co. Wis., 200 miles northwest of Milwaukee, on the Wisconsin river, and on the Chicago, Milwaukee and St. Paul and the Chicago and Northwestern railroads. Pop. 14,324.

WAVES, in physics, disturbances of matter in such a way that energy is transmitted through great distances, sometimes, but not always, accompanied with a slight permanent displacement of the particles of the conveying medium. When a disturbance is produced at a point in air, waves proceed from that point as concentric spheres and carry sound to the ear of a listener. Light is supposed to be propagated by the wave motion of the ether in a manner somewhat analogous to the propagation of sound in air. When waves are produced by the disturbance of a small quantity of liquid, as when a pebble is thrown into a pool, they appear to advance from the disturbed point in widening concentric circles, the height of the wave decreasing gradually as it recedes from the center; but there is no progressive motion of the liquid itself, as is shown by any body floating on its surface. The whole seems to roll onward, but, in reality, each particle of water only oscillates with a vertical ascent and descent. Where the depth of the liquid is invariable over its extent, or sufficient to allow the oscillations to proceed unimpeded, no progressive motion takes place, each ridge or column being kept in its place by the pressure of the adjacent columns. Should, however, free oscillation be prevented, as by the shelving of the shore, the columns in the deep water are not balanced by those in the shallower parts, and they thus acquire a progressive motion toward the latter, or take the form of breakers, hence the waves always roll in a direction toward the shore, no matter from what point the wind may blow. The height of the wave depends in a great measure on the depth of the water in which it is produced. The waves of the ocean have been known to reach a height of 43 feet, from trough to crest. The horizontal pressure of a strong Atlantic wave has been recorded as high as 3 tons to the square foot. Undulatory movements also take place in solids; such are earthquake waves.

WAX, an unctuous-feeling substance partaking of the nature of fixed oil. It is secreted by bees, and is also an abundant vegetable production, entering into the composition of the pollen of flowers, covering the envelope of the plum and of other fruits, and, in many instances, forming a kind of varnish to the surface of leaves. Common wax is always more or less colored, and has a distinct, peculiar odor, of both of which qualities it may be deprived by exposure in thin slices to air, light, and moisture, or more speedily by the action of chlorine. At ordinary temperature wax is solid and somewhat brittle; but it may be easily cut with a knife. Its specific gravity is 0.96. At 155° Fahr. it melts, and it softens at 86°, becoming so plastic that it may be molded by the hand into any form. Wax is insoluble in water, and is only dissolved in small quantities by alcohol or ether. The principal applications of wax are to make candles and medicinal cerates; to give a polish to furniture or floors; to form a lute or cement, for which it is used by chemists; and to serve as a vehicle for colors. Sealing wax is not properly a wax. See Candleberry, China Wax, Wax-palm.

WAX-PALM, a species of palm yielding a substance consisting of two-thirds resin and one-third wax, which is found on its trunk in the form of a varnish. It is a native of the Andes, towering in majestic beauty on mountains which rise many thousand feet above the level of the sea, and sometimes attaining the height of 160 feet.

WAX-WING, an insessorial bird belonging to the dentirostral section of the order. It derives its name from the appendages attached to the secondary and tertiary quill-feathers of the wings, which have the appearance of red sealing-wax.

WAYNE, Anthony, soldier, born in Pennsylvania in 1745; died in Erie, Penn., in 1796. After the battle of Three Rivers, where he was wounded, he was placed in charge of Fort Ticon-

deroga, and on February 21st was commissioned brigadier-general. He fought at the battles of Brandywine, Germantown, and Monmouth, captured the fort of Stony Point on the Hudson river, and successfully attacked Fort Lee, near New York City. Later Wayne was active in the investment and capture of Yorktown. The brevet of major-general was conferred on him October 10, 1783. At the close of the war he went to Georgia, and was elected to congress, serving from October 24, 1791, to March 21, 1792. In April of the last named year he was promoted general-in-chief of the United States army. In August, 1794, with 1,000 men, he marched against the Ohio Indians and signally defeated them, and while descending Lake Erie on his way from Detroit he died from an attack of the gout.

WEASEL, a digitigrade carnivorous animal, a native of almost all the temperate and cold parts of the northern hemisphere. It measures about 2½ inches in height, about 7½ in length, with a tail about 2½ inches long. The body is extremely slender, the head small and flattened, the neck long, the legs short. It feeds on mice, rats, moles, and small birds, and is often useful as a destroyer of vermin in ricks, barns, and granaries. The polecat, ferret, ermine, and sable are akin.

WEATHER. See Meteorology.

WEAVER-BIRD, a name given to birds of various genera, belonging to the Fringillidæ or finches. They are so called from the remarkable structure of their nests, which are woven in a very wonderful manner of various vegetable substances. Some species build their nests separate and singly, and hang

Yellow-crowned weaver and nest.

them from slender branches of trees and shrubs; but others build in companies, numerous nests suspended from the branches of a tree being under one roof, though each one forms a separate compartment and has a separate entrance. They are natives of the warmer parts of Asia, of Africa, and of Australia.

WEATHER AND STORM SIGNALS, flags, semaphores, lanterns, steam whistles, and other devices exhibited or sounded to inform mariners and others of storms or weather conditions. The system of observations began in 1870 and storm signals were first displayed in the autumn of 1871. The flags adopted for this purpose are five in number, and of the forms and colors indicated below:

When number 4 is placed above number 1, 2, or 3, it indicates warmer; when below, colder; when not displayed, the temperature is expected to remain about stationary. During the late spring and early fall the cold-wave flag is also used to indicate anticipated frosts.

Whistle signals.—A warning blast of from fifteen to twenty seconds duration is sounded to attract attention. After this warning the longer blasts (of from four to six seconds duration) refer to weather, and shorter blasts (of from one to three seconds duration) refer to temperature; those for weather are sounded first.

Blasts.	Indicate
One long	Fair weather.
Two long	Rain or snow.
Three long	Local rain or snow.
One short	Lower temperature.
Two short	Higher temperature.
Three short	Cold wave.

By repeating each combination a few times, with intervals of ten seconds, liability to error in reading the signals may be avoided.

Storm Warnings.—A red flag with a black center indicates that a storm of marked violence is expected. The pennants displayed with the flags indicate the direction of the wind; red, easterly (from northeast to south); white, westerly (from southwest to north). The pennant above the flag indicates that the wind is expected to blow from the northerly quadrants; below, from the southerly quadrants. By night a red light indicates easterly winds, and a white light above a red light westerly winds.

Hurricane Warnings.—Two red flags with black centers, displayed one above the other, indicate the expected approach of a tropical hurricane, and also one of those extremely severe and dangerous storms which occasionally move across the lakes and Northern Atlantic coast.

WEATHER BUREAU, a governmental organization for the purpose of maintaining regular meteorological observations, compiling statistics of the climate, predicting weather and storms, river floods, frosts, rain, and such other atmospheric phenomena as affect the welfare of mankind. The United States weather bureau was reorganized under the department of agriculture, July 1, 1891. The bureau receives daily two regular sets of weather telegrams at 8 a.m. and 8 p.m. on which are based the morning and evening weather charts and the forecasts for the next thirty-six hours. These forecasts are immediately telegraphed throughout the country and to vessels about to sail. The forecasts of heavy storms, cold waves, and injurious frosts and specially hot weather are verified almost without exception; the forecasts of rain are the least successful of any. Forecasts are communicated to vessels passing by, off the coast by wireless telegraphy. The condition of rivers, especially in times of flood, is telegraphed to all those interested. In the special interest of the crops and agriculture, a weather crop bulletin was published in 1887. During the summer season it gives full details of the temperature, and rainfall as compared with normal conditions, and shows the influence of the weather on the development of the future crop. In the winter season a monthly bulletin shows the quantity of snowfall, the ice in the rivers, the opening and closing of navigation, the condition of winter wheat, and the injury done to crops by cold waves, frosts, or floods. In the interests of the lake navigation, a monthly lake chart is published, showing every feature in regard to the weather or the condition of the lakes than can interest navigators.

WEAVER, James Baird, American politician, was born at Dayton, Ohio, in 1833. He removed to Iowa in 1856. During the civil war he enlisted in the Second Iowa Volunteers, eventually became colonel of the regiment, and in 1865 was brevetted brigadier-general of volunteers. He was active in the organization of the national Greenback party, was elected to represent that party in congress in 1878, and in 1880 was its candidate for the presidency, receiving a popular vote of 308,578. In 1892 he was the candidate of the people's party for the presidency, receiving 22 electoral votes, and a popular vote of 1,041,028. He published A Call to Action.

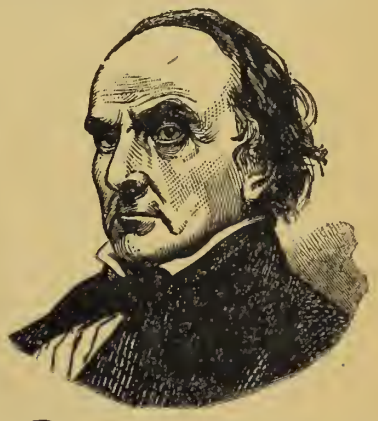
WEAVING, the art of interlacing yarn threads or other filaments by means of a loom, so as to form a web of cloth or other woven fabric. In this process two sets of threads are employed which traverse the web at right angles to each other. The first set extends from end to end of the web in parallel lines, and is commonly called the warp; while the other set of threads crosses and interlaces with the warp from side to side of the web, and is generally called the weft or woof. In all forms of weaving the warp threads are first set up in the loom, and then the weft threads are worked into the warp, to and fro, by means of a shuttle. It was by this fundamental process of interlacing two sets of thread in looms of simple mechanism that the mummy cloths of Egypt, the fine damasks and tapestries of the Greeks and Romans, the Indian muslins, the shawls of Cashmere, and the famed textile fabrics of Italy and the Netherlands were produced. Until comparatively modern times all weaving was effected by means of the hand-loom. This loom, in its latest form, consists

of a frame of four upright posts braced together by cross-beams, the center beam at the back being the warp beam, the beam in front being that upon which the web is wound, while just below this, in front, is the breast-beam for the support of the weaver at his work. At the top of the loom is an apparatus by which the heddles are lifted or lowered by means of treadles under the foot of the weaver. These heddles consist of two frames, from which depend cords attached by a loop or eye to each thread in the warp. As these threads are attached to the frames, alternately, it follows that when one heddle is raised every second thread in the warp is also raised, while the remaining threads are depressed; and this is called shedding the warp. When the warp threads are thus parted there is left a small opening or shed between the threads, and it is through this opening that the weaver drives his shuttle from side to side. The shuttle, which is hollow in the middle, contains the weft-thread wound round a bobbin or pirn, and as the shuttle is shot across the web this weft-thread unwinds itself. When the thread is thus introduced it is necessary to bring it to its place in the fabric. This is accomplished by means of the lay or batten, which is suspended from the top of the loom, and works to and fro like a pendulum by an attachment of vertical rods at each side called the swords. Attached to the lay is what is called the reed, which is a sort of comb having a tooth raised between every two threads of the warp, and so by driving up the lay after a weft-thread has been introduced the weaver strikes home that thread to its place in the cloth. A great improvement was made upon the hand-loom when John Kay about 1740 invented the fly-shuttle, as it was called. This enabled the weaver to drive the shuttle both ways with the right hand by means of a cord attached to a box or trough placed at each end of the shuttle-race, which impelled the shuttle to and fro at each jerk of the cord. But the most important improvement was made on the hand-loom by Joseph Jacquard of Lyons, who, in 1801, invented an apparatus by which the most intricate patterns could be woven as readily as plain cloth. This is accomplished by an ingenious arrangement of hooks and wires, by means of which the warp-threads are lifted in any order and to any extent necessary to make the shedding required by the pattern. The order in which these hooks and wires are successively lifted and lowered is determined by means of a series of pasteboard cards punctured with holes, the holes corresponding to a certain pattern and the cards passing successively over a cylinder or drum. The hooked wires pass through these holes and lift the warp-threads in an order which secures that the arranged pattern is woven into the fabric. When the pattern is extensive the machine may be provided with as many as 1000 hooks and wires. Another development was made in the art of weaving by the invention of the power-loom by the Rev. E. Cartwright in 1784. In the power-loom, which has been gradually improved and adapted to steam-power, the principal motions of the old method of weaving, such as shedding the warp threads, throwing the shuttle, and beating up the thread are still retained. The frame of the power-loom is of cast-iron, and motion is communicated to the loom by means of a shaft, the stroke of the lay being made by cranks attached to the driving shaft, while the shuttle is thrown by means of a lever attachment at the center of the loom. Although the principle of the loom is the same in all kinds of weaving, yet there are numberless modifications for the production of special fabrics. The lappet loom is one suitable for weaving either plain or gauze cloths, and also for putting in representations of flowers, birds, or the like. Cross weaving is a term applied to that process in which, as in gauze weaving, the warp-threads, instead of lying constantly parallel, cross over or twist around one another, thus forming a plexus or interlacing independent of that produced by the weft. Double weaving consists in weaving two webs simultaneously one above the other, and interweaving the two at intervals so as to form a double cloth. Kidderminster or Scotch carpeting is the chief example of this process. Pile weaving is the process by which fabrics like that of velvets, velveteens, corduroy, and Turkey carpets are produced. In the weaving of these fabrics, besides the ordinary warp and weft, there is what is called the pile-warp, the threads of which are left standing in loops above the general surface till cut, and the cutting of which constitutes the pile.

WEBB CITY, a city in Jasper co., Mo.; on the Kan. City, Ft. Scott and Mem., the Mo. Pac. and the St. L. and San Fran. railways; 9 miles s. by w. of Carthage, the county seat. It is a lead and zinc mining center, and is surrounded by an agricultural and fruit-growing region. Pop. 10,872.

WEBER (vā'bėr), Karl Maria Friedrich Ernst, Baron von, German musical composer, was born at Eutin in Holstein in 1786. In 1800 he wrote the opera of the Waldmädchen (Woodmaiden), and had it performed at Chemnitz and Freiberg in Saxony. In 1803 he visited Vienna, where he became acquainted with Haydn and the Abbé Vogler, from whom he received great help in his studies. The latter procured him a musical directorship in Breslau, on which he entered in 1804. Two years later he exchanged this post for a similar one at Carlsruhe, and he was subsequently (1813–16) director of the opera at Prague. At the close of 1816 he settled at Dresden, where he was founder and director of the German opera. In 1820 he went to Berlin to bring out Der Freischütz, the most celebrated of his compositions. It was performed in London and Paris two years later. In 1822 Euryanthe was produced on commission for Vienna, and was brought out there in August, 1823. In 1826 Weber visited London to superintend the production of Oberon, which he had composed for Covent Garden theater. It was enthusiastically received. The composer, however, was seriously out of health, and died in London, June 5, 1826.

WEBSTER, Daniel, a celebrated American statesman, born in 1782, at Salisbury in New Hampshire, studied for four years at Dartmouth college, and having adopted the legal profession, was admitted as a practitioner in the court of common pleas for Suffolk county. In 1813 he was returned to congress by the federal party in New Hampshire, and from that period to the close of his life took a prominent part in public affairs, being especially distinguished as an orator. No public speaker could surpass him in producing an impression on an audience. He became a

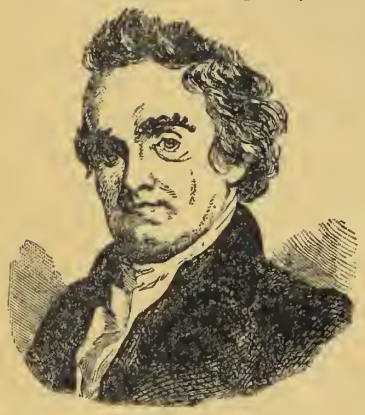


Daniel Webster

senator in 1828, and in 1836 (and again in 1848) was an unsuccessful candidate for the presidentship. In 1841, under the presidency of General Harrison, he was appointed secretary of state, and he had an important part in the arrangement of the Ashburton Treaty of 1842. He was opposed to the admission of Texas as a slave state and to the Mexican war, but supported Clay's "compromise" of 1850. In 1850 he succeeded General Taylor as secretary of state for foreign affairs under President Fillmore. This office he continued to occupy till his death, which took place at his estate of Marshfield, Massachusetts in 1852. A collection of his speeches, state papers, and correspondence was published at Boston the year before his death.

WEBSTER, Noah, LL.D., lexicographer, born at West Hartford, Connecticut, in 1758, and educated at Yale college. He chose the law as a profession, but relinquished it for teaching (1782). About the same time he began the compilation of books of school instruction, and published his Grammatical Institute of the English Language, in three parts, Part 1 (Webster's Spelling Book) containing A New and Accurate Standard of Pronunciation; Part 2, A Plain and Comprehensive Grammar; Part 3, An American Selection of Lessons in Reading and Speaking. All these works had an enormous sale. His literary activity was henceforth very great, the works issued by him during the next few years including important legal and linguistic studies. In 1789 he settled at Hartford to practice law, but removed in 1793 to New York, where for some time he devoted himself to journalism,

In 1806 he published an 8vo English dictionary, which led the way for his great work, the American Dictionary of the English Language. In preparing this work he visited England, and he



N Webster

finished the dictionary during an eight months' residence in Cambridge. In June, 1825, he returned to America. The first edition of his dictionary was published in 1828 (2 vols. 4to); it was followed by a second in 1841; since which time several enlarged and improved editions have appeared. He died in 1843.

WEDDING ANNIVERSARIES, the names given to the several anniversaries of a marriage are said to be of quite ancient origin, and arose from the gift which was regarded as the most suitable offering from the husband to the wife. The names commonly given to such anniversaries are for the first, paper; second, straw; third, candy; fourth, leather; fifth, wooden; seventh, floral; tenth, tin; twelfth, linen; fifteenth, crystal; twentieth, china; twenty-fifth, silver; thirtieth, pearl; thirty-fifth, coral fortieth, emerald; forty-fifth, ruby; fifteith, gold; seventy-fifth, diamond. The diamond wedding, however, is often celebrated at sixty years of married life. The others that are most frequently celebrated are the paper, wooden, tin, crystal, silver, and golden.

WEDGE, a piece of wood or metal, thick at one end, and sloping to a thin edge at the other, used in splitting wood, rocks, etc. In geometrical terms it is a body contained under two triangular and three rectangular surfaces. It is one of the mechanical powers, and besides being used for splitting purposes, is employed for producing great pressure, and for raising immense weights. All that is known with certainty respecting the theory of the wedge is that its mechanical power is increased by diminishing the angle of penetration. All cutting and penetrating instruments may be considered as wedges.

WEDGWOOD, Josiah, a celebrated potter, born at Burslem, in Staffordshire, in 1730. He turned his attention to white stoneware, and to the cream colored ware for which he became famous; and he succeeded in producing a ware so hard and durable as to render works of art produced in it almost indestructible. His reproduction of the Portland Vase is famous. He also executed paintings on pottery without the artificial gloss so detrimental to the effect of superior work. His improvements in pottery created the great trade of the Staffordshire Potteries. He died in 1795.

WEDGWOOD-WARE, a superior kind of semi-vitrified pottery, without much superficial glaze, and capable of taking on the most brilliant and delicate colors produced by fused metallic oxides and ochers; so named after the inventor. It is much used for ornamental ware, as vases, etc., and, owing to its hardness and property of resisting the action of all corrosive substances, for mortars in the laboratory.

WEDNESDAY, the name of the fourth day of the week (in Latin, dies Mercurii, day of Mercury), derived from the old Scandinavian deity Odin or Woden.

WEED, Thurlow, American journalist and political leader, was born at Cairo, Greene co., N. Y., in 1797. He became editor of the Rochester daily Telegraph in 1822, of which three years later he also became the proprietor. He was for several years a member of the state legislature. In 1830 Weed removed to Albany and established the Albany Evening Journal. For a brief period after the war he served on the editorial staff of the New York Times, and from 1867–78 was editor of the Commercial Advertiser. In 1866 he published Letters from Europe and the West Indies. He died in New York City, November 22, 1882.

WEEK, a period of seven days, one of the common divisions of time, the origin of which is doubtful. Among the nations who adopted the week as a division of time, the Chinese, Hindus, Egyptians, Chaldæans, Jews, Persians, and Peruvians have been mentioned, but in some cases the antiquity of the practice is doubtful, and in others the name has been applied to other cycles than that of seven days. The nations with whom the weekly cycle has been traced are the Egyptians and the Hebrews. With the former we only know of its existence, but with the latter it had a much more important character. The use of the week was introduced into the Roman empire about the 1st or 2d century of the Christian era from Egypt, and had been recognized independently of Christianity before the Emperor Constantine confirmed it by enjoining the observance of the Christian Sabbath. With the Mohammedans the week has also a religious character, Friday being observed by them as a Sabbath.

WEEK, Days of the. Sunday (Saxon), Sunnandæd, day of the sun; Monday (German), Montag, day of the moon; Tuesday (Anglo-Saxon), Tiwesdæg, from Tiw, the god of war; Wednesday (Anglo-Saxon), Wodnesdæg, from Odin, the god of storms; Thursday (Danish), Thor, the god of thunder; Friday (Saxon), Frigedæg, day of Freya, goddess of marriage; Saturday, the day of Saturn, the god of time. The names of the seven days of the week originated with the Egyptian astronomers. They gave them the names of the sun, moon, and five planets, viz.: Mars, Mercury, Jupiter, Venus, and Saturn.

WEEPING-ASH, a variety of ash differing from the common ash only in its branches arching downward instead of upward.

WEEPING-BIRCH, a variety of the birch-tree, with drooping branches.

WEEPING-WILLOW, a species of willow, whose branches grow very long and slender, and hang down nearly in a perpendicular direction.

WEEVER, a name of several fishes, included by many authorities among the perches. Two species, viz.: the dragon-weever, sea-cat, or sting-bull, about 10 or 12 inches long, and the lesser weever, called also the adder-pike, or sting-fish, which attains a length of 5 inches. They inflict wounds with the spines of their first dorsal fin, which are much dreaded. Their flesh is esteemed.

WEEVIL, the name applied to beetles distinguished by the prolongation of the head, so as to form a sort of snout or

Corn-weevil.

a, Insect natural size. *b*, Insect magnified. *c*, Larva. *d*, Egg (both magnified).

proboscis. Many of the weevils are dangerous enemies to the agriculturalist, destroying grain, fruit, flowers, leaves, and stems.

WEFT. See Weaving.

WEIGHING MACHINE. See Balance.

WEIGHT, the measure of the force by which any body, or a given portion of any substance, gravitates or is attracted to the earth; in a more popular sense, the quantity of matter in a body as estimated by the balance, or expressed numerically with reference to some standard unit. In determining weight in cases where very great precision is desired, due account must be taken of temperature, elevation, and latitude.

WEIGHTS AND MEASURES, the standards used in accurately weighing and measuring quantities, of special importance in buying and selling, scientific operations, etc. The origin of the English measures is the grain of corn. Thirty-two grains of wheat, well dried, and gathered from the middle of the ear, were to make what was called one pennyweight; 20 pennyweights were called one ounce; and 20 ounces, one pound. Subsequently, it was thought better to divide the pennyweight into 24 equal parts, to be called grains. William the Conqueror introduced into England what was called troy weight. The English were dissatisfied with this weight, because the pound did not weigh so much as the pound at that time in use in England; consequently a mean weight was established, making the pound equal to 16 ounces. But the troy pound was not entirely displaced by the pound avoirdupois; on the contrary it was retained in medical practice, and for the weighing of gold, silver, jewels, and such liquors as were sold by weight. There are 7000 grains in one pound avoirdupois, and

5760 grains in one pound troy; hence the troy pound is to the avoirdupois pound as 14 to 17, or as 1 to 1.215. The troy pound was retained as the British standard by an act passed in 1824; and in order that the standard pound, in case of damage or destruction, might be restored, by reference to a natural standard, it was ascertained that a cubic inch of distilled water, at a temperature of 62° Fahr., weighed, in air, 252.458 grains; and it was directed that the standard pound should be restored by the making of a new standard troy pound, weighing 5760 such grains. In Britain the unit of lineal measure is the yard, all other denominations being either multiples or aliquot parts of the yard. The length of the imperial standard yard, according to the act of parliament passed in 1824, was the straight line or distance between the centers of the two points in the gold studs in the brass rod in the custody of the clerk of the House of Commons, entitled standard yard, 1760. By the same act, the brass rod, when used, must be at the temperature of 62° of Fahrenheit's thermometer. It was enacted at this time that if this standard should be lost or destroyed the length of the yard should be determined by reference to the length of a pendulum vibrating seconds of mean time in a vacuum in the latitude of London, at sea-level. When the standard yard was actually destroyed, however, by the fire which consumed the two Houses of Parliament in 1834, the commissioners appointed to restore the standard decided that it was better to do so by means of authentic copies of the old standard that were in existence. This was accordingly done and five new official copies were made, one of which to be regarded as the national standard, is preserved at the exchequer in a stone coffin in a window-seat of a groined room. The national standard yard is thus the distance between two fine transverse lines on a square rod of gun-metal 38 inches long. In France the mètre is the standard or unit of linear measure; the are, or 100 square mètres, the unit of surface measure; and the stére, or cube of a mètre, the unit of solid measure. The system of measure, called the decimal or metric system, based upon these standards, is now largely adopted. For all sorts of liquids, corn, and dry goods, the British standard measure is declared by the act of 1824 to be the imperial gallon, which should contain 10 lbs. avoirdupois weight of distilled water weighed in air at the temperature of 62° Fahr., the barometer being at 30 inches. The official measurement of this quantity of water measured under the specified conditions gave as the result 277.274 cubic inches, which, though since ascertained to be slightly in excess of the true measurement (277.123 cubic inches), is still the legal capacity of the gallon. In the United States the weights and measures are identical with those of Britain. Prior to 1824 there existed a bewildering irregularity in the weights and measures used in Britain; but since then they have been in great measure regulated by statute, and entire uniformity has been introduced. By the statutes the imperial standard yard, pound, and gallon are fixed, and all local measures of capacity abolished. The legal stone is fixed at 14 lbs. avoirdupois. All articles sold by weight must be sold by avoirdupois, except gold, silver, platinum, and precious stones, which, as noted above, are still to be sold by troy weight. An act of 1889 fixes fines for being in possession of false weighing or measuring instruments (but such fines were also in force previously); enforces the official stamping of such measures, and empowers the board of trade to create new standards for measuring electricity, temperature, pressure, etc. See Avoirdupois, Troy Weight, Decimal System, etc.

WEIGHTS OF PRODUCE, MINIMUM. The following are minimum weights of certain articles of produce according to the laws of the United States:

	Per Bushel.
Wheat	60 lbs.
Corn, in the ear	70 "
Corn, shelled	56 "
Rye	56 "
Buckwheat	48 "
Barley	48 "
Oats	32 "
Peas	60 "
White beans	60 "
Castor beans	46 "
White potatoes	60 "
Sweet potatoes	55 "
Onions	57 "
Turnips	55 "
Dried peaches	33 "
Dried apples	26 "
Clover seed	60 "
Flax seed	56 "
Millet seed	50 "
Hungarian grass seed	50 "
Timothy seed	45 "
Blue grass seed	44 "
Hemp seed	44 "
Salt (see note below).	
Corn meal	48 "
Ground peas	24 "
Malt	34 "
Bran	20 "

Salt.—Weight per bushel as adopted by different states ranges from 50 to 80 pounds. Coarse salt in Pennsylvania reckoned at 80 pounds, and in Illinois at 50 pounds per bushel. Fine salt in Pennsylvania is reckoned at 62 pounds, in Kentucky and Illinois at 55 pounds per bushel.

WEI-HAI-WEI, seaport of China, Shantung peninsula, leased to Britain in 1898.

WEIMAR (vī'mär), the capital of the Grand-duchy of Saxe-Weimar. Weimar is closely associated with the names of Schiller, Goethe, Herder, and Wieland, the first three of whom are buried here, and statues to all the four adorn the town. The houses of Goethe, Schiller, Cranach, and Herder, are objects of much interest. Pop. 28,329.

WEIMAR, SAXE. See Saxe-Weimar.

WEIR, Harrison, English artist, was born at Lewes, Sussex, in 1824. His first exhibited picture was in oil, entitled The Dead Shot. In 1847 he was elected a member of the new Society of Painters in Water Colors. He is chiefly noted for his pictures of country life, animals, fruits, flowers, and landscapes. As an illustrator of books and periodicals he is well known. He is the author of The Poetry of Nature; Everyday Life in the Country; Animal Stories; Old and New; and Our Cats. He died in 1906.

WEISMANN (vīs'män), August, German zoölogist, was born January 17, 1834, at Frankfort-on-the-Main. Weismann's epoch-making work on the embryology of the flies appeared in 1864. These investigations were succeeded by his studies on the formation of the egg and the embryology of the little crustaceans Daphnidæ, and the origin of the sexual cells of the Hydromedusæ. His researches on the seasonal dimorphism of butterflies, and the origin of the markings of caterpillars, as embodied in his "Studies on the Theory of Descent" were most fruitful. Among his works are: Essays upon Heredity and Kindred Biological Problems; The Germ-Plasm, A Theory of Heredity; The All Sufficiency of Natural Selection; The Effect of External Influences upon Development; New Experiments on the Seasonal Dimorphism of Lepidoptera.

WELDING is the union produced between the surfaces of pieces of malleable metal when heated almost to fusion and hammered. When two bars of metal are properly welded the place of junction is as strong, relatively to its thickness, as any other part of the bar. Practically, iron is the only metal welded.

WELLESLEY (welz'li), Richard Colley, Viscount and Marquis, and Earl of Mornington, was born at Dublin in 1760. On his majority he took his seat as Earl of Mornington in the Irish House of Peers, and three years after was returned to the British House of Commons as member for Beeralston. Thus, by a curious anomaly, he was at once a peer and a commoner. He distinguished himself in 1789 in the debates on the regency question. In this discussion, his defense of the royal prerogative, made known to George III. after his recovery, pleased him so much that the earl at the next general election was returned for Windsor, and made a member both of the Irish and the English privy-council. These were only preliminaries to the higher appointment of governor-general of India, which was conferred upon him in 1797, along with a British peerage under the title of Baron Wellesley. His administration forms an era in the history of the British Indian empire. He returned to England in 1805, and in 1809 became foreign secretary under Mr. Perceval. In 1812 he resigned his place, chiefly because he was in favor of Catholic emancipation. He did not return to office till 1822, when he became lord-lieutenant of Ireland. This post he retained till 1827. In the Grey ministry he again (1833) became lord-lieutenant of Ireland but finally retired from public life in 1835. He died in 1842.

WELLINGTON, the capital of New Zealand, is situated on Port Nicholson, an inlet of Cook's strait, on the southwest extremity of the provincial district of Wellington, North Island. Pop. 49,344.—The provincial district of Wellington has an area of 11,250 sq. miles. Pop. 141,236.

WELLINGTON, Arthur Wellesley, Duke of, born in 1769. In 1787 he received a commission as ensign in the 73d Foot, and after a rapid series of changes and promotions, attained by purchase in 1793 the command as lieutenant-colonel of the 33d regiment. His regiment landed at Calcutta in February, 1797, at a critical moment for the British power in India. War had just been declared against Tippoo Saib, and an army of 80,000, of which Colonel Wellesley's regiment formed part, marched against him. An engagement took place at Mallavelly (Mysore) on the 27th, in which Wellesley, who commanded the left wing, turned the right of the enemy. Early in 1805, his health failing, Wellesley obtained leave to return home, and arrived in England in September. He had before leaving Madras received his appointment as Knight Commander of the Bath. He was elected M.P. for Rye in 1806, and in April, 1807, was appointed secretary of state for Ireland. In 1809 Wellesley was appointed to take the chief command in the Peninsula, which had been overrun by the French. The famous passage of the Douro, and the defeat of Soult which followed, fittingly opened this masterly campaign. For the victory at Talavera (July 28), the first of a long list that subsequently took place in the peninsula, the government raised the commander-in-chief to the peerage as Viscount Wellington. On August 12, 1812, Wellington entered Madrid. For his brilliant conduct of the campaign thus far he received the thanks of parliament, was raised to the dignity of marquis, and a sum of $500,000 was voted to purchase him an estate. Next followed the battle of Vittoria (June 21, 1813), for which decisive victory Wellington was given the baton of field-marshal; then battles in the Pyrenees, the capture of San Sebastian, and the crossing of the Bidassoa into France. In 1814 the battle of Orthez was gained, and in the same year the battle of Toulouse, in which Soult's best troops were routed, and the hopes of France in the peninsula utterly annihilated. The way was now open for the British troops to the heart of France. In six weeks, with scarcely 100,000 men, Wellington had marched 600 miles, gained two decisive battles, invested two fortresses, and driven 120,000 veteran troops from Spain. Napoleon abdicated on April 12, and a few days later the war was brought to a close by the signing of conventions with Soult and Berthier. In May the triumphant general was created Marquis of Douro and Duke of Wellington, with an annuity of $50,000, commuted afterward for $2,000,000. With the return of peace he resumed the career of politics. He accepted the post of master-general of the ordnance with a seat in the cabinet of Lord Liverpool in January, 1819. In 1822 he represented Great Britain in the congress of Vienna. In 1826 he was appointed high-constable of the Tower. On 22d January, 1827, he succeeded the Duke of York as commander-in-chief of the forces. On 8th January, 1828, he accepted the premiership, resigning the command of the forces to Lord Hill. In January, 1829, he was appointed governor of Dover castle and lord warden of the Cinque ports. In 1830 repeated motions for parliamentary reform were defeated, but the growing discontent throughout the country on this subject and a defeat in parliament caused the resignation of the government in November. His opposition to reform made the duke so unpopular that he was assaulted by the mob on 18th June, 1832, and his life endangered. He accepted office under Sir Robert Peel in 1834–41, and again in 1846, when he helped to carry the repeal of the corn-laws, which till then he had opposed. In 1842 he resumed the command of the forces on the death of Lord Hill. He died at Walmer castle, 14th September, 1852.

WELL'MAN, Walter, American journalist and explorer, was born in Mentor, Ohio, in 1858. In 1869 he founded the Cincinnati Evening Post, and after 1884 he was the Washington correspondent successively of the Chicago Herald and the Chicago Times-Herald. In 1894 he led an expedition to the Arctic regions and reached a point on the eighty-first degree of latitude, north-east of Spitzbergen. In 1898–99 he made another expedition to the Arctic regions, spending the winter of 1898–99 there, and reaching latitude 82° Wellman reported the discovery of some twenty new lands or islands.

WELLS, Horace, American dentist, was born in Hartford, Vt., in 1815. He conceived the idea that an anæsthetic might be used in dentistry to prevent pain, and had thought of the employment of nitrous oxide gas as early as 1840. In 1847 he published A History of the Discovery of the Application of Nitrous Oxide Gas, Ether, and Other Vapors to Surgical Operations. His constant experiments upon himself with chloroform produced mental alienation, and in 1848 he committed suicide.

WEN, an encysted tumor occurring on the scalp or other parts of the body. They are formed by the accumulation of sebum in a hair follicle, or in the recesses of the sebaceous gland of the hair sac, causing distension of the sac. An encysted tumor, in its commencement, is always exceedingly small, and perfectly indolent; and it is often many years before it attains any great size. The best mode of treatment is complete removal of the whole swelling by dissecting it out.

WENER, the largest lake of Sweden, and after those of Ladoga and Onega the largest in Europe, situated in the southwest of the kingdom. It is 147 feet above sea-level, and of very irregular shape. Its greatest length, northeast to southwest, is about 100 miles; and its breadth may average about 30 miles; area, 2306 sq. miles. Its chief feeder is the Klar. By a canal it communicates with Lake Wetter, but its only proper outlet is at its southwestern extremity, where its superfluous waters are received by the river Gotha. In winter it is frozen for several months, and crossed by sledges. It abounds with fish.

WENTWORTH, Sir Thomas, Earl of Strafford. See Strafford.

WEREWOLF, a man-wolf, a man transformed into a wolf according to a superstition prevalent in ancient and mediæval times. It was generally thought that such beings had the form of a man by day, and that of a wolf by night.

WERNER (vĕr'nĕr), Abraham Gottlob, a German mineralogist, born 1750, died 1817. Werner was the first to separate geology from mineralogy, and to place the former on the basis of observation and experience. The great geological theory with which his name is connected is that which attributes the phenomena exhibited by the crust of the earth to the action of water, and is known as the Wernerian or Neptunian theory, in distinction to the Huttonian or Plutonic, in which fire plays the chief part.

WESER (vā'zĕr), a river of Germany, formed by the junction of the Fulda and Werra at Münden, flows generally in a northwest direction, and, after a very circuitous course, traverses the city of Bremen, and then falls by a wide mouth, very much encumbered with sand-banks, into the German ocean. Its length, including the Werra, is about 430 miles. The navigation for vessels of large size ceases about 10 miles below Bremen. See Bremen.

WESLEY, John, the founder of Wesleyan Methodism, was born at Epworth, Lincolnshire June 17, 1703. He took his degree of B.A. in 1724, was ordained deacon in 1725, became a fellow of Lincoln college, and lecturer and moderator in classics in 1726; and took priest's orders in 1728. He now gathered together a number of pupils and companions who met regularly for religious purposes, and by so doing acquired the name of Methodists. Among these companions were Hervey, Whitefield, and Law, the author of the Serious Call to the Unconverted. In 1735 Wesley accepted an invitation from General Oglethorpe to go out to America to preach to the colonists of Georgia. After a stay of two years he returned to England (February, 1738). Early in the following year (1739) he began open-air preaching, in which he was closely associated with Whitefield, from whom, however, he soon separated. Having now the sole control of the religious body

John Wesley.

which adhered to him, he devoted his entire life without intermission to the work of its organization, in which he showed much practical skill and admirable method. His labors as an itinerant preacher were incessant. He would ride from 40 to 60 miles in a day. He read or wrote during his journeys, and frequently preached four or five times a day. He died in 1791.

WESLEYAN METHODISTS. See Methodists.

WESSEX, that is, West Saxons, one of the most important of the Anglo-Saxon kingdoms in England during the 6th, 7th, and 8th centuries, and the early part of the 9th, and that in which the other kingdoms were ultimately merged in the reign of Egbert in 827. It included the counties of Devon, Dorset, Somerset, Wilts, Hants, Berks, and a part of Cornwall.

WEST, Benjamin, painter, born at Springfield, Pennsylvania, in 1738; died in London in 1820. In July, 1760, he visited Italy, and settling in Rome painted Cimon and Iphigenia, and Angelica and Medora. He visited England in 1763, and was so well patronized that he determined to make it his future residence. He painted Hector and Andromache, The Return of the Prodigal Son, and a historical painting of Agrippina. He painted a series of historical works for Windsor castle, and for the oratory there a series on the progress of revealed religion. On the death of Reynolds, in 1792, he was elected president of the Royal academy. He afterward painted a number of religious and historical pictures of large size, among them being Christ Healing the Sick (in the National gallery), the Crucifixion, Ascension, and Death on the Pale Horse. The Death of General Wolfe at Quebec and The Battle of La Hogue are accounted the best of his historical pieces.

WEST BAY CITY, a city in Bay co., Mich., on the Saginaw river, opposite Bay City, and on the Michigan Central, the Detroit and Mackinac, and the Grand Trunk railroads, connected with Bay City by four bridges. Pop. 15,119.

WEST CHESTER, the county seat of Chester co., Pa., 25 miles west of Philadelphia, on the Pennsylvania and the Philadelphia, Baltimore and Washington railroads. It is in a productive farming section, known for its grain interests, and having extensive nurseries. Pop. 10,942.

WESTERN AUSTRALIA, a British colony which includes all that portion of the continent situated westward of 129° e. lon. The territory measures 1490 miles from n. to s., and 850 miles from e. to w. The total estimated area is 978,299 sq. miles, thus making it the largest of the Australian colonies. The really occupied portion, apart from scattered settlements round the coast is almost entirely in the southwest, and is about 600 miles in length and 150 miles in average breadth. Western Australia was first settled in 1829 as the Swan river settlement and for many years the population was very small; but in the year 1906 it had risen to over 200,000.

WEST HOBOKEN, a town in Hudson co., N. J.; 160 feet above tide-water; 1½ miles W. of Hoboken ferry on the Hudson river, directly opposite New York. It is principally engaged in the manufacture of silk goods. Pop. 26,172.

WEST INDIES, also called the Antilles, the extensive archipelago which lies between North and South America, stretching from Florida to the shores of Venezuela. It is divided into the Bahamas, the group stretching from near the coast of Florida in a southeasterly direction; the Greater Antilles, comprising the four largest islands of the group, Cuba, Hayti, Porto Rico, and Jamaica; and the Lesser Antilles, stretching like a great bow, with its convexity toward the east, from Porto Rico to Trinidad, near the coast of Venezuela. Almost the whole archipelago lies within the torrid zone. The total area does not exceed 95,000 sq. miles, of which the Greater Antilles occupy nearly 83,000 sq. miles. The climate is extremely hot, and the islands abound in tropical productions, as sugar, cotton, coffee, tobacco, corn, etc.; oranges, lemons, limes, pomegranates, citrons, pineapples, etc.; manioc, yams, potatoes, etc. Except Hayti (which is independent) and a few islands off the coast of South America, the West Indian islands are in the possession of European powers. The chief British possessions are: Jamaica, Barbadoes, St. Lucia, St. Vincent, Trinidad, Tobago, Antigua, St. Kitt's, Dominica, Virgin islands, and the Bahamas.—Dutch: St. Eustatius, Saba, St. Martin (partly French), Bonaire or Buen Ayre, Curaçao, and Oruba or Aruba.—French: Martinique, Deseada, Guadeloupe, Marie Galante, St. Martin (partly Dutch), St. Bartholomew, Les Saintes.—United States: Porto Rico.—Danish: Santa Cruz, St. Thomas, and St. John. Cuba is independent under the suzerainty of the United States.

WESTINGHOUSE, George, American inventor and engineer, was born at Center Bridge, Schoharie co., N. Y., in 1846. Invented at 15 a rotary engine. In 1864 he became assistant engineer in the United States navy. His next invention was a railway frog. In 1868 he invented the air brake which soon was used universally in the United States. Soon after he became interested in electricity and acquired patents for alternating current machinery. A large plant was erected at Pittsburg to manufacture air brakes, electrical, and other machines, and at these works the great power plants at Niagara Falls were constructed. Large factories and works have also been established in Europe. His invention of the air-brake and of automatic railway signals have been largely instrumental in the possibility and safety of modern high speed railroading. He has been decorated with the French Legion of Honor, the Royal Crown of Italy, and the Order of Leopold.

WESTMACOTT, Sir Richard, sculptor, born in London in 1775. Many of the monuments in St. Paul's are from his chisel. He designed also the Achilles in Hyde Park, the statue of Lord Erskine in Lincoln's Inn Old Hall, that of Nelson in the Liverpool exchange, besides statues of Addison, Pitt, etc. He was elected an associate of the Royal Academy in 1805, a full member in 1816, and in 1827 succeeded Flaxman as lecturer on sculpture. In 1837 the dignity of knighthood was conferred on him. He died in 1856.

WESTMEATH, a county in Ireland, in the province of Leinster, with an area of 434,000 acres. Pop. 61,527.

WESTMINSTER, a city, parl. and mun. bor. of Middlesex, England, in what is now the county of London. Within the city area are Westminster Hall, Abbey, and School, Kensington Palace, the Houses of Parliament, the Whitehall banqueting house, etc. Westminster had a royal residence as early as the time of Edward the Confessor. Pop. 182,977.

WESTMINSTER ABBEY, the coronation church of the sovereigns of England, and one of the chief ornaments of London, is a magnificent Gothic pile, situated near the Thames, and adjoining the Houses of Parliament. In 1065 a church was built here in the Norman style by Edward the Confessor. Part of this structure still remains in the pyx-house and the south side of the cloisters; but the main building, as it now stands, was begun in 1220 by Henry III. (who built the choir and transepts), and was practically completed by Edward I. Various additions, however, were made (including the nave and aisles, the west front, and the Jerusalem Chamber) down to the time of Henry VII., who built the chapel which bears his name, while the upper parts of the two western towers were designed by Sir C. Wren. The extreme length of the church, including Henry VII.'s chapel, is 531 feet; breadth of transepts, 203 feet; height of the roof, 102 feet; height of towers, 225 feet. The coronation ceremony takes place in the choir, where the coronation stone brought by Edward I. from Scotland is situated beside the coronation-chairs of the English sovereigns. Westminster Abbey is distinguished as the burial-place of numerous English kings from Edward the Confessor to George II.; the north transept is occupied chiefly by monuments to warriors and statesmen; while in the south transept is situated the "Poet's Corner," the burial and memorial place of most of England's great writers from Chaucer to Browning and Tennyson. See London.

WESTMORELAND, a county in England, bounded by Cumberland, Lancashire, Morecambe bay, Yorkshire, and Durham; area, 500,906 acres, or 783 sq. miles. Much of the celebrated lake-scenery of England is within the limits or on the borders of this county, the chief lakes being Ulleswater, Grasmere, Rydal Water, and Windermere. The principal rivers are the Eden, Lune, and Kent. The minerals include graphite roofing-slate, marble, and small quantities of coal, lead, and copper. The arable land is mostly confined to the valleys, while the greater part of the remaining surface is in natural pasture, or under wood. Appleby is the chief town. Pop. 64,305.

WES'TON, Edward, American electrician, born in 1850 in London, England, but in 1870 came to the United States. He improved the process of

nickel-plating, made investigations in electricity, and in 1875 established at Newark, N. J., the first factory in the United States exclusively for the manufacture of dynamo-electric machines. His inventions included improved meters for electric measurements.

WESTPHALIA, the name given at different periods to (1) one of the circles of the old German empire, (2) one of Napoleon's kingdoms (1807–13), conferred upon his brother Jerome; and (3) now to a province of Prussia. The latter is bounded by Rhenish Prussia, Holland, Hanover, Brunswick, Hesse, and Nassau. Its area is 7771 sq. miles. Besides iron and coal in abundance the minerals include copper, lead, zinc, and salt; and the manufactures are varied and important. Münster is the capital. Pop. 2,700,250.

WESTPHALIA, Peace of, the name given to the peace concluded in 1648 at Münster and Osnabrück, by which an end was put to the Thirty Years' war (which see). By this peace the sovereignty of the members of the empire was acknowledged. The concessions that had been made to the Protestants since the religious peace in 1555 were confirmed. The elector-palatine had the palatinate of the Rhine and the electorate restored to him; Alsace was ceded to France; Sweden received Western Pomerania, Bremen, Verden, Wismar, and a sum equal to $3,750,000; Brandenburg, Mecklenburg, Hanover, and Brunswick were compensated by the secularization of numerous ecclesiastical foundations. The independence of the United Provinces was recognized by Spain, and that of Switzerland by the empire.

WEST POINT, Orange co., N. Y., on the Hudson river, 52 miles north of New York. It is situated on a series of high bluffs overlooking the river, which takes a sharp bend at this point, and from the time of the revolutionary war has been an important military post. In 1794 the United States military academy was located here by act of congress, the act authorizing the enrollment of a corps of artillerists to garrison the forts, and providing for the attachment of thirty-two cadets to the force. Four years later the corps was enlarged, instructors appointed, and the cadets given definite rank in the army. Formerly they were enlisted for five years, but the term is now extended to eight. The commandant and officers detailed at the post serve only four years, while the professors with the rank of lieutenant colonel or colonel, after ten years' service, are appointed for life. The cadets are divided into battalions of four infantry companies, each commanded by an officer of the regular army and under him by cadet officers. Each congressional district and territory and the District of Columbia is entitled to have one cadet at the academy, the cadet to be named by the representative in congress from the district. There are also ten appointments at large made by the president. Admission is gained by passing a satisfactory examination. The number of cadets is about three hundred. The pay of each cadet is $540 per year, out of which all of his expenses are paid. Upon graduating a cadet receives an appointment as second lieutenant in the United States army.

WEST TROY, a town of Albany co., New York, on the right bank of the Hudson, opposite the town of Troy, and connected by an iron bridge. Pop. 14,140.

WEST VIRGINIA, a south Atlantic state of the United States, bounded on the northeast by Pennsylvania and Maryland, on the southeast and south by Virginia, on the southwest by Kentucky, and on the northwest by Ohio, being separated from the latter state by the Ohio river. Area 24,780 sq. miles. It ranks thirty-seventh in size among the states. The surface is uneven and in the east mountainous. The main range of the Alleghanies crosses the northeastern section, and farther south forms the state boundary toward Virginia. The state is drained by a number of rivers flowing from the mountain belt northwestward to the main river on

Obverse.

Reverse.
Seal of West Virginia.

the boundary. The largest of these rivers are the Big Sandy, the Guyandotte, Great Kanawha, Little Kanawha, and Monongahela. The climate is agreeable and healthful, with freedom from violent extremes of heat or cold. The rainfall ranges from 33 inches in the northeast to 45 inches in the south. In the northeast the soils are sandy and of little fertility; many of the mountains are covered with a fertile clayey soil, and the Ohio valley has a soil formed chiefly from limestone, which gives it great fertility. There are in the southeast and south dense forests of deciduous trees; black, red, white, and chestnut oak, hickory, chestnut, locust, maple, and tuplip-trees. There are also extensive forests of black spruce, white pine, and hemlock and birch on the mountains.

West Virginia includes 16,000 sq. miles of the Alleghany coal measures, chiefly bituminous. There are immense deposits of petroleum and rich reservoirs of natural gas. Iron ore is found, and among non-metallic minerals the most important are salt, sandstone, limestone, and clay. There are also a large number of valuable minerals springs, especially sulphur. The soil in the western part of the state consists of rich clay and sand loams, well suited to general farming. The flat hills to the eastward are better adapted to grazing. Wheat, corn, buckwheat, oats, and rye are the chief cereals. Tobacco and sorghum cane are the other important crops. Apples constitute 70 per cent of the fruit crop. Cattle, horses, and sheep are the principal stock raised. The iron and steel industry ranks first among the manufactures. In the manufacture of coke the state ranks second. The availability of natural gas has led to a thriving glass-manufacturing industry. Pottery, terra cotta, fire clay products, flour and grist milling, tanning and leather are the other principal industries. West Virginia has excellent transportation facilities. The navigable streams include the Ohio, Monongahela, Great and Little Kanawha, and the Big Sandy. The bulk of the state's foreign trade is carried on by way of the Ohio, which offers means of water communication with the gulf. There are three trunk lines traversing the state from east to west—the Chesapeake and Ohio, the Baltimore and Ohio, and the Norfolk and Western. The population by decades has been as follows: 1870, 442,014; 1881, 618,457; 1890, 762,794; 1900, 958,800. Estimated population in 1908 by the governor of the state 1,200,000. Among the institutions of higher education are: The University of West Virginia, at Morgantown; Bethany college, at Bethany; and Morris Harvey college, at Barboursville. For a number of years after the settlement of the eastern part of Virginia the western section was entirely unknown. In 1669 La Salle floated down the Ohio river and landed at several places within the state. Governor Spotswood of Virginia made an expedition into the present state in 1716. The establishment of West Virginia as a state was consummated on June 20, 1863. Its creation and admission were due to conditions which existed prior to the civil war of 1861–5, to popular sentiment which those conditions developed when the war was precipitated, and to the exigencies of the war itself. The western part of Virginia was sparsely peopled, its great forests undeveloped, its vast mineral resources only partially realized, and its slave interests comparatively small. The eastern section contained the larger population, owned the great bulk of slave property, and exercised controlling power over state affairs. The Alleghanies, dividing the two sections, in the absence of transverse railroad facilities, naturally sent the citizens of one side with the flow of their navigable waters to western and southern markets, while those of the other, moved by similar natural causes, turned to the seaboard for their commercial and business intercourse. The basis of taxation, the basis of representation, and the relation of the slave interests to these with the measure and distribution of public funds for works of internal improvement and other questions of local concern, constituted elements of con-

tinual controversy, and served to detract largely from the homogeneity of the population. When Virginia passed the ordinance of secession there was much dissatisfaction. Representatives from forty counties declared their independence of Virginia, and took measures for the establishment of a provisional government. During the war 32,068 men were furnished to the federal army. Slavery was entirely abolished in advance of the adoption of the thirteenth amendment. The vote of the state was cast for republican electors previous to 1870. From 1872 to 1892 democratic candidates were uniformly successful. In 1896, 1900, 1904 and 1908, the state went Republican.

WEST VIRGINIA UNIVERSITY, a coeducational state institution of higher learning at Morgantown, West Va., founded in 1868. It absorbed the West Virginia Agricultural college (founded 1867), the Monongahela academy (founded 1814), and the Woodburn Seminary. It now comprises colleges of art and sciences, engineering and mechanical arts, agriculture, and law, schools of music, military science and tactics, and commerce, and preparatory schools at Morgantown, Montgomery, and Keyser. Its principal sources of support are the land grant of 1862, the Morrill and Hatch funds, and biennial state appropriations.

WEXFORD, a maritime county in Ireland, in the province of Leinster, bounded by Wicklow, St. George's Channel, the estuary of the Suir and Barrow, Waterford Harbor, Kilkenny, and Carlow; area, 575,700 acres. Pop. 103,860.—Wexford, the county town, is a seaport on the river Slaney, where it enters Wexford harbor. Pop. 11,154.

WHALE, the common name given to the larger mammals of the order Cetacea. They are characterized by having finlike anterior limbs, the posterior limbs being absent, but having their place supplied by a large horizontal caudal fin or tail. The whalebone whales are distinguished by the absence of teeth, by the presence of baleen or whalebone in

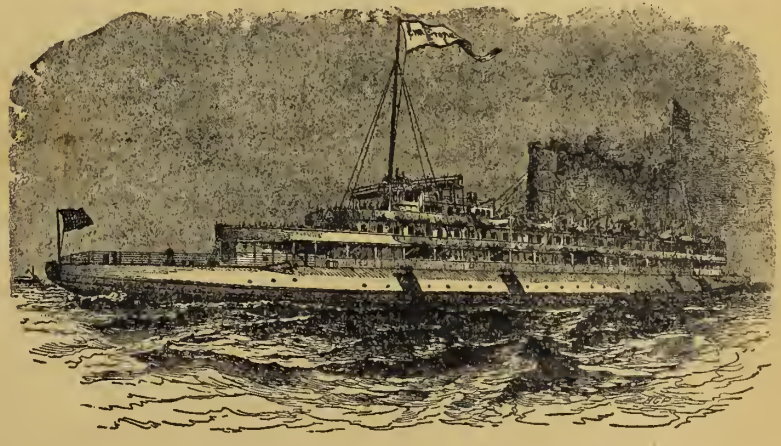
Greenland whale.

the mouth. The typical representative of this family is the common or Greenland whale, so valuable on account of the oil and whalebone which it furnishes. It is principally found in the Arctic seas, but it is also found in considerable numbers in many other parts of the world. Its length is usually about 60 feet, and its greatest circumference from 30 to 40 feet. Allied to the Greenland whale is the rorqual. It often measures about 100 feet in length, and from 30 to 35 feet in circumference. The sperm whale or cachalot averages from 50 to 70 feet in length. Some species of the Delphinidæ or dolphin family are also known as whales. Whale fishing for the sake of the oil and whalebone has been an important industry since the 12th century. It was for long prosecuted with great energy by the Dutch, English, French, and Americans, but of recent times it has greatly decreased, chiefly on account of the scarcity of whales. The instruments used in the capture of the whale are the harpoon and the lance. The harpoon is an iron weapon about 3 feet in length, terminating in an arrow-shaped head. This is attached to a line, and is thrown at the whale by hand, so as to transfix it, or is discharged from a small swivel cannon placed in a boat. The lance is a spear of iron about 6 feet in length, terminating in a thin, sharp steel head. These, with the necessary lines, boats, etc., are all the apparatus required for capturing the whale. When captured the animal is cut up, the blubber boiled and the oil extracted, and the whalebone dried.

WHALEBACK STEAMERS, vessels in which the hull has a form roughly resembling the back of a whale. The designer was Alexander McDougall, a seacaptain of Duluth, Minn., who brought them out about 1890. They have proved to be very moderate in their demand for power. The section of the vessel is oval, the decks as well as the bilges are rounded, and driven by steam-power solely, and are both easy to propel and quiet in motion. The seas are taken over them without obstruction, and produce no effect upon the movement of the ship. Whaleback steamers have been used mainly as grain-carriers, but the Christopher Columbus was employed throughout the period of the World's Columbian exposition, in Chicago in 1894, to carry passengers between the city and the exposition-grounds, and proved a great success. She now plys as a passenger-steamer between Chicago and Milwaukee, carrying as many as 3000 passengers. This ship is 362 feet over all, 42 feet beam, and 24 feet deep, driven by triple-expansion engines of 2,600 horse-power. Her average speed is nearly 20 miles an hour.

WHALEBONE, or **BALEEN,** a well-known elastic horny substance which hangs down in thin parallel plates from the sides of the upper jaw of whales. These plates vary in size from a few inches to 12 feet in length; the breadth of the largest at the thick end, where they are attached to the jaw, is about a foot, and the average thickness is from four to five-tenths of an inch. From its flexibility, strength, elasticity, and lightness, whalebone is employed for many special purposes, but it is now rather an expensive material. In commerce the plates of baleen are often called whale-fins.

WHEAT, the most important species of grain cultivated in the United States and Europe, and a very important crop in India, Australia, etc. It grows readily in almost every climate; but its natural home seems to be a temperate climate, and the soils best adapted for its culture are rich clays and heavy loams. Of cultivated wheats there are many varieties, the differences, however, being mostly due to soil, climate, and mode of cultivation. Three primary varieties may be mentioned: (a) winter or unbearded wheat; (b) summer or bearded wheat; (c) spelt or German wheat, which is of much less value than the others, but grows on poorer soils and more elevated localities. White wheat and red wheat are names applied according to the color of the grain, the red sorts being generally hardier than the white, but of inferior quality, and the yield is less. Winter wheat is sown in the autumn, with the view of being harvested the following year; summer wheat is sown in the spring of the year in which it is reaped.



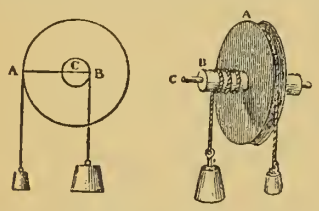
A whaleback steamer, the Christopher Columbus.

WHEATON, Loyd, American soldier, was born in Fairfield, Calhoun county, Mich., in 1838. He entered the federal army as a first sergeant in the Eighth Illinois Infantry and became a captain in March, 1862, a major in August, 1863, and a lieutenant-colonel in November, 1864, in the volunteer service. He took part in Custer's expedition to the Black Hills. In May, 1898, during the Spanish-American war, he was made a brigadier-general of volunteers, and commanded for a short time the first division of the Seventh

Army Corps in Cuba. He was sent to the Philippines early in 1899; in 1900 became commander of Northern Luzon. He was made major-general in the regular army in 1901, and in July, 1902, was retired from the service.

WHEATSTONE, Sir Charles, scientific investigator and discoverer, born at Gloucester in 1802, died at Paris in 1875. In 1823 he attracted the attention of men of science by the publication in Thomson's Annals of Philosophy of a paper entitled New Experiments on Sound. This was followed by a number of other papers, some of them describing inventions of his own, all of which are remarkable for their ingenuity. In 1836 he exhibited at King's college experiments showing the velocity of electricity, which suggested to him the idea of applying his apparatus to telegraphing, and in 1837, in conjunction with W. F. Cooke, he took out the first patent for the electric telegraph. He was a fellow of the Royal Society from the year 1836, and in 1868 he received the honor of knighthood.

WHEEL, an instrument of torture formerly employed in France and Germany, on which the criminal was placed with his face upward, and his legs and arms extended along the spokes. On the wheel being moved round the executioner broke the wretch's limbs by



Wheel and axle.

successive blows with a hammer or iron bar, and after a more or less protracted interval put an end to the sufferings of his victim by two or three severe blows, called coups de grâce (mercy strokes), on the chest or stomach or by strangling him. In Germany its use lingered down till the beginning of the 19th century.

WHEEL AND AXLE, one of the mechanical powers, which consists of a wheel round the circumference of which a string may be wound, having a small weight attached to its free end, and an axle whose circumference, being smaller than that of the wheel, will sustain a heavier weight at the end of a string which is wound upon it in the opposite direction to that of the string on the wheel. The wheel and axle is merely a case of the lever, c in the figures being the fulcrum, while a c and b c, the radius of the wheel and axle respectively are the longer and shorter arms of the lever. Hence the small weight in ounces or other measure of weight multiplied by the radius of the wheel is equal to the balancing weight on the axle multiplied by the radius of the axle. In a great many cases a crank takes the place of the wheel, the circle described by the handle corresponding to the circumference of the wheel. The common winch, the windlass, the capstan, and the tread-mill are so many applications of the wheel and axle; and the same principle may be adapted to a train of wheel-work wherein motion is regulated and power acquired.

WHEELING, a city and port in West Virginia, capital of Ohio county, on the east or left bank of the Ohio river, 92 miles below Pittsburg. It is the most important place on the river between Pittsburg and Cincinnati, and in respect to trade, manufactures, and population the most considerable town of the state. Coal is largely worked in the neighborhood; there are iron-foundries and forges, nail, glass, and paper works; cotton, silk, and steam-engine manufactories and a brisk traffic by river and railroad. Pop. 49,642.

WHEELER, Benjamin Ide, American educator, was born at Randolph, Mass., in 1854. In 1886 he became professor of comparative philology in Cornell university, and two years later professor of Greek. In 1899 he became president of the University of California. Among his published works are: Der griechische Nominalaccent, Analogy, and the Scope of Its Application in Language, Introduction to the Study of the History of Language, in collaboration with H. A. Strong and W. S. Logeman, Principles of Language Growth, The Organization of Higher Education in the United States, and Life of Alexander the Great.

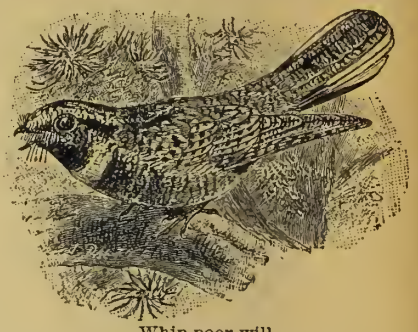
WHEELER, Joseph, American soldier, born in Augusta, Ga., in 1836. He entered the confederate service in 1861 as colonel of an Alabama regiment of infantry, to serve in the west. He was present at the battle of Shiloh, and the same year led the cavalry in the army under Gen. Braxton Bragg. In 1862 he was made brigadier-general, and January 19, 1863, was promoted to be major-general. He commanded the cavalry at the battle of Chickamauga, defeated Stoneman in July, 1864, capturing that officer, with many prisoners and all his artillery, and the same year defended Savannah, Ga., and Aiken, S. C. On February 28, 1865, he was promoted to be lieutenant-general, and continued in charge of the cavalry under Gen. Joseph E. Johnston until the end of the war. Later he was sent to congress, and in January, 1888, became a regent of the Smithsonian institution. In 1880 he was elected to congress as a democrat and was a member continuously until 1899. In May, 1898, he was appointed by President McKinley a major-general of volunteers. He commanded the troops in the engagement of Las Guasimas, and was senior field officer in the battle of San Juan Hill and commanded a brigade in the Philippine islands; was commissioned a brigadier-general in the regular army in 1901 and retired in September, 1901. He published The Santiago Campaign 1898. He died in 1906.

WHEELER, William Almon, vice-president of the United States, from 1877 to 1881, was born at Malone, N. Y., 1819. He was admitted to the bar in 1843, served several terms in the state legislature, and as president of the state constitutional convention of 1867, and was a member of the house of representatives from 1861 to 1877. He was nominated for the vice-presidency in 1876 by the republicans, and was seated, after a contest before the electoral commission. He died in 1887.

WHERRY, a light, shallow boat, seated for passengers, and plying on rivers.

WHEY. See Milk.

WHIP-POOR-WILL, the popular name of an American bird allied to the European goat-sucker or night-jar, and so called from its cry. It is very common in the eastern parts of the United


Whip-poor-will.

States; is about 10 inches long, and feeds on flying moths and other insects. Its note is heard in the evening, or early in the morning. During the day these birds retire into the darkest woods.

WHIRLPOOL, a circular eddy or current in a river or the sea produced by the configuration of the channel, by meeting currents, by winds meeting tides, etc., as those of Charybdis, the Maelstrom, and Corryvreckan.

WHIRLWIG, WHIRLWIG-BEETLE, a beetle which abounds in fresh water and may be seen circling round on its surface with great rapidity. Its eyes are divided by a narrow band, so that, although it has only two, it is made to look as if it had four.

WHIRLWIND, a violent wind moving in a spiral form, as if moving round an axis, this axis having at the same time a progressive motion. Whirlwinds are produced chiefly by the meeting of currents of air which run in different directions. When they occur on land they give a whirling motion to dust, sand, etc., and sometimes even to bodies of great weight and bulk, carrying them either upward or downward, and scattering them about in all directions. At sea they often give rise to water-spouts. They are most frequent and violent in tropical countries.

WHISKY, the name applied to an ardent spirit distilled generally from barley, but sometimes from wheat, rye, sugar, molasses, etc. There are two chief varieties of whisky—viz. malt-whisky and rye-whisky. The former variety is of finer quality, and made chiefly from malted barley or bere, and sometimes, though rarely, from rye. The latter is made from various substances, as sugar, molasses, potatoes, but principally from unmalted grain, as Indian corn, barley, oats, etc., dried and ground up. The grain most largely used is Indian corn. Grain-whisky requires the same process of fermentation and distillation as malt-whisky, but is cheaper, from its greater yield, and because it saves the expensive process of malting. Though coarser, it is stronger,

but if kept long enough is equally good. See Distillation.

WHIST, a well-known game at cards. The game is played with the full pack of fifty-two cards by four persons, two being partners against the other two, each player receiving thirteen cards dealt out one by one in rotation. The last card dealt is turned face up, and is called the trump card; it gives a special power to the suit to which it belongs. The cards rank as follows: ace (highest), king, queen, knave, and the others according to their number of pips. Play is commenced by the person on the left hand of the dealer laying down a card face up on the table, the other players following in succession with cards of the same suit if they have them. When all have played the player who has laid the highest card takes the four cards laid down, which constitute a trick. The winner of the trick then leads, as the first of a new trick, the winner of which becomes the leader, and so on. When a player cannot play a card of the same suit, he may play one of the trump suit, and take the trick, or lay one of a different suit, which gives him no chance of winning the trick. When the hand is played out the score is taken as follows: the partners who conjointly gain the majority of tricks score one point for every trick taken above six. The ace, king, queen, and knave of the trump suit are called honors, and count one each for the side who holds them; if one side hold three honors, they count two by honors, as the opposite side can have but one; if one side hold all the honors, four by honors is counted; should the honors be equally divided neither side counts, the honors being then said to cancel each other. In long whist, an obsolescent form of the game, ten of these points made a game. In short whist, the game now generally played, the number has been reduced to five, and in this form it is common to count by tricks alone. A rubber consists of a series of three games, and is won by the side that secures two of them. Should one party gain two games in succession, the third of the rubber is not played.

WHISTLER, James Abbott McNeill, painter, was born in Lowell, Mass., in 1834; was educated at the United States Military academy, studied drawing and painting in Paris, France, and in 1863 settled in London, England. He held original views concerning his art, and has made interesting experiments with color, in quest of novel effects. Mr. Whistler was also celebrated as an etcher and was the author of etchings and paintings of established reputation and worth. His Little White Girl achieved a signal success. His Little French Series, representing Parisian views, some of a genre character, established his reputation, and the wonderful Thames Series placed him in the first rank. His later subjects were taken from Holland, France, and other localities which he visited, but the best known are the First Venice Series and the Second Venice Series. They are the culmination of his etching, and place him in the same rank with Rembrandt, the world's greatest etcher, whom he even excels in sclection and subtlety of execution. His portraits of Carlyle, Rose Whistler, Lady Archibald Campbell, Theodore Duret, Comte de Montesquieu, Sarasite, the violinist, are masterful. In 1887 he was elected president of the Royal Society of British Artists. At the close of 1889, when he received the Cross of the Legion of Honor (Officer, 1891). He was made honorary member of the academies of Munich, Dresden, Rome, etc., Knight of the Bavarian Order of Saint Michael, and in 1900 he received the gold medal at the Paris exposition. He died in 1903.

WHITE, Andrew D., college president and diplomat, was born in Homer, N. Y., 1832. In 1858 he became professor of history and English literature at the University of Michigan. In 1863 he was elected to the New York state senate. At the expiration of his term in the senate, he was elected first president of Cornell university, a position which he held until 1885, when he resigned on account of ill health. In 1867 and 1868 he visited Europe to make a study of foreign school organization. In 1871 he was a member of the United States commission on San Domingo. And from 1879 to 1881 he was minister to Germany, and from 1892–4 to Russia, and from 1897 to 1902 ambassador to Germany. In 1888 he was elected regent of the Smithsonian institution in the place of Asa Gray, and in 1899 member of the peace commission at The Hague. He is the author of many valuable scientific works.

WHITE, Edward Douglas, associate justice of the supreme court of the United States, was born in Louisiana, in 1845. He was educated at Mt. St. Mary's college, Emmetsburg, at the Jesuit college of New Orleans, and the Georgetown university. He served in the confederate army and afterward practiced law. In 1874 he was elected state senator of Louisiana, and was appointed associate justice of the supreme court of Louisiana in 1878, and elected to the United States senate in 1891. In 1894, while serving as senator, he was appointed associate justice of the supreme court of the United States.

WHITE, Richard Grant, American author, was born in New York City in 1825. His literary tendencies drew him from law, and his musical, dramatic, and art criticisms gave him prominence. He occupied a place among the most learned Shakespearian scholars. He died in 1885.

WHITE, Hugh Lawson, American statesman, was born in Iredell county, N. C., in 1773. He served in the Cherokee war as a private. In 1825 he succeeded Gen. Andrew Jackson in the United States senate. He stood as a candidate for the presidency in 1836 and received the electoral votes of Georgia and Tennessee. He died in 1840.

WHITE, John Blake, American painter, was born at Eutaw Springs, S. C., in 1781. His best known painting was the Unfurling of the United States Flag in the City of Mexico. Other paintings by him include the "Battle of New Orleans," "General Marion inviting the British Officer to Dinner," etc., etc. He was repeatedly elected to the South Carolina legislature. He died in 1859.

WHITE-BAY, a tree that grows in wet ground in the United States. The bark and seed-cones are used as tonics.

WHITE-BEAR. See Bear.

WHITEBOYS, an illegal association formed in Ireland about 1760. The association consisted of starving day-laborers, evicted farmers, and others in a like condition, who used to assemble at nights to destroy the property of harsh landlords or their agents, the Protestant clergy, the tithe collectors, or any others that had made themselves obnoxious in the locality. In many cases they did not confine their acts of aggression merely to plunder and destruction, but even went the length of murder.

WHITEFIELD, George, founder of the Calvinistic Methodists, was born in 1714 at Gloucester. At the age of eighteen he became acquainted with the Wesleys, and joined the small society which procured them the name of Methodists. In 1738 he went to the American settlement of Georgia, where his ministrations gave great satisfaction to the colonists. In the following year he returned to England to procure subscriptions for building an orphan-house in the settlement. Having taken priest's orders, he repaired to London, where the churches in which he preached proved incapable of holding the crowds who assembled to hear him. He now adopted preaching in the open air. After visiting many parts of England, Scotland, and Wales he again returned to America, and remained there nearly four years. Soon after his return he was introduced to the Countess of Huntingdon, who made him one of her chaplains. On his seventh visit to America, he died at Newburyport, Mass., 1770.

WHITEHALL, a locality in Westminster, where are the admiralty office and that of the commander-in-chief (the Horse Guards), etc. On the bank of the Thames was a palace called Whitehall, built before the middle of the 13th century. In 1530 it became the residence of the court, but in 1695 was destroyed by fire, excepting the Banqueting Hall, added by James I., from a design of Inigo Jones, in 1619. Charles I was executed in front of Whitehall and Cromwell died there.

WHITE HOUSE, the official residence of the president of the United States, in Washington, is a two-story white freestone edifice, painted white, 170 by 86 feet. It contains the private apartments of the president on the second floor and reception rooms on the first floor. Among the latter are the famous East room, 80 by 40 feet, used for public receptions; the Blue room, used for diplomatic and social functions; and the Red and Green rooms. The original executive mansion was begun in 1792 and first occupied by President Adams in 1800. It was burned by the British in 1814, and rebuilt in 1818. The White House is surrounded by an attractive park, in which during the summer music is provided by the Marine band.

WHITE LEAD. See Ceruse.

WHITE MOUNTAINS, a group in the northeast of the United States, in New Hampshire, belonging to the Alleghanies. They have fine scenery and

are a favorite summer resort. The culminating point is Mount Washington, 6288 feet.

WHITE-OAK, a species of oak, a native of the United States of America and of parts of Canada.

WHITE-PINE, one of the most valuable and interesting species of pines, common to Canada and the northern parts of the United States. See Pine.

WHITE RIVER, (1) a river of Arkansas, with a course of 800 miles. It joins the Mississippi above the influx of the Arkansas river, and has several important affluents. Together with its tributaries it affords 500 miles of boat navigation. (2) A river in Indiana, formed by the confluence of the East and West Forks, emptying into the Wabash near Mount Carmel.

WHITE SEA, a large gulf of the Arctic ocean, penetrating into Northern Russia to the distance of between 300 and 400 miles. It has an area of about 47,000 sq. miles, with a coast-line of 1000 miles. It is navigable only from the middle of May to the end of September, being frozen over the rest of the year. Two canals, uniting the Dwina with the Volga and the Dnieper, connect the White sea with the Caspian and Black sea.

WHITE VITRIOL, sulphate of zinc. See Zinc.

WHITEWASH, a composition of lime and water, or of whiting, size, and water, used for whitening walls, ceilings, etc.

WHITING, a well-known fish belonging to the cod tribe. It abounds on all the British coasts, and in the seas of Northern Europe generally, and exceeds all the other fishes of its tribe in its delicacy and lightness as an article of food. It does not usually exceed 1½ lbs. in weight.

WHITING, a name for chalk, cleared of its grosser impurities, and employed as a whitewash and as a polishing powder for brass, silver, etc.

WHITLOW, in surgery, is an inflammation affecting the skin, tendons, or one or more of the bones of the fingers, and generally terminating in an abscess. There is a similar disorder which attacks the toes. Whitlows differ very much in their degree of violence and in their depth and extent. The usual exciting causes of whitlows are various external injuries, as pricks, contusions, etc. The lodgment of a thorn or splinter in the part is another frequent cause. They are much more common in young, healthy persons than in others, and in many cases occur without any assignable cause.

WHITMAN, Marcus, American pioneer, was born at Rushville, N. Y., in 1802. In 1836 with three other missionaries, he started westward. The party took the first wagon across the Rocky mountains, reached the Columbia river on May 21st, and located near the site of the present Walla Walla, Wash. On November 29, 1847, the Cayuse Indians attacked the station, murdered Whitman, his wife, and twelve other persons, and took the other residents prisoners. It has been claimed that Whitman's visit to the East in 1842–3 prevented the cession to England of the American claim to Oregon.

WHITMAN, Walt, an American poet born in Long Island, in the state of New York, in 1819. In his early days he worked at the carpentry trade and at printing. Subsequently he became a school teacher, and wrote for the press. During the civil war Whitman devoted himself to the care of the wounded in the hospitals of Virginia and Washington, and at the end of the war came out with his constitution irretrievably broken. He subsequently entered the government service in the capital, remaining there till 1874. He then removed to Camden, N. J., where he died in 1892. In 1887 his English admirers raised a subscription in his behalf. His poems are like nothing else in the language, rough, rude, chaotic even, but strongly individual. The best known are: Leaves of Grass, Drum Taps, and Democratic Vistas. Specimen Days and Collect, and November Boughs, contain his prose writings, old and new; though it is difficult in the case of Whitman to distinguish prose from poetry in the ordinary senses of the terms.

WHITNEY, Eli, American inventor, born at Westborough, Mass., in 1765, and educated at Yale college, where he graduated in 1792. Going then to Georgia as a teacher, he there invented a machine for separating the cotton from the seed. Returning to the north he started business in conjunction with a man named Miller as a manufacturer of cotton gins. But the profits of the business, together with 50,000 dollars voted to him by the state of South Carolina, were swallowed up in his lawsuits in defense of his rights. He subsequently went into the manufacture of firearms, for which he received a government contract, and so made a fortune. He died in 1825.

WHITNEY, Josiah Dwight, American geologist, was born at Northampton, Mass., in 1819. Through his studies in the mining regions of the United States he became the foremost authority of his day on economic geology. The best known of his writings are The Mineral Wealth of the United States, The Geological Survey of California, Reports on the Geology of the Lake Superior Land Region and of Ohio. He died in 1896.

WHITNEY, William Collins, American politician, was born at Conway, Mass., in 1841. From 1875 to 1882 he was corporation counsel to New York. He was active in the state campaign of 1882 which resulted in the election of Grover Cleveland as governor. He was appointed by President Cleveland in 1885 secretary of the navy. In 1892 he successfully managed the Cleveland presidential campaign. He died in 1904.

WHITNEY, William Dwight, a distinguished American philologist, born in 1827 at Northampton, Mass., studied at Williams' college, Williamstown, and at Yale college, giving special attention to Sanskrit. He also studied Sanskrit in Germany from 1850 to 1853, returning in the latter year to America. The first-fruits of his studies in Sanskrit was an edition of the Atharva-Veda. He had previously been made professor of Sanskrit and of comparative philology at Yale college. Among his independent works may be mentioned, Language and the Study of Language, Oriental and Linguistic Studies, Life and Growth of Language, Sanskrit Grammar, German Grammar, etc. He was chief editor of the Century Dictionary. He died in 1894.

WHITSUNTIDE. See Pentecost.

WHITTIER, John Greenleaf, American poet, was born of Quaker parents in 1807 at Haverhill, Mass., and educated at the academy of his native place. In his younger days he worked on his father's farm and learned the shoemaking trade, but early began to write for the press, and in 1831 published his first work, Legends of New England, in prose and verse. He carried on the farm himself for five years, and in 1835–36 he was a member of the legislature of

John G. Whittier

Massachusetts. After having edited several other papers he went to Philadelphia to edit the Pennsylvania Freeman, an anti-slavery paper, the office of which was burned by the mob in 1839. In the following year he returned to his native state, settling at Amesbury, where (or at Danvers, Mass.) he afterward chiefly resided. Among the numerous volumes of poetry which he from time to time gave to the world the following may be mentioned: Moll Pitcher, Lays of My Home, Miscellaneous Poems, The Voices of Freedom, Songs of Labor, The Chapel of the Hermits, Home Ballads and Poems, Snow Bound, In War-time, National Lyrics, Ballads of New England, Miriam, Mabel Martin, Hazel Blossoms, The King's Missive, Poems of Nature, St. Gregory's Guest, etc. Whittier's poems are distinguished by their freshness, their quiet power, and intense feeling. He died in 1892.

WHOOPING-COUGH. See Hooping-cough.

WHORL, in botany, a ring of organs all on the same plane.

WHORTLEBERRY, a genus of shrubby plants, with alternate leaves, pink or red bell-like flowers, and berrics of a dark purple, bluish, or red color. The common whortleberry, bilberry, or blaeberry is a hardy plant, which grows in forests, heaths, and on elevated moun-

tains. Whortleberries in North America are generally known as huckleberries.

WICH'ITA, a city in Kansas, situated on the east bank of the Arkansas river. It is the most important railway center in the state, being the junction of seven different lines. Wichita has sprung into existence since 1870. Pop. 30,000.

WICKLIFFE, Wycliffe, etc., John, was born about 1320 at Hipswell, near Richmond, in Yorkshire. He was educated at Oxford; was elected master of Balliol college, and in 1361 was appointed rector of Fylingham, or Fillingham, in Lincolnshire. He afterward became doctor of theology and teacher of divinity in the university; and for some time held the living of Ludgershall, in Buckinghamshire. Disputes existed at this period between Edward III. and the papal court relative to the homage and tribute exacted from King John, and the English parliament had resolved to support the sovereign in his refusal to submit to the vassage. Wickliffe came forward on behalf of the patriotic view and wrote several tracts, which procured him the patronage of John of Gaunt, duke of Lancaster. In some of his utterances he is said to have styled the pope Antichrist, charging him with simony, covetousness, ambition, and tyranny. His opinions began to spread,

John Wickliffe.

and the church grew alarmed. In May following the pope addressed three bulls to the king, the primate, and the University of Oxford, commanding them to take proceedings against Wickliffe, who in answer to the prelate's summons appeared in the chapel of Lambeth. Proceedings were, however, stopped by order of the queen-mother, and Wickliffe was dismissed with simply an injunction to refrain from preaching the obnoxious doctrines. In 1381 he publicly challenged the doctrine of transubstantiation, and his heresies were condemned by the theologians of Oxford, as well as by a provincial council called by Archbishop Courtenay and held at the Blackfriars, London, in 1382. Wickliffe was proclaimed a heretic, his works were condemned to be burned, and some of his followers were imprisoned; but he was allowed to retire unmolested to his rectory of Lutterworth. A stroke of paralysis terminated his life on the 31st of December, 1384. About thirty years after his death his doctrines were condemned by the Council of Constance, and in 1428 his remains were dug up, burned, and the ashes cast into the Swift. The influence of his doctrines spread widely on the continent, and may easily be traced in the history of the Reformation. Wickliffe was the author of an enormous number of writings in Latin and English, and he ranks undoubtedly as the father of English prose. Many of his writings still remain in MS., and it was not until 1850 that the whole of his Bible appeared.

WICKLOW, a maritime county of Ireland, in the province of Leinster, bounded by the county of Dublin, St. George's channel, Wexford, Carlow, and Kildare; greatest length, 40 miles; breadth, 33 miles; area, 500,178. Its chief towns are Bray, Arklow, Wicklow, and Baltinglass. Pop. 60,679.

WIDGEON, or **WIGEON,** a species of natatorial bird allied to the Anatidæ or ducks. The American widgeon is most abundant in Carolina, and is often called bald-pate, from the white on the top of the head.

WIESBADEN (vēs'bä-dĕn), a town in Prussia, province of Hesse-Nassau, finely situated at the foot of Mt. Taunus, in the valley of the Salzbach, about 2 miles from the Rhine. It is noted for its hot medicinal saline springs (the temperature of the Kochbrunnen being 156° F.), and it attracts annually upward of 60,000 visitors. The chief buildings are the Kursaal, a new town-house, an old and a new palace, library, museum, English church, and other churches, theater, etc. Pop. 86,086.

WIFE. See Husband and Wife.

WIG, an artificial covering of hair for the head, used generally to conceal baldness, but formerly worn as a fashionable means of decoration. Formally curled wigs are still worn professionally by judges and lawyers in Breat Gritain, and wigs are commonly used in making up for the stage.

WIG'AN, a municipal, parl., and county borough, Lancashire, England, on the Douglas, 21 miles northeast of Liverpool. Wigan stands in the center of an extensive coal-field, and its manufactures consist chiefly of calicoes, fustians, and other cotton goods, linens, checks, cotton twist, etc., besides iron-foundries, iron-forges, iron-rolling mills, chemical works, and corn and paper mills. Pop. 60,770.

WIGFALL, Lewis T., American lawyer and soldier, was born in South Carolina in 1816. He was a member of the Texas state legislature, at intervals, from 1849 to 1860, and was during the latter year elected United States senator. He entered the confederate army as an aide-de-camp to Gen. P. G. T. Beauregard, and received the surrender of Fort Sumter from Major Anderson in person. He was promoted to be brigadier-general, and subsequently represented Texas in the confederate congress. After the war he visited Europe, and in 1873 resumed the practice of law at Baltimore. He died in 1874.

WIGGIN, Kate Douglas, American, author, was born in Philadelphia, Pa., in 1857. Among her published stories are: The Story of Patsy, A Cathedral Courtship, Penelope's Progress, Penelope's Experience in Ireland, Diary of a Goose Girl, The Birds' Christmas Carol.

WIGHT, Isle of, an island off the south coast of England, in the county of Hants, separated from the mainland by Spithead and the Solent; 23 miles in length, 13 miles broad; area, 93,341 acres. The main slope of the island is to the north, as is shown by the course of its chief streams, the Medina, Yar, and Eastern Yar. The chief towns are Newport (the capital), Ryde, Cowes, Ventnor, Bembridge, Freshwater, Yarmouth and the fashionable health-resorts of Sandown and Shanklin. Near Cowes is Osborne House, a favorite residence of the late Queen Victoria. Carisbrooke castle is an interesting ruin. Pop. 82,387.

WILCOX, Ella (Wheeler), an American journalist and poet, was born in 1855. She was at an early age a frequent contributor to journals. Among her collections of verse may be named: Maurine, Poems of Passion and Poems of Pleasure. An Erring Woman's Love. Among her prose writings are: Mal Moulée, a novel; Men, Women, and Emotions: A Double Life, Sweet Dangers. She also published a children's book, The Beautiful Land of Nod. Her books of poems are very popular and enjoy a very large sale.

WIGWAM, an Indian cabin or hut, so called in North America. These huts are generally of a conical shape, formed of

Wigwams of North American Indians.

bark or mats laid over stakes planted in the ground and converging at top, where is an opening for the escape of the smoke.

WILBERFORCE, William, English philanthropist, born at Hull 1759, died 1833. After completing his education at St. John's college, Cambridge, he was, in 1780, elected member of parliament for his native town; and in 1784 he was returned by the county of York. In 1791 he moved for leave to bring in a bill to prevent further importation of African negroes into the British colonies. Year after year he pressed this measure, but was always defeated till 1807, when it was passed during the short administration of Fox. He then devoted his energies to bring about the total abolition of slavery, and three days before his death he was informed that the House of Commons had passed a bill which extinguished slavery in the British colonies.

WILD-DUCK. See Duck.

WILDE, Oscar, Irish poet, born at Dublin in 1856. He studied first at Trinity college, Dublin, and finally at Magdalen college, Oxford, graduating at the latter institution in 1878. About

this time he affected to have become an apostle of æstheticism, and was an object of considerable interest by reason of his dress and manners. He visited Greece in 1879, and in 1881 lectured in the United States. From 1893 to 1895 he won considerable success as a writer of comedies remarkable for their sparkling epigrammatic cleverness — Lady Windermere's Fan and The Importance of Being Earnest among them; also Salome, a drama in the mediæval style. The most widely read of his books was The Picture of Dorian Gray, a novel. The end of his life was sad. Convicted in 1895 of a grave offense against morality, he was imprisoned for two years, during which he wrote one of his strongest poems, A Ballad of Reading Gaol. After his release he went to Paris, where he arranged for the publication of his greatest work, De Profundis. He died November 30, 1900.

WILKES, Charles, American naval officer, born in New York City April 3, 1798. He entered the United States navy in 1818, as midshipman, and was promoted lieutenant in 1826. At the outbreak of the rebellion he was engaged in the West India waters, searching for the confederate cruiser Sumter, when he encountered the British steamer Trent, engaged in conveying two confederate commissioners, Mason and Slidell, to England and France. He demanded the two officials, and bore them as prisoners of war to Boston harbor. His action nearly involved Great Britain and the United States in war. Wilkes was, however, promoted to be commodore. Later, and until the close of the war, he was attached to the West Indian squadron, and was retired July 25, 1866, with the rank of rear-admiral. He died in 1877.

WILKESBARRE (wilks'ba-re), capital of Luzerne county, Pennsylvania, on the north branch of the Susquehanna, about 100 miles northwest of Philadelphia. It is the center of a rich anthracite coal-field, and has manufactures of machinery, locomotives, cars, mining engines and tools, iron castings, ropes, brewery products, etc. Pop. 61,416.

WILKIE, Sir David, one of the most famous painters of the British school, was son of the minister of Cults, near Cupar, Fifeshire, born there 1783, died at sea off Gibraltar 1841, while returning from a visit to Palestine. He was elected an associate of the Academy in 1809, and in 1811 became an academician. In 1825, owing to ill-health, he made an extended tour through Italy, Germany, and Spain. In the latter country his style as a painter underwent a marked change when he came under the influence of Velasquez and Murillo. Returning after three years to England, he was appointed (1830) painter in ordinary to the king, and was knighted in 1836. His pictures, such as the Blind Fiddler, Rent Day, Cottars' Saturday Night, Blind Man's Buff, Chelsea Pensioners reading the Gazette of Waterloo, John Knox preaching before the Lords of the Congregation, The Entrance of George IV. into Holyrood, The Spanish Council of War, The Maid of Saragossa, Napoleon and Pius VII., and The Queen's First Council, are well known.

WILKINSBURG, a town in Allegheny co., Pa., on the Penn. railroad; 7 miles e. of Pittsburg. It is closely identified with the business interests of Pittsburg. Pop. 13,602.

Sir David Wilkie.

WILL, The, is usually described as one of the three faculties by means of which the human mind finds expression, the other two being thought (or intellect) and feeling (or emotion). It is the faculty by which a choice is made between two courses of action, as distinct from the exercise of this power, which is more fitly described as volition. This faculty of the will, in the maturity of its complex power, is usually conceived as having been educated by a process of sensation; pleasure and pain giving rise to the motives by which the active determining energy is set in motion. Yet the exact relation between will and motive, the question whether the motive governs the will or the will determines the motive, has never been authoritatively settled. Thus the "freedom" of the will has, until now, been maintained as a metaphysical and theological belief in opposition to the doctrine of "necessity." Aristotle in his Ethics incidentally asserted the freedom of the will; with this the Stoics and Epicureans agreed; as did also Justin Martyr, Origen, and St. Augustine; while its later adherents were Reid, Stewart, Kant, and Hamilton. On the contrary, among the early Christians, the Gnostics denied the freedom of the human will; so also did Spinoza; while the more modern advocates of the doctrine of "necessity" were Hobbes, Hume, Jonathan Edwards, and John S. Mill.

WILL, or **TESTAMENT,** in law, the legal declaration of a man's intentions as to what he wills to be performed after his death in relation to his property. In England, as also in the British colonies and the United States, no will, whether of real or personal estate, is to be valid unless it be in writing, and signed at the foot or end by the testator, or by some person in his presence, and by his direction. Such signature must be made and the document acknowledged as his will by the testator in the presence of two or more witnesses present at the same time, and such witnesses must attest and subscribe the will in the presence of the testator. Any alteration or obliteration must also be duly signed by the testator and the witnesses. A will may be revoked by cancelling or obliteration, tearing, or burning; or by a new will expressly revoking the former, or containing provisions inconsistent with it.

WILLARD, Francis Elizabeth, American reformer, was born at Churchville, N. Y., in 1839. In 1874 she was corresponding secretary of the National Women's Christian Temperance Union, and later was president of the W. C. T. U. of Illinois; president of the N. W. C. T. U. 1879–97. She was one of the founders of the prohibition party; editor of the Chicago Post in 1879, and later of The Union Signal. In 1883 she organized the World's Women's Christian Temperance Union, and was made its president at the first convention at Boston, in 1891. Her works included Women and Temperance, Nineteen Beautiful Years, Women in the Pulpit, and Glimpses of Fifty Years. She died in 1898.

WILLET, a bird of the snipe family found in America. It is a fine game bird, and its flesh and eggs are prized for food. Called also stone curlew.

WILLIAM I., surnamed the Conqueror, King of England, and Duke of Normandy, born 1027, was the natural son of Robert, duke of Normandy, by Arlotta, the daughter of a tanner of Falaise. His father having no legitimate son, William became the heir at his death, and ruled Normandy with great vigor and ability. The opportunity of gaining a wider dominion presented itself on the death of his second cousin Edward the Confessor, king of England, whose crown he claimed. To enforce this claim he invaded England, and the victory of Hastings, in which his rival Harold was killed, ensured his success (1066). He established the administration of law and justice on a firm basis throughout England, conferred numerous grants of land on his own followers, and introduced the feudal constitution of Normandy in regard to tenure and services. He expelled numbers of the English church dignitaries and replaced them by Normans. Toward the end of his reign he instituted that general survey of the landed property of the kingdom, the record of which still exists under the title of Domesday Book. In 1087 he went to war with France, whose king had encouraged a rebellion of Norman nobles. He entered the French territory, and committed great ravages, but, by a fall from his horse at Mantes, received an injury which caused his death at the abbey of St. Gervais, near Rouen (1087).

WILLIAM II., surnamed Rufus, from his red hair, third son of the preceding, was born in Normandy in 1056, and crowned at Westminster in 1087 on the death of his father. A characteristic incident in William's reign was his contention with Anselm, archbishop of Canterbury, regarding church property and the sovereignty of the pope. In 1100 he met his death while hunting in the New Forest, by an arrow shot accidentally or otherwise from the bow of a French gentleman named Walter Tyrrel.

WILLIAM III., Stadtholder of Holland and King of England, son of William II. of Nassau, prince of Orange, and Henrietta Mary Stuart, daughter of

Charles I. of England, was born at the Hague on the 4th of November, 1650. During his early life all power was in the hands of the grand pentionary John De Witt, but when France and England in 1672 declared war against the Netherlands, there was a popular revolt, in which Cornelius and John De Witt were murdered, while William was declared captain-general, grand-admiral, and stadtholder of the United Provinces. In the campaign which followed he opened the sluices in the dykes and inundated the country round Amsterdam, thus causing the French to retire, while peace was soon made with England. In 1677 he was married, and the Peace of Nijmegen followed in 1678. As his wife was heir presumptive to the English throne he had kept close watch upon the policy of his father-in-law James II., and in 1688 he issued a declaration recapitulating the unconstitutional acts of the English king, and promising to secure a free parliament to the people. Being invited over to England by some of the leading men he arrived suddenly at Torbay, November 5, 1688, with a fleet of 500 sail, and with 14,000 troops. Upon landing a great part of the nobility declared in his favor, and in December James fled with his family to France, after which William made his entry into London. The throne was now declared vacant, the Declaration of Rights was passed, and on February 13, 1689, Mary was proclaimed queen and William king. Scotland soon afterward followed England's example (with a partial resistance under Dundee); but in Ireland, whither Louis XIV. sent James with an army, the majority of the Catholics maintained the cause of the deposed king, until they were defeated at the Boyne (1690) and at Aughrim (1691). In the war with France William was less successful; but although he was defeated at Steinkirk (1692) and Neerwinden (1693) Louis was finally compelled to acknowledge him king of England at the Peace of Ryswick in 1697. In 1701 James II. died, and Louis XIV. acknowledged his son as king of England. England, Holland, and the empire had already combined against Louis, and the war of the Spanish succession was just on the point of commencing when William died, 8th March, 1702, from the effects of a fall from his horse, his wife having already died childless in 1694.

William III.

WILLIAM IV., King of Great Britain and Ireland, and third son of George III., born 1765, died 1837. He served in the navy, rising successively to all the grades of naval command, till in 1801 he was made admiral of the fleet. In 1789 he had received the title of Duke of Clarence, and in June, 1830, he succeeded his brother George IV. to the throne.

WILLIAM I., first German emperor, and seventh king of Prussia, second son of Frederick William III., born 22d March, 1797, died 9th March, 1888. At an early age he began the study of military affairs; took part in the campaign of 1813–14 under Blücher; married in 1829 Princess Augusta of Saxe-Weimar; became heir-presumptive to the throne of Prussia on his father's death in 1840; was commander of the forces which suppressed the revolutionary movement (1849) in Baden; created regent in 1858, and on the death of the king, his brother, in 1861 he succeeded to the throne of Prussia. During his reign Prussia defeated Denmark (1846), annexing the duchies of Schleswig-Holstein; quarreled with Austria, and engaged in a campaign which ended in the victory of Sadowa (1866); and went with the rest of Germany to war with France in 1870 (see Germany and France). In this war the operations of the Prussian generals were under the personal supervision of the king. It was at Versailles, during the siege of Paris (January 18, 1871) that he was proclaimed German emperor.

WILLIAM II., King of Prussia and German emperor, eldest son of Frederick III. and Victoria, princess royal of England, was born January 27, 1859; educated at Cassel and Bonn, married Augusta Victoria of Schleswig-Holstein-Augustenburg in 1881, and succeeded his father, 15th June, 1888. Since his accession he has shown a great deal of energy in various directions, such as in military affairs and social questions, and his independent spirit brought about the retiral of Bismarck in 1890.

WILLIAM AND MARY COLLEGE, the second oldest college in the United States, was founded in 1693. The institution received a penny a pound on exports of tobacco and various other privileges, including the profits from the office of surveyor-general of Virginia. The college attained rapid prosperity, but it suffered heavily in the revolution. During the civil war it was occupied by the federal troops and much of its property was destroyed. In 1893 congress granted an indemnity of $64,000 for its losses. The college offers two courses—the collegiate, leading to the degrees of B.A. and M.A., and the normal. The college has a distinguished list of graduates, among them Presidents Jefferson, Monroe, Tyler, and Harrison, Chief Justice John Marshall, and Gen. Winfield Scott. The Phi Beta Kappa fraternity was established at William and Mary in 1776.

WILLIAM THE LION. See Scotland (History).

WILLIAM THE SILENT, Count of Nassau and Prince of Orange, eldest son of William, count of Nassau, was born in 1533. It was by his political prudence that the five northern provinces joined in the Union of Utrecht (1579), and thus laid the foundations of the republic of the United Netherlands. To check this growing power Philip set a price of 25,000 gold crowns upon the head of the prince, with the result that his life was attempted in 1582 at Antwerp, and he was ultimately assassinated at Delft in 1584 by a fanatic named Balthasar Gerard.

WILLIAMS, Roger, a puritan divine and founder of the colony of Rhode Island, North America, was born of Welsh or Cornish parents about 1599, died 1684. He emigrated in 1631 to New England. Here he became pastor of a church at Salem, until his extreme views regarding the jurisdiction of the civil magistrate caused him to be banished from the colony of Massachusetts. Upon this he repaired with a few companions to Rhode Island and founded a settlement, which he called Providence. He was twice in England in connection with a charter for the colony, and there made the acquaintance of Milton and other prominent puritans. He also published A Key into the Language of the Indians of America, The Bloudy Tenent of Persecution for the Cause of Conscience, The Bloudy Tenent yet more Bloudy, and George Foxe digged out of his Burrowes.

WILLIAMSPORT, a town in Lycoming county, Pennsylvania, on the west branch of the Susquehanna. It is a favorite summer residence, and the center of a large lumber trade. Pop. 39,161.

WILLIMAN'TIC, a town in Windham county, Connecticut, an important railroad and industrial center. Pop. 10,415.

WILLIS, Nathaniel Parker, an American author, born at Portland, Maine, 1807; died 1867. His numerous published writings include: Pencilings by the Way, Inklings of Adventure, Loiterings of Travel, People I have Met, Famous Persons and Places, Outdoors at Idlewild, The Convalescent, his Rambles and Adventures.

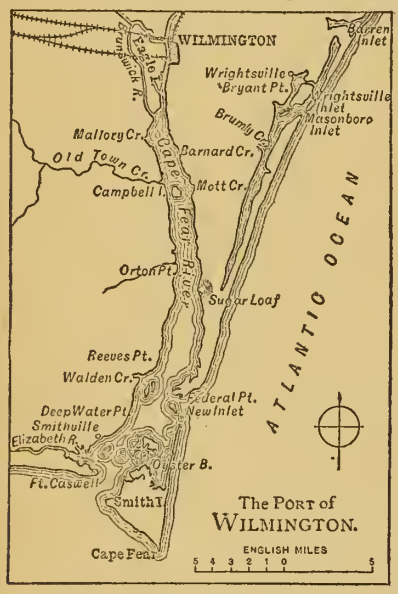
WILLOW, the common name of different species of plants. The species of willows are numerous, about 160 having been described. They are all either trees or bushes, and grow naturally in a moist soil. On account of the flexible nature of their shoots, and the toughness of their woody fiber, willows have always been used as materials for baskets, hoops, crates, etc. The wood is soft, and is used for wooden shoes, pegs, and the like; it is also much employed in the manufacture of charcoal, and the bark of all the species contains the tanning principle. The weeping willow is a native of China, and is a fine ornamental tree. The willow has for long been considered as symbolical of mourning.

WILLOW-WREN, one of the most abundant of the warblers, with a pleasing song. The general color is dull, olive-green above, the chin, throat, and breast yellowish-white, and the belly pure white.

WILMINGTON, a city in Delaware, 28 miles southwest of Philadelphia, near the Delaware between Brandywine and Christiana creeks. It is regularly built,

and has a university, a city-hall, an opera-house, an hospital, cotton and woolen factories, iron-foundries, rolling-mills, potteries, tanneries, breweries, and an extensive trade. Pop. 91,510.

WILMINGTON, a port in North Carolina, on the Cape Fear river, 160 miles n.e. of Charleston. It is the largest town in the state, has turpentine distilleries, machine-shops, etc., and exports large quantities of cotton and lumber. Pop. 22,056.



WILMOT, David, American political leader and jurist, was born in Bethany, Pa. He became prominent as a democratic politician, and from 1845 to 1851 was a member of the national house of representatives. Although a democrat he was opposed to the extension of slavery and in 1843 he moved his famous amendment, known as the Wilmot Proviso. He served in the United States senate 1861–63; and held the office of judge of the United States court of claims until his death in 1868.

WILMOT PROVISO, the war between Mexico and the United States terminated in the acquisition of a vast territory by the latter. Mr. Wilmot, of Pennsylvania, in 1846, offered in congress what became historic as the "Wilmot Proviso," that "no part of the territory thus acquired should be open to the introduction of slavery." This proviso brought heated discussion of the slave question, and civil war and a dissolution of the Union were threatened. The proviso failed of passage.

WILSON, Alexander, the American ornithologist, born at Paisley 1766, died at Philadelphia 1813. He emigrated to America in 1794, where he became a schoolmaster; assisted in editing the American edition of Rees's Cyclopædia; learned drawing, and ultimately determined to write and illustrate a work on American birds, being long interested in the subject of ornithology. The result of his labor was the American Ornithology (seven vols., 1808–13), a work which was left unfinished by Wilson, but was completed by his friend Ord, while a continuation was subsequently published by Lucien Buonaparte. A bronze statue of Wilson by Mossman has been erected in Paisley.

WILSON, Francis, American actor, was born in Philadelphia in 1854. He began his career in a minstrel show. In 1879 he appeared in M'liss with Annie Pixley. After several years in regular comedy, he took up comic opera. In 1889, he made his appearance as a star in The Oolah. Among his later pieces have been: The Lion Tamer, The Devil's Deputy, The Little Corporal, and the Toreador.

WILSON, Henry, statesman, was born in Farmington, N. H., in 1812. In 1840, as the "Natick cobbler," he addressed political meetings, in that year being elected to the Massachusetts legislature. In 1855 he was chosen United States senator. His speeches bear the impress of clear-sighted statesmanship. Mr. Wilson was an ardent antislavery man. In 1872 he was elected vice-president. He died in 1875.

WILSON, James, American cabinet officer, was born in Ayrshire, Scotland, in 1835. He came with his parents to the United States in 1852. He was a member of the Iowa state assembly for three terms. From 1873 to '77 and from 1883 to '85 he was a member of congress. In 1870–74 he was regent of the State University of Iowa, and from 1890–97 he was a director of the agricultural experiment station. In 1897 he became secretary of agriculture in McKinley's cabinet and was reappointed in 1904 by President Roosevelt.

WILSON, John, better known in literature as "Christopher North," was born in Paisley 1785, died 1854. He formed an acquaintance with Wordsworth, Southey, and Coleridge; contributed to Coleridge's Friend, and published a poem called The Isle of Palms (1812). Another poem, The City of the Plague, appeared in 1816. Besides his numerous magazine articles, the most characteristic of which were some of the Noctes Ambrosianæ and those published subsequently as the Recreations of Christopher North, he wrote three tales: The Lights and Shadows of Scottish Life, The Trials of Margaret Lindsay, The Foresters, and An Essay on the Genius and Character of Burns.

WILSON, Woodrow, American educator and historian, was born at Staunton, Va., in 1856. In 1883–85 he studied jurisprudence, history, and political science at the newly opened Johns Hopkins university, from which in 1885 he received the degree of Ph. D. In 1890 he became professor of jurisprudence and politics at Princeton. Upon the resignation of President Patton in June, 1902 Wilson was elected president of Princeton university by the unanimous vote of the trustees. In addition to Congressional Government and magazine articles and published addresses, his writings include: The State: Elements of Historical and Practical Politics; An Old Master, and Other Political Essays; Division and Reunion, 1829–1889; George Washington; and A History of the American People.

WILTS, or **WILTSHIRE,** a southwestern county of England, bounded by the counties of Gloucester, Somerset, Dorset, Hants, and Berks; area, 866,670 acres. Pop. 273,845.

WIMBLEDON, a town of England, county of Surrey, 7 miles southwest of London, at the northeast extremity of Wimbledon common. Up to 1889 it was well known in connection with the shooting competitions of the National Rifle association. Pop. 41,604.

WINCEY, a strong and durable cloth, plain or twilled, composed of a cotton warp and a wollen weft. Heavy winceys have been much worn as skirtings and petticoats.

WINCH, a kind of hoisting machine or windlass, in which an axis is turned by means of a crank-handle, and a rope or chain is thus wound round it so as to raise a weight.

WINCHELL, Alexander, American geologist, was born in North East, Duchess county, N, Y., in 1824. In 1854 he became professor of physics and civil engineering in the University of Michigan, and in the following year was transferred to the chair of geology, zoölogy, and botany, which he held until 1873, filling a similar professorship in the University of Kentucky from 1866 until 1869. He was director of the geological survey of Michigan from 1859 until 1871, with an intermission during the war. He was subsequently professor of geology, zoölogy, and botany in both the Syracuse and Vanderbilt universities, but in 1878, owing to his belief in the existence of a preadamite race, and his defense of the doctrine of evolution, he was forced out of Vanderbilt by the abolition of his lectureship. In 1879 he accepted the chair of geology and paleontology in the University of Michigan. The degree of LL.D. was conferred on him by Wesleyan in 1867. His name has been assigned to fourteen new species. He died February 19, 1891.

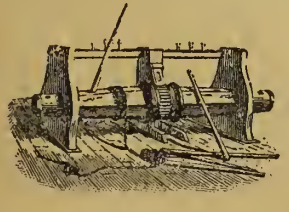
WINCHELL, Newton, Horace American geologist, was born at North East, Duchess co., N. Y., in 1839. In 1866 he became assistant state geologist. Three years later he was called to the chair of mineralogy and geology in Minnesota university, and at the same time accepted the position of state geologist. He was president of the Academy of Sciences of Minnesota, a member of the Assay Commission of the United States, and editor of the Ameritan Geologist.

WIND, a current in the atmosphere, as coming from a particular point. The principal cause of currents of air is the disturbance of the equilibrium of the atmosphere by the unequal distribution of heat. When one part of the earth's surface is more heated than another, the heat is communicated to the air above that part, in consequence of which the air expands, becomes lighter, and rises up, while colder air rushes in to supply its place, and thus produces wind. It is thus that the sea-breeze is produced every afternoon at places near the coast, especially in intertropical countries, the ground having been heated by the sun's rays to a higher temperature than the sea; while about twelve hours later, the reverse effect—a land-breeze—occurs, the ground having fallen at night to a lower temperature than the sea. As the heat of the sun is greatest in the

equatorial regions, the general tendency there is for the heavier columns of air to displace the lighter, and for the air at the earth's surface to move from the poles toward the equator. The only supply for the air thus constantly abstracted from the higher latitudes must be produced by a counter-current in the upper regions of the atmosphere, carrying back the air from the equator toward the poles. Besides the unequal distribution of heat already mentioned, there are various other causes which give rise to currents of air in the atmosphere, such as the condensation of the aqueous vapors which are constantly rising from the surfaces of rivers and seas, and the agency of electricity. Winds have been divided into fixed or constant, as the trade-winds; periodical, as the monsoons; and variable winds. (See Trade-winds, Monsoon.) There are also local winds, which receive particular names; as, the etesian wind, the sirocco, the simoom, the harmattan, the mistral, typhoon, etc. The velocity and force of the wind vary considerably, as shown by the anemometer. Thus a light wind traveling at the rate of 5 miles an hour exercises a pressure of 2 oz. on the square foot; a light breeze of 10 miles an hour has a pressure of 8 oz.; a good steady breeze of 20 miles, 2 lbs.; a storm of 60 miles, 18 lbs.; a violent hurricane of 100 miles, 50 lbs., a pressure which sweeps everything before it.

WIND-INSTRUMENT, an instrument of music, played by means of artificially produced currents of wind, as the organ, harmonium, etc., or by the human breath, as the flute, horn, etc. See Instrument and Instrumental Music.

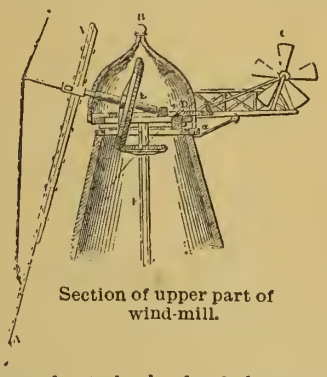
WINDLASS, a modification of the wheel and axle used for raising weights. The simple form of the windlass used in ships, for raising the anchors, consists of a strong beam of wood placed horizontally, and supported at its ends by iron spindles, which turn in collars or bushes inserted in what are termed the



Ship's windlass.

windlass bitts. This large axle is pierced with holes directed toward its center, in which long levers or hand-spikes are inserted for turning it round when the anchor is to be weighed or any purchase is required. It is furnished with pawls to prevent it from turning backward when the pressure on the handspikes is intermitted.

WIND-MILL, a mill which receives its motion from the impact of wind upon sails, and which is used for grinding corn, pumping water, etc. In structure the wind-mill is a conical or pyramidal tower, and from the position of the sails in relation to the wind-shaft it is described as either vertical or horizontal. In the former, a section of which is here given, the wind is made to act upon sails or vanes a a attached by means of rectangular frames to the axle or wind shaft of the mill. This axle is placed nearly horizontal, so that the sails by the pressure of the wind revolve in a nearly vertical plane, thus giving a rotatory motion to the driving wheel e fixed in the wind-shaft. The movement thus produced is transferred by means of bevel-wheels to the main shaft f, which is connected with the specific machinery of the mill. As the sails to be effective must always face the wind, this is accomplished in modern mills by a self-adjusting cap b, moved by a fan or flyer c attached to the projecting



Section of upper part of wind-mill.

framework at the back of the cap. By means of a pinion on its axis, motion is given to the inclined shaft and to the wheel d on the vertical spindle of the pinion a; this latter pinion engages the cogs on the outside of the fixed rim of the cap, and by these means the sails are kept constantly to the wind, when the wind causes the fan c to revolve. In the horizontal wind-mill, which is considered inferior to the other, the wind-shaft is vertical, so that the sails revolve in a horizontal plane. In most of the wind-mills used in America the sails consist of narrow boards arranged in a circular framework at a constant angle to catch the wind. The steam-engine has almost totally displaced wind-mills in Britain, but they are still largely used in Holland.

WINDOM, William, American statesman, was born at Waterford, Ohio, in 1829. He was educated in Ohio, studied law, and was admitted to the bar in 1850 at Mount Vernon. In 1855 he removed to Minnesota, and four years later he was elected to congress, serving in the lower house for ten years. He was elected United States senator in 1870, re-elected in 1871, and again in 1877, and in 1889 was made secretary of the treasury, which position he held until his death. He died in 1891.

WINDOW, an opening in the wall of a building to admit light and air into the interior. In dwelling-houses in ancient times the windows were narrow slits, and it was not until about the end of the 12th century that glass was used to any great extent in private houses in England. Windows, properly so-called, were almost unknown in the religious edifices of the Egyptians, Greeks, and Romans, the light being admitted at the roof, but they constitute an essential and distinguishing feature of the Gothic style. In modern houses windows are made capable of being opened and shut by means of casements or sashes. In Britain a winow-tax was imposed in 1695, and in 1851, when the tax was abolished, each house having more than seven windows was taxed.

WINDPIPE. See Trachea.

WINDSOR, or **NEW WINDSOR,** a municipal and parliamentary borough of England, county of Berks, beautifully situated on the Thames, 22 miles w. from London. Pop. 21,477. Windsor owes its chief importance to its castle, which stands east of the town on a height overlooking the river Thames, and is the principal royal residence in the kingdom. It was begun, or at least enlarged, by Henry I., and has been altered and added to by almost every sovereign since. The castle stands in the Home Park or "Little Park," which is 4 miles in circumference, and this again is connected with the Great Park, which is 18 miles in circuit, and contains an avenue of trees 3 miles in length. The chief features of interest in the castle are the old state apartments; St. George's Chapel, where the Knights of the Garter are installed, and the vaults of which contain the remains of Henry VI., Edward IV., Henry VIII., Charles I., George III., George IV., and William IV.; the Round Tower or ancient keep; and the present state apartments. In the Home Park is Frogmore, with the mausoleum of the Prince Consort and Queen Victoria; and in the Great Park is a large artificial lake called Virginia Water.

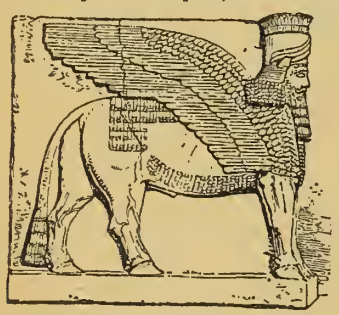
WINDWARD ISLANDS, one of the divisions of the Lesser Antilles in the West Indies, so called in opposition to another division of the same, called the Leeward Islands. The term is vaguely used, but generally includes Martinique, St. Lucia, St. Vincent, Grenada, Barbadoes, and Tobago.

WINE is the term specifically applied to the fermented juice of the grape or fruit of the vine, though it may also be applied to the fermented juice of any fruit. (See Vine.) Wines are distinguished practically by their color, hardness or softness on the palate, their flavor, and their being still or effervescing. The differences in the quality of wines depend partly upon differences in the vines, but more on the differences of the soils in which they are planted, in the exposure of the vineyards, in the treatment of the grapes, and the mode of manufacturing the wines. When the grapes are fully ripe, they generally yield the most perfect wine as to strength and flavor. The juice is expressed from the grapes by means of presses of all varieties of construction, from the simple lever and wedge press to the machine with hydraulic power. It is usual to separate the juice as it is expressed into first, second, and third "runs," the first pressing being the best quality, and the amount of all the juice is usually about 70 per cent of the weight of the grapes. The juice of the grape when newly expressed, and before it has begun to ferment, is of a sweet taste, and is called must. The fermenting process requires much time and attention, and if it be arrested while part of the sugar is unchanged a fruity wine is the result. If

the process, however, is completed, and all the sugar converted into alcohol, a dry wine is obtained. When an effervescing wine, like champagne, is desired the fermenting liquid is bottled, and the process of fermentation completed in the bottle, where the carbonic acid gas remains to give it a sparkling effervescent quality. When the wine is red in color it shows that the skins of the grape have remained in the vat during fermentation, while in white wines the skins have been removed before that process is begun. The leading character of wine must be referred to the alcohol which it contains, and upon which its intoxicating powers principally depend. The amount of alcohol in the stronger ports and sherries is from 16 to 25 per cent; in hock, claret, and other light wines from 7 to 12 per cent. Wine containing more than 13 per cent of alcohol may be assumed to be fortified with brandy or other spirit. The most celebrated ancient wines were those of Lesbos and Chios among the Greeks, and the Falernian and Cecuban among the Romans. The principal modern wines are Port, Sherry, Claret, Champagne, Madeira, Hock, Marsala, etc. The varieties of wine produced are almost endless, and differ in every constituent according to the locality, season, and age. The principal wine-producing countries are France, Germany, Spain, Portugal, Italy, Sicily, Greece, Cape Colony, Australia, and the United States.

WINE-MEASURE, an old English measure by which wines and other spirits were sold. In this measure the gallon contained 231 cubic inches, and was to the imperial standard gallon as 5 to 6 nearly.

WINGED BULL, an architectural decoration of frequent occurrence in ancient Assyrian temples, where winged



Assyrian winged human-headed bull.

human-headed bulls and lions of colossal size usually guarded the portals. They were evidently typical of the union of the greatest intellectual and physical powers.

WINGED LION, the symbol of the evangelist St. Mark, which was adopted as the heraldic device of the Venetian Republic. A celebrated bronze figure of the winged lion of St. Mark surmounting a magnificent red granite column, formed out of a single block, stands in the Piazzetta of St. Mark at Venice.

WINNIPEG, capital of the province of Manitoba, Canada, at the confluence of the Red river and Assiniboine, 40 miles s. of Lake Winnipeg. In 1870 this city was only a village, its sudden expansion being due in great measure to its central position on the Canadian Pacific railway. It is connected by railway with the United States, and several other lines radiate from it. It has a city-hall, parliament-house, governor's residence, court-house, university (well endowed and having four colleges affiliated to it), and is well supplied with water, gas, and electricity. On the west side of the Red river is the suburb of St. Boniface. Pop. 42,340.

WINO'NA, a city in Minnesota, beautifully situated on the west bank of the Mississippi. It is a flourishing place and an important center of trade and manufactures. Pop. 21,416.

WIN'STON, the county-seat of Forsyth county, N. C., 30 miles west of Greenboro; on the Southern and the Norfolk and Western railroads. It is adjacent to Salem, the two forming practically one community, know as Winston-Salem. Pop. Winston, 11,160; Salem, 3946.

WINTER, the coldest season of the year, in the northern hemisphere comprising the months of December, January, and February. The astronomical winter begins on the shortest day (December 22) and ends with the vernal equinox (March 21).

WINTERGREEN, a name of several plants, one of them being the partridgeberry. The name is also given to a genus of perennial plants having short stems, broad evergreen leaves, and usually racemose white or pink flowers. It possesses astringent properties and was formerly used in medicine.

WINTER-MOTH, a moth, the larvæ of which are exceedingly injurious to apple, pear, cherry, and plum trees. The moths appear in their perfect state in the beginning of winter.

WINTER'S-BARK, a plant of South America. It is an evergreen shrub, the bark of which has an agreeable, pungent, aromatic taste, and tonic properties.

WINTER SOLSTICE. See Solstice.

WIRE, any metallic substance drawn to an even thread or slender rod of uniform diameter by being passed between grooved rollers or drawn through holes in a plate of steel, etc. Wire is usually cylindrical, but it is also made in various other forms. The metals most commonly drawn into wire are gold, silver, copper, and iron; but the finest wire is made from platinum. Wiredrawing is the name for the process of making wire. The metal to be drawn is first hammered into a bar, and then passed successively through a series of holes in a hardened steel plate, successively diminishing in diameter. Extremely fine gold and platinum wires for the spider-lines of telescope micrometers are made, some of these having a diameter of only $\frac{1}{18000}$ of an inch. The applications of wire are very numerous and interesting. Ropes of wire are extensively used for winding purposes in mines, and generally for all similar purposes. They are much used for the standing rigging of ships, for telegraph purposes, etc. The conducting part of submarine telegraph cables is simply a wire-rope of copper wires, with an outside protection of iron wires (See Rope). Wire-gauze for blinds, etc., is woven in the same manner as ordinary textile fabrics. Fences, book-sewing, strings for musical instruments, pins and needles, etc., are among the innumerable modern uses to which wire is adapted.

WIRELESS TELEGRAPHY. The first practical working apparatus for the transmission of telegraphic messages without the use of wires was constructed by Gugliemo Marconi, an Ital-

Sig. Marconi.

ian electrical scientist. Its first public exhibition was at Toynbee hall, in London, on December 12, 1896. The first transmitter, then exhibited, was capable of sending a message for a distance of scarcely one mile. Since that date the science of wireless telegraphy has made such wonderfully rapid strides that messages are sent across the Atlantic ocean, and the system is a part of the commercial and industrial development of every civilized nation.

There are many wireless telegraph systems in use by the governments of the world. To Gugliemo Marconi belongs the honor of demonstrating the practicability of the science and its adaptation to the needs of the peoples.

The scientific principle which has enabled Marconi and his compeers to send telegraphic messages through space without the use of wires was known for a number of years before it was applied to practical use. In 1842 Professor Morse sent signals across the Susquehanna river without metallic connections of any sort by means of wires stretched along the banks. Science knew, for instance, that electricity, like heat, could be transmitted from one place to another by two entirely different processes. To illustrate: If one end of a wire be placed in a bed of live coals the other end soon becomes too hot to be held in the hand. The heat waves are carried along the wire, the wire itself serving as a conductor. But if the uncovered hand be placed a foot away from the live coals the heat, as in the case of the wire, soon becomes unbearable. The waves of heat are transmitted with only the air as a conductor. Now, for a bed of live coals, substitute a device for the generation of electricity. If the electricity is loosed upon a wire, the wire acts as a conductor and transmits the electric current to any required distance. It

is this principle which is adapted to the ordinary telegraph, telephone, or electric railway.

In 1886, however, Professor Hertz discovered that electricity could be made to radiate in the air, just as heat does. His discovery was the forerunner of the discovery of the possibility of wireless telegraphy. All that was necessary was to devise instruments for starting and stopping the electric waves, or, to be more exact, for making these waves longer or shorter, as might be desired, in order that the instrument which detected them could record them.

Marconi was not the first to devise these instruments, but he was the first to turn them to practical account. He only used, improved, and perfected the instruments devised by others. He was the first to send an intelligible wireless message in the Morse code; but several electrical scientists contributed to his success. Dr. Hertz, for instance, had discovered the principle of the electric waves. Dr. Edouard Branly devised the coherer—a glass tube filled with iron filings and attached to positive and negative wires—thus supplying an instrument for receiving the electric waves. Dr. O. J. Lodge devised the tapper, on the principle of the electric door bell, the hammer striking the wires attached to the Branly coherer, thus starting the electric oscillations and producing the electric waves. By means of the tapper, Dr. Lodge was able to regulate the length of the waves, making them correspond to the dots and dashes of the Morse telegraphic code. But Dr. Lodge was absorbed in the subject only from a purely scientific standpoint. Although he intimated that by the Branly coherer and the Lodge tapper signals might be transmitted through the air for a distance of half a mile, he made no effort to carry his experiments to a practical conclusion. Professor Popoff, the Russian scientist, made the next discovery. He attached a vertical wire to the Branly coherer to intercept the waves. He, too, used his discovery only for meteorological experiment and made no effort to adapt it to practical science. In 1901 Marconi sent a signal from St. John, N. F., to the Irish coast. In 1902 while on his way to the United States he received signals on board ship at a distance of 2099 miles. In 1903 a message from President Roosevelt was sent to King Edward from Cape Cod, Mass., direct to Poldhu, a distance of 3000 miles. In 1907 the ocean-going vessels plying between New York and Liverpool were constantly in touch with the land, the signals being picked up from one shore before being lost on the other. The war ships of all nations are now equipped with one or the other of the various systems and the signal service now warns vessels within 300 miles of the coast of approaching storms.

An achievement of wireless telegraphy that filled the civilized world with awe took place Jan. 23, 1909, when the big White Star liner Republic was disabled off Nantucket, Mass. The captain of the great vessel found his ship and his passengers in deadly peril. The engine room was full of water. No craft was in sight. Land was 26 miles away. Wireless telegraphy, the once-doubted invention of the wizard Marconi, was the captain's only hope. He rushed to the operator. Frantically the man at the instrument sent up into the air the signal for help. He had no guidance but the hope that some where in the mysterious sky above him the desperate appeal would be caught by air waves and wafted to another ship, or to some wireless magician on land. The hope was not in vain. The message reached two other big liners and two revenue cutters. "In distress and sinking," it said, and gave the name of the ship, and the latitude and longitude. The Republic was saved!

WISCON'SIN, one of the United States of North America, bounded north by Lake Superior, northeast by Michigan, east by Lake Michigan, south by Illinois, and west by Iowa and Minnesota, the Mississippi river separating it from these states; area, 56,040 sq. miles. It ranks twenty-first in size among the states. It consists of an undulating plateau, varying from 600 to 1500 feet above sea-level. Besides Michigan and Superior there are numerous small lakes; the chief rivers, which drain into the Mississippi, are the St. Croix, Chippewa, and Wisconsin. In winter the weather is severe, but on the whole the climate is dry and healthy. The annual rain fall is 31 inches. Agriculture is the chief industry, and the principal products are wheat, Indian-corn, and oats, besides rye, barley, potatoes, hops, and maple sugar. Cattle and horses are extensively reared, and agricultural and dairy produce are largely exported, as also lumber. The soils of the state are varied. Those of the drift-bearing region are derived from the deterogeneous mixture

Seal of Wisconsin.

of pre-glacial soils and glacial grindings, and constitute for the greater part loamy clays and sandy loams of a high degree of fertility and permanence. In the southwest a considerable portion of the soils are derived from the decomposition of the underlying limestone, and are highly fertile and easily tilled. In the central portion there is a considerable area underlaid by the Potsdam sandstone, from which sandy soils, of relatively low fertility, have been derived. The prevalent trees of this region are the oaks, poplars, hickories, and their usual associates. Along the eastern border of the state, except at the very south, is an extensive tract of heavy timber, in which maple, elm, ash, and their usual associates predominate. Toward the north the pines, hemlocks, and spruces come in. The north part of the state was originally covered by an almost unbroken forest, composed of groves of pine, of hard wood, and of a promiscuous mixture of species embracing both conifers and deciduous trees. This constitutes the great lumber region of Wisconsin. The whitefish and lake-trout fishing industries of Lake Michigan and Lake Superior are extensive, and the inland lakes and streams abound in bass, pike, pickerel, sturgeon, and brook-trout. A state fisheries commission annually stocks the waters with brook-trout, whitefish, and pike. The manufactures in the cities are chiefly furniture, agricultural implements, carriages, saddlery, woolen goods, etc. There are extensive iron-mines, besides lead and zinc deposits and granite and limestone quarries. The Chicago, Milwaukee, & St. Paul, the Chicago Northwestern, the Wisconsin Central, the Chicago, St. Paul, Minneapolis & Omaha, St. Paul & Sault Ste. Marie, the Green Bay & Western, and the Chicago, Burlington & Northern are the principal railroads. Elementary education is compulsory between the ages of seven and fifteen (for 12 weeks each year); there are a number of universities and colleges, the Wisconsin university, Madison, being liberally subsidized by the state. The state is noted for its exceptionally large number of animal mounds, the work of the "mound-builders." Wisconsin was the meeting ground of the Algonquin and Dakota Indian tribes. Its water system connecting the Great Lakes and the Mississippi made it the keystone of the French possessions in Canada and Louisiana. In 1665 Father Claude Allouez founded a Jesuit mission at La Pointe, and in 1669 the mission of St. Francis Xavier on the shores of Green bay. Louis Joliet, leaving Quebec under orders to discover the South sea, in 1673, took with him Father Marquette from Mackinaw, and reached the Mississippi by the diagonal waterway of the Fox and Wisconsin rivers. In 1674 Marquette made a canoe trip from Green bay to the site of what is now Chicago along the shores of Lake Michigan. Wisconsin formed a part of the old Northwest territory from 1787 to 1800, of Indiana territory from 1800 to 1805, of Michigan territory from 1805 to 1809, of Illinois territory from 1809 to 1818, and in the latter year was again placed under the jurisdiction of Michigan territory. In 1836, on the admission of Michigan into the Union, Wisconsin—including then the present states of Iowa and Minnesota and parts of the Dakotas—was erected into a territory. The legislature met at Madison for the first time in 1838. Wisconsin was formally admitted to the Union May 29, 1848. The anti-slavery sentiment in the state was strong and the state furnished a total of 91,379 men, more than the required quota, the ratio being 1 man to every 9 of its inhabitants. The first republican governor was elected in 1856, when Coles Bashford was chosen after a bitter contest. Since that time the state has been republican in every

presidential election except that of 1892. Milwaukee is the chief town, Madison is the capital. Pop. 2,476,819.

WISCONSIN, University of, situated at Madison, was founded in 1838, organized in 1848, and opened for instruction in 1851. The institution is co-educational in all its departments. The College of Letters and Science is the center of the institution, about which the technical work has grown up. The other colleges are those of law, agriculture, and engineering. The College of Engineering includes courses in civil engineering, sanitary engineering, mechanical engineering, electrical engineering, and general engineering. The university confers the baccalaureate degree in arts, science, law, and philosophy; the master's degree in arts and science; the doctor's degree in philosophy; and the degrees of civil, mechanical, and electrical engineer.

WISDOM, Book of, called by the Septuagint the Wisdom of Solomon, one of the apocryphal books of the Old Testament. It was considered canonical by some of the fathers of the church, who ascribed its authorship to Solomon; but it is now generally held to be apocryphal, most theologians agreeing that its author must have been a Jew of Alexandria of the 1st or 2d century B.C.

WINSLOW, John Ancrum, American naval officer, was born at Wilmington, N. C., in 1811. He was engaged in the Mexican war, was present at the capture of Vera Cruz. On July 16, 1862, he was placed in command of the United States steamer Kearsage, specially commissioned to pursue the confederate steamer Alabama. Captain Winslow followed his adversary to Sherbourg, and in June, 1864, blockaded her in that harbor. The armament of the two vessels was about equal. After an exchange of broadsides for about an hour, the Alabama made for the shore in a crippled condition; she soon was found to be sinking, and surrendered. Captain Winslow was promoted commodore for this important victory in 1866, and in 1867 commanded the Gulf squadron, was chief of the Pacific squadron from 1870 to 1872, and on March 2, 1870, was promoted to be rear-admiral. He died in 1873.

WISE, Isaac Mayer, American rabbi and educator, was born at Steingrub, Bohemia, in 1819. In 1846 he came to the United States and from 1854 until his death he was rabbi of the Congregation Bene Yeshurnn, Cincinnati. He was the editor of the Israelite, afterward The American Israelite, and the Chicago Israelite, both of which he established. In 1889 he organized the central conference of American rabbis and became its president. His works include History of the Isrealitish Nation, Origin of Christianity, Judaism, Its Doctrines and Duties, etc., etc. He died in 1900.

WISE, Henry Alexander, American statesman, was born in Drummondtown, Va., 1806. In 1833 he was elected to congress as a Jackson democrat, and was twice reëlected. In May, 1844, he was united States minister to Brazil, remaining there until October, 1847. In 1855 Mr. Wise was elected governor of Virginia. One of the last acts of his administration was signing the death-warrant of John Brown, who was executed December 2, 1859. When Virginia seceded he became brigadier-general of the confederate army. After the war he resumed the practice of law. He died in 1876.

WISE, John S., was born at Rio Janeiro, Brazil, in 1846. He served through the war in the confederate army, being wounded at New Market. After the fall of the confederacy, he studied law, and upon his admission to the bar, in 1867, opened an office in Richmond. He was a Readjuster member of congress for one term from 1882, and in 1885 was defeated for governor of the state by Fitzhugh Lee. He is the author of Doomed, The End of An Era, and The Lion's Skin.

WISTA'RIA, a genus of plants. The species are deciduous, twining, and climbing shrubs, natives of China and North America. When in flower, they form one of the handsomest ornaments of the garden.

WISTER, Owen, American author, was born in Philadelphia, Pa., in 1860. His stories deal largely with Western life and character; his greatest success was The Virginian, published in 1902. Among his other works are: Lin McLean, Jimmy John Boss and other stories, Oliver Wendell Holmes, Benjamin Franklin. His latest work, Lady Baltimore, published in 1906, has met with general commendation.

WITCHCRAFT, a supernatural power which persons were formerly supposed to obtain by entering into compact with the devil, who engaged that they should want for nothing, and be able to assume whatever shape they pleased, to visit and torment their enemies, and accomplish their infernal purposes. As soon as the bargain was concluded, the devil was said to deliver to the witch an imp or familiar spirit, to be ready at call, and to do whatever it was directed. By the aid of this imp and the devil together, the witch, who was almost always an old woman, was enabled to transport herself through the air on a broomstick, and to transform herself into various shapes, particularly those of cats and hares; to inflict diseases on whomsoever she pleased, and to punish her enemies in a variety of ways. The belief in witchcraft is very ancient. It was a common belief in Europe till the 16th century, and maintained its ground with tolerable firmness till the middle of the 17th century. Indeed it is not altogether extinct even at the present day. Numbers of reputed witches were condemned to be burned, so that in England alone it is computed that no fewer than 30,000 of them suffered at the stake. The last victim was executed in 1722 in Scotland, and in the United kingdom prosecution for witchcraft was abolished in 1736 by act of parliament. In America the last executions took place in 1692, and in France executions for witchcraft were prohibited by an edict of Louis XIV. as early as 1670.

WITCH-HAZEL. See Wych-hazel.

WITH'ERITE, a mineral, a carbonate of baryta, used in making plate-glass, etc.

WITNESS, in law, (*a*) one who signs his name as evidence of the genuineness of another signature; (b) a person who gives testimony or evidence under oath or affirmation in a judicial proceeding. See Evidence.

WITT, DE. See De Witt.

WOBURN, a town in Middlesex co., Massachusetts, 10 miles n.w. of Boston. Its principal industry is in the manufacture of leather. Pop. 14,499.

WODAN, Woden, the Anglo-Saxon form of the name of the deity called by the Norse Odin. Wednesday derives its name from him, and his name is also seen in several place-names, as Wednesbury, etc. See Odin.

WOLCOTT, Roger, American political leader, was born in Boston, Mass., in 1847. From 1877 to 1879 he was a member of the Boston Common council, from 1882 to 1885 a member of the state house of representatives, and was then again a member of the common council from 1887 to 1889. In 1892 he was elected lieutenant-governor of the state. He was reëlected in 1893, 1894, and 1895. Before the termination of his fourth term he became by the sudden death of Governor Greenhalge, in May, 1896, acting governor. In the following November he was chosen governor by the largest majority ever given to any candidate for that office in the history of the state, and was reëlected in 1897 and 1898. He died in 1901.

WOLF, a quadruped belonging to the digitigrade carnivora, and very closely related to the dog. The common European wolf is yellowish or fulvous gray; the hair is harsh and strong, the ears erect and pointed the tail straight, or nearly so, and there is a blackish band or streak on the forelegs about the carpus. The height at the shoulder is from 27 to 29 inches. The wolf is swift of foot, crafty, and rapacious; a destructive enemy to the sheep-cote and farm-yard;

Common wolf.

it associates in packs to hunt the larger quadrupeds, such as the deer, the elk, etc. When hard pressed with hunger these packs have been known to attack isolated travelers, and even to enter villages and carry off children. In general, however, wolves are cowardly and stealthy. The wolf of North America is generally considered to be the same species as the European wolf, though individuals vary much in color and otherwise. The little prairie-wolf or coyote abounding on the vast plains of Missouri and Mexico, is a burrowing animal. The Tasmanian wolf is a marsupial.

WOLFE, Rev. Charles, author of the Ode on the Burial of Sir John Moore, was born in Dublin 1791, died 1823. He was also the author of several other poems.

WOLFE, James, an English general, was born at Westerham, Kent, in 1727. After distinguished service against the French in America he was intrusted (1759) with an army of 8000 men with which to assault Quebec. During the night this small force scaled the Heights

Gen. Wolfe.

of Abraham, which commanded the town, and in the battle which took place next day the British were victorious; but General Wolfe was wounded in the engagement, and died in the moment of victory, his opponent Montcalm being also mortally wounded.

WOLFFIAN BODIES (after Wolff, the discoverer), in physiology, a term applied to certain bodies in the vertebrate embryo, preceding the two kidneys, whose functions they perform. As the fœtus advances they gradually disappear, their place being supplied by the true kidneys, except in fishes, in which they are permanent.

WOLF-FISH. See Sea-wolf.

WOLFRAM, a native tungstate of iron and manganese. Its color is generally a brownish or grayish black. It occurs massive and crystalized, and in concentric lamellar concretions, and is the ore from which the metal tungsten is usually obtained.

WOLLASTON, William Hyde, a distinguished chemist, born in London 1776, died 1828. He was the inventor of the goniometer, an instrument for measuring the angles of cyrstals, and the discoverer of palladium and rhodium and the malleability of platinum.

WOLSELEY (wu̇lz'li), Sir Garnet Joseph, Viscount Wolseley, British general, was born near Dublin in 1833; entered the army as ensign in 1852; took part in the second Burmese war; served in the Crimea, was wounded at the seige of Sebastopol; engaged in the siege and capture of Lucknow during the Indian mutiny of 1857–58; and was employed in 1860 in the Chinese war. He was despatched to Canada in 1861, and again in 1867, having received command of the Red river expedition, which he carried to a successful issue. When the Mahdi subdued the Soudan, and held General Gordon prisoner in Khartoum, Wolseley was despatched in 1884 with a relief expedition. He concentrated his forces at Korti, and sent a column across the desert to Khartoum, but the place had fallen. In 1885 he was created a viscount, in 1890–95 was commander-in-chief in Ireland, in 1894 made field-marshall; commander-in-chief of the army, 1895–1900. He is author of Narrative of the War with China, the Soldier's Pocket Book, Life of the Duke of Marlborough.

WOLSEY (wu̇l'zi), Thomas, Cardinal, was born at Ipswich in 1471. When Henry VIII. became king the advancement of Wolsey was rapid. Successively he was appointed Canon of Windsor, Dean of York, Bishop of Lincoln, Archbishop of York, and his nomination as cardinal in 1515 and pope's legate in 1518 completed his ecclesiastical dignities. In 1515 he was also appointed lord chancellor of the kingdom. This rapid preferment by the king was largely the result of a remarkable series of diplomatic victories, in which Wolsey had been the means of enabling Henry to hold the balance between Francis I. and the Emperor Charles V. In his ambitious career the cardinal made many enemies, who were held in check so long as he retained the favor of his royal master. This favor Wolsey lost when he failed to obtain from Pope Clement a decision granting the king's divorce from Catharine of Aragon. Thenceforth the enemies of the fallen prelate harried him unmercifully. He was banished from court, stripped of his dignities, found guilty of a præmunire, and sentenced to imprisonment. Finally, after a brief respite, during which he was restored to some of his offices, and had returned to his see of York, he was arrested at Cawood castle on a charge of high treason, and on his way to London as a prisoner he died in 1530 of dysentery at Leicester Abbey.

WOLSTONECRAFT, Mary (Godwin), English miscellaneous writer, was born at Hoxton, near London, April 27, 1759. In 1797, she married William Godwin, and became the mother of Mary, the future Mrs. Shelley. She died September 10, 1797. Mrs. Godwin was one of the 'advanced women' of her time. Her most notable work is Vindication of the Rights of Women. She attacked Rousseau's ideal woman, the heroine of novels and boarding-schools. She advocated the establishment of government day schools, and maintained the right of women to enter the professions and politics. In short, her thesis was the equality of the sexes. Among her other works are: Thoughts on the Education of Daughters; Vindication of the Rights of Men, a letter to Burke; Letters and Miscellaneous Pieces.

WOLVERHAMPTON, a municipal, county, and parl. borough of England, county of Stafford, 13 miles n.w. of Birmingham. The chief industries are the smelting of iron ore, and its conversion into all forms of iron-ware, and manufactures in brass, tin, steel, papier-mâché, galvanized iron, and chemicals. Pop. 192,750.

WOMAN'S CHRISTIAN TEMPERANCE UNION, the National W. C. T. U was organized in Cleveland, Ohio, in 1874, and is the sober second thought of the great woman's crusade. It is now regularly organized in every state of the Union. There are about 10,000 local unions, with a membership and following, including the children's societies, of about half a million. The W. C. T. U. has forty distinct departments of work, presided over by as many women experts, in the National society, and in nearly every state. All the states in the republic have laws requiring the study of scientific temperance in the public schools, and all these laws were secured by the W. C. T. U.; also the laws forbidding the sale of tobacco to minors. The first police matrons and most industrial homes for girls were secured through the efforts of this society, as were the refuges for erring women. Laws raising the age of consent and providing for better protection for women and girls have been enacted by many legislatures through the influence of the Union. The World's W. C. T. U. was founded through the influence of Francis E. Willard in 1883, and already has auxiliaries in more than fifty countries and provinces The white ribbon is the badge of all the W. C. T. U. members, and is now a familiar emblem in every civilized country.

WOMAN'S SUFFRAGE, a movement for the social and political enfranchisement of women which first took practical shape in 1848 at Senaca Falls, N. Y. in which Elizabeth Cady Stanton, Lucretia Mott, Martha C. Wright and Mary A. McClintock were prime movers. In 1869 the National Woman's Suffrage association, with Susan B. Anthony and Elizabeth Cady Stanton as leaders, was organized. In November, 1890, the American Woman's Suffrage association was organized with Lucy Stone, and Julia Ward Howe as leaders. The two associations were in the same year united into the National American Woman's Suffrage association. In 1892 Mrs. Stone and Mrs. Stanton were made honorary presidents; Miss Anthony remained as the active president until 1900, when she was succeeded by Mrs. Carrie Chapman Catt. Women have secured full suffrage in Wyoming (1869), Colorado (1893), Utah (1870–1887 as territory; 1895), and Idaho (1896); municipal suffrage in Kansas (1887); school suffrage varying in extent, in 25 states; suffrage on questions of tax levies in Louisiana (1898); and on bond issues in Iowa (1894). Amendments have been submitted and campaigns fought in Kansas (1869, 1894), Michigan (1874), Nebraska (1882), Oregon (1884, 1900), Rhode Island (1886), Washington (1889, 1898) South Dakota (1890, 1898), and California (1896). Women in England, Scotland, and Ireland can now vote in all except parliamentary elections. Property laws were modified in 1882 and 1893. Women have full suffrage in New Zealand, the Isle of Man, Pitcairn Island, South Australia, and West Australia. Under the new federal constitution of Australia women may vote. In Canada, Cape Colony, and Tasmania women have municipal suffrage. An international council of women for the advocacy of women's rights met at Washington in 1888 and similar councils have since been held.

WOMB. See Uterus.

WOMBAT, a marsupial animal, a native of Australia and Tasmania. It is about 3 feet in length, and has coarse, almost bristly fur, of a general gray tint, mottled with black and white. It burrows, feeds on roots, and its flesh is said in fatness and flavor to resemble pork.

WOMEN'S CLUBS, the first organizations of women such as the Female Society for the Relief and Employment of the Poor, church societies, female

Bible societies, Daughters of Temperance, the Sanitary Commission, the Woman's Loyal League, the Freedmen's Bureau, which came into existence during the civil war, etc., showed women what they could do. In 1868 Mrs. Croly founded the Sorosis. This gave the impulse for other clubs. The Woman's Club of Brooklyn was organized in 1869–70. The Association for the Advancement of Women, organized in New York in 1873, decided to stimulate the formation of clubs. At a convention in 1890 the General Federation of Women's Clubs was formed. The Federation began with 63 clubs in seventeen states. There are now Federations in all the states with a total membership of about 225,000. The Woman's Cycle, which was started in September, 1889, published a directory of clubs. Biennial meetings of the federation are held in all the large cities.

Wombat.

WOMEN MARRIED, RIGHTS OF. Any and all property which a woman owns at her marriage, together with the rents, issues, and profits thereof, and the property that comes to her by descent, devise, bequest, gift or grant, or which she acquires by her trade, business labor, or services performed on her separate account, shall, notwithstanding her marriage, remain her sole and separate property, and may be used, collected, and invested by her in her own name, and shall not be subject to the interference or control of her husband, or be liable for his debts, unless for such debts as may have been contracted for the support of herself or children by her as his agent. A married woman may likewise bargian, sell, assign, transfer and convey such property, and enter into contracts regarding the same on her separate trade, labor or business with the like effect as if she were unmarried. Her husband, however, is not liable for such contract, and they do not render him or his property in any way liable therefor. She may sue and be sued in all matters having relation to her sole and separate property in the same manner as if she were sole owner. In the following cases a married woman's contract may be enforced against her and her separate estate: 1. When the contract is created in or respecting the carrying on of the trade or business of the wife. 2. When it relates to or is made for the benefit of her sole or separate estate. 3. When the intention to charge the separate estate is expressed in the contract creating the liability. When a husband receives a principal sum of money belonging to his wife, the law presumes he receives it for her use, and he must account for it, or expend it on her account by her authority or direction, or that she gave it to him as a gift. If he receives interest or income and spends it with her knowledge and without objection, a gift will be presumed from acquiescence. Money received by a husband from his wife and expended by him, under her direction, on his land, in improving the home of the family, is a gift, and cannot be recovered by the wife, or reclaimed, or an account demanded. An appropriation by a wife, herself, of her separate property to the use and benefit of her husband, in the absence of an agreement to repay, or any circumstances from which such an agreement can be inferred, will not create the relation of debtor and creditor nor render the husband liable to account. Though no words of gift be spoken a gift by a wife to her husband may be shown by the very nature of the transaction, or appear from the attending circumstances. A wife who causelessly deserts her husband is not entitled to the aid of a court of equity in getting possession of such chattels as she has contributed to the furnishing and adornment of her husband's house. Her legal title remains, and she could convey her interest to a third party by sale, and said party would have a good title, unless her husband should prove a gift. Wife's property is not liable to a lien of a sub-contractor for materials furnished to the husband for the erection of a building thereon, where it is not shown that the wife was notified of the intention to furnish the materials, or settlement made with the contractor and given to the wife, her agent or trustee. The common law of the United States has some curious provisions regarding the rights of married women, though in all the states there are statutory provisions essentially modifying this law. As it now stands the husband is responsible for necessaries supplied to the wife even should he not fail to supply them himself, and is held liable if he turn her from his house, or otherwise separates himself from her without good cause. He is not held liable if the wife deserts him, or if he turns her away for good cause. If she leaves him through good cause, then he is liable. If a man lives with a woman as his wife, and so represents her, even though this representation is made to one who knows she is not, he is liable the same way as if she were his wife.

WONDERS OF THE WORLD, Seven. See Seven Wonders.

WOO-CHANG, a city of China, province of Hu-Pé, on the Yang-tse-kiang, opposite the city of Hankow. The latter is in effect but a suburb of Woo-Chang, another portion on the n. bank of the river being Hang-Yang-Foo. It is the great emporium for the tea exported by way of Shanghai. Pop. 1,000,000.

WOOD. See Timber.

WOOD, Ellen, or Price, English novelist, better known as Mrs. Henry Wood, born at Worcester 1820, died 1887. Among her many novels may be noted East Lynne, which has had an enormous success both as a book and a drama; The Channings; St. Martin's Eve; A Life's Secret; Roland Yorke; Dene Hollow; and the Johnnie Ludlow Stories, reprinted from the Argosy, of which she was long editor.

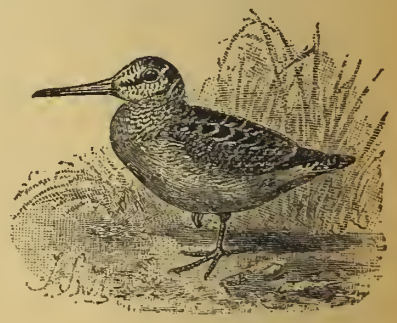
WOOD, Rev. John George, naturalist, born in London 1827, died suddenly at Coventry 1889. He was an enthusiast in natural history, and published a large number of books on zoology and kindred subjects which had great popularity. Among the best known of them are: Common Objects of the Sea-shore, Common Objects of the Country, Homes without Hands, Insects at Home, Natural History of Man, and an admirable illustrated Natural History of Animals.

WOODBINE. See Honeysuckle.

WOOD CHARCOAL. See Charcoal.

WOOD-CHUCK, the popular name of a rodent mammal, a species of the marmot tribe, the ground-hog, common in the United States and Canada. It is of a heavy form, from 15 to 18 inches long, blackish or grizzled above and chestnut-red below. It forms burrows in which it passes the winter in a dormant state.

WOODCOCK, a bird of the same genus as the snipe. It is widely distributed, being found in all parts of Europe, the north of Asia, and as far east as Japan. It is a game bird of Britain, where it is known chiefly as a winter visitant, but



American woodcock.

also breeds in certain districts. The bird is about 13 inches in length, the female being somewhat larger than the male. Its food is chiefly worms. The American woodcock is a smaller bird, but very similar in plumage and habits.

WOOD, Fernando, American politician, was born in Philadelphia in 1812. He removed to New York in 1820 and was elected to congress in 1841. In 1854, he was elected mayor of New York, and during his administration brought about reforms that so impressed citizens with the value of his services, that he was reëlected almost unanimously. In 1860 he was once more elected mayor and during this term he was subject to wide criticism and ridicule by suggesting the secession of New York at the outbreak of the civil war, and in 1863 was returned to congress, where he remained until 1865; he was reëlected in 1867 and served until 1877. He died in 1881.

WOOD, Leonard, American soldier, was born in Winchester county, Vt., in 1860. In 1886 he was appointed first lieutenant and assistant surgeon in the regular army. Upon the outbreak of the Spanish-American war Wood and

Theodore Roosevelt organized the regiment of "Rough Riders" and Wood was made Colonel and Roosevelt lieutenant-colonel. In 1898 he was made a brigadier-general of volunteers and in 1901 brigadier-general in the regular army. He was put in charge of Santiago after its surrender. In 1899 he was appointed governor-general of Cuba. In 1903 he was placed in command of a division of the army of the Philippines and was made major-general.

WOOD ENGRAVING. See Engraving.

WOOD-OIL, a balsamic substance (an oleoresin) obtained from several species of trees growing in Pegu, Assam, and some of the islands of the Indian archipelago. It is used medicinally, as a varnish, in lithographic ink, etc.

WOODPECKER, a name for the birds belonging to the order Scansores or climbers. They are characterized by their long, straight, angular beak, adapted for splitting the bark of trees; by their slender tongue, with its spines at the tip curved backward to enable them to extract insects from crevices; and by their stiff tail, which acts as a prop to support them while climbing. The noise they make in tapping the bark of a tree to discover where an insect is lodged can be heard at a considerable distance. In America the most characteristic species are the ivory-billed woodpecker, gold-winged woodpecker, and the California woodpeeker.

WOOD-PIGEON. See Ring-dove.

WOODMEN OF AMERICA, Modern, a fraternal and insurance order founded at Lyons, Iowa, in 1883, and chartered under the laws of Illinois in 1884. Divisions or branches are known as camps. It has camps in Illinois, Minnesota, Nebraska, Wisconsin, Michigan, Kansas, North Dakota, South Dakota, Missouri, Indiana and Ohio. The membership is about 850,000.

WOO-HOO, or **WUHU,** a treaty-port of China, on the Yang-tze-kiang, about 50 miles above Nanking, opened to trade in 1877. Pop. 79,000.

WOOL, that soft species of hair which grows on sheep and some other animals, as the alpaca, some species of goats, etc., which in fineness sometimes approaches to fur. Wool is divided into two classes—short or carding wool, seldom reaching over a length of 3 or 4 inches, and long or combing wool, varying in length from 4 to 8 inches, each class being subdivided into a variety of sorts, according to their fineness and soundness of the staple. Wools which unite a high degree of fineness and softness with considerable length of staple, bear a high price. English-bred sheep produce a good, strong, combing wool, that of the Scotch breeds being somewhat harsher and coarser. The finest carding wools were formerly exclusively obtained from Spain, the native country of the merino sheep, and at a later period extensively from Germany, where that breed had been successfully introduced and cultivated. The chief wool-producing countries of the world are: Argentina, Uruguay and other South American countries; Australia and New Zealand; the United States; Russia, Great Britain and Ireland, France, Spain; South Africa and India. The wool clip of the United States is 300,000,000 pounds annually, the product of 50,000,000 sheep. The principal wool-producing states are Montana, New Mexico, Ohio, Texas, Wyoming, Colorado, Oregon, Idaho, California, Utah, Michigan and Arizona.

WOOLEN MANUFACTURE, the use of wool as an article of clothing dates from the earliest times, and no doubt it was made into cloth earlier than either flax or cotton. Among the ancient Jews wool was the staple material of clothing; and the woolen fabrics of ancient Greece and Rome attained special excellence. In time the Roman manufactures were carried to the countries in which Roman colonies had been established. In England the making of woolen cloth seems to have been introduced by the Romans, but it did not rise into importance as a national employment until much later. The woolen cloths of England were for a considerable time confined to the coarser fabrics of domestic manufacture, finer cloths being imported from the continent, particularly from Brabant. At various times also the trade was hampered by many illiberal laws for its regulation, for prohibiting exportation, etc. In making woolen cloth the essential processes, as carried on in modern factories, are:—(1) the stapling of the raw wool. In this process the stapler or sorter works at a table covered with wire netting, through which the dirt falls while the various qualities of wool are being separated. The wool is then ready to be put through the (2) scouring machine, where it passes on an endless apron into an oblong vat, which contains a steaming soapy solution. Here it is carried forward gently by means of rakes until it is thoroughly soaked and cleansed. After this it is taken to the (3) drying framework of wire netting, under which are situated steam-heated pipes. A fan-blast drives the heated air upward through the wet wool, which lies on the wire netting, until it is all equally dried. When necessary this is the point in the process when it is "dyed in the wool." It is then ready for the (4) willeying or teasing machine, which consists of a revolving drum furnished with hooked teeth, close above which are set cylinders with hooked teeth moving in a contrary direction. The wool is fed in upon the drum, which whirls with great speed; and between the two sets of teeth working in opposite directions it is disentangled, torn, and cast out in fine, free fibers. With some classes of wool it is also necessary, at this stage, to remove suds and burrs by steeping them in a solution of sulphuric acid, or passing them through a burring machine, by which the burrs are extracted. The wool is now dry and brittle; and before submitting it to the process (5) of carding, it is sprinkled with oil and well beaten with staves in order to give it suppleness. This process of carding is accomplished by a series of three delicate and complex machines called a scribbler, an intermediate, and a finisher. These machines have various intricate cylinders and rollers, studded with teeth and working in opposite directions, over which the wool is passed until it is torn, interblended, and finally delivered from the finisher in a continuous flat lap. It is then cut into strips and passed (6) to the condensing machine, which rubs the strip into a soft, loose cord or sliver technically called a "slubbing." The wool is now ready for (7) spinning into yarn, and this is accomplished in a wool-spinning mule, which draws and twists the sliver into the required thinness, the process being essentially the same as in cotton-spinning. (See Cotton-spinning.) The wool, which has thus been brought into the form of yarn, is now fit for (8) weaving into woolen cloth. (See Weaving.) When it is taken out of the loom the cloth is washed, to free it from oil and other impurities, and also beaten while it lies in the water by wooden hammers moved by machinery, while it is again dyed if found necessary. After it has been scoured in water mixed with fullers' earth, the cloth undergoes a process of (9) teasling and shearing (see Teasel), in which the pile or nap is first raised, and then cut to the proper length by machines. When this is done it is (10) steamed and pressed between polished iron plates in a hydraulic press. In the manufacture of worsted yarn the long-staple wool fibers are brought as far as possible into a parallel condition by processes called gilling and combing. The wool, in a damp condition, is passed through a series of "gill boxes," in which steel gills or combs separate and straighten the fibers until, from the last box, it issues in a long sliver. In this condition it is run through a delicate combing machine. From the combing machine it is delivered in the condition of a fine sliver technically called top, and after being further attenuated by a process of roving the thread is spun into yarn on what is called a throstle-frame.

WOOLWICH (wụl'ich), a metropolitan municipal and parliamentary borough of England, on the Thames, 8 miles below London bridge. It stretches about 3 miles along the river, and owes its importance to the great arsenal, which has a circumference of 4 miles, and consists of gun and carriage factories, laboratory, barracks, ordnance departments, etc. Pop. 117,157.

WOONSOCKET, a town in Providence county, Rhode Island, about 40 miles s.w. of Boston. Its manufacturing establishments include cotton and woolen factories, machine-shops, rubber-works, iron-foundries, etc. Pop. 33,104.

WORCESTER (wụs'tẽr), capital of Worcestershire, and one of the most ancient cities in England, on the eastern bank of the Severn, 114 miles n.w. of London. Pop. 46,623. The county is bounded n. by Shropshire and Staffordshire, e. by Warwickshire, s. by Gloucestershire, and w. by Herefordshire; area, 472,453 acres, about half of which is in permanent pasture. The carpets of Kidderminster are famous, as are also the gloves and porcelain of Worcester. Pop. 488,401.

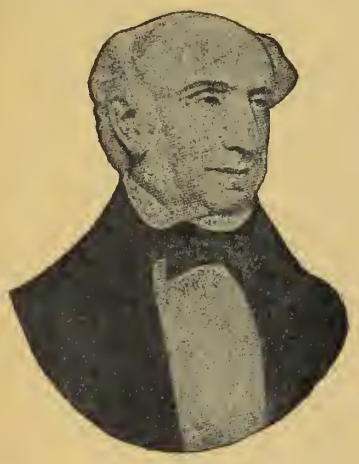
WORCESTER, a town in Massachusetts, about 40 miles west of Boston. It is situated in a fertile agricultural district, and is considered one of the finest towns in New England. It has manufactures of iron goods of various

kinds, including machinery, tools, etc.; also of woolens, carpets, boots and shoes, leather, paper, musical instruments, etc. Pop. 1909, 143,000.

WORCESTER, Edward Somerset, Marquis of, one of the earliest inventors of a steam-engine, was born about 1601, and died 1667.

WORCESTER, Joseph Emerson, philologist, born in Bedford, N. H., August 24, 1784. As a boy he worked on a farm, and in 1811 was graduated at Yale. In 1830 he visited Europe, and in 1847 received the degree of LL.D. from Brown, which was duplicated by Dartmouth in 1856. Doctor Worcester delivered lectures, edited a variety of gazetteers, geographies, histories, and almanacs, and finally made a life work of his Dictionary of the English Language, the first illustrated Dictionary in English. An enlarged edition appeared in 1881. He died in 1865.

WORDSWORTH, William, English poet, was born at Cockermouth, Cumberland, 7th April, 1770, and died 23d April, 1850. He crossed to France in November, 1791, and exhibited vehement sympathy with the revolution, remaining in France for nearly a year. After his return, disregarding all entreaties to enter upon a professional career, he published his Evening Walk and Descriptive Sketches (1793). With the consecrated helpfulness of his sister Dorothy he contrived to keep house for eight years, while he gave himself to poetic effort as his high "office upon earth." For the first two years they lived at Racedown in Dorset, where the



poet among other experiments began his tragedy of The Borderers. In this retreat they were visited (1797) by Coleridge, who had already recognized an original poetic genius in the author of Descriptive Sketches. Coleridge was at this time living at Nether Stowey, in Somerset, and during this visit he induced the Wordsworths to go into residence at Alfoxden, in his immediate neighborhood. Here the two poets held daily intercourse, and after a twelvemonth they published Lyrical Ballads (1798) in literary copartnership. Wordsworth's great philosophic poem, which, in his own phrase, was to be the Gothic cathedral of his labor, received only a fragmentary accomplishment in The Prelude, The Excursion, and The Recluse. Yet enough was achieved in his smaller poems to justify his own conception of himself as a "dedicated spirit," and to set him apart among the greatest of England's poets.

WORKHOUSE, a house in which paupers are maintained at the public expense, those who are able-bodied being compelled to work. Under the old poor-laws of England, there was a workhouse in each parish, partaking of the character of a bridewell, where indigent, vagrant, and idle people were set to work, and supplied with food and clothing, or what is termed indoor relief. These workhouses were described as, generally speaking, nurseries of idleness, ignorance, and vice; but a new system was introduced in 1834, parishes being now united for the better management of workhouses, which gave rise to the poor-law unions, with their workhouses. In these establishments the pauper inmates are employed according to their capacity and ability. Religious and secular instruction is supplied, while habits of industry, cleanliness, and order are enforced.

WORLD'S COLUMBIAN EXPOSITION, an international exposition held in Chicago in 1893 to celebrate the four hundredth anniversary of the landing of Columbus. The funds for the exposition consisted of $10,000,000 raised by the city of Chicago, a loan of $2,500,000 from congress, debenture bonds for $5,000,000 issued by the exposition authorities, together with miscellaneous contributions from various sources of about $3,000,000, making a total fund of about $20,000,000. Jackson park in the southeastern part of Chicago, on the shore of Lake Michigan, covering an area of 666 acres, was chosen as the site, where 150 different buildings were erected. The principal buildings were constructed of composition called staff, consisting of a mixture of plaster of Paris, with a little cement, glycerin, and dextrin, in water, which at a short distance gave the effect of marble. This appearance led to the name of White City, by which the exposition subsequently became generally known. The amusement features were in the Midway Plaisance, a strip of land west of Jackson park, and of these most worthy of note was the huge Ferris Wheel, 264 feet high. The total attendance at the exposition was 27,539,041, of which 21,479,661 were paid. The largest attendance was on Chicago day, October 9th, when there were 761,942 paid admissions. There were 65,422 exhibitors representing over 250,000 separate exhibits. At the close of the exposition the total receipts from all sources were $33,290,065, while the total disbursements were $31,117,353.

WORMS, a term loosely applied to many small longish creeping animals, entirely wanting feet or having but very short ones, including such various forms as the earthworm, the larvæ or grubs of certain insects, intestinal parasites, as the tape-worm, thread-worm, etc. In zoological classifications it is used as equivalent to Vermes or to Annelida. In medicine it is applied to the parasitic animals which exist chiefly in the intestines, and to the disease due to the presence of such parasites. Several kinds of worms may infest the human body, but the worms with which children are so commonly annoyed are the small worms known as thread-worms. Vermifuges or anthelmintics are names given to medicines that cure worms, such as extract of male-fern root for tape worms, santonin for thread-worms. See Wormwood, Tape-worm.

WORMS, a town in Germany, in the Grand-duchy of Hesse, on the Rhine, 25 miles s. of Mainz, and 20 miles n.w. of Heidelberg. The chief buildings of interest are the Romanesque cathedral (12th century), a magnificent structure with four round towers and two large domes; the Liebfrauenkirche and church of St. Martin; the town-house; and the monument to Luther, consisting of a colossal statue on a raised platform surrounded by figures of precursors of or persons directly connected with the Reformation. At Worms was held the famous diet in 1521, at which Luther defended his doctrines before the emperor Charles and an august assemblage. Pop. 40,705.

WORM-SEED, a seed which has the property of expelling worms from the intestinal tube or other open cavities of the body. It is brought from the Levant, and is the produce of a species of plant which is a native of Tartary and Persia.

WORMWOOD, a well-known plant, celebrated for its intensely bitter tonic and stimulating qualities, which have caused it to be an ingredient in various medicinal preparations, and even in the preparation of liquors. It is also useful in destroying worms in children.

WORSTED, a variety of woolen yarn or thread, spun from long-staple wool which has been combed, and which in the spinning is twisted harder than ordinary. It is knit or woven into stockings, carpets, etc. The name is derived from Worsted, a village in Norfolk where it is supposed to have been first manufactured.

WORT. See Brewing.

WOUND, in surgical phrase, a solution of continuity in any of the soft parts of the body occasioned by external violence, and attended with a greater or less amount of bleeding. Wounds have been classified as follows: (a) Cuts, incisions, or incised wounds, which are produced by sharp-edged instruments. (b) Stabs or punctured wounds, made by the thrusts of pointed weapons. (c) Contused wounds, produced by the violent application of hard, blunt, obtuse bodies to the soft parts. (d) Lacerated wounds, in which there is tearing or laceration, as by some rough instrument. (e) All those common injuries called gunshot wounds. (f) Poisoned wounds, those complicated with the introduction of some poison or venom into the part.

WRECK, in law, is defined as such articles of value as are cast upon land by the sea, includes jetsam, flotsam ligan, and derelict.

WREN, a name given to certain birds closely allied to the warblers, distinguished by their small size, slender beak, short, rounded wings, mottled

plummage, and the habit of holding the tail erect. The American house-wren is a very familiar bird, and a general favorite in America.

WREN, Sir Christopher, English architect, born in 1631, died in 1723. He had been appointed by Charles II. to restore old St. Paul's, but after the great fire (1666) it became necessary to rebuild the cathedral. The cathedral was begun in 1675, and the architect saw the last stone laid by his son thirty-five years afterward. Among the other notable buildings which Wren designed are: the modern part of the palace at Hampton court, the library of Trinity college, Cambridge, the hospitals of Chelsea and Greenwich, the churches of St. Stephen's, Walbrook; St. Mary-le-bow; St. Michael, Cornhill; St. Bride, Fleet street; as also the campanile of Christ church, Oxford. In 1680 he was chosen president of the Royal society, appointed in 1708 surveyor of the royal works, and from 1685 to 1700 represented various boroughs in parliament. Over the north doorway of St. Paul's is a memorial tablet on which are the well-known words: Si monumentum requiris, circumspice.

WRENCH, an instrument consisting essentially of a bar of metal having jaws adapted to catch upon the head of a bolt or a nut to turn it; a screw-

Wrenches.
1, Screw-wrench. 2, Tap-wrench.
3, Angle-wrench. 4, Tube-wrench.
5, Monkey-wrench for hexagonal and square nuts.

key. Some wrenches have a variety of jaws to suit different sizes and shapes of nuts and bolts, and others, as the monkey-wrench, having an adjustable inner jaw.

WRIGHT, Carroll Davidson, American economist, was born in Dumbarton, N. H., in 1840. He was elected to the Massachusetts senate in 1873, was chief of Labor statistics of Massachusetts from 1873 to 1888 and superintended the United States censuses of 1875 and 1885. From 1885-92 he was United States commissioner of labor. He was appointed by President Roosevelt in 1902 one of the commissioners to arbitrate the strike of the anthracite coal mines. In 1902 he accepted the presidency of Clark university. He was one of the original trustees of the Carnegie institute. His writings include a large number of essays and The Industrial Evolution of the United States and Outlines of Practical Sociology.

WRIGHT, Luke E., American lawyer and administrator, was born in Memphis, Tenn., in 1847. In 1900 he was appointed by President McKinley a member of the Philippine commission. In 1901 on the establishment of civil government in the islands he became vice-governor and acting governor during Governor Taft's absence in the United States and Europe in 1902. In 1903 he became governor of the Philippines.

WRIST. See Hand.

WRIT, in law, a precept under seal in the name of the sovereign, a judge, or other person having jurisdiction, and directed to some public officer or private person, commanding him to do a certain act therein specified. Writs in English law were formerly very multifarious, but a great number have been abolished.

WRITER'S CRAMP, a spasmodic affection in which the patient loses complete control over the muscles of the thumb and the fore and middle finger, so that all attempts to write regularly, and in the severer cases even legibly, are unsuccessful. The various methods of treatment for this trouble (such as surgical operations, the application of electricity, etc.) have not produced very satisfactory results. Called also Scrivener's Palsy.

WRITING, one of the oldest arts, is usually divided into ideographic writing, in which signs represent ideas, and into phonetic writing, in which signs represent sounds. Ideographic writing, in its earliest form, is supposed to have been an attempt to convey ideas by copying objects direct from nature, and this form of it has thus acquired the name of picture writing. After this came symbolical writing, in which abbreviated pictures were used as arbitrary symbols, first of things, and still later of sounds and words. This indicates the transition into phonetic writing, in which the signs may either represent a whole syllable (syllabic writing), or only a single sound, in which case they are called alphabetic. These signs differ in form and use in the various alphabets. Thus the Chinese signs are read in columns from top to bottom, the Mexican picture writing from bottom to top, the Hebrew writing from right to left, and Latin, Greek, and all European languages as well as Sanskrit from left to right. (See Alphabet.) In the Chinese system of writing there is no alphabet, the characters being syllabic and strictly ideographic. Writing was introduced to the western nations by the Phœnicians, and the Phœnician system was based on the Egyptian. The cuneiform writing, another ancient system, invented by the Accadian inhabitants of Chaldea, was also adapted to several languages, as the Assyrian, the Persian, etc., in a variety of ways, ideographic, syllabic, and alphabetic (see Cuneiform Writing). Also of independent origin is the Chinese system. The Egyptians had three distinct kinds of writing, the hieroglyphic, the hieratic, and the enchorial or demotic (see Hieroglyphic), and it was from the second that the Phœnician and other Semitic systems of writing was derived. The leading Semitic forms are the Samaritan or ancient Hebrew, the Chaldee or East Aramaic, the Syriac or West Aramaic, the Kufic or early Arabic, and the Neshki or modern Arabic. At what time writing was introduced into ancient Greece is not known with certainty, but probably between the 10th and the 7th century B.C. From Greece it passed to Sicily and Italy, and thence it was spread as Christianity spread. Like the Semites the Greeks originally wrote from right to left. In mediæval manuscripts a variety of styles were adopted in different epochs and countries. Capitals were not then used as now to distinguish prominent words, but whole manuscripts were written in large or small capitals. Uncial letters, which prevailed from the 7th to the 10th centuries, were rounded capitals with few hair-strokes. Gothic characters, which were merely fanciful deviations from the Roman types, became common in inscriptions from the 13th to the 15th centuries, and were employed in church books from the time of St. Louis. In England a variety of styles called Saxon prevailed in the early middle ages. A mixed style was formed of a combination of Roman, Lombardic and Saxon characters; the Norman style came in with William the Conqueror; and the English court hand, an adaptation of Saxon, prevailed from the 16th century to the reign of George II. There have been various attempts made to introduce systems of phonetic writing, in which each sound should be represented by one invariable sign. Systems of shorthand writing are generally phonetic. See Shorthand.

WRYNECK, a bird allied to and resembling the woodpeckers. It is remarkable for its long tongue, its power

Common wryneck.

of protruding and retracting it, and the writhing snake-like motion which it can impart to its neck without moving the rest of the body. It feeds chiefly on insects.

WURTEMBERG (vûr'tem-berh), or **WURTTEMBERG,** a kingdom of the German empire, between Bavaria, Baden, Hohenzollern, and the Lake of Constance, which separates it from Switzerland; area, 7531 sq. miles; pop. 2,169,434. In the west the Schwarzwald, or Black Forest forms part of the boundary, and the Alb or Rauhe Alp, forming part of the Franconian Jura, covers an extensive tract. The country belongs in large part to the basin of the Rhine, being drained northward into that river by the Neckar, while the Danube flows across the southern districts. In the lower and more favorable districts the fig and melon ripen in the open air, and the vine, cultivated on an extensive scale, produces several first-class wines; corn, wheat, hops, tobacco, and fruit, which is employed in cider making, are largely cultivated. About a third of the country is under forests, which consist chiefly of oaks, beeches, and pine. Of minerals, by far the most valuable are iron and salt, both of which are worked by the government; the others are limestone, gypsum, alabaster, slate, millstones, and potters'-

clay. The manufactures consist chiefly of cotton, woolen, and linen goods, paper, wooden clocks, toys, musical instruments, and chemical products. The government is an hereditary constitutional monarchy, the executive power being lodged in the sovereign, and the legislative jointly in the sovereign and a parliament, composed of an upper and a lower chamber. The latter, which is elected every six years, is composed of ninety-three members. In the Bundesrath Würtemberg is represented by four members, and in the Reichstag by seventeen. Education is generally diffused, and the center of the educational system is the University of Tübingen. Besides Stuttgart (the capical), the chief towns are Ulm, Heilbronn, and Esslingen. It became a member of the German empire on its foundation in 1871.

WURZBURG (vûrts'bụrh), a town in the northwest of Bavaria, on the Main, 60 miles s.e. of Frankfort. The most important edifices are the Romanesque cathedral, erected in the 10th century; the university, with various new buildings; the Julius hospital and school of medicine, and the royal palace. The university library has 200,000 volumes, and in other respects the university, especially in the medical faculty, is well equipped. The manufactures are varied in character. Pop. 75,497.

WY'ANDOTS (in Canada called Hurons), an Indian tribe in North America belonging to the Iroquois family. In the beginning of the 17th century they were settled on the eastern shore of Lake Huron, but in a tribal war (1636) they were nearly exterminated by the Iroquois. The tribe then suffered various vicissitudes. In 1812 a number of their warriors fought on the side of the British. Latterly a small number got a reservation in the Indian territory, but they are now very few in numbers.

WYANDOTTE CAVE, situated 5 miles n. of Leavenworth, Indiana, has been explored for over 20 miles, and rivals the Mammoth Cave in the size of some of its chambers and in its stalagmites and stalactites.

WYATT, Sir Thomas, the first writer of sonnets in the English language, born in 1503, died 1542. His poetical works, which include elegies, odes, and a metrical translation of the Psalms, were published in 1557, along with those of his friend the Earl of Surrey.

WYCHERLEY, William, an English dramatist, born about 1640 at Clive, near Shrewsbury; died 1715. His early years were spent in France, afterward he was educated at Oxford, and entered himself at the Temple; while in 1670 he became known as a fashionable man about town and the author of Love in a Wood. This comedy was followed by the Gentleman Dancing Master, the Country Wife, and the Plain Dealer. Wycherley is the typical dramatist of the Restoration group, in which all the brilliancy and dissoluteness of that school are very prominent.

WYCH-HAZEL, the common name of small trees, with alternate leaves on short petioles, and yellow flowers disposed in clusters in the axils of the leaves, and surrounded by a three-leaved involucrum. They are natives of North America, Persia, or China, and are very different from the true hazel. The Virginian wych-hazel is medicinally important.

WYCLIFFE. See Wickliff.

WYOMING, one of the northwestern states of the Union, is bounded on the n. by Montana, on the e. by South Dakota and Nebraska, on the s. by Colorado and Utah, and on the w. by Utah, Idaho, and Montana. Area, 97,890 sq. miles. It ranks sixth in size among the states. The state is traversed by the main axis of the Rocky mountains, and the greater part of it is a mountainous region. Yellowstone National park, 3600 sq. miles in area, occupies the northwestern corner, and is mainly within the limits of this state. The southwestern portion of the state slopes toward the Pacific ocean, and forms a part of the Green river valley. The eastern part of the state is drained by tributaries of the Missouri, the west-

Seal of Wyoming.

ern by the Snake or Shoshone river, which ultimately joins the Columbia, and in the southwest is the Green river, which eventually discharges its waters into the Colorado. The climate is dry and sunny and as a rule very pleasant and healthful. The winters, though very cold, are not exceedingly severe, as the snowfall is light, and the dry air makes the cold easily endurable. The average annual precipitation for the state is 13 inches, and the soil is generally a light sandy loam, becoming darker and richer in the river valleys. In the arid Red desert region the soil over large areas is strongly impregnated with saline matter and poor in humus. The coal resources of the state are enormous and give promise of playing an important part in the future development of the state. The state has also deposits of gold and silver, copper, iron, soda, some tin and an abundance of limestone. The numerous oil fields have begun to be developed. In the central part of the state a lubricating oil of superior quality is produced. Over one half of the area of the state is adapted to grazing. Wyoming raises more sheep than any other state, the breed is of superior quality and the yield of fleece is very large. Cattle-raising is also very important. The state produces a hardy stock of horses. About 90 per cent of the acreage devoted to crops is given to hay and forage. The climate is too severe for corn, but oats and wheat grow abundantly. Potatoes are a favorite crop. The hardier fruits and vegetables are successfully raised. The total wooded area of the state is estimated at 12,500 sq. miles, two-thirds of which, however, are in the Yellowstone National park and the United States reserves. The manufactures are limited to products for home consumption. The State university, chartered in 1886, is located at Laramie, and is the leading educational institution in the state. There are numerous public schools of all grades and many valuable libraries; also hospitals and charitable institutions. A fur-trading post established at what is now Fort Laramie, in 1834, is believed to have been the first white settlement in Wyoming. The state comprises portions of the territory acquired by the Louisiana purchase of 1803, and of that obtained by the treaty with Mexico in 1848. In 1867 the discovery of gold led to the founding of South Pass City, and the same year Cheyenne was laid out by the Union Pacific Railroad company. The surrounding country, which was without government of any sort, was formed into Laramie county, Dak., and a vigilance committee kept order. The territorial government was organized in 1869, and the same year woman's suffrage was adopted and has been maintained to the present time. The state was admitted to the Union July 10, 1890, as the constitution adopted in November, 1889, had been approved by congress. In national politics the state voted first in 1892 for the republican candidates. The free-silver agitation in 1896 carried it into the democratic column, but in 1900, 1904 and 1908 republican electors were chosen. The largest cities are Cheyenne, the capital, with a population of 16,841, and Laramie, 9865. The population of the state is 125,000.

WYOMING, University of, a coeducational state institution at Laramie, Wyo., founded in 1887 on the federal land grants. Its departments include colleges of liberal arts, agriculture, and mechanical engineering, a school of commerce, a school of mines, and normal, graduate, and preparatory departments. It confers the bachelor's degree in arts, sciences, and pedagogy, and gives the master's degree for advanced work.

X

X, the twenty-fourth letter of the English alphabet. Except when used at the beginning of a word, x in English is a double consonant, and has usually the sound of ks, as in wax, lax, axis, etc.; but when terminating a syllable, especially an initial syllable, if the syllable following it is open or accented, it often takes the sound of gz, as in exist, exhaust, exalt, example, etc. At the beginning of a word it has precisely the sound of z.

XANTHIPPE. See Socrates.

XAVIER, St. Francis (zav'i-er), surnamed the apostle of the Indies, was born in 1506 at the castle of Xavier in Navarre. He fell under the personal influence of Ignatius Loyola, and became one of the first members of Loyola's Society of Jesus. Having been appointed papal nuncio in the Indies, in 1542 he reached Goa, where, and in other parts of India, notably in Travancore, he prosecuted with success his missionary labors. After proselytizing at Ceylon, at Malacca, and in the Moluccas, he visited Japan, where he established a promising mission. In 1552 he started for China in the hope of converting it to Roman Catholic Christianity, but died in 1552, when at no great distance from Canton. He was canonized in 1621.

XEBEC, a three-masted vessel, formerly much used by the Algerine corsairs, and still to a small extent employed in

Xebec of Barbary.

Mediterranean commerce. It differs from the felucca chiefly in having several square sails, as well as lateen sails, while the latter has only lateen sails.

XENOC'RATES, of Chalcedon, Greek philosopher, a disciple of Plato, born 396 B.C., and from 339 until his death, 314 B.C., head of the famous Academy at Athens.

XENOPH'ANES, of Colophon, Greek philosopher, born probably about 330 B.C., for some time settled at Elea, and regarded as the founder of the Eleatic school of philosophy.

XEN'OPHON, the Greek historian and essayist, born at Athens about 430 B.C.; became early a disciple of Socrates. In 401 B.C., partly from curiosity, and in no military capacity, he joined the Greek mercenaries attached to the force led by Cyrus the Younger against his brother Artaxerxes II. After the defeat and death of Cyrus on the field of Cunaxa, the chief Greek officers were treacherously assassinated by the victorious satrap. Xenophon now came to the front, and mainly conducted the famous retreat of the 10,000 through wild and mountainous regions, often harassed by the guerrilla attacks of barbarous tribes, until after a five months' march they reached Trebizond on the Black Sea, February 400 B.C. The expedition and its sequel form the subject of his best-known work, the Anabasis. Xenophon fought on the side of the Lacedæmonians in the subsequent war between Sparta and Persia, and rose from poverty to competence through the ransom which he received from a wealthy Persian nobleman whom he had captured. With Agesilaus, under whom he had already served, he fought at Coroneia (394 B.C.) against his own countrymen, and was on this account formally banished from Athens. For more than twenty years he seems to have lived the life of a country gentleman at Scyllus in Elis, where he is supposed to have written most of his works. After the defeat of the Spartans at Leuctra (371 B.C.), Xenophon was driven from Elis, and is said to have retired to Corinth. He was certainly alive in 357 B.C. Xenophon's principal works, besides the Anabasis, are his Cyropædia, a political and educational romance based on the history of Cyrus the Great; the Hellenica, a history of Greece where Thucydides leaves off, from 411 to 362 B.C.; and the Memorabilia, recollections of Socrates.

XERES. See Jerez.

XERXES. I., King of Persia, famous for his unsuccessful attempt to conquer Greece, was the son of Darius and of Atossa, daughter of Cyrus. He began to reign 485 B.C., and continued his father's preparations for another Persian invasion of Greece. The army which he collected must on the soberest estimate have exceeded a million of men, with a fleet of 1200 sail. Xerxes crossed the Hellespont (480 B.C.), and met with no resistance until he reached the Pass of Thermopylæ. After Leonidas had fallen there with his Spartans, Xerxes pressed forward and burned Athens, which had been forsaken by almost all its inhabitants. He watched from the mainland the naval battle of Salamis (September, 480 B.C.), and fled ignominiously after the overwhelming defeat of his fleet. Xerxes was assassinated 465 B.C. He has been supposed to be the Ahasuerus of the Book of Esther.

XIMENES (hi-mā'nes), Francisco, Spanish cardinal, born in 1437, died in 1517. In 1492 he was appointed confessor to Queen Isabella of Castile, and in 1495 Archbishop of Toledo, distinguishing himself as a reformer of ecclesiastical and monastic abuses. In 1507 he was made a cardinal, and in 1509 he accompanied an expedition, fitted out at his own expense, which captured the Moorish city of Oran. In 1516 King Ferdinand died, leaving Ximenes regent during his grandson Charles's absence in the Netherlands. In 1517 Charles returned to Spain, and, prompted by jealousy of the power of Ximenes, dismissed him. Ximenes died almost immediately afterward. He founded and endowed the University of Alcala de Henares, and is said to have expended half a million of ducats on the famous Complutensian Polyglot.

X-RAYS, certain mysterious rays which emanate from a glass globe from which the air has been exhausted, and through which an electric charge is taking place. The rays were discovered in 1895 by Dr. Roentgen of Würzburg.

The most striking feature of X-rays at first sight is the fact that they penetrate with great ease certain substances which are opaque to light, and, on the other hand, are absorbed by certain substances which are very transparent to light. Thus the X-rays are absorbed largely by glass, but are transmitted most freely by aluminum, by wood, by human flesh, etc. It is owing to these facts that photographs may be obtained of many objects hidden from view, by allowing X-rays to cast a shadow picture of them on a photographic plate. In this manner photographs of the bones of the body, of metal objects contained in wooden boxes, etc., may easily be obtained.

When a careful study is made of the absorption produced in X-rays by various substances, it is found that there is a close connection between the intensity of absorption and the density of the absorbing body; and it is a general law that the greater the density of the body the greater is its absorptive power. This fact is of the utmost importance in the interpretation of photographs of portions of the human body and of other objects taken by the X-rays; the intensity on the photographic plate is in reality a measure of the density of the absorbing substance whose photograph is taken.

X-rays are observed to affect a photographic plate in the same manner as ordinary light, and this fact is made use of in nearly all applications of these rays. It was found also—in fact, it was the fundamental observation of Roentgen—that X-rays excite the fluorescent action of certain substances, so that when excited by the rays they emit light. A careful study has been made of various substances which are affected in this way, and certain of them are used in making so-called fluorescent screens, which may be used to receive the shadows cast by an X-ray tube instead of receiving them on a photographic plate.

Roentgen himself observed that if the X-rays were allowed to enter the eye of an observer who is situated in a room entirely dark, the retina of the eye received a stimulus and light was perceived. It is extremely probable that this is due to the fluorescent action of the X-rays on certain portions of the eye. It was observed, a few months after the discovery of the X-rays, that if the radiation is too intense its action on the skin of an observer might

produce most serious changes and cause what are known as "X-ray burns." X-ray pictures of parts of the body as seen when photographed are due to the power of absorption of different substances of different amounts of the rays in chemical composition, molecular grouping and thickness. When proficient the observer may recognize the presence and extent of tuberculosis, pneumonia, pleurisy, empyema, etc., and from the shortened excusion of the diaphragm the presence of bronchitis may be inferred. Much can be judged concerning the heart, and if displaced, by fluid or gas in the pleural cavities, pneumonia, pleurisy, tuberculosis, aneurism or tumor, or if it is attached or unusually placed or malformed, the condition may be ascertained by the X-ray examination. Aneurisms can be clearly defined when no other method is of service. All new growths as well as enlarged glands within the thorax may be diagnosed. Valuable information concerning the œsophagus, stomach, and other abdominal organs and viscera, the pelvic cavity, measurements of the uterus and extra-uterine pregnancy may be diagnosed. The X-ray is serviceable in the treatment of lupus, eczema, syphilitic lesions, nævus, sycosis, favus, acne, and psoriasis. In many cases of new growths, such as cancer, it has produced amelioration and actual cure. The Röentgen rays are used in surgery to detect the position or presence of foreign bodies, such as bullets, and to recognize fractures, and in cases of fracture it remains preëminent, both to confirm diagonsis and to decide if a fracture has been properly reduced, after it has been put into a retaining apparatus. The X-ray has added greatly to our knowledge of the human skeleton, especially of the joints.

The bones of the hand as shown by X-Rays.

Y

Y, the twenty-fifth letter of the English alphabet, was taken from the Latin, the Latin having borrowed it from the Greek Υ or upsilon. In modern English it is both a consonant and a vowel. At the beginning of syllables and followed by a vowel it is a consonant; in the middle of syllables and at the end of words it is a vowel.

YACHT (yŏt), a light and elegantly fitted up vessel, propelled by either steam or sail, used for pleasure or racing. There are two distinct species of yacht — the mere racer, with enormous spars and sails and deeply-ballasted hull, with fine lines, but sacrificing everything to speed; and the elegant, commodius, well-proportioned traveling yacht, often with steam-propelling machinery, fit for a voyage round the world. A type of yacht much used in America is that with a center-board or sort of movable keel. The practice of yachting as well as the word yacht was derived from the Dutch. The word yacht is found in use in English in Elizabeth's time, and James I had a yacht built for his son Henry early in the 17th century, but it was not till long after that yachting became a favorite pastime with the rich. The pleasure ship is as old as Homer or older. One of the Ptolemys (300 B.C.) had nearly 1000 pleasure ships, some of which were 300 feet long. Modern yachts and yachting dates from 1588 in Britain with the building of the Rat at Cowes, in the Isle of Wight. The first recorded yacht race took place on the Thames in October, 1661. Yacht racing took on new life about 1843 when Queen Victoria began to encourage it by offering valuable cups for prizes. In 1844 the New York Yacht Club was organized and in 1851 it sent to England a specially built yacht, the America, to take part in the yacht races as Cowes. The prize was a silver cup valued at $500, offered to all nations by the Royal Yacht Squadron, for a race around the Isle of Wight. The America won this cup against all nations and brought it back. In 1857 the owner of the America presented the cup to the New York Yacht Club to stand for all time as the symbol of the world's supremacy in yacht racing. The cup was thenceforward called "the America's cup." To get it back British yachtsmen are required to challenge the New York Yacht Club (or the United States, through that organization), and must send the challenger to American waters for the race. See Shamrock I, II, III.

The introduction of compound engines, with their economy of space and fuel, marks the real beginning of steam yachting, and since that time steam yachts have had a wonderful development.

The limit in this class was reached in the Arrow, built in 1900. She is 139.33 feet long and displaces 66 tons, with a record of 40 knots. She is fitted with quadruple-expansion engines that take steam at a pressure of 400 pounds from water-tube boilers.

YAK, a fine large species of ox, with cylindric horns, curving outward, long, pendent, silky hair fringing its sides, a bushy mane of fine hair, and long, silky, horse-like tail; inhabiting, both

Yak.

in the wild and the domesticated state, Tibet and the higher plateaus of the Himalayas; called grunniens (grunting) from its very peculiar voice, which sounds much like the grunt of a pig. It is the ordinary domestic animal of the inhabitants of those regions, supplying milk, food, and raiment, as well as being used as a beast of burden and to draw the plough. The tail of the yak is in great request for various ornamental purposes, and forms an important article of commerce.

YAKUTSK', a province of Eastern Siberia, includes nearly the whole of the basin of the Lena, between which river and its tributary, the Vitim, rich gold mines are worked. Area, 1,517,127 sq. miles. Pop. 243,450.

YALE UNIVERSITY, one of the oldest and largest of American universities, originally a collegiate school established at Saybrook, Connecticut, in 1701. It was removed in 1716 to New Haven, and soon after its name was changed to Yale college, after Elihu Yale (1649–1751), a native who had amassed a fortune in India, and was an early benefactor of the institution. It has four faculties or departments; philosophy, theology, law, and medicine, in all of which its governing body grants degrees. The first of these includes, besides the original academical or arts department of Yale college, a scientific and engineering school, a school of fine arts, and also post-graduate courses. The aggregate number of volumes in all the libraries of the university is over 500,000, of which 1000 were presented in 1730 by Bishop Berkeley. Its buildings are now very extensive, and its funds have greatly increased by private munificence. The teaching staff numbers nearly 400, and the total number of students is over 3,000.

YAM, a large esculent tuber or root produced by various plants growing in the warmer regions of both hemispheres. Yams, when roasted or boiled, form a wholesome, palatable, and nutritious food, and are extensively cultivated in many tropical and sub-tropical countries. The Chinese or Japanese yam contains more nitrogenous and therefore nutritive matter, but less starch, than potatoes. It is hardy in Great Britain and thrives in the United States, but its cultivation is impeded by the great depth to which its roots descend. The tubers of the West Indian yam, one of the species most widely diffused, sometimes attain a weight of 50 lbs.

YAMA, a Hindu god, the judge of the dead, whose good and bad actions are read to him out of a record, and who according to their merits and demerits are sent to the celestial or to the infernal regions. Hindus offer to him daily oblations of water.

YANG-TZE-KIANG, one of the two great rivers of China, is formed by two streams rising in Eastern Tibet, in lat. 26° 30′ n., lon. 102° e., and after flowing east and then south enters the Chinese province of Yunnan. Pursuing a very tortuous course, much of it through most fertile and densely-populated regions, it reaches the great city of Nanking, 200 miles from the sea, where it widens gradually into the vast estuary which connects it with the Yellow sea. Its whole course, under various names, is 2900 miles, and the area of its basin is computed to be 548,000 sq. miles. It is connected by the Grand canal with the Hoang-ho or Yellow river, and is navigable for vessels of considerable draught for 1200 miles from its mouth. By the treaty of Tien-tsin the Lower Yang-tze was opened to European trade; and 700 miles from its mouth is the treaty-port of Hangkow, the great commerical port of Mid-China. The highest port on the river at present reached by steamers is the treaty-port Ichang, 1000 miles from its mouth.

YANKEE, a cant name for Americans belonging to the New England states. During the American revolution the name was applied by the British to all the insurgents; and during the civil war it was the common designation of the federal soldiers by the confederates. In Britain the term is sometimes improperly applied generally to natives of the United States. The most common explanation of the term seems also the most plausible, namely, that it is a corrupt pronunciation of English or of French Anglais formerly current among the American Indians.

YANKEE-DOODLE, a famous air, now regarded as American and national. In reality the air is an old English one, called Nankey Doodle, and had some derisive reference to Cromwell. The really national tune of the whole United States, however, is "Hail, Columbia."

YARD, a British and American standard measure of length, equal to 3 feet or 36 inches, the foot in general being made practically the unit. As a cloth measure the yard is divided into 4 quarters, = 16 nails. A square yard contains 9 square feet, and a cubic yard 27 cubic feet. See Weights and Measures.

YARD, in ships, a long cylindrical piece of timber, having a rounded taper toward each end, slung crosswise to a mast. All yards are either square or lateen, the former being suspended across the masts at right angles for spreading square sails, the latter obliquely. Yards have sheave-holes near their extremities for the sheets reeving through. Either end of a yard, or rather that part of it which is outside the sheeve-hole, is called the yard-arm.

YARKAND', the chief town of the principal oasis of Chinese Turkestan, is situated on the river Yarkand. The inhabitants, chiefly Persians, are keen traders. Pop. about 60,000.—The river rises in the Karakorum mountains, and helps to form the river Tarim, which enters Lob Nor.

YARMOUTH, or, as it is more strictly called, Great Yarmouth, an English seaport, important fishing-station, watering-place, and municipal, parl., and county borough, in the county of Norfolk, 20 miles east of Norwich. It is the great seat of the English herring and mackerel fishery, and also furnishes large quantities of white-fish. The curing of herring as "Yarmouth bloaters" is an important industry. The coast is dangerous, but Yarmouth roads, between the shore and a range of sandbanks, offers a safe anchorage. Pop. 51,250.

YARN, any textile fiber prepared for weaving into cloth. See Thread.

YARRELL, William, an eminent naturalist, was born in London 1784, died 1856. His two works, the History of British Fishes and the History of British Birds are standard authorities.

YATES, Richard, war governor of Illinois, was born in Warsaw, Ky., in 1818. He was thirteen years of age when his family moved to Illinois. He graduated at Illinois college, Jacksonville, studied law, and practiced in Springfield. Elected to the state legislature in 1842, he was sent to congress in 1850, being the youngest member of that body. He was elected governor in 1860, and again in 1862. He was an outspoken opponent of slavery, and was very active in raising volunteers. It was in Gov. Yates's office that Ulysses S. Grant received his first distinct recognition as a soldier. Gov. Yates was elected United States senator and served one term, from 1865 to 1871. He died in 1873. His son, Richard, Jr., was elected governor of Illinois in 1900.

YATAGHAN, a sort of dagger-like saber with double-curved blade, about 2 feet long, the handle without a cross-guard, much worn in Mohammedan countries.

YAWL, a small ship's boat, usually rowed by four or six oars; a jolly-boat; also a sailing boat similar to a cutter, but having a small sail at the stern.

YAWNING, an involuntary opening of the mouth, generally produced by weariness, tedium, or an inclination to sleep, sometimes by hunger, etc. When yawning is troublesome, long, deep respiration, or drawing in the air at long intervals, relieves it.

YAWS, a disease occurring in America, Africa, and the West Indies, and almost entirely confined to the African races. It is characterized by cutaneous tumors, numerous and successive, gradually increasing from specks to the size of a raspberry, one at length growing larger than the rest; core a fungous excrescence; fever slight, and probably irritative merely. It is contagious, and cannot be communicated except by the actual contact of yaw matter to some abraded surface, or by innoculation, which is sometimes affected by flies.

YAZOO RIVER, a river of the United States, 290 miles long, navigable throughout its course, which is entirely in the state of Mississippi, joining the Mississippi river 12 miles above Vicksburg.

YEAR, the period of time during which the earth makes one complete revolution in its orbit, or the period which elapses between the sun's leaving either equinoctial point, or either tropic, and his return to the same. This is the tropical or solar year, and the year in the strict and proper sense of the word. This period comprehends what are called the twelve calendar months, and is usually calculated to commence on 1st January and to end on 31st December. It is not quite uniform, but its mean length is about 365 days, 5 hours, 48 minutes, and 51.6 seconds. In popular usage, however, the year consists of 365 days, and every fourth year of 366. —Lunar year, a period consisting of 12 lunar months. The lunar astronomical year consists of 12 lunar synodical months, or 354 days, 8 hours, 48 minutes, 36 seconds. The common lunar year consists of 12 lunar civil months, or 354 days. The embolismic or intercalary lunar year consists of 13 lunar civil months, and contains 384 days.—

YEAST, the yellowish substance, having an acid reaction, produced during the vinous fermentation of saccharine fluids, rising to the surface, when the temperature of the fluid is high, in the form of a frothy, flocculent, viscid

matter (surface yeast), and falling to the bottom (sediment yeast) when the temperature is low. The ordinary yeast of beer consists of an immense number of minute cells, which constitute a plant called the yeast-plant, which multiplies by budding off other cells, or sometimes by spores. Little is known regarding the genesis of the yeast-plant. Pasteur's researches seem to show that the yeast which forms in grape juice is derived chiefly from certain germs abounding about harvest-time on the grapes, and diffused throughout the atmosphere of breweries and wine-cellars, etc. Yeast is not only generally essential to the production of wine from grape and other fruit juices, and to the manufacture of beer, but it is also an agent in producing the fermentation whereby bread is rendered light, porous, and spongy.

YEDDO. See Tokio.

YELLOW, one of the prismatic colors; the color of that part of the solar spectrum situated between the orange and the green; a bright golden color, the type of which may be found in the field buttercup, which is a pure yellow. United with blue it yields green; with red it produces orange. See Color and Spectrum.

YELLOW-BIRD, a small singing bird common in the United States. The summer dress of the male is of a lemon yellow, with the wings, tail, and fore part of the head black. When caged the song of this bird greatly resembles that of the canary.

YELLOW-FEVER, popularly known as Yellow Jack, a malignant febrile disease, indigenous chiefly to the West Indies, northern coasts of South America, the borders of the Gulf of Mexico, and the Southern United States. It is attended with yellowness of the skin, of some shade between lemon-yellow and the deepest orange-yellow. The symptoms may appear within one or two days after the poison has entered the person's body, or may not occur for six or ten. The attack is sudden, beginning with shivering, headache, pain in the back and limbs, with fever. It is most fatal from May to August; is very contagious, but a sufferer from one attack is nearly safe from a second. It has occasionally appeared in Europe, but does not spread; cold weather kills it.

YELLOW-HAMMER, yellow-hammer, a passerine bird called also yellow-bunting. The head, cheeks, front of the neck, belly, and lower tail-coverts are of a bright yellow; the upper surface is partly yellow, but chiefly brown, the feathers on the top of the back being blackish in the middle, and the tail feathers are also blackish. The yellow-hammer is a resident in Britain, and generally throughout Europe.

YELLOW-PINE, a North American tree, Pinus mitis or variabilis. The wood is universally employed in the countries where it grows for domestic purposes, and is also extensively exported to Britain, and elsewhere.

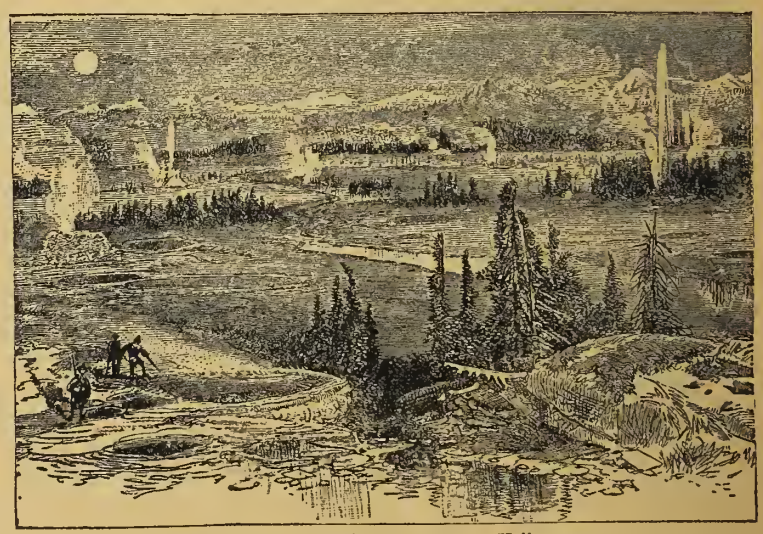
YELLOW RIVER. See Hoang-ho.

YELLOWS, an inflammation of the liver, or a kind of jaundice which affects horses, cattle, and sheep, causing yellowness of the eyes.

YELLOW SEA, an arm of the Pacific ocean, on the northeast coast of China; length, about 620 miles; greatest breadth about 400 miles. It is very shallow, and obtains its name from the lemon-yellow color of its water near the land, caused by mud suspended in the water from the inflow of the rivers Hoang-ho and Yang-tse-kiang.

Yellow hammer.

YELLOWSTONE NATIONAL PARK, a region mainly in Wyoming, United States, which in 1872 was withdrawn from settlement by the United States government to became a park or tract for the recreation of the people. Its area is 3312 sq. miles; its length north and south 61 miles, and its breadth 53. It is accessible by a branch of the Northern Pacific railway. Its surface is mainly an undulating plain, diversified, however, by great mountain ranges, one of which, the Absaroka, a range separating the waters of the Yellowstone river from those of the Big Horn, contains some of the grandest scenery in the United States. The whole region exhibits an endless variety of wild volcanic scenery—hot springs, mud volcanoes, geysers, cañons, waterfalls, etc. The geysers are more remarkable than those of Iceland, and the Grand Geyser in Firehole basin is the most magnificent natural fountain in the world. The Yellowstone lake, one of many, is a magnificent sheet of water, with an area of 150 sq. miles. A large part of the park is covered with forests. Stringent legislation protects the game, with the result that elk, deer, antelope, bear, and bison have taken refuge in it.



The great geyser basin of the upper Yellowstone.

YELLOWSTONE RIVER, a river of the United States, which rises in the Rocky mountains, about lat. 44° n. and lon. 110° w. After a course of about 25 miles it passes through the lake of the same name, and runs northward through the Yellowstone National park. Soon after issuing from the lake the river makes at intervals a series of falls (the last being 300 feet high), and traverses cañons, one of which, the Great Cañon, is 30 miles in length, its steep sides being colored in bright hues and shaped in great variety of fantastic forms. Running in a northeasterly direction the river ultimately joins the Missouri about lat. 48° n., after a course of some 1100 miles. Steamers can ascend it for 300 miles to the mouth of the Big Horn, which is its largest affluent.

YELLOW-THROAT, a small North American singing bird.

YEMEN, a division of Arabia, occupying the southwest angle of the peninsula, and known as Arabia Felix. Estimated area, 70,000 sq. miles; estimated population, about 600,000. The chief potentate is the Imám of Sana, a tributary of Turkey.

YEN, Japanese money of account, equivalent to 98c.

YENIKA'LE, Strait of, connecting the Black sea with the Sea of Azof, is about 20 miles long, and in some parts only 2 miles broad and 2 fathoms deep.

YENISEI (yen'i-si), a great river of Asia, rises in Mongolia, flows northward through Siberia, and after a course of about 2,500 miles enters the bay of the same name in the Arctic ocean.

YENISEISK, a vast province of Eastern Siberia, extending from the Chinese frontier to the Arctic ocean; area, 992,870 sq. miles. It contains rich auriferous deposits. Pop. 559,902.—

The capital, of the same name, is the chief entrepôt for the gold mines of the province and the Siberian fur-trade. Pop. 7050.

YER'KES, Charles Tyson, American capitalist, was born in Philadelphia, Pa., in 1837. From 1861 to 1886 he was in the banking business, making a specialty of dealing in bonds. In 1886 he secured virtual control of the street and elevated railway systems of Chicago. In 1892–93 he was an influential member of the board of directors of the World's Fair in Chicago. In 1892 he endowed the famous Yerkes observatory, which was completed in 1896. He took an active part in the construction and extension of the new London (Eng.) underground railway system. He died in 1905.

YERKES OBSERVATORY, the astronomical observatory of the University of Chicago, located at William Bay, Wis. It is named after its founder, Charles Tyson Yerkes, who supplied the funds for buildings and instruments. This institution contains the largest refracting telescope in existence. It is of 40 inches diameter. It is used principally for the observation of close or faint double stars, the planets and satellites, and spectroscopic work.

YESSO, YEZO, or **JESSO,** the most northerly of the larger Japan islands, has an area of about 35,000 sq. miles, and a pop. of 610,155, including a number of Ainos, a docile aboriginal race. The island is mountainous and volcanic, and is rich in minerals, including coal, gold and silver. Matsmai and Hakodadi are the chief towns.

YEW, an evergreen tree of the genus Taxus, indigenous in most parts of Europe. It is a handsome tree, growing to a height of from 30 to 40 feet, with numerous spreading branches, forming a dense head of foliage. Its trunk is thick, and has been known to attain a circumference of 56 feet. Its fruit is a red berry with green seeds. It used to be frequently planted in churches yards, and its tough elastic wood was extensively used in the manufacture of bows. In

Yew.

our own days, on account of the durability of the timber, and of its hard, compact, close grain, it is much used by cabinet-makers and turners. There are several varieties of it, the Irish yew, which has a more upright growth than the common yew, being esteemed the finest. The American yew is a low prostrate shrub, never forming an erect trunk. It is found in Canada, and the more northern of the United States, and is commonly called ground-hemlock.

YEZD, a city of Persia, province of Faristan, in an oasis in a sandy plain 190 miles southeast of Ispahan. It is noted for its velvet and other silk manufactures, and contains about 4000 fire-worshipers. Pop. about 50,000.

YOKOHA'MA is the most important of the Japanese ports opened by treaty to foreigners, from its proximity to Tokio, the capital of the empire, with which it is connected by a railway 18 miles in length. The foreign settlement consists of well-constructed streets with business establishments. The harbor, a part of the bay of Tokio, is good and commodious, and is much frequented by Japanese and other steamers. Pop. 187,200.

YONGE (yong), Charlotte Mary, English authoress, born at Otterborne, Hants, 1823. Her writings are very numerous, and include the well-known stories The Heir of Redclyffe, The Little Duke, Dynevor Terrace, The Daisy Chain, etc. She has published a work on Christian Names, A Life of Bishop Patteson, and numerous historical works for the young, including her Cameos from English History. She died in 1901.

YONKERS, a town in New York state, on the east bank of the Hudson, 16 miles by railway north of New York City, many of the merchants of which own handsome residences in it. There are manufactures of felt hats, silk, reapers and mowers, carpets, pencils, etc. Pop. 1909 estimated at 73,000.

YONNE, a department of Central France, traversed by the river Yonne, which is navigable throughout it. The granite mountains in the southeast attain a height of 2000 feet. The soil is very fertile, producing large wheat crops, and the vines yield the finest red wines of Lower Burgundy, and the finest of white wines, the well-known Chablis. Auxerre is the capital. Area, 183,475 acres. Pop. 316,047.

YORK, the largest county of England, is bounded on the north by the Tees, separating it from Durham, east by the North sea, south by Lincoln, Nottingham, Derby, and Chester, and west by Chester, Lancaster, and Westmoreland; area, 3,882,848 acres or nearly 6067 sq. miles. Total pop. 3,585,122. In the North is the capital of the whole county, York; Scarborough, a favorite watering-place; and Whitby, famous for its jet. In the East the area under cultivation greatly exceeds that laid down in permanent pasture. Its industrial activity is centered in the great seaport of Hull. In the West the proportion of land laid down in permanent pasture is larger than in any other, being two-thirds of that under cultivation. Leeds produces every variety of woolen goods; Bradford, mixed worsted fabrics and yarns; Dewsbury, Batley, and adjoining districts, shoddy; Huddersfield, plain goods, with fancy trouserings and coatings; and Halifax, worsted and carpets. Barnsley is famous for its linen manufactures, of which Leeds also is a seat, as well as of that of leather. Next to the woolen and other textile industries comes the manufacture of iron and steel machinery, and implements of every description. Leeds is one of the principal seats of all kinds of mechanical engineering, and Sheffield of ironwork and cutlery.

YORK, a cathedral city and archbishop's see, a municipal, county, and parl. borough, and capital of Yorkshire, 188 miles north of London by rail, is situated at the confluence of the Foss and the Ouse. The great object of attraction is the minster or cathedral, the finest in England, which dates from the 7th century, but did not begin to assume its present form till the 12th century, and was not completed till 1472. It is built in the form of a Latin cross with choir, aisles, transepts, a central tower and two western towers; extreme length, 524 feet; breadth, 250; height of central tower, 213 feet. Pop. 77,793.

YORK, capital of York county, Pennsylvania, has historical interest attached to it from the fact that for nearly a year (1777–78) it was the place of meeting of the continental congress. It possesses foundries, manufactories of agricultural implements, etc. Pop. 39,048.

YORK, House of, an English royal house, the rival of that of Lancaster. The House of York was united to the House of Lancaster when Henry VII. married the eldest daughter of Edward IV. The emblem of the Yorkists was a white rose.

YORKTOWN, capital of York county, Virginia, United States, on the right bank of York river, nearly 10 miles from its mouth, was the scene of the surrender of Lord Cornwallis to General Washington, October 19, 1781. In the civil war it was fortified by the confederates, who, having been besieged by General M'Clellan, evacuated it May 4, 1862. Pop. about 1000.

YO-SEMITE (sem'i-te), **VALLEY,** one of the greatest natural wonders of North America, is in Mariposa county, California, about 140 miles southeast of San Francisco and midway between the eastern and western bases of the Sierra Nevada. It is a narrow valley at an elevation of 4000 feet above the sea and is itself nearly level, about 6 miles in length, and varying in width from ½ mile to a mile. On each side rise enormous domes and almost vertical cliffs of granite, one of them called the Half Dome being 4737 feet higher than the river Merced at its base, while the more important waterfalls are the Yosemite and the Bridal Veil. This valley has been added by congress to the state of California, on condition that it shall be kept as a public park or free domain "inalienable for all time."

YOUNG, Brigham, president of the Mormon church, was born in 1801 in the state of Vermont, United States. In 1831 he became a Mormon, and an active preacher of the Mormon doctrine. He was one of the twelve founders of Nauvoo, and after the murder of the prophet, Joseph Smith, and the flight of the Mormons from Nauvoo, Young became their leader, was elected their president on their settling in Utah, and when this was made a territory he was appointed its governor by President Polk. In 1852 he announced that polygamy had been commanded in a special revelation to Joseph Smith, and it was accepted generally by the Mormons of Utah. Young was a man of

great practical ability. Utah flourished under his rule, and he long withstood successfully the efforts of the United States government to establish its authority there. He died in 1877.

YOUNG, Edward, English poet, was the son of a dean of Salisbury, and born in 1681. His first great literary success was his production of a series of satires, issued collectively in 1728 as The Love of Fame, the Universal Passion. Between 1742 and 1744 appeared the work by which chiefly he is remembered, the gloomy but striking Night Thoughts. He died in 1765.

YOUNG, James, an eminent practical chemist, was born at Glasgow in 1811, and died in 1883. Receiving appointments in chemical works at St. Helen's and Manchester, he discovered a method of distilling oil from shale, through which he became the founder of the mineral oil industry of Scotland, besides leading to the development of the petroleum industry in America and elsewhere.

YOUNG, Thomas, M. D., scientist, born of a Quaker family at Milverton in Somersetshire, in 1773. In 1802 he became the colleague of Davy as professor of natural philosophy at the Royal institution, having previously made the discovery of the interference of light, the result of researches which, completed by Fresnel, secured the triumph of the undulatory theory. In 1807 appeared his admirable Lectures on Natural Philosophy. Young preceded Champollion in the discovery of the alphabetic character of certain of the Egyptian hieroglyphs. He died in 1829.

YOUNG, Samuel Baldwin Marks, American soldier, was born in Pittsburg, Pa., in 1840. He served throughout the civil war, attained the rank of colonel in December, 1864, and in April, 1865, was brevetted brigadier-general of volunteers. He attained the rank of colonel of the Third Cavalry in 1897, and in 1898 was made a brigadier-general of volunteers for service in the Spanish-American war. He served under General Shafter in the early part of the Santiago campaign, was promoted to the rank of major-general of volunteers in 1898, and for a time commanded the Second Army Corps. From July, 1899, to March, 1901, he served in the Philippines, was military governor of Northwestern Luzon and commander of the first district of the department of Northern Luzon. In 1903, on the retirement of General Miles, he was promoted to the rank of lieutenant-general. When the new general staff system went into effect in 1903 he became chief of staff of the army.

YOUNG MEN'S CHRISTIAN ASSOCIATIONS, among the first of these was that founded in London in 1844 by Sir George Williams. Its object was the holding of religious meetings in business houses in the center of London. The movement extended, and became one not only for the religious but for the general culture and social well-being of young men engaged in business. The young men's Christian associations, all of which are self-governing while forming an organized union, are now nearly 8000 in number, with a total membership of about one million, the centers being scattered over the world. In the United Kingdom there are about 100,000 members. In the United States there are nearly 2000 associations with a membership of about 450,000.

YOUNG WOMEN'S CHRISTIAN ASSOCIATION, THE WORLD'S, the World's Young Women's Christian Association was formed in 1894. Eleven National associations are now affiliated: Great Britain, United States, Canada, Germany, Italy, France, Norway, Sweden, India, Denmark, and Hungary. The executive committee is composed of a resident membership in London and two representatives from America and other countries. The second World's conference was held in Geneva, Switzerland July, 1902. The American committee was formed in 1886. There are now associations affiliated with the American committee in 552 colleges and 104 cities, with 24 state organizations. Membership of local associations connected with the American committee, 100,252.

YOUNGSTOWN, town in Mahoning county, Ohio, on the Mahoning river 66 miles southeast of Cleveland, in the vicinity of iron ore and coal beds; has rolling-mills, blast-furnaces, and manufactures of machinery, etc. Pop. 52,340.

YPSILANTI, a distinguished Greek family claiming to be descended from the Comneni. Demetrius, born in 1793, entered the Russian service, and joining the Greeks in their war of independence distinguished himself so highly as to be made commander-in-chief of the Greek army after the liberation of Greece from the Ottoman yoke. He died in 1832.

YPSILANTI, a city in Washtenaw co., Mich., 29 miles west by south of Detroit, on the Huron river, and on the Michigan Central and the Lake Shore and Michigan Southern railroads. It is also connected by electric lines with Ann Arbor and Detroit. Population 10,000.

YTTRIA (it'ri-a), the protoxide of yttrium, a white powder, insoluble in water, but soluble in some acids. When ignited it glows with a pure white light.

YTTRIUM (it'ri-um), an earth metal, one of the elements, the basis of yttria; symbol Y, atomic weight 93. Its texture is scaly, and its color grayish-black.

YUCATAN', a peninsula forming the southeastern extremity of Mexico. Before its conquest by the Spaniards it was the seat of a flourishing civilization. It is now for the most part a sparsely cultivated region, whose forests yield excellent timber, cabinet-woods and dye-woods, and which has recently been productive of great quantities of sisal or so-called Yucatan hemp. Five-sixths of the inhabitants are Indians, preserving the speech of their ancestors, whom the Spaniards dispossessed. In 1861 the peninsula, which since 1824 had formed one state in the Mexican confederation, was divided into two: Yucatan, area 29,560 sq. miles, pop. 302,500, capital Merida; and Campeachy, area 25,830 sq. miles, pop. 90,500, capital Campeachy.

YUCCA, a genus of American plants. The species are handsome plants, with white flowers, extremely elegant, but destitute of odor.

YUKON GOLD FIELDS, See Klondike.

YUKON RIVER, a river of Alaska, is formed by the junction of the Lewis and Pelly at Port Selkirk, and flows westward across the territory of Alaska into Bering sea. Its length is some 2000 miles, being one of the largest rivers in North America. In its lower course it is more than 20 miles wide, and throughout it is navigable, at least for small boats. But the deposits of mud and silt where it finally reaches the sea have formed a great delta which renders its lower course unfit for navigation, and prevents vessels at sea from approaching within 60 miles of its many mouths. During three months of the year its waters swarm with salmon, some 80 to 120 lbs., and 5 to 6 feet long. These fish ascend the river for 1200 to 1500 miles. The water from this river flows with such force and volume that the water is fresh ten miles out from the mouth.

Yucca.

YULE, the old English and Scandinavian name for Christmas, still to some extent in use, as in the term yule-log.

YUNNAN', the most southwesterly province of China, is bounded on the south by Annam, Siam, and Burmah, and on the west by Burmah. It is extremely rich in minerals, especially iron and copper, containing also many varieties of precious stones. At least a third of the cultivated land is said to be under the poppy. By the convention of Chefoo in 1876 the establishment of commercial relations between British subjects and Yunnan was conceded by the Chinese government. Estimated area, 122,500 sq miles; estimated pop. 12,000,000.—Yunnan, the capital, is situated in the southeast, and is a busy and prosperous town, with large copper factories, and manufactures of silks and carpets. Pop. 200,000.

Z

Z, the last letter of the English alphabet, is a sibilant consonant, and is merely a vocal or sonant S, having precisely the same sound that s has in wise, ease, please, etc. (See S.) The words in modern English which begin with z are all derived from other languages, mostly from the Greek. When not initial however, we often find it representing an older s in genunie English words, as in blaze, freeze, gaze, graze, etc.

ZACATE'CAS, state of Mexico, belonging to the central table-land, and bounded by the states of Aguas-Calientes, Jalisco, Durango, Cohahuila, Nuevo-Leon, and San Luis Potosi. It is very rich in gold and silver, which are extensively mined. Area, 25,227 sq. miles. Pop. 422,506.—Zacatecas, the capital, 340 miles northwest of Mexico, is the center of one of the oldest and most productive silver-mining districts in the republic. Pop. 46,000.

ZAMBE'SI, the most important river in Southeastern Africa, and the largest flowing into the Indian ocean, has its source in several streams uniting in the far interior. It flows first southeast and then northeast, then curves again to the southeast, and reaches the Indian ocean by several mouths in the Mozambique channel opposite Madagascar. The delta of the Zambesi covers an area of about 25,000 sq. miles, and commences about 90 miles from the coast, a little below the confluence of the main stream with the Shiré. The course of the whole river is about 1600 miles, and it drains an area of 600,000 sq. miles. Its course as a whole is through fertile valleys and wooded plains; but the navigation is interrupted by rapids and cataracts, among the latter being the Victoria falls, which are among the grandest in the world. The navigation of the Zambesi is now free to vessels of all nations.

ZA'MIA, a genus of plants found in tropical America, at the Cape of Good Hope, and in Australia, and partly resemble palms, partly tree-ferns. Kaffir-bread is a common name for the genus in South Africa, where the central part of the stem pith is formed into cakes, baked, and eaten by the natives.

ZANESVILLE, the county town of Muskingum county, Ohio, situated on the Muskingum river, 37 miles south of Cleveland; has rolling-mills, machine-shops, cotton and woolen factories, glass-works, etc. Pop. 28,000.

ZANG'WILL, Israel, a British novelist and man of letters, was born in London, England in 1864. He traveled on lecturing tours in Ireland, Holland, Palestine, and the United States. Among his publications are: Children of the Ghetto, Ghetto Tragedies, The King of Schnorrers, grotesques and fantasies, including "A Rose of the Ghetto," Dreamers of the Ghetto, containing admirable sketches of great Jewish thinkers, as Spinoza and Lassalle; They that Walk in Darkness, and The Mantle of Elijah. Dramatized by the author in 1899, The Children of the Ghetto had a popular reception in New York and London. The Big Bow Mystery, Merely Mary Ann, The Grey Wig. He also wrote a considerable amount of verse.

ZANZIBAR', a sultanate of East Africa, which formerly comprised the whole coast between Magdishu (Magadoxo), about lat. 2° n., and Cape Delgado, lat. 10° 42′ s., with the four islands of Zanzibar, Pemba, Lamu, and Mafia. The continental part of the sultanate has recently become part of British East Africa and German East Africa; while the island and town of Zanzibar, and the island of Pemba, are entirely under British protection. The island (area, 600 sq. miles) is very fertile and well cultivated, being especially suited for the cultivation of cloves, sugar, coffee, cocoa, and various spices, of which there is a considerable export. The population (200,000) is extremely heterogeneous, including Europeans, Arabs, half-caste Portuguese from the Malabar coast of India, and the Suahilis from the mainland.—Zanzibar, the chief town (100,000 inhabitants), on the west side of the island, is the center of trade for the eastern seaboard of Africa, and of missionary and exploring work for the interior. At the instance of the British government the slave-trade has been abolished and slavery brought to an end.

ZEALAND, or **SEELAND,** the largest of the Danish islands, separated from Sweden by the Sound and from Funen by the Great Belt; length, 81 miles, breadth, 65. It produces large crops of corn, and has excellent pasture. It contains the capital of Denmark, Copenhagen. It is the most westerly province of Holland, has the greater part of its surface below the sea-level, and protected by dikes. The soil is fertile, producing rich crops of wheat, flax, and hemp, and much dairy produce is exported. The capital is Middleburg. Area, 689 sq. miles; pop. 198,567.

ZEBRA, a quadruped of Southern Africa, nearly as large as a horse, white, striped with numerous brownish-black bands on the head, trunk, and legs, except on the belly and inside of the thighs. The zebra is extremely difficult

Zebra.

to approach, from its watchful habits and great swiftness of foot. Only in a few instances has it been domesticated. The name has been sometimes applied to the now extinct quagga and the dauw or Burchell's zebra; but they differ from the zebra in having no stripes on the lower limbs, while those on the body are not so black as the true zebra's. The zebra is said to be nearly extinct.

ZEBU, a ruminant of the ox tribe, called also Brahman bull. This quadruped differs from the common ox in having one, or more rarely two, humps of fat on the shoulders, and in having eighteen caudal vertebræ instead of twenty-one. It is found extensively in India, and also in China, Japan, and Africa. Zebus are used as beasts of draught and burden, and occasionally for riding. Their flesh is eaten as an article of food, especially the hump, which is esteemed a great delicacy.

ZEBU. See Cebu.

Zebu.

ZEB'ULUN, was the tenth son of Jacob, and gave his name to one of the twelve tribes of Israel, and to a region of Palestine. At the first census the tribe numbered 57,400, and 60,500 at the second. The territory of the tribe lay in the fertile hilly country to the north of the plain of Jezreel, and included Nazareth.

ZECHARI'AH, or **ZACHARIAH,** the eleventh of the minor prophets, is supposed to have been born in Babylon, and to have been in the first detachment of the exiles who returned to Jerusalem under Zerubbabel and Joshua. He began to prophesy in the second year of Darius Hystaspes, and with his senior contemporary, the prophet Haggai, contributed powerfully by his appeals to the rebuilding of the temple (Ezra vi. 14). Chapters i.–viii. of the prophecies of Zachariah are generally admitted to be his composition. But the two other sections of the book into which critics and commentators have divided it, chapters ix.–xi. and xii.–xiii., have been ascribed by many to a pre-exilic author, partly because both what is said and is not said in them is regarded as irreconcilable with a post-exilic one.

ZEDEKI'AH, the last king of Judah of the line of David. When he was twenty-one years of age Nebuchadnezzar appointed him to succeed his nephew Jehoiachim (whom he carried to Babylon) as king of Judah. He took an oath of allegiance to Nebuchadnezzar, which he afterward broke by entering into an alliance with Egypt. His conduct in so doing was denounced by the prophet Jeremiah, who, as well as Ezekiel, then in Chaldæa, predicted the

approaching fall of Jerusalem, which was besieged by Nebuchadnezzar and taken, B.C. 588. Zedekiah, whose sons were killed in his presence, had his eyes put out, and was carried to Babylon, where probably he died.

ZED'OARY, a plant distinguished, like ginger, for the stimulating and aromatic properties of the root. It is a native of India and China. The roots of several other species are sold under the same name.

ZENA'NA, the name given to the portion of a house reserved exclusively for the females belonging to a family of good caste in India.

ZEND, an ancient Iranian language, in which are composed the sacred writings of the Zoroastrians. It is a member of the Aryan family of languages, and very closely allied to Sanskrit.

ZEND-AVESTA, the collective name for the sacred writings of the Guebers or Parsees, ascribed to Zoroaster, and reverenced as a bible, prayer-book, and sole rule of faith and practice. It consists of several divisions, of which the oldest is written in the primitive Zend language. This partly consists of gâthâs or songs, some of which may contain the actual words of Zoroaster, and are valuable as containing the doctrines he taught. An English translation of the Zend-Avesta has been published.

ZENITH, the vertical point of the heavens at any place, that is, the point right above a spectator's head, and from which a line drawn perpendicular to the plane of the horizon would, if produced, pass through the earth's center, supposing the earth a perfect sphere. Each point on the surface of the earth has therefore its corresponding zenith. The opposite pole of the celestial horizon is termed the nadir. (See Nadir.) The zenith distance of a heavenly body is the arc intercepted between the body and the zenith, being the same as the co-altitude of the body.

ZENO, was emperor of the East from 474 to 491 A.D. One of the chief events of his reign, which was full of vicissitudes, was the permission given by him to Theodoric to dethrone Odoacer, which led to the establishment of the Ostrogothic kingdom in Italy.

ZENO, of Citium, in Cyprus, where he was born, founder of the Stoic school of philosophy, flourished in the first half of the 3d century B.C. Settling in Athens he attached himself to various philosophical sects in succession, until he instituted a doctrine of his own. He taught in the Stoa, a porch adorned with the pictures of Polygnotus, whence his followers were called Stoics, and were sometimes designated "disciples of the porch." His writings are all lost. In his ethical system the nature of moral obligation was recognized as unconditional, virtue as the only good, and vice, not pain, as the only evil. Developed by his successors, Stoicism became the creed of the noblest of the Romans until Christianity was generally accepted. (See Stoics.) The date of his death is uncertain.

ZENO'BIA, Queen of Palmyra, was the wife of its king Odenathus, and accompanied him both in war and in the chase. Gallienus, in return for his services, acknowledged Odenathus as emperor, and when her husband was murdered, 267 A.D., she assumed the sovereignty, conquered Egypt, and called herself Queen of the East. Her ambition provoked the emperor Aurelian to make war on her, and after a stubborn resistance she fell into his power (273 A.D.), and was made to grace his triumph. She was allowed to pass the remainder of her life as a Roman matron. Zenobia was a woman of great courage, beauty, and linguistic accomplishments, and her studies were directed by Longinus.

ZEOLITE (zē'ō-līt), a generic name of a number of minerals which fuse under the blowpipe. They are hydrated double silicates, of which the principal bases are aluminium and calcium.

ZEPHYR, Zephyrus (zef'ėr, zef'i-rus), the west wind; and poetically, any soft, mild, gentle breeze. The poets personify Zephyrus, and make him the most mild and gentle of all the sylvan deities.

ZERE'BA, Zareeba, a word which came into notice in 1884 during British military operations in the Soudan, to denote an inclosure, the sides of which are protected by prickly brushwood from a sudden surprise of the enemy; a fenced encampment.

ZERO, in physics, any convenient point with reference to which quantitatively estimable phenomena of the same kind are compared; such as the point of a graduated instrument at which its scale commences; the neutral point between any ascending and descending scale or series, generally represented by the mark 0. In thermometers the zero of the centigrade and Réaumur scales is the freezing-point of water; in Fahrenheit's scale, 32° below the freezing-point of water. (See Thermometer.) Absolute zero is −273° C., or 273° C. below the freezing point of water, at which temperature any given body is supposed to contain no heat.

ZETLAND. See Shetland.

ZEUGLODON (zū'glo-don), an extinct genus of marine mammals, regarded by Huxley as intermediate between the true cetaceans and the carnivorous seals. They belong to the Eocene and Miocene, one species of the Middle Eocene of the United States attained a length of 70 feet.

ZEUS (zūs), in mythology, the supreme divinity among the Greeks; the ruler of the other gods; generally treated as the equivalent of the Roman Jupiter. He was the son of Cronos and Rhea, brother of Poseidon (Neptune) and Hera (Juno), the latter of whom was also his wife. He expelled his father and the dynasty of the Titans, successfully opposed the attacks of the giants and the conspiracies of the other gods, and became chief power in heaven and earth. See Jupiter.

ZEUSS (tsois), Johann Kaspar, born 1806, died 1856, a native of Bavaria, may be said to have founded Celtic philology with the publication in 1853 of his great work the Grammatica Celtica. In his later years he was a professor at the Bamberg Lyceum.

ZIBET, Zibeth (zib'et), an animal of the same genus as the civet-cat. It is found in Eastern Asia, and in some of the larger islands of the Indian archipelago. It secretes an odiferous substance which resembles that of the civet. It is often tamed by the natives of the countries where it is found, and it inhabits their houses like a domestic cat.

ZILLEH, a town of northeastern Asia Minor, 39 miles southwest of Tokat; with some manufactures, and an annual fair attended by from 40,000 to 50,000 persons. Pop. 15,000.

ZINC, a metal, frequently called spelter in commerce; atomic weight 65. It has a strong metallic luster and a bluish-white color. Its texture is lamellated and crystalline, and its specific gravity about 7. It is hard, being acted on by the file with difficulty, and its toughness is such as to require considerable force to break it when the mass is large. At low or high degrees of heat it is brittle, but between 250° and 300° F. it is both malleable and ductile, and may be rolled or hammered into sheets of considerable thinness and drawn into wire. Its malleability is considerably diminished by the impurities which the zinc of commerce contains. It fuses at 773° F., and when slowly cooled crystallizes in four or six-sided prisms. Zinc undergoes little change by the action of air and moisture. When fused in open vessels it absorbs oxygen, and forms the white oxide called flowers of zinc. Heated strongly in air it takes fire and burns with a beautiful white light, forming oxide of zinc. Zinc is found in considerable abundance in Britain, Austria, Germany, Belgium, Italy, etc. It does not occur in the native state, but is obtained from its ores, which are chiefly the sulphide, or zinc-blende, and the carbonate, or calamine. It has been reported native in small quantities in northeastern Alabama but this discovery needs further confirmation. The oxide of zinc is a fine white powder, insoluble in water, but very soluble in acids, which it neutralizes, being a powerful base of the same class as magnesia. It combines also with some of the alkalies. Several of the salts of zinc are employed in medicine and the arts; as the sulphate, which is used in calico printing, and in medicine as an astringent, a caustic, an emetic, and a tonic; the oxide and the carbonate, used as pigments, etc. Sheet-zinc is largely employed for lining water cisterns, baths, etc., for making spouts, pipes, for covering roofs, and several other architectural purposes. Plates of this metal are used as generators of electricity in voltaic batteries, etc.; they are also employed in the production of pictures, etc., in the style of woodcuts. (See Zincography.) Zinc is much employed in the manufacture of brass (see Brass) and other alloys, and in preparing galvanized iron.

ZINC-BLENDE, native sulphide of zinc, consisting essentially of sulphur and zinc, but often containing a considerable proportion of iron.

ZINC ETCHING, a process for making printing plates on which the lines or dots composing the picture are raised in relief, the blank spaces corresponding to the white paper between them being sunken so as not to receive ink or touch

the paper which is impressed against the lines in the printing press. The subject to be reproduced may be a pen drawing or crayon, or a print from a wood cut, steel engraving, etching on copper, or lithograph. It is necessary that the picture or print shall be in black upon white and that the surface represented shall be in distinct lines or dots. The copy is placed upon a flat board before a photographic camera and a negative made. This negative shows the light and shade of the copy reversed, and, when dry, is coated first with a solution of rubber to make it insoluble in the succeeding treatment, and when this is set, is again coated with a thick pellicle of plain collodion to give it body and strength. It is then, when dry, cut around on the edges and laid in a tray of acidulated water. After a few moments the film loosens from the glass and by careful handling is peeled from its support and laid face down upon another plate of glass. It is thus reversed to bring the print upon metal in the proper position to give direct impression when printed. A plate of zinc, usually about one sixteenth of an inch in thickness and about two inches larger in each dimension than the negative or group of negatives, is carefully polished to a brilliant luster and is coated with a solution of albumen, water, and bichromate of ammonia. The last named is the sensitizing agent and when the plate is dried it is easily affected by light, hence the operation is performed in a room where only a small amount of light is admitted through yellow glass. The negative is placed in a heavy printing frame, the sensitized metal plate laid upon it, and then brought in perfect contact by means of heavy screws or strong levers attached to the back of the frame. The printing requires from three to ten minutes by the electric light or two to four minutes in sunlight. When the metal plate is removed from the frame the image is only faintly visible. The albumen has become insoluble in the lines of the picture, but is easily washed away between them. In order to give the image strength to withstand etching, the plate when removed from the plate holder is rolled up thinly with a greasy ink and a leather roller. It is then laid in a tray of water and after a few moments is developed by rubbing gently with a tuft of cotton. The coating of ink disappears and the picture shows in clear lines of black ink upon the bright metal. It is then dried and dusted over with a fine resinous powder and again cleaned under water, dried and warmed enough to cause the resin to melt. It is then etched in a weak solution of nitric acid until the lines show a slight relief. After drying the plate is dusted with powdered dragon's blood and bruned in, and the process repeated successively from each end and side of the plate, thus protecting all the exposed sides of the lines. It is then ready for another etching. This round of operations is repeated from three to six times, or until the plate is etched to a depth of one-half its thickness in the open spaces. It is then given to the blocker, who with a routing machine, routs out the larger open spaces between the lines to a considerable further depth, saws off the waste zinc from the margins, nails it upon a base of wood or soft metal, trims the edges square and shaves the back down until the block is exactly type high. The block is then taken by the finisher, who removes any roughnesses or defects in the lines, leaving it ready for the printing press.

ZINC-WHITE, oxide of zinc, a pigment now largely substituted for white-lead as being less liable to blacken on exposure; but it has not an equal covering power.

ZINGIS KHAN. See Genghis Khan.

ZINZENDORF (tsin'tsen-dorf), Nicholas Ludwig, Count von, founder of the community of Moravian Brethren, or Herrnhuters, was born at Dresden in 1700. He worked assiduously in cooperation with congenial friends at creating a revival of religion in the Lutheran church. Having given an asylum on his estate to some persecuted religionists from Moravia, and built for them the village of Herrnhut, he settled among them, and by degrees established there a common worship, and a missionary and industrial organization based on the family, not on the monastic system. This association became known throughout the world as the Moravian Brethren. To the extension of its influence Zinzendorf devoted his fortune and his energies, visiting in the course of his journeys England and America. He died in 1760.

ZINZIBERA'CEÆ, a natural order of plants, of which the genus Zinziber (ginger) is the tpye. The species are all tropical plants, or nearly so, the greater number inhabiting various parts of the East Indies. They are generally of great beauty through the development of their floral envelopes and the rich colors of their bracts; but they are chiefly valued for the sake of the aromatic and stimulating properties of the rhizome or root found in ginger, galangal, zedoary, cardamoms, etc.

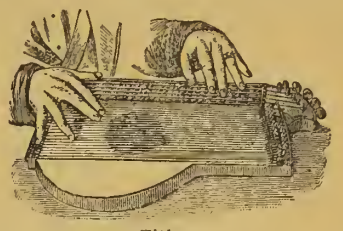
ZION, a mount or eminence in Jerusalem, the royal residence of David and his successors. See Jerusalem.

ZIRCON, a mineral, silicate of zirconium, originally found in Ceylon, and forming one of the gems, being met with either colorless or colored—red, brownish, green, etc. Hyacinth and jargon are varieties.

ZIRCONIA, the oxide of zircon, a hard, white solid, "sticks" of which are sometimes used in the oxyhydrogen flame instead of lime.

ZIRCONIUM, the metal contained in zircon and certain other rare minerals; symbol, Zr; atomic weight 90. It appears to form a link between aluminium and silicon.

ZITHER, ZITHERN (tsit'ĕr, tsit'ĕrn), a stringed musical instrument consisting of a sounding-box pierced with a large circular sound-hole near the middle, the strings, to the number of thirty-one in the more perfect forms of the instrument, being made of steel, brass, catgut, and silk covered with fine silver or copper wire, and tuned by pegs at one end. Five of the strings are stretched over a fretted keyboard, and are used for playing the melody, the fingers of the left hand stopping the strings on the frets, the right-hand thumb armed with a metal ring, striking the strings. These strings, which are tuned in fifths, have a chromatic range from C in the second space on the bass staff to D on the sixth



Zither.

ledger-line above the treble. All the remaining strings, called the accompanying strings, are struck by the first three fingers of the right hand, and being unstopped produce only the single tone to which they are tuned. The instrument while being played rests on a table with the key-board side nearest the performer.

ZOAN, the Tanis of the Greeks and Romans, an ancient Egyptian city, on the right bank of what was the Tanitic bank of the Nile, now only a canal. It was probably the residence of the Pharaoh of the Exodus, and consequently the scene of the "marvelous things" that were done "in the field of Zoan" (Ps. lxxxviii. 12). The temple was one of the grandest in Egypt. Its ruins, buried under mounds, have been explored, and one of the chief curiosities found in them is the Canopus stone, with a trilingual inscription, like that on the Rosetta stone, hieroglyphic, demotic, and Greek, recording a decree of Egyptian princes assembled at Canopus B.C. 254.

ZO'DIAC, an imaginary belt or zone in the heavens, extending about 9° on each side of the ecliptic. It is divided into twelve equal parts called signs. It was marked out by the ancients as distinct from the rest of the heavens because the apparent places of the sun, moon, and the planets known to them were always within it. This, however, is not true of all the planets. See Ecliptic.

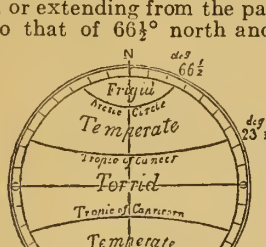
ZODI'ACAL LIGHT, in astronomy, a luminous tract of an elongated triangular figure, lying nearly on the ecliptic, its base being on the horizon, and its apex at varying altitudes, seen at certain seasons of the year either in the west after sunset or in the east before sunrise. It appears with greatest brilliance within the tropics, where it sometimes rivals the Milky Way. The most plausible hypothesis respecting it is that it consists of a continuous disc, probably of meteors revolving round the sun.

ZOLA, Emile, French novelist, born in 1840, the son of an Italian engineer, died in 1902. After working for Paris publishers and writing for the press he attempted fiction. He first became generally known by commencing, in 1871 the famous series of novels entitled Les Rougon Macquart Histoire Naturelle d'une Famille sous le Second Empire. They were based on a theory that it is the duty of the modern novelist to depict human life, in all grades of society, exactly as it is, omitting and softening

nothing, however repulsive and disgusting. L'Assommoir, portraying the evil consequences of drunkenness, was dramatized by Charles Reade as "Drink," and became popular. Among Zola's other novels are Nana, Germinal, L'Œuvre, La Terre, La Bête Humaine, La Débâcle, Dr. Pascal, Lourdes, Rome, Paris, Labor, Money, Fruitfulness.

ZOLLVEREIN (tsol'vĕr-în), the German customs union, the precursor of the present German empire, founded in 1827, and afterward greatly extended through the efforts of the government of Prussia. Its principal object was the establishment of a uniform rate of customs duties throughout the various states joining the union. The territories of the Zollverein now coincide with those of the German empire, and include also Luxembourg.

ZONE, (1) in geography, one of the five great divisions of the earth, bounded by circles parallel to the equator, and named according to the temperature prevailing in each. The zones are: the torrid zone, extending from tropic to tropic, or 23½° north and 23½° south of the equator; two temperate zones, situated between the tropics and polar circles, or extending from the parallel of 23½° to that of 66½° north and south,



Zones of the earth.

and therefore called the north temperate and south temperate zone respectively; and two frigid zones, situated between the polar circles and the north and south poles. (See Climate.) (2) In natural history, the name is given to any well-defined belt within which certain forms of plant or animal life are confined; as the different belts of vegetation which occur as we ascend mountains.

ZO'OID, in biology, an animal organism, not independently developed from a fertilized ovum, but derived from a preceding individual by the process either of fission or gemmation.

ZOOLOGICAL GARDENS, a public garden in which a collection of animals is kept. The gardens of the Zoological society, Regent's park, London, (familiarly termed "the Zoo"), founded in 1828, are probably the finest of the kind in the world. They belong to the Zoological society of London, which was founded in 1826, among its promoters being Sir Humphrey Davy and Sir Stamford Raffles. Of the other chief zoological gardens, the Jardin des Plantes in Paris is the oldest, having been founded in 1794. In the United States there are Zoo's in all the large cities located generally in one of the parks. Those in Central park, New York, and Lincoln park, Chicago, are noteworthy.

ZOOLOGICAL STATIONS, stations or centers which have of late years been established in various parts of the world for the study of zoology. The Stazione Zoologica, at Naples, founded mainly by Dohrn in 1872, is of an international character. Other institutions of the same kind on a smaller scale have been established in various parts of France, Russia, America, and Scotland.

ZOOLOGY. that science which treats of the natural history of animals, or their structure, physiology, classification, habits, and distribution. The term "natural history" has been frequently used as synonymous with zoology; but such a term is obviously of wider signification, and should be used to indicate the whole group of the natural sciences. Zoology is a branch of biological science, constituting, in fact, with its neighbor branch botany, the science of biology. Its study comprehends such branches as the morphology of animals, or the science of form or structure, which again includes comparative anatomy, by which we investigate external and internal appearances, the positions and relations of organs and parts; the development of animals, which treats of the various stages leading from the embryonic to the mature state; the physiology of animals, which includes the study of the functions of nutrition, reproduction, and of the nervous system; classification or taxonomy, which assigns to the various individuals their proper place in the scale of life. A new department has been added in recent times, sometimes called etiology, which investigates the origin and descent of animals, or treats of the evolutionary aspect of zoological science. Various systems of classification have been framed by zoologists. Linnæus divided the animal kingdom into six classes, viz.: Mammalia, Birds, Fishes, Amphibia, Insects, and Worms (Vermes). Cuvier proposed a more scientific arrangement. He divided the animal kingdom into four sub-kingdoms, viz.: Vertebrata, Mollusca, Articulata, and Radiata. Modern classifications have been based chiefly on morphological characters, with the addition of the study of cellular empryology, and the facts of heredity and adaptation. They have been very largely influenced by the theory of evolution, which has induced many naturalists to arrange animal forms as nearly as possible on the lines of descent from which they are believed to have originated. Among those who have modified the classification of Cuvier may be noted Lamarck, Ehrenberg, Owen, Milne-Edwards, Von Siebold, Leuckart, Agassiz, Huxley, Haeckel, Müller, Dohrn, Ray Lankester, and others. Professor Huxley recognizes the following sub-kingdoms: Vertebrata, Mollusca, Molluscoida, Annulosa, Annuloida, Cœlenterata, Infusoria, and Protozoa. Haeçkel's classification gives the broad divisions—Vertebrata, Arthropoda, Echinodermata, Mollusca, Vermes, Zoophyta, and Protozoa.

ZOOSPORE (zō'os-pōr), a spore occurring in cryptogamic plants, which, having cilia or long filiform moving processes projecting from its surface, moves spontaneously for a short time after being discharged from the spore-case of the parent plant.

Zoospores.

ZOROAS'TER, one of the great religious teachers of the East, the founder of what was for centuries the national religion of Persia, and is still adhered to by the Parsees. He has been represented by eminent authorities as purely mythical, but it seems more reasonable to believe that he was a real and historical personage. If this view be accepted, he was probably a native of the east of Iran, but there is great uncertainty as to the time in which he appeared as a religious teacher. He is supposed by some to have been a contemporary of Moses, by others his date is assigned to the 10th century before Christ. His doctrines are to be found in the Parsee scriptures called the Zend-Avesta (which see), and the Gâthâs, which is the oldest part of that work, are declared to contain his authentic utterances. The fundamental idea of his doctrine was the existence, since the beginning, of a spirit of good, Ahurô Mazdaô (Ormuzd), and a spirit of evil, Angrô Mainyush (Ahriman). These two are in perpetual conflict, and the soul of man is the great object of the war. Ormuzd created man free, so that if he allows himself to fall under the sway of Ahriman he is held to be justly punishable. When he dies his good and evil deeds will be weighed against each other, and accordingly as the balance is struck will be sent to heaven or to hell. If they are exactly equal, the soul passes into an intermediate state, and remains there until the day of judgment. Ormuzd is to triumph ultimately, and then there will be one undivided kingdom of God in heaven and on earth. The religion of Zoroaster, when it became that of Iran, was expounded by a widely-spread priesthood, and these provided for it a ritual and ceremonial. Minutely elaborated laws for the purification of soul and body were laid down. They included a prohibition of the burning or the burying of the dead bodies of believers, which, by the Parsees in Bombay and elsewhere, are still left to be devoured by vultures. See Fire-worshippers, Parsees.

ZOUAVES (zwävz), originally mercenaries belonging to a Kabyle tribe. The Zouaves in the pay of the Dey of Algiers were, when Algeria became a French possession, incorporated with the French army there, preserving their Arab dress. Ultimately the native element was eliminated, and the Zouaves became merely French soldiers in the picturesque Arab costume. As such they distinguished themselves in the Crimea and the Franco-Italian war of 1859.

ZUG (tsöh), a central and the smallest undivided canton of Switzerland, bounded by Zürich, Schwyz, Lucerne, and Aargau. Area, 923 sq. miles; pop. 25,045.—Zug, the capital, stands on the north shore of the lake, is 12 miles northeast of Lucerne, with which and with

Zürich it is connected by railway. Pop. 5160.—Lake of Zug, or Zugersee, chiefly in the canton of Zug, 9 miles long north to south, and in breadth from 3 miles to 1 mile. The shores are low in all directions except the south and southeast. In the former direction the Rigi with Mount Pilatus towering behind it, and in the latter the Rossberg, rise in lofty precipices, presenting scenery of a grand description. At the foot of the Rossberg the lake is 1200 feet deep. The fishing, principally pike and carp, is productive.

ZUIDER- (or Zuyder) **ZEE,** a gulf of the North sea, on the coast of Holland; 80 miles long, 40 miles greatest breadth. It was formerly a lake, but was united with the German ocean by inundations in the 12th and 13th centuries. The islands Texel, Vlieland, Terschelling, Ameland, etc., separate it from the North sea, with which it communicates by various channels, the principal being Hellsdeur (Hell-gate), between the Helder and Texel. It is very shallow, and to avoid the difficulties of its navigation to Amsterdam the North Holland canal was constructed. There is a proposal to inclose certain areas of it by means of dams or dikes, and by pumping and drainage to add much reclaimed land to the country.

ZU'LULAND, a South African territory northeast of Natal, and under its government. Inland it is bounded chiefly by Natal, the Tugela being the southern boundary; on the north it has Tongaland, on the east the Indian ocean. The Zulus are a warlike Kaffir tribe, and for a time were formidable to the colonists of Natal, possessing an organized army of considerable numbers. In 1879, under their king Cetewayo, they came into conflict with the British. At first the war was unfortunate for the British, but in July, 1879, a general engagement took place at Ulundi, where the power of the Zulus was crushed. Etshowe is the seat of the resident British commissioner, who is under the governor of Natal. The holding of land by Europeans is not permitted, except for missionary, trading, or mining purposes. The minerals of the country include gold and coal. Area, about 10,000 sq. miles; estimated population, about 200,000.

ZURICH (tsü'rih), a town of Switzerland, capital of the canton of the same name, is beautifully situated at the northern end of the Lake of Zürich, on both sides of the Limmat, and having on the west the Sihl, which joins it immediately below. It has a university and a polytechnic school, both occupying handsome buildings, a Romanesque cathedral of the 11th-13th centuries, town-hall, public library, etc. Its most considerable industry is that of silk, but its cotton-spinning and manufacture of locomotives and machinery are also important. Its inhabitants are mainly German speaking Protestants. Pop. 152,942. It is one of the northern cantons and extends from the lake of the same name to the Rhine, to which its waters are carried by the Thur, Töss, Glatt, and Limmat. There are extensive manufactures of silk and cotton goods. Area, 655 sq. miles. Pop. 430,336.

ZURICH, Treaty of, signed there 10th November, 1859, by the plenipotentiaries of France and Austria, embodied the conditions of the preliminaries of peace agreed to at Villafranca, on the part of Napoleon III. and the Emperor of Austria, Francis Joseph, and closed the Franco-Italian war by Austria's abandonment of her right to Lombardy.

ZUYDER-ZEE. See Zuider-Zee.

ZWICKAU (tsvik'ou), a town of Saxony, 60 miles w.s.w. of Dresden. Zwickau has manufactures of linen and cotton goods, dyes, and chemical products, etc. Pop. 55,829.

ZWINGLI, or **ZUINGLIUS, ULRICH,** the Swiss reformer, was born in the canton of St. Gall. His first overt revolt against the Roman Catholic system was when he was a priest at Einsiedeln (1516), which a supposed miracle-working image of the Virgin had made a favorite resort of pilgrims. He denounced the superstition of pilgrimages so effectively that his sermons were talked of in Rome, and it is said futile offers of promotion were made to bribe him into silence. In 1518 he was appointed preacher in the cathedral of Zürich, where he denounced and baffled a vendor of indulgences. Then followed other denunciations of Roman Catholic practices and doctrines, until Zürich, the authorities of which supported Zwingli, and the people of which adhered to him, became thoroughly Protestant, and adopted a reformed theology, worship, and discipline. Zwingli went further than Luther, whose doctrine of consubstantiation led to what proved on the whole a resultless conference on the subject between him and Luther and Melanchthon at Marburg in 1528. In 1531 the Forest Cantons, which adhered to the Roman Catholic faith, made war upon Zürich, whose troops Zwingli accompanied as chaplain. While in the thick of an engagement at Kappel, near Zürich, he was mortally wounded, October 11, 1531.

ZWOLLE (zwol'lė), a town of Holland, capital of the province of Overijssel. Zwolle communicates with the sea by means of the Willemsvaart canal. Among its industries are ship-building, cotton-manufacture, tanning, rope-making, etc. Three miles from the town is the monastery of the Agnetenberg, where Thomas à Kempis spent most of his life. Pop. 30,848.

ZYMOTIC DISEASES, a name applied to epidemic and endemic, contagious diseases, because they are supposed to be produced by some morbific principle acting on the system like a ferment. This morbific principle or poison gets into the blood in minute particles or germs, which there increase and multiply the disease lasting until the poison has become worked out, or has been destroyed. The chief of these diseases are measles, scarlet-fever, small-pox, typhus, typhoid, diphtheria, hooping-cough, croup, and erysipelas.

This book is given special protection for the reason indicated below:

Autograph	Giftbook
Association	Illustration
✓Condition	Miniature book
Cost	Original binding or covers
Edition	Presentation
Fine binding	✓Scarcity — (no other ed. of this title found)
Format	Subject

L82—5M—1-52—49125

UNIVERSITY OF ILLINOIS-URBANA
031 W399 C001
Webster's American encyclopadia.
3 0112 087526346